

CLAIMS:

- 5 1. ~~A cushion module for a patient interface, the cushion module comprising a first cavity, a second cavity, a nasal aperture and an oral aperture and wherein:~~
 ~~(a) the first and second cavities are separated by a cavity wall that enables respiratory gas to flow within the cushion module between the first and second cavities when in use;~~
10 ~~(b) the first cavity is configured to communicate respiratory gas to both the mouth and the nares of a patient via the oral aperture and the nasal aperture respectively;~~
 ~~(c) the cushion module comprises an exhaust vent to communicate respiratory gas from within the cushion module to externally of the cushion module; and~~
15 ~~(d) the second cavity is in communication with the exhaust vent.~~
2. ~~The cushion module as claimed in claim 1, wherein the first cavity is a primary flow cavity and the second cavity is an exhaust cavity.~~
- 20 3. ~~The cushion module as claimed in claim 1 or claim 2, wherein the cushion module is configured to accelerate respiratory gas through the first cavity into the nares.~~
4. ~~The cushion module as claimed in any one of the preceding claims, wherein the first cavity is configured to accelerate respiratory gas and to direct the accelerated respiratory gas toward the nasal aperture.~~
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5. ~~The cushion module as claimed in claim 4, wherein the first cavity is configured with a taper that narrows toward the nasal aperture.~~
- 30 6. ~~The cushion module as claimed in claim 5, wherein the taper is formed between the cavity wall and a face-contacting wall portion disposed between the oral aperture and the nasal aperture.~~
- 35 7. ~~The cushion module as claimed in any one of the preceding claims, wherein the cavity wall comprises a deformation region which preferentially deforms with respect to the remainder of the cavity wall when a deformation force is applied to the cavity wall.~~

5 8.—~~The cushion module as claimed in claim 7, wherein the deformation region comprises a deformation panel that is less resilient than the remainder of the deformation region such that the deformation panel preferentially deforms when a deformation force is applied to the seal member.~~

10 9.—~~The cushion module as claimed in claim 8, wherein the deformation region further comprises first and second resilient regions between which the deformation panel is disposed and wherein the resilient regions direct a deformation force into the deformation panel to cause preferential deformation of the deformation panel.~~

15 10.—~~The cushion module as claimed in claim 9, wherein the deformation of the deformation region involves a reduction in the spacing between the first and second resilient regions and an associated deformation of the deformation panel to accommodate the reduction in spacing.~~

20 11.—~~The cushion module as claimed in any one of claims 8 to 10, wherein the deformation panel includes first and second walls that are adapted to deform in a predetermined sequence.~~

12.—~~The cushion module as claimed in claim 11, wherein the predetermined sequence includes the deformation panel rolling over itself.~~

25 13.—~~The cushion module as claimed in claim 11 or claim 12, wherein the predetermined sequence includes the second wall rolling over the first wall.~~

30 14.—~~The cushion module as claimed in any one of claims 11 to 13, wherein the first wall projects from the first resilient region in a first direction, the second wall projects from the second resilient region in a second direction different from the first direction and the first wall meets the second wall, and wherein the predetermined sequence includes the first wall being folded against the first resilient region.~~

35 15.—~~The cushion module as claimed in any one of claims 11 to 14, wherein the second wall is configured to induce rolling of the second wall over the first wall.~~

16.—~~The cushion module as claimed in claim 15, wherein the second wall has a curved profile from the first wall to the second resilient region to induce a rolling movement in the second wall.~~

17.—The cushion module as claimed in claim 15 or claim 16, wherein the second wall increases in thickness from the first wall to the second resilient region to cause initial folding of the first wall during deformation and cause subsequent rolling in the second wall starting from an intersection between the second wall and the first wall.

18.—The cushion module as claimed in any one of claims 9 to 17, wherein the deformation panel has a wall thickness that is selected to induce deformation of the deformation panel in preference to the first and second resilient regions.

19.—The cushion module as claimed in claim 18, wherein the first and second resilient regions have a wall thickness that is at least three times the wall thickness of the deformation panel.

20.—The cushion module as claimed in any one of claims 7 to 19, wherein the deformation region is part of the cavity wall.

21.—The cushion module as claimed in claim 20, wherein the cushion module comprises a housing and a flexible seal member connected with a perimeter of the housing and wherein the seal member includes the cavity wall.

