

MASK ASSEMBLIES FOR RESPIRATORY THERAPY

BACKGROUND

Field

[0001] The present disclosure relates to mask assemblies for respiratory therapy. In particular, the present disclosure relates to full-face mask assemblies that cover the mouth and nose of the user.

[0002] This application claims priority from provisional applications US63/202988 filed 2 July 2021, US63/218431 filed 5 July 2021, and US63/293305 filed 23 December 2021, the entire contents of each of which are herein incorporated by reference in their entirety.

Description of Related Art

[0003] Obstructive sleep apnea is commonly treated with the application of positive airway pressure (PAP) therapy. PAP therapy involves delivering a flow of gas to a patient at a therapeutic pressure above atmospheric pressure that will reduce the frequency and/or duration of apneas, hypopneas, and/or flow limitations. The therapy is often implemented by using a positive airway pressure device to deliver a pressurized stream of air through a conduit to a patient through a mask assembly positioned on the face of the patient.

[0004] Typical mask assemblies are configured to provide sealed communication with a user's airway by sealing around parts of the user's nose and/or mouth. These mask assemblies are commonly used to provide therapies such as, but not limited to, non-invasive ventilation (NIV) and continuous positive airway pressure (CPAP). CPAP therapy is commonly used to treat obstructive sleep apnea (OSA) and involves providing a constant supply of pressurized air to a user's airway.

[0005] Various problems exist in respect of such full-face mask assemblies. One such problem can be that when the user is side sleeping, one or more parts of the mask assembly can contact the bed or pillow, move and deform, and allow inspiratory gas to leak from the mask assembly, reducing the effectiveness of the therapy, and also

causing noise and draughts. Further such movement and deformation can be uncomfortable for the patient. Another problem is the noise made by the inspiratory gas flowing into the mask assembly during therapy. Such noise can be annoying to the patient and others around the patient. A general problem in providing a mask assembly is to improve patient adherence in wearing the mask assembly when required, and for as long as required.

[0006] A need exists to provide mask assembly with improved comfort and/or sealing performance; and/or to improve on any one or more of the problems mentioned above; and/ or to provide the public with a useful choice.

SUMMARY

[0007] The mask assemblies described herein have innovative aspects, no single one of which is indispensable or solely responsible for their desirable attributes. Without limiting the scope of the claims, some of the advantageous features will now be summarized.

[0008] According to an aspect of this disclosure there is provided a mask assembly comprising

- a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture, and

- a frame comprising an inlet opening configured to connect to a source of pressurised gas,

- the distal inlet aperture of the cushion is removably connected to the inlet opening of the frame, and

- the frame further comprising a pair of upper and a pair of lower headgear connectors;

- the cushion comprising an uppermost portion;

- both pairs of upper and lower headgear connectors being below the cushion uppermost portion.

- [0009] The frame may comprise a central connection portion, configured to be removably connected to the cushion. The inlet opening may be formed in the central connection portion. The frame material at the central connection portion may circumscribe the inlet opening.
- [0010] The cushion may comprise a lower portion adjacent the inlet aperture, and an upper portion defining the top of the cushion.
- [0011] The frame may comprise an elongate frame member extending across the upper portion of the cushion.
- [0012] The elongate member may extend down the side wall.
- [0013] The lower portion of the frame may be wider than the upper portion, the upper and lower portions being spaced apart.
- [0014] The lower portion of the frame may comprise lateral arms which extend laterally outwardly from the inlet opening.
- [0015] The lateral arms may be relatively narrow as compared to the lower portion, the lower portion being relatively wide.
- [0016] The inlet opening may be provided in the relatively wide, lower portion.
- [0017] The lower portion of the frame may extend symmetrically about a central axis of the inlet opening of the frame.
- [0018] The lower portion of the frame may be positioned centrally, when the mask assembly is viewed from the front.
- [0019] The frame inlet opening may comprise a central axis, the central axis extending generally downwardly from the mask assembly.
- [0020] The inlet aperture of the cushion may taper from the bottom of the inlet aperture to the top of the inlet aperture.

- [0021] The inlet aperture of the cushion may comprise a substantially planar base and inwardly inclined sides.
- [0022] The mask assembly may comprise an inlet connector configured to be connected to the frame at the central connection portion, the inlet connector being configured to be connected to the source of pressurised gas.
- [0023] The inlet connector, when connected to the central connection portion, may be received in the inlet opening,
- [0024] The cushion may be mounted on the inlet connector and/or the frame so as to receive gas from the inlet connector. The inlet connector may provide the connection between the cushion and the frame.
- [0025] The inlet connector may form a gas flow path, for the pressurised gas, between the source of pressurised gas and the cushion.
- [0026] The inlet aperture of the cushion may be configured to be fluidly coupled to a breathing gas delivery conduit via the inlet connector.
- [0027] The inlet connector may be configured to be positioned between the cushion and the frame.
- [0028] The inlet connector may comprise an inlet boss configured to receive breathing gas from the gas delivery conduit.
- [0029] The inlet boss may comprise an inlet port.
- [0030] The inlet connector may comprise an outlet boss in fluid communication with both the inlet boss and the cushion.
- [0031] The outlet boss may comprise an outlet port.
- [0032] The inlet boss may comprise a conduit connector configured to connect with the breathing gas delivery conduit.

- [0033] The outlet boss may be larger than the inlet boss.
- [0034] The outlet boss may taper from the bottom of the outlet opening to the top of the outlet opening.
- [0035] The outlet boss may comprise a substantially planar base and inwardly inclined sides.
- [0036] The inlet connector may taper from the bottom to the top of the inlet connector.
- [0037] The inlet connector may comprise a substantially planar base and inwardly inclined sides.
- [0038] The inlet connector may be integrally formed with the cushion, at the cushion inlet aperture.
- [0039] The inlet connector may be permanently mounted on the cushion, at the cushion inlet aperture.
- [0040] The inlet connector may be removably mounted on the cushion, at the cushion inlet aperture.
- [0041] The inlet connector may be integrally formed with the frame, at the frame inlet opening.
- [0042] The inlet connector may be permanently mounted on the frame, at the frame inlet opening.
- [0043] The inlet connector may be removably mounted on the frame, at the frame inlet opening.
- [0044] The inlet opening may be provided in a planar region of the lower portion the frame, the plane of the planar region being less than 30° from horizontal, or less than

20° from horizontal, or less than 10° from horizontal, or less than 5° from horizontal, or substantially horizontal.

- [0045] The planar region may comprise a generally planar base of the frame.
- [0046] The mask assembly may comprise one or more vent holes and/or one or more anti-asphyxia valve openings.
- [0047] The one or more vent holes and/or one or more anti-asphyxia valve openings may be adjacent the inlet opening of the frame.
- [0048] The one or more vent holes and/or one or more anti-asphyxia valve openings, may be above the inlet opening of the frame.
- [0049] The lower portion of the frame may comprise a recess, adjacent the inlet opening, the one or more vent holes and/or one or more anti-asphyxia valve openings being exposed through the recess.
- [0050] The cushion may comprise a transparent region extending around at least part of the inlet aperture of the cushion, the frame being configured such that the transparent region is exposed.
- [0051] The face contacting portion may comprise a sealing surface comprising an inner margin, the inner margin comprising a thin flap.
- [0052] The cushion may be removably mounted on the frame.
- [0053] The cushion may be permanently mounted on the frame.
- [0054] The cushion may comprise a region configured to buckle in a single direction to define a roll of material that extends over the mask frame.
- [0055] The cushion may comprise a distal non-face contacting surface or side, the uppermost portion of the cushion comprising a rolling bridge portion and being pivotable relative to a lower portion of the cushion, the uppermost portion comprising a region of reduced stiffness that is positioned between a first boundary, the first

boundary being defined by a stiffness greater than that in the region of reduced stiffness, the second boundary being defined by a stiffness greater than that in the region of reduced stiffness, wherein when the first boundary is moved toward the second boundary, the region of reduced stiffness buckles to define a roll of material that increases in size away from the face-contacting portion as the first boundary continues to move toward the second boundary to facilitate movement of the rolling bridge portion of the cushion relative to the lower portion of the cushion; wherein the mask frame is configured to overlay an exterior portion of the second boundary such that the roll of material extends over/overlaps with the mask frame.

[0056] The cushion may comprise an interior surface positioned to be adjacent the nose of the patient in use, the interior surface comprising an internally recessed portion, adjacent the patient's nose. This can assist in providing greater clearance between the interior surface of the cushion and the patient's nose. The recessed region may be located centrally directly below a rolling bridge portion of the cushion.

[0057] The frame may be configured to overlay an exterior portion of the side wall; wherein a lateral dimension is defined between the lower or the upper pair of headgear connectors; wherein the frame is configured to be laterally compliant so as to resiliently deform such that the lateral dimension can change when subject to lateral forces.

[0058] The frame may be configured to overlay an exterior portion of the side wall; wherein the distal inlet aperture of the cushion forms a connection with the frame by way of being connected to the inlet opening of the frame; the remainder of the cushion not being connected to the frame.

[0059] The frame may be configured to be:
laterally compliant so as to resiliently deform such that the lateral dimension between the headgear connectors can change when subject to lateral forces; and
longitudinally non-compliant in a longitudinal direction between the proximal face contacting portion and the distal non-face contacting portion, so as to resist deformation of the mask frame when subject to longitudinal forces.

[0060] The distal inlet aperture of the cushion may be removably connected to the inlet opening of the frame, and the frame is configured to overlap an exterior portion of the side wall.

[0061] The frame may comprise:

- a) an upper frame portion;
- b) opposed side frame portions;
- c) a lower frame portion comprising the inlet opening configured to connect to a source of pressurised gas; wherein

a frame aperture is defined between the upper, side and lower frame portions.

[0062] The frame aperture may be configured such that the cushion is exposed through the frame aperture.

[0063] The mask assembly may be fluidly coupled to a breathing gas delivery conduit via an inlet connector, the inlet connector being configured to be positioned between the cushion and the frame, wherein the inlet connector is exposed through the frame aperture.

[0064] The upper, side and lower frame portions may be configured to overlap with and support the cushion, except at the inlet opening and the frame aperture.

[0065] The upper frame portion may comprise an elongate frame element extending laterally across an upper portion of the cushion. The elongate frame element preferably extends below an uppermost portion of the cushion.

[0066] The upper frame portion may comprise a rear surface which rests against the upper portion of the cushion, when the cushion is mounted on the frame. The upper portion of the cushion may comprise an elongate recess extending laterally across the cushion, the upper frame portion being received in the elongate recess. The upper frame portion may be received in the elongate recess with an interference fit. The elongate recess may be configured to resiliently deform to receive the upper frame portion.

[0067] The upper frame portion may comprise a plurality of elongate frame elements. In one example the upper frame portion comprises two elongate frame elements. The elongate frame elements may be spaced apart so as to define a space between them. The cushion may be exposed through the space. The elongate frame elements may be configured such the space between the elongate frame elements can be adjusted. One, both or each elongate frame element may be movably mounted on the frame, so as to be movable towards or away from another elongate frame element. One, both or each elongate frame element may be pivotally mounted on the frame. One both or each elongate frame element may be resiliently deformable, or comprise one or more resiliently deformable regions, such that an elongate frame element may be resiliently deformed towards or away from another elongate frame element. One, both or each elongate frame element may be adjustable between two or more predetermined positions.

[0068] The frame may be configured to deform the cushion when the cushion is mounted on the frame. For example, the frame may laterally squeeze the cushion. In other words, the lateral width of the cushion when mounted on the frame, may be less than the lateral width of the cushion when not mounted on the frame.

[0069] The opposed side portions of the frame may define a lateral distance between them which is less than the corresponding lateral distance between side walls of the cushion. In particular, the lateral distance between cushion engaging surfaces of the opposed side portions may be less than the distance between the side walls of the cushion. For example, the lateral distance between the opposed side portions may be 90% of the lateral distance between side walls of the cushion.

[0070] The distal inlet aperture of the cushion may form a connection with the frame by way of being connected to the inlet opening of the frame, the remainder of the cushion not being connected to the frame.

[0071] The cushion may be cantilevered on the frame by way of the distal inlet aperture of the cushion being connected to the inlet opening of the frame.

[0072] The inlet opening may be provided at a lower part of the frame; wherein

the distal inlet aperture of the cushion is removably connected to the inlet opening of the frame; and

the side wall comprises a proximal portion adjacent the face contacting portion and a distal portion distal from the face contacting portion, the frame being configured to overlap the proximal portion of the cushion side wall and to expose the distal portion of the cushion side wall.

[0073] The distal inlet aperture of the cushion may be removably connected to the inlet opening of the frame; and
the inlet opening is provided at a lower part of the frame; and
the frame comprises an elongate frame member extending up the side wall and across an upper portion of the cushion.

[0074] The mask assembly may comprise lateral arms on either side of the inlet opening that extend towards the face contacting portion of the cushion; and
an elongate frame member that extends over an upper portion of the cushion and connects the lateral arms.

[0075] Each headgear connector may comprise an elongate post on which a respective headgear strap is configured to be mounted; wherein the elongate posts of the lower pair of headgear connectors are inclined relative to the elongate posts of the upper pair of elongate posts.

[0076] The cushion may comprise a rolling bridge portion which is pivotable about a pivot axis relative to the remainder of the cushion towards or away from the user; wherein each headgear connector is positioned such that headgear straps overlap the pivot axis when connected to the headgear connectors.

[0077] The frame may comprise opposed lateral arms extending laterally outwardly from the frame, each lateral arm comprising at least one of the headgear connectors onto which a respective headgear strap can be connected; wherein

the lateral arms each extend laterally outwardly from the frame in a direction substantially aligned with a primary force vector from the headgear straps when connected to the headgear connectors.

[0078] The frame may comprise at least one guide surface configured to guide headgear straps, during connection of the headgear straps to the headgear connectors, toward a respective headgear connector.

[0079] The mask assembly may comprise one or more headgear clips configured to connect the lower and /or upper headgear straps to the lower and/or upper headgear connectors.

[0080] The headgear clip may comprise a clip body. The clip body may be elongate. The clip body may comprise a slot to receive a headgear strap. The clip body may comprise a hook to receive a post of a headgear connector.

[0081] The headgear clip may comprise an extension configured to extend away from the body and support the side wall of the cushion. This can assist in reducing or preventing cushion blow out.

[0082] Each headgear clip may comprise a pair of upper and lower extensions. The extensions may be shaped to match the shape of the side wall of the cushion, and each comprise a support surface against which the cushion side wall can rest. The lower extension may comprise a distal end which terminates below the lateral frame arm. The upper extension may comprise a distal end which terminates adjacent upper headgear connector.

[0083] The cushion may comprise an exterior indent configured to be positioned adjacent a headgear clip when the cushion is mounted on the frame and a headgear strap is mounted on an upper or lower headgear connector, the indent providing clearance between the cushion and the headgear clip.

[0084] The indent may be provided on a region of the side wall of the cushion adjacent a headgear connector of the frame. The indent may be adjacent a lower

headgear connector. The indent may be adjacent an upper headgear connector. A plurality of indents may be provided. Each indent may be elongate and may extend rearwardly. The indent may be configured such that the headgear clip can move relative to the lower headgear connector, without contacting the cushion.

[0085] The cushion may be provided with one or more support ribs, internally of the cushion, to resist deformation of the cushion.

[0086] The cushion may comprise a pair of laterally spaced apart, generally laterally extending support ribs, one on each side of the central vertical axis of the cushion. The laterally extending support ribs may be located in an upper portion of the cushion adjacent a rolling bridge portion of the cushion.

[0087] The cushion may comprise a pair of laterally spaced apart, generally vertically extending support ribs. Each rib may be at or adjacent a pivot axis of a rolling bridge portion of the cushion. These vertically extending support ribs can limit by how much the nose portion of the cushion balloons under pressure, reducing the likelihood of eye leaks for example.

[0088] Each rib may be integrally formed with the cushion, from the same cushion material.

[0089] The lower part of the frame may comprise a pair of finger grips, the inlet opening being intermediate and adjacent the finger grips.

[0090] The inlet opening may be provided at a lower part of the frame; wherein the inlet opening comprises a central axis, the central axis extending generally downwardly.

[0091] The central axis of the frame inlet opening may extend through the cushion inlet aperture and below the lower part of the frame.

[0092] The inlet opening may be provided at a lower part of the frame, the inlet opening comprising a central axis; wherein the assembly further comprises an anti-asphyxia valve comprising a valve member and a valve outlet opening, the valve

being movable between a closed position in which the valve member closes the valve outlet opening, and an open position in which the valve member opens the valve outlet opening, the valve outlet opening comprising a valve outlet central axis; wherein

the inlet opening central axis is substantially perpendicular to the valve outlet central axis.

[0093] The lower part of the frame may comprise a vent hole and a diffuser configured to cover the vent hole.

[0094] The mask assembly may comprise an anti-asphyxia valve provided between the cushion inlet aperture and the frame inlet opening, and comprising a valve member and a valve outlet opening, the valve member being movable between a closed position in which the valve member closes the valve outlet opening, and an open position in which the valve member opens the valve outlet opening, the valve outlet opening comprising a valve outlet opening central axis; wherein the valve member is pivotally mounted above the frame inlet opening, the valve outlet opening being positioned above the valve member and above the frame inlet opening, the valve member pivoting away from the cushion to close the valve outlet opening, the valve outlet opening being provided on a forward part of the assembly.

[0095] In embodiments of this disclosure a mask assembly is provided which comprises:

- a) a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture;
- b) a frame comprising at least one headgear connector and an inlet opening configured to connect to a source of pressurised gas; wherein
- c) the cushion is mounted on the frame.

[0096] For example, the distal inlet aperture of the cushion may be removably connected to the inlet opening of the frame. The frame may be configured to overlap an exterior portion of the side wall of the cushion.

[0097] In embodiments of this disclosure a mask assembly is provided which comprises a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture, and a frame comprising an inlet opening configured to connect to a source of pressurised gas.

[0098] The distal inlet aperture of the cushion may be removably connected to the inlet opening of the frame. The frame may comprise a pair of upper and a pair of lower headgear connectors. The cushion may comprise an uppermost portion, both pairs of upper and lower headgear connectors being below the cushion uppermost portion.

[0099] The mask assembly may further comprise a headgear assembly. The headgear assembly may comprise a strap assembly including at least a pair of opposing side straps, and/or a rear strap or panel, and/or a crown strap. The pair of opposing side straps may be a pair of opposing upper side straps; the headgear assembly further comprising a pair of opposing lower side straps. A free end of each of the upper straps may be coupled to the mask frame. A free end of each of the lower side straps may be coupled to the mask frame.

[0100] According to an aspect of this disclosure there is provided a mask assembly comprising a mask seal and a mask frame, the mask seal comprising a region configured to buckle in a single direction to define a roll of material that extends over the mask frame.

[0101] According to an aspect of this disclosure there is provided a mask assembly comprising a mask seal mounted on a mask frame, the mask frame comprising an elongate member extending over an apex of the mask seal, the mask seal comprising a region configured to buckle in a single direction to define a roll of material that extends over the elongate member.

[0102] According to an aspect of this disclosure there is provided a mask assembly comprising a mask seal mounted on a mask frame, the mask frame defining an upper frame portion and a lower frame portion and an opening therebetween, the mask seal being exposed through the opening, the mask seal comprising a region configured to buckle in a single direction to define a roll of material that extends over the upper frame portion.

[0103] According to an aspect of this disclosure there is provided a mask assembly comprising a mask seal and a mask frame, the mask seal comprising a region configured to buckle in a single direction to define a roll of material that extends over the mask frame, the mask frame comprising at least one headgear connector.

[0104] According to an aspect of this disclosure there is provided a mask assembly comprising

- a) a cushion with a face contacting portion and a non-face contacting portion, a side wall extending between the face contacting portion and the non-face contacting portion, and
- b) a frame comprising an inlet opening configured to connect to a source of pressurised gas; wherein
the cushion comprises an upper portion adjacent the nasal bridge of the user;
the upper portion of the cushion comprising a rolling bridge portion which is pivotable towards or away from the nasal bridge of the user to overlap with the mask frame.

[0105] According to an aspect of this disclosure there is provided a mask assembly comprising a mask cushion and a mask frame, the mask seal comprising a proximal face-contacting portion and a distal non-face contacting portion, the mask cushion further comprising an upper portion and a lower portion, the upper portion comprising a rolling bridge portion and being pivotable relative to the lower portion, the upper portion comprising a region of reduced stiffness that is positioned between a first boundary, the first boundary being defined by a stiffness greater than that in the

region of reduced stiffness, the second boundary being defined by a stiffness greater than that in the region of reduced stiffness, wherein when the first boundary is moved toward the second boundary, the region of reduced stiffness buckles to define a roll of material that increases in size away from the face-contacting portion as the first boundary continues to move toward the second boundary to facilitate movement of the rolling bridge portion of the mask cushion relative to the lower portion of the mask cushion,

wherein the mask frame is configured to overlay an exterior portion of the second boundary such that the roll of material extends over the mask frame.

[0106] The roll of material may be movable relative to the lower portion of the mask cushion to extend partially over an upper portion of the mask frame.

[0107] The roll of material may be movable relative to the lower portion of the mask cushion to extend fully over the upper portion of the mask frame.

[0108] The upper portion of the mask cushion may be pivotable relative to the lower portion of the mask cushion about a pivot axis, the pivot axis being substantially mid-way up the mask cushion, when the mask cushion is viewed from the side.

[0109] The roll of material may extend over a forward margin of the upper portion of the mask frame.

[0110] The region of reduced stiffness may buckle in a single direction to define the roll of material.

[0111] The frame may form part of the second boundary.

[0112] The frame may comprise at least one headgear connector and an inlet opening configured to connect to a source of pressurised gas; the cushion comprising an inlet aperture; wherein

the inlet aperture of the cushion is removably connected to the inlet opening of the frame; and

the frame is configured to overlap an exterior portion of the side wall.

[0113] The frame may comprise any one or more of:

- a) an elongate frame member extending across the upper portion of the cushion.
- b) an upper frame portion;
- c) opposed side frame portions;
- d) a lower frame portion comprising the inlet opening configured to connect to a source of pressurised gas;
- e) a frame aperture defined between the upper, side and lower frame portions, and configured such that the cushion is exposed through the frame aperture.

[0114] An inlet aperture of the cushion may form a connection with the frame by way of being connected to an inlet opening of the frame, the remainder of the cushion not being connected to the frame.

[0115] According to an aspect of this disclosure there is provided a mask assembly comprising:

a cushion with a proximal face contacting portion and a distal non-face contacting portion;

a side wall extending between the face contacting portion and the non-face contacting portion;

a mask frame, wherein the cushion module is mounted on the frame;
wherein;

the mask frame comprising a pair of laterally opposed headgear connectors spaced part by a lateral dimension, wherein

the mask frame is configured to be laterally compliant so as to resiliently deform such that the lateral dimension between the headgear connectors can change when subject to lateral forces.

[0116] According to an aspect of this disclosure there is provided a mask assembly comprising:

a cushion with a proximal face contacting portion and a distal non-face contacting portion,

a side wall extending between the face contacting portion and the non-face contacting portion;

a mask frame, wherein the cushion module is mounted on the frame;
wherein;

the mask frame comprising a pair of laterally opposed headgear
connectors spaced part by a lateral dimension, wherein

the mask frame is configured to be longitudinally non-compliant in a
longitudinal direction between the proximal face contacting portion and the
distal non-face contacting portion, so as to resist deformation of the mask
frame when subject to longitudinal forces.

[0117] According to an aspect of this disclosure there is provided a mask assembly
comprising

a cushion with a proximal face contacting portion and a distal non-face
contacting portion,

a side wall extending between the face contacting portion and the non-
face contacting portion;

a mask frame, wherein the cushion module is mounted on the frame;
the mask frame comprising a pair of laterally opposed lower headgear connectors,
and a pair of laterally opposed upper headgear connectors; wherein;
the frame is configured to deform under lateral forces to the extent that, when in a
deformed condition:

- a) elongate elements of the upper headgear connectors, which are inwardly
inclined when viewed from the front in a rest condition of the mask assembly,
are displaced to a position in which the elongate elements are substantially
parallel; and/or
- b) the lower headgear connectors are displaced to a position in which the lower
headgear connectors are each aligned with a respective outer margin of an
inlet opening of the frame; and/or
- c) the lower headgear connectors are displaced to a position in which the lower
headgear connectors are each aligned with a respective laterally outermost
margin of a central portion of the frame; and/or
- d) the lower headgear connectors are displaced to a position in which the lower
headgear connectors are each aligned with a respective weakened region or
living hinge adjacent a central portion of the frame; and/or

- e) the lower headgear connectors are displaced to a position in which the lateral distance between the lower headgear connectors decreases by a distance in the range of 140mm to 20mm, or 140 to 60mm, or 110 to 40mm.

[0118] According to an aspect of this disclosure there is provided a mask assembly comprising:

- a cushion with a face contacting portion and a non-face contacting portion,
- a side wall extending between the face contacting portion and the non-face contacting portion, and
- a frame configured to overlay an exterior portion of the side wall of the cushion; wherein the frame comprises:
 - a pair of headgear connectors, and
 - a lateral dimension defined between the pair of headgear connectors;wherein the frame is configured to be laterally compliant so as to resiliently deform such that the lateral dimension can change when subject to lateral forces.

[0119] According to an aspect of this disclosure there is provided a mask assembly comprising:

- a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture, and
 - a frame comprising a pair of headgear connectors, a lateral dimension defined between the pair of headgear connectors;
- the distal inlet aperture of the cushion being connected to the frame;
- the remainder of the cushion not being connected to the frame;
 - wherein the frame is configured to be laterally compliant so as to resiliently deform such that the lateral dimension can change when subject to lateral forces.

