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(54) Title: A HAND HELD APPLIANCE

(57) Abstract: Disclosed is a hand held appliance comprising an outer wall, an inner wall, a fluid flow path extending within the inner wall from a fluid inlet into the appliance to a fluid outlet, a fan unit disposed within the inner wall for drawing fluid in through the fluid inlet and a seal disposed between the outer wall and the inner wall. Fluid in the fluid flow path may flow from the fluid inlet to an upstream end of the fan unit, through the fan unit to a downstream end of the fan unit and on to a fluid outlet. The seal may be downstream of the fluid inlet. The seal may be downstream of the fan unit. The outer wall may comprise a handle of the appliance. The seal may comprise an o-ring, a lip seal or any over moulded seal.

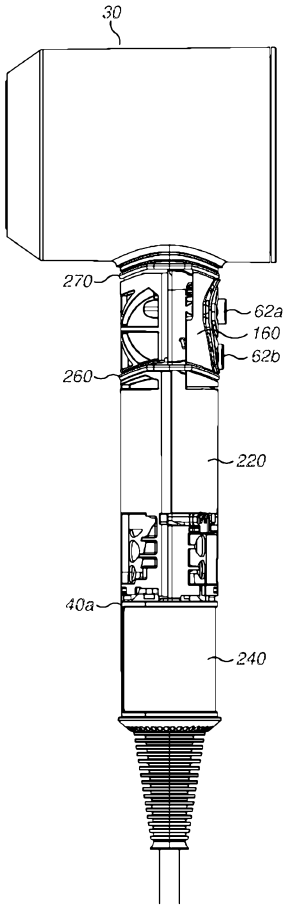

FIG. 4a

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A Hand Held Appliance

This invention relates to hand held appliance and in particular a hair care appliance.

Any discussion of the prior art throughout the specification should in no way be considered as an admission that such prior art is widely known or forms part of common general knowledge in the field.

Generally, a motor and fan are provided which draw fluid into a body; the fluid may be heated prior to exiting the body. The motor is susceptible to damage from foreign objects such as dirt or hair so conventionally a filter is provided at the fluid inlet to the blower. The fan and heater require power in order to function and this is provided via internal wiring from either a mains power cable or batteries attached to the appliance.

The invention provides a hand held appliance comprising: an outer wall extending along an axis; an inner wall extending along the axis; a fluid flow path extending within the inner wall from a fluid inlet into the appliance to a fluid outlet; a fan unit disposed within the inner wall for drawing fluid in through the fluid inlet, and a first seal and a second seal which are disposed between adjacent faces of the outer wall and the inner wall; wherein the adjacent faces extend longitudinally along the axis.

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”.

Having an outer wall and an inner wall is convenient for a number of reasons. There is a reduction in the transmission of vibrations and noise from the fan unit. The internal components, such as the fan unit, are housed within the inner wall isolating them from the outer wall. It enables the outer wall to be formed as a tube without join lines which

is aesthetically pleasing. For construction, the inner wall is conveniently formed in two parts so that internal components, such as the fan unit, can be assembled, prior to the two parts of the inner wall being connected then the outer wall is slid over the inner wall.

In the arrangement of having an outer wall and an inner wall, there is an issue with fluid passing in the space between the outer wall and the inner wall and recirculating within this space. Any recirculation causes pressure losses within the appliance and impacts

the velocity and volume of fluid exiting the appliance. The recirculation is caused by a pressure differential in fluid within the appliance caused by the action of the fan unit.

Accordingly, a seal is provided to prevent such recirculation. Preferably, fluid in the fluid flow path flows from the fluid inlet to an upstream end of the fan unit, through the fan unit to a downstream end of the fan unit and on to a fluid outlet. It is preferred that the seal is downstream of the fluid inlet.

Preferably, the seal is downstream of the fan unit. The seal is provided in any convenient position such that fluid cannot recirculate around the fan unit i.e. flow passed the fan unit in one direction within the inner wall and in the opposite direction between the inner wall and the outer wall.

In one embodiment, the outer wall comprises a handle of the appliance. Thus, the fluid inlet and the fan unit are provided in the handle of the appliance. The fan unit is the largest component that is housed within the handle and thus determines the diameter of the handle. In order not to increase the diameter of the handle it is advantageous to locate the seal upstream or downstream of the fan unit.

Preferably, the seal comprises an o-ring, a lip seal or any over moulded seal that extends around either the radially outer circumference of the inner wall or the radially inner circumference of the outer wall.

Regardless of what type of seal is used, it is preferable to position the seal longitudinally spaced as far as possible from the fluid inlet. This reduces the frictional forces produced when assembling the handle by sliding the outer wall over the inner wall.

In one embodiment, the inner wall comprises at least one noise mitigating perforation which provides an easy path for fluid to pass into the space between the inner wall and the outer wall. In this embodiment, the seal is preferably located downstream of the at least one perforation.

Preferably, a second seal is provided. It is preferred that this second seal is provided downstream of the first seal.

In one embodiment, the outer wall comprises a user interface comprising at least one user operable button. Preferably, the first seal is positioned upstream of this user interface. It is preferred that the second seal is positioned downstream of the user interface.

The user interface provides a potential source of fluid leaking either into or out of the fluid flow path therefore it is advantageous to seal around the user interface so that any such leaking is mitigated.

Preferably, the user interface further comprises a switch located within the inner handle which cooperates with the user operable button. In a preferred embodiment the user operable button cooperates with an actuator which is mechanically connected to the switch. Preferably, the actuator forms part of a switch assembly which connects to the inner wall.

