

WHAT IS CLAIMED IS:

1. ~~1. A nasal seal, comprising:
a seal body defining a breathing chamber;
a nasal port in the seal body, the nasal port comprising a central portion straddled by a pair of lateral portions, the nasal port further comprising an upper edge and a lower edge;
wherein the upper edge defines an inwardly projecting portion within the central portion, and wherein the lower edge defines an inwardly protection portion within the central portion.~~
2. ~~2. The nasal seal of Claim 1, wherein the inwardly projection portions of one or both of the upper edge and the lower edge is curved.~~
3. ~~3. The nasal seal of Claim 1 or Claim 2, wherein the nasal port is generally bean-shaped or bowtie-shaped.~~
4. ~~4. The nasal seal of any one of the preceding Claims, further comprising a thickened rim portion extending around a portion or an entirety of a periphery of the nasal port, the thickened rim portion having a larger wall thickness than a portion of the seal immediately adjacent the thickened rim portion.~~
5. ~~5. The nasal seal of any one of the preceding Claims, wherein the seal body comprises a central portion straddled by a pair of lateral portions, wherein in use the seal body is configured such that the lateral portions move inwardly when pressure is applied to the central portion by a user.~~
6. ~~6. The nasal seal of any one of the preceding Claims, wherein a user-facing surface of the nasal seal comprises a thinned wall portion.~~
7. ~~7. The nasal seal of Claim 6, wherein the thinned wall portion of the user-facing surface has or is equal to the smallest wall thickness of the seal body.~~
8. ~~8. The nasal seal of any one of the preceding Claims, further comprising a pair of thickened wall portions that, in use, contacts the user's cheeks.~~
9. ~~9. The nasal seal of Claim 8, wherein the thickened wall portions have or are equal to the largest wall thickness of the seal body.~~
10. ~~10. The nasal seal of Claim 8 or Claim 9, wherein the thickened wall portions each comprise a groove within the thickened wall portion that allows decoupled movement of portions of the thickened wall portion on either side of the groove.~~

11.—~~The nasal seal of any one of the preceding Claims, further comprising a connector configured to allow the nasal seal to be coupled to a frame, wherein the connector comprises a first portion within the seal body and a second portion outside of the seal body, wherein the first portion and the second portion are coupled to one another.~~

12.—~~The nasal seal of Claim 11, wherein the first portion comprises a flange and a hub, wherein the hub extends through an aperture of the seal body and wherein the second portion is coupled to the hub of the first portion.~~

13.—~~The nasal seal of Claim 12, wherein the seal body comprises a rim extending partially or entirely around the aperture, wherein the rim is captured between the first portion and the second portion.~~

14.—~~The nasal seal of Claim 13, wherein the rim comprises a generally T-shaped cross-section having a base, a first lobe extending in a first direction from the base and a second lobe extending in a second direction from the base opposite the first direction.~~

15.—~~The nasal seal of Claim 14, wherein each of the first portion and the second portion of the connector comprises a recess configured to receive a respective one of the first lobe and the second lobe.~~

16.—~~The nasal seal of any one of Claims 12-15, wherein the seal and the connector comprise interfering portions that inhibit or prevent relative rotation between the seal and the connector.~~

17.—~~The nasal seal of any one of the preceding Claims, wherein the seal body has a first texture on a user-contacting side and a second texture on the opposite side, wherein the second texture is different from the first texture.~~

18.—~~A nasal mask, comprising:~~

~~the nasal seal of any one of the preceding Claims; and~~

~~a frame, wherein the frame comprises a central portion and a pair of arm portions that extend rearwardly from the central portion, wherein the arm portions are configured for connection to a headgear.~~

19.—~~The nasal mask of Claim 18, wherein the central portion of the frame is shaped to correspond to a side of the seal body that faces the central portion.~~

20.—~~The nasal mask of Claim 18 or Claim 19, wherein the central portion is more rigid than the arm portions.~~

21.—~~The nasal mask of any one of Claims 18-20, wherein the pair of arm portions are overmolded onto the central portion.~~

