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(72) Inventors:
• **THOMPSON, Daniel**
Malmesbury, Wiltshire SN16 0RP (GB)
• **COULTON, Robert**
Malmesbury, Wiltshire SN16 0RP (GB)
• **COURTNEY, Stephen**
Malmesbury, Wiltshire SN16 0RP (GB)
• **HEFFER, Jonathan**
Malmesbury, Wiltshire SN16 0RP (GB)

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(71) Applicant: **Dyson Technology Limited**
Malmesbury, Wiltshire SN16 0RP (GB)

(74) Representative: **Mackisack, Anna Elizabeth et al**
Dyson Technology Limited
Intellectual Property Department
Tetbury Hill
Malmesbury, Wiltshire SN16 0RP (GB)

(54) **ATTACHMENT FOR A HANDHELD APPLIANCE**

(57) An attachment including an air inlet for receiving airflow from a hair styling apparatus, an air outlet, a duct for conveying air from the air inlet to the air outlet, wherein the air inlet is located at one end of the duct, and the air

outlet extends along the length of the duct and the cross-sectional area of the duct decreases in size from the air inlet along the length of the air outlet.

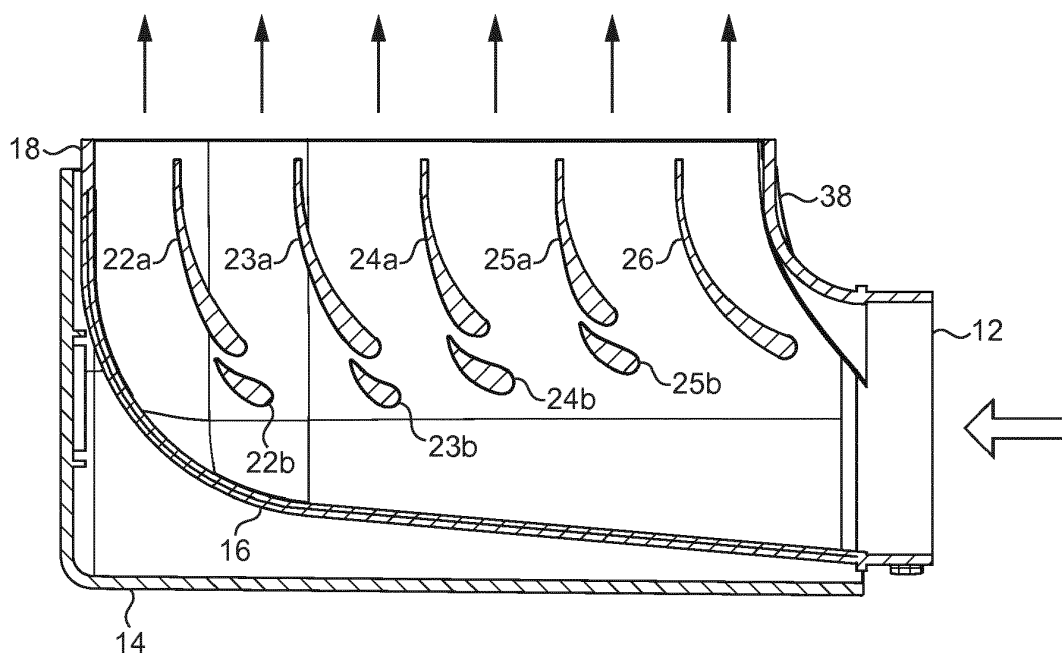


FIG. 6

Description

FIELD OF THE INVENTION

[0001] The present invention relates to an attachment for a handheld appliance, in particular a hair care appliance such as a hot air styling device or hair dryer.

BACKGROUND OF THE INVENTION

[0002] In a conventional hot air styling device, air is drawn into an inlet by a fan unit and directed towards the hair by an attachment or head. Depending on the style desired, the airflow may or may not be heated. Removable attachments are attached to the airflow outlet end of the hot air styling device or hairdryer, and serve to modify the velocity and form of the airflow emitted from the hot air styling device before it is incident upon the hair of the user.

[0003] A concentrator is a known attachment which focuses and flattens the emitted airflow. Another known attachment is a diffuser which reduces the velocity of the emitted airflow. Heated airflow through an attachment may cause an outer surface of the attachment to become uncomfortably hot to touch. It is desirable to mitigate excessive heat on the outer surface whilst not impeding the drying and styling function of the attachment.

SUMMARY OF THE INVENTION

[0004] In a first aspect, the present invention provides an attachment for a hair styling apparatus, the attachment comprising an air inlet for receiving airflow from a hair styling apparatus; an air outlet; a duct for conveying air from the air inlet to the air outlet; wherein the air inlet is located at one end of the duct, and the air outlet extends along the length of the duct; and the cross-sectional area of the duct decreases in size from the air inlet along the length of the air outlet. Advantage is found in such gradual reduction of the cross-sectional area of the duct towards the distal end of the attachment, because this creates a greater consistency of pressure throughout the duct. Advantageously, the attachment functions as a rough drying tool and the emitted airflow is uniform in temperature and velocity across the width and length of the air outlet.