Preferably, the user interface further comprises an actuator which cooperates with the user operable button wherein the actuator is mechanically connected to a switch.

In a preferred embodiment, the seal and the second seal extend around the switch assembly and the inner wall. This holds the switch assembly in place with respect to the inner wall. In addition, when the outer wall is slid into position over the inner wall, and the first seal and second seal are squashed between the two walls, the first and second seals provide a seal above and below the switch assembly thus reducing fluid leaks into the fluid flow path via the user interface.

Preferably, the switch assembly comprises a flexible membrane which surrounds the actuator and comprises a protrusion that seals against the inner wall. Preferably, the protrusion extends along a longitudinal axis of the inner wall. In a preferred

embodiment, the protrusion extends either side of the actuator along the longitudinal axis of the inner wall. In this embodiment, the user interface is sealed both radially and longitudinally to reduce stray fluid floe and also to mitigate ingress of and duct etc... into the fluid flow path at the user interface.

Preferably a further seal is provided. This further seal is preferably provided downstream of the fluid inlet and spaced from the seal. The seal is provided to prevent fluid from recirculating between the outer wall and the inner wall so, the seal is proud of either the radially outer surface of the inner wall or the radially inner surface of the outer wall. This can cause the outer wall to rock or pivot about the seal with respect to the inner wall. For this reason a further seal is provided which centralises the outer wall with respect to the inner wall and mitigates any rocking or pivoting.

In one embodiment the functions of the second seal and the further seal are combined; thus the second seal both seals the user interface and mitigates rocking or pivoting of the outer wall with respect to the inner wall.

Preferably, the appliance is a hair care appliance.

Preferably, the hair care appliance is a hairdryer. Alternatively, the hair care appliance is a hot styling appliance.

The invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows a hairdryer according to the invention;

Figure 2 shows a cross section through the hairdryer of Figure 1;

Figure 3 shows a further cross section through the hairdryer of Figure 1;

Figures 4a and 4b show a side view and a rear view of a the hairdryer of Figure 1 without the outer wall of the handle;

Figure 5 is a further cross section through the handle of hairdryer shown in Figure 1;

Figure 6 shows a different cross section through the handle of the hairdryer of Figure 1; and

Figure 7 shows the radially inner surface of the switch assembly of Figure 4a.

Figures 1, 2 and 3 show a hairdryer 10 with a handle 20 and a body 30. The handle has a first end 22 which is connected to the body 30 and a second end 24 distal from the body 30 and which includes a primary fluid inlet 40. Power is supplied to the hairdryer 10 via a cable 50. At a distal end of the cable 50 from the hairdryer 10 a plug (not shown) is provided, the plug may provide electrical connection to mains power or to a battery pack for example.

The handle 20 has an outer wall 200 which extends from the body 30 to a distal end 24 of the handle. At the distal end 24 of the handle an end wall 210 extends across the outer wall 200. The cable 50 enters the hairdryer through this end wall 210. The primary fluid inlet 40 in the handle 20 includes first apertures that extend around and along 42 the outer wall 200 of the handle and second apertures that extend across 46 and through the end wall 210 of the handle 20. The cable 50 is located approximately in the middle of the end wall 210 so extends from the centre of the handle 20. The handle 20 has a longitudinal axis X-X along which the outer wall 200 extends from the body 30 towards the distal end 24.

An inner wall 220 is provided that extends within the outer wall 200 from a downstream end 40a of the fluid inlet 40 to the body 30. The inner wall 220 includes a number of perforations 280 located between the downstream end 40a of the fluid inlet 40 and the

fan unit 70. These perforations stop some noise that is generated within the handle 20 from being transmitted to the outside of the handle 20.

The fluid inlet 40 is a primary filtration for the fluid that enters the fluid flow path 400. A second filter 240 is provided within the outer wall 200 extending from the end wall 210 to the downstream end 40a of the fluid inlet. This second filter is a secondary filtration for fluid that enters the fluid flow path 400.

Downstream of the primary fluid inlet 40, a fan unit 70 is provided. The fan unit 70 includes a fan and a motor. The fan unit 70 draws fluid through the primary fluid inlet 40 towards the body 30 through a primary fluid flow path 400 that extends from the primary fluid inlet 40 and into the body 30 where the handle 20 and the body 30 are joined 90. The body 30 has a first end 32 and a second end 34, the primary fluid flow path 400 continues through the body 30 towards the second end 34 of the body, around a heater 80 and to a primary fluid outlet 440 where fluid that is drawn in by the fan unit exits the primary fluid flow path 400. The primary fluid flow path 400 is non linear and flows through the handle 20 in a first direction and through the body 30 in a second direction which is orthogonal to the first direction.

The body 30 includes an outer wall 360 and an inner duct 310. The primary fluid flow path 400 extends along the body from the junction 90 of the handle 20 and the body 30 between the outer wall 360 and the inner duct 310 towards the primary fluid outlet 440 at the second end 34 of the body 30.

Another fluid flow path 300 is provided within the body 30; this flow is not directly processed by the fan unit 70 or the heater 80 but is drawn into the hairdryer 10 by the action of the fan unit producing the primary flow through the hairdryer. This fluid flow is entrained into the hairdryer by the fluid flowing through the primary fluid flow path 400.

The first end 32 of the body includes a fluid inlet 320 and the second end 34 of the body includes a fluid outlet 340. Both the fluid inlet 320 and the fluid outlet 340 are at least partially defined by the inner duct 310 which is an inner wall of the body 30 and extends within and along the body. A fluid flow path 300 extends within the inner duct 310 from the fluid inlet 320 to the fluid outlet 340. At the first end 32 of the body 30, a side wall 350 extends between the outer wall 360 and the inner duct 310. This side wall 350 at least partially defines the fluid inlet 320. The primary fluid outlet 440 is annular and surrounds the fluid flow path 300.