22.—The cushion module as claimed in claim 21, wherein the cavity wall connects with the housing interiorly of the connection between the perimeter of the seal member and the perimeter of the housing.

23.—The cushion module as claimed in claim 22, wherein the housing includes the exhaust vent.

24.—The cushion module as claimed in claim 23, wherein the cavity wall connection with the housing extends at least partially around the exhaust vent.

25.—The cushion module as claimed in claim 24, wherein the exhaust vent is bound by the cavity wall connection with the housing and a connection between the perimeter of the seal and the perimeter of the housing.

26.—The cushion module as claimed in any one of claims 21 to claim 25, wherein the seal member is adapted to maintain a spaced relationship between the cavity wall and the nasal aperture when a deformation force is applied to the seal member.

27.—The cushion module as claimed in claim 26, wherein the spaced relationship comprises the cavity wall being recessed from a rim the nasal aperture.

28.—The cushion module as claimed in claim 27, wherein the spaced relationship further comprises the cavity wall being located such that first and second cavities open to the nasal aperture.

29.—The cushion module as claimed in any one of claims 21 to 28, wherein the seal member is configured to direct at least some of a deformation force into the deformation region.

30.—The cushion module as claimed in claim 29, wherein the cavity wall is linked to the face contacting portion of the seal member to maintain the spaced relationship between the cavity wall and the nasal aperture when a deformation force is applied to the seal member.

31.—The cushion module as claimed in any one of claims 21 to 30, wherein the seal member includes a linking member which connects the deformation region to a face contacting portion of the seal member such that at least some of a deformation force applied to the face contacting portion is directed to the deformation region.

32.—The cushion module as claimed in any one of claims 21 to 28 when dependent on claim 20, wherein the cavity wall comprises a deflector panel adjacent to the nasal aperture, a main panel associate with the housing and the deformation region between the deflector panel and the main panel.

33.—The cushion module as claimed in claim 32, wherein the deflector panel is recessed from the rim of the nasal aperture and the linking member connects the face contacting wall portion with the deflector panel to direct a deformation force into the deformation region.

34.—The cushion module as claimed in any one of the preceding claims, wherein an outlet from the first cavity to the nares and an inlet to the second cavity form the nasal aperture.

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35.—The cushion module as claimed in any one of the preceding claims, wherein the first cavity is a lower cavity and the second cavity is an upper cavity disposed above the first cavity.

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36.—The cushion module as claimed in any one of the preceding claims, wherein the nasal aperture is in communication with an outlet of the first cavity outlet and an inlet of the second cavity inlet.

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37.—A cavity wall for separating first and second cavities in a cushion module of a patient interface, the cavity wall having a deformation region that is adapted to preferentially deform under a deformation force applied to the cushion module.

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38.—The cavity wall as claimed in claim 37, wherein the deformation region comprises a deformation panel that deforms under a deformation force.

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39.—The cavity wall as claimed in claim 38, wherein the deformation region further comprises first and second resilient regions between which the deformation panel is disposed and wherein the resilient regions direct a deformation force into the deformation panel to cause preferential deformation of the deformation panel.

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40.—The cavity wall as claimed in claim 39, wherein the deformation of the deformation region involves a reduction in the spacing between the first and second resilient regions and an associated deformation of the deformation panel to accommodate the reduction in spacing.

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41.—The cavity wall as claimed in claim 40, wherein the deformation panel includes first and second walls that are adapted to deform in a predetermined sequence.

42.—The cavity wall as claimed in claim 41, wherein the first wall projects from the first resilient region in a first direction, the second wall projects from the second resilient region in a second direction different from the first direction and the first and second walls have a connecting portion between them, and wherein the

~~predetermined sequence includes the first wall being folded against the first resilient region.~~

5 ~~43.—The cavity wall as claimed in claim 42, wherein the predetermined sequence includes the second wall buckling to accommodate the reduction in spacing between the first and second resilient regions.~~

10 ~~44.—The cavity wall as claimed in claim 43, wherein the second wall is configured to induce the buckling when the distance between the second resilient region and the connection portion is less than length of the second wall.~~

15 ~~45.—The cavity wall as claimed in claim 44, wherein the second wall has a curved profile from the connecting portion to the second resilient region to induce buckling of the second wall.~~