22.—~~The nasal mask of any one of Claims 18-21, wherein each of the pair of arm portions comprises a hinge portion that permits rearward ends of the arm portions to flex relative to the central portion of the frame.~~

23.—~~The nasal mask of any one of Claims 18-22, wherein the central portion comprises a seal connector portion configured to removably receive the seal.~~

24.—~~The nasal mask of any one of Claims 18-23, wherein the central portion comprises a conduit connector portion that supports a conduit connector.~~

25.—~~The nasal mask of Claim 24, wherein the conduit connector comprises an elbow.~~

26.—~~The nasal mask of Claim 25, further comprising a bias flow vent located on the conduit connector portion.~~

27.—~~The nasal mask of Claim 26, further comprising an expansion within a flow passage defined between an upstream end of the conduit connector portion and the breathing chamber of the seal body, wherein the bias flow vent is located upstream of the expansion.~~

28.—~~The nasal mask of any one of Claims 24-27, further comprising a mask tube coupled to the conduit connector, an upstream end of the mask tube comprising a connector configured to be connected to a gases supply conduit of an associated respiratory therapy system, wherein an interior of the connector is the same size and shape as an interior of the mask tube.~~

29.—~~The nasal mask of Claim 28, wherein an end of the connector abuts against the upstream end of the mask tube and the connector and mask tube are coupled by a coupling sleeve.~~

30.—~~The nasal mask of Claim 29, wherein the coupling sleeve is overmolded onto the mask tube and the connector.~~

31.—~~The nasal mask of any one of Claims 18-30, further comprising a pad positioned on an inward facing surface of each of the pair of arm portions.~~

32.—~~The nasal mask of Claim 31, wherein the pad and the arm portion are joined by an overmolding process.~~

33.—~~The nasal mask of Claim 31 or Claim 32, wherein the pad comprises a textured surface finish.~~

~~34.—The nasal mask of any one of Claims 31-33, wherein the pad comprises a fabric outer layer.~~

~~35.—An interface assembly, comprising:~~

~~the nasal mask of any one of Claims 17-34; and~~

~~a headgear comprising an upper strap, a rear strap and forward strap extensions that connect to the arm portions of the frame.~~

~~36.—The interface assembly of Claim 35, wherein at least the upper strap and the forward strap extensions are inextensible.~~

~~37.—The interface assembly of Claim 35 or Claim 36, wherein the rear strap is extensible.~~

~~38.—The interface assembly of any one of Claims 35-37, wherein one of the forward strap extension and the arm portion includes a plurality of posts and the other of the forward strap extension and the arm portion includes a plurality of openings, each configured to receive one of the posts.~~

~~39.—The interface assembly of Claim 38, wherein one of the plurality of posts is different in shape from another of the plurality of posts and wherein one of the plurality of openings is different in shape from another of the plurality of openings.~~

~~40.—The interface assembly of any one of Claims 35-39, wherein the forward strap extensions and the arm portions are adjustably connected to one another.~~

~~41.—The interface assembly of Claim 40, wherein the forward strap extensions and the arm portions have a plurality of discrete adjustment positions.~~

~~42.—An interface assembly, comprising:~~

~~a nasal mask;~~

~~a frame attached to the nasal mask;~~

~~a headgear; and~~

~~side arms connecting the frame and the headgear, wherein~~

~~the side arms are rigid in a vertical plane and movable in a horizontal plane with respect to a user's face.~~

~~43.—The interface assembly of Claim 42, wherein the side arms include a hinge.~~

~~44.—The interface assembly of Claim 42, wherein the side arms are formed from modular segments.~~

45.—~~The interface assembly of Claim 42, wherein the side arms include an accordion spring.~~

46.—~~The interface assembly of Claim 42, wherein the side arms have kerfing on surfaces of the side arms.~~

47.—~~The interface assembly of Claim 42, wherein ends of the side arms have a hook connector that engages a toothed post disposed on the frame.~~