A PCB 75 including the control electronics for the hairdryer is located in the body 30 near the side wall 350 and fluid inlet 320. The PCB 75 is ring shaped and extends round the inner duct 310 between the inner duct 310 and the outer wall 360. The PCB 75 extends about the fluid flow path 300 and is isolated from the fluid flow path 300 by the inner duct 310.

The PCB 75 controls parameters such as the temperature of the heater 80 and the speed of rotation of the fan unit 70. Internal wiring (not shown) electrically connects the PCB 75 to the heater 80 and the fan unit 70 and the cable 50. The internal wiring consists of a live wire 112 and a neutral wire 122 that extend from the cable to the switch mechanism. Control buttons 62, 64 are provided and connected to the PCB 75 to enable a user to select from a range of temperature settings and flow rates for example. Control button 62 comprises a pair of buttons. A first button 62a switches the product on and off and a second button 62b provides a second function, in this case a cold shot function.

In use, fluid is drawn into the primary fluid flow path 400 by the action of the fan unit 70, is optionally heated by the heater 80 and exits from the primary fluid outlet 440. This processed flow causes fluid to be entrained into the fluid flow path 300 at the fluid inlet 320. The fluid combines with the processed flow at the second end 34 of the body. In the example shown in Figure 3, the processed flow exits the primary fluid outlet 440 and the hairdryer as an annular flow which surrounds the entrained flow that exits from

the hairdryer via the fluid outlet 340. Thus fluid that is processed by the fan unit and heater is augmented by the entrained flow.

Referring to Figures 4 to 7 in particular, the invention will now be described. The handle 20 has an outer wall 200 and an inner wall 220 extending from the fluid inlet 40 to the body 30. The fluid flow path 400 extends within the inner wall 220 however, as there is clearance between the outer wall 200 and the inner wall 220 to enable assembly of the outer wall 200 over the inner wall 220, some fluid drawn in by the action of the fan unit can flow between the outer wall 200 and the inner wall 220. To stop this, an o-ring 260 is provided between the outer wall 200 and the inner wall 220. The inner wall 220 includes a recess 262 that extends around the inner wall 220 which partially accommodates the o-ring 260, leaving enough thickness of the o-ring 260 proud of the outer surface 220b of the inner wall 200 for the o-ring to engage with and seal against an inner surface 200a of the outer wall 200.

Conveniently, the o-ring 260 has a second function. This is possible as the seal can be made anywhere along the length of the inner wall 220 where a recirculation path for the fluid flowing within the handle 20 is prevented. Thus, for the example where perforations 280 are provided within the inner wall 220, the seal must be made downstream of the perforations 280. In this embodiment, the seal can be made anywhere along the inner wall 220 downstream of the perforations 280 to the body 30, in theory. However, in one embodiment, having a user interface 500 having control buttons 62a,62b provided on the handle 20, the o-ring 260 is used to additionally provide a seal with respect to that user interface 500. Thus, the o-ring 260 is downstream of the fan unit 70 and upstream of the user interface 500.

The outer wall 200 includes a pair or apertures 202,204 through which the user operable buttons 62a,62b activate a respective switch 100, 126. These apertures provide a potential leak path into fluid flow path 400. A number of features are provided to mitigate that potential including having a switch assembly 150 disposed between the inner wall 220 and the outer wall 200, a sealing lip 174 extending from the switch

assembly 150 and the o-ring 260 which extends around the inner wall 220 and the switch assembly 150 thus biasing the switch assembly 150 towards the inner wall 220.

The switch assembly 150 includes a frame 160, a flexible membrane 170 and an actuator 180. The frame 160 provides a support for the switch assembly 150. The actuator 180 provides a support for the user operable button 62a. The flexible membrane 170 connects the actuator 180 to the frame 160 and allows the actuator 180 to be moved by a user operating the button 62a whilst providing a seal between the actuator 180 and the frame 160.

The switch assembly 150 is located within the handle 20 of the hairdryer 10. For convenience, the switch assembly 150 is connected to an inner wall 220 of the handle 20 via a pair of locating pins 152. The inner wall 220 includes an aperture 226 through which the switch assembly 150 can engage with the switch mechanism 100 when the switch assembly 150 is connected to the inner wall 220.

The different parts can be retained by mechanically fixing them together for example using glue, however in this embodiment, a switch cover 110 is used to house and retain the switch mechanism 150 with respect to the inner wall 220.

For the switch assembly 150, the locating pins 152 retain it with respect to the inner wall 200, then the o-ring 260 is positioned within recess 262 and the outer wall 200 is positioned over the inner wall 220 by sliding the outer wall 200 along the inner wall 220. The outer wall 200 is provided with an aperture 202 through which button 62a cooperates with its' switch 100. Once the outer wall 200 is correctly located, the user operable button 62a is attached to the actuator 180 through aperture 202.

In this embodiment the switch mechanism 100 is a sliding switch with an activation knob 102. In order to accommodate the sliding action of the activation knob 102 and the actuator 180, the flexible membrane is provided with a bellows 172 which extends around the actuator.