20 ~~46.—The cavity wall as claimed in claim 44 or claim 45, wherein the second wall increases in thickness from the connecting portion to the second resilient region to cause initial folding of the first wall during deformation and subsequent buckling in the second wall.~~

25 ~~47.—The cavity wall as claimed in any one of claims 40 to 46, wherein the deformation panel has a wall thickness that is selected to induce deformation of the deformation panel in preference to the first and second resilient regions.~~

30 ~~48.—The cavity wall as claimed in claim 47, wherein the first and second resilient regions have a wall thickness that is at least three times the wall thickness of the deformation panel.~~

35 ~~49.—A non-invasive patient interface that is configured to deliver pressurized respiratory gas to the mouth and nares of a patient, the patient interface having a cushion module that has first and second cavities with respective nasal and oral apertures which are configured to communicate respiratory gas with the mouth and nares respectively of a patient and wherein:~~

~~(a) the first and second cavities are separated by a cavity wall that enables respiratory gas to flow within the cushion module between the first and second cavities when in use; and~~

~~(b) the cavity wall is formed according to any one of claims 37 to 48 and is configured to direct external deformation forces on a face contacting portion of~~

~~the cushion module into the deformation region so that the cavity wall preferentially deforms in the deformation region.~~

50.—~~The patient interface as claimed in claim 49, wherein the first cavity is adapted to receive respiratory gas from a source and the second cavity is adapted to vent respiratory gas from within the cushion module.~~

51.—~~The patient interface as claimed in claim 49 or claim 50, wherein the cavity wall is positioned relative to the nasal aperture and the oral aperture to enable respiratory gas to flow from the first cavity to the nares through the nasal aperture.~~

52.—~~The patient interface as claimed in any one of claims 49 to 51, wherein the cavity wall is positioned relative to the nasal aperture and the oral aperture to enable exhaled respiratory gas from the mouth and nares to flow into the second cavity.~~

53.—~~The patient interface as claimed in any one of claims 49 to 52, wherein the cavity wall is at a recessed position relative to a rim of the nasal aperture.~~

54.—~~The patient interface as claimed in any one of claims 48 to 53, wherein the cavity wall is positioned relative to the nasal aperture such that the first and second cavities are in communication with the nasal aperture.~~

55.—~~The patient interface as claimed in claim 54, wherein an outlet of the first cavity and an inlet of the second cavity are in communication with the nasal aperture.~~

56.—~~The patient interface as claimed in any one of claims 49 to 55, wherein the cushion module includes a linking member extending from the face-contacting wall portion to the cavity wall so that at least some of the deformation force applied to the face-contacting wall portion is directed to the cavity wall.~~

57.—~~The patient interface as claimed in claim 56, wherein the cavity wall is configured so that the linking member directs forces imparted on the face-contacting wall portion into the deformation region of the cavity wall.~~

58.—~~The patient interface as claimed in claim 56 or claim 57, wherein the linking member is connected to the cavity wall along a first line of connection.~~

59.—The patient interface as claimed in any one of claims 56 to 58, wherein the linking member is recessed from the nasal aperture

60.—The patient interface as claimed in any one of claims 56 to 59, wherein the face-contacting wall portion of the seal member is a first wall portion between the nasal aperture and the oral aperture so that at least some of the forces applied to the first wall portion are directed to the cavity wall.

61.—The patient interface as claimed in claim 60, wherein the linking member is connected to the first wall portion along a second line of connection.

62.—The patient interface as claimed in claim 61, wherein the second line of connection comprises at least 10% of the first wall portion distance measured between the nasal aperture and the oral aperture on the exterior of the seal member.

63.—The patient interface as claimed in claim 61, wherein the second line of connection comprises at least 20% of the first wall portion distance measured between the nasal aperture and the oral aperture on the exterior of the seal member.

64.—The patient interface as claimed in any one of claims 49 to 59, wherein the face-contacting wall portion of the seal member is a second wall portion of the seal member located between the nasal aperture and the exhaust vent so that forces applied to the second wall portion are transferred to the cavity wall.

65.—The patient interface as claimed in claim 64, wherein the linking member is connected to the second wall portion along a third line of connection.

