relement 6 ist wiederum eine Bohrung 16 vorgesehen, durch die eine Schraube (nicht gezeigt) geführt werden kann, die dann mit dem Verschraubungsmittel 15 verschraubt werden kann, um die beiden Teile 12, 13 des Aufsatzes 5 fest miteinander zu verbinden. Alternativ können natürlich auch andere geeignete Verbindungsarten, wie eine clipsartige Verbindung oder ein Verkleben oder Verschweißen, Verwendung finden. Am Ubergang zwischen Wandabschnitt 8 und Luftfokussierungselement 10 weist das Luftfokussierungselement 10 einen Vorsprung auf, der im verschraubten Zustand des Aufsatzes 5 den Wandabschnitt 8 übergreift.

[0035] Im Zusammenhang mit den Fig. 2b bis Fig. 2d wird nun die Aufsteckfunktion erläutert. Dabei zeigt Fig. 2b die Kontur das Wandabschnitts 7 rein schematisch ohne Zusammenwirken mit dem Gehäuse 2: Fig. 2c zeigt die Kontur des Wandabschnitts 7 beim Zusammenwirken mit dem Gehäuse 2, welches allerdings nicht dargestellt ist, und Fig. 2d zeigt die Kontur entsprechend Fig. 2c, wobei das Gehäuse nun gezeigt ist.

[0036] Bevorzugt ist der Wandabschnitt 7 aus einem elastischen Material, bevorzugt Kunststoff hergestellt, und verjüngt sich von der Aufstecköffnung 17 her, um ihn flexibel auch bei unterschiedlichen Luftapparaturen 1 mit unterschiedlichen Außendurchmessern deren Luftaustrittsseiten 11 zu verwenden. Zusätzlich wird diese Flexibilität noch dadurch erhöht, dass der Wandabschnitt 7 zwei mit unterschiedlicher Querschnittskontur ausgebildete Bereiche 18, 19 aufweist, wie in Fig. 2b bis Fig. 2d, Fig. 3 und Fig. 4 zu erkennen ist. Der kegelstumpfförmige Bereich 18 stellt für das Gehäuse 2 eine Aufsteck- und Einführhilfe dar, wodurch der Aufsatz 5 sehr einfach auf das Gehäuse 2 aufgesteckt und zentriert wird. Der an der Luftaustrittsseite 11 befindliche Gehäuseabschnitt 20 wird dann beim Aufstecken des Aufsatzes 5 auf das Gehäuse 2 in den kegelstumpfförmigen Bereich 18 eingeführt und zentriert. Danach dringt der Gehäuseabschnitt 20 in den pyramidenstumpfförmigen Bereich 19 ein. Da der Gehäuseabschnitt 20 eine runde oder ovale Außenkontur besitzt und der Wandabschnitt 7 des Aufsatzes 5 im pyramidenstumpfförmigen Bereich 19 einen rechteckigen Querschnitt, findet beim Aufstecken eine Ausweitung und Dehnung des elastischen Wandabschnitts 7 über dem Gehäuseabschnitt 20 statt. Dadurch erfolgt eine flächige Anlage des Wandabschnitts 7 an dem Gehäuseabschnitt 20, wodurch der Aufsatz 5 sehr sicher auf dem Gehäuse 2 befestigt ist und zugleich auch eine hervorragende Abdichtung stattfindet.

[0037] Natürlich kann der zweite Bereich 19 auch jegliche andere Kontur aufweisen, solange sichergestellt ist, dass sich diese Kontur stark von der Kontur des Gehäuseabschnitts 20 unterscheidet, da es dadurch auf Grund von Dehnungen zu einem umlaufenden linienhaften oder flächenhaften Anliegen kommt. Wenn die beiden Konturen dagegen übereinstimmen, wird es im wesentlichen nur zu einem teilweisen linienhaften Anliegen des Wandabschnitts 7 des Aufsatzes 5 am Gehäuseabschnitt 20 kommen und es wird keine so sichere Verbindung zwischen Aufsatz 5 und Gehäuse 2 sicher gestellt und diese ist auch nicht so dicht gegenüber Luftdurchtritt.

[0038] Am oberen Bestandteil 12 des Aufsatzes 5, an dem das Luftfokussierungselement 10 verwirklicht ist, ist bevorzugt ein Temperaturindikator (nicht gezeigt) angebracht. Dies kann beispielsweise eine wärmeempfindliche Folie sein, die in Abhängigkeit von der Temperatur ihre Farbe ändert. Oder ein temperaturempfindliches Material bildet zumindest einen äußeren Bereich des Luftfokussierungselements 10 selbst. Der Farbumschwung ist dann so einzustellen, dass bei Uberschreiten einer für den Säugling kritischen Temperatur eine deutliche Warnwirkung an den Benutzer gegeben wird, beispielsweise dadurch, dass ein Farbumschwung von grün zu leuchtendem Rot stattfindet. Andererseits kann natürlich auch ein elektrooptischer oder/und elektroakustischer Warnmechanismus vorgesehen werden, bei dem also die Temperatur elektronisch erfasst und dann ein optisches oder akustisches Warnsignal gegeben wird. Vorzugsweise ist ein solcher Temperaturindikator am Aufsatz 5 selbst angebracht, da dann beim Benutzen des Luftapparats 1 die Warnwirkung leicht erfasst werden kann, jedoch kann der Temperaturindikator auch an dem Gehäuse 2 vorgesehen sein. Bevorzugt besteht der Aufsatz 5 aus einem beispielsweise spritzgegossenen Kunststoffmaterial, wobei das Material nur im Wandabschnitt 7 elastisch ausgebildet ist, um die notwendige Steifigkeit des Aufsatzes 5 sicherzustellen. Elastisch in diesem Zusammenhang bedeutet allerdings nur eine Dehnbarkeit des Materials, die eine Verformbarkeit der Innenkontur des Wandabschnitts 7 ermöglicht. Beim Material wird bevorzugt, dass dieses isolierend ist, und als diesbezüglicher Kunststoff, der gleichzeitig gewisse elastische Eigenschaften aufweist, wird PVC bevorzugt.

[0039] Der Offnungsdurchmesser A der Luftaustrittsöffnung 4 liegt bevorzugt im Bereich von 40 bis 90 mm, die axiale Länge des Wandabschnitts 7 beträgt bevorzugt 40 bis 90 mm und die anfängliche Offnung E des kegelstumpfförmigen ersten Bereichs 18 beträgt bevorzugt 50 bis 90 mm. Die Innenkontur des Wandabschnitts 7 weist demzufolge am Beginn des kegelstumpfförmigen ersten Bereichs 18 einen Innenumfang E von bevorzugt 50 bis 90 mm auf. Im Ubergang 21 zwischen kegelstumpfförmigen ersten Bereich 18 und stromabwärts angeordneten pyramidenstumpfförmigen zweiten Bereich 19 soll der Innenumfang bevorzugt 40 bis 70 mm betragen und am stromabwärts befindlichen Ende des pyramidenstumpfförmigen zweiten Bereichs 19 weist die Innenkontur des Wandabschnitts 7 einen Innenumfang von

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bevorzugt 30 bis 60 mm auf. Das Sperrelement 6 hintergreift den Wandabschnitt 7 bevorzugt über eine Länge C von 2 bis 10 mm.

[0040] Bei den im Fachhandel gebräuchlichen Haartrocknern, deren Gehäuse 2 im vorderen Gehäuseabschnitt 20 einen Durchmesser von ca. 50 bis 60 mm aufweisen, wird durch den erfindungsgemäßen Aufsatz 5 ein sicheres Aufstecken und Fixieren ermöglicht. Prinzipiell kann der erfindungsgemäße Aufsatz aber über einen sehr großen Bereich von Außenumfängen erhältlicher Föngehäuse durch seine besondere Ausgestaltung verwendet werden. Für die angegebene bevorzugte geometrische Gestaltung beispielsweise kann der Außenumfang zwischen ca. 30 und 90 mm betragen und es wird dennoch ein sicheres und abdichtendes Fixieren mit dem Aufsatz 5 ermöglicht. Der erfindungsgemäße Aufsatz 5 ist also sehr flexibel einsetzbar und kann insbesondere auch als Universalaufsatz für andere Anwendungszwecke als im Säuglingsbereich angewendet werden. Beispielsweise können damit auch gebräuchliche Friseurhilfsmittel, wie fönbetriebene Kämme und Bürsten, universell für verschiedene Haartrockner bereitgestellt werden.

[0041] Aus dem Vorstehenden ist deutlich geworden, dass der erfindungsgemäße Luftapparat 1 zum Fönen von Säuglingen und Kleinkindern mit Luft besonders geeignet ist, da er die Nachteile bisheriger Luftapparate beseitigt. Mit dem erfindungsgemäßen Aufsatz 5 können herkömmliche Luftapparate 1 in besonders einfacher und kostengünstiger Weise nachgerüstet werden und der erfindungsgemäße Aufsatz 5 lässt sich auch als universeller Aufsatz unter Verwirklichung verschiedener Funktion verwenden, beispielsweise als Kamm oder Bürste, wenn solche Elemente am Aufsatz 5 vorgesehen werden, wobei dann natürlich die besonderen Schutzmittel 5 für Säuglinge entbehrlich sind.

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Zitierte Patentliteratur

- EP 1633217 A2 [0005]

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Patentansprüche

1. Luftapparat (1), insbesondere Haartrocknungsapparat, zum Fönen von Säuglingen und Kleinkindern mit Luft, umfassend ein Gebläse und ein Gehäuse (2) mit einem Luftführungskanal (3) und einer Luftaustrittsöffnung (4), **dadurch gekennzeichnet**, dass Schutzmittel (5, 6, 7, 8, 9, 10) vorgesehen sind, die verhindern, dass durch einen auf die Luftaustrittsöffnung (4) gerichteten Flüssigkeitsstrahl Flüssigkeit zu Strom führenden Bauteilen im Inneren des Gehäuses (2) gelangt.

2. Luftapparat nach Anspruch 1, dadurch gekennzeichnet, dass die Schutzmittel eine Einrichtung (6, 7, 8, 10) zur mindestens einmaligen Umleitung, bevorzugt Umkehrung des Luftführungskanals (3) zwischen Gebläse und Luftaustrittsöffnung aufweisen, wobei der Luftführungskanal (3) bevorzugt gefaltet, insbesondere S-förmig ausgebildet ist.

3. Luftapparat nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass die Schutzmittel ein erstes Sperrelement (6) umfassen, dessen flüssigkeitsundurchlässiger Querschnitt (A) größer ist als ein stromaufwärts angeordneter Querschnitt (B) des Luftführungskanals (3), wobei bevorzugt das erste Sperrelement (6) den stromaufwärts angeordneten Querschnitt (B) in Bezug auf die Längserstreckung des Luftführungskanals (3) hintergreift (C).

4. Luftapparat nach einem der vorherigen Ansprüche, dadurch gekennzeichnet, dass die Schutzmittel ein zweites Sperrelement (6) umfassen, dessen flüssigkeitsundurchlässiger Querschnitt (A) größer ist als ein stromabwärts angeordneter Querschnitt (D) des Luftführungskanals (3), wobei insbesondere das zweite Sperrelement und das erste Sperrelement gemäß Anspruch 3 oder 4 in einem einheitlichen Sperrelement (6) verwirklicht sind.

5. Luftapparat nach einem der vorherigen Ansprüche, dadurch gekennzeichnet, dass der Luftführungskanal (3) zumindest bereichsweise Versteifungselemente, insbesondere Versteifungsrippen (9) aufweist.

6. Luftapparat nach einem der vorherigen Ansprüche, dadurch gekennzeichnet, dass im Bereich der Luftaustrittsöffnung (4) zumindest ein Luftfokussierungselement (10) vorgesehen ist, das bevorzugt die austretende Luft in einem Abstand von 10 cm bis 50 cm, insbesondere 20 cm bis 30 cm stromabwärts der Luftaustrittsöffnung (4) fokussiert.

7. Aufsatz (5) für einen Luftapparat (1), insbesondere Haartrocknungsapparat, zum Fönen von Säuglingen und Kleinkindern mit Luft, bevorzugt einen Luftapparat (1) nach einem der vorherigen Ansprüche, gekennzeichnet durch die die Schutzmittel (5) betreffenden Merkmale von Anspruch 1, bevorzugt in Verbindung mit einem der Ansprüche 2 bis 6.

8. Aufsatz (5), insbesondere nach Anspruch 7, für einen Luftapparat (1), insbesondere Haartrocknungsapparat, zum Fönen von Säuglingen und Kleinkindern mit Luft, bevorzugt einen Luftapparat (1) nach einem der Ansprüche 1 bis 6, gekennzeichnet durch einen Abschnitt (7) zum Aufstecken des Aufsatzes (5) auf den Luftapparat (1) an der Luftaustrittsseite (11) des Luftapparats (1), wobei der Aufsteckabschnitt (7) elastisch und insbesondere stromaufwärts erweitert ausgebildet ist.

9. Aufsatz nach Anspruch 8, dadurch gekennzeichnet, dass der Aufsteckabschnitt (7) zumindest zwei Bereiche (12, 13) mit unterschiedlicher geometrischer Kontur aufweist, wobei bevorzugt ein stromaufwärts angeordneter kegelstumpfförmiger erster Bereich (12) und ein stromabwärts angeordneter pyramidenstumpfförmiger zweiter Bereich (13) vorgesehen sind.

10. Luftapparat nach einem der Ansprüche 1 bis 6 und/oder Aufsatz nach einem der Ansprüche 7 bis 9, dadurch gekennzeichnet, dass ein Temperaturindikator vorgesehen ist, der insbesondere als auf dem Aufsatz aufgebrachte temperaturempfindliche Folie ausgebildet ist oder als temperaturempfindliches Material, das zumindest einen äußeren Bereich des Aufsatzes selbst bildet, wobei die temperaturempfindliche Folie oder das temperaturempfindliche Material in Abhängigkeit von der Temperatur ihre Färbung ändern.