The switch assembly 150 additionally contains a second actuator 190 which is surrounded by the flexible membrane 170. The second actuator 190 is connected to a second button, in this case a cold shot button 62b which restricts or cuts power to the heater when activated to provide a cool flow from the hairdryer. The outer wall 200 is provided with a second aperture 204 through which the cold shot button 62b engages with the second actuator 190. When the cold shot button 62b is activated the actuator 190 engages with an electronic switch 126 which is housed on a PCB extension 120. This PCB extension 120 is electrically connected to the PCB 75 to provide signals to controlling software relating to activation and deactivation of the electronic switch 126. This cold shot button 62b is also attached to the second actuator 190 through the second aperture 204 after the outer wall 200 has been assembled over the inner wall 220.

The flexible membrane 170 is provided with a sealing lip 174 (Figure 7). This sealing lip 174 extends radially inwards from the radially inner surface 150a of the switch assembly. The sealing lip 174 extends along the longitudinal axis X-X of the handle 20 to seal around both the actuator 180 and the second actuator 190. The sealing lip 174 may also extend completely about the actuator 180 and the second actuator 190 to encapsulate them. Thus any fluid or dirt that passes between a user operable button 62a,62b and its' respective actuator 180, 190 has a convoluted path between the inner wall 220 and the switch assembly 150, through the lip seal 174 and then between the inner wall 220 and the switch cover 110 in order to enter the fluid flow path 400.

A second o-ring 270 is provided and this second o-ring 270 can be positioned anywhere along the inner wall 220 between the inner wall 220 and the outer wall 200. It is advantageous that this second o-ring 270 is spaced from the o-ring 260 as one of the functions of this second o-ring 270 is to stop a pivoting action between the outer wall 200 and the inner wall 220 by providing two spaced apart points of contact between the outer wall 200 and the inner wall 220.

In this embodiment, the second o-ring 270 is provided near a downstream end 150b of the switch assembly 150 and the o-ring 260. This seal has dual functionality in that it seals between the outer wall 200 and the inner wall 220 and in addition is used to bias the downstream end 150b of the switch assembly 150 towards the inner wall 220 to help prevent ingress of fluid or dirt from the user interface or specifically the apertures 202, 204 in the outer wall 200 through which user operable buttons 62a,62b engage with respective switches 100, 120.

The outer wall 220 is tubular and moulded as a single unit. This limits the number of places where either fluid can escape from the fluid flow path or foreign mater and fluid can be introduced.

Alternatively, the two functions of the second o-ring provided in this embodiment are provided by a second o-ring and a further o-ring. The further o-ring (not shown) is preferably spaced from both the o-ring 260 and the second o-ring 270.

The invention has been described in detail with respect to a hairdryer however, it is applicable to any appliance that draws in a fluid and directs the outflow of that fluid from the appliance.

The appliance can be used with or without a heater; the action of the outflow of fluid at high velocity has a drying effect.

The fluid that flows through the appliance is generally air, but may be a different combination of gases or gas and can include additives to improve performance of the appliance or the impact the appliance has on an object the output is directed at for example, hair and the styling of that hair.

The invention is not limited to the detailed description given above. Variations will be apparent to the person skilled in the art.

CLAIMS

1. A hand held appliance comprising: an outer wall extending along an axis; an inner wall extending along the axis; a fluid flow path extending within the inner wall from a fluid inlet into the appliance to a fluid outlet; a fan unit disposed within the inner wall for drawing fluid in through the fluid inlet, and a first seal and a second seal which are disposed between adjacent faces of the outer wall and the inner wall; wherein the adjacent faces extend longitudinally along the axis.

2. An appliance according to claim 1, wherein fluid in the fluid flow path flows from the fluid inlet to an upstream end of the fan unit, through the fan unit to a downstream end of the fan unit and on to a fluid outlet.

3. An appliance according to claim 1 or claim 2, wherein the seal is downstream of the fluid inlet.

4. An appliance according to any preceding claim, wherein the seal is downstream of the fan unit.

5. An appliance according to any preceding claim, wherein the outer wall comprises a handle of the appliance.

6. An appliance according to claim 5, wherein the seal comprises an o-ring, a lip seal or any over moulded seal.

7. An appliance according to claim 6, wherein the seal extends around the radially outer circumference of the inner wall.

8. An appliance according to claim 6, wherein the seal extends around the radially inner circumference of the outer wall.

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9. An appliance according any preceding claim, wherein the inner wall comprises at least one noise mitigating perforation wherein the seal is located downstream of the at least one perforation.

10. An appliance according to any preceding claim, wherein a second seal is provided.

11. An appliance according to claim 10, wherein the second seal is provided downstream of the first seal.

12. An appliance according to claim 10 or claim 11, wherein the outer wall comprises a user interface comprising at least one user operable button.

13. An appliance according to claim 12, wherein the first seal is positioned upstream of this user interface and the second seal is positioned downstream of the user interface.

14. An appliance according to claim 11 or claim 12, wherein the user interface further comprises an actuator which cooperates with the user operable button wherein the actuator is mechanically connected to a switch.

15. An appliance according to claim 14, wherein the actuator forms part of a switch assembly which connects to the inner wall.

16. An appliance according to claim 15, wherein the seal extends around the switch assembly and the inner wall.

17. An appliance according to claim 15 or claim 16, wherein the second seal extends around the switch assembly and the inner wall.

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18. An appliance according to any preceding claim, wherein the appliance is a hair care appliance.