[0120] The frame may be configured to be longitudinally non-compliant in a longitudinal direction between the proximal face contacting portion and the distal non-face contacting portion, so as to resist deformation of the mask frame when subject to longitudinal forces.

- [0121] The frame may be configured to be relatively laterally compliant and relatively longitudinally non-compliant.
- [0122] The frame may comprise a plurality of frame regions, at least one frame region being weakened relative to at least one other frame region.
- [0123] The plurality of frame regions may comprise at least one frame region which is relatively thin in one dimension to encourage bending of the frame about a first predetermined axis and relatively wide in another dimension to resist bending about a second predetermined axis.
- [0124] The frame may comprise an upper portion which extends laterally across a portion of the mask assembly, the upper portion comprising a weakened region configured to allow bending of the upper portion.
- [0125] The upper portion may be arcuate, wherein bending of the upper portion increases or decreases radius of arc.
- [0126] At least one of the frame regions may comprise a living hinge.
- [0127] A weakened frame region may be adjacent the inlet.
- [0128] According to an aspect of this disclosure there is provided a mask assembly comprising:
a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture, and
a frame comprising at least one headgear connector and an inlet opening configured to connect to a source of pressurised gas; wherein
the distal inlet aperture of the cushion is removably connected to the inlet opening of the frame, and
the frame is configured to overlap an exterior portion of the side wall.
- [0129] The frame may comprise a lower portion, the inlet opening being provided in the lower portion, the lower portion overlapping with the cushion.

[0130] The frame may comprise an upper portion, the upper portion overlapping an upper portion of the cushion.

[0131] The frame may comprise any one or more of:

- a) an elongate frame member extending across an upper portion of the cushion.
- b) an upper frame portion;
- c) opposed side frame portions;
- d) a lower frame portion comprising the inlet opening configured to connect to a source of pressurised gas;
- e) a frame aperture defined between the upper, side and lower frame portions, and configured such that the cushion is exposed through the frame aperture.

[0132] An inlet aperture of the cushion may form a connection with the frame by way of being connected to an inlet opening of the frame, the remainder of the cushion not being connected to the frame.

[0133] According to an aspect of this disclosure there is provided a mask assembly comprising a resilient deformable cushion, and a frame, wherein the frame comprises:
an upper frame portion;
opposed side frame portions;
a lower frame portion comprising an inlet opening configured to connect to a source of pressurised gas; wherein
a frame aperture is defined between the upper and lower frame portions, and configured such that the cushion is exposed through the frame aperture.

[0134] The upper frame portion may extend across an upper portion of the cushion.

[0135] The cushion may comprise a region configured to buckle in a single direction to define a roll of material that extends over the upper frame portion, the upper frame portion extending across the upper portion of the cushion adjacent the region configured to buckle. In another embodiment, the upper frame portion may extend across the upper portion of the cushion so as to be spaced below the region configured to buckle.

- [0136] The upper frame portion may comprise a forward margin, the cushion being exposed below the forward margin.
- [0137] At least one of the upper frame portion, side frame portions, and lower frame portion may comprise an elongate frame member.
- [0138] The inlet opening may comprise a central axis, the central axis extending generally downwardly.
- [0139] The central axis of the frame inlet opening may extend through the cushion inlet aperture and below the lower part of the frame.
- [0140] The inlet aperture of the cushion may form a connection with the frame by way of being connected to an inlet opening of the frame, the remainder of the cushion not being connected to the frame.
- [0141] According to an aspect of this disclosure there is provided a mask assembly comprising:
a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture, and
a frame comprising at least one headgear connector and an inlet opening configured to connect to a source of pressurised gas,
the distal inlet aperture of the cushion forming a connection with the frame by way of being connected to the inlet opening of the frame, the remainder of the cushion not being connected to the frame.
- [0142] According to an aspect of this disclosure there is provided a mask assembly comprising:
a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture, and

a frame comprising at least one headgear connector and a central connection portion configured to connect to a source of pressurised gas;

the distal inlet aperture of the cushion forming a connection with the frame by way of being connected to the central connection portion of the frame, the remainder of the cushion not being connected to the frame.

[0143] The cushion may be cantilevered on the frame by way of the distal inlet aperture of the cushion being connected to the inlet opening and/or central connection portion of the frame.

[0144] The frame may be configured to overlap an exterior portion of the side wall of the cushion.

[0145] The frame may be configured to be laterally compliant so as to resiliently deform such that a lateral dimension of the mask assembly can change when subject to lateral forces.

[0146] The frame may comprise any one or more of:

- a) an elongate frame member extending across an upper portion of the cushion.
- b) an upper frame portion;
- c) opposed side frame portions;
- d) a lower frame portion comprising the inlet opening configured to connect to a source of pressurised gas;
- e) a frame aperture defined between the upper, side and lower frame portions, and configured such that the cushion is exposed through the frame aperture.

[0147] According to an aspect of this disclosure there is provided a mask assembly comprising:

a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture, and

a frame comprising at least one headgear connector and an inlet opening configured to connect to a source of pressurised gas; wherein the inlet opening is provided at a lower part of the frame;

the distal inlet aperture of the cushion is removably connected to the inlet opening of the frame, and

the side wall comprises a proximal portion adjacent the face contacting portion and a distal portion distal from the face contacting portion, the frame being configured to overlap the proximal portion of the cushion side wall and to expose the distal portion of the cushion side wall.

[0148] The frame may comprise an upper frame portion that extends across an upper portion of the cushion.

[0149] The upper frame portion may comprise a forward margin, the cushion being exposed below the forward margin.

[0150] The inlet opening may comprise a central axis, the central axis extending generally downwardly.

[0151] The central axis of the frame inlet opening may extend through the cushion inlet aperture and below the lower part of the frame.

[0152] The frame may comprise any one or more of:

- a) an elongate frame member extending across an upper portion of the cushion.
- b) an upper frame portion;
- c) opposed side frame portions;
- d) a lower frame portion comprising the inlet opening configured to connect to a source of pressurised gas;
- e) a frame aperture defined between the upper, side and lower frame portions, and configured such that the cushion is exposed through the frame aperture.

[0153] At least one of the upper frame portion, side frame portions and lower frame portion may comprise an elongate frame member.

[0154] According to an aspect of this disclosure there is provided a mask assembly comprising:

a cushion with:

a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture, and
a frame comprising an inlet opening configured to connect to a source of pressurised gas; wherein
the distal inlet aperture of the cushion is removably connected to the inlet opening of the frame, and
the inlet opening is provided at a lower part of the frame; and
the frame comprises an elongate frame member extending up the side wall and across an upper portion of the cushion.

[0155] According to an aspect of this disclosure there is provided a mask assembly comprising:

a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture; and
a frame comprising an inlet opening configured to connect to a source of pressurised gas; wherein
the distal inlet aperture of the cushion is removably connected to the inlet opening of the frame, and
the inlet opening is provided at a lower part of the frame; and
the frame comprises an elongate frame member extending across an upper portion of the cushion; the elongate frame member comprising an apex portion, the apex portion of the elongate frame member comprising an elongate narrowed portion.

[0156] The elongate frame member may comprise distal end portions adjacent the side wall, the apex portion being between the distal end portions, the elongate narrowed portion being between the distal end portions and the central apex portion.

[0157] The cushion may comprise a nasal bridge portion, the elongate frame member being spaced below the nasal bridge portion.

- [0158] The elongate frame member may comprise a forward margin, the cushion being exposed in front of the forward margin.
- [0159] The inlet opening may comprise a central axis, the central axis extending generally downwardly.
- [0160] The central axis of the frame inlet opening may extend through the cushion inlet aperture and below the lower part of the frame.
- [0161] The frame may comprise a frame aperture defined between the upper, side and lower frame portions, and configured such that the cushion is exposed through the frame aperture.
- [0162] According to an aspect of this disclosure there is provided a mask assembly comprising:
a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture;
and
a frame comprising:
at least one headgear connector;
an inlet opening configured to connect to a source of pressurised gas;
lateral arms on either side of the inlet opening that extend along the side wall towards the face contacting portion of the cushion; and
an elongate frame member that extends over an upper portion of the cushion and connects the lateral extensions/arms.
- [0163] The elongate frame member may be arcuate.
- [0164] The cushion may comprise an apex portion, the elongate frame member extending at or adjacent the apex portion.
- [0165] The lateral arms and the elongate frame member may be configured to define a frame aperture which exposes the cushion.

- [0166] The frame aperture may expose the cushion above the inlet opening of the frame, above the lateral extensions/arms and below the elongate connecting member.
- [0167] The upper frame portion may comprise a forward margin, the cushion being exposed forward of the forward margin.
- [0168] The frame may comprise a lower portion, the inlet opening being provided in the lower portion, the inlet opening comprising a central axis, the central axis extending generally downwardly.
- [0169] The central axis of the frame inlet opening may extend through the cushion inlet aperture and below the lower part of the frame.
- [0170] An inlet aperture of the cushion may form a connection with the frame by way of being connected to an inlet opening of the frame, the lateral arms of the frame not being connected to the cushion.
- [0171] According to an aspect of this disclosure there is provided a mask assembly comprising:
- a cushion with a face contacting portion and a non-face contacting portion,
 - a side wall extending between the face contacting portion and the non-face contacting portion; and
 - a frame comprising an inlet opening configured to connect to a source of pressurised gas; wherein
- the mask frame comprises:
- an upper pair and a lower pair of headgear connectors onto which a respective headgear strap is configured to be mounted;
 - the lower pair of headgear connectors being inclined relative to the elongate posts of the upper pair of elongate posts, such that the headgear straps are non-parallel when connected to the headgear connectors.

[0172] According to an aspect of this disclosure there is provided a mask assembly comprising:

- a cushion with a face contacting portion and a non-face contacting portion;
- a side wall extending between the face contacting portion and the non-face contacting portion; and

- a frame comprising an inlet opening configured to connect to a source of pressurised gas; wherein

the mask frame comprises:

- an upper pair and a lower pair of headgear connectors, each headgear connector comprising an elongate post on which a respective headgear strap is configured to be mounted;

- the elongate posts of the lower pair of headgear connectors being inclined relative to the elongate posts of the upper pair of elongate posts.

[0173] The elongate posts of the lower pair of headgear connectors may be substantially vertical when the mask assembly is viewed from the front.

[0174] The elongate posts of the upper pair of headgear connectors may be inwardly inclined when the mask assembly is viewed from the front.

[0175] The elongate posts of the lower pair of headgear connectors may be substantially vertical when the mask assembly is viewed from the side.

[0176] The elongate posts of the upper pair of headgear connectors may be forwardly inclined when the mask assembly is viewed from the side.

[0177] The lower pair of headgear connectors may be at a widest part of the frame.

[0178] The widest part of the frame may comprise a lower portion of the frame, an upper portion of the frame being narrower than the lower portion of the frame, when the mask assembly is viewed from the front.

- [0179] The elongate posts of the upper pair of headgear connectors may be at or below an upper portion of the cushion.
- [0180] According to an aspect of this disclosure there is provided a mask assembly comprising:
- a cushion with a face contacting portion and a non-face contacting portion, a side wall extending between the face contacting portion and the non-face contacting portion; and
 - a frame comprising an inlet opening configured to connect to a source of pressurised gas;
 - the cushion comprising a rolling bridge portion which is pivotable about a pivot axis relative to the remainder of the cushion towards or away from the user;
- wherein
- the mask frame comprises:
 - a pair of laterally opposed headgear connectors onto which respective headgear straps can be connected;
 - each headgear connector being positioned such that the headgear straps overlap the pivot axis when the headgear straps are mounted on the headgear connectors.
- [0181] The pair of laterally opposed headgear connectors may comprise an upper pair of headgear connectors, the mask assembly further comprising a lower pair of headgear connectors.
- [0182] The elongate posts of the upper pair of headgear connectors may be at or below an upper portion of the cushion.
- [0183] The pair of headgear connectors may be inwardly inclined when the mask assembly is viewed from the front.
- [0184] The upper pair of headgear connectors may be forwardly inclined when the mask assembly is viewed from the side.
- [0185] Each headgear connector may comprise an elongate post.

[0186] According to an aspect of this disclosure there is provided a mask assembly comprising:

a cushion with a face contacting portion and a non-face contacting portion, a side wall extending between the face contacting portion and the non-face contacting portion; and

a frame comprising an inlet opening configured to connect to a source of pressurised gas;

the inlet opening being provided at a lower part of the frame; wherein the mask frame comprises:

opposed lateral arms extending laterally outwardly from the lower part of the frame, each lateral arm comprising a headgear connector onto which a respective headgear strap can be connected; wherein the lateral arms each extend laterally outwardly from the lower part of the frame in a direction substantially aligned with a primary force vector from the headgear straps when connected to the headgear connectors.

[0187] The inlet opening may comprise a central axis, the lateral arms extending away from the inlet opening at an angle inclined relative to the central axis.

[0188] The angle may be between 10 and 80°, or between 10 and 80°, or between 15 and 70°, or between 20 and 60°, or between 25 and 55°, or is substantially 45°.

[0189] The headgear connectors may be positioned sufficiently rearwardly on the frame to be adjacent the face contacting portion of the cushion.

[0190] The headgear connectors may be positioned sufficiently rearwardly to be aligned with a rolling bridge portion of the cushion.

[0191] The headgear connectors may be positioned nearer the rear of the mask assembly than the front of the mask assembly.

- [0192] The cushion may comprise an inlet aperture, the inlet aperture forming a connection with the frame by way of being connected to an inlet opening of the frame, the lateral arms of the frame not being connected to the cushion.
- [0193] According to an aspect of this disclosure there is provided a mask assembly comprising:
- a cushion with a face contacting portion and a non-face contacting portion,
 - a side wall extending between the face contacting portion and the non-face contacting portion; and
 - a frame comprising an inlet opening configured to connect to a source of pressurised gas; wherein
- the inlet opening is provided at a lower part of the frame,
 - the mask frame comprising a pair of opposed headgear connectors onto which respective headgear straps can be connected; wherein
 - the mask frame comprises at least one guide surface configured to guide the headgear straps, during connection to the headgear connectors, toward a respective headgear connector.
- [0194] The guide surface may extend forwardly of the headgear connector.
- [0195] The frame may comprise a central portion, the inlet opening being provided in the central portion, and lateral portions laterally outward of the central portion, the lateral portions each comprising a guide surface.
- [0196] The guide surface may comprise a portion of a leading or forward edge of the frame.
- [0197] Each headgear connector may be elongate, the or each guide surface being elongate, a longitudinal axis of each guide surface intersecting a longitudinal axis of a respective headgear connector.
- [0198] The guide surface may comprise upper and lower guide surfaces that are relatively inclined to define a guide mouth converging on the headgear connector element

[0199] According to an aspect of this disclosure there is provided a mask assembly comprising

a cushion with a face contacting portion and a non-face contacting portion, a side wall extending between the face contacting portion and the non-face contacting portion; and
a frame comprising an inlet opening configured to connect to a source of pressurised gas;

the inlet opening being provided at a lower part of the frame; wherein

the inlet opening comprises a central axis, the central axis extending generally downwardly and below the lower part of the frame.

[0200] According to an aspect of this disclosure there is provided a mask assembly comprising:

a cushion with a face contacting portion and a non-face contacting portion;
a side wall extending between the face contacting portion and the non-face contacting portion; and
a frame comprising an inlet opening configured to connect to a source of pressurised gas;
the inlet opening being provided at a lower part of the frame,
the inlet opening having a central axis which extends generally vertically; wherein
the cushion comprises an inlet aperture, the central axis of the frame inlet opening extending through the cushion inlet aperture.

[0201] According to an aspect of this disclosure there is provided a mask assembly comprising:

a cushion with a face contacting portion and a non-face contacting portion;
a side wall extending between the face contacting portion and the non-face contacting portion; and

a frame comprising an inlet opening configured to connect to a source of pressurised gas;
the inlet opening is provided at a lower part of the frame, the inlet opening comprising a central axis; wherein
the assembly further comprises an anti-asphyxia valve comprising a valve member and a valve outlet opening, the valve being movable between a closed position in which the valve member closes the valve outlet opening, and an open position in which the valve member opens the valve outlet opening, the valve outlet opening comprising a valve outlet central axis,
the inlet opening central axis being substantially perpendicular to the valve outlet central axis.

[0202] According to an aspect of this disclosure there is provided a mask assembly comprising:

a cushion with a face contacting portion and a non-face contacting portion;
a side wall extending between the face contacting portion and the non-face contacting portion; and
a frame comprising an inlet opening configured to connect to a source of pressurised gas;
the inlet opening is provided at a lower part of the frame; wherein
the lower part of the frame comprises a pair of finger grips, the inlet opening being intermediate and adjacent the finger grips.

[0203] According to an aspect of this disclosure there is provided a mask assembly comprising:

a cushion with a face contacting portion and a non-face contacting portion;
a side wall extending between the face contacting portion and the non-face contacting portion; and
a frame comprising an inlet opening configured to connect to a source of pressurised gas; wherein
the inlet opening is provided at a lower part of the frame,

the mask assembly further comprising a vent hole and a diffuser configured to cover the vent hole.

[0204] The diffuser may be removably mounted on the mask assembly.

[0205] The diffuser may comprise a diffuser frame. The diffuser may be integral with the diffuser frame.

[0206] The diffuser may be configured to clip onto the frame.

[0207] The diffuser may be mounted on the frame. The diffuser may be integral with the frame. The diffuser may be mounted on a separate component, the separate component being mounted on the frame.

[0208] The mask assembly may comprise an array of vent holes.

[0209] The frame may comprise two opposed pairs of headgear connectors:

- a) a lower pair of headgear connectors; and
- b) an upper pair of headgear connectors.

[0210] The headgear connectors may all be located below a nasal bridge portion of the mask assembly.

[0211] The mask assembly may comprise a lower, central portion that is a different colour to the remainder of the frame and/or cushion.

[0212] The diffuser may be configured such that part of the colour of lower, central portion is exposed, when the diffuser is mounted on the mask assembly.

[0213] The frame may comprise a recess when viewed from the front, the diffuser being exposed through the recess.

[0214] The recess may comprise inclined side margins. The recess may be substantially 'V' shaped. The angle of the side margins of the recess may be substantially the same as the longitudinal axis of headgear straps of the mask assembly, when the headgear straps are connected to the headgear connectors.

[0215] According to an aspect of this disclosure there is provided a mask assembly comprising:

- a cushion with a face contacting portion and a non-face contacting portion;

- a side wall extending between the face contacting portion and the non-face contacting portion; and

- a frame comprising an inlet opening configured to connect to a source of pressurised gas:

- the inlet opening is provided at a lower part of the frame;

- the cushion comprising an inlet aperture in the non-face contacting portion;

- an anti-asphyxia valve being provided between the cushion inlet aperture and the frame inlet opening, and comprising a valve member and a valve outlet opening, the valve member being movable between a closed position in which the valve member closes the valve outlet opening, and an open position in which the valve member opens the valve outlet opening, the valve outlet opening comprising a valve outlet opening central axis; wherein

- the valve member is pivotally mounted above the frame inlet opening, the valve outlet opening being positioned above the valve member and above the frame inlet opening, the valve member pivoting away from the cushion to close the valve outlet opening, the valve outlet opening being provided on a forward part of the assembly, the inlet opening central axis being substantially perpendicular to the valve outlet central axis.

[0216] According to another aspect of this disclosure there is provided a mask assembly comprising:

- a cushion with a proximal face contacting portion, a distal inlet aperture; and a side wall between the proximal face contacting portion and the distal inlet

aperture; and

a frame comprising:

at least one headgear connector;

a central portion, the central portion being substantially rigid;

a pair of lateral arms, each arm extending away from a respective side of the central portion; the lateral arms being flexible along at least a portion of their length; and

a connecting frame member that connects the lateral arms at a position distal from the central frame portion.

[0217] The central portion of the frame may comprise any one or more of:

- a) an inlet opening configured to connect to a source of pressurised gas;
- b) a bias vent hole;
- c) a diffuser;
- d) an anti-asphyxiation valve;
- e) an outlet configured to fluidly couple with the distal inlet aperture of the cushion.

[0218] The connecting frame member may comprise an elongate band.

[0219] The connecting frame member may connect the lateral arms at a position above and behind the central portion.

[0220] The connecting frame member may extend over an upper portion of the cushion.

[0221] The connecting frame member may be integral with the lateral arms.

[0222] The connecting frame member may be flexible along at least a portion of its length.

[0223] The connecting frame member may comprise a central region, the central region being flexible.

- [0224] The central region may be an apex region of the frame.
- [0225] The cushion may comprise an upper portion adjacent the nasal bridge of the user; the upper portion of the cushion comprising a rolling bridge portion which is pivotable towards or away from the nasal bridge of the user to overlap with the central region of the connecting frame member.
- [0226] The connecting frame member may comprise end regions, distal from the central region, the end regions being less flexible than the central region.
- [0227] The central region may comprise a relatively thin and/or weakened structure, and the end regions comprise a relatively thick and/or reinforced structure.
- [0228] The central region may comprise a first width, and the end regions comprise a second width, the second width being greater than the first width.
- [0229] At least one headgear connector may comprise a pair of headgear connectors, the pair of headgear connectors being at or adjacent the end regions.
- [0230] The central portion, lateral arms, and connecting frame member may together define a closed aperture of the frame.
- [0231] The mask assembly may be arranged such that, from the side, an acute angle is formed between the lateral arms and the connecting frame member.
- [0232] According to an aspect of this disclosure, a mask assembly may be provided comprising any one or more of the above features, wherein the cushion comprises an upper portion comprising a region of reduced stiffness that is positioned between a first boundary, the first boundary being defined by a stiffness greater than that in the region of reduced stiffness, the second boundary being defined by a stiffness greater than that in the region of reduced stiffness, wherein when the first boundary is moved toward the second boundary, the region of reduced stiffness buckles in a single direction to define a roll of material that increases in size away from the face-contacting flange or side as the first boundary continues to move toward the second

boundary to facilitate movement of the rolling bridge portion of the mask seal relative to the lower portion of the mask seal .

[0233] In embodiments of this disclosure a mask assembly is provided which comprises:

- a) a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture;
- b) a frame comprising at least one headgear connector and a central connection portion configured to connect to a source of pressurised gas; wherein the cushion is mounted on the central connection portion of the frame.

[0234] The frame may comprise a frame clip configured to removably mount the frame on another component of the mask assembly. The central connection portion may comprise the frame clip.

[0235] The frame clip may be configured to be mounted only on one component of the mask assembly. The frame clip may therefore be configured not to be mounted on any other component of the mask assembly.

[0236] The frame may be configured to be removed from the other components of the mask assembly, without disassembly of those other components.

[0237] The cushion of the mask assembly may be configured to be removably mounted on a component of the mask assembly. The mask assembly may be configured such that the cushion can be removed from the component of the mask assembly without removing the mask frame from the mask assembly. The mask assembly may be configured such that the cushion can be removed from the component of the mask assembly without removing any other component from the mask assembly.

[0238] The mask assembly may comprise an inlet connector configured to be connected to a gas delivery conduit to deliver breathable gas into the inlet connector

and into the cushion, the frame clip being configured to be removably mounted on the inlet connector. The cushion may be configured to be removably mounted on the inlet connector. The inlet connector may comprise an inlet port configured to be connected to the gas delivery conduit. The inlet connector may comprise an outlet port configured to be connected to the cushion. A gas flow path may be defined between the inlet port and the outlet port, through the inlet connector.

- [0239] The mask assembly may comprise a conduit connector cuff of a gas delivery conduit configured to deliver breathable gas into the cushion, the frame clip being configured to be removably mounted on the conduit connector cuff.
- [0240] The frame clip may be removably mounted on both the inlet connector and the conduit connector cuff.
- [0241] The frame clip may comprise opposed ends between which is defined a mouth configured to receive another part of the mask assembly to mount the frame clip on the mask assembly.
- [0242] The frame clip may comprise a front wall, and side walls extending rearwardly from the front wall, each side wall comprising an opposed end, the opposed ends being spaced apart to define the mouth at the rear of the frame clip.
- [0243] The frame clip may comprise a rear wall, and side walls extending forwardly from the rear wall, each side wall comprising an opposed end, the opposed ends being spaced apart to define the mouth at the front of the frame clip.
- [0244] The inlet port of the inlet connector may comprise a central inlet axis.
- [0245] The mask assembly may be configured such that the central inlet axis is substantially vertical when the mask assembly is viewed from the front.
- [0246] The inlet port may be considered to occupy a plane, the plane of the inlet port being substantially horizontal, or inclined less than 30° from the horizontal, in normal use, when the mask assembly is viewed from the front.

- [0247] The central inlet axis may extend generally downwardly, when the mask assembly is viewed from the side. The central inlet axis may be inclined less than 30° from the vertical, when viewed from the side.
- [0248] The central inlet axis may be substantially vertical when the mask assembly is viewed from the side.
- [0249] The frame clip may be configured to be mounted on the mask assembly in a mounting direction substantially orthogonal to the central inlet axis.
- [0250] The frame clip may be configured to be mounted on the mask assembly in a mounting direction that intersects the central inlet axis.
- [0251] The mounting direction may be from front to rear of the mask assembly. The mounting direction may be from rear to front of the mask assembly.
- [0252] At least one portion of the frame clip may be resiliently deformable, and configured to resiliently deform during mounting of the frame on the mask assembly. Preferably the at least one portion of the frame clip is configured to resiliently deform such that that opposed ends of the frame clip may deform away from each other to increase the size of the mouth of the frame clip, during mounting of the frame clip on the mask assembly. The frame clip may resiliently expand during mounting of the mask frame onto the remainder of the mask assembly, and then contract when fully mounted on the mask assembly.
- [0253] The frame clip may be configured to be spaced from the remainder of the frame, such that forces applied to the remainder of the frame are decoupled from the frame clip. This decoupling may assist in minimising, for example, forces applied to the headgear connector(s) via headgear tension from deforming the frame clip and inadvertently disconnecting the frame clip from the mask assembly. The frame clip may comprise opposed sides that extend away from the mask frame, the opposed sides being spaced from the lateral arms and/or headgear connectors of the frame. The lateral arms and/or headgear connectors of the frame may be configured to deflect towards and/or away from the mask frame, without deforming the frame clip.