48.—~~The interface assembly of Claim 42, wherein the side arms include leaf springs configured to bias the frame between the side arms.~~

49.—~~The interface assembly of Claim 42, further comprising:~~

~~a central portion connected to ends of the side arms,~~

~~a channel disposed on the frame, wherein~~

~~the central portion is positioned within the channel such that the frame is movably supported by the central portion.~~

50.—~~The interface assembly of Claim 42, wherein the side arms are extensible.~~

51.—~~A nasal seal comprising:~~

~~a seal body defining a breathing chamber;~~

~~a nasal port positioned on the seal body, the nasal port comprising a central portion straddled by a pair of lateral portions, the nasal port further comprising an upper edge and a lower edge; and~~

~~a flange extending towards the breathing chamber from the upper edge, wherein the flange is configured to contact the user's nose when the user's nose is inserted into the nasal port.~~

52.—~~The nasal seal of Claim 51, further comprising:~~

~~through holes positioned in the flange.~~

53.—~~A nasal seal comprising:~~

~~a seal body defining a breathing chamber;~~

~~a nasal port positioned on the seal body, the nasal port further comprising an upper edge and a lower edge; and~~

~~a nose obstructing member configured to contact a user's nose that is inserted into the nasal port.~~

54.—~~The nasal seal of Claim 53, wherein the nose obstructing member is disposed on the nasal port and includes a woven mesh attached to and spanning across the nasal port.~~

55.—~~The nasal seal of Claim 53, wherein the nose obstructing member is disposed on the nasal port and includes through holes extending through the nose obstructing member.~~

56.—~~The nasal seal of Claim 53, wherein the nose obstructing member is disposed on the nasal port and includes tethers attached to a bottom surface of the breathing chamber.~~

57.—~~The nasal seal of Claim 53, wherein the nose obstructing member extends from a bottom surface of the breathing chamber towards the nasal port.~~

58.—~~The nasal seal of Claim 53, wherein a distance between the upper and lower edges is narrowest at a midpoint along a width of the nasal port.~~

59.—~~The nasal seal of Claim 53, wherein the nasal port includes a thickened bead positioned along the upper edge of the nasal port.~~

60.—~~A nasal seal comprising:~~

~~a seal body defining a breathing chamber;~~

~~a nasal port positioned on the seal body, the nasal port further comprising outer lateral portions and a central portion positioned between the outer lateral portions,~~

~~wherein the central portion of the nasal port is narrower than the outer lateral portions of the nasal port,~~

~~wherein the central portion is configured to contact a user's nose that is inserted into the nasal port.~~

61.—~~The nasal seal of Claim 60, wherein a distance between an upper edge of the nasal port and a lower edge of the nasal port is narrowest at a lateral midpoint of the nasal port.~~

62.—~~The nasal seal of Claim 60, wherein the outer lateral portions further comprises ovular ports and the central portion further comprises a throat portion, wherein the throat portion connects the ovular ports.~~

63.—~~The nasal seal of Claim 62, wherein the ovular ports are angled toward each other.~~

64.—The nasal seal of Claim 62, wherein the throat portion is closer to lower-most edges of the ovular ports than upper-most edges of the ovular ports.

65.—The nasal seal of Claim 62, wherein the throat portion is closer to upper-most edges of the ovular ports than lower-most edges of the ovular ports.

66.—The nasal seal of Claim 60, wherein the nasal port is crescent-shaped.

67.—The nasal seal of Claim 60, wherein the nasal port is kidney-shaped.

68.—The nasal seal of Claim 60, wherein the outer lateral portions comprise ovular ports that are separated by the central portion.

69.—The nasal seal of Claim 60, wherein an upper portion of the nasal port and a lower portion of the nasal port overlap.

70.—The nasal seal of Claim 62, wherein the upper portion has a recess and the lower portion has a protrusion, wherein the protrusion is positioned within the recess.

71.—A nasal seal comprising:

a seal body defining a breathing chamber;

a nasal port positioned on the seal body; and

a marking positioned on the seal body configured to indicate a position of the user's nose over the nasal port.