19. An appliance according to claim 18, wherein the hair care appliance is a hairdryer.

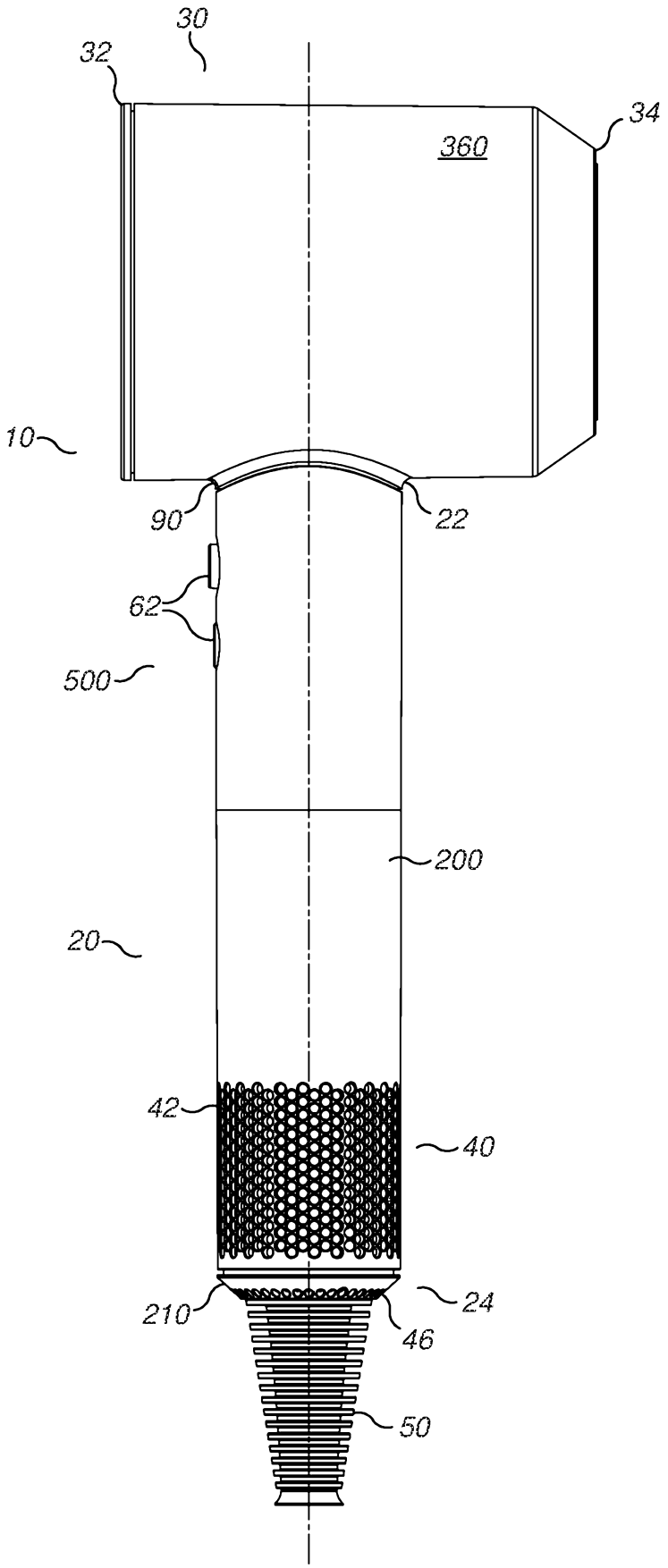
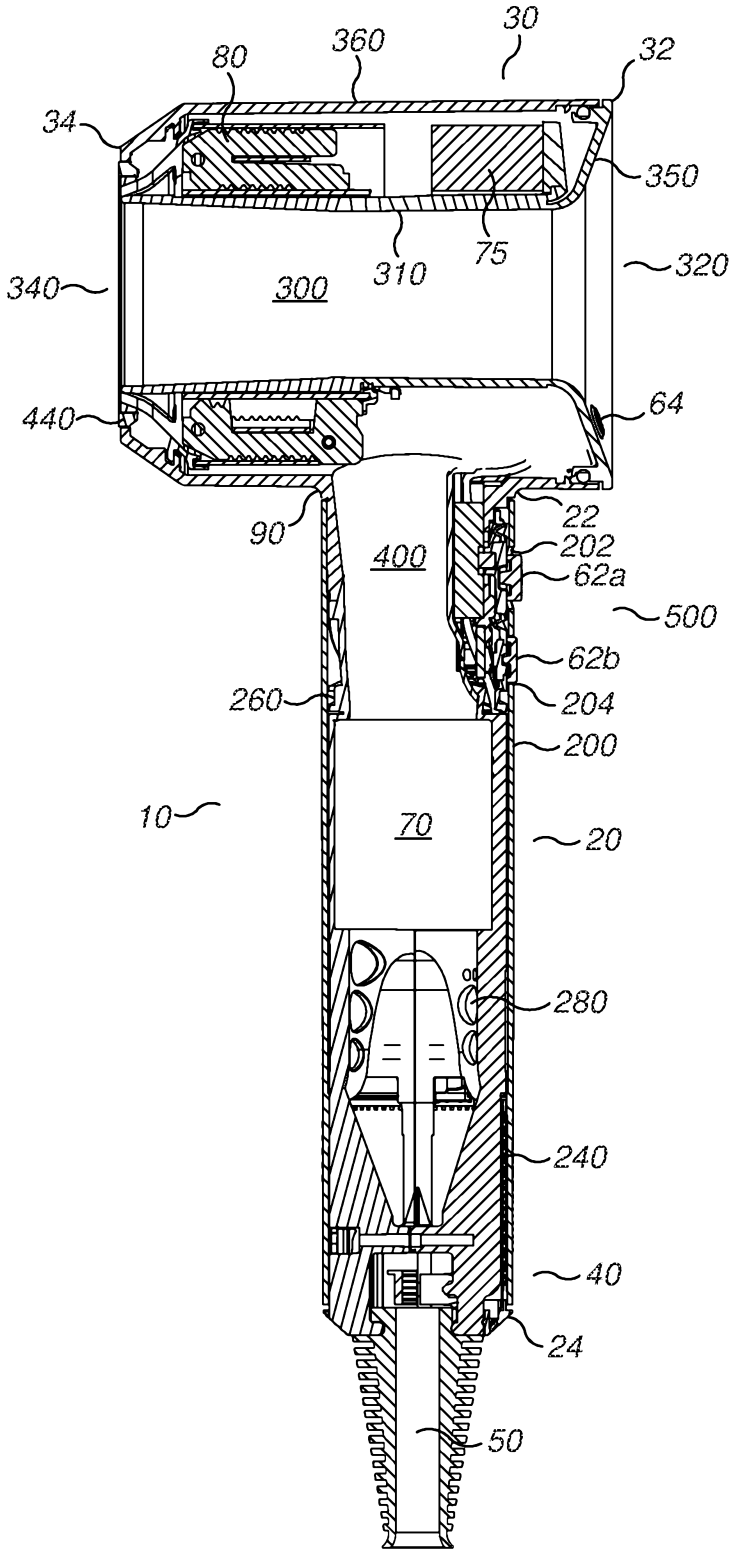