[0254] The frame clip may extend from the central connection portion of the frame. The frame clip may extend only from the central connection portion, such that the remainder of the frame clip is spaced from the remainder of the mask frame.

[0255] The opposed ends of the frame clip may extend outwardly away from the central connection portion. In such a configuration the opposed ends may comprise elongate fingers that define guide surfaces configured to guide the mask assembly during assembly. The elongate fingers may function as grips for the user to assist in expanding the frame clip during assembly and disassembly.

[0256] The opposed ends of the frame clip may function as locking formations configured to engage with another component of the mask assembly to resist removal of the frame clip from the mask assembly.

[0257] The frame clip may comprise a single integral component. The frame clip may comprise a plurality of components. The frame clip may comprise a pair of frame clip components the front and rear of the frame clip each comprising a respective mouth. Each of the frame clip components may comprise an end of a lateral arm of the frame, the other end of each lateral arm comprising a headgear connector.

[0258] The frame clip may be configured to be mounted on, and received in, a corresponding recess on the mask assembly. The recess may be provided for example on the inlet connector or on the conduit connector cuff, or may be on both components. The recess may be bounded by a lower radially outwardly extending formation, such as an annular flange, to resist movement of the frame clip in a generally downward direction. The recess may be bounded by an upper radially outwardly extending formation, such as an annular flange, to resist movement of the frame clip in a generally upward direction.

[0259] The mask assembly may comprise one or more guide surfaces configured to engage the frame clip during mounting of the frame clip on the mask assembly to guide the frame clip into a fully mounted position on the mask assembly.

- [0260] The one or more guide surfaces may comprise inclined surfaces. The guide surfaces may be inclined generally upwardly in the mounting direction. The guide surfaces may comprise upper and lower guide surfaces, the guide surfaces converging in the mounting direction.
- [0261] The one or more guide surfaces may be provided on the inlet connector. The one or more guide surfaces may be alternatively or additionally provided on the conduit connector cuff.
- [0262] The mask assembly may comprise an end stop configured to abut the frame clip to limit the amount by which the frame clip can be moved onto the mask assembly.
- [0263] The frame clip may be configured to resist or prevent relative rotation between the mask frame and the remainder of the mask assembly.
- [0264] The frame clip may comprise at least one substantially straight or flat wall portion. The frame clip may comprise a plurality of substantially straight or flat wall portions. The substantially straight or flat wall portion may be configured to engage with one or more corresponding straight or flat portions of the mask assembly.
- [0265] The frame clip may comprise a side wall, the straight or flat wall portion comprising a portion of the side wall.
- [0266] The frame clip may comprise a pair of laterally opposed straight or flat side wall portions.
- [0267] The side wall portions may be substantially straight and parallel.
- [0268] The side wall portions may be substantially straight and non-parallel. For example, the side wall portions may converge as the side wall portions extend away from the mouth.
- [0269] The frame clip may comprise one or more internal walls that define an inlet opening of the frame, the opening being non-circular.

[0270] The frame clip may comprise a front or rear wall, the straight of flat wall portion comprise a portion of the front or rear wall.

[0271] The frame clip may comprise an engagement formation, configured to engage a corresponding engagement formation on the mask assembly. The engagement formations may comprise a combination of one or more recesses on one component configured to receive one or more protrusions on another component. The engagement formations may be located laterally of the frame clip. The engagement surfaces may be provided on, or located adjacent, the frame clip. The engagement formations may be located on an interior surface of the frame clip. The engagement formations may be provided on an exterior surface of the frame clip. The exterior surface may be provided on a tab that projects forwardly of the frame clip. The engagement formations may engage with an interference fit.

[0272] The mask assembly components may comprise:

- a) a mask frame comprising at least one headgear connector; and
- b) a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture; and
- c) an inlet connector configured to receive breathable gases from, and be connected to, a gas delivery conduit, the inlet connector being in fluid communication with the cushion.

[0273] The mask assembly may be configured such that the mask frame, and in particular the frame clip, is sandwiched between other components of the mask assembly.

[0274] The frame clip may be sandwiched between:

- a) An exterior surface of the inlet connector and a front surface of the mask assembly;
- b) An exterior surface of the inlet connector and an interior surface of the distal inlet aperture;

- c) An exterior surface of the inlet connector and an interior surface of the cushion;
- d) An exterior surface of the inlet connector and a front surface of the cushion.

[0275] The frame clip may be substantially flush with a front surface of the mask assembly. The frame clip may be spaced behind a front surface of the mask assembly.

[0276] The frame clip, when fully mounted on the mask assembly, may be connected to one of, or a combination of:

- a) The cushion.
- b) The distal aperture of the cushion.
- c) The inlet connector.
- d) The gas delivery conduit.

[0277] The cushion may be provided with a latching formation, such as a tooth, configured to engage with a latch on the mask frame, and when so engaged to retain the mask frame on the cushion.

[0278] The cushion may comprise a pair of laterally spaced apart teeth. The teeth may extend laterally.

[0279] The latch may be provided on the frame clip. The latch may comprise a button to release the latch from engaging the tooth. The button may comprise a tab on the frame clip, the tab being movable relative to the frame clip between latching and non-latching positions.

[0280] The mask frame may comprise a second latch configured to releasably engage the inlet connector.

[0281] The second latch may be provided on the tab such that the tab functions as a dual function button. A first, for example front part, of the tab, can be pressed to move each tab in a first direction relative to the inlet connector and cushion to

disengage the tooth, and release the cushion from the mask frame. A second, for example rear, part of the tab can be moved in the opposed direction, to disengage the second latching formation from the inlet connector, and release the frame from the inlet connector.

[0282] The tab may provide a single button with which the user can:

- a) release the cushion from the frame whilst retaining the frame on the inlet connector; or
- b) release the inlet connector from the frame, whilst retaining the frame on the cushion.

[0283] According to an aspect of this disclosure there is provided a mask assembly comprising:

- a) a mask frame comprising at least one headgear connector;
- b) a cushion; and
- c) an inlet connector configured to receive breathable gases from, and be connected to, a gas delivery conduit, the inlet connector being in fluid communication with the cushion.

[0284] The cushion may comprise any one or more of:

- a) a proximal face contacting portion;
- b) a distal inlet aperture;
- c) a side wall between the proximal face contacting portion and the distal inlet aperture.

[0285] The mask frame may comprise a central connection portion; the inlet connector being mounted on the central connection portion.

[0286] The cushion may be mounted on the inlet connector and/or the frame so as to receive gas from the inlet connector.

[0287] The frame may be removable from the remainder of the mask assembly independently of the cushion and independently of the inlet connector.

- [0288] The cushion may be removable from the remainder of the mask assembly independently of the frame and/or independently of the inlet connector.
- [0289] The inlet connector may comprise an inlet port configured to be connected to the source of pressurised gas. The inlet port of the inlet connector may comprise a central inlet axis,
- [0290] The central inlet axis may be substantially vertical when the mask assembly is viewed from the front; and/or extends substantially downwardly when viewed from the side.
- [0291] The mask frame may be removably mounted on a component of the mask assembly by moving the mask frame onto the component of the mask assembly in a mounting direction, the mounting direction intersecting, and preferably being orthogonal, to the central inlet axis.
- [0292] The frame may comprise a frame clip configured to be removably mounted on the inlet connector to mount the central connection portion of the frame to the inlet connector.
- [0293] The frame clip may be spaced from, and not in contact with, the remainder of the frame, such that forces applied to the remainder of the frame are decoupled from the frame clip.
- [0294] The central connection portion may be relatively rigid. The remainder of the frame may be relatively flexible.
- [0295] The frame may comprise lateral portions that extend away from the central connection portion, the lateral portions being relatively flexible.
- [0296] The frame may be configured to be laterally resiliently deformable. The frame maybe configured to resist deformation in a direction from front to rear of the mask assembly, or vice versa.

- [0297] The frame may be made from material which is different from the material of the cushion. The frame may be made from material which is relatively harder and/or less deformable than the cushion, and preferably is made from a plastics material.
- [0298] The inlet connector may be made from material which is different from the material of the cushion. The inlet connector may be made from material which is relatively harder and/or less deformable than the cushion, and preferably is made from a plastics material.
- [0299] The cushion may be formed from a relatively soft material. The cushion may be formed from a resiliently deformable material, and preferably is formed from silicone. The side walls of the cushion may be resiliently deformable.
- [0300] A portion of the frame may overlay the cushion. Preferably a portion of the frame overlays the side walls of the cushion. A portion of the frame may overlay an upper portion of the cushion.
- [0301] The frame may comprise lateral arms, and an upper portion comprising a connecting frame member which extends over an upper portion of the cushion between the lateral arms.
- [0302] The connecting frame member may:
- a) be integral with the lateral arms.
 - b) be flexible along at least a portion of its length.
 - c) comprise a central region, wherein the central region may be flexible, and/or may be an apex region of the frame.
 - d) comprise a central region and end regions, distal from the central region, the end regions being less flexible than the central region.
 - e) comprise a central region comprising a first width, and end regions comprising a second width, the second width being greater than the first width.

[0303] The cushion may comprise an upper portion adjacent the nasal bridge of the user; the upper portion of the cushion comprising a rolling bridge portion which is pivotable towards or away from the nasal bridge of the user to overlap with a central region of the connecting frame member.

[0304] In embodiments of this disclosure a mask assembly is provided which comprises:

- a) a cushion
- b) an inlet connector configured to connect to a source of pressurised gas;
- c) a frame comprising at least one headgear connector; the inlet connector being mounted on the frame; the cushion being mounted on the inlet connector so as to receive gas from the inlet connector; wherein the frame is removable from the inlet connector independently of the cushion.

[0305] The cushion may comprise a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture.

[0306] The frame may comprise a central connection portion, the inlet connector being mounted on the central connection portion.

[0307] The frame may comprise a frame clip configured to mount the frame onto another part of the mask assembly.

[0308] The frame clip may be configured to be removably mounted on the inlet connector.

[0309] In embodiments of this disclosure a mask assembly is provided which comprises:

- a) a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture;
- b) an inlet connector comprising an inlet port configured to connect to a source of pressurised gas;

- c) a frame comprising at least one headgear connector and a central connection portion; the inlet connector being mounted on the central connection portion; the cushion being mounted on the inlet connector and/or the frame so as to receive gas from the inlet connector; wherein the inlet port of the inlet connector comprises a central inlet axis, wherein the central inlet axis is substantially vertical when the mask assembly is viewed from the front; wherein the mask frame is removably mounted on the mask assembly by moving the mask frame onto the mask assembly in a mounting direction, the mounting direction being orthogonal to the opening axis.

[0310] In embodiments of this disclosure a mask assembly is provided which comprises:

- a) a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture;
- b) an inlet connector comprising an inlet port configured to connect to a source of pressurised gas;
- c) a frame comprising at least one headgear connector and a central connection portion; the central connection portion being mounted on the inlet connector; the cushion being mounted on the inlet connector and/or the frame so as to receive gas from the inlet connector; wherein the inlet port of the inlet connector comprises a central inlet axis, wherein the central inlet axis extends downwardly; wherein the mask frame is removably mounted on the inlet connector by moving the mask frame onto the inlet connector in a mounting direction, the mounting direction intersecting the central inlet axis.

[0311] The central inlet axis may be inclined relative to the vertical, when the mask assembly is viewed from the side.

[0312] The mounting direction may be orthogonal to the central inlet axis.

[0313] In embodiments of this disclosure a mask assembly is provided which comprises:

- a) a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture;
- b) an inlet connector comprising an inlet port configured to connect to a source of pressurised gas;
- c) a frame comprising at least one headgear connector and a central connection portion; the central connection portion being mounted on the inlet connector; the cushion being mounted on the inlet connector and/or the frame so as to receive gas from the inlet connector;; wherein the inlet port of the inlet connector comprises a central inlet axis; wherein the frame is removably mounted on the inlet connector by moving the frame onto the inlet connector in a mounting direction, the mounting direction being orthogonal to the central inlet axis; wherein the cushion is removably mounted on the frame and/or the inlet connector.

[0314] The mask assembly may be configured such that:

- a) The cushion may be removed from the inlet connector and/or frame without removing any other component of the mask assembly; and/or
- b) The inlet connector may be removed from the frame and/or cushion without removing any other component of the mask assembly.

[0315] In embodiments of this disclosure a mask assembly is provided which comprises:

- a) a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture;
- b) an inlet comprising an inlet connector comprising an inlet port configured to be connected to a conduit connector cuff configured to receive pressurised gas;
- c) a frame comprising at least one headgear connector and a central connection portion; the inlet being mounted on the central connection portion; the cushion being mounted on the inlet and/or the frame so as to receive gas from the inlet;

the at least one headgear connector being spaced from the central connection portion; wherein

the frame comprises a frame clip configured to be removably mounted on the inlet to mount the central connection portion of the frame to the inlet; wherein the frame clip is spaced from, and not in contact with, the remainder of the frame, such that forces applied to the remainder of the frame are decoupled from the frame clip.

[0316] The frame clip may comprise opposed sides that extend away from the mask frame, the opposed sides being spaced from the headgear connectors of the frame.

[0317] The headgear connectors of the frame may be configured to deflect towards and/or away from the mask frame, without deforming the frame clip.

[0318] In embodiments of this disclosure a mask assembly is provided which comprises:

- a) a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture;
- b) an inlet comprising an inlet connector comprising an inlet port configured to be connected to a conduit connector cuff configured to receive pressurised gas;
- c) a frame comprising at least one headgear connector and a central connection portion; the inlet connector being mounted on the central connection portion; the cushion being mounted on the inlet connector and/or the frame so as to receive gas from the inlet connector;; wherein
the frame is removably mounted on the inlet by moving the frame onto the mask assembly in a mounting direction; wherein the mask assembly comprises at least one guide formation configured to engage the frame and guide the frame onto the mask assembly in the mounting direction.

[0319] In embodiments of this disclosure a mask assembly is provided which comprises:

- a) a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture;
- b) an inlet comprising an inlet connector comprising an inlet port configured to be connected to a conduit connector cuff configured to receive pressurised gas;
- c) a frame comprising at least one headgear connector and a central connection portion; the inlet being mounted on the central connection portion; the cushion being mounted on the inlet and/or the frame so as to receive gas from the inlet;; wherein
the frame comprises a frame clip, the frame clip being configured to be removably mounted on the inlet to mount the frame to the inlet, the frame clip comprising at least one alignment surface that engages with the mask assembly to resist relative rotation between the frame and mask assembly.

[0320] According to an aspect of this disclosure there is provided a respiratory mask kit comprising:

- a) the mask assembly of any one of the preceding statements; and
- b) headgear.

[0321] The headgear may comprise
a strap assembly comprising a pair of opposing upper side straps, and a pair of opposing lower side straps; wherein the lower side straps each terminate in headgear connector elements configured to connect to headgear connectors on the frame of the mask assembly.

[0322] The respiratory mask kit may comprise any one or more of:

- a) a tube connector for connecting a breathing gas delivery tube to the mask assembly;
- b) a breathing gas delivery tube.

[0323] The breathing gas delivery tube may comprise:

- a) a tube heater wire; and/or
- b) a sensor wire; and/or

- c) a connector cuff at an end of the tube.

BRIEF DESCRIPTION OF THE DRAWINGS

[0324] Throughout the drawings, reference numbers can be reused to indicate general correspondence between reference elements. The drawings are provided to illustrate example embodiments described herein and are not intended to limit the scope of the disclosure.

[0325] **Figure 1** is a front and top perspective view of a mask assembly in accordance with this disclosure, and a breathing conduit and conduit connector.

[0326] **Figure 2** is an exploded view corresponding to Figure 1.

[0327] **Figure 3** is an enlarged perspective view of the mask assembly of Figure 1, additionally showing straps of a headgear connected to the mask assembly.

[0328] **Figures 4a to 4c** are perspective views of components of the mask assembly of Figure 1, respectively the mask assembly in an assembled condition, a cushion, and a mask frame. In this embodiment the mask frame is connected to, or includes, an inlet connector.

[0329] **Figures 5a to 5c** are front views of components of the mask assembly of Figure 1, respectively showing the mask assembly in an assembled condition, a cushion, and a mask frame. In this embodiment the mask frame is connected to, or includes, an inlet connector.

[0330] **Figures 6a to 6c** are side views of components of the mask assembly of Figure 1, respectively showing the mask assembly in an assembled condition, a cushion, and a mask frame. In this embodiment the mask frame is connected to, or includes, an inlet connector.

[0331] **Figures 7a to 7c** are top views of components of the mask assembly of Figure 1, respectively showing the mask assembly in an assembled condition, a cushion, and a mask frame. In this embodiment the mask frame is connected to, or includes, an inlet connector.

[0332] **Figures 8a to 8c** are bottom views of components of the mask assembly of Figure 1, respectively showing the mask assembly in an assembled condition, a cushion, and a mask frame. In this embodiment the mask frame is connected to, or includes, an inlet connector.

[0333] **Figures 9a to 9c** are rear views of components of the mask assembly of Figure 1, respectively showing the mask assembly in an assembled condition, a cushion, and

a mask frame. In this embodiment the mask frame is connected to, or includes, an inlet connector.

- [0334] **Figure 10** is an enlarged perspective view of the mask assembly of Figure 1, showing an upper end of a breathing gas delivery conduit connected to the mask assembly.
- [0335] **Figure 11** is an exploded perspective view from the rear of the mask assembly of Figure 1.
- [0336] **Figures 12a) to 12e)** are perspective, top, rear, front, and side views of a mask frame of the mask assembly of Figure 1, with the inlet connector omitted.
- [0337] **Figures 13a) and 13b)** are front and top views respectively of the frame of Figure 12, with arrows showing the direction of applied forces.
- [0338] **Figure 14** is a rear view of the frame of Figure 12, showing frame regions that have different resistance to bending.
- [0339] **Figure 15** is an enlarged view of part of the frame of Figure 14.
- [0340] **Figure 16** is a top view of the frame of Figure 12, connected to a breathing gas delivery conduit.
- [0341] **Figure 17** is a perspective view corresponding to Figure 16.
- [0342] **Figure 18a)** is a side view of a cushion of the mask assembly of Figure 1, with **Figure 18b)** being an enlarged view of the area shown in the box of Figure 18a), with both figures showing an upper portion of the cushion in a first condition.
- [0343] **Figure 19** is a view corresponding to Figure 18, showing the upper portion of the cushion in a second condition in which the upper portion of the cushion is pivoted forwardly so as to extend over an upper part of the frame.
- [0344] **Figures 20a) to 20c)** are side views of the cushion, with the dashed lines of Figures 20a showing the cushion in the second condition, and Figure 20c showing the cushion in the second condition.
- [0345] **Figures 21a) and 21b)** are perspective views showing the cushion in the first and second conditions.
- [0346] **Figure 22a)** is a top view of the frame of Figure 12 with the dashed lines showing a deformed position of the frame when subject to lateral forces; whilst **Figures 22b) and 22c)** are front and top views with the dashed lines indicating a deformed position of the cushion when subject to lateral forces.

- [0347] **Figures 23a) and 23b)** are top views of the mask assembly, with Figures 23b) showing the mask assembly in a deformed position when subject to lateral forces.
- [0348] **Figures 24a) and 24b)** are side views of the mask assembly of Figure 1 connected to headgear having upper and lower side straps connected to the frame of the mask assembly, showing the angle of the upper and lower side straps relative to each other, and to the mask assembly.
- [0349] **Figures 25a) and 25b)** are top views of the mask assembly of Figure 1 connected to headgear having upper and lower side straps connected to the frame of the mask assembly, showing the angle of the upper side straps relative to each other, and to the mask assembly, and showing the angle of the lateral arms of the frame.
- [0350] **Figure 26** is a perspective view of the mask assembly of Figure 1 connected to headgear and a breathing gas delivery conduit, showing a diffuser of the mask assembly.
- [0351] **Figure 27** is a perspective view of a mask assembly in accordance with this disclosure, with a modified frame.
- [0352] **Figure 28** is an enlarged side view of a headgear connector of the frame of Figure 27.
- [0353] **Figure 29** is a perspective view of the frame of Figures 27 and 28 and an inlet connector attached to, mounted on, or comprising part of, the frame.
- [0354] **Figure 30** is an enlarged perspective view of the frame and inlet connector of Figure 29, with a diffuser partially removed.
- [0355] **Figure 31** is a rear perspective view corresponding to Figure 30, with the diffuser in place.
- [0356] **Figure 32** is a front perspective view corresponding to Figure 30, with the diffuser partially removed.
- [0357] **Figure 33** is a rear perspective view corresponding to Figure 30, with the diffuser partially removed.
- [0358] **Figure 34** is an enlarged front view corresponding to Figure 30, with the diffuser in place.
- [0359] **Figure 35** is a front view of the mask assembly of Figure 1, showing a position of an upper strap of a headgear connected to the mask assembly.
- [0360] **Figure 36** is an enlarged rear view of the inside of the inlet connector of the mask assembly of Figure 1, showing vent or bias holes and an anti-asphyxia valve.

- [0361] **Figure 37** is an exploded rear perspective view showing the anti-asphyxia valve and conduit connector and breathing gas delivery conduit.
- [0362] **Figures 38a) and 38b)** are enlarged views of the anti-asphyxia valve in closed and open positions respectively.
- [0363] **Figure 39** is an enlarged side view corresponding to Figure 37.
- [0364] **Figure 40** is an exploded view of another frame and inlet connector of a mask assembly in accordance with this disclosure.
- [0365] **Figure 41** is an exploded view of another frame and inlet connector of a mask assembly in accordance with this disclosure.
- [0366] **Figure 42** is a front view of another frame and inlet connector of a mask assembly in accordance with this disclosure.
- [0367] **Figures 43 to 46** are views of another frame of a mask assembly in accordance with this disclosure, showing a means of mounting lateral arms of the frame to a central portion of the frame.
- [0368] **Figure 47** is a perspective view of a mask assembly in accordance with this disclosure.
- [0369] **Figures 48a) to 48d)** are views of mask assemblies in accordance with this disclosure, showing different configurations of finger grips.
- [0370] **Figure 49** is a side view of the mask assembly of Figure 1 connected to a breathing gas delivery conduit, with the black outline showing the relative orientation of a prior art mask assembly.
- [0371] **Figure 50** is an enlarged, part sectional view of a lower part of the mask assembly of Figure 49.
- [0372] **Figures 51a) to 51c)** are respectively perspective, front and rear views of an inlet connector of a mask assembly in accordance with this disclosure.
- [0373] **Figure 52** is an enlarged sectional side view of a mask assembly in accordance with this disclosure, with the arrows showing approximate directions of a breathing gas flow into and out from the mask assembly.
- [0374] **Figure 53** is a rear view of a mask assembly in accordance with this disclosure.
- [0375] **Figure 54** is a rear view of the mask assembly of Figure 53, showing example dimensions.
- [0376] **Figure 55** is a side view of the mask assembly of Figures 53 and 54, showing example dimensions.

- [0377] **Figure 56** is a front view of a cushion of the mask assembly of Figures 53 to 55, showing example dimensions.
- [0378] **Figure 57** is a side view of a cushion of the mask assembly of Figures 53 to 55, showing example dimensions.
- [0379] **Figure 58a)** is a front view of another mask assembly in accordance with this disclosure, comprising a different frame; whilst **Figures 58b) and c)** are front and side views of the frame.
- [0380] **Figures 59a) and b)** are perspective and side views of a mask assembly in accordance with this disclosure comprising different headgear strap connectors, whilst **Figures 59c) and d)** are perspective and side views of the headgear strap connectors.
- [0381] **Figures 60a) to 60c)** are front views of a mask assembly in accordance with this disclosure, comprising a different frame having an adjustable upper portion, with the upper portion in first, second and third conditions.
- [0382] **Figures 61a) and b)** are side and front views of the frame of Figure 60.
- [0383] **Figures 62a) and b)** are perspective views of a mask assembly in accordance with this disclosure, each showing a frame having a modified upper portion. **Figures 62c) to e)** are perspective, front and side views of the mask frame of the mask assembly of Figure 62a).
- [0384] **Figures 63a) and b)** are views from underneath a mask assembly in accordance with this disclosure, showing a modified frame, and modified frame and cushion respectively, whilst **Figures 63c) and d)** are front and rear views of the cushion and frame respectively.
- [0385] **Figure 64a)** is a front view of a mask assembly in accordance with this disclosure having a modified frame and cushion, and **Figures 64b) and c)** are enlarged sectional side views of the frame and cushion, Where **Figure 64b)** shows the frame and cushion of Figure 1, whilst **Figure 64c)** shows the modified frame and cushion of Figure 64.
- [0386] **Figure 65** is a rear view of a modified cushion of a mask assembly in accordance with this disclosure.
- [0387] **Figures 66a) to c)** are perspective, front and side views of a modified cushion of a mask assembly in accordance with this disclosure, and **Figures 66d) to e)** showing the modified cushion with the mask frame and headgear strap connectors.
- [0388] **Figure 67a)** is a view from below of a modified cushion of a mask assembly in accordance with this disclosure, where the modified cushion has internal laterally

extending reinforcing structures, and **Figures 67b) and c)** are sectional views of the modified cushion taken on lines A-A, and B-B of Figure 67a).