66.—The patient interface as claimed in claim 61 or claim 65, wherein the second and/or third lines of connection terminate at a location or at respective locations spaced from the rim of the nasal aperture.

67.—The patient interface as claimed in claim 66, wherein the location or the respective locations are spaced from a bead surrounding a rim of the nasal aperture.

68.—The patient interface as claimed in any one of claims 49 to 67, wherein the first cavity is a lower cavity which is configured to communicate respiratory gas to both the mouth and the nares.

69.—The patient interface as claimed in any one of claims 49 to 68, wherein the cushion module further comprises an exhaust vent to communicate respiratory gas from within the cushion module to externally of the cushion module

70.—The patient interface as claimed in claim 69, wherein the second cavity is an upper cavity disposed above the first cavity and is in communication with the exhaust vent.

71.—The patient interface as claimed in claim 70, wherein the cushion module comprises a housing and a seal member and the cavity wall connects with the housing.

72.—The patient interface as claimed in claim 71, wherein the housing includes the exhaust vent.

73.—The patient interface as claimed in claim 71 or claim 72, wherein the cavity wall connection with the housing at least partially surrounds the exhaust vent.

74.—The patient interface as claimed in any one of claims 71 to 73, wherein the exhaust vent is bound by the cavity wall connection with the housing and a connection between the perimeter of the seal and the perimeter of the housing.

75.—The patient interface as claimed in any one of claims 71 to 74, wherein the cavity wall further comprises a main panel which connects the housing to the first resilient region.

76.—The patient interface as claimed in claim 75, wherein the cavity wall further comprises a deflector panel which is recessed from the rim of the nasal aperture and which forms a channel for the flow of respiratory gas from the first cavity to the nasal aperture.

77.—The patient interface as claimed in claim 76, wherein the deflector panel abuts the second resilient region such that deformation forces are directed to the second resilient region.

78.—The patient interface as claimed in claim 76 or claim 77, wherein the deformation region is arranged to structurally decouple the deflector panel from the main panel.

79-1. A non-invasive patient interface that is configured to deliver pressurized respiratory gas to the mouth and nares of a patient, the patient interface comprising a cushion module which comprises:

- (a) a seal for sealing around the mouth and nares of the patient;
- (b) a housing connected to the seal;
- (c) an interior volume ~~as claimed~~defined by the seal and the housing; and
- (d) the seal ~~comprises~~includes a cavity wall located within the interior volume so as to define first and second cavities within the interior volume of the cushion module.

80-2. The patient interface as claimed in claim 791, wherein the cushion module further ~~comprises~~includes a preferential deformation region that ~~comprises~~includes a deformation panel.

81-3. The patient interface as claimed in claim 802, wherein the deformation region further comprises first and second resilient regions between which the deformation panel is disposed.

82-4. The patient interface as claimed in claim 813, wherein deformation of the deformation region involves a reduction in the spacing between the first and second resilient regions and an associated deformation of the deformation panel to accommodate the reduction in spacing.

83-5. The patient interface as claimed in claim 813, wherein the deformation panel includes first and second walls and a connecting portion between the first and second walls.

84-6. The patient interface as claimed in claim 835, wherein the first wall projects from the first resilient region in a first direction, the second wall projects from the second resilient region in a second direction different from the first direction.

85-7. The patient interface as claimed in claim 846, wherein the second direction is inclined downwardly from a plane intersecting the second resilient region and the connecting portion.

86-8. The patient interface as claimed in claim 846, wherein the connecting portion has a bend profile which, at rest, aligns with the first direction of the first wall and aligns with an end of the second wall remote from the second resilient region.

87-9. The patient interface as ~~as~~ claimed in claim ~~84-6~~ or claim ~~857~~, wherein the second wall has a curved profile from the connecting portion to the second resilient region.

5 88-10. The patient interface as ~~as~~ claimed in any one of claims ~~84-6~~ to ~~868~~, wherein the second wall increases in thickness from the connecting portion to the second resilient region.

10 89-11. The patient interface as ~~as~~ claimed in any one of claims ~~80-1~~ to ~~879~~, wherein the deformation panel has a wall thickness that is less than the wall thickness of the first and second resilient regions.