FIG. 1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360
80
32
34
350
310
75
320
340
300
64
440
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62a
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10
70
20
280
240
40
24
50

FIG. 2

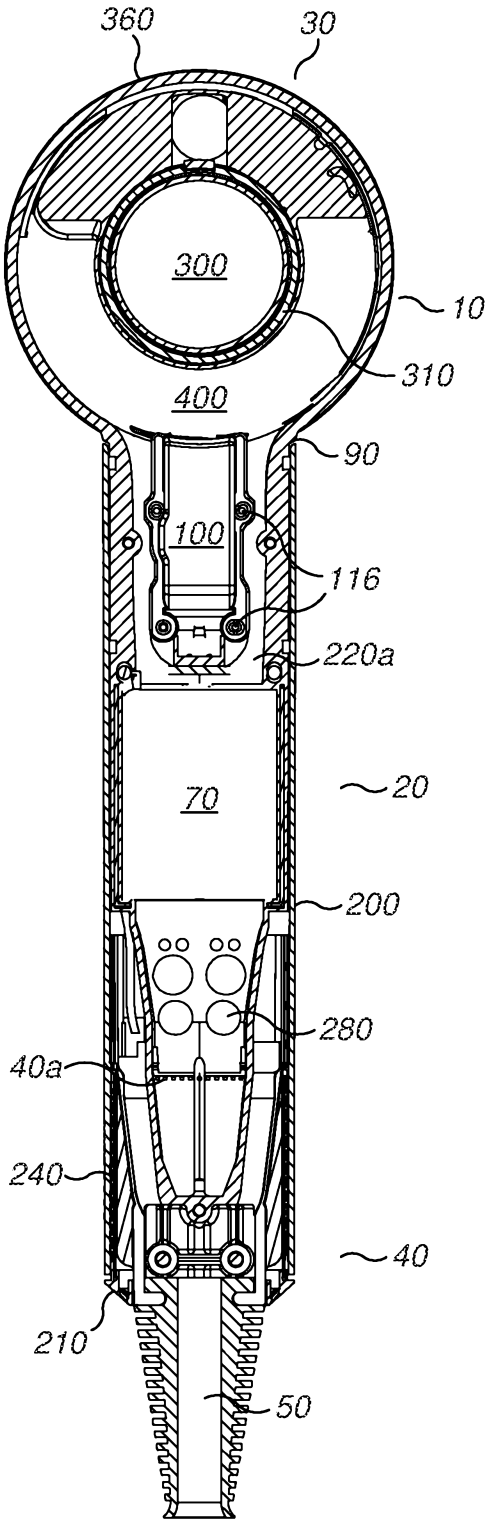
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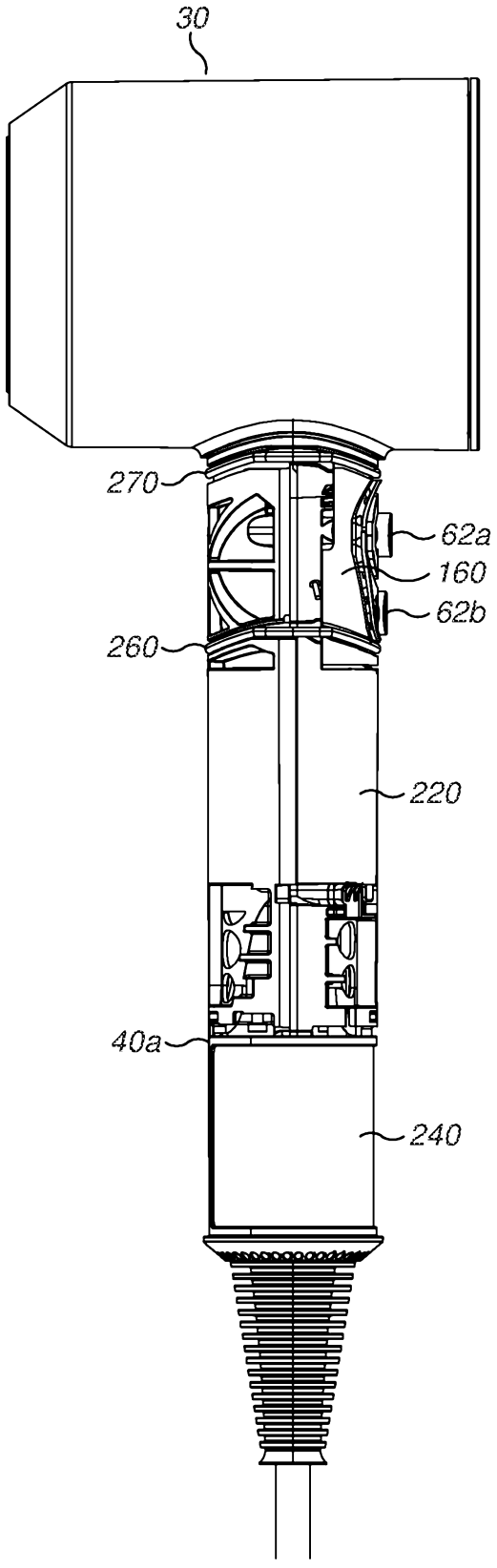
FIG. 3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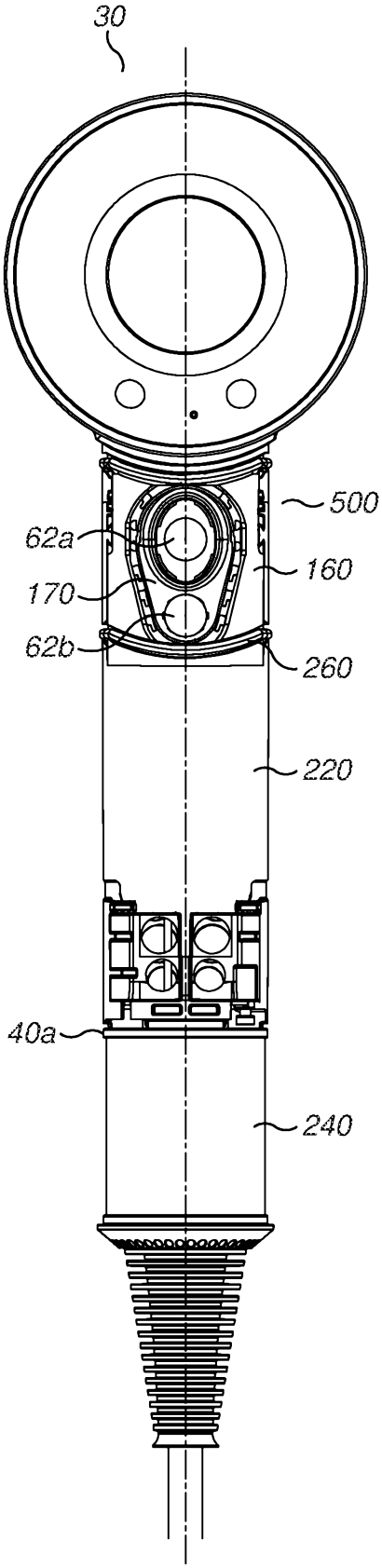
62a
160
62b
260
220
40a
240

