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(71) Applicant: **DYSON TECHNOLOGY LIMITED** [GB/G-B]; Tetbury Hill, Malmesbury Wiltshire SN16 0RP (GB).

(72) Inventor: **SERRA, Eric**; c/o Dyson Technology Limited, Tetbury Hill, Malmesbury Wiltshire SN16 0RP (GB).

(74) Agent: **CAROBENE, Simon** et al.; Intellectual Property Department, Dyson Technology Limited, Tetbury Hill, Malmesbury Wiltshire SN16 0RP (GB).

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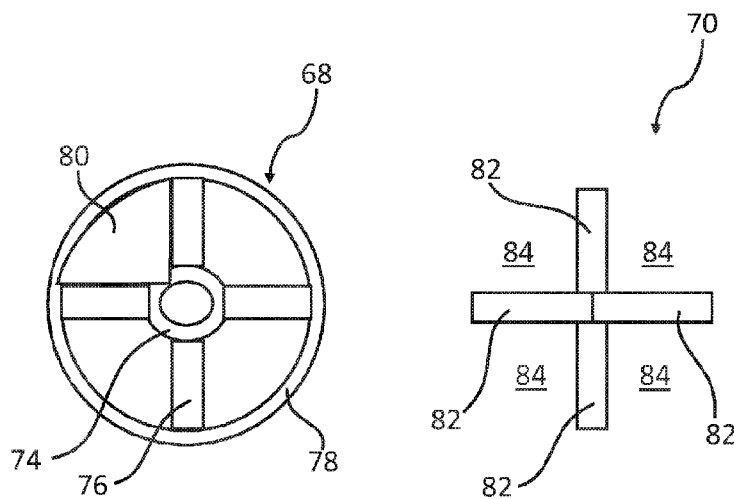


Fig. 5

(57) Abstract: A haircare appliance includes an air inlet, an air outlet, and a channel between the air inlet and the air outlet. The haircare appliance includes an airflow generator for generating an airflow from the air inlet to the air outlet through the channel, and a flow divider configured to divide airflow through the channel into first and second airflow portions. The haircare appliance includes an occlusion located upstream of the air outlet within the channel, the occlusion movable between a first position within the channel, and a second position within the channel different to the first position within the channel. The haircare appliance is configured to cause recombination of the first and second airflow portions downstream of the occlusion.

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A HAIRCARE APPLIANCE

Field of the Invention

- 5 The present invention relates to a haircare appliance.

Background of the Invention

- 10 Haircare appliances are generally used to treat or style hair, and some haircare appliances may treat or style hair using airflow and/or heat. Haircare appliances may be used to treat or style hair in a number of different ways, and some haircare appliances include different attachments to provide different treatment or styling functionality.

15 Summary of the Invention

- According to a first aspect of the present invention there is provided a haircare appliance comprising: an air inlet; an air outlet; a channel between the air inlet and the air outlet; an airflow generator for generating an airflow from the air inlet
20 to the air outlet through the channel; a flow divider configured to divide airflow through the channel into first and second airflow portions; and an occlusion located upstream of the air outlet within the channel, the occlusion movable between a first position within the channel, and a second position within the channel different to the first position within the channel; wherein the haircare
25 appliance is configured to cause recombination of the first and second airflow portions downstream of the occlusion.

- Use of the flow divider alongside the occlusion may provide the first and second airflow portions within the channel with different characteristics, for example with
30 a greater degree of airflow flowing through a first portion of the channel in comparison with a second portion of the channel, whilst recombining the first and

second airflow portions may enable airflow at the air outlet to be directed in a particular direction based on the position of the occlusion. For example, where the first airflow portion is weaker than the second airflow portion the second airflow portion may dictate the direction of airflow from the air outlet. Moving the occlusion within the channel may thereby enable a direction of airflow from the air outlet to be varied without a user altering a position of the haircare appliance relative to hair. Moving the occlusion within the channel may also provide airflow at the air outlet with a varying direction which may aid with separating hair, and decreasing hair drying time where the haircare appliance comprises a heater for heating the airflow through the channel.

A portion of the channel downstream of the occlusion, intermediate the flow divider and the air outlet may be shaped to cause recombination of the first and second airflow portions downstream of the occlusion. Shaping the channel may provide a relatively simply way to recombine the airflow portions downstream of the occlusion.

The portion of the channel may be convergent toward the air outlet. This may cause recombination of the airflow portions and enable the haircare appliance to provide concentrator functionality.

The haircare appliance may comprise a recombination surface downstream of the occlusion within the channel, the recombination surface positioned to cause recombination of the first and second airflow portions downstream of the occlusion. This may provide a relatively simply way to recombine the airflow portions downstream of the occlusion. The recombination surface may be symmetric around a centre point of the channel.

The recombination surface may comprise a substantially convex surface. This may facilitate recombination of the airflow portions. For example, the first and second airflow portions may attach the convex surface, and flow across the

convex surface, before meeting and detaching from the convex surface, via the coanda effect. The convex surface may comprise a coanda surface.

5 The flow divider may be a passive flow divider, for example an unpowered flow divider. This may provide a relatively simple and less expensive flow dividing arrangement than, for example, an arrangement where a powered flow divider is utilised. The flow divider may comprise a rib extending across the channel.

10 The flow divider may be configured to divide airflow into no more than the first and second portions. This may provide an airflow at the air outlet that effectively oscillates in a side-to-side fashion, for example as a result of airflow selectively flowing through the first portion of the channel to a greater degree than through the second portion of the channel, and vice versa.

15 The occlusion may be movable between the first and second positions and a third position within the channel different to the first and second positions, and the flow divider may be configured to divide airflow through the channel into the first and second, and a third, airflow portions. This may provide an airflow at the air outlet that rotates, for example as a result of airflow selectively flowing through first,
20 second or third portion of the channel to a greater degree than through the others of the first, second and third portions of the channel.

The occlusion may be movable between the first, second, and third positions and a fourth position within the channel different to the first, second, and third
25 positions, and the flow divider may be configured to divide airflow through the channel into the first, second, and third, and a fourth, airflow portions. Dividing the airflow into four such portions may be particularly effective at generating a rotating airflow at the air outlet whilst providing a relatively simple flow divider within the channel.

The haircare appliance may comprise first and second air outlets, and first and second conduits extending between the air inlet and the respective first and second air outlets, the flow divider may be configured to divide the airflow from the air inlet into a plurality of portions within each of the conduits, and the occlusion may be movable to selectively inhibit portions of airflow within the first and second conduits. This may enable an oscillating and/or rotating airflow to be provided at each of the first and second air outlets.

The occlusion may be rotatable within the channel. Rotation may provide a simple movement mechanism for the occlusion, and may allow for desirable airflow characteristics to be imparted to airflow, for example with rotation of the occlusion enabling a spinning airflow to be generated at the air outlet.

The occlusion may be rotatable within the channel at a rate of no more than 600rpm, for example no more than 400rpm. Such a speed of rotation may be more effective in providing a rotating airflow at the air outlet than, for example, an arrangement where the occlusion is rotatable at a rate of greater than 400rpm. The occlusion may be rotatable within the channel at a rate of no less than 200rpm, or no less than 150rpm, or no less than 100rpm.

The occlusion may be rotatable about a central axis of the channel. This may enable selective blocking of portions of the channel in a similar manner. The central axis of the channel may comprise a central longitudinal axis of the channel. The channel may be substantially cylindrical in form, and the central axis of the channel may comprise a central longitudinal axis of the cylindrical channel. The channel may be substantially annular in form, and the central axis of the channel may comprise an axis that passes through a centre point about which a periphery of the annular channel extends.

A rate of movement of the occlusion may be selectable by a user of the haircare appliance. This may provide the user with control of movement of the occlusion,

and may provide the user with control to select the rate of movement of the occlusion dependent on a desired drying and/or styling operation the user is to perform.

- 5 The haircare appliance may be operable in a plurality of modes of operation, and a rate of movement of the occlusion is dependent on the mode of operation of the haircare appliance. This may impart a desired characteristic to airflow at the air outlet dependent on a current or future mode of operation of the haircare appliance. For example, a user may select a mode of operation of the haircare
10 appliance, and the occlusion may be moved within the channel in response to such a selection.

Different modes of operation of the haircare appliance may comprise different flow rates of airflow generated by the airflow generator. The haircare appliance
15 may comprise a heater for heating airflow within the channel, and different modes of operation of the haircare appliance may comprise operating the heater at different temperatures.

The haircare appliance may comprise a drive motor configured to drive
20 movement of the occlusion within the channel. Use of a drive motor to drive movement of the occlusion may facilitate greater control of movement than, for example, a passive arrangement where movement of the occlusion is driven by airflow through the channel. For example, use of a drive motor may enable the occlusion to be driven at slower speeds than a passive arrangement where
25 movement of the occlusion is driven by airflow through the channel. This may facilitate provision of airflow at the air outlet with certain desirable characteristics, such as a rotating airflow.

The drive motor may be located at a position removed from the central axis of the
30 channel. This may be beneficial as it may remove the drive motor from airflow within the channel, for example where the channel is generally cylindrical in form.

The drive motor may be located remotely from airflow within the channel, for example save for a drive shaft that is driven by the drive motor. The haircare appliance may comprise a geared wheel to which the occlusion is attached, and the drive motor may be configured to drive motion of the geared wheel.

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The drive motor may automatically drive movement of the occlusion in response to selection of the mode of operation by the user. A controller of the haircare appliance may select a mode of operation of the haircare appliance, for example in response to input from one or more sensors, and the drive motor may automatically drive movement of the occlusion in response to selection of the mode of operation by the controller.

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The occlusion may comprise a cross-sectional area smaller than a cross-sectional area of the channel. This may enable portions of the channel to be covered by the occlusion whilst others are not, to thereby vary characteristics of airflow at the air outlet.

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The occlusion may comprise a cross-sectional area of around 50% smaller than a cross-sectional area of the channel, of around 33% smaller than a cross-sectional area of the channel, or of around 25% smaller than a cross-sectional area of the channel.

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The occlusion may be shaped to cover no more than half of the channel at any time, no more than a third of the channel at any time, or no more than a quarter of the channel at any time.

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The haircare appliance may comprise a sensor to sense an object external to the appliance, and a control module configured to determine a property of the object based on data output by the sensor, wherein movement of the occlusion within the channel is based on the determination of the property of the object. In such a manner the occlusion may be movable in response to the property of the object

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external to the haircare appliance, enabling airflow characteristics at the air outlet to be determined based on the property of the object external to the haircare appliance.