Es folgen 4 Blatt Zeichnungen

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Anhängende Zeichnungen

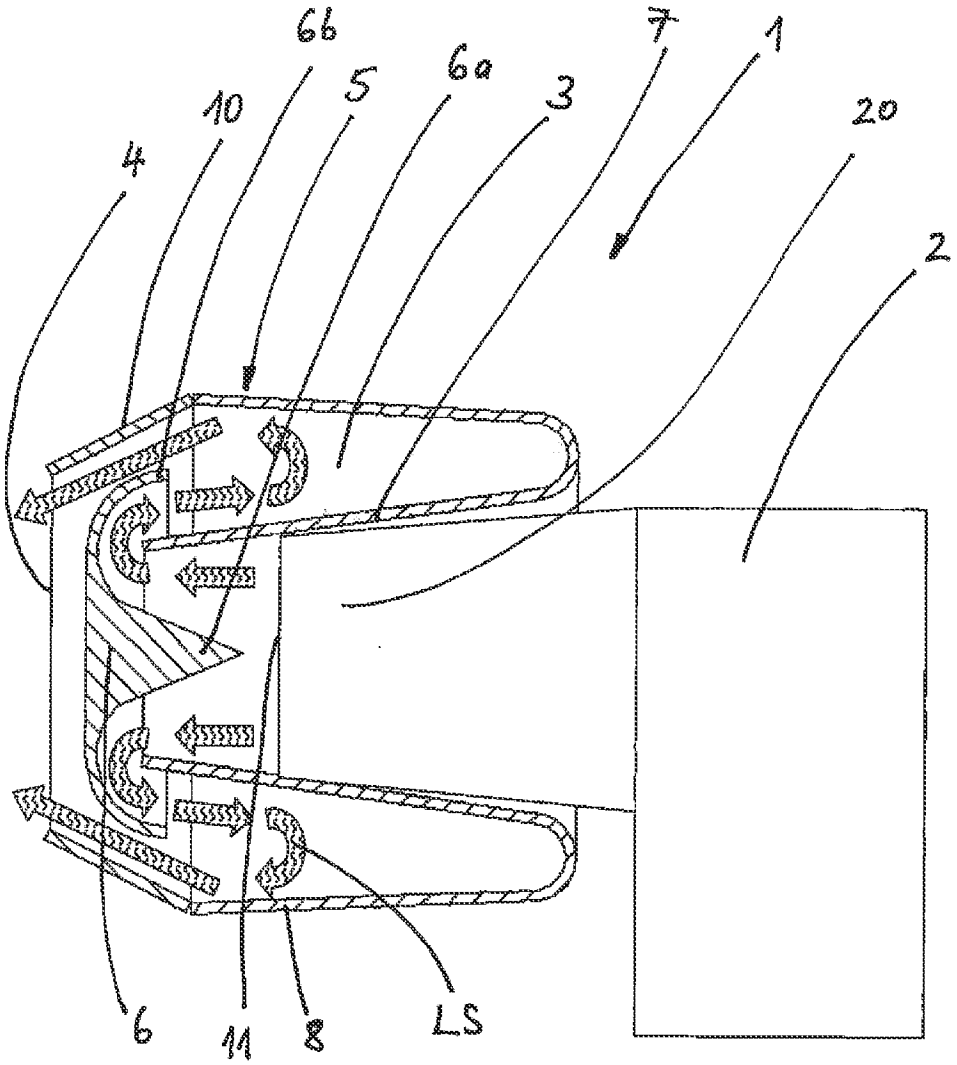


Fig. 1

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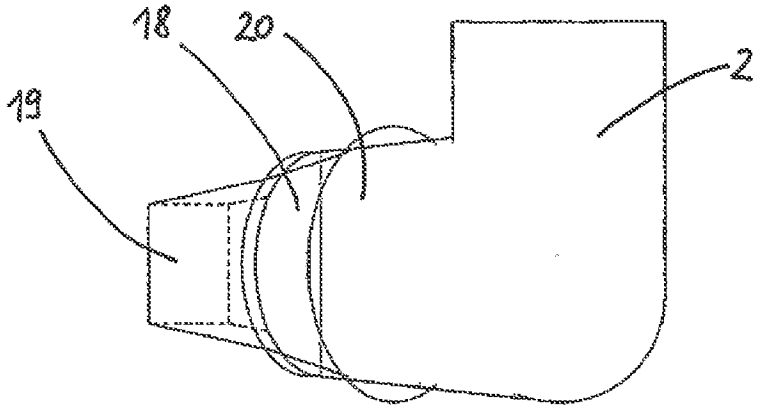


Fig. 2d

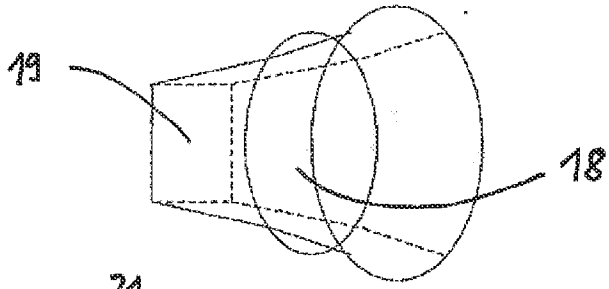


Fig. 2c

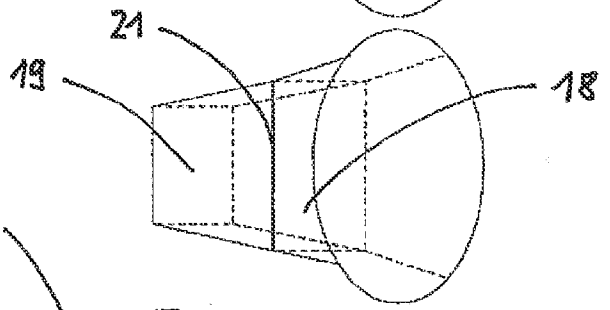


Fig. 2b

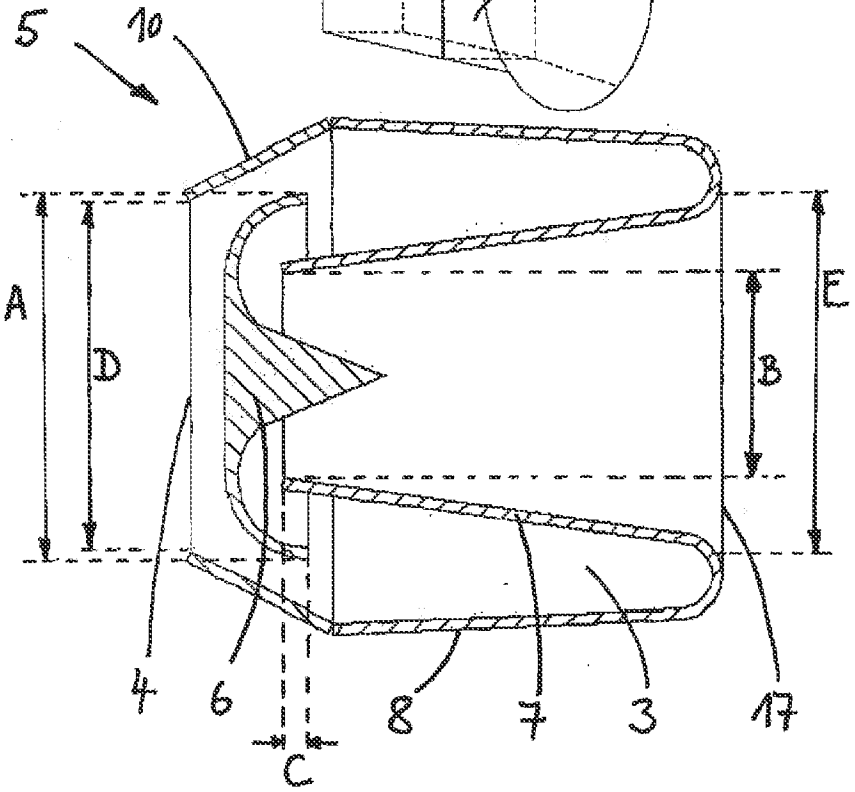


Fig. 2a

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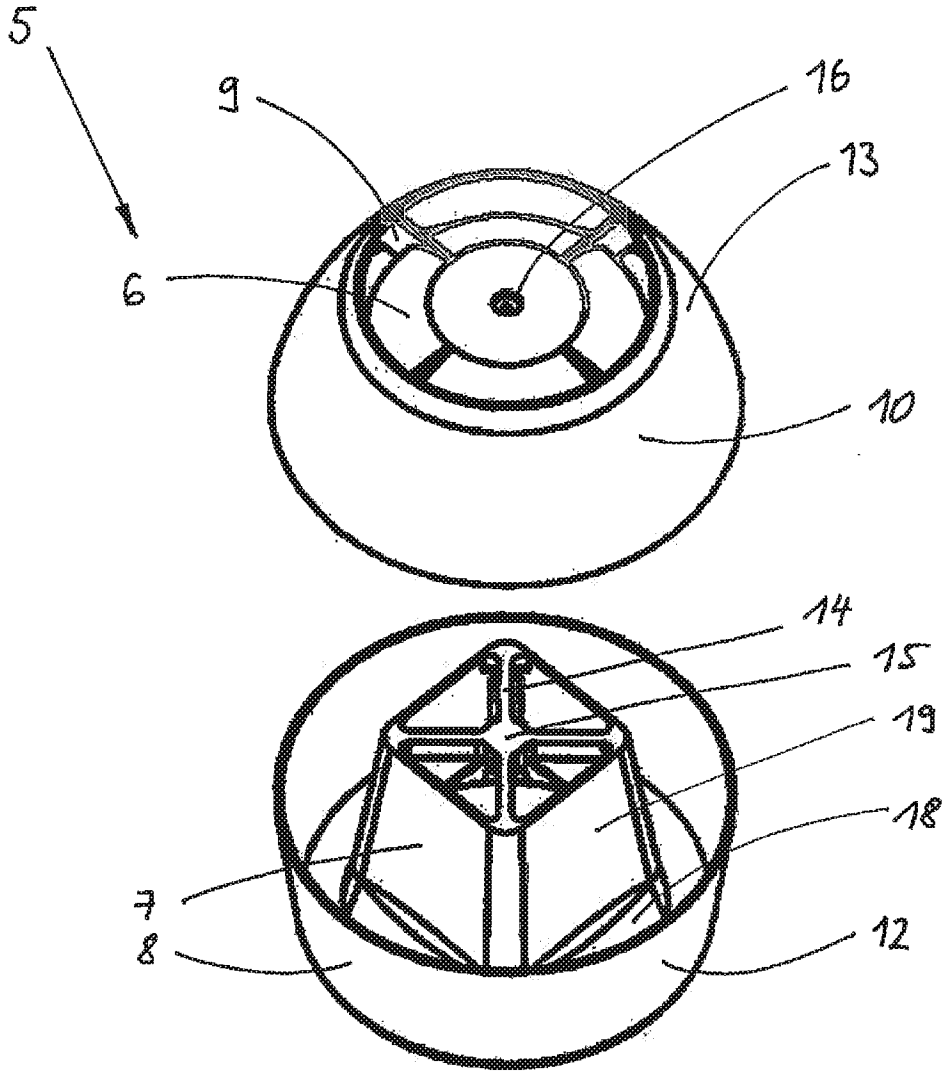


Fig. 3

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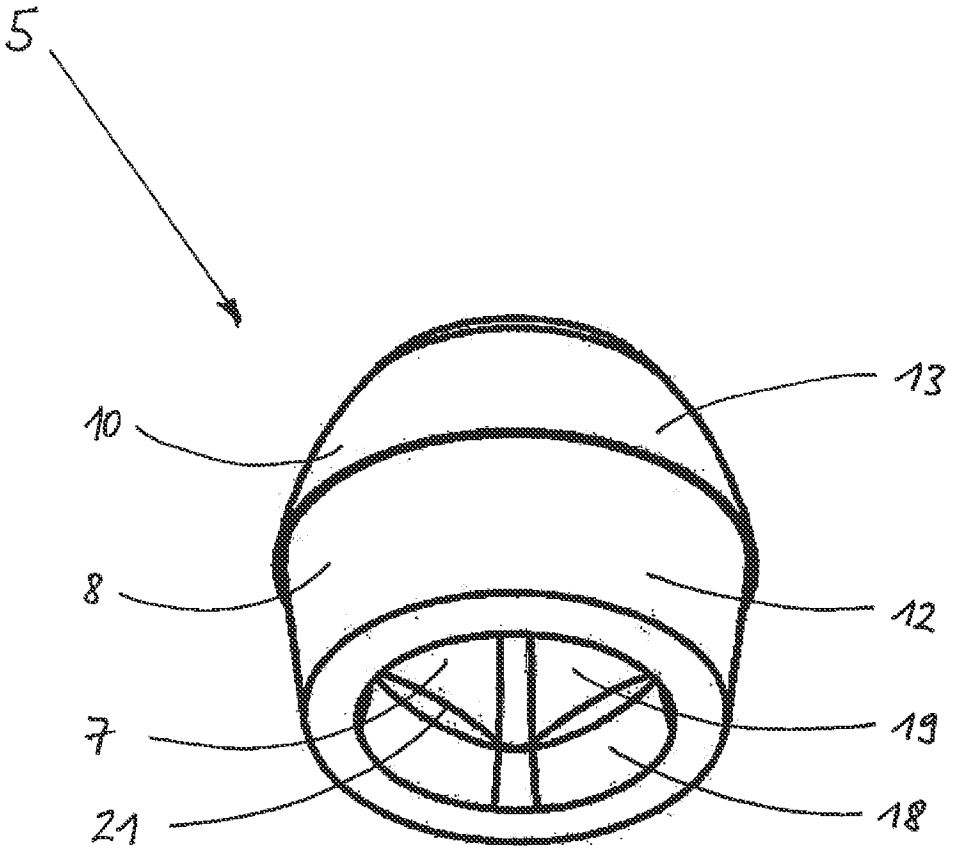


Fig. 4

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Fan housing of blower

Page bookmark	CN201948229 (U) - Fan housing of blower
Inventor(s):	SHIQIANG LIU ±
Applicant(s):	SHIQIANG LIU ±
Classification:	**- international:** ***A45D20/12***
	- cooperative:
Application number:	CN20102693228U 20101230
Priority number(s):	CN20102693228U 20101230

Abstract of CN201948229 (U)

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The utility model discloses a fan housing of a blower, which comprises a fan housing main body and a sheathing part which is integrally formed with the fan housing main body and is sheathed with a wind outlet of the blower, wherein the lower end of the fan housing main body is connected with a base cover; and the sheathing part is internally provided with a wind force and wind direction adjusting sheet, an adjusting valve for adjusting the wind force and wind direction adjusting sheet is arranged on the sheathing part, the front end of the adjusting vale is provided with an adjustment clamping opening for clamping the wind force and wind direction adjusting sheet, and the adjusting vale is clamped and matched with the wind force and wind direction adjusting sheet by the adjustment clamping opening. The fan housing has the advantages of being simple in structure, ingenious in design, good in blowing effect and the like.