15 90-12. The patient interface as ~~as~~ claimed in claim ~~8811~~, wherein the first and second resilient regions have a wall thickness that is at least three times the wall thickness of the deformation panel.

91-13. The patient interface as claimed in any one of claims ~~80-1~~ to ~~9012~~, wherein the deformation region is part of the cavity wall.

20 92-14. The patient interface as claimed in claim ~~9113~~, wherein the cavity wall further comprises a main panel which connects the housing to the first resilient region.

25 93-15. The patient interface as claimed in claim ~~9214~~, wherein the cavity wall further comprises a deflector panel which is recessed from a rim of the nasal aperture and which forms a channel configured to direct respiratory gas from the first cavity to the nasal aperture.

30 94-16. The patient interface as claimed in claim ~~9315~~, wherein the deflector panel abuts the second resilient region.

95-17. The patient interface as claimed in claim ~~93-15~~ or claim ~~9416~~, wherein the deformation region is arranged to structurally decouple the deflector panel from the main panel.

35 96-18. The patient interface as claimed in any one of claims ~~80-1~~ to ~~9517~~, wherein the cavity wall is positioned relative to the nasal aperture and the oral aperture to enable respiratory gas to flow from the first cavity to the nares through the nasal aperture.

5 ~~97-19.~~ The patient interface as claimed in any one of claims ~~80-1~~ to ~~96~~18, wherein the cavity wall is positioned relative to the nasal aperture and the oral aperture to enable exhaled respiratory gas from the mouth and nares to flow into the second cavity.

10 ~~98.~~ The patient interface as claimed in any one of claims ~~80~~ to ~~97~~, wherein the nasal aperture is defined at the seal by a rim and the cavity wall is recessed within the cushion module relative to the rim.

15 ~~99.~~ The patient interface as claimed in any one of claims ~~80~~ to ~~98~~, wherein the cavity wall is positioned relative to the nasal aperture to enable the first and second cavities to communicate respiratory gas with the nasal aperture.

20 ~~100.~~ The patient interface as claimed in claim ~~99~~, wherein an outlet of the first cavity and an inlet of the second cavity are in communication with the nasal aperture.

25 ~~101.~~ The patient interface as claimed in any one of claims ~~80~~ to ~~100~~, wherein the cushion module further comprises (a) a face contacting wall portion of the seal and (b) a linking member extending from the face contacting wall portion to the cavity wall.

30 ~~102.~~ The patient interface as claimed in claim ~~101~~, wherein the linking member braces the cavity wall in position relative to the nasal aperture and the face contacting wall portion.

35 ~~103.~~ The patient interface as claimed in claim ~~101~~ or claim ~~102~~, wherein the linking member is connected to the cavity wall along a first line of connection.

40 ~~104.~~ The patient interface as claimed in any one of claims ~~100~~ to ~~103~~, wherein the linking member is recessed from the nasal aperture

45 ~~105.~~ The patient interface as claimed in any one of claims ~~101~~ to ~~59~~, wherein the face contacting wall portion is a first wall portion between the nasal aperture and the oral aperture.

50 ~~106.~~ The patient interface as claimed in claim ~~105~~, wherein the linking member is connected to the first wall portion along a second line of connection.

5 ~~107. The patient interface as claimed in claim 106, wherein the second line of connection comprises at least 10% of the first wall portion distance measured between the nasal aperture and the oral aperture on the exterior of the seal member.~~

10 ~~108. The patient interface as claimed in claim 106, wherein the second line of connection comprises at least 20% of the first wall portion distance measured between the nasal aperture and the oral aperture on the exterior of the seal member.~~

15 ~~109. The patient interface as claimed in any one of claims 49 to 59, wherein the face-contacting wall portion of the seal member is a second wall portion of the seal member located on an opposite side of the nasal aperture to the face-contacting wall portion.~~

20 ~~110. The patient interface as claimed in claim 64, wherein the linking member is connected to the second wall portion along a third line of connection.~~

25 ~~111. The patient interface as claimed in claim 106 or claim 110, wherein the second and/or third lines of connection terminate at a location or at respective locations spaced from the rim of the nasal aperture.~~

30 ~~112. The patient interface as claimed in claim 111, wherein the location or the respective locations are spaced from a bead surrounding a rim of the nasal aperture.~~

35 ~~113. The patient interface as claimed in any one of claims 80 to 112, wherein the first cavity is a lower cavity which is configured to communicate respiratory gas to both the mouth and the nares.~~

40 ~~114.20.~~ The patient interface as claimed in any one of claims ~~80-1~~ to ~~113~~19, wherein the cushion module further comprises an exhaust vent to communicate respiratory gas from within the cushion module to externally of the cushion module.