72.—The nasal seal of Claim 71, wherein the marking is printed onto the seal body.

73.—The nasal seal of Claim 71, wherein the marking is scented.

74.—The nasal seal of Claim 71, wherein the marking is formed from frosted silicone.

75.—The nasal seal of Claim 71, wherein the marking is deformable.

76.—An interface assembly, comprising:

a nasal mask;

a frame attached to the nasal mask;

a headgear;

an upper connecting member rotatably connected to an upper portion of the frame and the headgear; and

a lower connecting member connecting a lower portion of the frame and the headgear, wherein

~~relative movement between the upper and lower connecting members cause rotation of the frame.~~

~~77. The interface assembly of Claim 76, wherein the upper and lower connecting are connected to the headgear by pulleys.~~

~~78. A nasal seal comprising:~~

~~a seal body defining a breathing chamber; and~~

~~a downwardly deflectable upper portion, wherein~~

~~the downwardly deflectable upper portion rolls in a downward direction relative to a lower portion of the seal.~~

~~79. The nasal seal of Claim 78, further comprising:~~

~~an upwardly deflectable lower portion, wherein~~

~~the upwardly deflectable lower portion rolls in an upward direction relative to a lower portion of the seal.~~

~~80. A nasal seal comprising:~~

~~a seal body defining a breathing chamber;~~

~~a nasal port positioned on the seal body; and~~

~~a deformable nose interfacing portion formed above the nasal port, wherein~~

~~the deformable nose interfacing portion deforms in an inward direction into the breathing chamber and expands in an outward direction from the breathing chamber.~~

~~81. The nasal seal of Claim 80, further comprising a stiffened region surrounding the nasal port, wherein the stiffened region has a thickness that is greater than the deformable nose interfacing portion.~~

~~82. A nasal seal, comprising:~~

~~a front wall having a rim that circumferentially surrounds a gas inlet opening, the front wall extending proximally from the rim to join a rear wall;~~

~~a breathing chamber disposed between the front and rear walls;~~

~~a recess in the rear wall formed by a central portion of the rear wall extending distal to a first and a second lateral portion of the rear wall, the central portion being disposed between the first and second lateral portions; and~~

~~a nasal aperture communicating to the breathing chamber through the recess of the rear wall.~~

~~83. The nasal seal of Claim 82, wherein the front wall has a first region having a first thickness and a second region having a second thickness, the first thickness being at least three times greater than the second thickness.~~

~~84. The nasal seal of Claim 82 or Claim 83, wherein the front wall extends to the rear wall without passing through an inflection point.~~

~~85. The nasal seal of any one of Claims 82-84, further comprising a connector secured to the rim.~~

~~86. The nasal seal of Claim 85 wherein the connector comprises arms that extend proximally along the front wall.~~

~~87. The nasal seal of any one of Claims 82-86, wherein at least a portion of the nasal aperture is closer to a distal most point of the front wall than to a proximal most point of the front wall.~~

~~88. The nasal seal of Claim 87, wherein the entire nasal aperture is closer to the distal most point of the front wall than to the proximal most point of the front wall.~~

~~89. The nasal seal of any one of Claims 82-88, further comprising a bottom wall that extends from the gas inlet opening to the recess, the bottom wall having a front portion distal to a back portion, the back portion having a thickness that is greater than a thickness of the front portion.~~

~~90. The nasal seal of Claim 89, wherein the bottom wall further comprises a central portion interposed between the front and back portions, the central portion having a thickness that is less than the thickness of the front portion.~~

~~91. The nasal seal of any one of Claims 82-90, wherein the rear wall further comprises a thickened portion that surrounds the nasal aperture.~~

~~92. The nasal seal of Claim 91, wherein the thickened portion extends away from the nasal aperture by a width that is less than three times a maximum thickness of the thickened portion.~~

~~93. The nasal seal of Claim 91, wherein the thickened portion extends away from the nasal aperture by a width that is more than three times a maximum thickness of the thickened portion.~~

~~94. The nasal seal of any one of Claims 82-93, wherein the rim comprises a truncated portion having a radius of curvature that is less than a radius of curvature of an adjacent portion of the rim.~~

95. The nasal seal of any one of Claims 82-94, wherein in use the nasal seal has a use angle of between 0° and 70° , the use angle being an angle formed between a horizontal line and a line normal to a line extending between a distal most point and a proximal most point of the gas inlet opening.