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DESCRIPTION CN201948229

Technical field

The utility model relates to a hair dryer accessories, and more particularly, to a hair dryer hood.

BACKGROUND

For the hair dryer, the hair dryer socket cover on the hair dryer is essential.

Hair dryer hood for how to improve hair effect is a very critical component.

Currently, the traditional hair dryer hood is simple, its poor hair dryer hair effect.

Utility Model Content

The utility model technical problem to be solved is to provide a simple structure, cleverly designed, hair dryer good effect hood.

In order to solve the above problems, the present utility model program uses the following technologies:

One kind of hair dryer hood, including hood and hood main body and one-piece for a hair dryer socket outlet socket of the Ministry, at the lower end is connected to the main hood bottom; Ministry said sockets are equipped with wind wind flap and is mounted on the socket portion of the wind blowing direction adjusting plate for adjusting the valve, the valve opening of the distal end of the grip with the wind blowing direction adjusting plate for adjusting the jaws and the jaws of the control valve by adjusting the wind direction and wind The flap clamp fit.

Preferably, the wind blowing direction adjusting piece waveform thereof.

Preferably, the at least one detent provided on the wind direction of the wind flap.

Preferably, the upper end of the hood main body is small, the lower end of a large cone.

Preferably, the bottom surface of the opening of the cover has a plurality of diamond-shaped apertures.

Preferably, the bottom U-shaped cross section.

Preferably, the main body between the hood and the bottom cover also has a connection circle, circle one end of the connection kit hood body at the lower end of the connecting ring rotatably connected to the other end of the bottom cover.

Preferably, the socket portion of the suit has a silicone ring.

Preferably, the socket portion between the hood and the body angle of 20 ° ~ 30 °.

Preferably, the socket between the body portion and hood angle of 22 °.

The utility model above-described structure, it has the following advantageous effects:

(1) Wind wind flap on the inlet and outlet air play a very critical role, through the wind wind wind flap increase strength, while the wind by adjusting the valve regulating wind flap, so the wind can be converted, achieve double-sided correspondence effect, improving hair effect.

(2) Wind wind flap waveform body, there is ease of wind when the wind is not blocked, further increase the strength of the wind.

(3) the upper end of the hood main body is small, a large lower cone, which can prevent the blow-down wind direction to further increase the strength of the wind.

(4) at the bottom surface of the opening of the cover has a plurality of diamond-shaped holes, for cooling.

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(5) bottom U-shaped cross section, the rotation of the inner hair, curly hair which can play effect.

(6) between the hood and the bottom is also a main connection circle, elongate body hair for a long time to use the connection circle, connecting the rotating ring and bottom connections can prevent hair fall.

(7) on the socket portion of suits have silicone ring, silicone ring for fastening the hair dryer and the utility model hair dryer hood, which can prevent hair dryer hood slipped.

(8) socket portion of the body between the hood and the angle of 20 ° ~ 30 °, such as the socket portion of the angle between the body and the hood is 22 °, the above wind upward slope can prevent further increase of the wind efforts.

Read in conjunction with the accompanying detailed description of embodiments of the utility model after the utility model features and advantages will become more apparent.

Brief Description

Figure 1 is a block diagram of an embodiment of the utility model; and

Figure 2 is an exploded view of the structure.

Embodiment

Here in one embodiment of the present utility model for further detailed description, it should be noted, the utility model protection is not limited to this.

Referring to Figures 1 and 2 A hair dryer hood, the hood body 30, and includes a hood body 30 and integrally molded socket for the hairdryer outlet socket portion 70, the upper end of the hood body 30 is small, the lower end of the large cone; in the hood body 30 is connected to the lower end of the bottom cover 10, bottom cover 10 is U-shaped cross section, the bottom surface 101 of the cover 10 is opened a plurality of diamond-shaped apertures 102.

There is in the socket portion 70 60 Wind wind flap, flap 60 to wind the wind wave body, the wind blowing direction adjusting at least one card with a 601-bit on-chip 60-bit 601 as the two cards, the card used to place 601 fastening member.

Socket portion 70 is mounted on the adjustment valve 50, the regulating valve 50 opened a distal end for gripping the wind blowing direction adjusting plate 60 to adjust the jaws 501, the control valve 50 by adjusting the flap 60 clamp the clamp port 501 with the wind wind direction .

Between the hood 30 and the bottom body 10 is also provided with the connection ring 20, one end of the connection ring 20 fitted over the lower end of the hood main body 30, the other end of the connection ring 20 is connected with the bottom cover 10 is rotated.

Set in the socket portion 70 has a silicone ring 40, the silicone ring 40 has a high temperature, wear effect.

Angle between the socket 70 and 30 hood body to 20 ° ~ 30 °, for example, the socket body 70 and wind shield angle of between 30 and 22 °, etc., in which a certain inclination to prevent wind up, thereby increasing the intensity of the wind.

Wind wind flap 60, the control valve 50 are based on engineering plastics, engineering plastics play a high temperature capabilities.

The problem extends in the hood outer body 30 has a lower end edge of the flange 301, which resolves to put put bad hair while increasing the aesthetic appearance.

When used in the embodiment, the hair dryer of the present embodiment the hood portion 70 through the socket on the socket hair dryer, the hair dryer when the work can be adjusted by adjusting the valve 50 of the wind blowing direction adjusting plate 60.

Although described in conjunction with the drawings an embodiment of the utility model, those skilled in the art that various changes and modifications may be within the scope of the appended claims, do not exceed the scope of the utility model described in the claims , should be within the scope of the utility model protection.

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CLAIMS CN201948229

1.

A hair dryer hood, including hood body (30) and with the hood body (30) integrally molded hair dryer outlet socket for the socket (70), at the lower end of the hood body (30) connected to the bottom (10); characterized in that: said socket portion (70) is provided with the wind blowing direction adjusting piece (60) and the socket portion (70) is mounted on the wind direction of the wind for adjusting the adjustment flap (60) the front end of the valve (50), the regulating valve (50) for gripping the wind Wind opened a flap (60) of the adjusting jaws (501) and the regulating valve (50) by adjusting the jaws (501) to adjust the wind direction and wind piece (60) with clamp.

2.

Hair dryer hood according to claim 1, wherein: the wind blowing direction adjusting piece (60) of the waveform thereof.

3.

According to a hood hair dryer according to claim 1 or 2, characterized in that: the wind blowing direction adjusting piece (60) with at least one detent (601) on.

4.

According to the hood hair dryer according to claim 1 or claim 2, wherein: said hood body (30) is small the upper end of the lower end of the large cone.

5.

According to the hood hair dryer according to claim 1 or claim 2, characterized in that: there is a plurality of diamond-shaped opening (102) (101) in said bottom cover (10) of the cover surface.

6.

Hair dryer hood according to claim 5, wherein: said bottom cover (10) is U-shaped cross section.

7.

According to a hair dryer hood 1 or claim 2, wherein: between the hood body (30) and bottom (10) also has a connection ring (20), the coupling ring (20) a Set the hood body at the lower end (30) of the coupling ring (20) and the other end of the bottom cover (10) rotatably connected.

8.

According to a hair dryer hood 1 or claim 2, wherein: said socket (70) on the package have silicone ring (40).

9.

According to a hair dryer hood 1 or claim 2, wherein: the angle between the socket (70) and the hood body (30) is 20 ° ~ 30 °.

10.

According to a hair dryer hood according to claim 9, wherein: said socket (70) and the angle of the main hood 22 ° (30) between.

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PN - CN201948229U U 20110831

TI - Fan housing of blower

AB - The utility model discloses a fan housing of a blower, which comprises a fan housing main body and a sheathing part which is integrally formed with the fan housing main body and is sheathed with a wind outlet of the blower, wherein the lower end of the fan housing main body is connected with a base cover; and the sheathing part is internally provided with a wind force and wind direction adjusting sheet, an adjusting valve for adjusting the wind force and wind direction adjusting sheet is arranged on the sheathing part, the front end of the adjusting vale is provided with an adjustment clamping opening for clamping the wind force and wind direction adjusting sheet, and the adjusting vale is clamped and matched with the wind force and wind direction adjusting sheet by the adjustment clamping opening. The fan housing has the advantages of being simple in structure, ingenious in design, good in blowing effect and the like.

PA - SHIQIANG LIU

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AN - 2011-L89922

TI - Blower cover, has regulating valve matched with wind power wind direction regulating plate through clamp hole, where regulating clamp hole is opened at front end of regulating valve to clamp wind direction regulating plate

AB - NOVELTY :

The cover has a U-shaped bottom cover (10) connected to a lower end of a conical cover body (30). A wind power wind direction regulating plate (60) is mounted in a sleeve part (70) that is provided with a regulating valve (50) to regulate the wind direction regulating plate. A regulating clamp hole (501) is opened at a front end of the regulating valve to clamp the wind direction regulating plate, where the wind direction regulating plate is a wave-shaped body. The regulating valve is matched with the wind direction regulating plate through the clamp hole in a clamping manner.

- USE :

Blower cover.

- ADVANTAGE :

The cover is simple in structure and design. The cover has better blowing effect.

- DESCRIPTION OF DRAWINGS :

The drawing shows an exploded perspective view of a blower cover.

10 : Bottom cover

30 : Conical cover body

50 : Regulating valve

60 : Wind power wind direction regulating plate

70 : Sleeve part

501 : Regulating clamp hole

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(19)中华人民共和国国家知识产权局

(12)实用新型专利

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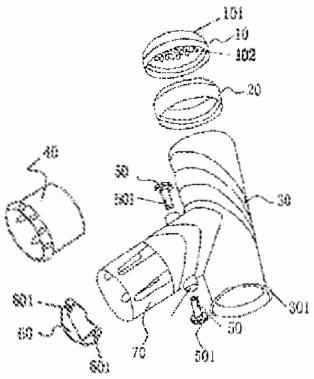
权利要求书 1 页 说明书 2 页 附图 2 页

(54)实用新型名称

吹风机风罩

(57)摘要

本实用新型公开了一种吹风机风罩，包括风罩主体以及与风罩主体一体成型的供吹风机出风口套接的套接部，在风罩主体下端连接有底盖；在所述套接部内设有风力风向调节片，以及在套接部上安装有用于调节风力风向调节片的调节阀，该调节阀的前端开设有用于夹住风力风向调节片的调节夹口并且该调节阀通过调节夹口与风力风向调节片夹紧配合。本实用新型具有结构简单、设计巧妙、吹风效果佳等优点。



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1. 一种吹风机风罩，包括风罩主体 (30) 以及与风罩主体 (30) 一体成型的供吹风机出风口套接的套接部 (70)，在风罩主体 (30) 下端连接有底盖 (10)；其特征在于：在所述套接部 (70) 内设有风力风向调节片 (60)，以及在套接部 (70) 上安装有用于调节风力风向调节片 (60) 的调节阀 (50)，该调节阀 (50) 的前端开设有用于夹住风力风向调节片 (60) 的调节夹口 (501) 并且该调节阀 (50) 通过调节夹口 (501) 与风力风向调节片 (60) 夹紧配合。

2. 根据权利要求 1 所述的吹风机风罩，其特征在于：所述风力风向调节片 (60) 为波形体。

3. 根据权利要求 1 或 2 所述的吹风机风罩，其特征在于：在所述风力风向调节片 (60) 上设有至少一个卡位 (601)。

4. 根据权利要求 1 或 2 所述的吹风机风罩，其特征在于：所述风罩主体 (30) 为上端小、下端大的锥形体。

5. 根据权利要求 1 或 2 所述的吹风机风罩，其特征在于：在所述底盖 (10) 的盖面 (101) 上开设有若干个菱形孔 (102)。

6. 根据权利要求 5 所述的吹风机风罩，其特征在于：所述底盖 (10) 截面为 U 形。

7. 根据权利要求 1 或 2 所述的吹风机风罩，其特征在于：在所述风罩主体 (30) 和底盖 (10) 之间还设有连接圈 (20)，该连接圈 (20) 一头套装在风罩主体 (30) 的下端，该连接圈 (20) 的另一端与底盖 (10) 旋转连接。

8. 根据权利要求 1 或 2 所述的吹风机风罩，其特征在于：在所述套接部 (70) 上套装有硅胶圈 (40)。

9. 根据权利要求 1 或 2 所述的吹风机风罩，其特征在于：所述套接部 (70) 与风罩主体 (30) 之间夹角为 20° ～ 30° 。

10. 根据权利要求 9 所述的吹风机风罩，其特征在于：所述套接部 (70) 与风罩主体 (30) 之间夹角为 22° 。

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吹风机风罩

技术领域

[0001] 本实用新型涉及一种吹风机配件，更具体地说，涉及一种吹风机风罩。

背景技术

[0002] 对于吹风机来说，在吹风机上套接吹风机外罩是必不可少的。吹风机风罩对于如何改善吹风效果是一个非常关键的部件。目前，传统吹风机风罩较为简单，其吹风机吹风效果不佳。

实用新型内容

[0003] 本实用新型所要解决的技术问题是提供一种结构简单、设计巧妙、吹风效果佳的吹风机风罩。

[0004] 为了解决上述技术问题，本实用新型采用了以下技术方案：

[0005] 一种吹风机风罩，包括风罩主体以及与风罩主体一体成型的供吹风机出风口套接的套接部，在风罩主体下端连接有底盖；在所述套接部内设有风力风向调节片，以及在套接部上安装有用于调节风力风向调节片的调节阀，该调节阀的前端开设有用于夹住风力风向调节片的调节夹口并且该调节阀通过调节夹口与风力风向调节片夹紧配合。

[0006] 优选地，所述风力风向调节片为波形体。

[0007] 优选地，在所述风力风向调节片上设有至少一个卡位。

[0008] 优选地，所述风罩主体为上端小、下端大的锥形体。

[0009] 优选地，在所述底盖的盖面上开设有若干个菱形孔。

[0010] 优选地，所述底盖截面为 U 形。

[0011] 优选地，在所述风罩主体和底盖之间还设有连接圈，该连接圈一头套装在风罩主体的下端，该连接圈的另一端与底盖旋转连接。

[0012] 优选地，在所述套接部上套装有硅胶圈。

[0013] 优选地，所述套接部与风罩主体之间夹角为 20° ～ 30° 。

[0014] 优选地，所述套接部与风罩主体之间夹角为 22° 。

[0015] 本实用新型由于采用了上述结构，故其具有以下有益效果：

[0016] (1) 风力风向调节片对进风和出风起到非常关键的作用，通过该风力风向调节片可增加风的力度，同时，通过调节阀调节该风力风向调节片，可转换左右出风，达到双面对应功效，改善吹风效果。