- 5 The property of the object may comprise any of a presence or absence of the object, a type of the object, a distance of the object from the haircare appliance, a temperature of the object, and a moisture content of the object. The sensor may comprise a time-of-flight sensor. The control module may be operable to control the airflow generator in response to the determination of the property of
10 the object.

The haircare appliance may comprise a main unit comprising a barrel section having a central bore, and the sensor may be located within the bore.

- 15 The haircare appliance may comprise a main unit, and an attachment releasably attachable to the main unit, and the attachment may comprise the air outlet, the occlusion, and the flow divider. This may enable the attachment to be retrofitted to existing haircare appliances comprising an airflow generator. The attachment may be configured to cause recombination of the first and second airflow portions
20 downstream of the occlusion.

- According to a second aspect of the present invention there is provided an attachment for a haircare appliance, the attachment comprising: an air inlet for receiving an airflow from a main unit of the haircare appliance; an air outlet; a
25 channel between the air inlet and the air inlet; a flow divider configured to divide airflow through the channel into first and second airflow portions; and an occlusion located upstream of the air outlet within the channel, the occlusion movable between a first position within the channel, and a second position within the channel different to the first position within the channel; and wherein the
30 haircare appliance is configured to cause recombination of the first and second airflow portions downstream of the occlusion.

Optional features of aspects of the present invention may be equally applied to other aspects of the present invention, where appropriate.

5 Brief Description of the Drawings

Figure 1 is a schematic view of a first embodiment of a haircare appliance;

Figure 2 is a schematic sectional view of a main unit of the haircare appliance of
10 Figure 1;

Figure 3 is a schematic rear view of the main unit of Figure 2;

Figure 4 is a schematic cross-sectional view of a first embodiment of an
15 attachment of the haircare appliance of Figure 1;

Figure 5 is a schematic exploded view of components of the attachment of Figure
4;

20 Figure 6 is a schematic illustration of the haircare appliance of Figure 1 when an
attachment is attached to the main unit;

Figure 7 is a schematic cross-sectional view of a second embodiment of an
attachment of the haircare appliance of Figure 1;

25 Figure 8 is a schematic exploded view of components of the attachment of Figure
7;

Figure 9 is a first schematic view of a third embodiment of an attachment of the
30 haircare appliance of Figure 1;

Figure 10 is a second schematic view of the attachment of Figure 9;

Figure 11 is a schematic view of a second embodiment of a haircare appliance;

5 Figure 12 is a schematic view of a third embodiment of a haircare appliance;

Figure 13 is a schematic view of a fourth embodiment of a haircare appliance;

10 Figure 14 is a schematic view of an alternative occlusion for use with the haircare appliance of Figure 13; and

Figure 15 is a schematic view of a fifth embodiment of a haircare appliance.

Detailed Description of the Invention

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A first embodiment of a haircare appliance 10 is illustrated schematically in Figures 1-3. The appliance 10 comprises a main unit 12, and an attachment 14 attachable to the main unit 12.

20 The main unit 12 is shown schematically in isolation in Figures 2 and 3, and comprises a handle portion 18, a head portion 20, an airflow generator 22, a heater 24, user controls 26, a control module 28, a drive motor 30, and a drive shaft 31.

25 The handle portion 18 is generally cylindrical and hollow in form, and houses the airflow generator 22. The handle portion 18 has an air inlet 32 in the form of a plurality of perforations at a first end 34 of the handle portion 18.

30 The head portion 20 is generally cylindrical and hollow in form, and is disposed at a second end 36 of the handle portion 18, with a central axis of the head portion 20 orthogonal to a central axis of the handle portion 18 such that the main unit 12

is generally T-shaped in form. The head portion 20 houses the heater 24, the control module 28, the drive motor 30, and the drive shaft 31. The head portion 20 comprises a bore 38 through which air is entrained, and a flowpath 40 heading towards an air outlet 42. The air outlet 42 is generally annular in form about a periphery of the bore 38. The head portion 20 further comprises an annular magnet (not shown) for releasably connecting the handle unit 12 to the attachment 14. The annular magnet extends annularly about the air outlet 42.

The user controls 26 are provided on both the handle portion 18 and the head portion 20, and comprise a first button 44 or slider to power on and off the appliance 10, a second button 46 to momentarily power off the heater 24 such that the appliance 10 delivers a cold shot of air, a third button 48 to control the flow rate of the airflow, and a fourth button 50 to control the temperature of the airflow.

The control module 28 is responsible for controlling the airflow generator 22, the heater 24, and the drive motor 30, in response to inputs from the user controls 26. For example, in response to inputs from the user controls 26, the control module 28 may power on and off the airflow generator 22 and/or the heater 24. Additionally, the control module 28 may control the power or speed of the airflow generator 22 in order to vary the flow rate of the airflow. For example, repeatedly pressing the third button 48 may cause the control module 28 to cycle through different flow rates (e.g., low, medium and high). Similarly, the control module 28 may control the power of the heater 24 in order to vary the temperature of the airflow. For example, repeatedly pressing the fourth button 50 may cause the control module 28 to cycle through different temperature settings (e.g., cold, warm, hot).

The control module 28 further controls the drive motor 30 in response to inputs from the user controls 26, as will be discussed in more detail hereafter.

The drive motor 30 is located in the head portion, and is capable of driving a load at a rate in the region of 200-600rpm. The drive motor comprises any appropriate motor, whether brushed or brushless, for imparting a rotational force to the drive shaft 31. The drive shaft 31 is coupled to an output of the drive motor 30, and
5 comprises a first shaft portion 52 coupled to a second shaft portion 54 by a linkage 56.

The first shaft portion 52 extends obliquely relative to the walls of the bore 38, towards a central longitudinal axis of the bore 38. The second shaft portion 54
10 extends substantially coaxially with the central longitudinal axis of the bore 38 toward an end 58 of the bore 38. An end of the second shaft portion 54 in the region of the end 58 of the bore 38 has a connection mechanism (not shown) for connecting to the attachment 14. The linkage 56 comprises any appropriate linkage for enabling rotational motion to be transferred from the first shaft portion
15 52 to the second shaft portion 54 in use.

The attachment 14 is illustrated schematically in Figures 4-5.

The attachment 14 comprises a housing 60 defining an air inlet 62 and an air
20 outlet 64, a channel 66, an occlusion 68, a flow divider 70, and a recombination surface 72.

The housing 60 is generally frustoconical in form, and tapered toward the air outlet 64. The attachment 14 may thus be considered a concentrator attachment.
25 The air inlet 62 is substantially annular in form, and is positioned on the attachment 14 such that when the attachment 14 is attached to the main unit 12, the air inlet 62 of the attachment overlies and is in fluid communication with the air outlet 42 of the main unit 12. The air outlet 64 is substantially circular in cross-sectional shape, and is located at an opposite end of the housing 60 to the air
30 inlet 62.

The channel 66 is located internally of the housing 60, and extends between the air inlet 62 and the air outlet 64. The occlusion 68 is located within the channel 66 downstream of the air inlet 62. The occlusion 68 comprises a connection portion 74, four arms 76, an annular outer portion 78, and a blocking member 80.

5

The connection portion 74 is annular in form and is shaped and dimensioned to engage with the connection mechanism of the second shaft portion 54. The connection portion 74 is substantially concentric with a central longitudinal axis of the channel 66. The four arms 76 are spaced evenly about a circumference of the connection portion 74, and extend radially between the connection portion 74 and the annular outer portion 78. The blocking member 80 is substantially solid in form, and fills the space between two of the four arms 76, the connection portion 74, and the annular outer portion 78.

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The flow divider 70 is located within the channel 66 downstream of the occlusion 68. The flow divider 70 comprises four ribs 82 that are evenly spaced about the channel 66, and divide the channel 66 into sub-channels 84. The spacing between ribs 82 corresponds substantially to a circumferential extent of the blocking member 80.

20

The recombination surface 72 is located downstream of the flow divider 70, and is located partly in the channel 66 and partly in the air outlet 64. The recombination surface 72 comprises the outer surface of a spherical ball that is disposed substantially centrally within the channel 66.

25

In use, the attachment 14 is attached to the main unit 12, as shown schematically in Figure 6. A user can use the user controls 26 to set flow and/or heat settings, for example modes of operation, of the haircare appliance 10, and the control module 28 controls the airflow generator 22, heater 24, and the drive motor 30 accordingly. It will be appreciated that although not described in relation the user controls 26 of the first embodiment of the haircare appliance 10, other

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embodiments may have a specific user control for the drive motor as part of the user controls 26.

In response to operation of the airflow generator 22, air is drawn through the air inlet 32, along the handle portion 18 toward the head portion 20. Air flows through the flowpath 42, over the heater 24, and towards the air outlet 42. Air leaves the main unit 12 through the air outlet 42, and enters the attachment 14 via the air inlet 62. Air flows through the channel 66 from the air inlet 62 toward the air outlet 64.

At the same time, the drive motor 30 imparts a rotational force or torque to the drive shaft 31, which causes rotation of the drive shaft 31. Rotation of the drive shaft 31 rotates the occlusion 68 within the channel 66, and in particular rotates the blocking member 80 within the channel 66. As a result, the blocking member selectively and sequentially blocks regions of the channel 66, in either a clockwise or an anticlockwise manner depending on the direction of rotation, such that airflow is stronger in certain parts of the channel 66.

The flow divider 70 splits airflow downstream of the occlusion 68 into flows within the sub-channels 84. As a result of the rotation of the blocking member 80, airflow within each of the sub-channels 84 varies, or has a variable strength, over time. The recombination surface 72 effectively acts as a coanda surface, with airflow from the sub-channels 84 attaching to the recombination surface 72. Airflows from the sub-channels 84 flowing over the recombination surface 72 collide and recombine in the region of the air outlet 64.

Given that airflow through the sub-channels 84 has different strengths at any given time, the recombined airflow is directed in a particular direction from the air outlet 64. As the occlusion 68, and hence the blocking member 80, are rotatably driven within the channel 66 by the drive motor 30, the relative strength of airflows within the sub-channels 84 varies with rotation of the blocking member 80. This

means that airflow at the air outlet 64 of the attachment 14 is directed in different directions with rotation of the occlusion 68. In effect, this creates a spinning or rotating airflow at the air outlet 64.