96. The nasal seal of Claim 95, wherein the use angle is between 40° and 50° .

97. The nasal seal of Claim 95, wherein the use angle is selected to reduce a hose pull force imposed on the nasal seal by a hose connected to the nasal seal.

98. The nasal seal of any one of Claims 82-98, wherein the inlet aperture forms an air pocket disposed between the inlet aperture and a nose of a user of the nasal seal.

99. The nasal seal of any one of Claims 82-98, further comprising a thickened ridge disposed above the nasal aperture and extending distally from the rear wall.

100.—A nasal seal, comprising:

a front wall having a rim that circumferentially surrounds a gas inlet opening, the front wall extending proximally from the rim to join a rear wall;

a breathing chamber disposed between the front and rear walls;

a recess in the rear wall formed by a central portion of the rear wall extending distal to a first and a second lateral portion of the rear wall, the central portion being disposed between the first and second lateral portions;

a nasal aperture communicating to the breathing chamber through the recess of the rear wall; and

a bottom wall that extends from the gas inlet opening to the recess.

101.—The nasal seal of Claim 100, wherein the bottom wall further comprises a front portion, a back portion, and a central portion interposed between the front and back portions, the central portion having a thickness that is less than the thickness of the front portion.

102.—The nasal seal of Claim 100 or Claim 101, wherein the central portion has a thickness that is less than the thickness of the back portion.

103.—The nasal seal of any one of Claims 100-102, wherein the bottom wall further comprises at least one thickened portion that extends from the front portion to the back portion.

104.—The nasal seal of Claim 103, wherein the bottom wall comprises at least two thickened portions, the at least two thickened portions being spaced apart from one

~~another to form a sub-nasal window interposed between two adjacent at least two thickened portions.~~

~~105.—The nasal seal of any one of Claims 100-104, wherein a lateral portion of the central portion extends from the bottom wall onto at least a portion of the front wall, the rear wall, or both the front wall and the rear wall of the nasal seal.~~

~~106.—The nasal seal of any one of Claims 100-105, wherein a thickness of the central portion varies across the central portion.~~

~~107.—The nasal seal of any one of Claims 100-106, wherein a thickness of the central portion varies across the central portion in a discontinuous fashion.~~

~~108.—The nasal seal of any one of Claims 100-106, wherein a thickness of the central portion varies across the central portion in a continuous fashion.~~

~~109.—The nasal seal of any one of Claims 100-108, further comprising an inner clip and an outer clip, at least a portion of the inner clip being disposed within the breathing chamber, the rim being disposed between the inner clip and the outer clip.~~

~~110.—The nasal seal of any one of Claims 100-109, wherein the inner clip is attached to the outer clip by an interference fit.~~

~~111.—The nasal seal of any one of Claims 100-110, wherein the inner clip is attached to the outer clip by a weld selected from the group consisting of a shear weld and a face weld.~~

~~112.—The nasal seal of any one of Claims 100-111, wherein the inner clip extends to a rear face of the outer clip and separates the outer clip from the gas inlet opening across an entire perimeter of the gas inlet opening.~~

1. A frame for an interface for use in a positive pressure respiratory therapy system, the frame comprising a base and side arms, wherein:

the base is configured to support a seal of the interface;

each of the side arms includes a connector separately attached to the base;

at their outer or free ends the side arms comprise connector portions for detachably connecting the side arms to a headgear of the interface;

the side arms have both an outer kerfing and an inner kerfing along a length of the side arms, the outer kerfing and the inner kerfing consisting of a series of live hinges or slots recessed into the side arms along a thickness direction of the side arms;

the side arms are formed from an injection moulded plastic material and the outer kerfing and the inner kerfing are integrally and unitarily-formed into the side arms or formed by cutting, molding or otherwise creating the slots in the side arms; and

the side arms are resiliently flexible towards and away from a face of the user in an approximately horizontal plane (when worn), to accommodate different face sizes, but are relatively inflexible in an approximately vertical plane.