[0389] **Figure 68a)** is a view from below of a modified cushion of a mask assembly in accordance with this disclosure, where the modified cushion has internal vertically extending reinforcing structures, and **Figures 68b) and c)** are sectional views of the modified cushion taken on lines A-A, and B-B of Figure 67a).

[0390] **Figure 69** is a part sectional side view of a modified cushion of a mask assembly in accordance with this disclosure, where the modified cushion has internal reinforcing structures adjacent a rolling bridge portion of the cushion.

[0391] **Figures 70a) and c)** are perspective views of a mask assembly in accordance with this disclosure, each showing a modified mask frame, with **Figure 70b)** showing the modified mask frame.

[0392] **Figures 71a) and c)** are perspective views of a mask assembly in accordance with this disclosure, each showing a modified mask frame, with **Figure 71b)** showing the modified mask frame, **Figure 71d)** being an enlarged view of part of the inlet connector, and **Figure 71e)** being an enlarged perspective view from the rear of part of the modified mask frame.

[0393] **Figures 72a) and c)** are perspective and exploded views of a mask assembly in accordance with this disclosure, each showing a modified mask frame, with **Figure 72b)** showing the modified mask frame.

[0394] **Figures 73a), c) and f)** are perspective, exploded and side views of a mask assembly in accordance with this disclosure, each showing a modified mask frame, with **Figure 73b)** showing the modified mask frame, **Figure 73d)** showing the modified mask frame and inlet connector, **Figure 73e)** showing the modified mask frame and inlet conduit.

[0395] **Figures 74a), d) and e)** are perspective, front and side views of a mask assembly in accordance with this disclosure, each showing a modified mask frame, with **Figure 74b)** omitting the mask frame, **Figure 74c)** showing the modified mask frame, and **Figure 74f)** being an enlarged view of a lower part of the mask frame and inlet connector.

[0396] **Figures 75a), c), d) and e)** are perspective, front and side views of a mask assembly in accordance with this disclosure, each showing a modified mask frame, with **Figure 75b)** omitting the mask frame, **Figure 75f)** being an enlarged view of

part of the modified mask frame and inlet connector, and **Figure 75g)** being an enlarged sectional view of a lower part of the mask frame and inlet connector.

[0397] **Figures 76a), b)** are side and front views of a mask assembly in accordance with this disclosure, each showing a modified mask frame, with **Figures 76c) and d)** being enlarged side and perspective views of part of the mask frame and inlet connector, **Figure 76e)** showing a view from below of the modified mask frame and inlet connector, and **Figure 76f)** being an enlarged view of a central part of the mask frame.

[0398] **Figures 77a), b)** are side and front views of a mask assembly in accordance with this disclosure, each showing a modified mask frame, with **Figures 76c) and d)** being enlarged side and sectional views of part of the mask frame and inlet connector, and **Figure 76e)** showing a view from below of the modified mask frame and inlet connector.

[0399] **Figures 78a), b)** are side and front views of a mask assembly in accordance with this disclosure, each showing a modified mask frame, with **Figure 78c)** being a view from below of the mask frame, **Figure 78d)** being an enlarged exploded perspective view of the mask frame and inlet connector, **Figures 78e)** being an enlarged sectional view of part of the mask frame and inlet connector, and **Figure 78f)** showing a view from below of the modified mask frame and inlet connector.

[0400] **Figures 79a), b) and c),** are side, front and perspective views of a mask assembly in accordance with this disclosure, each showing a modified mask frame, with **Figure 79d), e) and f)** being enlarged sectional side, perspective and rear views of the mask frame and inlet connector.

[0401] **Figures 80a) and b)** are perspective and side views of a mask assembly in accordance with this disclosure, each showing a modified mask frame, with **Figures 80c), d) and e)** being enlarged view of part of a lower part of the modified mask frame and inlet connector, **Figures 80f) and g)** being enlarged views of the modified mask frame and inlet connector in assembled and partially disassembled conditions, and **Figure 80h)** being an enlarged view from below of the mask frame and inlet connector. **Figure 80i)** is a top view of the modified mask frame, and **Figure 80j)** is an enlarged top view of part of the modified mask frame. **Figure 80k)** is a schematic top view of the modified mask frame, with the dashed lines indicating example deflected positions of the lateral arms. **Figure 80l)** is an exploded side view of the mask assembly of **Figures 80a) to 80k)**, with the diffuser mounted on the inlet, and

Figure 80m) is an exploded side view of the mask assembly of **Figures 80a) to 80k)**, with the diffuser removed from the inlet. **Figures 81 a) and b)** are perspective and exploded views of a mask assembly in accordance with this disclosure with a modified mask frame.

[0402] **Figures 82 a) and b)** are perspective and exploded views of a mask assembly in accordance with this disclosure with a modified mask frame, with **Figure 82c)** being an enlarged side view of part of the modified mask frame.

[0403] **Figures 83a) to d)** are schematic sectional side views showing different configurations of inlet connector mask frame and cushion.

[0404] **Figures 84a), b)** are front and side views of a mask assembly in accordance with this disclosure, each showing a modified mask frame, with **Figure 84c)** being a sectional side view of the mask assembly, and **Figure 84d)** being a perspective of the mask frame.

[0405] **Figure 85a)** is a front view of a modified mask frame and inlet connector of a mask assembly in accordance with this disclosure, **Figure 85b)** is a front view of the mask frame, and **Figure 85c)** is an enlarged side view of part of the mask frame and inlet connector.

[0406] **Figure 86a)** is an exploded view of an inlet connector and part of a mask frame of a mask assembly in accordance with this disclosure, **Figure 86b)** is an enlarged front view of a central part of the mask frame, and **Figure 86c)** is an enlarged side view of part of the inlet connector and mask frame.

[0407] **Figure 87** is an exploded view of a mask frame and inlet connector of a mask assembly in accordance with this disclosure.

[0408] **Figure 88** is an exploded view of a mask frame and inlet connector of a mask assembly in accordance with this disclosure.

[0409] **Figures 89a), b) and c),** are front, side and perspective views of a mask assembly in accordance with this disclosure, each showing a modified mask frame, with **Figure 89d),** being an exploded view, and **Figure 89e)** being an enlarged exploded view of the inlet connector and part of the mask assembly.

[0410] **Figures 90a), b) and c),** are front, side and exploded views of a mask assembly in accordance with this disclosure.

[0411] **Figure 91a)** is a perspective view of a mask assembly in accordance with this disclosure, **Figure 91b)** is a perspective view of a cushion of the mask assembly, and **Figure 91c)** is an enlarged sectional top view of the mask assembly and cushion.

- [0412] **Figure 92** is a front view of a modified mask frame of a mask assembly in accordance with this disclosure.
- [0413] **Figures 93 a) and b)** are perspective and exploded perspective views of a mask assembly in accordance with this disclosure, with an integral mask frame and inlet connector.
- [0414] **Figures 94 a) and b)** are perspective and exploded perspective views of a mask assembly in accordance with this disclosure, with an integral mask frame and inlet connector.
- [0415] **Figures 95 a) and b)** are perspective and exploded perspective views of a mask assembly in accordance with this disclosure, with an integral mask frame and inlet connector.

DETAILED DESCRIPTION

- [0416] Embodiments of mask assemblies, components and methods of assembly and manufacture will now be described with reference to the accompanying figures, wherein like numerals refer to like or similar elements throughout. Although several embodiments, examples and illustrations are disclosed below, it will be understood by those of ordinary skill in the art that the disclosures described herein extend beyond the specifically disclosed embodiments, examples and illustrations, and can include other uses of the disclosures and obvious modifications and equivalents thereof. The terminology used in the description presented herein is not intended to be interpreted in any limited or restrictive manner simply because it is being used in conjunction with a detailed description of certain specific embodiments of the disclosures. In addition, embodiments of the disclosures can comprise several novel features and no single feature is solely responsible for its desirable attributes or is essential to practicing the disclosures herein described.
- [0417] With reference initially to Figures 1 and 2, a mask assembly 1 is provided comprising a frame 3, a cushion 5, and an inlet connector 7. The mask assembly 1 is connected to a breathing gas delivery conduit 9 via the inlet connector 7.
- [0418] The mask assembly is configured to be relatively compact, and in particular to minimise the height of the mask assembly from top to bottom, and the depth of the mask assembly from front to back.
- [0419] The mask assembly 1, when viewed from the front, comprises an elongate base, inclined sides inclining inwardly from bottom to top, the inclined sides meeting

at an apex portion. The apex portion is arcuate, and comprises rounded intersections with the inclined sides. The elongate base also comprises rounded intersections with the inclined sides. When viewed from the front (for example, in Figure 5) the cushion 5 has an identical or similar shape to the frame 3. The outermost periphery of the frame 3 is substantially contained within the outermost periphery of the cushion 5. The frame 3 comprises headgear connectors for connection to headgear straps. In the embodiments described herein, the headgear connectors provide a four-point connection to headgear.

[0420] The inlet connector 7 is multi-functional, and comprises all the gas flow features required for the mask assembly 1 to function. The inlet connector 7 comprises the connection to the breathing gas delivery conduit 9, the breathing gas flow path from the conduit 9 to the interior cavity of the cushion 5, bias flow vent holes, an anti-asphyxia valve, and a diffuser. The inlet connector 7 occupies, despite all of these features, a relatively small proportion of the frontal area of the mask assembly 1. For example, the maximum width of the inlet connector 7 may be between a third and a half of the maximum width of the frame 3. The maximum height of the inlet connector 7 may be around half of the maximum height of the frame 3.

[0421] The frame 3 comprises a lower, central portion 11 comprising an inlet opening 13 configured to receive an inlet part, such as an inlet boss 47, of the inlet connector 7. The inlet opening 13 comprises an inlet opening axis 13A (see Figures 2, 6, and 13a) which is configured to extend generally downwardly in use of the mask assembly 1, such that the inlet opening 13 is formed in a base of the frame 3. The inlet opening 13 comprises an interior surface that is substantially smooth and flat, to assist in guiding inlet connector 7 into the inlet opening 13, during assembly or reassembly. The inlet opening axis 13A is inclined downwardly and towards the rear of the mask assembly when viewed from the side, see Figure 6. The inlet opening axis 13A is substantially vertical when viewed from the front, see Figure 13a).

[0422] The inlet opening axis 13A may be substantially aligned with an inlet axis 47A of the inlet boss 47 of the inlet connector 7, see for example the embodiment of Figures 2 and 70. In other embodiments, the inlet opening axis 13A may not be aligned with, and may intersect, the inlet axis 47A, see for example the embodiment of Figure 84. The gas flow path from the conduit 9 to the cushion 5 extends through the inlet connector 7.

[0423] Lateral arms 15 extend, as elongate side frame elements, outwardly from the sides of the lower, central portion 11 in a generally horizontal direction, for example see Figure 5. The lateral arms 15 are inclined upwardly relative to the inlet opening axis 13A, when the frame 3 is viewed from the front and side, see for example Figures 5a), 6a), and 13a). The lateral arms 15 may each twist along their length, that is about a longitudinal axis extending along each arm 15. Such twisting can help enable the lower headgear connectors 19 to be correctly orientated relative to the remainder of the frame 3. The central portion 11, and the opening 13 provided in the central portion 11, are therefore intermediate the pair of lateral arms 15, at a lowermost part of the mask frame 3.

[0424] The ends of the lateral arms 15 terminate in a pair of lower headgear connectors 17.

[0425] The frame 3 further comprises a pair of upper headgear connectors 19, above the lower headgear connectors 17.

[0426] The frame 3 therefore comprises a pair of laterally spaced lower headgear connectors 17 and a pair of laterally spaced upper headgear connectors 19. As can be seen in Figure 3, each headgear connector 17, 19 is configured to be connected to a respective headgear strap 21, 23. The upper ends of the pair of upper headgear connectors 19 are connected via end regions of a connecting frame member in the form of an upper frame portion 25 comprising an arcuate elongate frame element that comprises the upper most part of the frame 3. The central portion 11, lateral arms 15, headgear connectors 17, 19 and upper frame portion 25 form a frame ring inside of which is defined a closed, frame aperture 20 through which the cushion 5 is exposed. The central portion 11 is relatively rigid. The lateral arms 15 and the upper frame portion 25 are relatively flexible. As can be seen in Figure 12e), the connecting frame member is inclined forwardly, such that when viewed from the side, an acute angle is formed between the lateral arms and the connecting frame member. For example, a longitudinal axis of the connecting frame member may be inclined at an acute angle relative to a longitudinal axis of the adjacent lateral arm. The acute angle may be between 10° and 80°, or between 20° and 65°, and in some embodiments is substantially 45°. As can be seen in Figure 6, the connecting frame member connects the lateral arms 15 at a position above and behind the central portion 11. The connecting frame member extends over an upper portion of the cushion. The connecting frame member is integral with the lateral arms 15.

- [0427] The central portion 11 is relatively tall when the frame 3 is viewed from the front. The central portion 11 tapers into the lateral arms 15 which are relatively narrow. Likewise the upper frame portion 25 is relatively narrow and forms a strip or band extending across the cushion 5.
- [0428] The central portion 11 has a greater resistance to deformation and/or bending, as compared to the lateral arms 15 and upper frame portion 25. It is envisaged that the central portion 11 may be configured not to deform when side sleeping. In contrast the lateral arms 15 and upper frame portion 25 may deform relatively easily during side sleeping. The relative rigidity of the central portion 11 assists in maintaining a proper connection with the inlet connector 7.
- [0429] The connecting frame member is flexible along at least a portion of its length, and in particular the connecting frame member comprises a central region being an apex of the connecting frame member, see Figure 5, the central region being relatively flexible. The connecting frame member comprises end regions, distal from the central region, the end regions being less flexible than the central region. The end regions comprise the upper pair of headgear connectors 19. The central region comprises a relatively thin and/or weakened structure, and the end regions comprise a relatively thick and/or reinforced structure, for example at enlarged regions 19A of the frame 3.
- [0430] Each headgear connector 17, 19 in this embodiment is elongate. The lower pair of headgear connectors 17 are each in the form of an elongate element comprising a mounting post. The lower headgear straps 21 may be mounted to the mounting posts via a suitable headgear clip that comprises a hook that receives the mounting post. Alternatively, each lower headgear connector 17 can comprise a hook, the lower headgear strap 21 comprising a post that is received in the hook.
- [0431] The upper pair of headgear connectors 19 each comprise an elongate element around which each upper headgear strap 23 may be looped and secured to itself using a suitable securing component such as a hook and loop fastener, or a buckle for example.
- [0432] The mounting posts of the lower pair of headgear connectors 17 are substantially parallel, and extend substantially vertically when the mask assembly 1 is viewed from the front and from the side in use. The mounting posts are inclined forwardly relative to the inlet opening axis 13A. When viewed from the front, the longitudinal axes of the elongate posts are parallel with that inlet opening axis 13A.

- [0433] The elongate elements of the upper pair of headgear connectors 19 are inclined relative to the mounting posts of the lower pair of headgear connectors 17. The elongate elements of the upper pair of headgear connectors 19 are also inclined inwardly towards one another when the mask assembly 1 is viewed from the front. Further the elongate elements of the upper pair of headgear connectors 19 are inclined forwardly when the mask assembly 1 is viewed from the side in use. The elongate elements of the upper pair of headgear connectors 19 are inclined inwardly relative to the central axis 13A of the inlet opening 13, when the mask assembly 1 is viewed from the front. The elongate elements of the upper pair of headgear connectors 19 are inclined forwardly such that they intersect the inlet opening axis 13A, when the mask assembly 1 is viewed from the side, for example as shown in Figures 4a) and 6a).
- [0434] The elongate elements of the upper pair of headgear connectors 19 may be inclined forwardly so as to define an acute angle relative to the lateral arms 15. For example, a longitudinal axis of an elongate element of the upper pair of headgear connectors 19 may be inclined at an acute angle relative to a longitudinal axis of the adjacent lateral arm 15. The acute angle may be between 10° and 80°, or between 20° and 65°, and in some embodiments is substantially 45°.
- [0435] In this embodiment the lower headgear connectors 17 comprise the rearmost part of the frame 3, when the mask assembly 1 is viewed from the side. The lower headgear connectors 17 also comprise the outermost part of the frame 3 when viewed from the front.
- [0436] As noted above, and as can be seen in Figures 5 and 6, the frame 3 further comprises an enlarged region 19A extending behind the elongate element of each upper headgear connector 19, such that a slot 19B is defined between each enlarged region 19A and the respective elongate element. The cushion 5 defines an elongate recess 62 which extends across the cushion 5. The upper portion 25 of the frame 3 rests in the recess 62. The distal ends of the recess 62 are shaped to match the shape of, and receive, the enlarged region 19A. the enlarged regions 19A are connected via the upper frame portion 25.
- [0437] The recess 62 can comprises a thickened region of the cushion 5.
- [0438] The enlarged regions 19A each provide an enlarged surface area that overlays the sides of the cushion 5, as compared to the upper frame portion 25, providing additional support to the cushion 5 in those regions.

[0439] The combination of the elongate element of the upper headgear connectors 19 and the adjacent enlarged regions 19A, increases the rigidity of the frame 3 in those regions, and resists bending of the upper headgear connectors 19. The enlarged regions 19A also act to ensure there is enough space/clearance for the upper headgear straps 23 to attach to the upper headgear connector 19, without interfering with the protruding, forward edge of the rolling bridge portion 33. The central region of the upper frame portion 25 is relatively thin, as compared to the relatively wide enlarged regions 19A. The enlarged regions 19A comprise end regions of the upper frame portion 25, that extend between, and connect, the distal ends of the lateral arms 15.

[0440] The frame 3 is made from material such as a plastics material which is relatively harder and less deformable than the cushion 5, such that the frame 3 provides support to the cushion 5, and in particular to resist outward movement of the cushion 5. The frame 3 is structured to permit the frame to resiliently deform in a lateral direction, but to resist deformation in the front to back direction. This will be described further below.

[0441] The inlet connector 7 may be made from material which is relatively harder and less deformable than the cushion 5, and preferably is made from a plastics material.

[0442] The frame 3 and/or the inlet connector 7, may be made from a plastics material comprising, solely or in combination:

- a) Nylon (Nylon 12, 11, 6);
- b) TPE - PEBA (Pebax® 7033, 7233);
- c) Polypropylene;
- d) Polycarbonate; and/or
- e) Co-polyester.

[0443] The cushion 5 is configured to be mounted on the frame 3, and in this embodiment to be removably mounted on the frame 3. Mounting features can be provided to ensure the cushion 5 can be mounted on the frame 3. In the described embodiments, the cushion 5 is mounted on the frame 3 via the inlet connector 7.

[0444] The cushion 5 may be mounted on the frame 3 via engagement between the inlet opening 13 of the frame 3, with the inlet connector 7. The engagement may be provided by any one or more of:

- a) frictional engagement between the inlet opening 13 of the frame 3;
- b) an interference fit between the inlet opening 13 of the frame 3;

- c) one or more clips on the inlet opening 13 or frame 3 engaging with one or more recesses on the other of the inlet opening 13 and frame 3;
- d) one or more protrusions on the inlet opening 13 or frame 3 engaging with one or more apertures or slots on the other of the inlet opening 13 and frame 3;
- e) adhesive; and/or
- f) overmoulding.

[0445] The cushion 5 is formed from a relatively soft, resiliently deformable material such as silicone. The cushion 5 defines an internal cavity that receives breathing gases from the breathing gas delivery conduit 9 via the inlet connector 7. The cushion 5 is provided with an inlet aperture 26.

[0446] The cushion 5 comprises a proximal face contacting portion 27, a distal non face contacting portion 29, and a side wall 31 extending between the face contacting portion 27 and the non-face contacting portion 29. The inlet aperture 25 is provided in the distal non-face contacting portion 29.

[0447] At least part of the side wall 31 is transparent 32 so as to define a clear region of the cushion 5 where the inside of the cushion 5 can be seen from outside the cushion 5.

[0448] This clear region 32 is arcuate when viewed from the front and extends upwardly from one lower headgear connector 17, across the top of the inlet connector 7, and downwardly to the other lower headgear connector 17.

[0449] An upper portion of the cushion 5 comprises a rolling bridge portion 33 which is pivotable relative to a lower portion 35 of the cushion 5, between a rest position in which the rolling bridge portion 33 is relatively rearward, to an in use position in which the rolling bridge portion 33 pivots forwardly such that part of the rolling bridge portion 33 buckles to provide a roll of material that extends over the mask frame 3. The rolling bridge portion 33 pivots about a pivot axis 33A. The pivotal movement of the rolling bridge portion 33 enables the upper part of the cushion to better accommodate, and seal against, differently sized noses.

[0450] The rolling bridge portion 33 further comprises an arcuate reinforcing band 34, which extends over the apex over the rolling bridge portion 33, and down each side of the cushion to the pivot axis 33A.

[0451] The rolling bridge portion 33 comprises a region of reduced stiffness 93 that is positioned between a first boundary 94, the first boundary 94 being defined by a stiffness greater than that in the region of reduced stiffness 93, and a second boundary

96, the second boundary being defined by a stiffness greater than that in the region of reduced stiffness. In this example, the first boundary 94 is adjacent the reinforcing band 34. The second boundary 96 is at the forward margin of the rolling bridge portion 33. When the first boundary 94 is moved toward the second boundary 96, the region of reduced stiffness 93 buckles to define a roll of material that increases in size away from the face-contacting portion of the cushion 5 as the first boundary 94 continues to move toward the second boundary 96 to facilitate movement of the rolling bridge portion 33 of the cushion 5 relative to the lower portion of the cushion 5.

[0452] The inlet aperture 25 is defined in the distal non-face contacting portion 29 of the cushion 5, and in particular in a lower, forwardmost portion of the cushion 5. The inlet aperture 25 is larger than the inlet opening 13 in the frame 3. The inlet aperture 25 may be non-circular, may be taller than it is wide, and in this embodiment comprise a substantially planar base and inwardly inclined sides.

[0453] The inlet aperture 25 is defined in this example by a relatively rigid ring 37 that comprises an integral part of, or is a separate component which is secured to the distal non-face contacting portion 29 of the cushion 5, for example via adhesive or overmoulding or the like. The rigid ring 37 may be a separate component formed of a material which is more rigid than the relatively soft cushion 5. The rigid ring may comprise a thickened or reinforced part of the cushion 5, formed from the same material as the cushion 5.

[0454] The rigid ring 37 may be provided with connecting formations 39 configured to allow the rigid ring 37 to be connected to the inlet connector 7.

[0455] The rigid ring 3 may be made from a plastics material comprising, solely or in combination:

- a) Nylon (Nylon 12, 11, 6)
- b) TPE - PEBA (Pebax® 7033, 7233)
- c) Polypropylene
- d) Polycarbonate
- e) Co-polyester

[0456] The inlet connector 7, which can best be seen in Figure 51, comprises a connector body 41 comprising a proximal, rearwardly directed outlet boss 45 and a distal, lower inlet boss 47. The outlet boss 45 is configured to be received in, and to be connected to or mounted on the rigid ring 37 of the cushion 5. The inlet boss 47 is

configured to be received in, and to be connected to or mounted on the inlet opening of the frame 3. When so positioned, the inlet connector body 41 forms a breathing gases flow path between the breathing gases delivery conduit 9 and the cavity inside the cushion 5.

[0457] As will be described in embodiments below, the inlet connector 7 may be:

- a) removably connected to the frame 3;
- b) removably connected to the cushion 5;
- c) permanently connected to the frame 3;
- d) permanently connected to the cushion 5;
- e) integrally formed with the frame 3;
- f) integrally formed with the cushion 5.

[0458] With reference to Figure 51, the inlet connector 7 advantageously combines a number of gas flow features into a single, relatively compact, component.

[0459] In this embodiment the inlet connector 7 comprises:

- a) a rearwardly directed outlet boss 45 for connection to the cushion 5, the outlet boss 45 comprising an outlet port 45a that is in fluid communication with the cushion cavity;
- b) a downwardly directed inlet boss 47 for connection to the frame 3, the inlet boss 47 comprising an inlet port 47b configured to receive breathable gas from the conduit 9, and comprising a central inlet axis 47a;
- c) one or more bias vent holes 49. In this embodiment a plurality of vent holes 49 are provided in a single vent hole array 51;
- d) an anti-asphyxia valve 53. In this embodiment the valve 53 comprises a valve body 54, and a valve member 55 movably mounted adjacent the inlet boss 47, and an inlet valve opening 57 above the inlet boss 47. The valve member 55 is movable between a closed position in which the valve member 55 closes the valve opening 57, and an open position in which the valve member 55 opens the opening instead closing the passage through the inlet boss 47. The valve member 55 comprises a planar valve flap;
- e) a diffuser 59. Diffuser 59 comprises a body of diffuser material that covers the vent holes 49, so as to diffuse any gases flow from those vent holes 49. The diffuser material may be permanently mounted on the inlet connector 7, for example via adhesive or overmoulding, or could be removably mounted on

the inlet connector 7, for example via a rigid diffuser frame 61 that clips onto the inlet connector 7.

[0460] The inlet connector 7 has a base and inclined sides, when viewed from the front. The outlet boss 45 matches the size and shape of the rigid ring 37 of the cushion 5. The inlet connector 7 comprises an inclined, forward wall 63 that extends between the outlet boss 45 and inlet boss 47, as can be seen in Figure 51a). The vent holes 49 and valve opening 57 are provided on the forward wall 63. The plane of the forward wall 63 is substantially parallel with the inlet opening axis 13A of the inlet opening 13 of the frame 3. When mounted on the rigid ring 37, the forward wall 63 has substantially the same profile as the non-face contacting portion 29 and the side wall 31 of the cushion 5.