[0005] A cool wall preferably surrounds the duct between the air inlet and the air outlet. Advantage the cool wall minimizes the surface touch temperature of the attachment in use.

[0006] A spacing is preferably maintained between the duct and the cool wall. Preferably, the spacing between the air outlet of the duct and a top opening of the coolwall is substantially constant. The spacing preferably has a dimension which is in the range of 1.5 to 5.5mm.

[0007] Preferably, the attachment comprises at least one rib extending between the duct and the cool wall. Such ribs are provided on the external surface of the duct and function to maintain a substantially constant spacing

between the duct and the coolwall.

[0008] It is preferred that the air inlet is circular and the air outlet is a generally elongate rectangle shape. Preferably, the air outlet of the duct protrudes beyond the end of the cool wall. The attachment preferably comprises a contoured duct wall extending between the air inlet and the air outlet.

[0009] In a second aspect, the present invention provides an attachment for a hair styling apparatus comprising a duct having an air inlet for receiving an airflow from a hair styling apparatus; and at least one vane located within the duct for directing the airflow towards an air outlet; and the air outlet is elongate in shape and orientated generally parallel to the direction of airflow at the air inlet.

[0010] Advantage is found in utilizing one or more vanes within the duct in order to direct the inlet airflow smoothly towards the air outlet. The at least one vane is preferably connected to the duct. Preferably, the at least one vane is connected to a wall of the duct. The airflow exiting the attachment is straight, even flow with an outlet airflow velocity lower than the inlet airflow velocity.

[0011] It is preferred that the at least one vane has an aerofoil-shaped cross-section.

[0012] In one preferred embodiment, the at least one vane is an unbroken vane.

[0013] In a further preferred embodiment, the at least one vane is a split vane having a minor section and a major section. Preferably, the major section is positioned generally perpendicular to the air outlet. The minor section is preferably positioned between the major section and the air inlet. Advantage is found in utilizing a split vane within the duct in order to ensure enhanced attachment of incident airflow to the vanes and minimized turbulence.

[0014] In a further preferred embodiment, the attachment comprises two or more vanes. Preferably, a first vane is in closest proximity to the air inlet and the first vane is an unbroken vane. Furthermore, the embodiment preferably comprises at least one split vane and at least one unbroken vane.

[0015] In another embodiment, the attachment preferably comprises five vanes fixed within the duct.

[0016] It is preferred that each vane extends across the duct from a first duct wall to a second duct wall, and preferably the first duct wall and the second duct wall are at opposing sides of the elongate air outlet. Advantageously, the vanes function to guide the inlet airflow through approximately 90 degrees to the airflow outlet. The vanes may also be referred to a "baffles".

[0017] Advantageously, the attachment minimizes turbulent airflow within the attachment and consequently the audible volume of the hot air styling device with attachment is minimized in use.

[0018] Features described above in connection with the first aspect of the invention are equally applicable to the second aspect of the invention, and vice versa.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] Preferred features of the present invention will now be described by way of example only with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of an attachment;

Figure 2 is an exploded view of the attachment;

Figure 3 is a side view of the attachment;

Figure 4 is an end view of the attachment;

Figure 5 is a top view of the attachment;

Figure 6 is a cross-sectional view taken along line A-A in Figure 5;

Figure 7 is a cross-sectional view taken along line B-B in Figure 5;

Figure 8 is a cross-sectional view taken along line C-C in Figure 5;

Figure 9 is a side view of an example of a hot air styling device to which the attachment may be connected.

DETAILED DESCRIPTION OF THE INVENTION

[0020] Figures 1, 3, 4 and 5 are external views of an attachment 10. The attachment 10 comprises an air inlet 12 for receiving an airflow from an air outlet end of a hot air styling device or similar apparatus. The air inlet 12 is generally circular in shape, to enable an air-tight connection with a generally annular air outlet end of the hot air styling device.

[0021] The air inlet 12 is in fluid communication with a duct 16. The duct 16 has an air outlet 18, which in this example is elongate in shape. A external surface of the attachment 10 is in the form of a cool wall 14 extending partially about the duct 16. The air outlet 18 extends beyond a top opening 20 of the cool wall 14.

[0022] Figure 2 illustrates the three components of the attachment, and the internal features thereof.