2. The frame of claim 1, wherein the slots extend through an entire width of the side arms such that a thickness of the side arms is thinner at portions having the slots than at portions between the slots.

3. The frame of claim 1 or claim 2, wherein the side arms have a rectangular cross-sectional shape, and the rectangular cross-sectional shape of the side arms have a height substantially greater than a thickness such that a resistance to bending in a direction parallel to the height direction is substantially greater than the resistance to bending in a direction parallel to the thickness direction.

4. The frame of any one of claims 1 to 3, wherein the slots have a semicircular shape.

5. The frame of any one of claims 1 to 4 wherein, when assembled with the seal and the headgear of the interface:

the outer kerfing is positioned closest to the seal; and

the inner kerfing is positioned closest to the headgear.

6. The frame of any one of claims 1 to 5, wherein the side arms extend toward or to a location between ears and eyes of the user and/or to or near a temple of the user, where the side arms connect to the headgear.

7. The frame of any one of claims 1 to 6, wherein the side arms, when assembled with the seal and the headgear of the interface, extend outwardly (away from each other), rearwardly and upwardly at a shallow angle, past left and right extremities of the seal and along left and right cheeks and in particular cheekbones of the user to connect to the headgear for holding the seal on the face of the user.

8. The frame of any one of claims 1 to 7, wherein a length of the side arms is between about 100mm and about 150mm.

9. The frame of any one of claims 1 to 8, wherein the side arms comprise a softer material fully around a portion of the side arms, for softening contact of the side arms with a face of the user.

10. The frame of any one of claims 1 to 8, wherein an interior surface of the side arms includes pads that face and/or contact a face of a user, the pads have a fabric outer surface to promote comfort, and the pads are removable for cleaning or replacement.

11. The frame of any one of claims 1 to 10, wherein:
a central portion of the base defines an aperture through which gases can flow;
a first annular wall surrounds the aperture and projects in a rearward direction to define a seal connector for connection with the seal; and
a second annular wall surrounds the aperture and projects in a forward direction to define an elbow connector for connection with an elbow.

12. The frame of claim 11, wherein the elbow connector comprises a recess configured to receive a protrusion of the elbow, the recess being an annular recess that extends around the entire circumference of the elbow connector so that the elbow is rotatable relative to the frame.

13. The frame of any one of claims 1 to 12, wherein the base is configured to be removably coupled with the seal by a snap-fit.

14. The frame of any one of claims 1 to 13, wherein each of the connector portions comprises a recess or receptacle configured to receive a complementary connector of the headgear.

15. The frame of any one of claims 1 to 14, wherein the frame is stiffer than at least a portion of the seal, such as a portion that defines a user-contacting surface.

16. The frame of any one of claims 1 to 15, wherein the base and the connectors are permanently connected to one another.

17. A mask for an interface for use in a positive pressure respiratory therapy system, the mask comprising:

the frame of any one of claims 1 to 16; and

the seal removably coupled to the frame.

18. The mask of claim 17, wherein a wearer side of the seal is formed of a silicone material or thermoplastic elastomer, and is bonded to a more rigid shell which couples to the frame.

19. The mask of claim 17, wherein the seal is a foam seal.

20. The mask of any one of claims 17 to 19, wherein the seal and the frame together form an enclosure having a gas flow inlet from the positive pressure respiratory therapy system and an aperture through the seal to the user.

21. The mask of any one of claims 17 to 20, wherein the seal is a nasal seal.

22. An interface for use in a positive pressure respiratory therapy system, the interface comprising:

the mask of any one of claims 17 to 21;

the headgear, detachably connecting the side arms; and

an elbow removably connected to the frame.