FIG. 4a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62a
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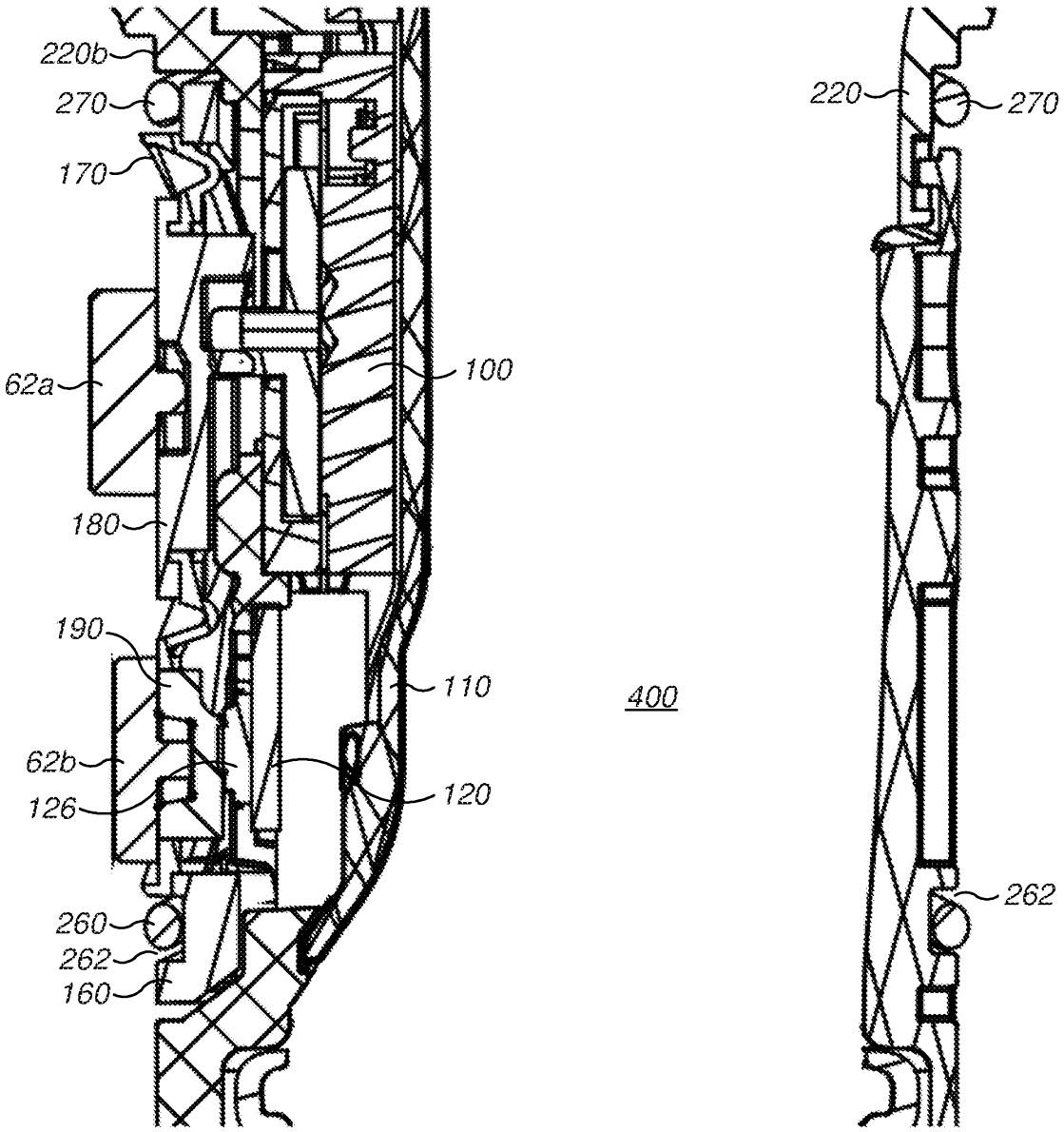
170
62b
260
220
40a
240