- 5 This may facilitate drying and/or styling of hair, for example with a rotating airflow increasing hair separation, thereby decreasing hair dry time. Use of the drive motor 30 to drive movement of the occlusion 68 may facilitate greater control of movement than, for example, a passive arrangement where movement of the occlusion 68 is driven by airflow through the channel 66. For example, use of a
- 10 drive motor 30 may enable the occlusion 68 to be driven at slower speeds than a passive arrangement where movement of the occlusion 68 is driven by airflow through the channel 66. This may facilitate provision of airflow at the air outlet 64 with certain desirable characteristics, such as a rotating airflow.
- 15 An alternative embodiment of an attachment 100 for use with the main unit 12 of the first embodiment 10 of the haircare appliance is illustrated schematically in Figures 7 to 8.

The attachment 100 comprises a housing 102 defining an air inlet 104 and an air

20 outlet 106, a channel 108, an occlusion 110, a flow divider 112, and a recombination surface 114.

The housing 102 is tapered toward the air outlet 106. The attachment 100 may thus be considered a concentrator attachment. The air inlet 104 is substantially

25 annular in form, and is positioned on the attachment 100 such that when the attachment 100 is attached to the main unit 12, the air inlet 104 of the attachment overlies and is in fluid communication with the air outlet 42 of the main unit 12. The air outlet 106 is substantially oval in cross-sectional shape, and is located at an opposite end of the housing 102 to the air inlet 104.

The channel 108 is located internally of the housing 102, and extends between the air inlet 104 and the air outlet 106. The occlusion 110 is located within the channel 108 downstream of the air inlet 104. The occlusion 110 comprises a connection portion 116, two arms 118, an annular outer portion 120, and a blocking member 122.

The connection portion 116 is annular in form and is shaped and dimensioned to engage with the connection mechanism of the second shaft portion 54. The connection portion 116 is substantially concentric with a central longitudinal axis of the channel 66. The two arms 118 are spaced evenly about a circumference of the connection portion 116, and extend radially between the connection portion 116 and the annular outer portion 120. The blocking member 122 is substantially solid in form, and fills the space between the two arms 118, the connection portion 116, and the annular outer portion 118, on one side of the channel 108.

The flow divider 112 is located within the channel 108 downstream of the occlusion 110. The flow divider 112 comprises two ribs 124 that are evenly spaced about the channel 108, and divide the channel 108 into two sub-channels 126. The spacing between ribs 124 corresponds substantially to a circumferential extent of the blocking member 122.

The recombination surface 114 is located downstream of the flow divider 112, and is located partly in the channel 108 and partly in the air outlet 106. The recombination surface 114 comprises the outer surface of a tubular member that is disposed substantially centrally within the channel 108.

Similar to the embodiment of the attachment 14 described in relation to the first embodiment of the haircare appliance 10 above, the alternative embodiment of attachment 100 of Figures 7 to 8 receives airflow from the main unit 12 in use. The drive motor 30 drives movement of the occlusion 110 within the channel 108, and the flow divider 112 splits airflow downstream of the occlusion into the two

sub-channels 126. The recombination surface 114 recombines airflow from the two sub-channels 126 at the air outlet 106, and, as a result of the rotation of the occlusion 110, airflow is directed in a different direction depending on relative strength of airflow through the two sub-channels 126.

5

Here, however, as there are only two sub-channels 126, instead of a spinning or rotating airflow being generated at the air outlet 106, the airflow instead oscillates between first and second sides of the tubular member that defines the recombination surface 114. Such an oscillating airflow may provide for increased hair separation, which may lead to reduced hair dry times.

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A further alternative embodiment of an attachment 150 for use with the main unit 12 of the first embodiment 10 of the haircare appliance is illustrated schematically in Figures 9 and 10.

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The attachment 150 comprises an inlet portion 152, a movable occlusion 154, a flow divider 156, first 158 and second 160 conduits, first 162 and second 164 outlet portions, and first 166 and second 168 recombination surfaces.

20 The inlet portion 152 is generally tubular in form, and at least partially defines a channel 170. The movable occlusion 154 comprises first 172 and second 174 opposing triangular blocking members, and is located within the channel 170. The movable occlusion 154 is driven in a manner similar to that previously described above.

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The flow divider 156 is located within the channel 170 downstream of the movable occlusion 154, and comprises eight evenly spaced ribs. Each rib of the flow divider 156 also extends within one of the respective first 158 and second 160 conduits toward the first 162 and second 164 outlet portions. Here four ribs of the flow divider 156 are located in each of the first 158 and second 160 conduits.

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The ribs twist along the lengths of the first 158 and second 160 conduits to form four sub-channels within the first 158 and second 160 conduits.

The first 158 and second 160 conduits are hollow in form, and extend between the inlet portion 152 and the respective first 162 and second 164 outlet portions. The first 162 and second 164 outlet portions have the form of spherical caps, and are hollow. The first 166 and second 168 recombination surfaces are defined by spherical members located within the respective first 162 and second 164 outlet portions.

Similar to the embodiment of the attachment 14 described in relation to the first embodiment of the haircare appliance 10 above, the alternative embodiment of attachment 150 of Figures 9 and 10 receives airflow from the main unit 12 in use. The drive motor 30 drives movement of the occlusion 154 within the channel 170, and the flow divider 156 splits airflow downstream of the occlusion 154 into the sub-channels. The first 166 and second 168 recombination surfaces recombines airflow from the sub-channels within the first 158 and second 160 conduits at the first 162 and second 164 outlet portions, and, as a result of the rotation of the occlusion 154, airflow is directed in a different direction depending on relative strength of airflow through the subchannels.

In view of the number of sub-channels, a spinning or rotating airflow is generated at each outlet portion 162, 164. Such a spinning airflow may provide for increased hair separation, which may lead to reduced hair dry times.

A second embodiment of a haircare appliance 200 is illustrated schematically in Figure 11, where like reference numerals are used for sake of clarity.

The haircare appliance 200 comprises a main unit 202, and an attachment 204.

The main unit 202 is substantially the same as the main unit 12 of the first embodiment 10 of the haircare appliance described above, save for the form and location of the driveshaft 206. Here the driveshaft 206 extends within a housing of the head portion 20, in a direction parallel to, but spaced apart from, the bore 38. The driveshaft 206 is a single portion driveshaft coupled to an output of the drive motor 30, with a gear 208 located on an end of the driveshaft 206.

The attachment 204 is substantially the same as the attachment 14 of the first embodiment 10 of the haircare appliance described above, save for the form of the occlusion 210. The occlusion 210 comprises an annular toothed ring 212, and a blocking member 214 fixedly attached to the annular toothed ring 212.

In use, the driveshaft 206 drives motion of the annular toothed ring 212 within the channel 66, which in turn results in rotation of the blocking member 214. Such an offset drive mechanism may remove the driveshaft from a central location of the channel 66.

A third embodiment of a haircare appliance 400 is illustrated schematically in Figure 13, where like reference numerals are used for sake of clarity.

The haircare appliance 400 comprises a main unit 402, and an attachment 404.

The main unit 402 and the attachment 404 are substantially the same as the main unit 12 and attachment 14 of the first embodiment 10 of the haircare appliance described above, save that the drive motor 406 and the driveshaft 408 are located within the attachment 404. This may enable the attachment to be retrofitted to existing main units, whilst still providing the functionality previously discussed herein. The drive motor 406 can be powered either through electrical attachment to the main unit 402, or via a self-contained power supply within the attachment 404 itself.

A fourth embodiment of a haircare appliance 500 is illustrated schematically in Figure 14, where like reference numerals are used for sake of clarity.

The haircare appliance 500 comprises a main unit 502, and an attachment 504.

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The main unit 502 and the attachment 504 are substantially the same as the main unit 12 and attachment 14 of the first embodiment 10 of the haircare appliance described above, save that there is no drive motor and driveshaft, and the occlusion 506 is instead driven by airflow through the haircare appliance 500.

10 Here it will be appreciated that the flow divider 70 and recombination surface may find utility irrespective of whether the occlusion is actively or passively driven to rotate. The occlusion 506 comprises an impeller-like blade 508 which, when driven by airflow, causes rotation of the occlusion 506, and also acts as a blocking member. In some embodiments, a governor may be used alongside the impeller-like blade 508 to provide a frictional counter-force to slow down rotation of the
15 occlusion 506 to a desired degree. As the occlusion 506, the flow divider 70, and the recombination surface 72 are all located within the attachment 504, the attachment 504 may be retrofit to existing main units of haircare appliances.

20 An alternative occlusion 510 for use with the fifth embodiment of the haircare appliance 500 is illustrated schematically in Figure 15. The occlusion 510 comprises an upstream portion 512, and a downstream portion 514. The upstream portion 512 comprises a first annular toothed ring 516 and an impeller blade 518. The downstream portion 514 comprises a second annular toothed
25 ring 520 and a blocking member 522 fixed to the second annular toothed ring 520. The upstream portion 512 and the downstream portion 514 are linked by appropriate reduction gears (not shown) and a shaft 524. In such a manner, the upstream portion 512 may be driven by airflow, whilst the downstream portion 514, and hence the blocking member 522, is driven at a lower rate of rotation.
30 This may enable the occlusion 510 to contribute to creation of spinning or rotating airflow at the air outlet 46 of the attachment 504.

A fifth embodiment of a haircare appliance 600 is illustrated schematically in Figure 16, where like reference numerals are used for sake of clarity.

- 5 The haircare appliance 600 comprises a main unit 602, a drive motor 604, an occlusion 606, a flow divider 608, and an air outlet 610.

The drive motor 604 and the occlusion 606 are located within a handle portion 612 of the main unit 602, whilst the flow divider 608 is located within a head
10 portion 614 of the main unit 602. The flow divider 608 comprises upper 616 and lower 618 ribs located within the head portion 614 that divide the head portion into left and right flowpaths. The shape of the head portion 614 is convergent at the air outlet 610, such that airflow from the left and right flowpaths recombines downstream of the air outlet 610 in use. The occlusion 606 can selectively block
15 one of the left and right flowpaths, which may provide an oscillating left-to-right and right-to-left airflow in use.

In each of the embodiments described above, rotation of an occlusion within a channel of a haircare appliance, alongside use of a flow divider and
20 recombination of airflows downstream of the flow divider, may be utilised to provide airflow in a desired direction, and to provide airflow having desired oscillating or rotating characteristics.

Whilst particular examples and embodiments have thus far been described, it
25 should be understood that these are illustrative only and that various modifications may be made without departing from the scope of the invention as defined by the claims.