[0023] A first component 21 defines a first half of the duct 16 and has a plurality of vanes 22, 23, 24, 25, 26 integrally moulded. A second component 28 defines a second half of the duct 16 and has the air inlet 12 integrally moulded. The first component 21 and the second component 28 are joined together to form the duct 16. During assembly, these components may be joined together in a snap-fit connection or by gluing or welding. A third component 29 is cool wall 14 which, during assembly, is then slid over the duct 16. Several structural ribs 30 are positioned on the outer surface of the duct 16. These ribs 30 function to maintain a substantially con-

stant spacing between the inner surface of the cool wall 14 and the outer surface of the duct 16. The ribs 30 are fused to the inner surface of the cool wall 14 by, for example, ultrasonic welding. Such a fused structure also functions to add rigidity to the cool wall 14. Also illustrated in Figure 2, is an assembly clip 32 which aids positioning of the cool wall 14 in relation to the duct 16 during assembly of the components.

[0024] A preferred embodiment of the attachment 10 illustrated in Figure 2 has a series of four split vanes 22, 23, 24, 25 and one unbroken vane 26 positioned within the duct 16. The major section 22a, 23a, 24a, 25a of each split vane is positioned in proximity to the air outlet 18 and the minor section 22b, 23b, 24b, 25b of each split vane is positioned towards a rounded wall of the duct 16. The unbroken vane 26 is located closest to the air inlet 12.

[0025] In Figure 3, regularly spaced protrusions 34 on the annular air inlet 12 enable a click-fit connection to an air outlet end of a hot air styling device. Alternative connection options will be apparent to the skilled person, such as screw-fit or push-fit arrangements.

[0026] An end face 36 of the cool wall 14, as shown in Figure 4, has contour edges within the general profile of the end face 36, as indicated by finer lines in the figure.

[0027] With particular reference to Figure 5, the air outlet 18 of the duct 16 is in the form of a slot with a squared form at the upstream end and a rounded form at the downstream end. The elongate top opening 20 of the cool wall 14 has a larger area than the air outlet 18 and a spacing 27 of a constant distance is maintained between the air outlet 18 and the top opening 20, along the longitudinal dimension of the attachment 10. In a preferred embodiment, the dimensions of the air outlet 18 are 80mm in length and 4mm in width and the width of the spacing 27 between the air outlet 18 and top opening 20 may be 1.5mm - 5.5mm. It is also shown in Figure 5 that the vanes 22, 23, 24, 25, 26 within the duct 16 are visible when the attachment 10 is assembled. The vanes 22, 23, 24, 25, 26 are positioned approximately 5mm from the edge of air outlet 18 in order to avoid splitting of the airflow.

[0028] Figure 6 is a cross-sectional view which shows a gradually reducing height of the duct 16 towards a distal end of the attachment 10. Consequently, and with reference to Figure 2, the cross-sectional area of the duct 16 decreases, or tapers, gradually towards the distal end of the attachment 10. The cross-sectional area of the cool wall 14 does not vary in size along its length towards the distal end of the attachment 10, and so the spacing 27 between the duct 16 and the cool wall 14 gradually increases in cross-sectional area towards the distal end of the attachment 10. At the upstream end of the duct 16, a contoured wall 38 extends between the air inlet 12 and air outlet 18.

[0029] A preferred embodiment illustrated in Figure 6 shows an attachment 10 comprising five vanes 22, 23, 24, 25, 26. The unbroken vane 26 in closest proximity to the airflow inlet end of the duct 16 and has an aerofoil

form. The orientation of the unbroken vane 26 is aligned closely to the natural airflow direction, and a downstream end terminates normal to the air outlet 18.

[0030] The four further vanes 22, 23, 24, 25 are split vanes, each comprising a major section 22a, 23a, 24a, 25a and a minor section 22b, 23b, 24b, 25b. Each vane 22, 23, 24, 25 has slightly differing dimensions and proportions. In a preferred embodiment illustrated in Figure 6, there is a distance of approximately 1.5mm between the major section 22a, 23a, 24a, 25a and the minor section 22b, 23b, 24b, 25b of each split vane 22, 23, 24, 25. A longitudinal axis of each minor section 22b, 23b, 24b, 25b is approximately 10°-15° to the inlet airflow direction and the rounded aerofoil end of each minor section 22b, 23b, 24b, 25b has a diameter of approximately 3mm. A downstream end of the major section 22a, 23a, 24a, 25a of each split vane 22, 23, 24, 25 is a narrow tail which terminates normal to, and in close proximity to, the air outlet 18. The downstream ends of the major section 22a, 23a, 24a, 25a of each split vane 22, 23, 24, 25 are positioned at approximately regular intervals of 14mm-15mm.

[0031] In use, the attachment 10 is attached to the airflow outlet end of a hot air hair styling device. The airflow passes through the air inlet 12 of the attachment to enter the duct 16. The airflow is guided by the vanes 22, 23, 24, 25, 26 towards the air outlet 18 where the airflow is emitted from the attachment 10.

