elements are sufficiently distributed on the surface area of the mask to evenly or substantially evenly heat the interior space of the mask.

[0066] The heating elements 110 can be powered by the electrical current from the CPAP or other flow generator/humidifier system. Power can be supplied directly to the mask assembly 100 such as via a separate power line. In some configurations, the power can be conveyed through another component of the system, such as the breathing tube 120 or circuit, for example.

[0067] Figures 48 and 49 illustrate mask assemblies comprising heating elements with alternative or auxiliary power configurations for powering the heating elements. With reference to Figure 48, heating elements 210 (e.g., copper wire or other conductive material) is heated with current produced in a small generator 212 in the mask assembly 200. The generator 212 can comprise any suitable configuration, such as a small fan and motor placed in the mask so that airflow from the CPAP (or other flow generator) will cause the fan blades to rotate (or otherwise power the generator). The rotation will produce an electrical current that passes through the heating element 210.

[0068] Figure 49 illustrates a mask assembly 300 with in-moulded heating elements 310 (e.g., copper coils or other conductive material) that form a circuit with a circuit board 312 attached to a suitable location (e.g., the exterior) of the mask. The circuit board 312 can contain a battery ~~218~~314 to power the heating element 310 with current and, optionally, a microcontroller and/or sensors (such as a temperature sensor) to allow smart control of the heating element 310.

[0069] Figure 3 illustrates a mask assembly 400 having one or more loops of heating element 410. The one or more loops of heating element 410 can be clamped in place by a retaining mechanism 412, such as plastic hooks or tabs, similar to the ones used to connect the mask strap to the mask in the GLIDER™ strap configurations used in the FLEXIFIT™ series nasal masks sold by Fisher & Paykel Healthcare. For example, a suitable configuration is disclosed in international patent publication number WO2011/077254 A2, especially in Figure 27, the entirety of the publication which is incorporated by reference herein. The heating element can be of any suitable construction, such as the same as or similar to that used in the Evaqua 2™ breathing circuit sold by Fisher & Paykel Healthcare. Figure 4 illustrates a

connection is made again. However, in some applications, this position may be unlikely to occur or, if it occurs, is unlikely to occur for a significant period of time.

[0076] With respect to Figure 11, electromagnetic induction can also be used to transmit energy to the mask assembly 800 and induce a current. By winding conductive wires tightly around the connection at the breathing tube 820, the current in the tube windings 822 can induct a magnetic field. The mask assembly 800 can have mask windings 812 that induce electrical current when the mask windings are positioned in the magnetic field produced by the tube windings 822, such as when the breathing tube 820 is connected to the mask assembly 800. In such configurations, the power source preferably is either a time-varying current or an alternating current (AC) in the tube and not DC.

[0077] In some configurations, the mask assembly can comprise reusable portions and disposable portions. For example, a reusable portion can comprise of one or more heating elements or coils of heater wire that can be over-moulded onto the reusable portion. Electrical connections can be configured to <u>be</u> connected to a heated breathing tube's wiring. The reusable portion of the mask assembly can couple onto the rest of the mask assembly, such as the mask seal or elbow, which may be disposable portions. Since the portion of the mask assembly containing heating elements ~~are~~ <u>is</u> usually a more expensive component, it can be reused whereas other portions of the mask assembly can be disposable after a single use or for short term use (days, weeks, or months). This would be desirable in hospital usage, such as for patients requiring breathing support, as masks are designed to be single use only. With this configuration, portions of the mask assembly can still be kept disposable for sanitary reasons, but the high cost parts can be cleaned and reused. This allows a high cost part to be integrated with the mask system while reducing overall costs.

[0078] Figures 12-20 illustrate various configurations of a multi-layer mask, which is embodied as a double-layer mask assembly in the illustrated configurations. However, in other configurations, the mask can include more than two layers (e.g., three, four or more layers). In some configurations, air from the interior of the mask passes through a second chamber (insulation or transition space) defined between a first layer and a second layer (or other layers in a mask having more than two layers) before exiting the mask. The insulation or transition space provides insulation to the interior of the mask.