FIG. 4b


220b
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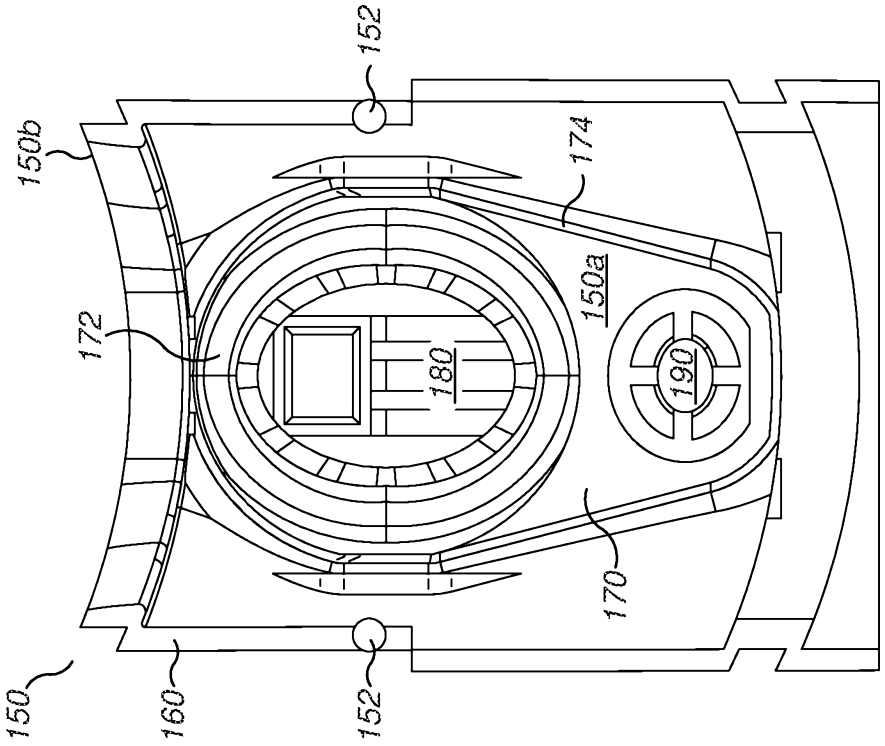
170
62a
100
180
190
110
62b
120
126
260
262
160
400
220
270
262

FIG. 5


150b
152
174
172
150a
180
190
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150
160
152

FIG. 7

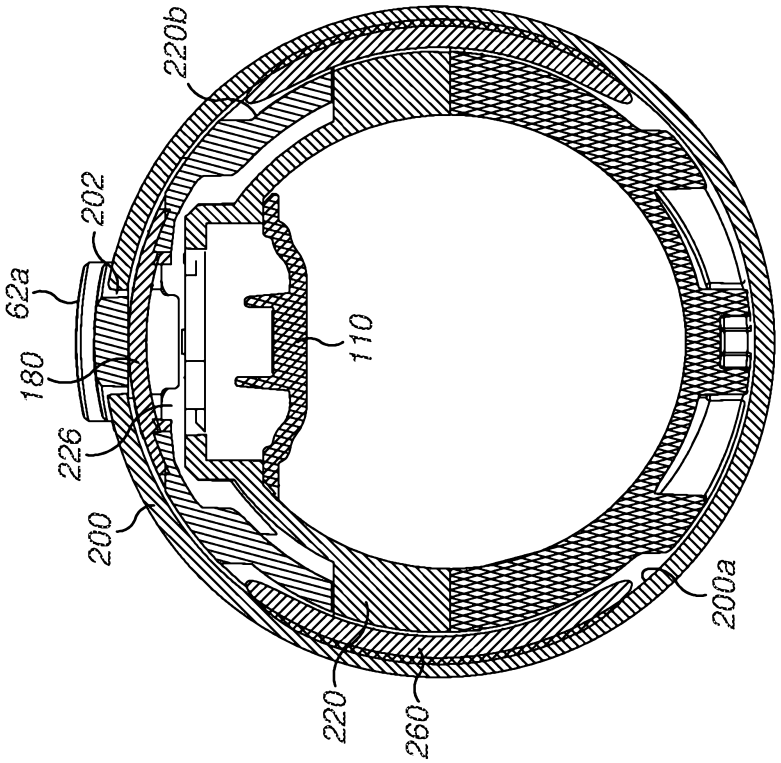
220b
202
62a
180
110
226
200
200a
220
260

FIG. 6