[0032] At the upstream end of the duct 16, the contoured wall 38 functions to direct the airflow towards the air outlet 18 with a minimum of turbulence and low velocity flow. The airflow velocity of the airflow proximal to the airflow inlet 12 is adequate to ensure a required level of attachment of the airflow to the unbroken vane 26. Split vanes 22, 23, 24, 25 function to improve attachment of the airflow to the vane as the incident airflow velocity is reduced. The airflow exiting the attachment 10 is straight, even flow with an outlet airflow velocity lower than the inlet airflow velocity. Furthermore, the outlet airflow has a relatively slow velocity decay and leaves the duct 16 uniformly at right-angles to the direction of the incident airflow into the attachment 10. In an exemplary embodiment, the velocity of the airflow exiting the duct 16 is around 30m/s-35m/s.

[0033] The cross-sectional area of the duct 16 tapers gradually towards the distal end of the attachment 10. The function of this reduction in cross-sectional area is to ensure a constant pressure of airflow exiting the attachment along the entire length of the air outlet 18 and to prevent turbulent flow. Specifically, the reduction in cross-sectional area is proportional to falling mass flow rate of the airflow within the duct 16. The mass flow falls as airflow exits the duct 16 via the air outlet 18 from the upstream end of the attachment 10 to the downstream end of the attachment 10. Consequently, the reduction in cross-sectional area of the duct 16 results in a constant outlet airflow velocity along the length of the air outlet 18. It is also observed that attachment of airflow to vanes 22,

23, 24, 25, 26 is improved as a consequence of the reduction in cross-sectional area of the duct 16.

[0034] The inlet airflow may be heated before entering the attachment 10 and consequently the duct 16 may become hot during use. The cool wall 14 functions to minimize the temperature of the outermost surface of the attachment 10, as the air-filled spacing 27 insulates the cool wall 14 from the duct 16.

[0035] Alternative embodiments of the attachment may comprise different arrangements of vanes. For example, more than five vanes or fewer than five vanes may be used, and unbroken vanes and split vanes may be present in any combination. In a preferred alternative embodiment, a first vane at the airflow inlet end of the duct is a split vane and four further downstream vanes are unbroken. In a further preferred alternative embodiment, all vanes are unbroken.

[0036] Advantageously, turbulent airflow is minimized within the attachment and consequently the audible volume of the hot air styling device with attachment is minimized in use.

[0037] Figure 7 is a cross-sectional view taken along line B-B of Figure 5 which is approximately at the distal end of the attachment 10. The cross-sectional area of the duct 16 is at a minimum in Figure 7. Figure 8 is a cross-sectional view taken along line C-C in Figure 5 which is approximately at the upstream end of the attachment 10. The cross-sectional area of the duct 16 is at a maximum in Figure 8. With reference also to Figure 6, the cross-sectional area of the duct tapers gradually between the minimum cross-section at the distal end and the maximum cross-section at the upstream end. It is also apparent in Figures 7 and 8, that the cross-sectional dimensions of the cool wall 14 are constant between the upstream end and the distal end of the attachment. Several vanes 22, 23, 24, 25, 26 are also visible in this view and it is apparent that each vane extends transversely from side to side of the duct 16 forming an airtight join with the sides of the duct 16.

[0038] The attachment 10 may be fabricated from any suitable heat resistant material, and in a preferred embodiment, is fabricated from glass-filled nylon. The highest preferred operating temperature of such an attachment 10 connected to a hot air styling device is approximately 130 degrees centigrade.

[0039] In an alternative embodiment, it may be desirable to produce a reduced exit airflow velocity from an attachment 10 whilst utilizing a similar hot air styling device to provide the input airflow. This may be achieved by increasing the overall dimensions of the attachment 10. For example, each of the overall length, height and width of the attachment may be 10mm greater, and the width of the air outlet may be increased to 8mm.

[0040] Figure 9 shows an example of a hot air styling device 38 to which the attachment 10 may be connected. The hot air styling device 38 comprises a generally tubular handle 40 having an air inlet 42 and an air outlet 44 at opposing ends. At the air inlet 42, an array of ap-

ertures 46 extend around and partially along the handle 40. A fan unit (not shown) is housed within the handle and comprises a fan and a motor. In use, the motor drives the fan and air is drawn in through the air inlet 42, along an air flow path which extends through the length of the handle 40. The air is optionally heated by a heater (not shown) before exiting the hot air styling device 38 at the air outlet 44.

[0041] The invention is not limited to the detailed description given above. Variations will be apparent to the person skilled in the art.

Claims

1. An attachment for a hair styling apparatus comprising:

an air inlet for receiving airflow from a hair styling apparatus;
an air outlet;
a duct for conveying air from the air inlet to the air outlet;
wherein the air inlet is located at one end of the duct, and the air outlet extends along the length of the duct; and
the cross-sectional area of the duct decreases in size from the air inlet along the length of the air outlet.