[0097] Figures 33-34 illustrate mask assemblies that make use of Bernoulli's principle to actively flow air over the surface of the water vapor breathable material to reduce condensation and Figures 35-38 illustrate vents that permit air to be drawn into or otherwise enter the mask assembly to reduce condensation. In some configurations, such as those in Figures 33 and 34, the mask assembly 2700 is composed of mostly rigid material (e.g., polycarbonate or other plastics) except for a water vapor breathable membrane layer 2730 which divides the mask assembly into two chambers. Fluids can leave the mask assembly 2700 through recessed vent holes 2704, which can be made of rigid material and clamped, glued, or otherwise attached to the water vapor breathable membrane layer 2730. The fluids can flow out to the environment via a cutout 2705 or other vent holes or exits in the outer shell 2708, which can be made of a rigid plastic. Water vapor can pass through the water vapor breathable membrane 2730 and into the intermediary chamber 2702 (space between the water breathable membrane layer 2730 and the outer shell 2708) instead of condensing on the interior surfaces. In the illustrated configurations, entrainment holes 2709 around the perimeter of the outer shell 2708 can suck air in from the environment due to Bernoulli's principle and actively dry the water vapor breathable membrane layer 2730 by moving through the intermediary chamber 2702, and exit through the cutout 2705 near the vent holes 2704.

[0098] Figures 35 and 36 illustrate a mask assembly 2800 with a water vapor breathable membrane layer 2830 and an outer shell 2808. The outer shell 2808 forms a pathway leading from the recessed vent holes 2804 to the environment. The exterior side of the breathable membrane layer 2830 can be dried passively by air entering the intermediary chamber 2802 through drying holes 2809.

[0099] The mask assembly 2900 of Figure 37 is similar to the mask of Figure 36 except the vent holes 2904 are not recessed but instead extend from the water vapor breathable membrane layer 2930 to the outer shell 2908.

[00100] Figure 38 illustrates another configuration of a mask assembly 3000 with vent holes 3004 clamped or otherwise coupled to the water vapor breathable membrane layer 3030. Fluids can pass through the vent holes 3004 and into the intermediary chamber ~~2802~~ 3002. The fluids can then exit the mask assembly 3000 via exhaust holes 3005 around the perimeter of the outer shell 3008.

11. The patient interface of Claim 9 or Claim 10, wherein the insulation space is in fluid communication with the vent.

12. The patient interface of any one of Claims 7-11, wherein the body is configured so that the flow of gases flows through the insulation space before exiting the interface.

13. The patient interface of any one of Claims 7-12, wherein the outer layer is releasably attached to the inner layer.

14. The patient interface of any one of Claims 7-13, further comprising at least one heat pad coupled to the outer layer.

15. The patient interface of any one of Claims 7-14, further comprising a phase change material in the insulation space.

16. The patient interface of any one of Claims 7-15, wherein the inner layer is configured to diffuse gases from the gas delivery system and is heated by the gases.

17. A patient interface comprising:

a foamed breathable membrane body that allows water vapor to pass through the body;

a frame structure attached to the foamed breathable membrane body; and

a coupling for fluid connection to a gas delivery system.

18. The patient interface of Claim 17, further comprising a water vapor breathable layer.

19. The patient interface of Claim 17 or Claim 18, further comprising a vent that allows a flow of gases from an interior of the interface to an exterior of the interface.

20. The patient interface of any one of Claims 17-19, further comprising a seal adapted to form at least a substantial seal with a user's face.

21. The patient interface of any one of Claims 17-20, wherein the foamed breathable membrane body is ribbed.

~~22. A patient interface comprising:~~

~~a body adapted to form a seal with a user's face, the body comprising:~~

~~an inner layer made of a thermally conductive material; and~~

~~an outer layer made of an insulating material; and~~

~~a coupling for fluid connection to a gas delivery system.~~

~~23. The patient interface of Claim 22, further comprising a vent that allows a flow of gases from an interior of the body to an exterior of the body.~~

24. The patient interface of Claim 22 or Claim 23, further comprising a heating element in thermal communication with the inner layer.

25. The patient interface of any one of Claims 22-24, wherein the thermally conductive material is a polymer.

26. The patient interface of any one of Claims 22-24, wherein the thermally conductive material is a metal.

27. The patient interface of Claim 22 or Claim 23, further comprising a thermoelectric cooling device in thermal communication with the inner layer.

28. The patient interface of any one of Claims 22-27, further comprising a sensor to provide feedback of the temperature of the inner layer.