[0017] (2) 风力风向调节片为波形体，有便于出风时的风力不受阻，进一步增加风的力度。

[0018] (3) 风罩主体为上端小、下端大的锥形体，其可以防止风向倒吹，进一步增加风的力度。

[0019] (4) 在底盖的盖面上开设有若干个菱形孔，其用于散热。

[0020] (5) 底盖截面为 U 形，头发在内旋转时，其能够起到发梢卷曲的效果。

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[0021] (6) 在风罩主体和底盖之间还设有连接圈，该连接圈用于加长主体发丝较长时使用，连接圈与底盖旋转连接能够防止头发掉下来。

[0022] (7) 在套接部上套装有硅胶圈，硅胶圈用于紧固吹风机与本实用新型的吹风机风罩，其能够防止吹风机风罩的滑落。

[0023] (8) 套接部与风罩主体之间夹角为 20° ～ 30°，如套接部与风罩主体之间夹角为 22°，上述斜度也能够防止风力上行，进一步增加风的力度。

[0024] 在结合附图阅读本实用新型的实施方式的详细描述后，本实用新型的特点和优点将变得更加清楚。

附图说明

[0025] 图 1 是本实用新型的实施方式的结构图；以及

[0026] 图 2 是图 1 所述的结构分解图。

具体实施方式

[0027] 下面以一个实施方式对本实用新型作进一步详细的说明，但应当说明，本实用新型的保护范围不仅仅限于此。

[0028] 参阅图 1 和图 2，一种吹风机风罩，包括风罩主体 30 以及与风罩主体 30 一体成型的供吹风机出风口套接的套接部 70，风罩主体 30 为上端小、下端大的锥形体；在风罩主体 30 下端连接有底盖 10，底盖 10 截面为 U 形，在底盖 10 的盖面 101 上开设有若干个菱形孔 102。在套接部 70 内设有风力风向调节片 60，风力风向调节片 60 为波形体，在风力风向调节片 60 上设有至少一个卡位 601，如两个卡位 601，卡位 601 用于紧固部件。在套接部 70 上安装有调节阀 50，调节阀 50 的前端开设有用于夹住风力风向调节片 60 的调节夹口 501，调节阀 50 通过调节夹口 501 与风力风向调节片 60 夹紧配合。

[0029] 在风罩主体 30 和底盖 10 之间还设有连接圈 20，连接圈 20 一头套装在风罩主体 30 的下端，该连接圈 20 的另一端与底盖 10 旋转连接。在套接部 70 上套装有硅胶圈 40，硅胶圈 40 具有耐高温、耐磨的效果。套接部 70 与风罩主体 30 之间夹角为 20° ～ 30°，例如套接部 70 与风罩主体 30 之间夹角为 22° 等，其中，一定的倾斜度能够防止风力上行，从而增加风的力度。风力风向调节片 60、调节阀 50 都是采用工程塑料制成，采用工程塑料起到耐高温功能。在风罩主体 30 下端边缘向外延伸有翻边 301，其可解决放发丝不好放的问题，同时增加外观的美感。

[0030] 本实施方式使用时，把本实施方式的吹风机风罩通过其套接部 70 套接在吹风机上，当吹风机工作后，可通过调节阀 50 来调节所述的风力风向调节片 60。

[0031] 虽然结合附图描述了本实用新型的实施方式，但是本领域的技术人员可以在所附权利要求的范围之内作出各种变形或修改，只要不超过本实用新型的权利要求所描述的保护范围，都应当在本实用新型的保护范围之内。

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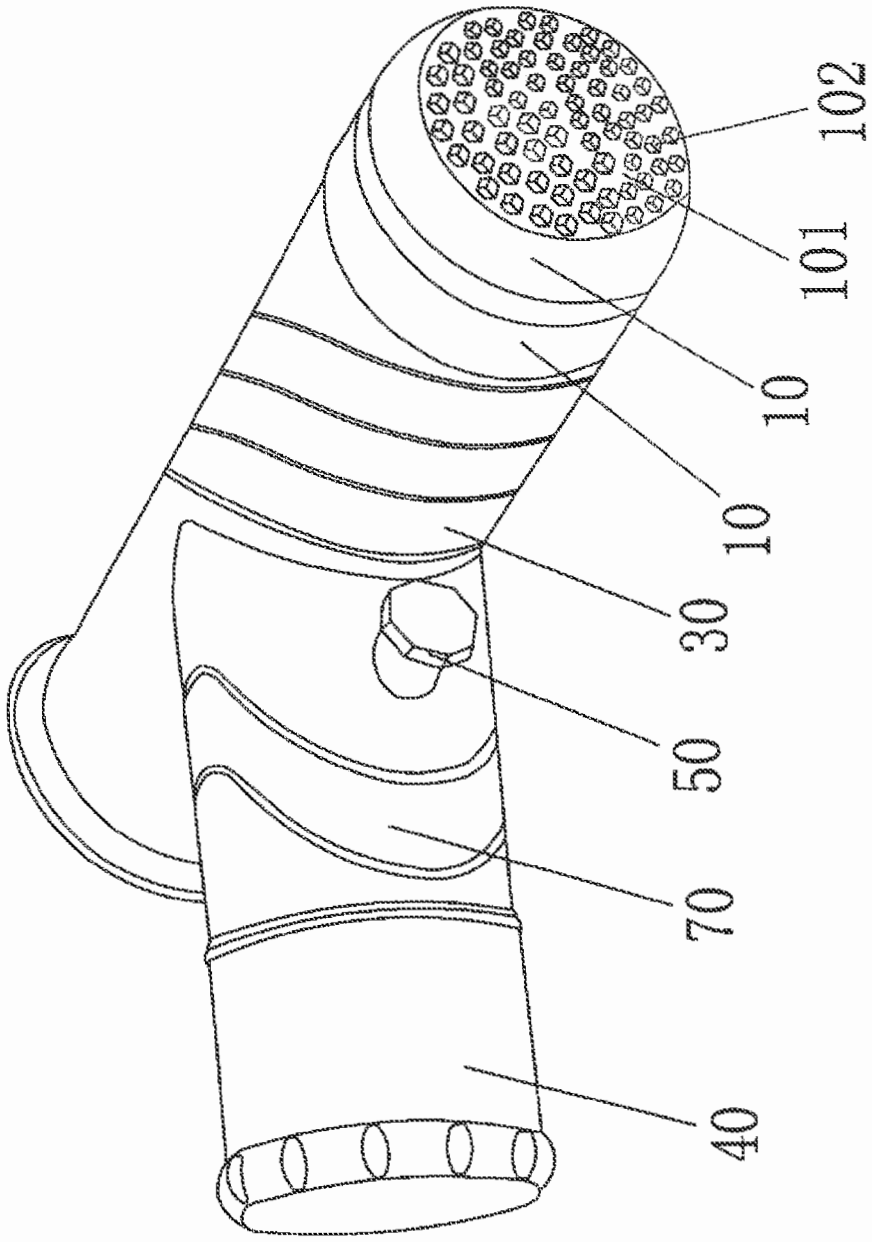


图 1

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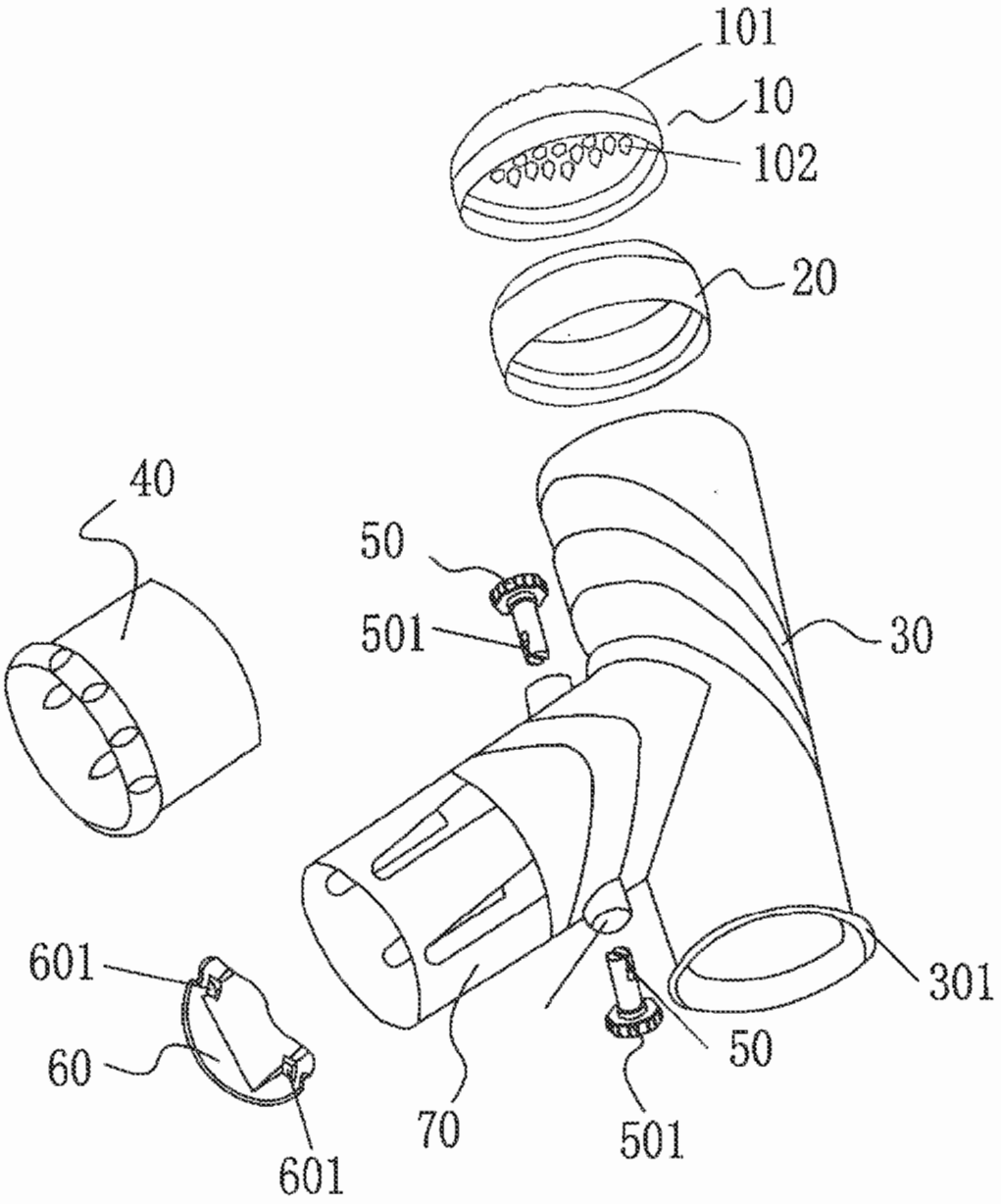


图 2

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(12) UK Patent Application (19) GB (11) 2478927 (13) A

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(22) Date of Filing: 23.03.2010

(51) INT CL:
F24F 13/28 (2006.01) *F04D 25/08* (2006.01)

(56) Documents Cited:
JP S60167897 A JP 110159499 A
US 5094676 A US 4905340 A

(58) Field of Search:
INT CL F04D, F24F
Other: ONLINE: WPI, EPODOC

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United Kingdom

(54) Title of the Invention: A fan
Abstract Title: Portable fan with filter unit

(57) A portable fan, especially a bladeless fan, includes a casing having an air inlet and a filter unit connected to the casing, the filter unit comprising a filter located upstream of the air inlet, and an air outlet connected to the filter unit. There may be connectors to attach the filter to a base and connectors for attaching the filter to the air outlet. Preferably the filter is an annular sleeve which is locatable over an air inlet of the fan and is formed from two annular discs 206, 208 between which the filter, preferably in the form of a radially pleated filter material, is located. The filter may be surrounded by a perforated cylindrical outer cover 204 which is preferably transparent. The fan may be a desk fan, a tower fan or a pedestal fan.