Claims

1. A haircare appliance comprising:

an air inlet;

5 an air outlet;

a channel between the air inlet and the air outlet;

an airflow generator for generating an airflow from the air inlet to the air outlet through the channel;

a flow divider configured to divide airflow through the channel into

10 first and second airflow portions; and

an occlusion located upstream of the air outlet within the channel, the occlusion movable between a first position within the channel, and a second position within the channel different to the first position within the channel;

15 wherein the haircare appliance is configured to cause recombination of the first and second airflow portions downstream of the occlusion.

2. A haircare appliance as claimed in Claim 1, wherein a portion of the channel downstream of the occlusion, intermediate the flow divider and the air outlet, is shaped to cause recombination of the first and second airflow portions downstream of the occlusion.

20

3. A haircare appliance as claimed in Claim 2, wherein the portion of the channel is convergent toward the air outlet.

25

4. A haircare appliance as claimed in any preceding claim, wherein the haircare appliance comprises a recombination surface downstream of the occlusion within the channel, the recombination surface positioned to cause recombination of the first and second airflow portions downstream of the occlusion.

30

5. A haircare appliance as claimed in Claim 4, wherein the recombination surface comprises a substantially convex surface.

6. A haircare appliance as claimed in any preceding claim wherein the flow divider is a passive flow divider.

7. A haircare appliance as claimed in any preceding claim, wherein the flow divider is configured to divide airflow into no more than the first and second portions.

8. A haircare appliance as claimed in any preceding claim, wherein the occlusion is movable between the first and second positions and a third position within the channel different to the first and second positions, and the flow divider is configured to divide airflow through the channel into the first and second, and a third, airflow portions.

9. A haircare appliance as claimed in any preceding claim, wherein the occlusion is rotatable within the channel.

10. A haircare appliance as claimed in Claim 9, wherein the occlusion is rotatable within the channel at a rate of no more than 600rpm.

11. A haircare appliance as claimed in Claim 9 or Claim 10, wherein the occlusion is rotatable about a central axis of the channel.

12. A haircare appliance as claimed in any of Claims 9 to 11, wherein a rate of movement of the occlusion is selectable by a user of the haircare appliance.

13. A haircare appliance as claimed in any of Claims 9 to 12, wherein the haircare appliance is operable in a plurality of modes of operation, and a rate of

movement of the occlusion is dependent on the mode of operation of the haircare appliance.

14. A haircare appliance as claimed in any preceding claim, wherein the haircare appliance comprises a drive motor configured to drive movement of the occlusion within the channel.

15. A haircare appliance as claimed in Claim 14, wherein the drive motor is located at a position removed from the central axis of the channel.

16. A haircare appliance as claimed in any preceding claim, wherein the occlusion comprises a cross-sectional area smaller than a cross-sectional area of the channel.

17. A haircare appliance as claimed in any preceding claim, wherein the haircare appliance comprises a sensor to sense an object external to the appliance, and a control module configured to determine a property of the object based on data output by the sensor, wherein movement of the occlusion within the channel is based on the determination of the property of the object.

18. A haircare appliance as claimed in any preceding claim, wherein the haircare appliance comprises a main unit, and an attachment releasably attachable to the main unit, the attachment comprises the air outlet, the occlusion, and the flow divider.

19. An attachment for a haircare appliance, the attachment comprising:
an air inlet for receiving an airflow from a main unit of the haircare appliance;
an air outlet;
a channel between the air inlet and the air inlet;

a flow divider configured to divide airflow through the channel into first and second airflow portions; and

an occlusion located upstream of the air outlet within the channel, the occlusion movable between a first position within the channel, and a second
5 position within the channel different to the first position within the channel; and

wherein the haircare appliance is configured to cause recombination of the first and second airflow portions downstream of the occlusion.

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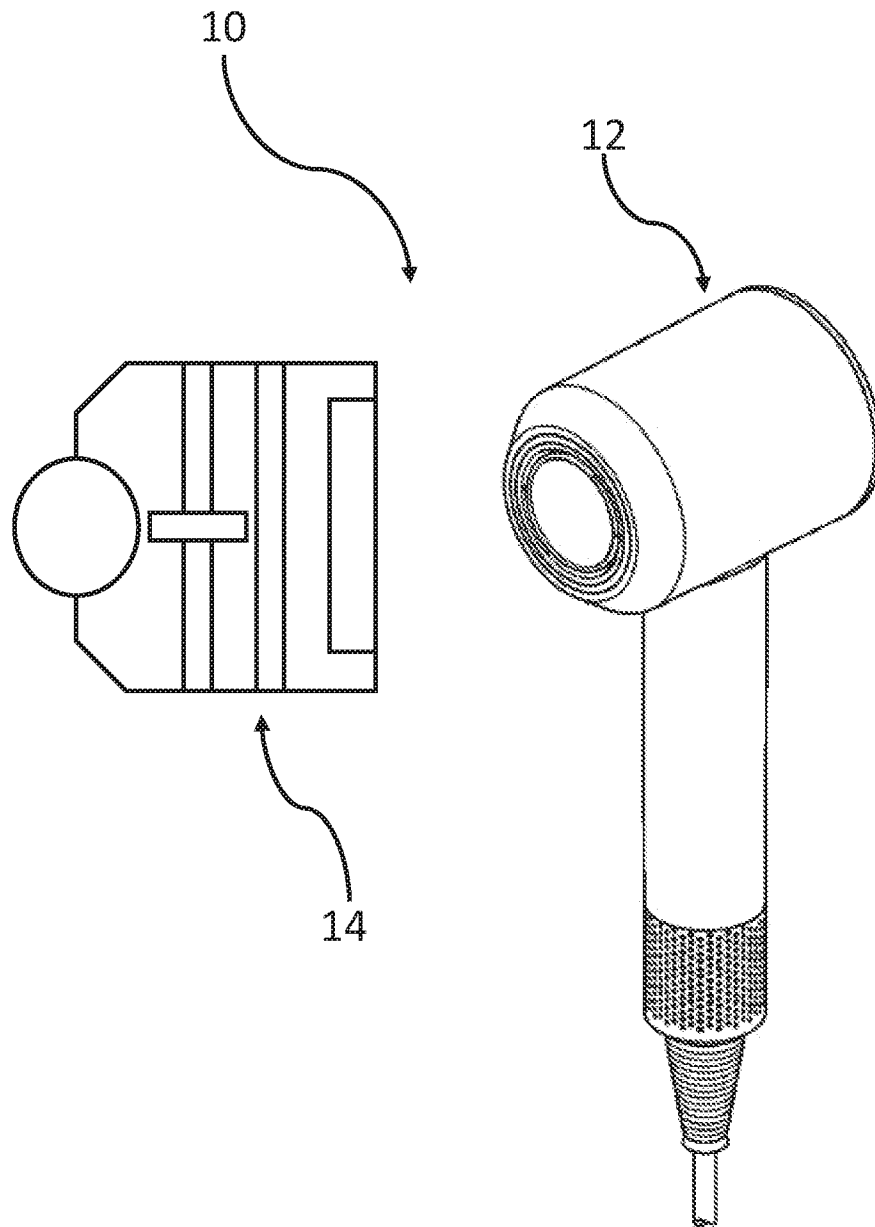


Fig. 1

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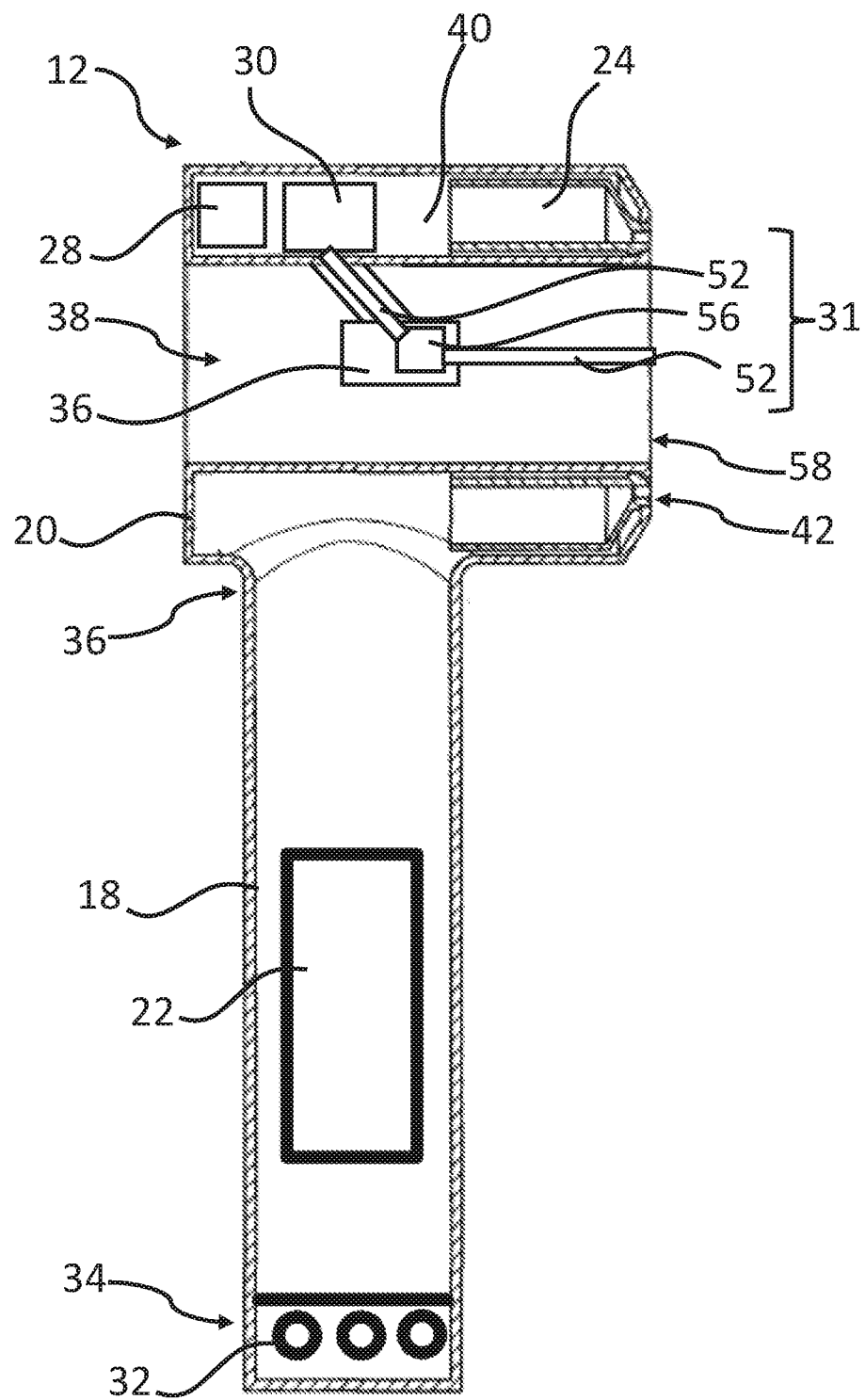