[0461] Referring additionally to Figures 4 to 11, further aspects of the mask assembly 1 in accordance with this disclosure are now described.

[0462] The cushion 5 is removably mounted on the frame 3. In this embodiment, the cushion 5 is mounted on the frame 3 via a connection between the central portion 11 of the frame 3, and the distal non-face contacting portion 29 of the cushion 5. The connection is provided by the rigid ring 37 of the cushion 5 being connected (permanently or removably) to the outlet boss 45 of the inlet connector 7, and by the inlet boss 47 of the inlet connector 7 being connected to the inlet opening 13 of the frame 3, as described above.

[0463] In this embodiment the cushion 5 is removably mounted on the frame 3 solely by the connection between the distal non-face contacting portion 29 of the cushion 5 and the central portion 11 of the frame 3. The remainder of the cushion 5 is not connected to the remainder of the frame 3. The cushion 5 may therefore be considered to be cantilevered to the frame 3, with the fulcrum of the cantilever being the connection at the central portion 11 of the frame 3, with the remainder of the cushion 5 being free to move relative to the frame 3.

[0464] However, the remainder of the frame 3 that is not connected to the cushion 5, namely the lateral arms 15, lower and upper pairs of headgear connectors 17, 19, and the upper frame portion 25, support the cushion 5, and in particular resist the cushion 5 deflecting or inflating outwardly. This is achieved by the remainder of the frame 3 overlaying the cushion 5, and in particular overlaying the side wall 31 and upper portion of the cushion 5, below the rolling bridge portion 33.

- [0465] This configuration enables the mask assembly 1 to be relatively flexible in a lateral direction. In particular the lower centre of the mask assembly, including the central portion of frame 11, is relatively inflexible, but the lateral regions and upper centre of the mask assembly 1, including the lateral arms 15 and upper frame portion 25, are relatively flexible, enabling the lateral regions of the mask assembly 1 to be relatively easily elastically deformed when side sleeping for example.
- [0466] Portions of the cushion 5 may be recessed so as to receive, partially receive or partially engage portions of the frame 3. For example, the upper portion of the cushion 5, below the rolling bridge portion 33, comprises elongate recess 62 which extends laterally across the upper portion of the cushion 5, and in which the upper portion 25 of the frame 3 is received. The side walls of the recess 62 engage the margins of the upper portion 25 of the frame 3. Likewise, the side wall 31 of the cushion 5 comprises generally vertically extending side recesses 64 that engage the lower and/or upper headgear connectors 17, 19 of the frame 3.
- [0467] The frame 3 substantially overlays the cushion 5. However, the frame comprises frame portions that are relatively thin, in particular the lateral arms 15 and the upper frame portion 25. Consequently, the frame 3 defines a relatively large frame aperture 20 through which the cushion 5 is exposed, and in particular through which the non-face contacting portion 29 and the side wall 31 are exposed. The frame aperture 20 forms a window, through which the cushion 5 is exposed.
- [0468] The frame aperture 20 corresponds to the transparent part 32 of the cushion 5 such that the transparent part 32 of the cushion is exposed via the frame aperture 20. This enables the inside of the cushion 5, and therefore part of the user's face, especially the nose, to be seen from outside the mask assembly 1, when the mask assembly 1 is worn by the user and in use. This can have the effect of significantly reducing the visual impact of the mask assembly 1 when worn, increasing compliance of use by the user, and/or minimising any psychologically adverse effect of having to wear such a mask assembly 1.
- [0469] As can best be seen in Figures 5 and 12, the frame aperture 20 is arcuate when the mask assembly 1 is viewed from the front. The central lower part of the mask assembly 1 is provided by the inlet connector 7 which covers the tip of the nose of the user. The mouth of the user is covered by the central portion 11 of the frame 3. The central portion 11 is wider than the remainder of the frame 3 and comprises two generally upwardly directed triangular wings 67 that provide support to the central

part of the cushion 5, and strengthen the intersection of the lateral arms 15 with the central portion 15 of the frame 3. The wings 67 provide rigidity to the central portion 15 of the frame 3. The wings 67 defined between them a 'V' or 'U' shaped recess in which the forward wall 63 of the inlet connector 7 is received.

[0470] With reference to Figures 1, 5a) and 6a), the size and configuration of the inlet connector 7 further minimises the visual impact of the mask assembly 1 in that the inlet connector 7 comprises a number of different components and functions into a relatively small connector body 41, thus freeing up the remainder of the frame 3 and cushion 5 to not need to provide such components and functions. An inlet connector 7 having such multiple functions assists in providing a relatively large frame aperture 20.

[0471] Referring to Figures 13 to 15, 22 and 23, one aspect of the mask assembly 1 in accordance with this disclosure is the ability for the frame 3 and cushion 5 to resiliently deform in a lateral direction, as shown by the arrows in Figure 13a). Another aspect of the mask assembly 1 in accordance with this disclosure is the ability of the frame 3 and cushion 5 to resist deformation in a front to back (or vice versa) direction, as shown by the arrows in Figure 13b).

[0472] In particular the frame 3 is configured to be relatively laterally resiliently deformable (that is relatively flexible across the user's face), but to be relatively non-deformable in a front to back direction (that is relatively rigid in a direction into the user's face).

[0473] The frame 3 is configured to do this by:

- a) comprising a central portion 11 being relatively wide, relatively thick, and comprising a relatively large amount of material, and by the lateral arms 15 and upper frame portion 25 being relatively narrow, relatively thin, and comprising a relatively small amount of material; and/or
- b) being connected to the cushion 5 only at the central portion 11; and/or
- c) having a frame opening 13 which is reinforced and/or braced, as compared to the lateral arms 15. For example, the front and rear margins 13B, 13C of the frame opening 13 extend laterally across the central portion 13 and can be considered to form struts that function to brace the frame opening 13 against lateral compression.
- d) comprising one or more reinforced regions; and/or
- e) comprising one or more weakened regions.

- [0474] For example, with reference to Figure 14, three weakened regions 71, 73, 75 are shown, region 71 being provided by the relatively thin, arcuate upper portion 25 of the frame, regions 73, 75 being regions of thinned material, where the central portion 11 transitions into the lateral arms 15. Region 71 comprises a central region of the elongate frame portion 25. Region 71 comprises a thinner band of material than the widened regions 19A. The weakened regions 71, 73, 75 are more flexible than the adjacent regions.
- [0475] With reference to Figures 12 and 14, the sides of the central portion 13, either side of the frame opening 13 are reinforced with an arcuate, upwardly extending ridge or thickened portion 76, 78. These thickened portions join the front and rear margins 13B, 13C to increase the rigidity of the central portion 13 of the frame 3.
- [0476] Referring to Figure 27, a discrete hinge 77 may be provided at one or more regions of the frame 3, for example where the central portion 11 transitions into the lateral arms 15. The hinge 77 may comprise a living hinge.
- [0477] Referring to Figures 16, 17 and 26, the mask assembly 1 comprises a pair of laterally spaced finger grips 81 configured to facilitate the user gripping the mask assembly with two fingers.
- [0478] The finger grips 81 are below the centre of the mask assembly 1 when viewed from the front, above the inlet opening 13 in the frame, and adjacent the inlet connector 7, in particular adjacent the vent holes 49 and the diffuser 59.
- [0479] In the embodiment of Figures 16 and 17, the finger grips 81 are provided at the upper margins of the wings 67 of the central portion 11 of the frame 3, these upper margins comprising a thickened edge of the frame 3 to provide a larger surface for the fingers to grip, for example when detaching the cushion 5 from the frame 3. The frame 3 deflects inwardly to allow the user's fingers to grip this edge, as shown in Figure 26.
- [0480] Figure 48 shows alternative embodiments of finger grips 81. Figure 48a shows finger grips 81 each provided by a recessed region formed in the inlet connector 7 and cushion 5. Figure 48b) shows finger grips 81 formed by indented region of the lateral margins of the wings of the frame 3. Figure 48c) is similar to Figure 48a) but with deeper recesses in the frame 3 and cushion 5. Figure 48d) shows a finger grip 81 comprising an elongate, arcuate recess in the cushion extending around the sides and top of the central portion 11 of the frame 3.

[0481] Referring to Figures 18 to 21, these figures show the rolling bridge 33 of the cushion 5 in more detail. Figures 18 and 19 show an embodiment for the upper portion 25 of the frame 3. In this embodiment the elongate frame member of the upper portion 25 of the frame 3 is of rectangular cross section and comprises upper and lower walls 83, 85 and forward and rear walls 87, 89. The rear wall 89 rests against the forward surface of the cushion 5. The upper wall 83 is positioned underneath the forward part of the rolling bridge 33. The upper portion 25 of the frame may have other cross sections, for example quadrilateral, circular, elliptical, or triangular. Whichever shape cross section is provided will have a forwardmost margin, and an uppermost margin, over which the rolling bridge portion 33 can roll.

[0482] An upper portion of the cushion 5 comprises a rolling bridge portion 33 which is pivotable relative to a lower portion 35 of the cushion 5, between a rest position in which the rolling bridge portion 33 is relatively rearward, to an in use position in which the rolling bridge portion 33 pivots forwardly such that part of the rolling bridge portion 33 buckles to provide a roll of material that extends over the mask frame 3. The rolling bridge portion 33 pivots about a pivot axis 33A.

[0483] As shown in Figures 19, 20 and 21, a forward margin of the rolling bridge portion comprises a bend 91 and a stiffer region (e.g., a region of thicker cross section) adjacent to a region of reduced stiffness 93 help to initiate rolling of the region of reduced stiffness 93. In other words, a controlled buckling of the region of reduced stiffness 93 occurs with the assistance of the adjacent stiffer portions. In addition, positioning an edge of the relatively more rigid upper frame portion 25 adjacent to the bend 91 further helps to induce rolling in the region of reduced stiffness 93. In some configurations, the region of reduced stiffness 93 is bounded by a first boundary 94, and a second boundary 96, wherein the first boundary 94 and the second boundary 96 have an increased stiffness relative to the region of reduced stiffness. The first boundary 94 may be defined by or alongside the thickened band 34 extending over the rolling bridge portion 33, while the second boundary is defined by or alongside the bend 91. In some configurations, the second boundary 96 can be defined by or alongside an edge of the more rigid upper frame portion 25. In some configurations, the second boundary 96 can be defined along a portion of the cushion 5 positioned between the mask frame 3 and the region of reduced stiffness 93.

[0484] As the rolling bridge 33 of the cushion 5 is displaced about the pivot axis 33A, the roll increases in size. In other words, as the first boundary 94 initially moves

toward the second boundary 96, a roll is formed in the cushion 5. As the first boundary 94 continues to move toward the second boundary 96, the roll continues to increase in size. Thus, in the illustrated embodiment, the roll defined in the rolling bridge 33 starts at nothing and progressively increases during displacement. Preferably, the rolling between the first boundary 94 and the second boundary 96 creates a single bend or inflection between the first boundary 94 and the second boundary 96. The single bend results in legs approaching the bend location that increase in size as the first boundary 94 moves toward the second boundary 96. In other words, the rolling created by movement of the first boundary 94 toward the second boundary 96 preferably does not result in a fan-folding appearance such as a pleated configuration.

[0485] The rolling bridge 33 is configured to move forwardly from a rest condition where the rolling bridge 33 is not pivoted about pivot axis 33A, as shown in Figures 18, 20b) and 21a). The rolling bridge 33 can roll forwardly, about pivot axis 33A to a fully pivoted condition where the rolling bridge 33 extends over the upper and forward walls 83, 87 of the upper frame portion 25. This can be seen with reference to Figures 18b), 19, 20a) and c), and 21b). As can best be seen with reference to Figure 19, the forward portion 33A of the rolling bridge 33 rolls forwardly and downwardly when such that when in the fully pivoted condition, the forward portion 33B extends over and substantially encloses the upper frame portion 25, and in particular the forward wall 87 of the upper frame portion 25.

[0486] Referring to Figures 24 and 35 the headgear straps 21, 23 are shown connected to respective headgear connectors 17, 19 on one side of the mask assembly 1. The upper headgear strap 23 extends from upper headgear connector 19 in a direction in which the upper headgear strap 23 overlaps the pivot axis 33A of the rolling bridge 33. The longitudinal axis 23A of the upper headgear strap 23 may intersect with the pivot axis 33A. As can best be seen in Figure 24b), the elongate element of the upper headgear connector 19 has an axis 19A. A line which perpendicularly bisects the first axis 19A intersects with the pivot axis 33A of the rolling bridge portion 33. In other words a line through the centre of the headgear connector intersects the rolling bridge axis 33A, when the mask assembly 1 is viewed from the side.

[0487] Referring to Figures 25 and 35, the headgear straps 21, 23 extend outwardly from the lateral arms 15 of the mask frame 3 such that the longitudinal axis of the headgear straps 21, 23 is aligned with the longitudinal axis 15A of the arms 15, when

the mask assembly 1 is viewed from above. In other words the angle of the arms is substantially aligned with a direction of tensile force applied by the straps 21, 23, when the straps are connected to the headgear connectors 17, 19. This facilitates the frame 3 holding the cushion 5 to the face effectively, and reduces a tendency for the frame 3 to bend due to the force applied by the straps. This curved shape allows the headgear connectors 17, 19 to be located further back from the front of the mask assembly 1 and thus closer to the face. This allows the user, when side sleeping, to turn their face further into the pillow, without being obstructed by a rigid frame. In the embodiment illustrated, the lower headgear connectors 17 are the rearmost part of the frame 3, when the frame 3 is viewed from the side.

[0488] When the cushion 5 is mounted on the frame 3, the lateral arms 15 may be spaced away from the sides of the cushion 5 so that there is a gap or clearance therebetween.

[0489] Referring now to Figure 28, the lower headgear connectors 17 are located in a guide mouth 101 defined by a lower guide surface 103 being the top surface of a portion of the lateral arms 15, and an upper guide surface 105 being the underside of a portion of the upper portion 25 of the frame, adjacent the upper headgear connectors 19. The guide surfaces 103, 105 are downwardly and upwardly inclined respectively away from the headgear connectors 17 so that the distal ends of the guide surfaces 103, 105, are spaced further vertically apart than the length of the post of each headgear connector 17. The guide surfaces 103, 105 thus define a guide mouth 101 into which the headgear strap 21 can be positioned and pulled rearwardly, to facilitate engagement of the headgear strap 21 with a lower headgear connector 17. The headgear strap 21 may comprise a clip comprising a hook that is guided, along guide surfaces 103, 105 onto the headgear connector 17 as the headgear strap is pulled rearwardly. The guide surfaces 103, 105 thus facilitate quick, reliable and easy connection of the lower headgear strap 17 to a lower headgear connector 17.

[0490] In the embodiment shown in the figures the lower guide surface 103 comprises an arcuate top surface of the lateral arms 15. The top surface may be rounded or planar. The upper guide surface 105 comprises an arcuate underside of the enlarged region 19A of the frame 3.

[0491] Referring now to Figures 29 to 33, some further detail of the inlet connector 7 are shown. The bias vent holes 49 are provided in an array on the inclined forward wall 63 of the inlet connector 7. The bias vent holes 49 help circulate air and ensure

that expired carbon dioxide is not rebreathed by the patient. As noted above, a diffuser 59 may be provided to cover the bias vent holes 49. The diffuser 59 diffuses gases flow from the bias vent holes 49, minimising any unwanted jetting effects and noise caused by the bias flow.

[0492] The diffuser 59 may be removably or permanently mounted on the inlet connector 7 via a diffuser frame 61 to which the diffuser material 59 is mounted, for example via adhesive, overmoulding, hot welding or the like. The diffuser frame 61 may be removably mounted onto the inlet connector 7 via connection formations 61A on one or both of the frame 61 and inlet connector 7. The diffuser frame 61 may alternatively be permanently or removably mounted on the central portion 11 of the frame 3. When removably mounted, the diffuser frame 61 may be provided with an outwardly protruding finger tab 61B to facilitate the user applying a force to the diffuser frame 61 to remove the diffuser frame 61 from the mask assembly 1.

[0493] Additionally or alternatively, a cut-out may be provided on the diffuser frame 61 or the forward wall 62 of the inlet connector 7, to create a touch point for a user's finger.

[0494] The inner margins of the wings 67 of frame 3 between them define a recess 67A in which the diffuser frame 61 is received. The margins of the recess 67A are substantially straight and inwardly inclined, and facilitate correct alignment of the diffuser frame 61 with the frame 3, and alignment of any connection formations 61A.

[0495] The connection formations 61A may comprise a tab at a lower margin of the diffuser frame 61 that is inserted into a recess at the bottom or recess 67A. The diffuser frame 61 can be pivoted forwardly via engagement of the tab with the recess, such that an upper part of the diffuser frame 61 clips onto, or engages with, the inlet connector 7 above the array of vent holes 49 via one or more further connections formations 61A.

[0496] When the diffuser frame 61 is mounted in the recess 67A, a space 67B may be provided between the margins of the diffuser frame 61 and the recess 67A. Space 67B therefore comprises a channel, for example approximately 0.5mm wide around the perimeter of the diffuser frame 61, which provides a small tolerance to the fit of the diffuser frame 61 in the recess 67A.

[0497] As can be seen in Figure 34, the inlet connector 7 may be of a different colour from the diffuser frame 61, and/or the frame 3. For example, the inlet connector 7 may be blue, and the diffuser frame 61 grey or white. Consequently, when the

diffuser frame 61 is mounted on the inlet connector 7, the colour of the inlet connector 7 can be viewed through the space 67B.

[0498] As can be seen in Figures 34 and 35, the recess 67A comprises opposed outer side margins that are substantially straight and which are inclined so as to converge at a base of the recess 67A. The recess 67A can be considered to be substantially V shaped when the mask assembly 1 is viewed from the front. When the upper headgear straps 23 are connected to the upper headgear connectors 19, the longitudinal axis of each upper headgear straps 23 is parallel with a respective side margin of the recess 67A. An edge margin of each upper headgear strap 23 may be substantially aligned with a respect side margin of the recess 67A. The upper headgear straps 23, the recess 67A, and the diffuser frame 61, each have a shape with similarly inclined, straight, side margins, giving the mask assembly 1 a distinctive appearance when viewed from the front.

[0499] Referring now to Figures 36-39 the anti-asphyxia valve 53 can be seen in more detail. The valve opening 57 acts as a non-return valve (NRV). When a positive pressure is applied, the valve member 55 is open and covers valve opening 57. When a negative pressure arises, the valve member 55 covers the gas inlet to prevent backflow and provide a large leak for exhaled gas through the valve opening 57.

[0500] In this embodiment the valve member 55 is movably mounted adjacent the inlet boss 47, at a forward part of the inlet connector 7. The valve member 55 pivots upwardly and forwardly towards the forward wall 53, away from the outlet boss 45. The valve member 55 is movable between a closed position on which the valve member 55 closes the valve opening 57, and an open position in which the valve member 55 opens the opening (instead closing the passage through the inlet boss 47). When in the closed position, because the valve member 55 pivots to a position substantially parallel with the forward wall 63 of the inlet connector, the valve member 55 is out of the inlet flow path through the inlet connector 7, between the inlet boss 47 and outlet boss 45. This allows the outlet opening defined by outlet boss 45 to be relatively large, and to be positioned relative to inlet boss 47 such that the inlet flow path through the inlet connector 7 is substantially straight. Thus, flow path can be seen via the arrows in Figure 52. Because of this configuration, a substantial part of the inlet flow can be delivered directly into the cavity inside the cushion 5, without having to be deflected or turn a corner.

- [0501] Further, the positioning of the anti-asphyxia valve 53 in this way, also enables the inlet connector 7 to be relatively small and discrete, and to occupy a relatively small proportion of the frontal area of the mask assembly 1. This minimises the visual impact of the inlet connector 7, vents holes 49, and the anti-asphyxia valve 53, and enables a relatively large frame aperture 20 to be provided. Having a multi-function inlet connector 7 further facilitates providing these benefits.
- [0502] Such an inlet connector 7 is also relatively compact when viewed from the side or front, in a vertical direction, i.e. the inlet connector 7 extends a smaller distance below the cushion 5. The entire mask assembly 1 can therefore be more compact in a vertical direction.
- [0503] In this embodiment the central axis through the inlet boss 47, and frame inlet opening 13 is substantially perpendicular to the axes through the vent holes 49. In other words, the direction of the inlet gases flow is substantially perpendicular to the direction of the bias vent flow, as indicated by the arrows in Figure 52.
- [0504] Referring to Figures 40 and 41, alternative inlet connectors 7 are provided. These inlet connectors 7 can have any of the features described above, for example the outlet boss 45, inlet boss 47, vent holes 49, anti-asphyxia valve 53, and diffuser 59.
- [0505] The inlet connector 7 may be a separate component, or could be integrally formed with the frame 3.
- [0506] The diffuser 59 may be mounted on, or integrally formed with, the frame 3, or the inlet connector 7.
- [0507] Figure 40 shows an embodiment where the frame 3 and diffuser 59 are integral, with the inlet connector 7 a separate component.
- [0508] Figure 41 shows an embodiment where the frame 3, inlet connector 7, and diffuser 59 are integral, and form a single component.
- [0509] In the above embodiments, the lateral arms 15 are integrally formed with, and part of, the frame 3. Referring now to Figures 42 to 47, the lateral arms 15 and frame 3 may be separate components. This allows the frame 3 to be made of a different material from the lateral arms 15 for example. Figure 44 shows a dove tail connection 120 between the dove tailed ends 121 of the lateral arms 15 and a corresponding slot 123 in the lower portion of the frame 3. Figures 42, 43, 45 and 46 show barbed ends 125 of the lateral arms 15 that are received in corresponding shaped slots 127 in the lower portion of the frame 3. The barbed ends 125 may then be overmoulded 129 to

the central frame portion 15. The ends of the arms 15 may be provided with apertures 129 through which overmould material can flow during manufacturing. These examples help ensure that the connection between the arms 15 and frame 3 is sufficient to withstand the tensile forces exerted by the headgear straps 21, 23 on the frame 3 in use.

[0510] Referring now to Figures 3, 49 and 52 the configuration of the frame 3, cushion 5 and inlet connector 7 is such that the breathing gas inlet conduit 9 extends generally below the mask assembly 1. That is, when viewed from the side, the inlet conduit 9 extends downwardly from the mask assembly 1, and upper end of the conduit 9 does not project substantively forwardly. The upper end of the conduit does not project forwardly of the forward margin of the mask assembly 1, that forward margin being defined by the central portion 13 of the frame 3.

[0511] A comparison between the angle of the conduit 9 between the current mask assembly 1 and a prior art mask assembly 121 can be seen in Figure 49. In normal use, with a user standing or sitting, the mounting posts of the lower headgear connectors 17 are substantially vertical. The base of the central portion 13 of the frame 3 is substantially planar, the inlet opening 13 being slightly inclined. Likewise, the inlet boss 47 of the inlet connector 7 is also slightly inclined. Consequently, the connection between the conduit 9 and the inlet connector 7 is such that the conduit 9 hangs below the mask assembly 1, when viewed from the side. The upper end of the conduit 9 is within the forwardmost margin of the mask assembly 1. This configuration minimises any forward, outward, protrusion of the inlet connector 7 and conduit 9 in use, that could contact a pillow or bed when the patient is side sleeping.

[0512] When viewed from the front, the maximum vertical dimension of the frame 3 is less than the maximum vertical dimension of the cushion 5. In particular the rolling bridge portion 33 of the cushion 5 projects above the uppermost part of the frame 3.

[0513] When viewed from the front the maximum lateral dimension of the frame 3 is substantially the same as the maximum lateral dimension of the cushion. The outer margin of the lower most headgear connectors 17 is substantially aligned with the outer margin of the side wall 31 of the cushion 5.

[0514] When viewed from the front, the shape of the outer periphery of the frame 3 substantially matches the shape of the outer periphery of the cushion 5. In this embodiment, the cushion and frame comprise a substantially planar base and inwardly

inclined sides.. The lower part of the mask assembly 1 is relatively wide, the sides of the mask assembly 1 are inwardly inclined towards a relatively narrow apex portion.

[0515] When viewed from the front, the outer periphery of the frame 3 is substantially within the outer periphery of the cushion 5.

[0516] When viewed from the side, the outer periphery of the lateral arms 15 and upper frame portion 25 are within the outer periphery of the cushion 5.

[0517] The ratio of the height of the inlet connector 7 to the height of the frame 3 may be between 0.5 to 0.75, and is preferably approximately 0.67.

[0518] The ratio of the width of the central portion 13 of the frame 3 to the width of the frame 3 may be between 0.45 and 0.65, and is preferably approximately 0.57.

[0519] With reference to Figures 53 to 57 some example dimensions of a mask assembly 1 in accordance with this disclosure are shown.

[0520] Referring initially to Figure 53, the overall width D1 of the frame 3, from one lower headgear connector 17 to the other, may be approximately 100mm, and preferably 96mm. The overall width D2 of the central portion 13 of the frame 3 may be approximately 55mm. A vertical distance between the bottom of the lower headgear connectors 17 and the apex of the frame 3 (at the top of elongate frame portion 25) may be approximately 50mm, and preferably 47mm.

[0521] The frame 3 may be configured such that the maximum lateral deformation of the frame 3 is equal to the difference between D1 and D2, that is, the frame 3 can deform sufficiently that the lower headgear connectors 17 can move to a position aligned with the outer margin of the lower portion 13 of the frame 3.

[0522] The frame 3 may be configured to be able to resiliently deform in a lateral direction from a resting condition, to a deformed condition in which the frame width:

- a) equals the width of the central portion 13 of the frame 3; or
- b) is greater than the width of the central portion 13 of the frame 3; or
- c) is less than the width of the central portion 13 of the frame 3.