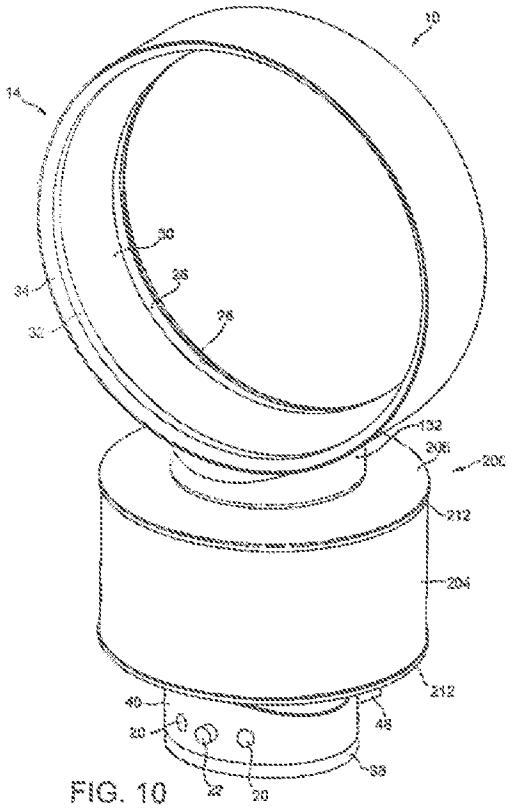


FIG. 10

GB 2478927 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

04 03 11

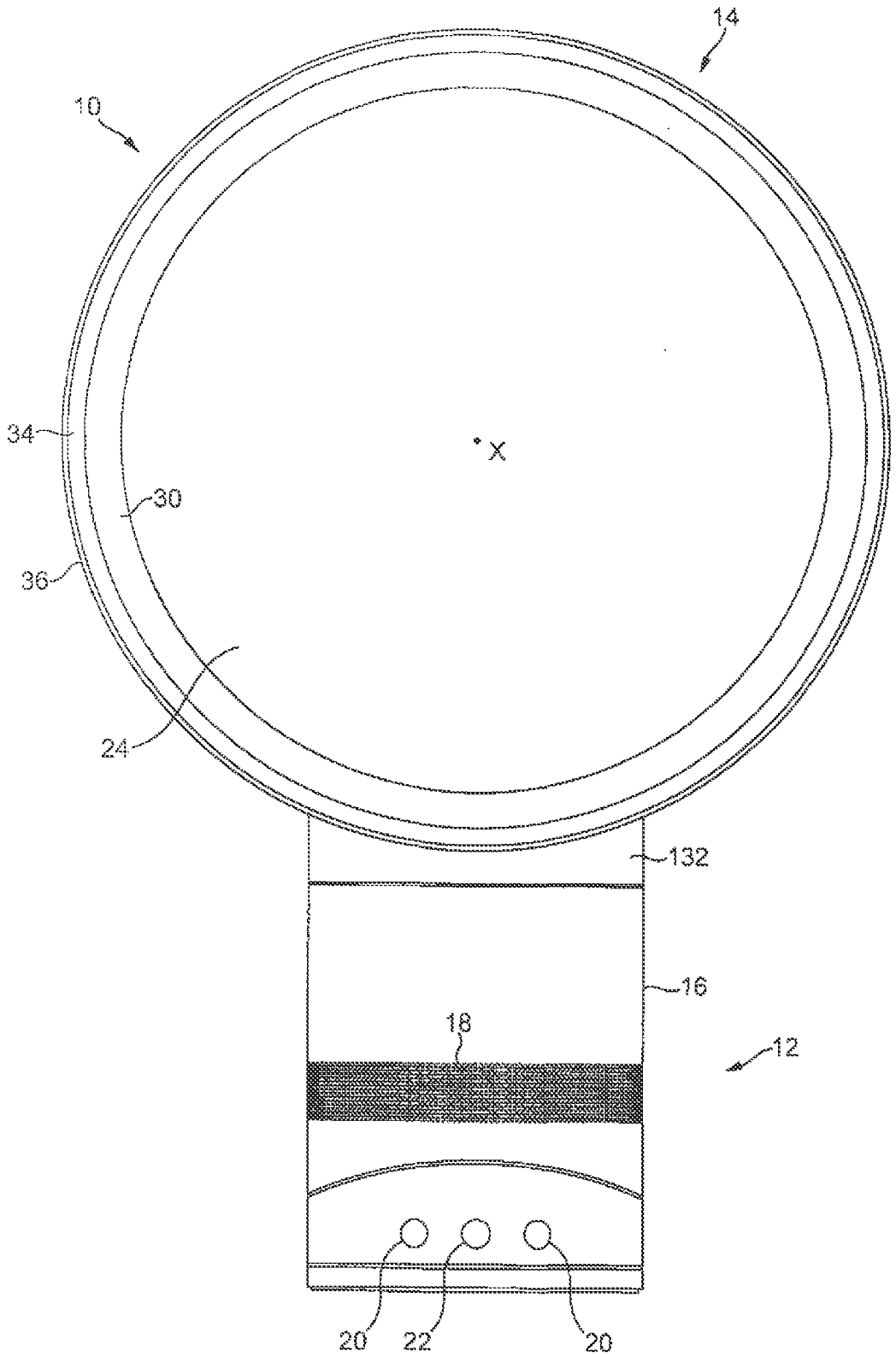


FIG. 1

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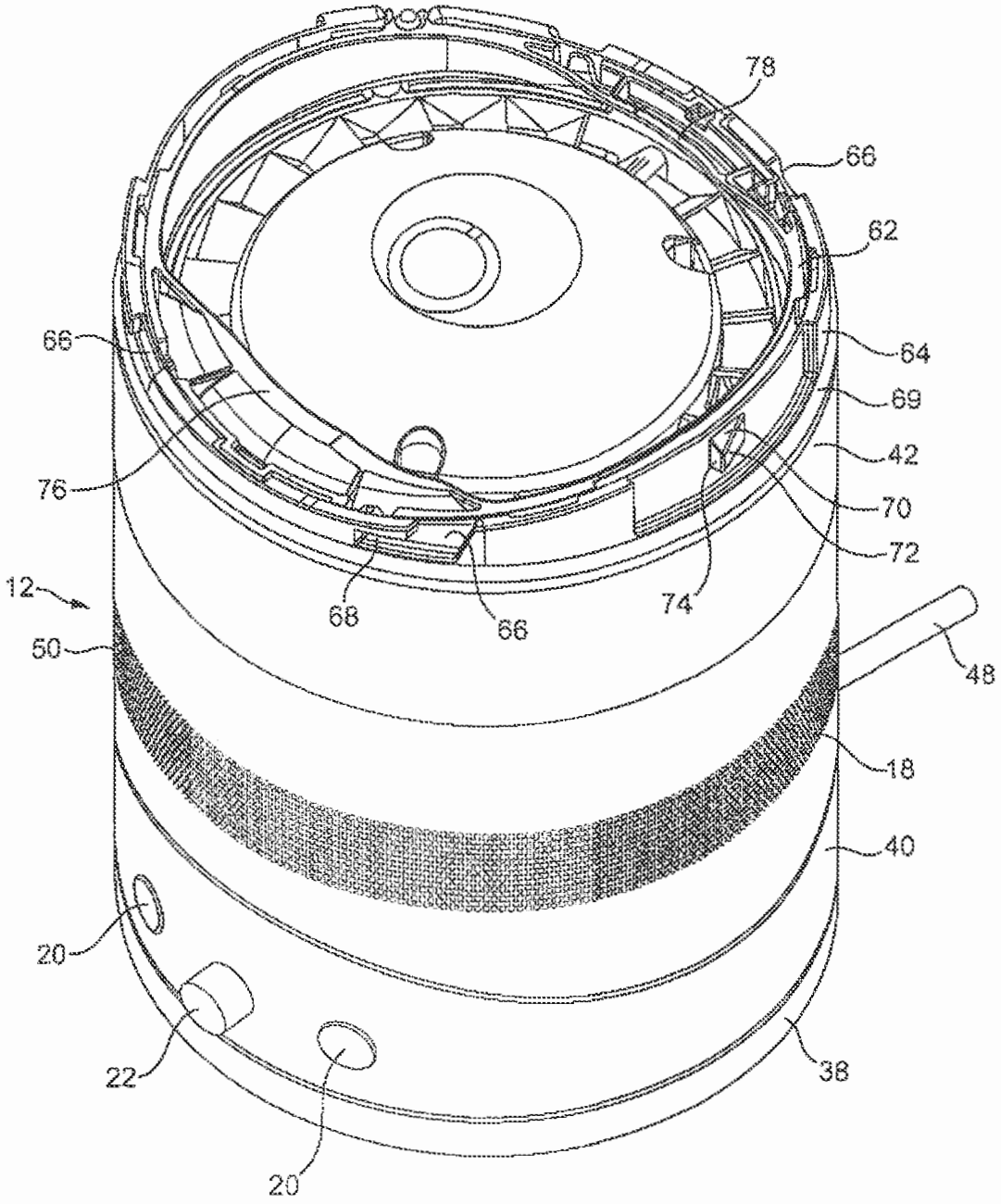