Fig. 2

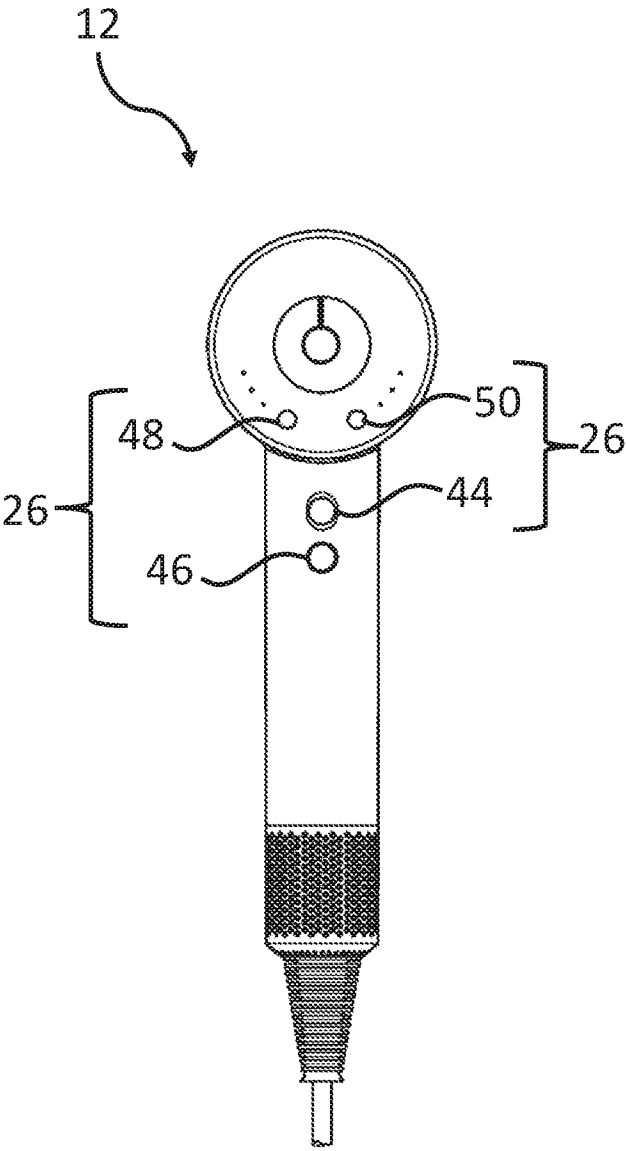


Fig. 3

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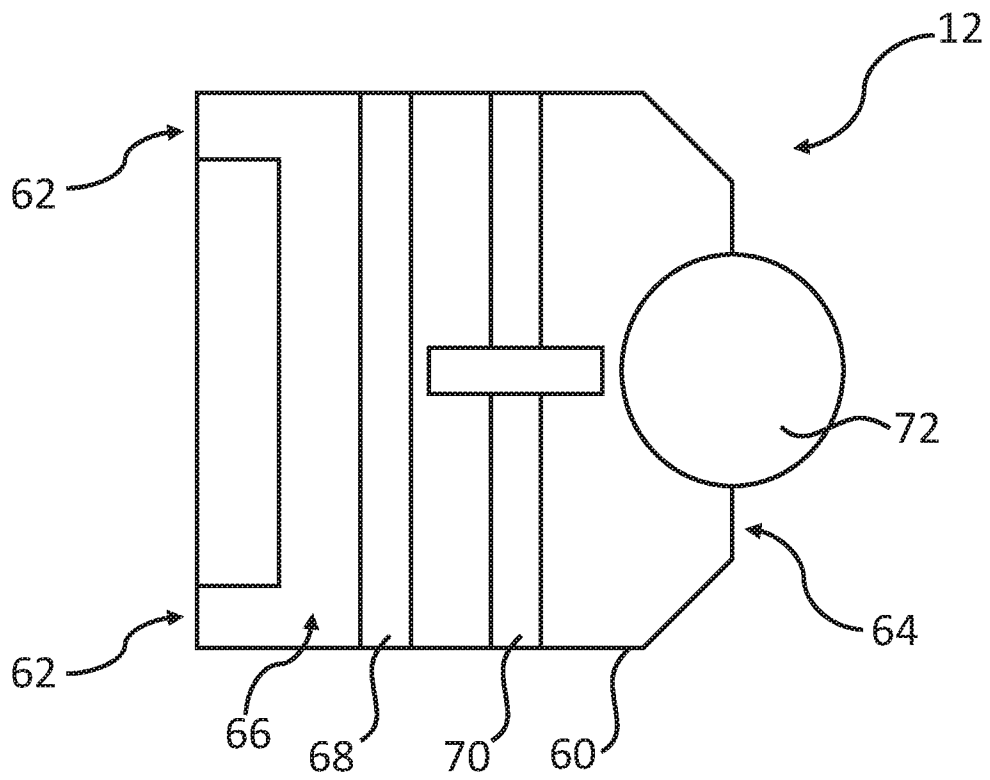


Fig. 4

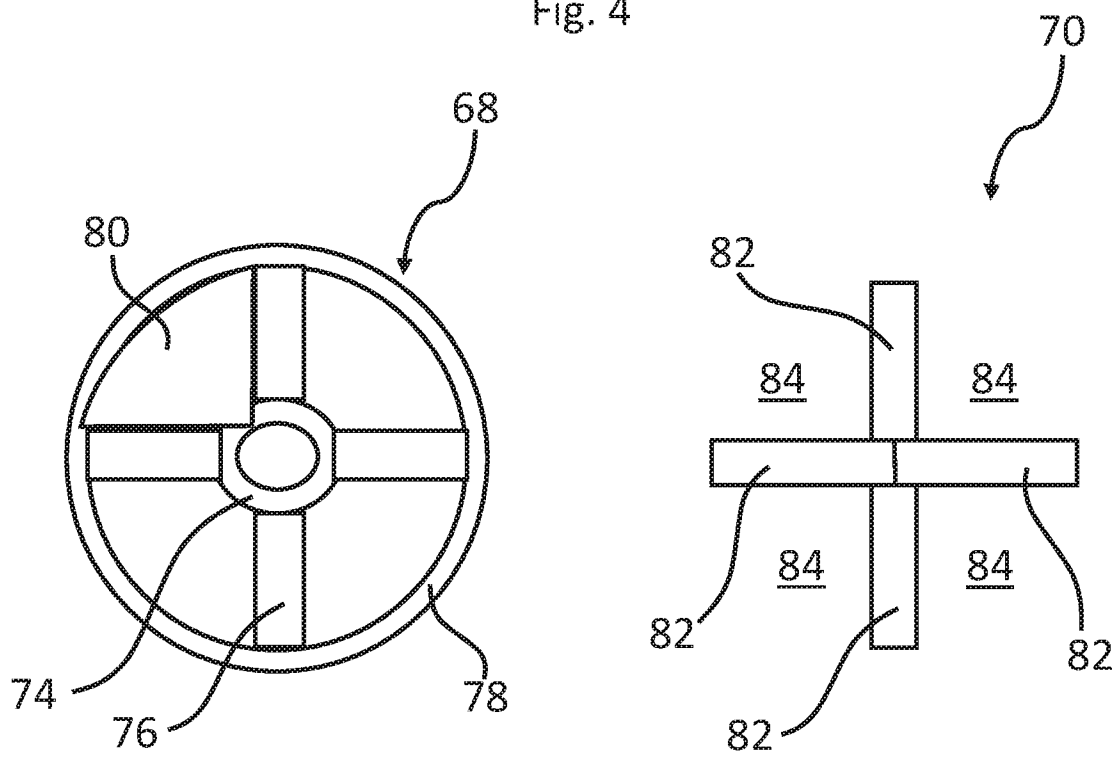


Fig. 5

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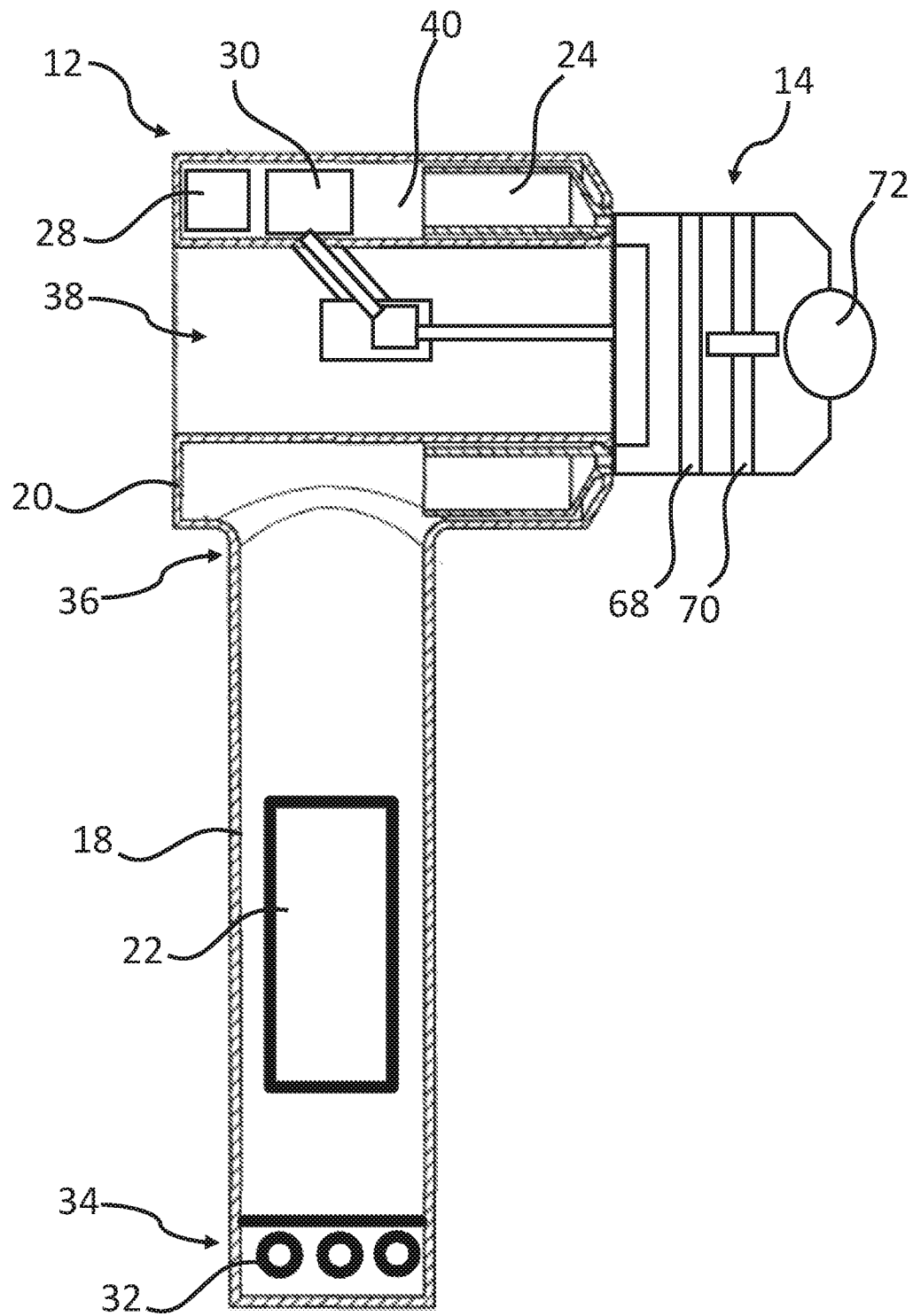