[0523] The frame 3 may be configured such that the maximum lateral deformation of the frame is substantially equal to D1, that is, the frame 3 can deform sufficiently that the lower headgear connectors 17 can move to a position aligned with the centre of the lower portion 13 of the frame 3, that is, aligned with the axis 13A.

[0524] In embodiments in accordance with this disclosure, D1 may be between 60-140mm, 60-96mm, 60-100mm, 60-110mm, 70-100mm, 80-110mm, 90-100mm, less than 110mm or less than 140mm.

[0525] In embodiments in accordance with this disclosure, D2 may be between 30-70mm, 40-70mm, 40-55mm, 40-60mm, 50-70mm, less than 60mm, or less than 70mm.

[0526] In embodiments in accordance with this disclosure, D3 may be between 30-80mm, 30-50mm, 35-50mm, 40-50mm, 40-60mm, 40-80mm, less than 50mm, less than 60mm, or less than 80mm.

[0527] With reference to Figures 54 and 55, some possible dimensions for a mask assembly 1 in accordance with this disclosure, can include any one or more of:

- a) frame height from inlet boss 47, when viewed from the front: 71mm;
- b) frame height from inlet opening 13, when viewed from the front: 67mm;
- c) frame width: 96mm;
- d) frame depth, when viewed from the side with the elongate posts of the lower headgear connectors 17 vertical: 45mm;
- e) width of central portion 15: 55mm;
- f) inlet opening 13: 24mm high by 26mm wide;
- g) frame aperture 20: 25mm wide, length from one lateral arm 15 to the other: 140mm;
- h) height of inlet connector 7 from inlet boss 47: 33mm;
- i) length of mounting post of lower headgear connectors 17: 15mm;
- j) inlet connector height from inlet boss 47: 45mm.

[0528] With reference to Figure 55, some possible angles for a mask assembly 1 in accordance with this disclosure, can include any one or more of:

- a) angle of elongate element of upper headgear connector 19 relative to angle of mounting post of lower headgear connector 17, when viewed from the side: 45°;
- b) angle of upper margin of frame 3 relative to the mounting post of lower headgear connectors 17, when viewed from the side: 60°.

[0529] With reference to Figures 56 and 57, some possible dimensions for a mask assembly 1 in accordance with this disclosure, include:

- a) cushion height when looking in direction along axis of inlet opening 25: 90mm;
- b) cushion height when viewed from the front: 94mm
- c) cushion width: 96mm;

- d) cushion depth front to back, in a direction perpendicular to axis of inlet boss 47: 60mm;
- e) inlet aperture 25: 37mm high, 35mm wide;
- f) height of pivot axis 33A from base of cushion 5 when viewed from the side: 52mm.

[0530] With reference to Figure 58, a mask assembly comprises a modified frame 3. In this embodiment, features of the frame 3 are wider as compared to earlier described embodiments. The frame features have an increased contact area with the cushion as compared to earlier examples. The wider features provide increased support to the cushion 5, to assist in preventing or reducing leaks from the cushion 5, seal inversions and/or excessive ballooning of the cushion 5. The features of the frame 3 that are widened in this example include the lateral arms 15 and the upper portion 25.

[0531] The arms 15 are significantly widened so that the distal end of each arm 15 extends to a position adjacent both the lower and the upper headgear connectors 17, 19. The upper margin of each arm 15 is inclined upwardly from the frame opening 13 and terminates adjacent upper headgear connector 19. The lower margin of each arm 15 extends as per earlier embodiments to the lower end of lower headgear connector 17.

[0532] The upper portion 25 is also significantly wider than in earlier embodiments, such that the lower forward margin of the upper portion 25 is arcuate and defines the upper margin of the opening in which inlet connector 7 is received. The lower forward margin of the upper portion 25 is in contact with and engages the upper margin of the inlet connector 7. In this embodiment the frame 2 does not comprise window 20, instead comprising a trapezoidal opening 120 configured to receive and engage with the inlet connector 7.

[0533] With reference to Figure 59, a mask assembly comprises headgear clips 151 configured to connect the headgear straps to the frame 3. In one example, a pair of headgear clips 151 are provided to connect the lower headgear straps 21 to the lower headgear connectors 17 on the frame 3.

[0534] Each headgear clip 151 comprises an extension configured to support the side wall 31 of the cushion 5 to assist in reducing or preventing cushion blow out.

[0535] Each headgear clip 151 comprises an elongate body 153 one end of which comprises a slot 155 to receive the lower headgear strap 21, and the other end of which comprises a hook 157 to receive the post of the lower headgear connector 17.

Each headgear clip 151 further comprises a pair of upper and lower extensions 159, 161 that extend away from the body 153. The extensions 159, 161 in this example are each shaped to match the shape of the side wall 31 of the cushion 5, and each comprise a support surface 159A, 161A against which the cushion side wall 31 can rest. Each support surface 159A, 161A limits lateral expansion of the cushion side wall 31, to help resist cushion blow out.

[0536] The lower extension 159 curves downwardly and inwardly to match the shape of a lower portion of the cushion side wall 31, the distal end of the lower extension 159 terminating below the lateral frame arm 15. The upper extension 161 curves upwardly and inwardly to match the shape of a side portion of the cushion side wall 31, the distal end of the upper extension 161 terminating adjacent upper headgear strap 23 and adjacent upper headgear connector 19.

[0537] With reference to Figure 60, a mask assembly comprises a modified frame 3. In particular, upper portion 25 comprises a pair of arcuate elongate frame elements 25A, 25B that are vertically spaced apart. Frame element 25A comprises the upper most part of the frame 3. Frame element 25B defines the upper margin of the closed, frame aperture 20 through which the cushion 5 is exposed.

[0538] The frame elements 25A, 25B may be configured to be fixed in spaced apart relationship relative to frame 3. The spacing of the frame elements 25A, 25B, and the provision of more than one frame element 25A, 25B, can provide additional support to the cushion 5. This may help pull the cushion 5 towards the face, rather than pulling cushion 5 upwardly.

[0539] The frame elements 25A, 25B may be configured such that the space between the frame elements 25A, 25B can be adjusted to adjust the support provided to the cushion 5 by the frame elements 25A, 25B. The spacing may be adjusted, for example, between a closed position in which the frame elements 25A, 25B are relatively close together, for example with reference to Figure 60A, to an intermediate position in which the frame elements 25A, 25B are spaced apart for example with reference to Figure 60B, to a spaced position in which the frame elements 25A, 25B are relatively spaced apart for example with reference to Figure 60C. By adjusting the spacing between the frame elements 25A, 25B, the support provided by the upper frame portion 25 to the cushion 5 may be adjusted.

[0540] With additional reference to Figure 61, the upper frame element 25A may extend between upper headgear connectors 19 as per earlier embodiments. The lower

frame element 25B may be movable relative to the fixed upper frame element 25A and the remainder of the frame 3. The lower frame element 25B may be a separate component that is movably mounted to frame 3, for example by way of a pivotal mount 163. The lower frame element 25B may be integral with the frame 3 but comprise one or more regions that allow the lower frame element 25B to move relative to the upper frame element 25A, for example regions of predetermined weakness, one or more living hinges.

[0541] In another example, the lower frame element 25B may be fixed relative to frame 3, with upper frame element 25A being movable. In a further example, both frame elements 25A, 25B may be movable relative to frame 3.

[0542] With reference to Figure 62, a mask assembly comprises a modified frame 3. In particular, frame 3 comprises an upper portion 25 which is spaced below the forward margin of the nasal bridge region 33 of the cushion 5. The upper portion 25 may be spaced below the uppermost margin of the frame 3. In this position, the upper portion 25 of the frame pushes the cushion 5 towards the face more effectively, and can create a more equal load distribution on the cushion 5 that improves the seal with the patient's face.

[0543] Furthermore, when the frame 3 is experiencing a horizontal compressive force (for example as shown in Fig 13a), frame upper portion 25 is less likely to lift away from the cushion 5.

[0544] With reference to Figures 62a) and c) to e), the distal ends of the upper portion 25 narrows from a wider frame region adjacent the upper end of each upper headgear connector 19 to a narrower central apex, to define a space 170 between the forward margin of the nasal bridge region 33 of the cushion 5 and the upper margin of the upper portion 25 of the frame 3. The upper portion 25 thus comprises a narrowed region. As can be seen with reference to Figure 62d), the upper margin of the narrowed region is positioned below the uppermost margin of the frame 3. In this embodiment, space 170 is defined by a cut-out portion of the central apex of the upper portion 25.

[0545] With reference to Figure 62b) the upper portion 25 extends from the upper end of each upper headgear connector 19 across the mask assembly and smoothly tapers to a narrowed region, such that the upper portion 25 is spaced 170 below the forward margin of the nasal bridge region 33 of the cushion 5. Again, the upper margin of the narrowed region is below the uppermost margin of the frame 3.

[0546] With reference to Figure 63, a mask assembly comprises a modified frame 3.

In particular, frame 3 is configured to deform the cushion 5 when the cushion 5 is mounted on the frame 3. The frame 3 squeezes the cushion 5, which can improve the seal between the cushion 5 and the patient's face, particularly at the patient's nose.

[0547] The frame 3 in this embodiment may therefore be narrower than the frame 3 of earlier embodiments. With reference to Figure 63a) a frame 3 in accordance with this embodiment with a narrower width W1 is shown superimposed on a frame 3 as per previous embodiments with a wider width W2.

[0548] The frame 3 of this embodiment comprises lateral arms 15 which define a distance between them which is less than the corresponding dimension of the cushion 5. In particular the distance between the cushion engaging surfaces of the lateral arms 15 is less than the distance between the side walls 31 of the cushion 5. With reference to Figure 63, example lateral dimensions of the cushion 5 and between the frame arms 15 are 82 mm and 74 mm respectively. In this example the distance between the frame arms 15 is around 90% of the lateral dimension of the cushion 5. In other examples the distance between the frame arms 15 may be between 80 and 97% of the lateral dimension of the cushion, or between 85 and 95%.

[0549] With reference to Figure 64, a mask assembly comprises a modified frame 3 and cushion 5.

[0550] Referring to Figure 64b), and earlier Figures 18 to 21, the elongate frame member of the upper portion 25 of the frame 3 of earlier embodiments is of rectangular cross section and comprises upper and lower walls 83, 85 and forward and rear walls 87, 89. The rear wall 89 rests against the forward surface of the cushion 5. The upper wall 83 is positioned underneath the forward part of the rolling bridge 33. The upper portion 25 of the frame 3 rests in recess 62 across the front of the cushion 5.

[0551] In the current embodiment, with reference to Figure 64a) and c), the upper portion 25 of the frame 3 rests on the adjacent surface of the front wall of the cushion 5. As the cushion 5 and frame 3 are assembled together, the more rigid frame 3 deforms the resiliently deformable cushion 5. In particular, the upper portion 25 of the frame 3 deforms the adjacent surface of the cushion 5 such that the upper portion 25 rests on the front wall of the cushion 5. The upper portion 25 is mounted on the cushion 5 with an interference fit, as can be seen with reference to Figures 64a) and c). The upper portion 25 thus resiliently deforms the cushion 5 during assembly, the

deformation assisting in retaining the cushion 5 on the upper portion 25 of the frame 3. When so retained, the outer surface of the upper portion 25 may be flush with the outer surfaces of the cushion 5 adjacent the recess 62.

[0552] In the modified embodiment, as described above with reference to Figure 62, the upper portion 25 of the frame 3 presses against the upper front surface of the cushion 5 at a position spaced 170 below the rolling bridge portion 33 of the cushion 5, and in particular below the second boundary 96 at the forward margin of the rolling bridge portion 33. This spacing 170 allows more clearance for the rolling bridge portion 33 to roll forwardly in use. The pressing of the upper portion 25 against the cushion 5 deforms the cushion 5 such that the upper portion 25 squeezes the cushion 5 in an interference fit.

[0553] Referring to Figures 64c) and 65, the cushion 5 in this embodiment is modified to comprise a recessed region 171 to provide greater clearance between the interior surface of the cushion 5 and the patient's nose. The recessed region 171 is located centrally, on the interior of the cushion 5, directly below, but adjacent to, the rolling bridge portion, and in particular directly below the second boundary 96.

[0554] Referring to Figure 66, a mask assembly comprises a modified cushion 5. In particular the region of the side wall 31 of the cushion 5 adjacent each lower headgear connector 17 of frame 3 is indented 173. Each indent 173 is located adjacent a respective lower headgear connector 17, and extends rearwardly. As can be seen in Figures 66d) and e), each indent 173 allows clearance between the hook portion of a headgear clip 175 and the side wall 31 of the cushion 5. Each indent 173 may allow the headgear clip 175 to rotate about the post of lower headgear connector 17, without contacting the cushion 5.

[0555] Referring to Figures 67 and 68, a mask assembly comprises a modified cushion 5. In this embodiment the cushion 5 is provided with one or more support ribs, internally of the cushion 5, to resist deformation of the cushion 5.

[0556] With reference to Figure 67, pair of laterally spaced apart, generally laterally extending inclined support ribs 177 are provided, one each side of the vertical axis of the cushion 5. These laterally extending support ribs 177 are located in an upper portion of the cushion 5, adjacent the rolling bridge portion 33. Each rib 177 may be integrally formed with the cushion, from the same cushion material.

[0557] With reference to Figure 68, a pair of laterally spaced apart, generally vertically extending support ribs 179 are provided, each rib 179 being at or adjacent

the pivot axis 33A of the rolling bridge portion 33 of the cushion 5. These vertically extending support ribs 179 can limit how much the nose portion of the cushion 5 balloons under pressure, reducing the likelihood of eye leaks.

[0558] With reference to Figure 69, a pair of laterally spaced apart support ribs 180 are provided, each rib 180 being adjacent but below the pivot axis 33A of the rolling bridge portion 33 of the cushion 5. These ribs provide support and reinforcement adjacent the area of the cushion 5 that pivots during movement of the rolling bridge portion 33.

[0559] Mask assemblies can be cleaned regularly by the patient. Some disassembly of the mask assembly may be required for this process.

[0560] It may be advantageous to separate the cushion 5 for individual cleaning. The cushion 5 may require more frequent cleaning than other components of the mask assembly. At least some of the above described embodiments allow for the cushion 5 to be disconnected independently from the remainder of the mask assembly, to enable this.

[0561] It may be advantageous to separate the headgear for individual cleaning. It may be advantageous to be able to remove the headgear without altering the strap connections with the mask frame 3, such that re-sizing is not required when next donning the headgear. In some embodiments, the upper headgear straps 23 are fastened around the frame 3, for example as shown in Figure 24. As such, it may be advantageous to have the ability to remove the headgear and frame 3 together without needing to remove the inlet connector 7 and/or conduit 9 first.

[0562] The following embodiments are configured to provide the ability to selectively remove one or more components of the mask assembly, such as the headgear and/or frame 3, without disassembly of other components.

[0563] Referring to Figure 70, a mask assembly comprises a modified mask frame 3. In this embodiment the frame 3 is removably connected to the inlet connector 7 and can be removed from the other components of the mask assembly, namely the inlet connector 7, cushion 5 and conduit 9, without disassembly of those other components.

[0564] In this embodiment the central portion 11 of the frame 3 comprises a frame clip 14 that is configured to mount the frame 3 onto the inlet 7. The central portion 11 is therefore a central connection portion of the frame 3. The opening 13 in the central connection portion of the frame 3 is defined by the internal walls of the frame clip 14, the central connection portion circumscribing the inlet opening. In this embodiment

the frame clip 14 comprises front 14a and side 14b walls that extends around the front and sides of the opening 13. The side walls 14b terminate towards the rear to leave a mouth 14c at the rear of the opening 13, defined between opposed spaced apart ends 14d of the side walls 14b of the frame clip 14, such that the opening 13 is not bound completely by the frame clip 14.

[0565] When viewed from above, along the central axis of the opening 13, the frame clip 14 is omega shaped. The mouth 14d allows the side walls 14b of the frame clip 14 to resiliently deform during assembly of the inlet connector 7 on the frame 3. The frame clip 14 resiliently expands during mounting of the mask frame 3 onto the remainder of the mask assembly, and then contracts around the inlet connector 7 when the inlet connector 7, or at least part of the inlet boss 47, is fully received in the opening 13. The frame 3 is not connected to the inlet connector 7 and cushion 5 at any other location, other than at the frame clip 14, namely at the central connection portion. In use, the headgear provides tension through the frame 5, encouraging the clip 14 to remain secured to the inlet connector 7. Consequently, the frame 3 can be removed, as a single component, from the remainder of the mask assembly, by expanding the frame clip 14, increasing the size of the opening 13, such that the frame clip 14 disengages the inlet connector 7.

[0566] The frame clip 14 may comprise one or more anti-rotation and/or guide surfaces configured to resist rotation of the frame 3 relative to the mask assembly. For example, the front and/or side walls 14a, 14b of the frame clip 14 may be straight or flat, or comprise one or more straight or flat portions. This may help resist or prevent relative rotation between the mask frame 3 and the inlet connector 7. The frame clip 14 in this embodiment, comprises at least one non-circular wall portion 14e that engages the inlet connector 7. In this embodiment the opening 13 comprises a plurality of substantially straight side wall portions 14e of the side walls 14b that engage with corresponding straight portions of the inlet connector 7.

[0567] Referring to Figure 71, the modified mask frame 3 is similar to that of Figure 70. However, in this embodiment the front part of the central portion 11 of the frame 3 is recessed 11a, when viewed from the front, such that a portion of the central portion 11 adjacent the frame clip 14 is relatively thinner than the remainder of the central portion 11. This may enable the front portion of the frame 3 to be more flexible, for example to allow the frame clip 14 to more easily deform during assembly and disassembly with the inlet connector 7.

[0568] With further reference to Figure 71, the frame 3 and the inlet connector 7 are provided with corresponding engagement features that engage with one another when the frame 3 is mounted on the inlet connector 7. In this embodiment the frame 3 comprises a female engagement feature 183 that receives a male engagement feature in the form of a lug 185 on the inlet connector 7. In this embodiment that engagement features are positioned laterally of the central portion 11 of the frame 3. When engaged, the engagement features 183, 185 help retain the inlet connector 7 on the frame 3, and help resist relative rotation between the inlet connector 7 and the frame 3.

[0569] Referring to Figure 72, the modified mask frame 3 is similar to that of Figure 70. However, in this embodiment the front part of the central portion 11 has an increased height front wall 11c, when viewed from the front, such that a portion of the central portion 11 adjacent the frame clip 14 is relatively thicker than the remainder of the frame clip 14. This may enable the front portion of the frame 3 to be more rigid, for example to resist the frame clip 14 from deforming. Arrow M indicates a mounting direction in which the frame 3 is pushed onto the inlet connector 7.

[0570] Referring to Figure 73, in this embodiment the mask frame 3 is removably mounted on a conduit connector cuff 9a at the end of the inlet conduit 9, instead of being mounted on the inlet connector 7. In this embodiment, the mask frame 3 is only connected to the conduit connector cuff 9a, and is not connected to the remainder of the mask assembly.

[0571] In this embodiment the frame clip 14 is similar to the frame clip 14 described with reference to Figure 70, and comprises a mouth 14c at the rear of the frame clip 14, defined between opposed spaced apart ends 14d of the frame clip 14, such that the opening 13 is not fully bound by the frame clip 14. The frame clip 14 resiliently deforms outwardly to expand the mouth 14c as the spaced part ends 14d engage the conduit connector cuff 9a, and then return to their rest position to contract the mouth 14c to connect the mask frame 3 to the conduit connector cuff 9a.

[0572] The conduit connector cuff 9a may comprise a frame location feature configured to locate and/or guide the frame 3 into the desired position on the conduit connector cuff 9a.

[0573] Referring to Figures 73c), e) and f), the conduit connector cuff 9a comprises a pair of spaced apart frame location features in the form of longitudinally spaced apart circumferential flanges 9b between which is defined a recess 9c that receives the

mask frame clip 13. The flanges 9b resist movement of the mask frame 3 in a direction along the axis of conduit 9.

[0574] The frame clip 14 extends away from the frame's lateral arms 15 to partially extend around the rear of conduit connector cuff 9a. The frame clip 14, at least at the sides, is laterally spaced from the remainder of the frame 3, in particular from the lateral arms 15. The frame clip 14 is therefore decoupled from the remainder of the frame 3 in the sense that forces exerted onto the frame via the headgear are decoupled from the frame clip 14. This decoupling of forces assists in preventing unintentional disconnection of the frame 3 from the conduit connector cuff 9a in situations where the sides of the frame 3 are pushed forwards or away from each other, as this deformation is less likely to affect the connection at the frame clip 14.

[0575] Referring to Figure 74, the modified mask frame 3 is similar to that of Figure 73 and comprises a mouth 14c at the rear of the frame clip 14, defined between opposed spaced apart ends 14d of the frame clip 14, such that the opening 13 is not closed by the frame clip 14. However, in this embodiment, the frame 3 connects with both the inlet connector 7 and the conduit connector cuff 9a of the conduit 9.

[0576] The internal walls of the frame clip 14 are shaped to resist or prevent relative rotation between the mask frame 3 and the inlet connector 7, and between the mask frame 3 and the conduit connector cuff 9a. In this embodiment the frame clip 14 comprises a plurality of substantially straight portions 14e of side walls 14b at the sides of the frame clip 14. The conduit connector cuff 9a comprises a corresponding plurality of substantially straight wall portions 9d. When the mask is connected to the conduit connector cuff 9a the wall portions 14e engage the wall portions 9d to resist relative rotation.

[0577] In this embodiment, the straight wall portions 14e of the frame clip 14 extend upwardly from the frame clip 14 and overlap with side portions 7a of the inlet connector 7. The wall portions 14e extend to some extent around the rear of the inlet connector 7 such that the wall portions 14e connect with the inlet connector 7. The frame 3 therefore engages the front, sides, and some of the rear of the inlet connector 7 and the conduit connector cuff 9a.

[0578] The conduit connector cuff 9a comprises an end stop 9e against which the frame clip 14 abuts when the frame 3 is fully connected to the conduit connector cuff 9a, to limit by how much the mask frame 3 can be pushed onto the conduit connector cuff 9a.

- [0579] In this embodiment the conduit connector cuff 9a comprises a single, lower circumferential flange 9b, generally upward movement of the frame 3 being limited by the lowermost surface of the inlet connector 7. Recess 9c is therefore defined between the lower flange 9b and the lowermost surface of the inlet connector 7.
- [0580] Referring now to Figure 75, an embodiment is shown which is similar to that of Figure 74, and which comprises a frame 3 that connects to both the inlet connector 7 and the conduit connector cuff 9a.
- [0581] In this embodiment the recess 9c on the conduit connector cuff 9a is deeper than in the Figure 74 embodiment. Consequently, the frame clip 14 that fits into and connects with the recess 9c, can be thicker. The thicker frame clip 14 has an increased stiffness that helps prevent the frame 3 from unintentional disconnection when the front of the frame 3 is rotated up or down, for example due to tensile forces from the headgear, or movement of the mask assembly by the user. The thicker frame clip 14 in this embodiment comprises an annular rib 14f that projects away from the remainder of the mask frame 3, into the opening 13.
- [0582] With further reference to Figure 75, the frame 3 and the conduit connector cuff 9A are provided with corresponding engagement features that engage with one another when the frame 3 is mounted on the conduit connector cuff 9a. In this embodiment the conduit connector cuff 9a comprises a female engagement feature 193 that receives a male engagement feature in the form of a lug 195 on the opening 13. In this embodiment the engagement features are positioned laterally of the central portion 11 of the frame 3. When engaged, the engagement features 193, 195 help retain the frame 3 on the conduit connector cuff 9a, and help resist relative rotation between the frame 3 and the conduit connector cuff 9a.
- [0583] With further reference to Figure 75, the frame clip 14 comprises substantially straight, parallel, opposed side portions 14e that engage with corresponding substantially straight side surfaces 9d of the conduit connector cuff 9a. The engagement between the side portions 14e and surfaces 9d resists rotation of the mask frame 3 relative to the conduit 9.
- [0584] In the embodiments of Figures 70 to 75, the portion of the mask frame 3 around the opening 13 that fits into and connects with the recess 9c, can be considered to be a resiliently deformable frame clip 14, that clips onto the inlet connector 7 and/or the conduit connector cuff 9A. In these embodiments, the frame clip 14 releasably clips onto the inlet connector 7 and/or the conduit connector cuff 9A.

[0585] Referring now to Figure 76, an embodiment is shown which is similar to that of Figure 74, and which comprises a frame 3 that connects to both the inlet connector 7 and the conduit connector cuff 9a.

[0586] In this embodiment the side portions 9e of the recess 9c in the conduit connector cuff 9a are upwardly inclined towards the lower part of the inlet connector 7. The inclined side portions 9e lead to upwardly inclined side portions 7e on the inlet connector 7. The side portions 9e, 7e together define smooth, upwardly inclined guide surfaces that guide the frame clip 14 into the desired position to connect with the inlet connector 7 and the conduit connector cuff 9a, as the mask frame 3 is pushed onto these components from the front of the mask assembly.

[0587] In this embodiment, the female engagement feature 193 is provided on the inlet connector 7 rather than on the inlet conduit connector 9a. The engagement features 193, 195 help retain the frame 3 on the inlet connector 7, and help resist relative rotation between the frame 3 and the inlet connector 7, once the frame 3 has been fully pushed onto the inlet connector 7.

[0588] As can best be seen in Figure 76e) and f), the frame clip 14, when viewed from above or below comprises substantially straight side walls 14b. The side walls 14b are angled towards one another as they extend away from the mouth 14c. Consequently, as the frame clip 14 is pushed onto the inlet connector 7 and conduit connector cuff 9a, increasing force is required to fully mount the frame clip 14 onto the inlet connector 7 and conduit connector cuff 9a.