2. An attachment according to claim 1, wherein a cool wall surrounds the duct between the air inlet and the air outlet.

3. An attachment according to claim 1 or claim 2, wherein a spacing is maintained between the duct and the cool wall.

4. An attachment according to claim 3, wherein the spacing between the air outlet of the duct and a top opening of the coolwall is substantially constant.

5. An attachment according to claim 3 or claim 4, wherein the spacing has a dimension which is in the range of 1.5 to 5.5mm.

6. An attachment according to any preceding claim, comprising at least one rib extending between the duct and the cool wall.

7. An attachment according to any preceding claim, wherein the air inlet is circular and the air outlet is a generally elongate rectangle shape.

8. An attachment according to any any of claims 2 to 7, wherein the air outlet of the duct protrudes beyond the end of the cool wall.

9. An attachment according to any preceding claim, comprising a contoured duct wall extending between the air inlet and the air outlet.

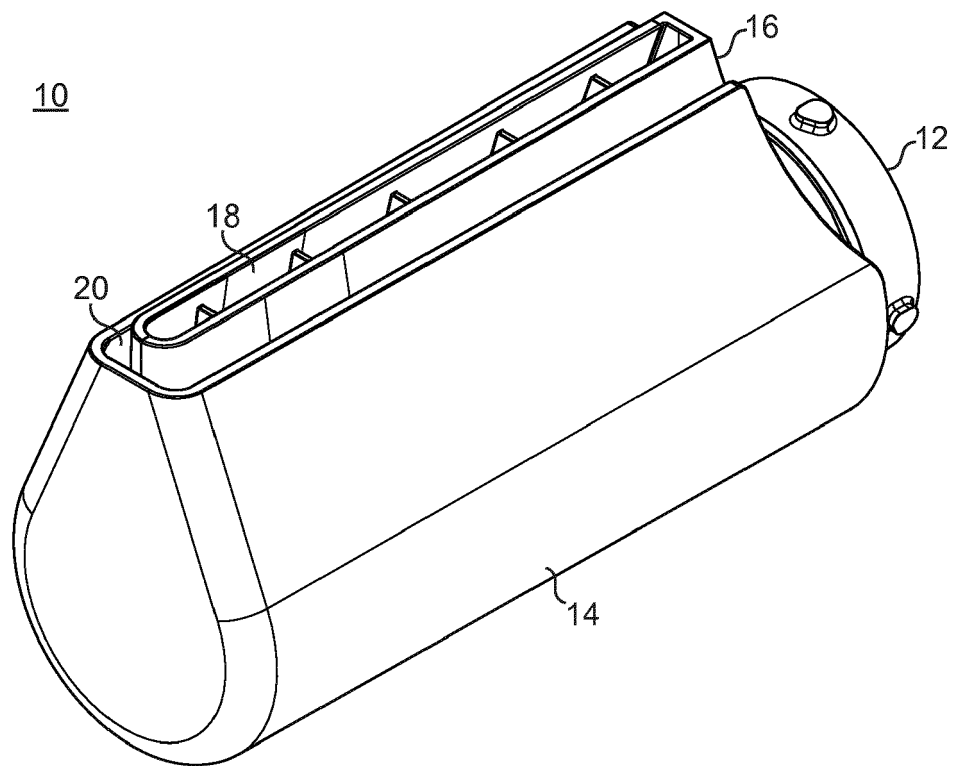


FIG. 1

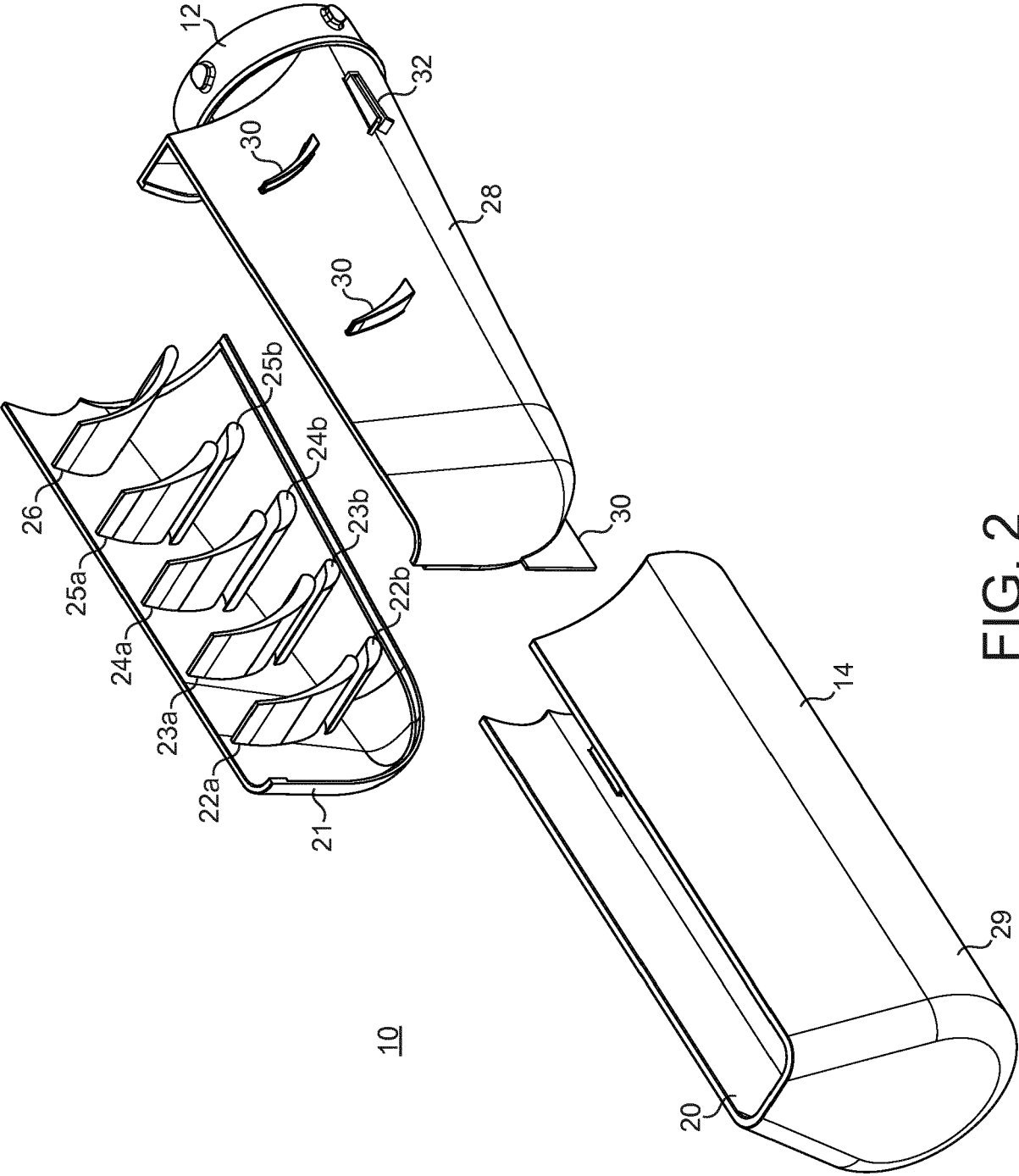


FIG. 2

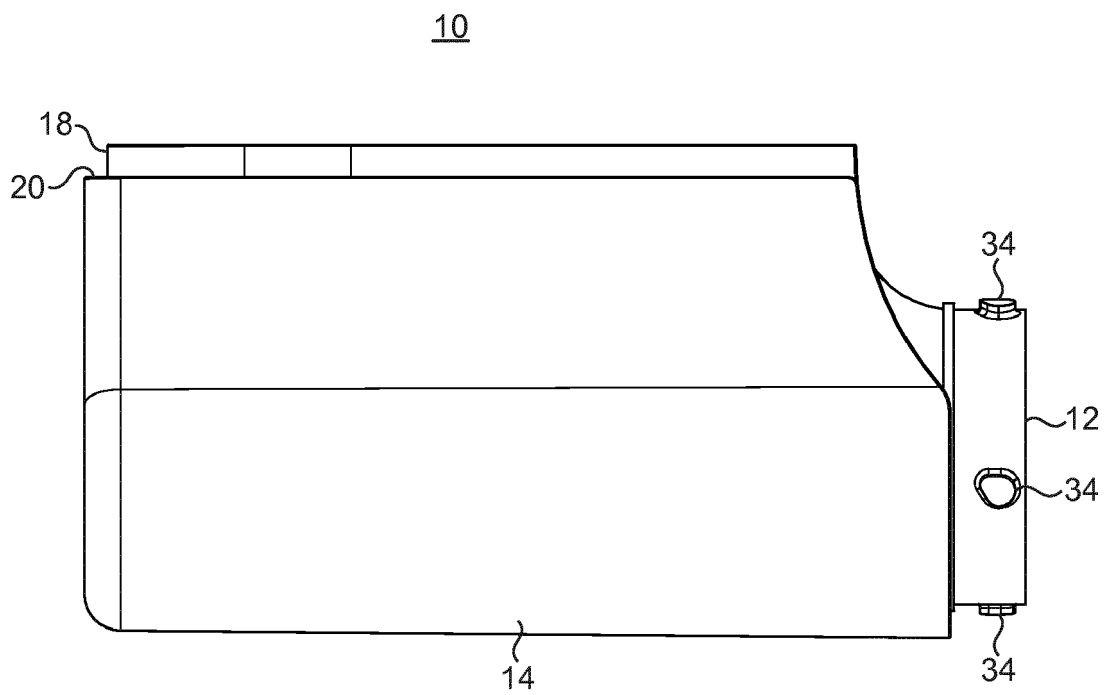


FIG. 3

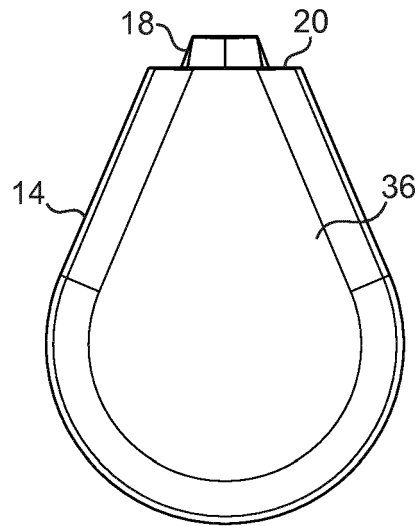


FIG. 4

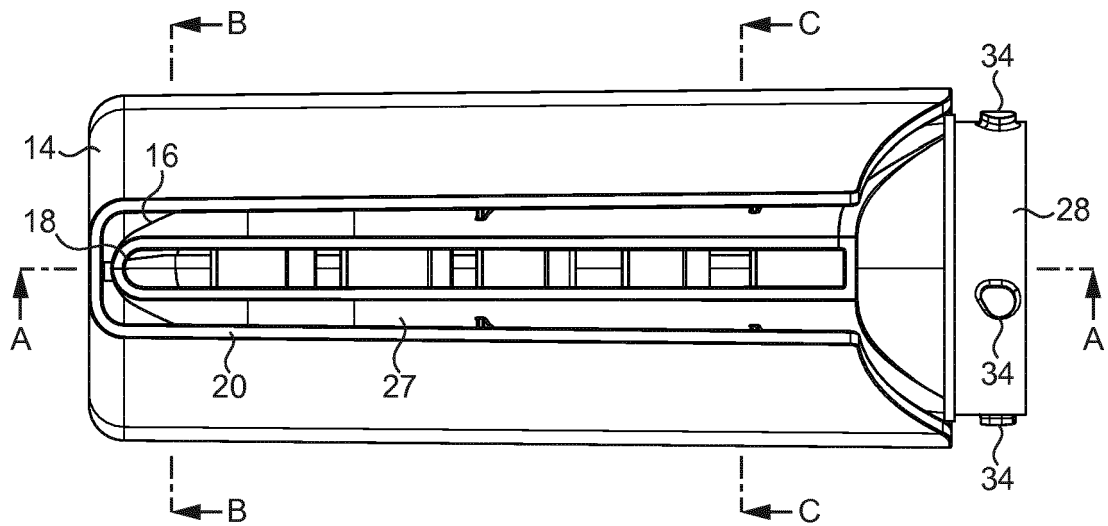


FIG. 5

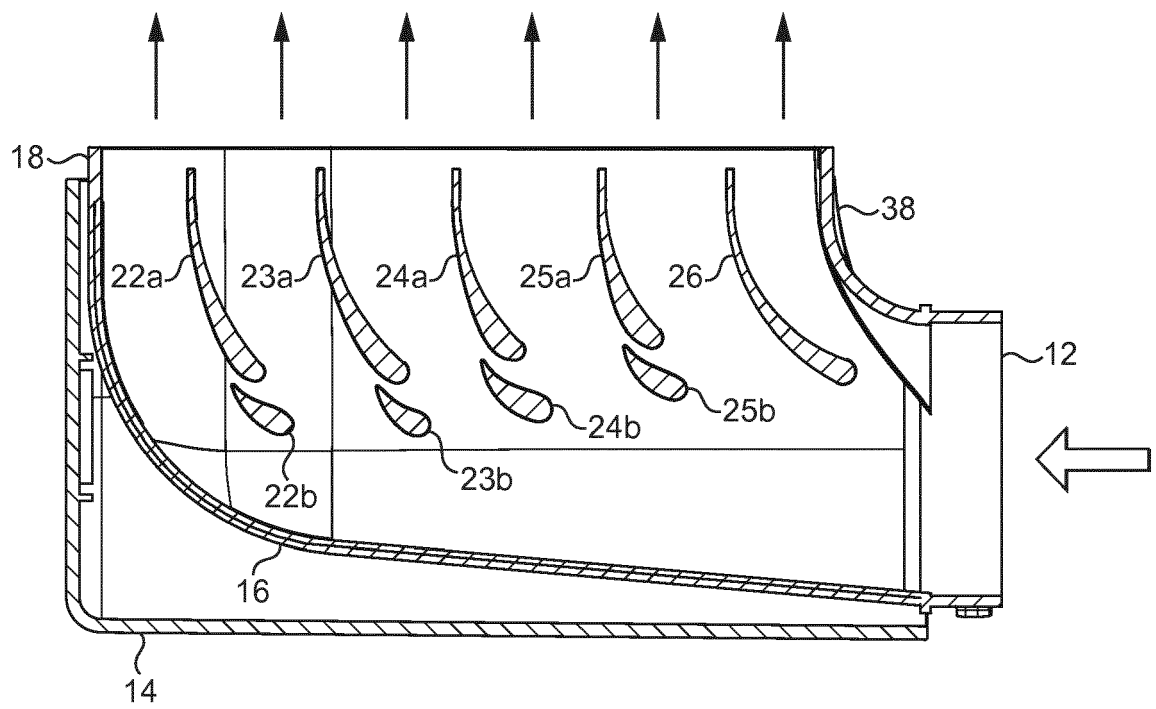