Fig. 6

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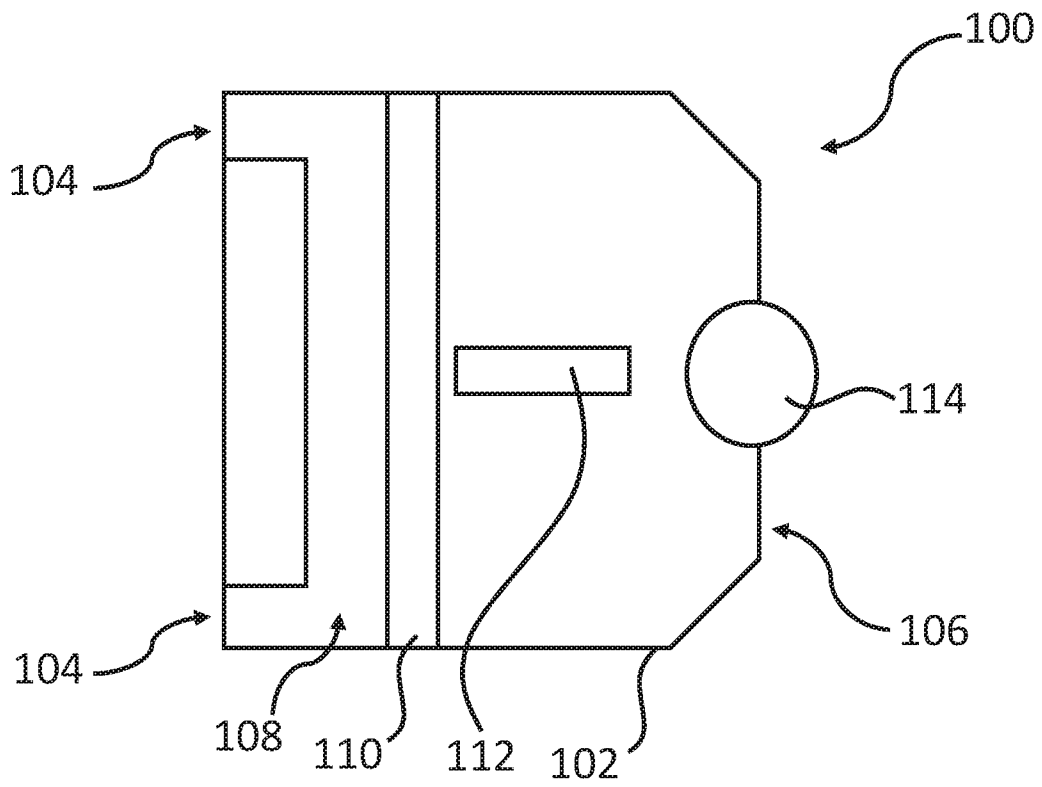


Fig. 7

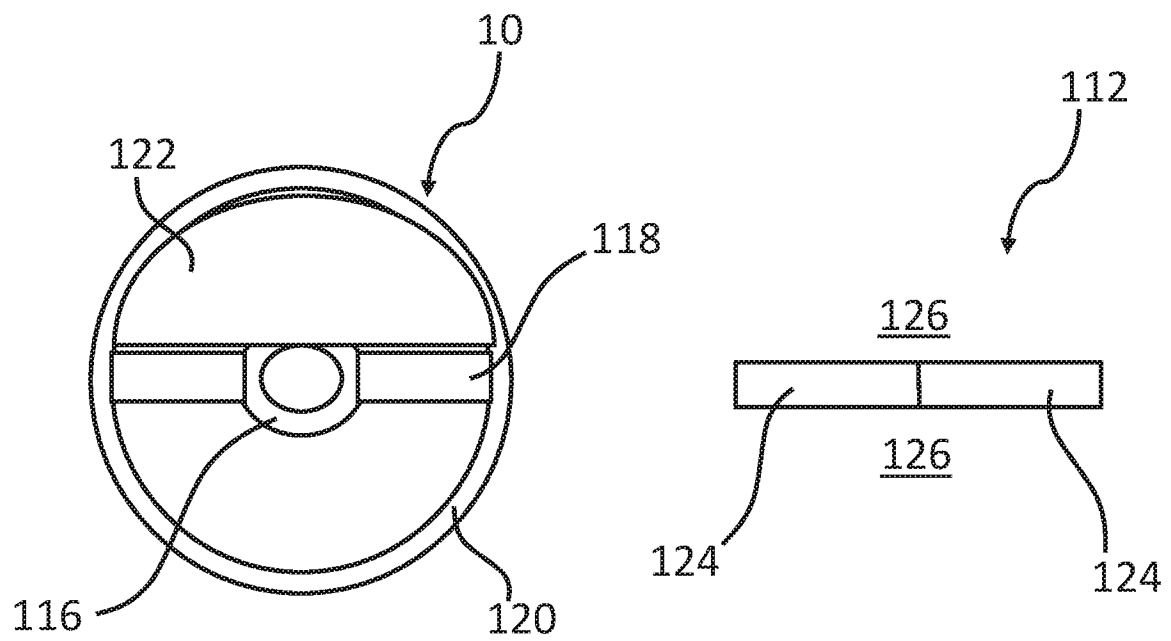


Fig. 8

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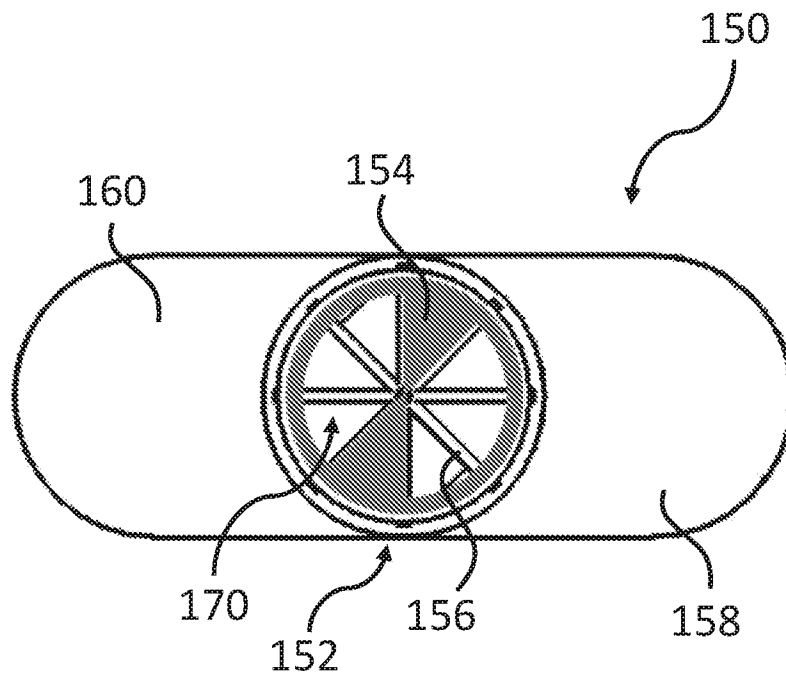