FIG. 2

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04 03 11

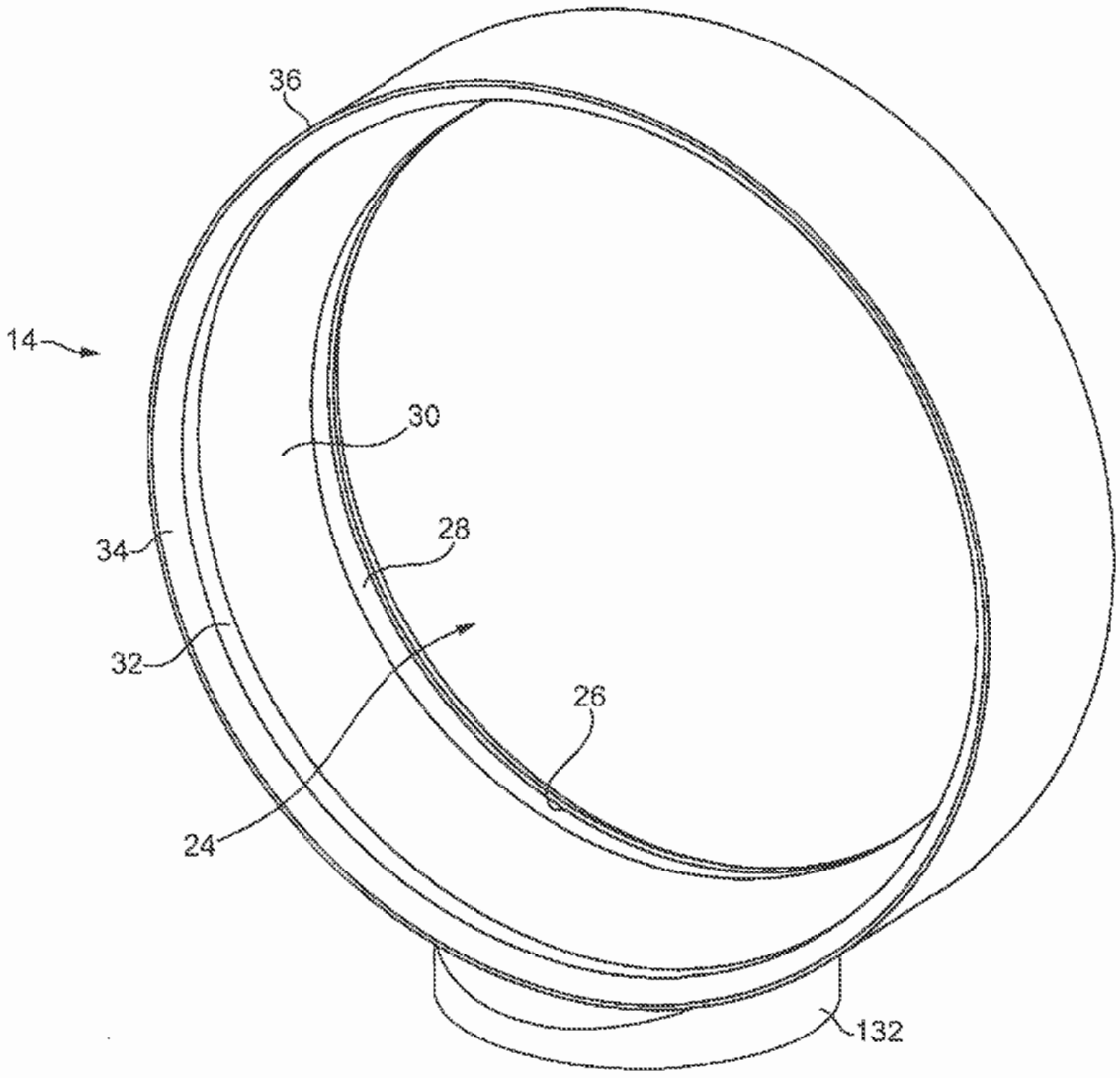


FIG. 3

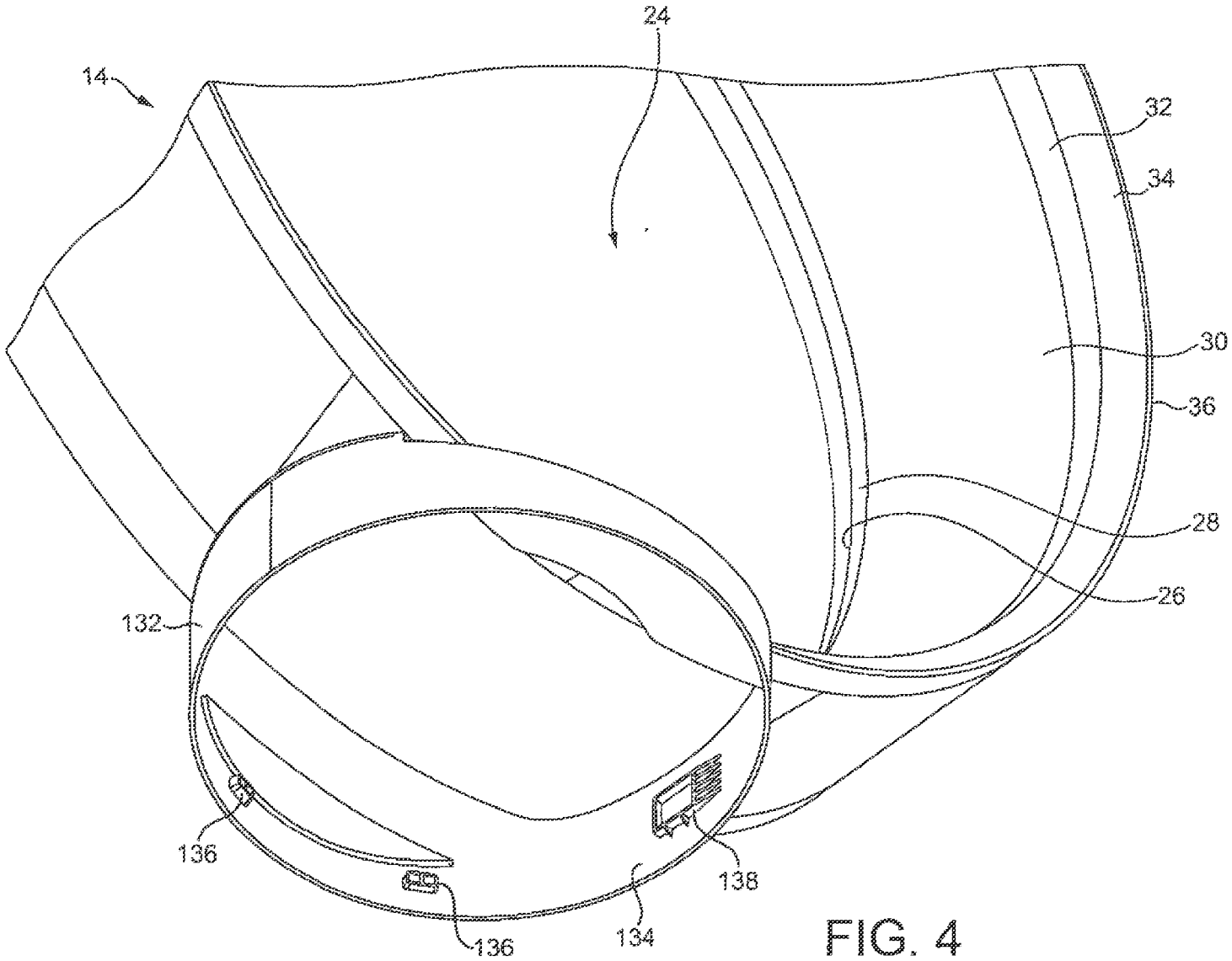


FIG. 4

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04 03 11

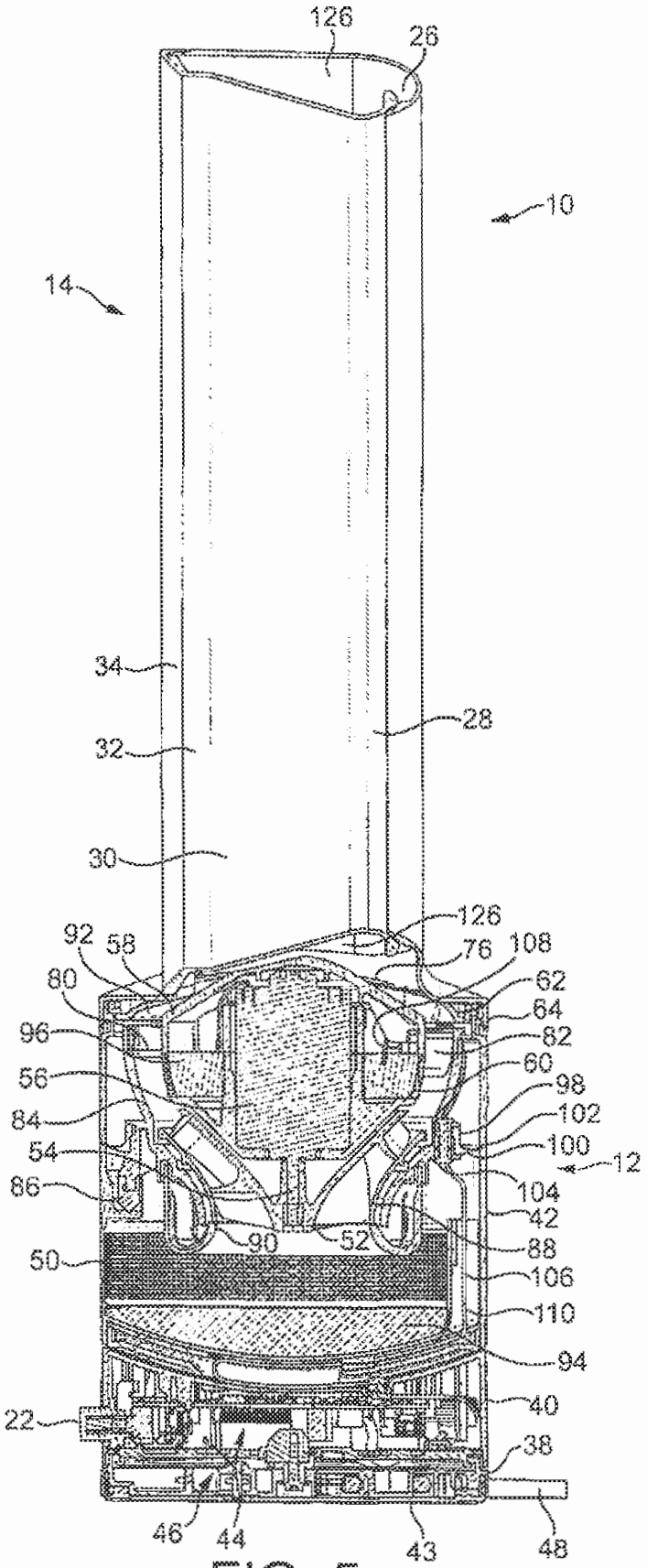


FIG. 5

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04 03 11

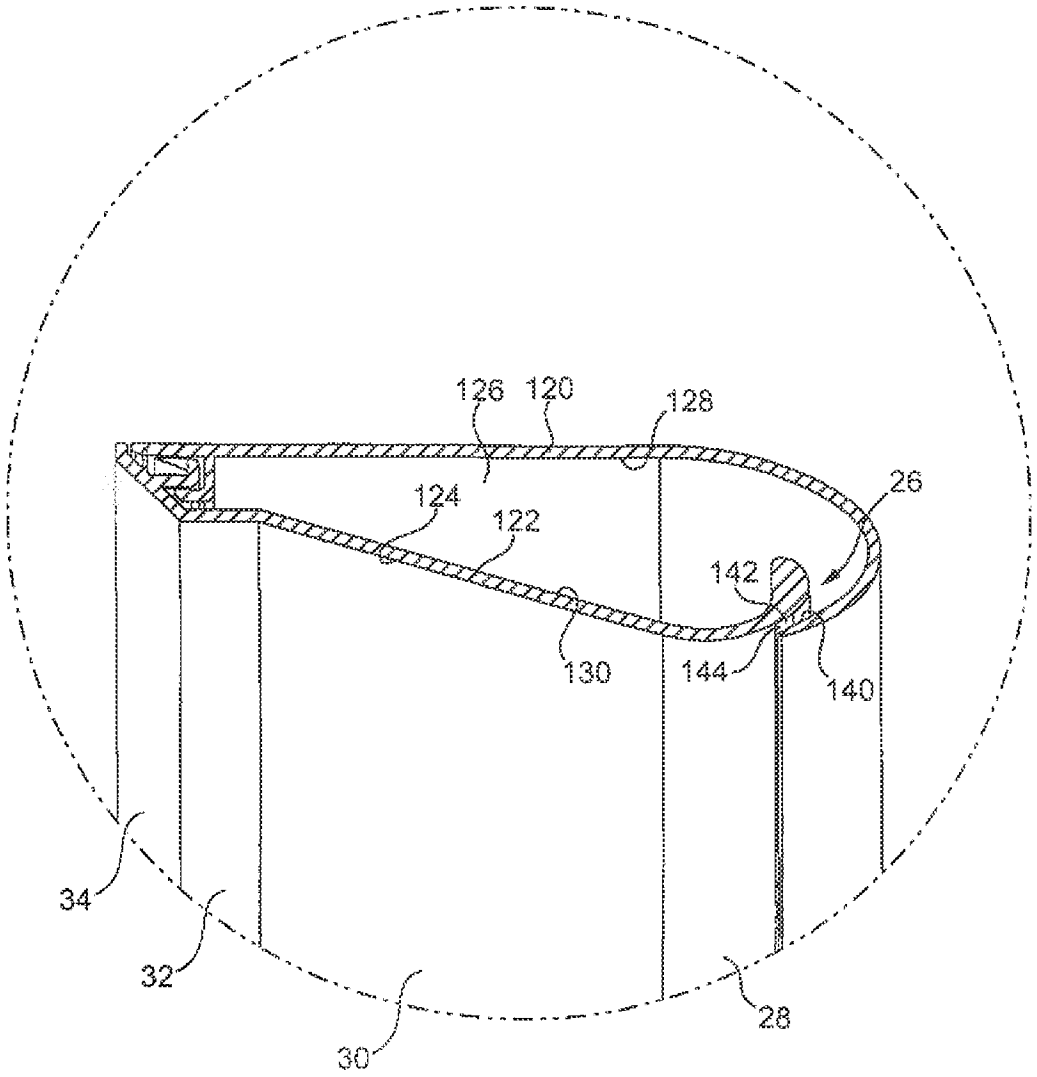


FIG. 6

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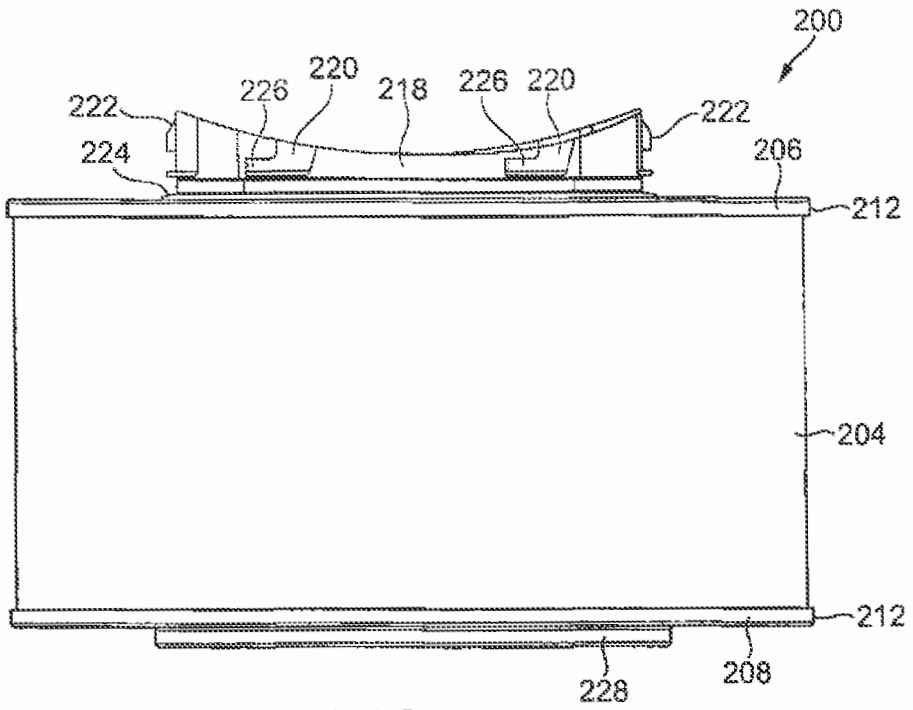