FIG. 6

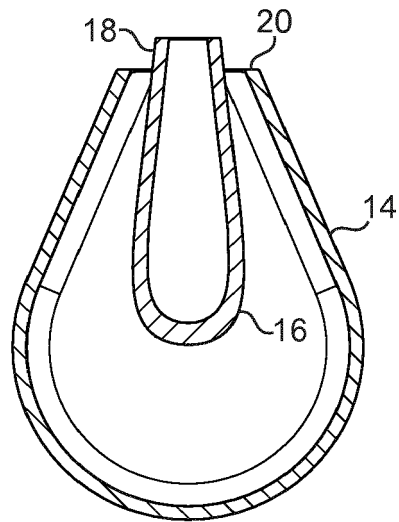


FIG. 7

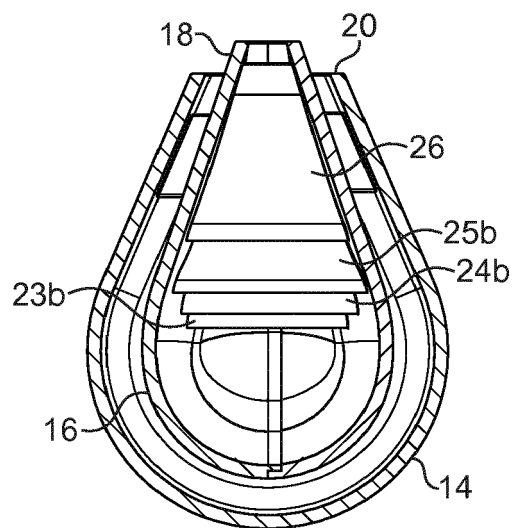
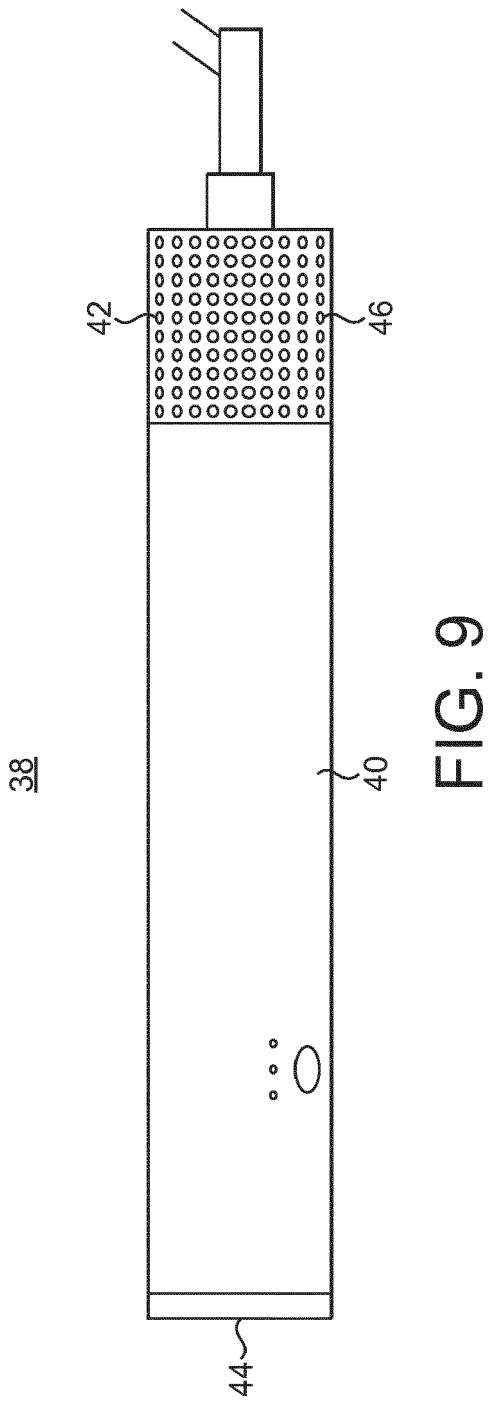


FIG. 8





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Application Number
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 16 March 2017	Examiner Fidalgo Marron, B
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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