[0589] The ends 14d of frame clip 14 define fingers that project from the ends of the frame clip 14 radially inwardly towards one another. The fingers 14d are configured to engage the rear of the inlet connector 7, to retain the frame clip 14 on the inlet connector 7, as shown in Figure 76e). To disconnect the components, the fingers 14d are moved outwardly, away from one other, to so that they no longer engage the rear of the inlet connector 7.

[0590] Referring now to Figure 77, an embodiment is shown which comprises a frame 3 that connects only to the inlet connector 7, and not to the conduit connector cuff 9a.

[0591] In this embodiment, the lower part of the inlet connector 7 comprises a skirt 7e that extends downwardly over the front and sides of the conduit connector cuff 9a. The skirt 7e comprises a recess 7f configured to receive and engage with the frame clip 14 of the mask frame 3, and a guide flange 7g that projects outwardly from the

skirt 7e below the recess 7f. The sides of the guide flange 7g are inclined upwardly from front to rear, to guide the mask frame 3 upwardly as it is pushed onto the inlet connector 7. The inclined recess 7f and inclined flange 7g together provide smooth uninterrupted surfaces for the frame clip 14 to slide over and engage with.

Additionally, any forward rotation of the mask frame 3 will be less likely to disconnect the conduit connector cuff 9a unintentionally.

[0592] The conduit connector cuff 9a comprises a rear release tab 9f that projects from a rear part of the cuff 9a, behind the inlet connector 7. This enables the user to grip and release the conduit 9 from the mask assembly, by pivoting the rear of the conduit connector cuff 9a away from the inlet connector 7.

[0593] The inlet connector 7 further comprises recessed hand grip portions 7b either side of the diffuser, and above the skirt 7e.

[0594] In this embodiment the engagement features 193, 195 are located at the front and rear of the frame clip 14 and conduit connector cuff 9a, so that the sides of the frame clip 14 and cuff 9a are smooth and therefore allow less resistance to pushing of the frame clip 14 onto the cuff 9a,

[0595] Similar to the frame clip 14 of Figure 76, the side walls 14b are inwardly inclined away from mouth 14c, and the fingers 14d engage the rear of the inlet connector 7.

[0596] Referring now to Figure 78, an embodiment is shown which has similar features to that of Figure 77, in which the mask frame 3 connects only to the inlet connector 7.

[0597] In this embodiment, the frame clip 14 of the mask frame 3 that fits into and connects with the inlet connector recess 7f clips onto the inlet connector 7.

[0598] The frame clip 14 comprises front and side walls 14a, 14b, that extend partially around the rear of the opening 13, leaving a mouth 14c at the rear that initially receives the inlet connector 7. As the mask frame 3 is further pushed onto the inlet connector 7 from the front, the frame clip 14 resiliently deforms, to allow the inlet connector 7 to be fully received in, and to engage with, the frame clip 14.

[0599] In this embodiment, the frame clip ends 14d comprise fingers that project from the ends of the frame clip 14 radially outwardly away from the side walls 14b. The fingers 14d are therefore angled away from each other when viewed along opening axis 13a, to comprise guide surfaces that together define mouth 14c. At the start of assembly, the guide surfaces of the fingers 14d engage the inlet connector 7. Further

movement of the mask frame 3 towards the inlet connector 7 further engages the fingers 14d which are forced to deform outwardly to increase the size of the mouth 14c to allow the inlet connector 7 to be fully received in the frame clip 14. When so received, the fingers 14d snap back to reduce the size of the mouth, engage the inlet connector 7 and retain the inlet connector 7 on the mask frame 3.

[0600] The fingers 14d are spaced apart from the frame 3 and in particular are spaced from the lateral arms of the frame 3. The fingers 14d are therefore decoupled from the lateral arms 15 of the frame 3, such that the lateral arms 15 of the frame 3 can be moved (for example under headgear tension) without opening and disconnecting the frame clip 14 from the inlet connector 7.

[0601] Referring to Figures 78a) and e) the frame clip 14 is relatively tall, when viewed from the front and back, and relatively deep, when viewed in cross section, increasing the rigidity, and the resistance to deformation, of the frame clip 14. Providing a frame clip 14 with increased dimensions can also provide a more solid and reassuring feel to the user.

[0602] Referring to Figure 78d) the inlet connector flange 7g extends around the rear of the inlet connector 7, so as to engage the fingers 14d of the frame clip 14.

[0603] Referring now to Figure 79, an embodiment is shown which has similar features to that of Figures 77 and 78, in which the mask frame 3 connects only to the inlet connector 7.

[0604] With reference to Figure 79d) the uppermost rear portion of the conduit connector cuff 9A is downwardly inclined 9h towards the rear of the cuff 9a. This allows clearance for the cuff 9a to be more easily disconnected from the inlet connector 7 when the user presses down on the release tab 9e.

[0605] With particular reference to Figure 79f), the fingers 14d extend further away from the opening 13 to provide release fingers that can be pushed apart to release the frame clip 14 from the inlet connector 7.

[0606] With particular reference to Figures 79a) and b) the grip portions of the inlet connector 7 are deeper than those described above.

[0607] Referring now to Figure 80, an embodiment is shown which has similar features to that of Figure 77-79, in which the mask frame 3 connects only to the inlet connector 7.

[0608] In this embodiment, the lower part of the inlet connector 7 comprises the mounting recess 7F which is partly defined by the lower flange 7g at the sides and

rear of the inlet connector 7. The lower flange 7g does not extend around the front of the inlet connector 7, leaving a gap 7h. In this embodiment, the conduit connector cuff 9a release tab 9e is located at the front of the cuff 9a and is dimensioned to be received in the gap 7h and when so received to define the front of the recess 7f. With reference to Figures 80d) and e), to release the conduit 9 from the inlet connector 7, the release tab 9e is pushed downwardly, such that the front part of the conduit connector cuff 9a rotates away from the inlet connector 7.

[0609] As can best be seen in Figures 80c) and f), the fingers 14d of the frame clip 14 are relatively short, and only project a short distance outwardly away from the remainder of the frame clip 14. The fingers 14d also extend only a short distance along the sides to the rear of the inlet connector 7, when the frame 3 is mounted on the inlet connector 7. Consequently, the flange 7g need only extend a relatively short distance along the sides to the rear of the inlet connector 7. The rear of the inlet connector 7 has no flange, as can be seen in Figure 80e),

[0610] The shape of the interior walls 14a, 14b of the frame clip 14 closely correspond to the exterior profile, when viewed from above, of the inlet connector 7. This combined with the relatively short fingers 14d, provides the mask assembly with a relatively smooth, clean look, with minimal regions in the connection between the frame 3 and inlet connector 7 that are angular or project significantly outwardly.

[0611] Referring to Figures 80i) and j), the frame clip side walls 14b are substantially straight, as is a central portion of front wall 14a, to resist rotation of the frame clip 14 relative to the mask assembly.

[0612] Referring to Figure 80k), the frame clip 14 is to some extent decoupled from the lateral arms 15, such that the lateral arms 15 may deflect, for example to the positions shown in dashed line, without substantially affecting the mounting of the frame clip 14 on the inlet connector 7. For example, the lateral arms 15 may be temporarily deflected outwardly, away from the face, when for example the user is pushing the mask assembly away from their face to talk, or when adjusting the mask, or disconnecting the headgear. The lateral arms 15 may be pushed inwards for example when the headgear is being connected to the mask assembly. The fingers 14d of the frame clip 14 are substantially decoupled from the lateral arms, and therefore the geometry of the frame clip 14 is relatively unaffected by deformation of the mask frame 3.

[0613] Referring to Figures 80l) and m), the relative orientations of the mask frame 3, cushion 5, and inlet connector 7 can be seen. These figures also shows the mounting direction M of the mask frame 3 onto the inlet connector 7, in a direction which is inclined but generally horizontal, in a rearward direction from front to rear of the mask assembly, in a direction substantially orthogonal to the to the central inlet axis 47a of the inlet port 47b of inlet boss 47. In this embodiment the mounting direction M is also substantially orthogonal to the opening axis 13a. In this embodiment the central inlet axis 47a is aligned with the opening axis 13a. The cushion 5 is mounted on to the rear of the inlet connector 7 in a generally forward direction MC from rear to front of the mask assembly, and in a downwardly inclined direction. The central outlet axis 45A of the outlet port 45b of the outlet boss 45 of the inlet connector 7 is inclined relative to the central inlet axis 47a, for example at an angle of between 30 and 60 degrees. In this embodiment the central axis 45A of the outlet boss 45 is also inclined relative to the opening axis 13A.

[0614] Referring now to Figure 81, an embodiment is shown in which the mask frame 3 connects only to the inlet connector 7. In this embodiment the mask frame 3 comprises a frame clip 14 that connects to the rear, rather than the front, of the inlet connector 7.

[0615] The frame clip 14 is reversed from that described with reference to Figures 77 to 80 in that the mouth 14c is located at the front of the frame clip 14 rather than the rear. Consequently, in this embodiment, inlet connector 7 is pushed onto the mask frame 3 from the front so that the inlet connector 7 is initially received in the mouth 14c and then pushed rearwardly into the opening 13 and onto the frame clip 14. The cushion 5 is then pushed onto the rear of the inlet connector 7, through the frame 3 that is already connected to the inlet connector 7. In this embodiment, the cushion 5 can first be removed, before removal of the frame 3 from the inlet connector 7.

[0616] Referring now to Figure 82, an embodiment is shown in which the mask frame 3 connects only to the inlet connector 7. In this embodiment the mask frame 3 comprises a frame clip 14 that connects to the rear of the inlet connector 7.

[0617] The frame clip 14 comprises a pair of opposed side walls 14b, but no front or rear portion. The frame clip 14 thus comprises a mouth 14c at the front and rear, such that the frame clip 14 only partially defines the opening 13. Each side wall 14b extends from a forward end of a respective lateral frame arm 15.

- [0618] With further reference to Figures 82 b) and c), the frame 3 and the inlet connector 7 are provided with corresponding engagement features that engage with one another when the frame 3 is mounted on the inlet connector 7. In this embodiment the frame 3 comprises a female engagement feature 183 that receives a male engagement feature in the form of a lug 185 on the inlet connector 7. In this embodiment that engagement features are positioned laterally of the central portion 11 of the frame 3. The female engagement features 183 are provided on the frame clip side portions 13F. When engaged, the engagement features 183, 185 help retain the inlet connector 7 on the frame 3, and help resist relative rotation between the inlet connector 7 and the frame 3.
- [0619] It is envisaged that the mask frame 3, cushion 5, and inlet connector can be configured to be connected together such that the mask frame 3 is sandwiched between the cushion 5 and the inlet connector 7.
- [0620] With reference to Figure 83 four examples of such a sandwiched connection are shown schematically.
- [0621] In the example of Figure 83a), the frame 3, and specifically the front portion of the frame clip 14 is located at the front surface of the mask assembly, and is sandwiched between the inlet 7 below, and the cushion rigid ring 37 and cushion 5 to the rear and above. The upper portion of the diffuser 59 abuts the front surface of the frame 3. The mask frame 3 is flush with the front surface of the mask assembly, namely the diffuser 59 and the cushion 5.
- [0622] In the example of Figure 83b), the frame 3, is recessed behind the front surface of the mask assembly, and is sandwiched between the inlet 7 below, and the cushion rigid ring 37 to the rear and above.
- [0623] In the example of Figure 83c), the frame 3, is recessed behind the front surface of the mask assembly, and is sandwiched between the inlet 7 below, the cushion rigid ring 37 to the rear, and the cushion 5 above.
- [0624] In the example of Figure 83d), the frame 3, and specifically the front portion of the opening 13 is located at the front surface of the mask assembly, and is sandwiched between the inlet 7 below, and the cushion rigid ring 37 and cushion 5 to the rear. The upper portion of the diffuser 59 abuts the front surface of the frame 3. The mask frame 3 is stepped back from the front surface of the mask assembly such that the inlet connector 7 projects forwardly of the mask frame 3.

- [0625] In these embodiments, the cushion 5 must be removed before disconnecting the frame 3 and headgear.
- [0626] In these embodiments the frame 3 is not exposed to, and does not form part of, the flow path of breathable gases into the mask assembly. This provides an advantage that the frame 3 requires less cleaning than if the frame 3 were exposed to the flow path.
- [0627] Referring now to Figure 84, an embodiment is provided in which the frame 3 is sandwiched between the cushion 5 and rigid ring 37 at the rear, and the inlet connector 7 and diffuser 59 at the front. The upper part of the central connection portion at the frame opening 13 is stepped back from the diffuser 59, when the mask assembly is viewed from the side. In this embodiment the frame clip 14 fits onto and around the exterior of the front of the inlet connector 7, and is sandwiched between the cushion and the inlet connector 7/diffuser 59. As can best be seen in Figure 84c), this provides a recess 59a behind the upper part of the diffuser cover 61 which allows the user to more easily grip and remove the diffuser cover without interference from the mask frame 3.
- [0628] Referring to Figure 85, a mask assembly is provided with similar features to that of Figure 84. In this embodiment, the front portion of the mask frame 3 towards the top of the frame clip 14 is provided with two laterally spaced apart cut-outs 14j which ensure that the mask frame 3 does not interfere with the diffuser cover 61. The upper margin of the frame clip 14 is also relatively thin and relatively straight, to space the upper margin of the frame clip 14 from the diffuser cover 61.
- [0629] It may be desirable to hold the frame 3 when disconnecting the cushion 5. In such a situation, it would be undesirable for the frame 3 to disconnect from the inlet connector 7 at the same time. It can therefore be desirable to ensure the frame 3 connects to the inlet connector 7 relatively securely, such that the connection resists disconnection.
- [0630] Referring to Figure 86, a mask assembly is provided in which the inner walls 14a, 14b of the frame clip 14, which fit around and connect to the outlet boss 45 of the inlet connector 7, are provided with at least one protrusion 14k that engages the outlet boss 45. In the embodiment of Figure 86, a plurality of protrusions 14k are provided, spaced around the interior walls 14a, 14b of the frame clip 14. Each protrusion 14k is in the form of a small bump that is dimensioned to provide an interference fit with the outlet boss 45, as can best be seen in Figure 86c).

- [0631] Referring to Figures 87 and 88, a mask assembly is provided with similar features to that of Figure 86. In this embodiment, the frame clip 14 is provided with a smaller number of larger protrusions 14k. In this embodiment, the larger protrusions 14k fit into and engage with corresponding recesses 45a on the inlet boss.
- [0632] In the embodiment of Figure 87, the frame clip 14 is provided with a pair of laterally spaced apart elongate protrusions 14k that fit into respective elongate recesses 45a on the outlet boss 45. In the embodiment of Figure 88, the frame clip 14 is provided with two opposed pairs of elongate protrusions 14k that fit into respective pairs of elongate recesses 45a on the outlet boss 45.
- [0633] Referring to Figure 89, a mask assembly is provided with similar features to those of Figures 86-88. In this embodiment, the side walls 14b of the frame clip 14 comprises forwardly directed tabs 14m that fit into corresponding cutouts 7j at the sides of the inlet connector 7. Each tab 14m comprises a protrusion 14k that engages a corresponding recess 7k in each cutout 7j to help retain the mask frame 3 on the inlet connector 7.
- [0634] Referring to Figure 90, a mask assembly is provided with similar features to that of Figure 89. In this embodiment, each tab 14m comprises a rearwardly directed extension 14n that can be gripped by a user to help release the frame 3 from the inlet connector 7.
- [0635] Referring now to Figure 91, a mask assembly is provided with similar features to that of Figure 90. As can best be seen from Figure 91b), the rigid ring 37 of the cushion 5 is provided with a pair of laterally spaced apart, laterally extending teeth 37a. The rear of the rearwardly directed extension 14n of each tab 14m comprises a hook 14p each of which engages a respective tooth 37a, when the frame 3 is mounted on the cushion 5. Each tab 14m now functions as a dual function button. A front part of each tab 14m can be pressed to pivot each tab 14m in a first direction relative to the inlet connector 7 and cushion 5. When pivoted in this first direction, the hook 14p of each tab 14m disengages the tooth 37a, and releases the cushion 5 from the mask frame 3. When each tab 14m is pivoted in the opposed direction, by pressing a rear part of each tab 14m, the protrusions 14k on the tabs 14m disengage from their respective recesses 7k on the inlet connector, thus releasing the frame 3 from the inlet connector 7. Each tab 14m therefore provides a single button with which the user can:

- a) release the cushion from the frame 3 whilst retaining the frame 3 on the inlet connector; or
- b) or release the inlet connector 7 from the frame 3, whilst retaining the frame 3 on the cushion 5.

[0636] Referring to Figure 92, a frame 3 of a mask assembly is provided comprising a frame clip 14. The frame clip 14 defines a mouth 14c at the bottom of the frame clip 14 that receives the top of the inlet connector 7, when the frame clip 14 is pushed substantially vertically downwardly onto the inlet connector 7. When viewed from the front the frame clip 14 comprises a wider lower portion, inclined side portions, and a narrower upper portion. The ends 14d extend inwardly such that the mouth 14c is smaller than the widest part of the frame clip 14. Consequently, as the frame clip 14 is pushed onto the inlet connector 7, the ends 14d resiliently deform in a laterally outward direction until the inlet connector 7 is fully received in the opening 13. The ends 14d of the frame clip 14 then snap back to their rest position, resisting removal of the frame 3 from the inlet connector 7.

[0637] Referring to Figure 93, a mask assembly is provided in which the frame 3 and inlet connector 7 are integral and therefore comprise a single component. Reducing the number of components of the mask assembly may reduce manufacturing and/or assembly costs, as well as simplifying use as less components must be assembled.

[0638] Referring to Figure 94, a mask assembly is provided with similar features to that of Figure 93. The frame 3 and inlet connector 7 are integral. In this embodiment, a headgear connector yoke 25A is removably mounted on the upper portion 25 of frame 3. In this embodiment the upper headgear connectors 19 are provided on the yoke 25A, rather than on the upper portion 25. The yoke 25A is provided with a plurality of apertures 25b configured to received corresponding lugs 25c on the upper portion 25. The engagement of the apertures 25b and lugs 25c locates and retains the yoke 25a on the upper portion 25 of the frame 3. Because the yoke 25a can be detached from the frame 3, the headgear can be removed without removing the cushion 5 and frame 3.

[0639] Referring to Figure 95, a mask assembly is provided with similar features to that of Figures 93 and 94, and includes a headgear connector yoke 25A. In this embodiment, the window 20 between the lower part of the frame 3 and inlet connector 7, and the upper portion 25 of the frame 3, is omitted. Instead, the frame 3 further comprises an extended portion 3a that extends across the frame 3, from one

lateral arm 15 to the other, above the inlet connector 7. The material of the extended portion 3a can add stability and rigidity to the mask frame 3.

[0640] In embodiments of this disclosure the mask assembly comprises a cushion 5 with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture. A frame 3 is provided comprising at least one headgear connector and an inlet opening 13 configured to connect to a source of pressurised gas. The cushion 5 is mounted on the frame 3. For example, the distal inlet aperture of the cushion 5 may be removably mounted to the central connection portion of the frame 3 adjacent the inlet opening 13 of the frame 3. The frame 3 is configured to overlap an exterior portion of the side wall of the cushion 5.

[0641] In embodiments of this disclosure the mask assembly may comprise a cushion 5 with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture, and a frame 3 comprising an inlet opening 13 configured to connect to a source of pressurised gas. The distal inlet aperture of the cushion 5 is removably connected to the central connection portion of the frame 3. The frame 3 comprises a pair of upper and a pair of lower headgear connectors. The cushion 5 comprises an uppermost portion, both pairs of upper and lower headgear connectors being below the cushion uppermost portion.

[0642] The frame 3 comprises a lower, central portion 11 which comprises a central connection portion configured to be removably connected to the cushion 5.

[0643] In embodiments of this disclosure the mask assembly 1 provides advantages when side sleeping. In particular, the mask assembly 1 is configured such that the lateral part of the mask assembly 1 that is nearest the bed or pillow can readily deform, whilst the lateral part of the mask assembly 1 furthest from the bed or pillow does not deform. The lateral deformation accommodates movement of the user's head, and to accommodates lateral forces applied by the bed or pillow to the lateral part of the mask assembly.

[0644] The deformation of the lateral part of the mask assembly 1 is preferably configured as elastic deformation, such that the lateral part of the mask assembly 1 reverts to its original shape once the deformation forces are removed. The cushion 5, plus the lateral arms 15 and upper frame portion 25 of the frame 3 can all be configured to elastically deform.

[0645] The frame 3, or at least portions thereof, can be configured to add only a relatively small amount of resistance to lateral deformation of the cushion 5, when lateral forces are applied to the mask assembly 1. The lateral arms 15 and upper frame portion 25 of the frame 3 can be so configured.

[0646] The frame 3 may be configured to deform under lateral forces to the extent that, when in a deformed condition:

- a) the elongate elements of the upper headgear connectors 19, which are inwardly inclined when viewed from the front in a rest condition of the mask assembly 1, are displaced to a position in which the elongate elements are substantially parallel;
- b) the lower headgear connectors 17 are displaced to a position in which the lower headgear connectors 17 are each aligned with a respective outer margin of the inlet opening 13 of the frame 3;
- c) The lower headgear connectors 17 are displaced to a position in which the lower headgear connectors 17 are each aligned with a respective laterally outermost margin of the central portion 11 of the frame 3;
- d) the lower headgear connectors 17 are displaced to a position in which the lower headgear connectors 17 are each aligned with a respective weakened region or living hinge between the lateral arms 15 and central portion 11 of the frame 3;
- e) the lower headgear connectors 17 are displaced to a position in which the lateral distance between the lower headgear connectors decreases by a distance in the range of 140mm to 20mm, or 140 to 60mm, or 110 to 40mm.

[0647] The mask assembly 1 can be provided in a range of sizes, for example small, medium and large.

[0648] Certain terminology may be used in the description for the purpose of reference only, and thus are not intended to be limiting. For example, terms such as “above” and “below” refer to directions in the drawings to which reference is made. Terms such as “front,” “back,” “left,” “right,” “rear,” and “side” describe the orientation and/or location of portions of the components or elements within a consistent but arbitrary frame of reference which is made clear by reference to the text and the associated drawings describing the components or elements under discussion. For example, as the context may dictate, the terms “front” and/or forward can be used relative to components described herein positioned relatively or entirely distal to the

user's face when the mask assembly as described herein is worn by the user. As the context may dictate, the terms "rear" and/or "back" can be used relative to components described herein positioned relatively or entirely proximal to the user's face and/or components that are forward or at the front of the mask assembly when the mask assembly as described herein is worn by the user. Moreover, terms such as "first," "second," "third," and so on may be used to describe separate components. Such terminology may include the words specifically mentioned above, derivatives thereof, and words of similar import.

[0649] Unless the context clearly requires otherwise, throughout the description and the claims, the words "comprise", "comprising", and the like, are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense, that is to say, in the sense of "including, but not limited to". Conditional language used herein, such as, among others, "can," "could," "might," "may," "e.g.," and the like, unless specifically stated otherwise, or otherwise understood within the context as used, is generally intended to convey that certain embodiments include, while other embodiments do not include, certain features, elements and/or states. Thus, such conditional language is not generally intended to imply that features, elements and/or states are in any way required for one or more embodiments or that one or more embodiments necessarily include logic for deciding, with or without author input or prompting, whether these features, elements and/or states are included or are to be performed in any particular embodiment.

[0650] The term "plurality" refers to two or more of an item. Recitations of quantities, dimensions, sizes, formulations, parameters, shapes and other characteristics should be construed as if the term "about" or "approximately" precedes the quantity, dimension, size, formulation, parameter, shape or other characteristic. The terms "about" or "approximately" mean that quantities, dimensions, sizes, formulations, parameters, shapes and other characteristics need not be exact, but may be approximated and/or larger or smaller, as desired, reflecting acceptable tolerances, conversion factors, rounding off, measurement error and the like and other factors known to those of skill in the art. Recitations of quantities, dimensions, sizes, formulations, parameters, shapes and other characteristics should also be construed as if the term "substantially" precedes the quantity, dimension, size, formulation, parameter, shape or other characteristic. The terms "approximately," "about," and "substantially" as used herein represent an amount close to the stated amount that still

performs a desired function or achieves a desired result. For example, in some embodiments, as the context may dictate, the terms “approximately”, “about”, and “substantially” may refer to an amount that is within less than or equal to 10% of the stated amount. The term “generally” as used herein represents a value, amount, or characteristic that predominantly includes, or tends toward, a particular value, amount, or characteristic. For example, as the context may dictate, the term “generally linear” can mean something that departs from exactly parallel by less than or equal to 15°.

[0651] Numerical data may be expressed or presented herein in a range format. It is to be understood that such a range format is used merely for convenience and brevity and thus should be interpreted flexibly to include not only the numerical values explicitly recited as the limits of the range, but also interpreted to include all of the individual numerical values or sub-ranges encompassed within that range as if each numerical value and sub-range is explicitly recited. As an illustration, a numerical range of “1 to 5” should be interpreted to include not only the explicitly recited values of about 1 to about 5, but should also be interpreted to also include individual values and sub-ranges within the indicated range. Thus, included in this numerical range are individual values such as 2, 3 and 4 and sub-ranges such as “1 to 3,” “2 to 4” and “3 to 5,” etc. This same principle applies to ranges reciting only one numerical value (e.g., “greater than 1”) and should apply regardless of the breadth of the range or the characteristics being described.