FIG. 7

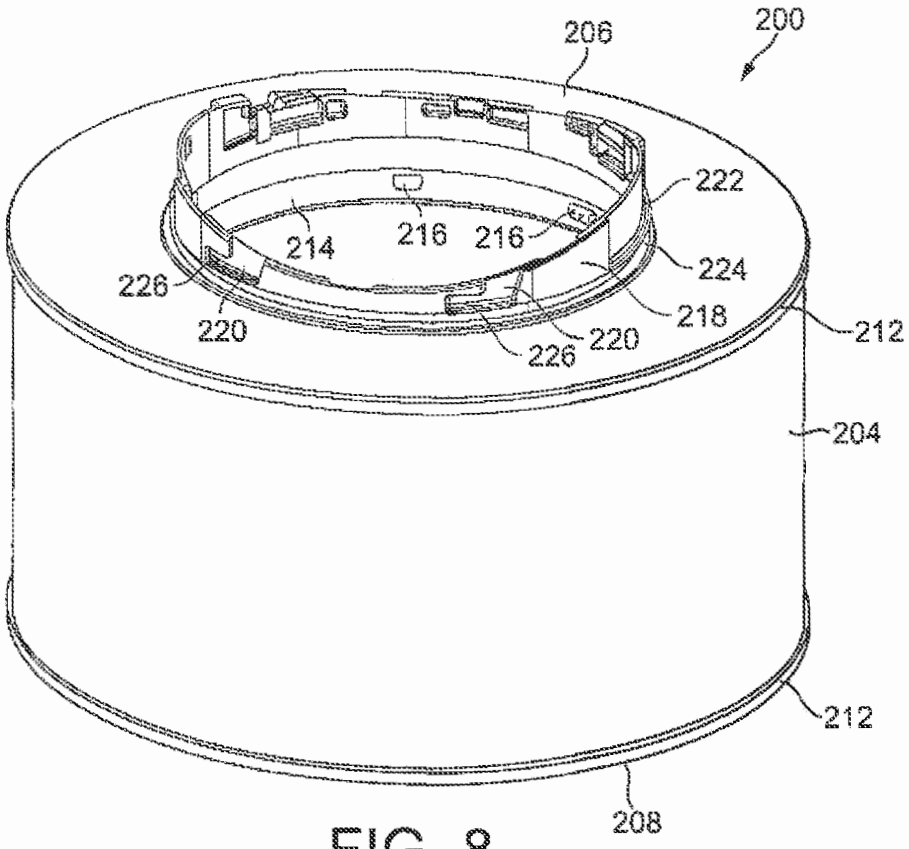


FIG. 8

04 03 11

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04 03 11

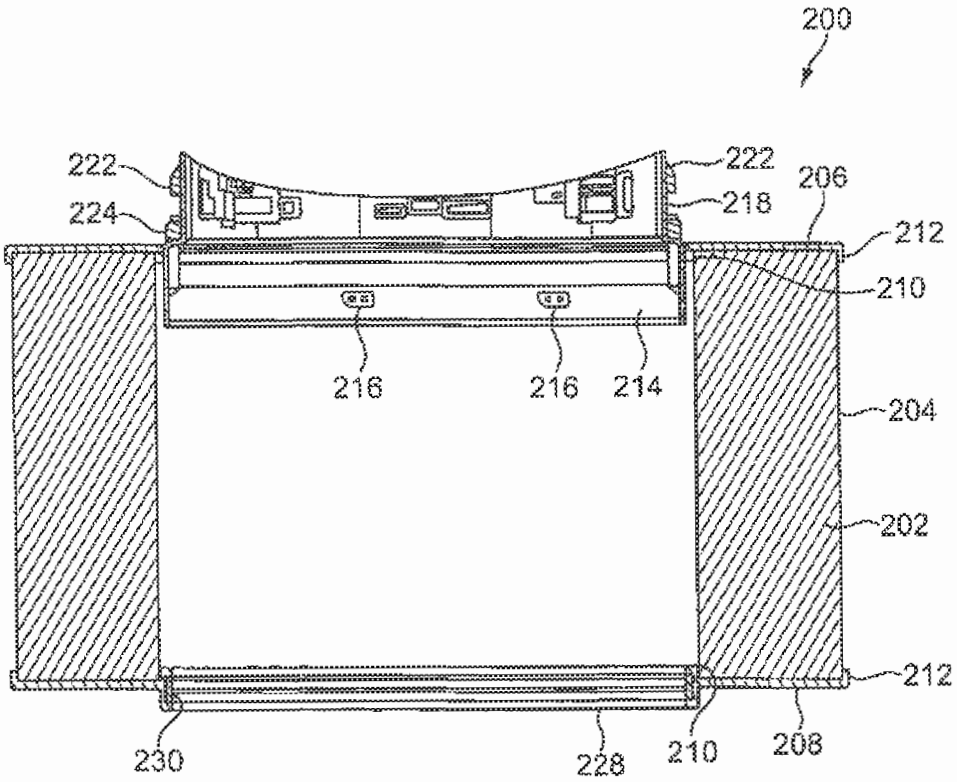


FIG. 9

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04 03 11

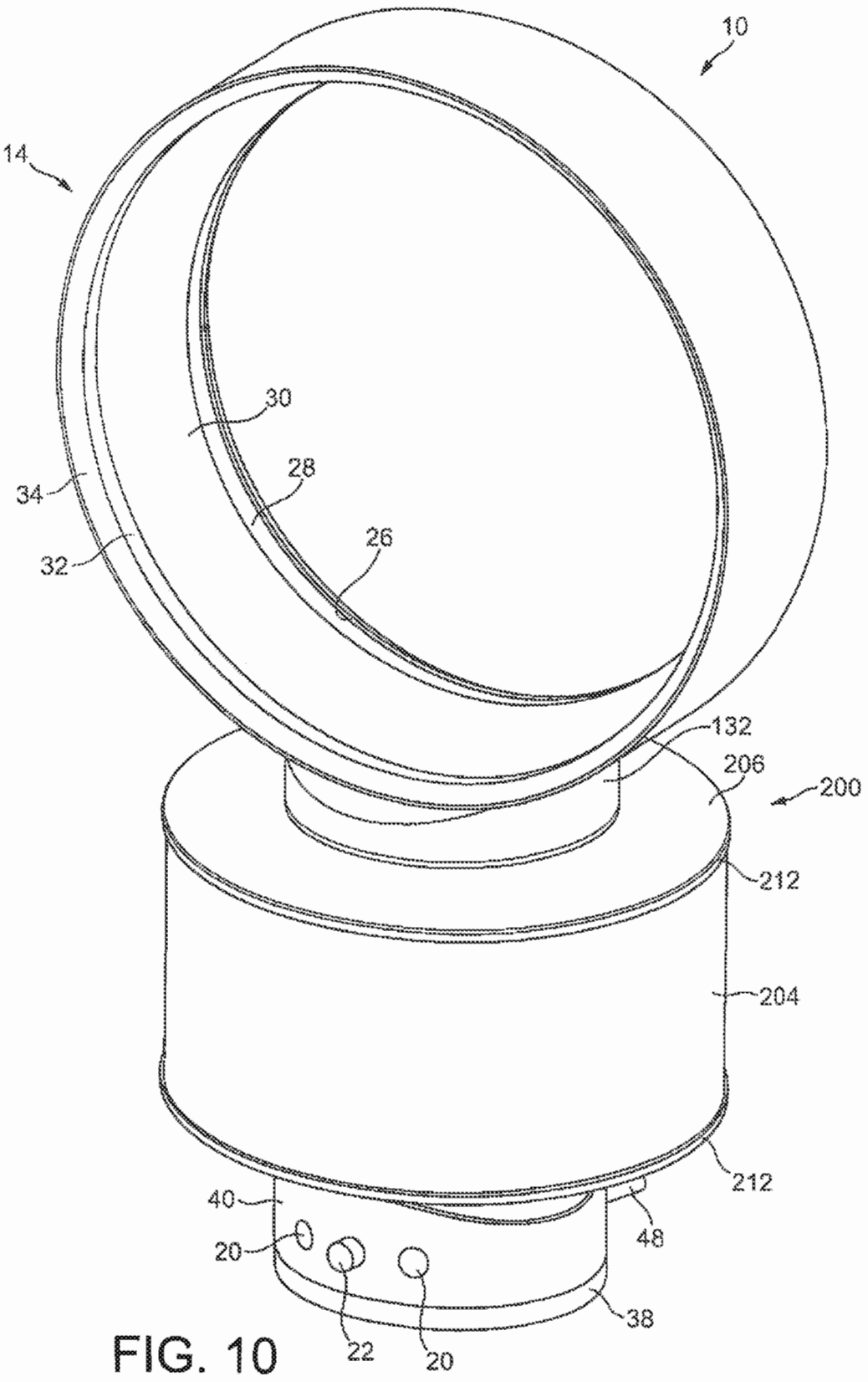


FIG. 10

04 03 11

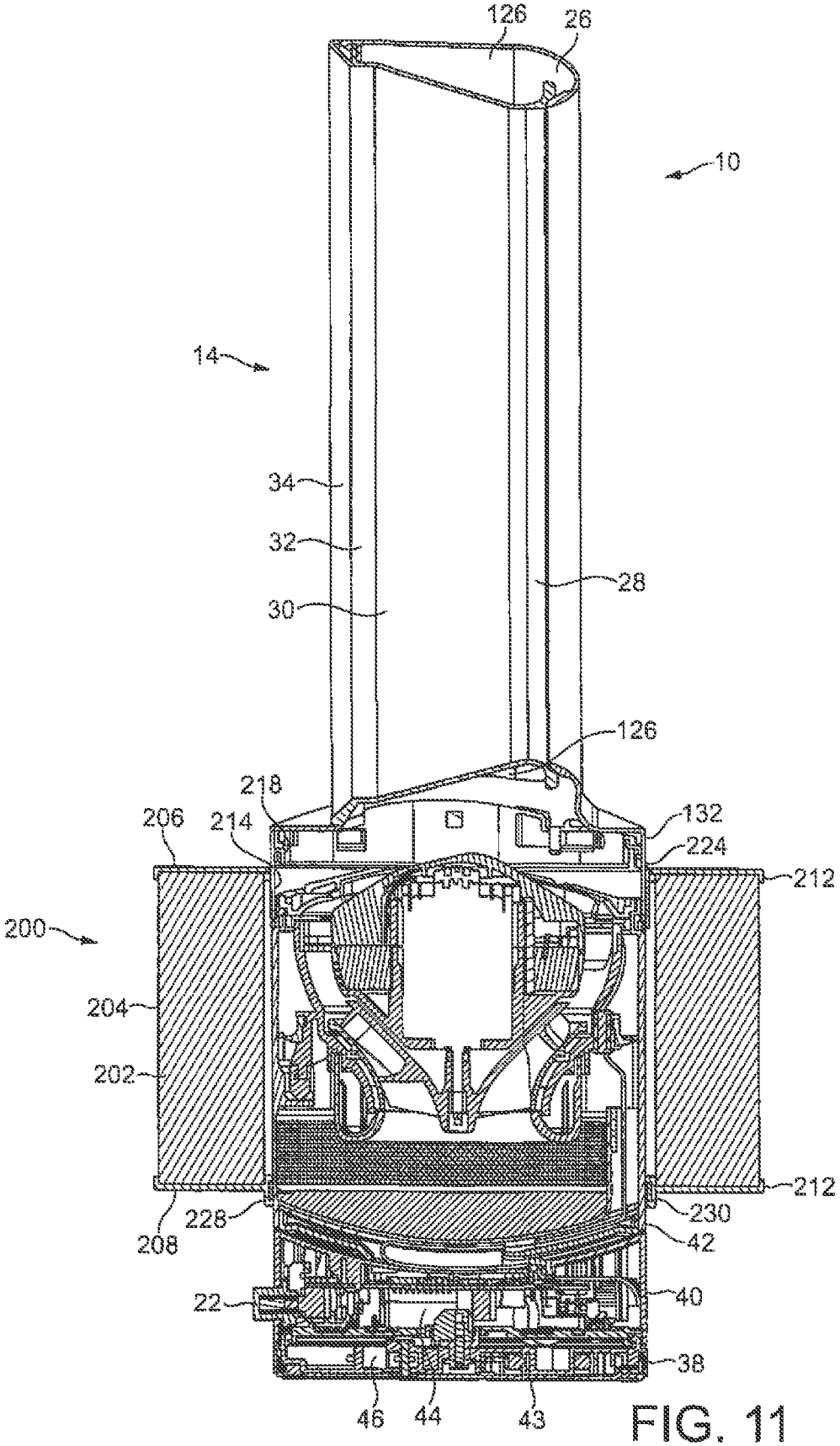


FIG. 11

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A Fan

The present invention relates to a portable fan. Particularly, but not exclusively, the present invention relates to a floor or table-top fan, such as a desk, tower or pedestal fan.

A conventional domestic fan typically includes a set of blades or vanes mounted for rotation about an axis, and drive apparatus for rotating the set of blades to generate an air flow. The movement and circulation of the air flow creates a 'wind chill' or breeze and, as a result, the user experiences a cooling effect as heat is dissipated through convection and evaporation. The blades are generated located within a cage which allows an air flow to pass through the housing while preventing users from coming into contact with the rotating blades during use of the fan.

The use of fans in hospitals to keep patients cool is widespread, both in general wards and in isolation wards. For example, depending on the medical condition of the patient it may be preferable to reduce the body temperature of the patient using a fan rather than by using pharmaceuticals. When a fan is assigned to a patient, generally that fan is treated as an item of medical equipment and so, like other medical equipment, will require frequent cleaning by a nurse or other hospital employee. The cleaning of bladed fans can be time consuming for the employee, as the cage housing the blades of the fan needs to be disassembled before the blades of the fan can be cleaned. This disassembly usually requires the use of a screw driver, which can not be carried by a nurse on a hospital ward. Often, it can be more convenient for the hospital to engage a specialist cleaning company to clean the fan off site, although this can be very expensive.

WO 2009/030879 describes a fan assembly which does not use caged blades to project air from the fan assembly. Instead, the fan assembly comprises a base which houses a motor-driven impeller for drawing a primary air flow into the base, and an annular nozzle connected to the base and comprising an annular slot through which the primary air flow is emitted from the fan. The nozzle defines a central opening through which air

in the local environment of the fan assembly is drawn by the primary air flow emitted from the mouth, amplifying the primary air flow.

The time required to clean of the external surfaces of this type of "bladeless" fan is much shorter than that required to clean a fan having caged blades, as there is no requirement to dismantle any parts of the fan to access any exposed parts of the fan. For example, the external surfaces of the fan may be wiped clean using a cloth. While this level of cleaning may be sufficient for bladeless fans which are assigned to patients on general wards, when the bladeless fan is assigned to a patient in an isolation ward or infection containment ward there remains a need to keep the internal components of the base clean to avoid cross-contamination when the fan is assigned to another patient.

In a first aspect the present invention provides an external accessory for a portable fan, the accessory comprising a high energy particle arrester filter and attachment means for detachably attaching the accessory to the fan.

The accessory is preferably in the form of a disposable filter unit which can be replaced when, for example, the fan is assigned to a different patient, when the fan is moved with the patient from an isolation ward to a general ward, or when the filter has reached the end of a prescribed usage period. This can significantly reduce the costs associated with the use of the fan, as the frequency with which the fan may need to be taken off site for cleaning can be significantly reduced.

The accessory is particular suitable for use with a portable bladeless fan, such as the Dyson Air Multiplier™ fan, in which an impeller for generating an air flow is located within a casing of the fan. In this case, the accessory may be locatable over or around the casing so that the filter is located upstream from the air inlet of the casing to remove airborne particulates from the primary air flow generated by the impeller before the air flow enters the casing. However, the accessory can be used with any fan which generates an air flow of sufficient pressure that the air flow is not choked by the attachment of the accessory to the fan. For example, the accessory may be used with a

fan which is arranged to generate an air flow with a static pressure of at least 150Pa so that the air flow is not choked when the accessory is attached to the fan, and so the present invention also provides an accessory for a fan for generating an air flow with a static pressure of at least 150Pa, the accessory comprising a high energy particle arrester filter and attachment means for detachably attaching the accessory to the fan.

The attachment means are preferably manually operable to allow a user to attach the accessory to the fan, and subsequently detach the accessory from the fan, without the need for a tool.

In addition to a high energy particle arrester (HEPA) filter, the accessory may comprise one or more of a foam, carbon, paper, or fabric filter.

The accessory preferably comprises at least one seal for engaging an outer surface of the fan. This can enable the accessory to form one or more air-tight seals with the fan to ensure that the air flow generated by the fan passes through the filter and not around the filter.

In a preferred embodiment the accessory is in the form of a sleeve which is locatable about an external surface of a fan. Forming the accessory in the form of a sleeve can enable the accessory to be easily pushed or pulled over the fan as required.

The filter preferably has a surface area in the range from 0.5 to 1.5m^2 which is exposed to the air flow generated by the fan. To minimise the volume of the filter, the filter is preferably pleated to form a filter which is substantially annular in shape for surrounding an air inlet of the fan. In this case, the accessory may comprise two annular discs between which the filter is located. These discs can be easily wiped clean during use of the accessory. Each disc may comprise a raised rim extending towards the other disc for retaining the filter between the discs. The filter may be readily adhered to the discs during the construction of the accessory.

The accessory may comprise an outer cover comprising a plurality of apertures through which air enters the accessory. This outer cover can provide a first, relatively course filter of the accessory to prevent airborne objects such as insects or large particles of dust from coming into contact with the filter, and can prevent the filter from being contacted by a user, particularly during the attachment of the filter to the fan, and so prevent damage to the filter. The outer cover is preferably transparent to allow a user to see the amount of dust or debris which has been captured by the filter.

In a second aspect the present invention provides a combination of an accessory as aforementioned and a portable fan. The fan is preferably arranged to generate an air flow having a static pressure of at least 150Pa, more preferably in the range from 250 to 1.5kPa.

Preferably, the fan comprises an air inlet for admitting air into the fan and an air outlet for exhausting air from the fan, with the accessory being attachable to the fan so that the filter is located upstream from the air inlet of the fan. Preferably, the accessory is attachable to the fan so that the filter is located over the air inlet of the fan.

The fan may comprise a base to which the accessory is attachable, the base comprising the air inlet over which the filter is locatable. The air inlet may extend at least partially about the base, and may comprise an array of apertures. The base may be substantially cylindrical in shape. The base of the fan may house means for generating an air flow from the air inlet to the air outlet. The means for generating the air flow preferably comprises an impeller driven by a motor. A diffuser is preferably located downstream from the impeller.

The accessory may be attachable to the portable fan between the base and the air outlet of the fan so that the filter is located upstream of the air inlet of the base.

Part of the accessory may be surrounded by part of the air outlet when the accessory is attached to the fan. For example, the air outlet may comprise a base which is located over part of the accessory when the air outlet is connected to the accessory.

The accessory may comprise a first seal for engaging the base of the fan, and a second seal for engaging the air outlet of the fan so that an air flow is drawn through the filter unit between the seals and through the filter.