115.21. _____ The patient interface as claimed in claim 11420, wherein the second cavity is an upper cavity disposed above the first cavity and is in communication with the exhaust vent.

5 116.22. _____ The patient interface as claimed in claim 11521, wherein the housing includes the exhaust vent and the cavity wall connection with the housing at least partially surrounds the exhaust vent.

10 117.23. _____ The patient interface as claimed in claim 11622, wherein the exhaust vent is bound by the cavity wall connection with the housing and a connection between the perimeter of the seal and the perimeter of the housing.

15 118.24. _____ The patient interface as claimed in claim 11723, wherein the exhaust vent comprises one or more groups of apertures.

20 ~~119. A non-invasive patient interface having a seal-forming seal member which is shaped to encompass a mouth and nares of a patient, the interface comprising:~~
~~(a) a primary flow cavity to communicate respiratory gas to each of the mouth and the nares separately, and~~
~~(b) an exhaust flow cavity to communicate exhaled gas from the mouth and nares and to communicate excess respiratory gas from the primary flow cavity or both to externally of the interface; and~~
~~wherein the seal member includes a cavity wall that separates the primary flow cavity from the exhaust flow cavity and includes a nasal aperture that enables~~
~~respiratory gas to flow into and from the nares and wherein the cavity wall and the~~
~~nasal aperture are arranged to enable fresh respiratory gas from the primary flow~~
~~cavity to flow to the nares via the nasal aperture and enable exhaled respiratory~~
~~gas from the nares, the primary flow cavity or from both to flow to the exhaust~~
~~cavity via the nasal aperture.~~

30 ~~120. The patient interface as claimed in claim 119, wherein the cavity wall is formed according to any one of claims 37 to 48.~~

35 ~~121. The patient interface as claimed in claim 119 or claim 120, wherein the primary flow cavity and the exhaust flow cavity are within a cushion module formed by the seal member and a housing.~~

~~122. The patient interface as claimed in any one of claims 119 to 121, wherein the cavity wall is positioned relative to the nasal aperture and an oral aperture of the primary flow cavity to enable respiratory gas to flow from the primary flow cavity to the nares via the nasal aperture.~~

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~~123. The patient interface as claimed in claim 122, wherein the cavity wall is positioned relative to the nasal aperture and the oral aperture to enable exhaled respiratory gas from the mouth and nares to flow into the exhaust flow cavity.~~

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~~124. The patient interface as claimed in any one of claims 119 to 123, wherein the cavity wall is at a recessed position relative to a rim of the nasal aperture.~~

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~~125. The patient interface as claimed in any one of claims 119 to 124, wherein the cavity wall is positioned relative to the nasal aperture such that the primary flow and exhaust flow cavities are in communication with the nasal aperture.~~

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~~126. The patient interface as claimed in claim 125, wherein an outlet of the primary flow cavity and an inlet of the exhaust flow cavity are in communication with the nasal aperture.~~

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~~127. The patient interface as claimed in any one of claims 119 to 126, wherein the cushion module includes a linking member extending from a face contacting wall portion to the cavity wall so that at least some of a deformation force applied to the face contacting wall portion is directed to the cavity wall.~~

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~~128. The patient interface as claimed in claim 127, wherein the cavity wall is configured so that the linking member directs forces imparted on the face contacting wall portion into the deformation region of the cavity wall.~~

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~~129. A method of delivering respiratory gas to a patient comprising:~~

~~delivering respiratory gas at an elevated pressure to a first cavity in a cushion module of a patient interface to supply pressurised respiratory gas to the mouth and nares of the patient from the first cavity; and~~

~~accelerating respiratory gas flow through a portion of the first cavity to deliver an accelerated respiratory gas flow to the nares of the patient.~~

~~130. The method as claimed in claim 129, further comprising exhausting respiratory gas from a second cavity in the cushion module, the second cavity being in fluid communication with the first cavity.~~