[0652] Any dimensions included in this disclosure are example dimensions of one or more components of a mask assembly in accordance with this disclosure, and are in mm.

[0653] A plurality of items may be presented in a common list for convenience. However, these lists should be construed as though each member of the list is individually identified as a separate and unique member. Thus, no individual member of such list should be construed as a de facto equivalent of any other member of the same list solely based on their presentation in a common group without indications to the contrary. Furthermore, where the terms “and” and “or” are used in conjunction with a list of items, they are to be interpreted broadly, in that any one or more of the listed items may be used alone or in combination with other listed items. The term “alternatively” refers to selection of one of two or more alternatives, and is not

intended to limit the selection to only those listed alternatives or to only one of the listed alternatives at a time, unless the context clearly indicates otherwise.

[0654] Reference to any prior art in this specification is not, and should not be taken as, an acknowledgement or any form of suggestion that that prior art forms part of the common general knowledge in the field of endeavour in any country in the world.

[0655] The disclosure may also be said broadly to consist in the parts, elements and features referred to or indicated in the specification of the application, individually or collectively, in any or all combinations of two or more of said parts, elements or features.

[0656] Where, in the foregoing description reference has been made to integers or components having known equivalents thereof, those integers are herein incorporated as if individually set forth.

[0657] It should be noted that various changes and modifications to the presently preferred embodiments described herein will be apparent to those skilled in the art. Such changes and modifications may be made without departing from the spirit and scope of the disclosure and without diminishing its attendant advantages. For instance, various components may be repositioned as desired. It is therefore intended that such changes and modifications be included within the scope of the disclosure. Moreover, not all of the features, aspects and advantages are necessarily required to practice the present disclosure. Accordingly, the scope of the present disclosure is intended to be defined only by the claims that follow.

WHAT IS CLAIMED IS:

1. A mask assembly comprising:
 - a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture; and
 - a frame comprising an inlet opening configured to connect to a source of pressurised gas; wherein
 - the distal inlet aperture of the cushion is removably connected to the inlet opening of the frame; and
 - the frame further comprises a pair of upper and a pair of lower headgear connectors;
 - the cushion comprising an uppermost portion;
 - both pairs of upper and lower headgear connectors being below the cushion uppermost portion.
2. The mask assembly of claim 1 wherein the cushion comprises a lower portion adjacent the inlet aperture, and an upper portion defining the top of the cushion.
3. The mask assembly of claim 2 wherein the frame comprises an elongate frame member extending across the upper portion of the cushion.
4. The mask assembly of claim 3 wherein the elongate member extends down the side wall.
5. The mask assembly of claim 3 or claim 4 wherein the lower portion of the frame is wider than the upper portion, the upper and lower portions being spaced apart.
6. The mask assembly of any one of the preceding claims wherein the lower portion of the frame comprises lateral arms which extend laterally outwardly from the inlet opening.

7. The mask assembly of claim 6 wherein the lateral arms are relatively narrow as compared to the lower portion, the lower portion being relatively wide.
8. The mask assembly of claim 7 wherein the inlet opening is provided in the relatively wide, lower portion.
9. The mask assembly of any one of the preceding claims wherein the lower portion of the frame extends symmetrically about a central axis of the inlet opening of the frame.
10. The mask assembly of any one of the preceding claims wherein the lower portion of the frame is positioned centrally, when the mask assembly is viewed from the front.
11. The mask assembly of any one of the preceding claims wherein the frame inlet opening comprises a central axis, the central axis extend generally downwardly from the mask assembly.
12. A mask assembly comprising:
 - a cushion with a face contacting portion and a non-face contacting portion,
 - a side wall extending between the face contacting portion and the non-face contacting portion; and
 - a frame configured to overlay an exterior portion of the side wall of the cushion,wherein the frame comprises:
 - a pair of headgear connectors, and
 - a lateral dimension defined between the pair of headgear connectors;wherein the frame is configured to be laterally compliant so as to resiliently deform such that the lateral dimension can change when subject to lateral forces.
13. A mask assembly comprising:
 - a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet

aperture; and

a frame comprising a pair of headgear connectors, a lateral dimension defined between the pair of headgear connectors;

the distal inlet aperture of the cushion being connected to the frame;

the remainder of the cushion not being connected to the frame;

wherein the frame is configured to be laterally compliant so as to resiliently deform such that the lateral dimension can change when subject to lateral forces.

14. The mask assembly of claim 12 or 13 wherein the frame is configured to be longitudinally non-compliant in a longitudinal direction between the proximal face contacting portion and the distal non-face contacting portion, so as to resist deformation of the mask frame when subject to longitudinal forces.
15. The mask assembly of claim 14 wherein the frame is configured to be relatively laterally compliant and relatively longitudinally non-compliant.
16. The mask assembly of any one of claims 13 to 15 wherein the frame comprises a plurality of frame regions, at least one frame region being weakened relative to at least one other frame region.
17. The mask assembly of claim 16 wherein the plurality of frame regions includes at least one frame region which is relatively thin in one dimension to encourage bending of the frame about a first predetermined axis and relatively wide in another dimension to resist bending about a second predetermined axis.
18. The mask assembly of claim 16 or claim 17 wherein the frame comprises an upper portion which extends laterally across a portion of the mask assembly, the upper portion comprising a weakened region configured to allow bending of the upper portion.
19. The mask assembly of claim 18 wherein the upper portion is arcuate, wherein bending of the upper portion increases or decreases the radius of the arc of the upper portion.

20. The mask assembly of claim 16 wherein at least one of the frame regions comprising a living hinge.
21. The mask assembly of claim 16 wherein a weakened frame region is adjacent the inlet.
22. A mask assembly comprising:
- a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture; and
 - a frame comprising at least one headgear connector and an inlet opening configured to connect to a source of pressurised gas; wherein:
 - the distal inlet aperture of the cushion is removably connected to the inlet opening of the frame, and
 - the frame is configured to overlap an exterior portion of the side wall.
23. The mask assembly of claim 22 wherein the frame comprises a lower portion, the inlet opening being provided in the lower portion, the lower portion overlapping with the cushion.
24. The mask assembly of claim 23 wherein the frame comprises an upper portion, the upper portion overlapping an upper portion of the cushion.
25. The mask assembly of any one of claims 22 to 24 wherein the frame comprises any one or more of:
- a. an elongate frame member extending across an upper portion of the cushion.
 - b. an upper frame portion;
 - c. opposed side frame portions;
 - d. a lower frame portion comprising the inlet opening configured to connect to a source of pressurised gas;
 - e. a frame aperture defined between the upper, side and lower frame portions, and configured such that the cushion is exposed through the frame aperture.

26. The mask assembly of any one of claims 22 to 24 wherein an inlet aperture of the cushion forms a connection with the frame by way of being connected to an inlet opening of the frame, the remainder of the cushion not being connected to the frame.
27. A mask assembly comprising a resilient deformable cushion, and a frame, wherein the frame comprises:
- an upper frame portion;
 - opposed side frame portions;
 - a lower frame portion comprising an inlet opening configured to connect to a source of pressurised gas; wherein
 - a frame aperture is defined between the upper and lower frame portions, and configured such that the cushion is exposed through the frame aperture.
28. The mask assembly of claim 27 wherein the upper frame portion extends across an upper portion of the cushion.
29. The mask assembly of claim 28 wherein the upper frame portion comprises a forward margin, the cushion being exposed below the forward margin.
30. The mask assembly of any one of claims 27 to 29 wherein at least one of the upper frame portion, side frame portions and lower frame portion comprises an elongate frame member.
31. The mask assembly of any one of claims 27 to 30 wherein the inlet opening comprises a central axis, the central axis extending generally downwardly.
32. The mask assembly of claim 31 wherein the central axis of the frame inlet opening extending through the cushion inlet aperture and below the lower part of the frame.
33. The mask assembly of any one of claims 27 to 90 wherein an inlet aperture of the cushion forms a connection with the frame by way of being connected to an inlet opening of the frame, the remainder of the cushion not being connected to the frame.

34. A mask assembly comprising:

a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture; and

a frame comprising at least one headgear connector and an inlet opening configured to connect to a source of pressurised gas,

the distal inlet aperture of the cushion forming a connection with the frame by way of being connected to the inlet opening of the frame, the remainder of the cushion not being connected to the frame.

35. The mask assembly of claim 34 wherein the cushion is cantilevered on the frame by way of the distal inlet aperture of the cushion being connected to the inlet opening of the frame.

36. The mask assembly of claim 34 or claim 35 wherein the frame is configured to overlap an exterior portion of the side wall of the cushion.

37. The mask assembly of any one of claims 34 to 36 wherein the frame is configured to be laterally compliant so as to resiliently deform such that a lateral dimension of the mask assembly can change when subject to lateral forces.

38. The mask assembly of any one of claims 34 to 37 wherein the frame comprises any one or more of:

- a. an elongate frame member extending across an upper portion of the cushion.
- b. an upper frame portion;
- c. opposed side frame portions;
- d. a lower frame portion comprising the inlet opening configured to connect to a source of pressurised gas;
- e. a frame aperture defined between the upper, side and lower frame portions, and configured such that the cushion is exposed through the frame aperture.

39. A mask assembly comprising:

a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture; and

a frame comprising at least one headgear connector and an inlet opening configured to connect to a source of pressurised gas; wherein

the inlet opening is provided at a lower part of the frame;

the distal inlet aperture of the cushion is removably connected to the inlet opening of the frame; and

the side wall comprises a proximal portion adjacent the face contacting portion and a distal portion distal from the face contacting portion, the frame being configured to overlap the proximal portion of the cushion side wall and to expose the distal portion of the cushion side wall.

40. The mask assembly of claim 39 wherein the frame comprises an upper frame portion that extends across an upper portion of the cushion.
41. The mask assembly of claim 40 wherein the upper frame portion comprises a forward margin, the cushion being exposed below the forward margin.
42. The mask assembly of any one of claims 39 to 41 wherein the inlet opening comprises a central axis, the central axis extending generally downwardly.
43. The mask assembly of claim 42 wherein the central axis of the frame inlet opening extending through the cushion inlet aperture and below the lower part of the frame.
44. The mask assembly of any one of claims 39 to 43 wherein the frame comprises any one or more of:
- a. an elongate frame member extending across an upper portion of the cushion.
 - b. an upper frame portion;
 - c. opposed side frame portions;
 - d. a lower frame portion comprising the inlet opening configured to connect to a source of pressurised gas;

- e. a frame aperture defined between the upper, side and lower frame portions, and configured such that the cushion is exposed through the frame aperture.

45. The mask assembly of claim 44 wherein at least one of the upper frame portion, side frame portions and lower frame portion comprises an elongate frame member.

46. A mask assembly comprising a cushion with:

- a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture; and
- a frame comprising an inlet opening configured to connect to a source of pressurised gas; wherein
- the distal inlet aperture of the cushion is removably connected to the inlet opening of the frame, and
- the inlet opening is provided at a lower part of the frame; and
- the frame comprises an elongate frame member extending up the side wall and across an upper portion of the cushion.

47. A mask assembly comprising a cushion with:

- a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture; and
- a frame comprising an inlet opening configured to connect to a source of pressurised gas; wherein
- the distal inlet aperture of the cushion is removably connected to the inlet opening of the frame, and
- the inlet opening is provided at a lower part of the frame; and
- the frame comprises an elongate frame member extending across an upper portion of the cushion; the elongate frame member comprising

an apex portion, the apex portion of the elongate frame member comprising an elongate narrowed portion.

48. The mask assembly of claim 47 wherein the elongate frame member comprises distal end portions adjacent the side wall, the apex portion being between the distal end portions, the elongate narrowed portion being between the distal end portions and the central apex portion.
49. The mask assembly of claim 47 or claim 48, wherein the cushion comprises a nasal bridge portion, the elongate frame member being spaced below the nasal bridge portion.
50. The mask assembly of any one of claims 46 to 49 wherein the elongate frame member comprises a forward margin, the cushion being exposed in front of the forward margin.
51. The mask assembly of any one of claims 46 to 50 wherein the inlet opening comprises a central axis, the central axis extending generally downwardly.
52. The mask assembly of claim 51 wherein the central axis of the frame inlet opening extends through the cushion inlet aperture and below the lower part of the frame.
53. The mask assembly of any one of claims 46 to 52 wherein the frame comprises a frame aperture defined between the upper, side and lower frame portions, and configured such that the cushion is exposed through the frame aperture.
54. A mask assembly comprising:
- a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture; and
 - a frame comprising:
 - at least one headgear connector;
 - an inlet opening configured to connect to a source of

pressurised gas;
lateral arms on either side of the inlet opening that extend along the side wall towards the face contacting portion of the cushion;
and
an elongate frame member that extends over an upper portion of the cushion and connects the lateral arms.

55. The mask assembly of claim 54 wherein the elongate frame member is arcuate.
56. The mask assembly of claim 55 wherein the cushion comprises an apex portion, the elongate frame member extending at or adjacent the apex portion.
57. The mask assembly of any one of claims 54 to 56 wherein the lateral arms and the elongate frame member are configured to define a frame aperture which exposes the cushion.
58. The mask assembly of claim 57 wherein the frame aperture exposes the cushion above the inlet opening of the frame, above the lateral extensions/arms and below the elongate connecting member.
59. The mask assembly of any one of claims 54 to 58 wherein the upper frame portion comprises a forward margin, the cushion being exposed forward of the forward margin.
60. The mask assembly of any one of claims 54 to 59 wherein the frame comprises a lower portion, the inlet opening being provided in the lower portion, the inlet opening comprising a central axis, the central axis extending generally downwardly.
61. The mask assembly of claim 60 wherein the central axis of the frame inlet opening extends through the cushion inlet aperture and below the lower part of the frame.
62. The mask assembly of any one of claims 54 to 59 wherein an inlet aperture of the cushion forms a connection with the frame by way of being connected to an inlet opening of the frame, the lateral arms of the frame not being connected to the cushion.

63. A mask assembly comprising:

- a cushion with a face contacting portion and a non-face contacting portion,
- a side wall extending between the face contacting portion and the non-face contacting portion; and
- a frame comprising an inlet opening configured to connect to a source of pressurised gas; wherein

the mask frame comprises:

- an upper pair and a lower pair of headgear connectors, each headgear connector comprising an elongate post on which a respective headgear strap is configured to be mounted;
- the elongate posts of the lower pair of headgear connectors being inclined relative to the elongate posts of the upper pair of elongate posts.

64. The mask assembly of claim 63 wherein the elongate posts of the lower pair of headgear connectors are substantially vertical when the mask assembly is viewed from the front.

65. The mask assembly of claim 63 or claim 64 wherein the elongate posts of the upper pair of headgear connectors are inwardly inclined when the mask assembly is viewed from the front.

66. The mask assembly of any one of claims 63 to 65 wherein the elongate posts of the lower pair of headgear connectors are substantially vertical when the mask assembly is viewed from the side.

67. The mask assembly of any one of claims 63 to 66 wherein the elongate posts of the upper pair of headgear connectors are forwardly inclined when the mask assembly is viewed from the side.

68. The mask assembly of any one of claims 63 to 67 wherein the lower pair of headgear connectors are at a widest part of the frame.
69. The mask assembly of claim 68 wherein the widest part of the frame comprises a lower portion of the frame, an upper portion of the frame being narrower than the lower portion of the frame, when the mask assembly is viewed from the front.
70. The mask assembly of any one of claims 63 to 69 wherein the elongate posts of the upper pair of headgear connectors are at or below an upper portion of the cushion.
71. A mask assembly comprising:
- a cushion with a face contacting portion and a non-face contacting portion,
 - a side wall extending between the face contacting portion and the non-face contacting portion; and
 - a frame comprising an inlet opening configured to connect to a source of pressurised gas,
- the cushion comprising a rolling bridge portion which is pivotable about a pivot axis relative to the remainder of the cushion towards or away from the user; wherein
- the mask frame comprises:
- a pair of laterally opposed headgear connectors onto which respective headgear straps can be connected;
 - each headgear connector being positioned such that the headgear straps overlap the pivot axis when the headgear straps are mounted on the headgear connectors.
72. The mask assembly of claim 71 wherein the pair of laterally opposed headgear connectors is an upper pair of headgear connectors, the mask assembly further comprising a lower pair of headgear connectors.

73. The mask assembly of claim 72 wherein the elongate posts of the upper pair of headgear connectors are at or below an upper portion of the cushion.
74. The mask assembly of any one of claims 71 to 73 wherein the pair of headgear connectors are inwardly inclined when the mask assembly is viewed from the front.
75. The mask assembly of any one of claims 71 to 74 wherein the upper pair of headgear connectors are forwardly inclined when the mask assembly is viewed from the side.
76. The mask assembly of any one of claims 71 to 75 wherein each headgear connector comprises an elongate post.
77. A mask assembly comprising:
a cushion with a face contacting portion and a non-face contacting portion,
a side wall extending between the face contacting portion and the non-face contacting portion; and
a frame comprising an inlet opening configured to connect to a source of pressurised gas,
the inlet opening being provided at a lower part of the frame; wherein
the mask frame comprises:
opposed lateral arms extending laterally outwardly from the lower part of the frame, each lateral arm comprising a headgear connector onto which a respective headgear strap can be connected; wherein
the lateral arms each extend laterally outwardly from the lower part of the frame in a direction substantially aligned with a primary force vector from the headgear straps when connected to the headgear connectors.
78. The mask assembly of claim 77 wherein the inlet opening comprises a central axis, the lateral arms extending away from the inlet opening at an angle inclined relative to the central axis.

79. The mask assembly of claim 78 wherein the angle is between 10 and 80°, or between 10 and 80°, or between 15 and 70°, or between 20 and 60°, or between 25 and 55°, or is substantially 45°.
80. The mask assembly of any one of claims 77 to 78 wherein the headgear connectors are positioned sufficiently rearwardly on the frame to be adjacent the face contacting portion of the cushion.
81. The mask assembly of any one of claims 77 to 80 wherein the headgear connectors are positioned sufficiently rearwardly to be aligned with a rolling bridge portion of the cushion.
82. The mask assembly of any one of claims 77 to 81 wherein the headgear connectors are positioned nearer the rear of the mask assembly than the front of the mask assembly.
83. The mask assembly of any one of claims 77 to 82 wherein the cushion comprises an inlet aperture, the inlet aperture forming a connection with the frame by way of being connected to an inlet opening of the frame, the lateral arms of the frame not being connected to the cushion.
84. A mask assembly comprising:
a cushion with a face contacting portion and a non-face contacting portion,
a side wall extending between the face contacting portion and the non-face contacting portion; and
a frame comprising an inlet opening configured to connect to a source of pressurised gas; wherein
the inlet opening is provided at a lower part of the frame;
the mask frame comprising a pair of opposed headgear connectors onto which respective headgear straps can be connected; wherein
the mask frame comprises at least one guide surface configured to guide the headgear straps, during connection to the headgear connectors, toward a respective headgear connector.

85. The mask assembly of claim 84 wherein the guide surface extends forwardly of the headgear connector.
86. The mask assembly of claim 85 wherein the frame comprises a central portion, the inlet opening being provided in the central portion, and lateral portions laterally outward of the central portion, the lateral portions each comprising a guide surface.
87. The mask assembly of any one of claims 84 to 86 wherein the guide surface comprises a portion of a leading or forward edge of the frame.
88. The mask assembly of any one of claims 83 to 87 wherein each headgear connector is elongate, the or each guide surface being elongate, a longitudinal axis of each guide surface intersecting a longitudinal axis of a respective headgear connector.
89. The mask assembly of any one of claims 83 to 88 wherein the guide surface comprises upper and lower guide surfaces that are relatively inclined to define a guide mouth converging on the headgear connector element.
90. A mask assembly comprising:
- a cushion with a proximal face contacting portion, a distal inlet aperture, and a side wall between the proximal face contacting portion and the distal inlet aperture; and
 - a frame comprising:
 - at least one headgear connector;
 - a central portion, the central portion being substantially rigid;
 - a pair of lateral arms, each arm extending away from a respective side of the central portion; the lateral arms being flexible along at least a portion of their length; and
 - a connecting frame member that connects the lateral arms at a position distal from the central frame portion.
91. The mask assembly of claim 90 wherein the central portion of the frame comprises any one or more of:
- a. an inlet opening configured to connect to a source of pressurised gas;

- b. a bias vent hole;
 - c. a diffuser;
 - d. an anti-asphyxiation valve;
 - e. an outlet configured to fluidly couple with the distal inlet aperture of the cushion.
92. The mask assembly of claim 90 or 91 wherein the connecting frame member comprises an elongate band.
93. The mask assembly of any one of claims 90 to 92 wherein the connecting frame member connects the lateral arms at a position above and behind the central portion.
94. The mask assembly of any one of claims 90 to 93 wherein the connecting frame member extends over an upper portion of the cushion.
95. The mask assembly of any one of claims 90 to 94 wherein the connecting frame member is integral with the lateral arms.
96. The mask assembly of any one of claims 90 to 95 wherein the connecting frame member is flexible along at least a portion of its length.
97. The mask assembly of claim 96 wherein the connecting frame member comprises a central region, the central region being flexible.
98. The mask assembly of claim 97 wherein the central region is an apex region of the frame.
99. The mask assembly of claim 98 wherein the cushion comprises an upper portion adjacent the nasal bridge of the user; the upper portion of the cushion comprising a rolling bridge portion which is pivotable towards or away from the nasal bridge of the user to overlap with the central region of the connecting frame member.
100. The mask assembly of claim 96 wherein the connecting frame member comprises end regions, distal from the central region, the end regions being less flexible than the central region.

101. The mask assembly of claim 100 wherein the central region comprises a relatively thin and/or weakened structure, and the end regions comprise a relatively thick and/or reinforced structure.
102. The mask assembly of claim 100 or 101 wherein the central region has a first width, and the end regions have a second width, the second width being greater than the first width.
103. The mask assembly of any one of claims 100 to 102 wherein the at least one headgear connector comprises a pair of headgear connectors, the pair of headgear connectors being at or adjacent the end regions.
104. The mask assembly of any one of claims 90 to 103 wherein the central portion, lateral arms, and connecting frame member together define a closed aperture of the frame.
105. The mask assembly of any one of claims 90 to 104 wherein, from the side, an acute angle is formed between the lateral arms and the connecting frame member.
106. A mask assembly comprising:
- a. a mask frame comprising at least one headgear connector;
 - b. a cushion; and
 - c. an inlet connector configured to receive breathable gases from, and be connected to, a gas delivery conduit, the inlet connector being in fluid communication with the cushion.
107. The mask assembly of claim 106 wherein the cushion comprises any one or more of:
- a. a proximal face contacting portion;
 - b. a distal inlet aperture;
 - c. a side wall between the proximal face contacting portion and the distal inlet aperture.

108. The mask assembly of claim 106 or 107 wherein the mask frame comprises a central connection portion; the inlet connector being mounted on the central connection portion.
109. The mask assembly of any one of claims 106 to 108 wherein the cushion is mounted on the inlet connector and/or the frame so as to receive gas from the inlet connector.
110. The mask assembly of any one of claims 106 to 109 wherein the frame is removable from the remainder of the mask assembly independently of the cushion and independently of the inlet connector.
111. The mask assembly of any one of claims 106 to 109 wherein the cushion is removable from the remainder of the mask assembly independently of the frame and/or independently of the inlet connector.
112. The mask assembly of any one of claims 106 to 111 wherein the inlet connector comprises an inlet port configured to be connected to the source of pressurised gas, the inlet port of the inlet connector comprising a central inlet axis.
113. The mask assembly of claim 112 wherein the central inlet axis is substantially vertical when the mask assembly is viewed from the front and/or extends substantially downwardly when viewed from the side.
114. The mask assembly of claim 112 or 113 wherein the mask frame is removably mounted on a component of the mask assembly by moving the mask frame onto the component of the mask assembly in a mounting direction, the mounting direction intersecting, and preferably being orthogonal, to the central inlet axis.
115. The mask assembly of any one of claims 106 to 114 wherein the frame comprises a frame clip configured to be removably mounted on the inlet connector to mount the central connection portion of the frame to the inlet connector.

116. The mask assembly of claim 115 wherein the frame clip is spaced from, and not in contact with, the remainder of the frame, such that forces applied to the remainder of the frame are decoupled from the frame clip.
117. The mask assembly of any one of claims 108 to 116 wherein the central connection portion is relatively rigid and preferably the remainder of the frame is relatively flexible.
118. The mask assembly of claim 117 wherein the frame comprises lateral portions that extend away from the central connection portion, the lateral portions being relatively flexible.
119. The mask assembly of any one of claims 106 to 118 wherein the frame is:
- a. configured to be laterally resiliently deformable; and/or
 - b. configured to resist deformation in a direction from front to rear of the mask assembly, or vice versa.
120. The mask assembly of any one of claims 106 to 119 wherein the frame is made from material which is different from the material of the cushion; preferably material which is relatively harder and/or less deformable than the cushion; and most preferably is made from a plastics material.
121. The mask assembly of any one of claims 106 to 120 wherein the inlet connector is made from material which is different from the material of the cushion; preferably from material which is relatively harder and/or less deformable than the cushion; and most preferably is made from a plastics material.
122. The mask assembly of any one of claims 106 to 121 wherein the cushion is formed from a relatively soft material.
123. The mask assembly of any one of claims 106 to 122 wherein the cushion is formed from a resiliently deformable material; and preferably is formed from silicone.

124. The mask assembly of claim 123 wherein the side walls of the cushion are resiliently deformable.
125. The mask assembly of any one of claims 106 to 124 wherein a portion of the frame overlays the cushion.
126. The mask assembly of claim 125 wherein:
- a. a portion of the frame overlays the side walls of the cushion; and/or
 - b. a portion of the frame overlays an upper portion of the cushion.