Fig.9

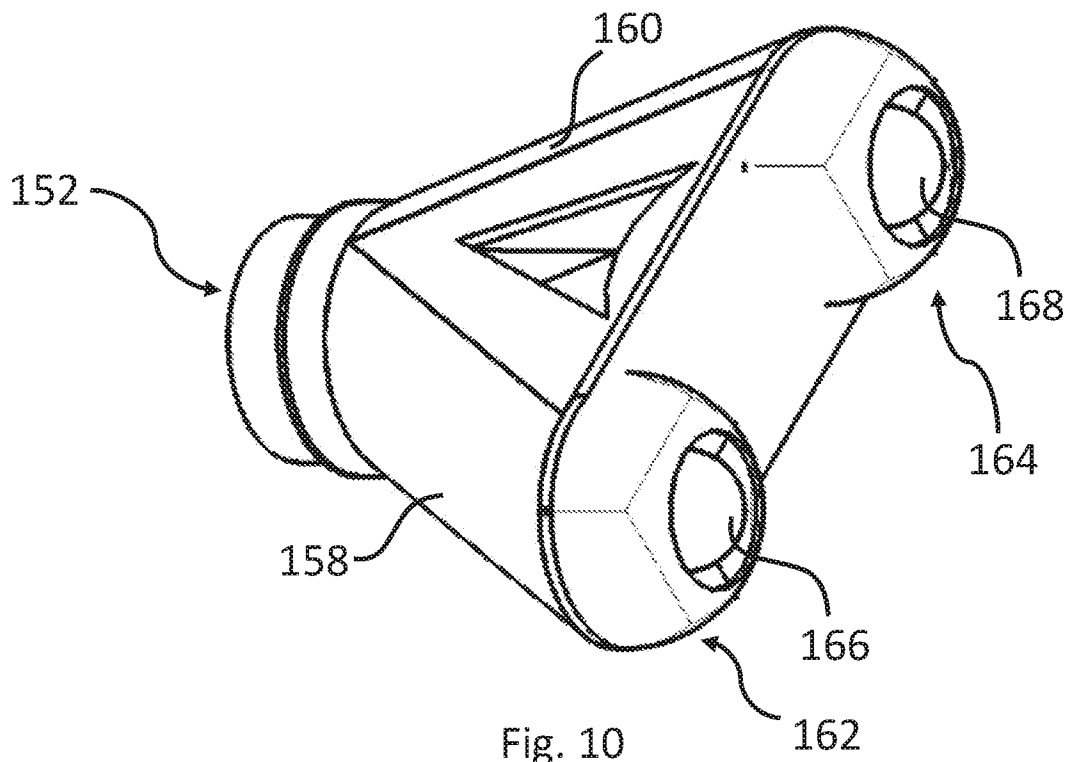


Fig. 10

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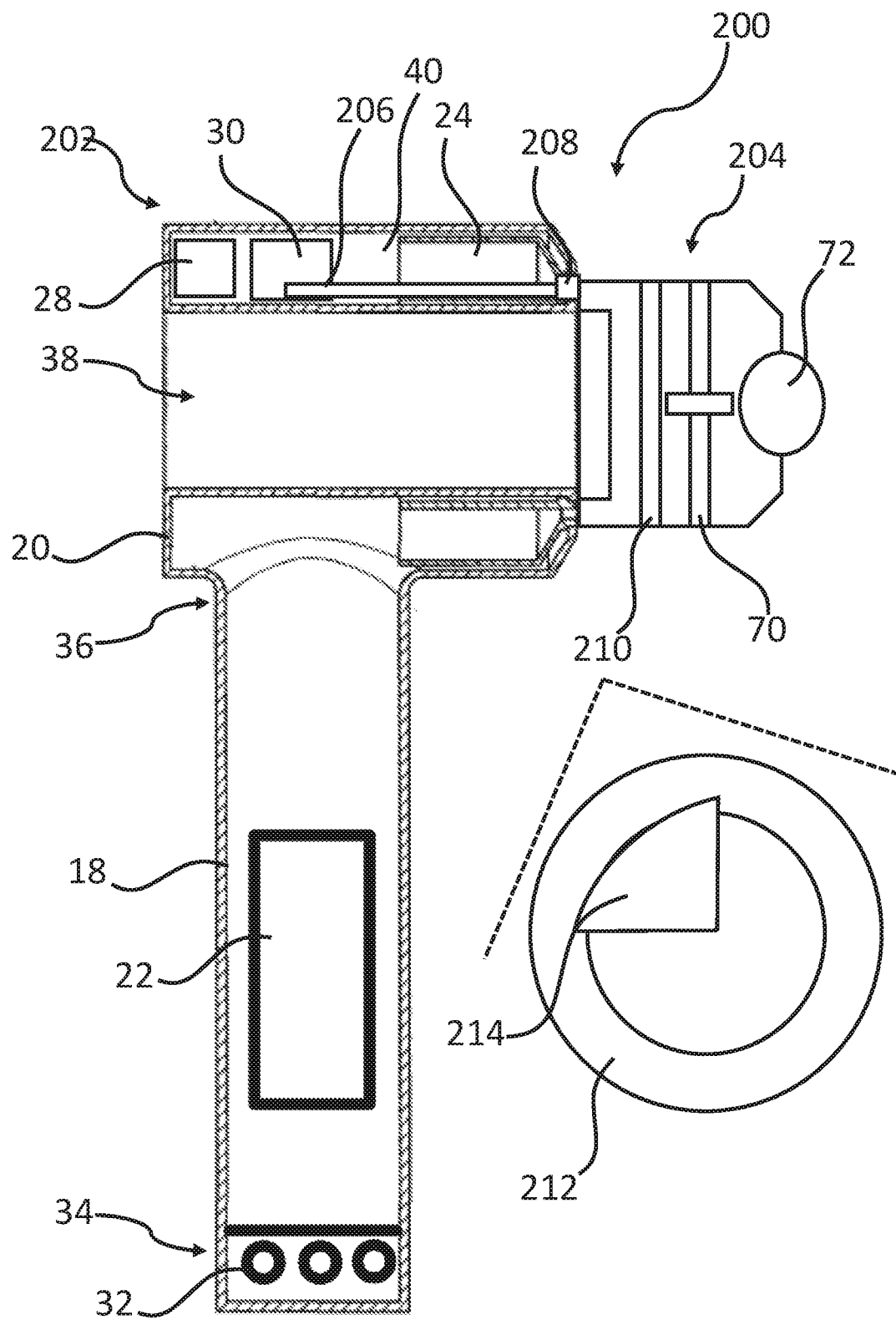


Fig. 11

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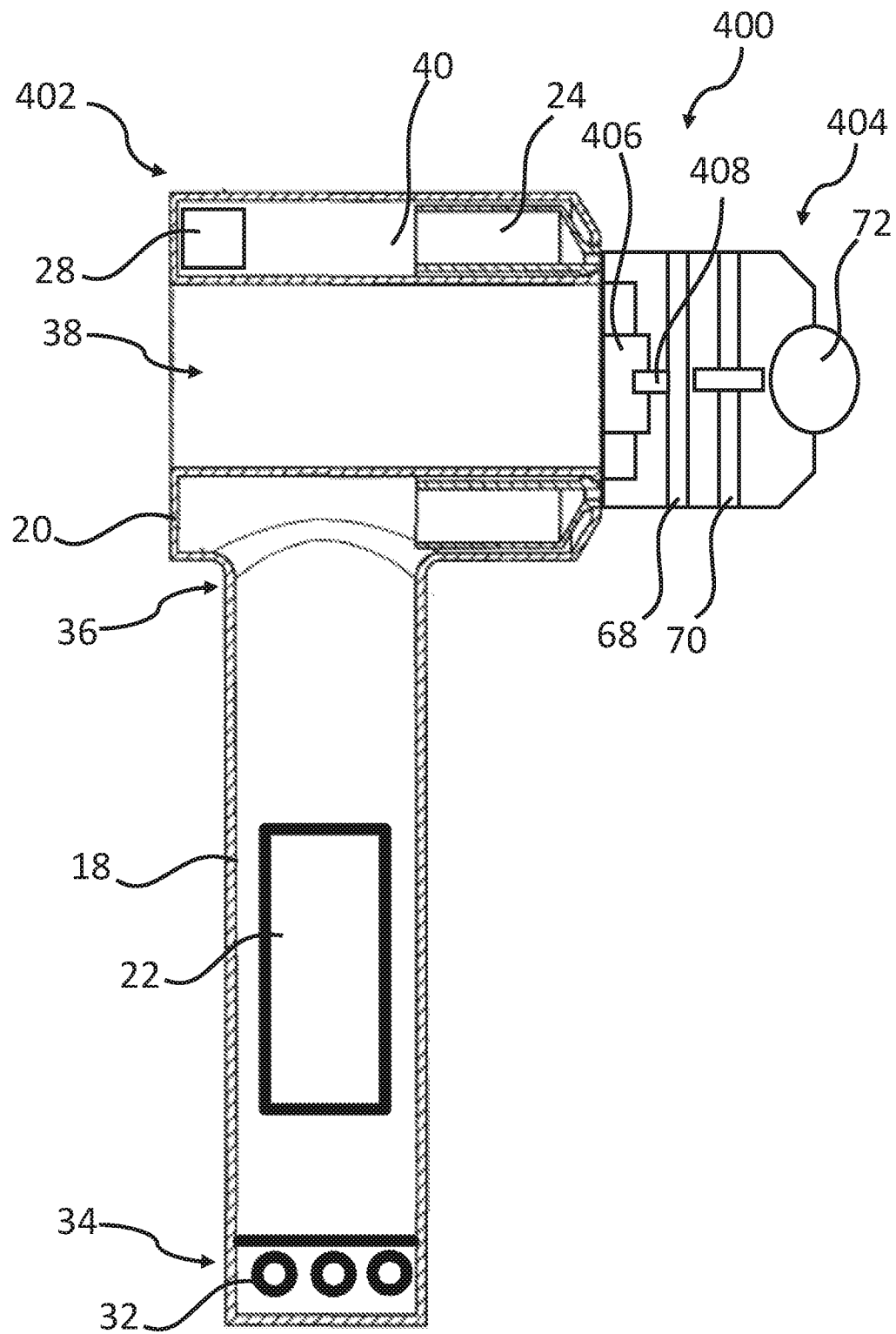


Fig. 12

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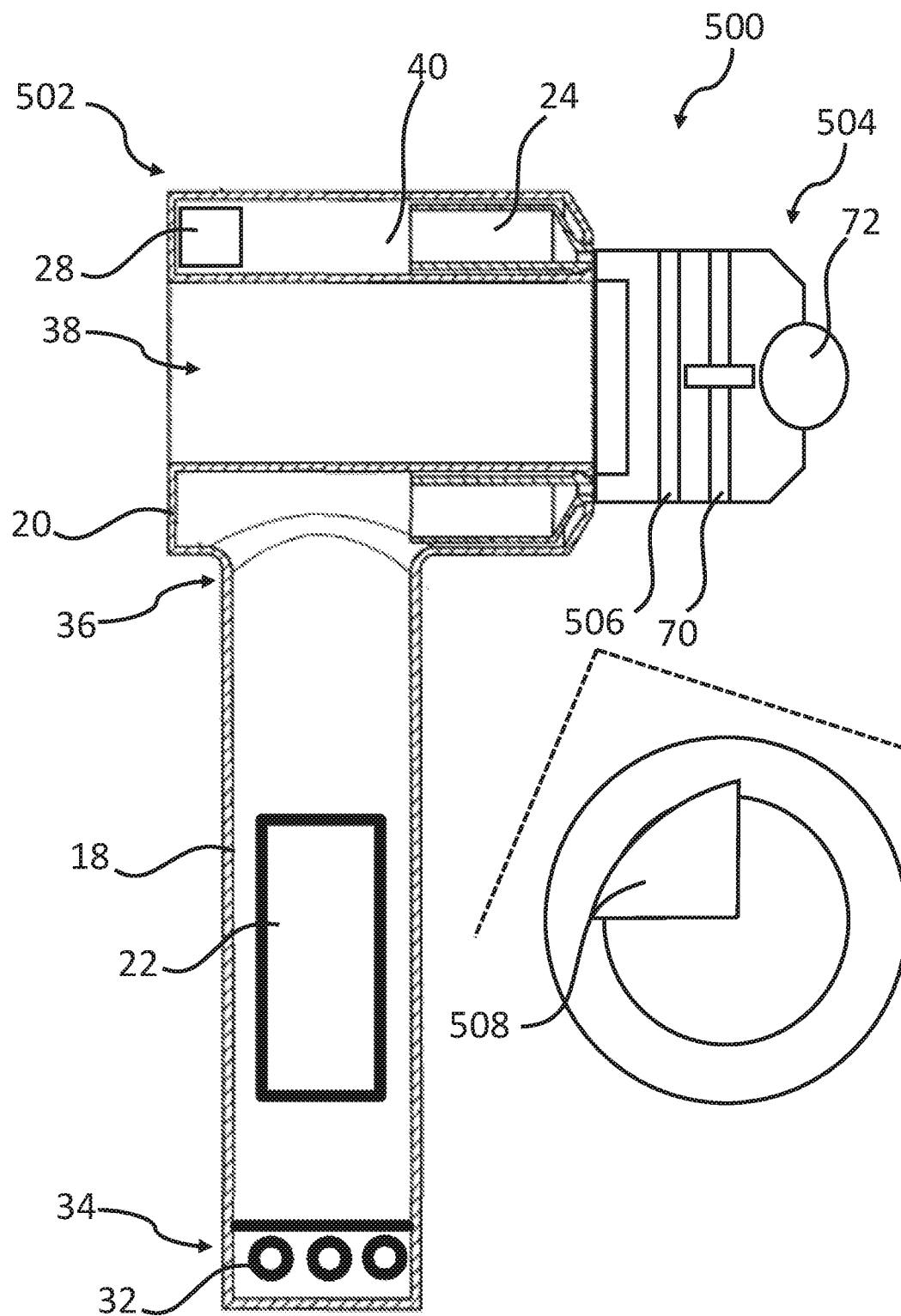


