

performed by forcing the stream of air to travel through a respiratory humidifier containing water and a heater for heating the water. In such a system, the heater encourages the evaporation of the water, which in turn imbues the stream of air with moisture and/or heat. This moisture and/or heat may help to ameliorate discomfort that may arise from the use of unhumidified PAP therapy. Respiratory humidifiers may also be used with other gas-based therapies, such as high flow therapy, and may have similar therapeutic benefits when used with other gas-based therapies.

SUMMARY OF THE INVENTION

In some cases, when utilizing a respiratory therapy system involving the administration of gases, it is desired to use a respiratory humidifier to heat and/or humidify the gases being delivered to a patient. The respiratory humidifier may comprise a humidification chamber comprising a resistive metallic heating plate and a reservoir that may interface with the resistive metallic heating plate. The gas may pass through the reservoir and/or humidification chamber. The resistive metallic heating plate may be used to heat liquid contained in the reservoir to encourage liquid entrainment in the gas flow. However, there may be difficulty in the industrial use of some such resistive metallic heating plates. Many metals may be difficult and/or expensive to mold into desired shapes. The price of the raw material used to craft a resistive metallic heating plate may be high. The electrical and/or thermal conductivity of the resistive metallic heating plate may not be ideal. A resistive metallic heating plate, if used in a humidification chamber, may not blend seamlessly with the rest of the humidification chamber, and may not be aesthetically pleasing to a consumer. Accordingly, it is an object of the disclosure to provide an improved heating system that might solve one or more of the above problems, or at least provide the public with a useful choice.

Thus, in accordance with at least one of the embodiments disclosed herein, a humidifier is disclosed. The humidifier may be a respiratory humidifier. The humidifier may comprise a humidifier comprising:

- a heater for heating a liquid in a reservoir that is part of or is received by the humidifier;

- wherein the heater is constructed from an electrically conductive plastic (ECP) material and comprises a thermoconductive layer that is non-electrically conductive at least partially covering the ECP material; and

- wherein the thermoconductive layer comprises thermoconductive visually pronounced macrostructures to promote or effect heat transfer to the liquid in the reservoir.

In some embodiments, the humidifier comprises a chamber to receive a said reservoir in use and the heater is located in or forms part of a wall or base of the chamber to heat the water via a wall or base of the reservoir.

In some embodiments, the heater is over-moulded in a wall or base of the chamber.

- 5 In some embodiments, substantially all of the walls and base of the chamber is formed from an ECP material.

In some embodiments, the humidifier comprises a said reservoir, and wherein the heater is located in or forms part of the reservoir.

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In some embodiments, the heater forms part of a wall or base of the reservoir.

- 15 In some embodiments, substantially all of the walls and base of the reservoir is formed from an ECP material, such that the reservoir forms the heater. Thus, in some embodiments, the humidifier comprises a reservoir for receiving water and wherein the reservoir comprises a base and a wall or walls, and wherein the walls and base are constructed from an electrically conductive plastic (ECP) material and comprises a thermoconductive layer that is non-electrically conductive at least partially covering the ECP material, the ECP material providing a heater to be energized to heat water
20 received by the reservoir.

In some embodiments, the heater is over-moulded in a wall or base of the reservoir.

In some embodiments, the ECP material is over-moulded in a wall or base of the reservoir, and the wall or base is formed from a thermoconductive material, the thermoconductive material of the wall or base forming the thermoconductive layer.

- 25 In some embodiments, the heater is configured to promote differential heating of liquid in the reservoir.

In some embodiments, the thermoconductive structures are one or more of thermoconductive fins, ridges, ribs, depressions, channels and/or fenestrations.

WHAT IS CLAIMED IS:

1. A humidifier comprising:
a heater for heating a liquid in a reservoir that is part of or is received by the humidifier;
wherein the heater is constructed from an electrically conductive plastic (ECP) material and comprises a thermoconductive layer that is non-electrically conductive at least partially covering the ECP material, and
wherein the thermoconductive layer comprises thermoconductive visually pronounced macrostructures to promote or effect heat transfer to the liquid in the reservoir.
2. The humidifier according to claim 1 wherein the thermoconductive macrostructures comprise fins, ridges, ribs, depressions, channels and/or fenestrations.
3. The humidifier of claim 1 or 2, wherein the humidifier comprises a chamber to receive a said reservoir in use.
4. The humidifier of claim 3, wherein the heater is located in or forms part of a wall or base of the chamber to heat the liquid via a wall or base of the reservoir.
5. The humidifier of claim 4, wherein the heater is over-moulded in a wall or base of the chamber.
6. The humidifier as claimed in claim 4, wherein substantially all of the walls and base of the chamber is formed from an ECP material.
7. The humidifier of claim 1, further comprising a said reservoir, and wherein the heater is located in or forms part of the reservoir.
8. The humidifier of claim 5, wherein the heater forms part of a wall or base of the reservoir.
9. The humidifier as claimed in claim 8, wherein substantially all of the walls and base of the reservoir is formed from an ECP material, such that the reservoir forms the heater.

10. The humidifier of claim 8, wherein the heater is over-moulded in a wall or base of the reservoir.
11. The humidifier as claimed in any of claims 7 or 8, wherein the ECP material is over-moulded in a wall or base of the reservoir, and the wall or base is formed from a thermoconductive material, the thermoconductive material of the wall or base forming the thermoconductive layer.
12. The humidifier of any one of claims 1 to 11, wherein the heater is configured to promote differential heating of liquid in the reservoir.
13. The humidifier of any one of claims 1 to 12, wherein the heater comprises a biocompatible layer covering the thermoconductive layer.
14. The humidifier of claim 13, wherein the biocompatible layer is biocompatible and hydrophilic.
15. The humidifier of claim 13 or claim 14, wherein the biocompatible layer is over-moulded to the thermoconductive layer.
16. The humidifier of any one of claims 1 to 15, wherein the heater comprises a hydrophilic layer covering the thermoconductive layer or a biocompatible layer of the heater.
17. The humidifier of claim 16, wherein the hydrophilic layer is over-moulded to the thermoconductive layer or the biocompatible layer.
18. The humidifier of claim 1, wherein the thermoconductive layer is over-moulded to the ECP material.
19. The humidifier of any one of claims 1 to 18, wherein the thermoconductive layer is biocompatible or hydrophilic or biocompatible and hydrophilic.
20. The humidifier of any one of claims 1 to 19, wherein the thermoconductive layer substantially covers all of the ECP material.
21. The humidifier of any one of claims 1 to 20, wherein the thermoconductive later is electrically isolating.