Fig. 13

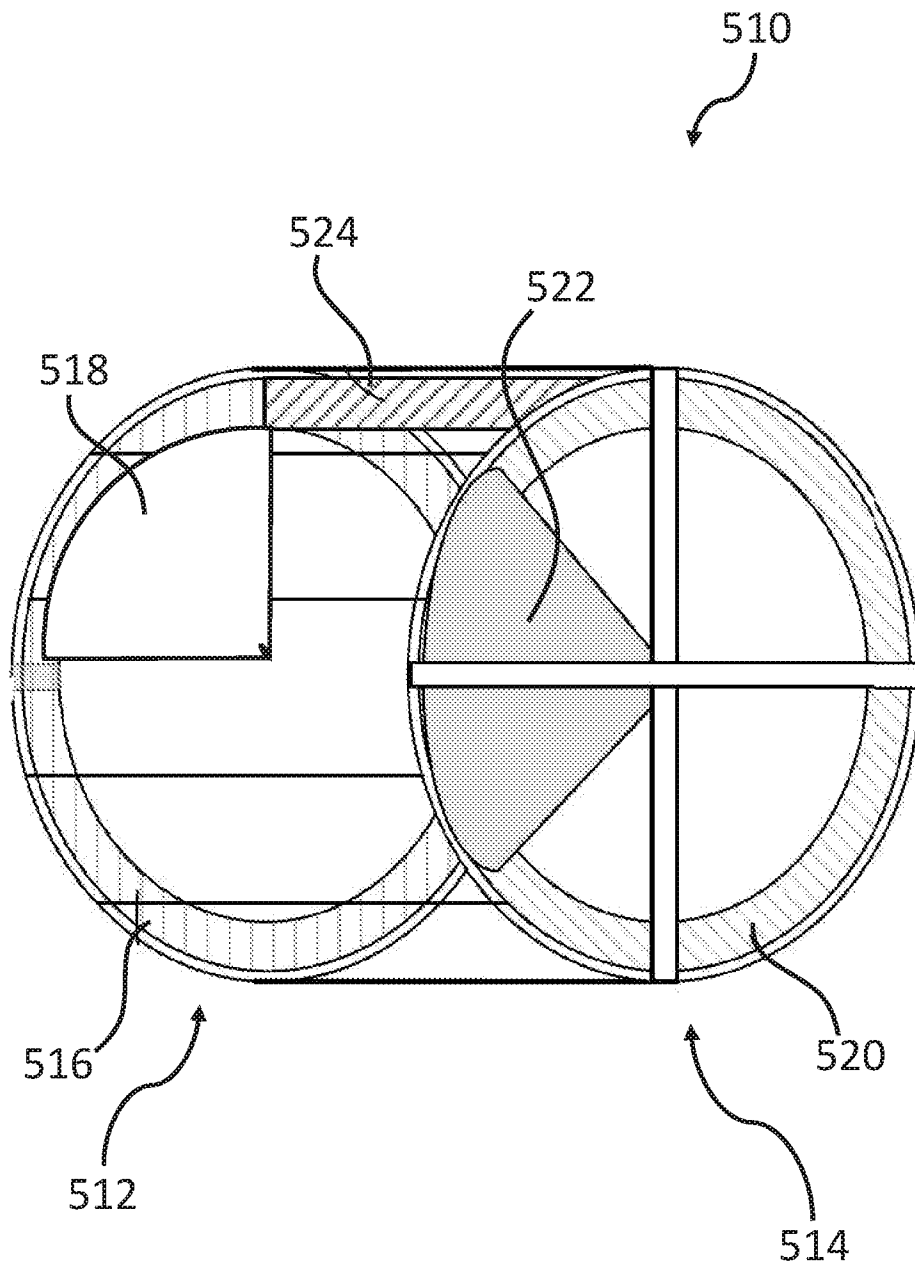


Fig. 14

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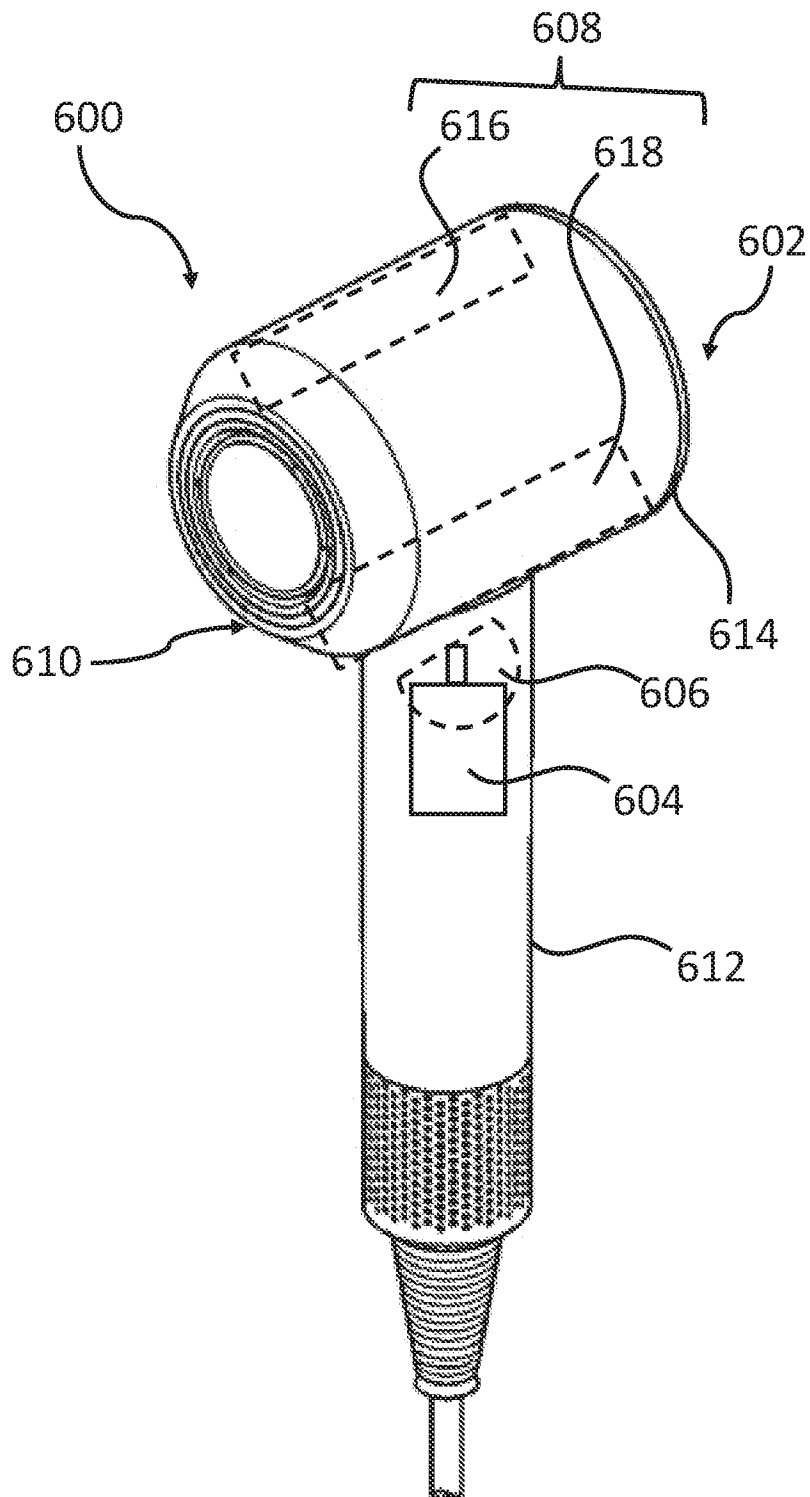


Fig. 15

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2023/057908

A. CLASSIFICATION OF SUBJECT MATTER

INV. A45D20/10 A45D20/12

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A45D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 132 360 A (LEE JR LAWRENCE J) 2 January 1979 (1979-01-02)	1, 4, 6-13, 16, 18, 19
A	column 2, line 15 - column 3, line 14; figures	2, 3, 5, 14, 15, 17
A	US 5 161 317 A (MCDUGALL GREGORY J [HK]) 10 November 1992 (1992-11-10) column 1, line 47 - line 57; figures	10
A	KR 101 494 686 B1 (UNKNOWN) 23 February 2015 (2015-02-23) figures	1
A	CH 680 978 A5 (SPEMOT AG) 31 December 1992 (1992-12-31) figures	1



Further documents are listed in the continuation of Box C.



See patent family annex.

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

9 November 2023

Date of mailing of the international search report

22/11/2023

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2

NL - 2280 HV Rijswijk

Tel. (+31-70) 340-2040,

Fax: (+31-70) 340-3016

Authorized officer

van de Beek-Duijker

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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