The attachment means may comprise means for connecting the accessory to the base, and means for connecting the accessory to the air outlet. The air outlet of the fan is preferably detachably connected to the base of the fan. The air outlet of the fan preferably comprises means for connecting the air outlet to the base, which is preferably substantially the same as the means for connecting the accessory to the base. Similarly, the base of the fan preferably comprises means for connecting the base to the air outlet, which is preferably substantially the same as the means for connecting the accessory to the air outlet. This can simplify the attachment of the accessory to the fan, as the technique for connecting the air outlet to the base is the same as that for connecting the accessory to the base, and for connecting the air outlet to the accessory.

The air outlet may comprise an interior passage for receiving an air flow and a mouth for emitting the air flow. The interior passage may extend about an opening through which air is drawn by the air flow emitted from the mouth.

In a third aspect the present invention provides a portable fan comprising a casing having an air inlet; an air outlet for emitting air from the fan; means for generating an air flow between the air inlet and an air outlet and which has a static pressure of at least 150 Pa downstream from the air generating means, and a filter unit detachably attached to the fan so that a filter of the fan unit is located upstream of the air inlet.

In a fourth aspect the present invention provides a portable fan comprising a casing having an air inlet, a filter unit connected to the casing, the filter unit comprising a filter located upstream from the air inlet, and an air outlet connected to the filter unit.

As mentioned above, the filter unit preferably comprises means for connecting the filter unit to the base, and means for connecting the filter unit to the air outlet. The air outlet preferably comprises means for connecting the air outlet to the base, and the means for connecting the filter unit to the base is preferably substantially the same as the means for connecting the air outlet to the base. The base preferably comprises means for connecting the base to the air outlet, and the means for connecting the filter unit to the air outlet is preferably substantially the same as the means for connecting the base to the air outlet.

In a fifth aspect the present invention provides a portable fan comprising a casing having an air inlet and first connecting means, a filter unit comprising second connecting means for connecting the filter unit to the first connecting means, a filter which is located upstream from the air inlet when the filter unit is connected to the casing, and third connecting means which is substantially the same as the first connecting means, and an air outlet comprising fourth connecting means which is substantially the same as the second connecting means of the filter unit.

Other advantageous features are set out in the subsidiary claims.

Features described above in connection with the first aspect of the present invention are equally applicable to any of the second to fifth aspects of the invention, and vice versa.

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

Figure 1 is a front view of a fan;

Figure 2 is a perspective view of the base of the fan of Figure 1;

Figure 3 is a perspective view of the air outlet of the fan of Figure 1;

Figure 4 is a lower perspective view of a portion of the air outlet of the fan of Figure 1;

Figure 5 is a sectional view of the fan of Figure 1;

Figure 6 is an enlarged view of part of Figure 5;

Figure 7 is a side view of an accessory for attachment to the fan of Figure 1;

Figure 8 is a perspective view, from above, of the accessory of Figure 7;

Figure 9 is a sectional view of the accessory of Figure 7;

Figure 10 is a perspective view of the fan of Figure 1 with the accessory of Figure 7 attached thereto; and

Figure 11 is a sectional view of the fan of Figure 10.

Figure 1 is a front view of a fan 10. The fan 10 is preferably in the form of a bladeless fan 10 comprising a base 12 and an air outlet 14 connected to the base 12. With reference also to Figure 2, the base 12 comprises a substantially cylindrical outer casing 16 having a plurality of air inlets 18 in the form of apertures formed in the outer casing 16 and through which a primary air flow is drawn into the base 12 from the external environment. The base 12 further comprises a plurality of user-operable buttons 20 and a user-operable dial 22 for controlling the operation of the fan 10. In this example the base 12 has a height in the range from 200 to 300 mm, and the outer casing 16 has an external diameter in the range from 100 to 200 mm.

As shown in Figure 3, the air outlet 14 has an annular shape and defines an opening 24. The air outlet 14 has a height in the range from 200 to 400 mm. The air outlet 14 comprises a mouth 26 located towards the rear of the fan 10 for emitting air from the fan 10 and through the opening 24. The mouth 26 extends at least partially about the opening 24, and preferably surrounds the opening 24. The inner periphery of the air outlet 14 comprises a Coanda surface 28 located adjacent the mouth 26 and over which the mouth 26 directs the air emitted from the fan 10, a diffuser surface 30 located downstream of the Coanda surface 28 and a guide surface 32 located downstream of the diffuser surface 30. The diffuser surface 30 is arranged to taper away from the central axis X of the opening 24 in such a way so as to assist the flow of air emitted from the fan 10. The angle subtended between the diffuser surface 30 and the central axis X of the opening 24 is in the range from 5 to 25°, and in this example is around 15°. The guide surface 32 is arranged at an angle to the diffuser surface 30 to further assist the efficient delivery of a cooling air flow from the fan 10. The guide surface 32 is preferably arranged substantially parallel to the central axis X of the opening 24 to present a substantially flat and substantially smooth face to the air flow emitted from the mouth 26. A visually appealing tapered surface 34 is located downstream from the guide surface 32, terminating at a tip surface 36 lying substantially perpendicular to the central axis X of the opening 24. The angle subtended between the tapered surface 34 and the central axis X of the opening 24 is preferably around 45°. The overall depth of the air outlet 14 in a direction extending along the central axis X of the opening 24 is in the range from 100 to 150 mm, and in this example is around 110 mm.

Figure 5 illustrates a sectional view through the fan 10. The base 12 comprises a lower base member 38, an intermediary base member 40 mounted on the lower base member 38, and an upper base member 42 mounted on the intermediary base member 40. The lower base member 38 has a substantially flat bottom surface 43. The intermediary base member 40 houses a controller 44 for controlling the operation of the fan 10 in response to depression of the user operable buttons 20 shown in Figures 1 and 2, and/or manipulation of the user operable dial 22. The intermediary base member 40 may also house an oscillating mechanism 46 for oscillating the intermediary base member 40 and

the upper base member 42 relative to the lower base member 38. The range of each oscillation cycle of the upper base member 42 is preferably between 60° and 120°, and in this example is around 90°. In this example, the oscillating mechanism 46 is arranged to perform around 3 to 5 oscillation cycles per minute. A mains power cable 48 extends through an aperture formed in the lower base member 38 for supplying electrical power to the fan 10.

The upper base member 42 may be tilted relative to the intermediary base member 40 to adjust the direction in which the primary air flow is emitted from the fan 10. For example, the upper surface of the intermediary base member 40 and the lower surface of the upper base member 42 may be provided with interconnecting features which allow the upper base member 42 to move relative to the intermediary base member 40 while preventing the upper base member 42 from being lifted from the intermediary base member 40. For example, the intermediary base member 40 and the upper base member 42 may comprise interlocking L-shaped members.

The upper base member 42 has an open upper end, and comprises an array of apertures 50 which extend at least partially about the upper base member 42. The apertures 50 provide the air inlet 18 of the base 12. The upper base member 42 houses an impeller 52 for drawing the primary air flow through the apertures 50 and into the base 12. Preferably, the impeller 52 is in the form of a mixed flow impeller. The impeller 52 is connected to a rotary shaft 54 extending outwardly from a motor 56. In this example, the motor 56 is a DC brushless motor having a speed which is variable by the controller 44 in response to user manipulation of the dial 22. The maximum speed of the motor 56 is preferably in the range from 5,000 to 10,000 rpm. The motor 56 is housed within a motor bucket comprising an upper portion 58 connected to a lower portion 60. The motor bucket is retained within the upper base member 42 by a motor bucket retainer 62. The upper end of the upper base member 42 comprises a cylindrical outer surface 64. The motor bucket retainer 62 is connected to the open upper end of the upper base member 42, for example by a snap-fit connection. The motor 56 and its motor bucket

are not rigidly connected to the motor bucket retainer 62, allowing some movement of the motor 56 within the upper base member 42.

Returning to Figure 2, the upper end of the upper base member 42 comprises two pairs of open grooves 66 formed by removing part of the outer surface 66 to leave a shaped 'cutaway' portion. The upper end of each of the grooves 66 is in open communication with the open upper end of the upper base member 42. The open groove 66 is arranged to extend downwardly from the open upper end of the upper base member 42. A lower part of the groove 66 comprises a circumferentially extending track 68 having upper and lower portions bounded by the outer surface 66 of the upper base member 42. Each pair of open grooves 66 is located symmetrically about the upper end of the upper base member 42, the pairs being spaced circumferentially from each other. An annular sealing member 69 extends about the outer surface of the upper base member 42, and is located beneath the tracks 68 of the grooves 66.

The cylindrical outer surface 64 of the upper end of the upper base member 42 further comprises a pair of wedge members 70 having a tapered part 72 and a side wall 74. The wedge members 70 are located on opposite sides of the upper base member 42, with each wedge member 70 being located within a respective cutaway portion of the outer surface 64.

The motor bucket retainer 62 comprises curved vane portions 76, 78 extending inwardly from the upper end of the motor bucket retainer 62. Each curved vane 76, 78 overlaps a part of the upper portion 58 of the motor bucket. Thus the motor bucket retainer 62 and the curved vanes 76, 78 act to secure and hold the motor bucket in place during movement and handling. In particular, the motor bucket retainer 62 prevents the motor bucket becoming dislodged and falling towards the air outlet 14 if the fan 10 becomes inverted.

With reference again to Figure 5, one of the upper portion 58 and the lower portion 60 of the motor bucket comprises a diffuser 80 in the form of a stationary disc having spiral

fins 82, and which is located downstream from the impeller 52. One of the spiral fins 82 has a substantially inverted U-shaped cross-section when sectioned along a line passing vertically through the upper base member 42. This spiral fin 82 is shaped to enable a power connection cable to pass through the fin 82.

The motor bucket is located within, and mounted on, an impeller housing 84. The impeller housing 84 is, in turn, mounted on a plurality of angularly spaced supports 86, in this example three supports, located within the upper base member 42 of the base 12. A generally frusto-conical shroud 88 is located within the impeller housing 84. The shroud 88 is shaped so that the outer edges of the impeller 52 are in close proximity to, but do not contact, the inner surface of the shroud 88. A substantially annular inlet member 90 is connected to the bottom of the impeller housing 84 for guiding the primary air flow into the impeller housing 84. The top of the impeller housing 84 comprises a substantially annular air outlet 92 for guiding air flow emitted from the impeller housing 84 towards the air outlet 14.

Preferably, the base 12 further comprises silencing members for reducing noise emissions from the base 12. In this example, the upper base member 42 of the base 12 comprises a disc-shaped foam member 94 located towards the base of the upper base member 42, and a substantially annular foam member 96 located within the impeller housing 84.

A flexible sealing member is mounted on the impeller housing 84. The flexible sealing member inhibits the return of air to the air inlet member 90 along a path extending between the outer casing 16 and the impeller housing 84 by separating the primary air flow drawn in from the external environment from the air flow emitted from the air outlet 92 of the impeller 52 and the diffuser 80. The sealing member preferably comprises a lip seal 98. The sealing member is annular in shape and surrounds the impeller housing 84, extending outwardly from the impeller housing 84 towards the outer casing 16. In the illustrated embodiment the diameter of the sealing member is greater than the radial distance from the impeller housing 84 to the outer casing 16.

Thus the outer portion 100 of the sealing member is biased against the outer casing 16 and caused to extend along the inner face of the outer casing 16, forming a seal. The lip seal 98 of the preferred embodiment tapers and narrows to a tip 102 as it extends away from the impeller housing 84 and towards the outer casing 16. The lip seal 98 is preferably formed from rubber.

The lip seal 98 further comprises a guide portion 104 for guiding a power connection cable 106 to the motor 56. The guide portion 104 of the illustrated embodiment is formed in the shape of a collar and may be a grommet. The electrical cable 106 is in the form of a ribbon cable attached to the motor at joint 108. The electrical cable 106 extending from the motor 56 passes out of the lower portion 60 of the motor bucket through spiral fin 82. The passage of the electrical cable 106 follows the shaping of the impeller housing 84 and the guide portion 104 of the lip seal 98 is shaped to enable the electrical cable 106 to pass through the flexible sealing member. The collar of the lip seal 98 enables the electrical cable 106 to be clamped and held within the upper base member 42. A cuff 110 accommodates the electrical cable 106 within the lower portion of the upper base member 42.

Figure 6 illustrates a sectional view through the air outlet 14. The air outlet 14 comprises an annular outer casing section 120 connected to and extending about an annular inner casing section 122. Each of these sections may be formed from a plurality of connected parts, but in this embodiment each of the outer casing section 120 and the inner casing section 122 is formed from a respective, single moulded part. The inner casing section 122 defines the central opening 24 of the air outlet 14, and has an external peripheral surface 124 which is shaped to define the Coanda surface 28, diffuser surface 30, guide surface 32 and tapered surface 34.

The outer casing section 120 and the inner casing section 122 together define an annular interior passage 126 of the air outlet 14. Thus, the interior passage 126 extends about the opening 24. The interior passage 126 is bounded by the internal peripheral surface 128 of the outer casing section 120 and the internal peripheral surface 130 of the inner

casing section 122. As shown in Figure 4, the outer casing section 120 comprises a base 132 having an inner surface 134. Formed on the inner surface 134 of the base 132 are two pairs of lugs 136 and a pair of ramps 138 for connection to the upper end of the upper base member 42. Each lug 136 and each ramp 138 upstands from the inner surface 134. Thus the base 132 is connected to, and over, the open upper end of the motor bucket retainer 62 and the upper base member 42 of the base 12. The pairs of lugs 136 are located around the outer casing section 120 and spaced from each other so that the pairs of lugs 136 correspond to the spaced arrangement of the pairs of open grooves 66 of the upper end of the upper base member 42 and so that the location of the pair of ramps 138 corresponds to the location of the pair of wedge members 70 of the upper end of the upper base member 42.

The base 132 of the outer casing section 120 comprises an aperture through which the primary air flow enters the interior passage 126 of the air outlet 14 from the upper end of the upper base member 42 and the open upper end of the motor bucket retainer 62.

The mouth 26 of the air outlet 14 is located towards the rear of the fan 10. The mouth 26 is defined by overlapping, or facing, portions 140, 142 of the internal peripheral surface 128 of the outer casing section 120 and the external peripheral surface 124 of the inner casing section 122, respectively. In this example, the mouth 26 is substantially annular and, as illustrated in Figure 4, has a substantially U-shaped cross-section when sectioned along a line passing diametrically through the air outlet 14. In this example, the overlapping portions 140, 142 of the internal peripheral surface 128 of the outer casing section 120 and the external peripheral surface 124 of the inner casing section 122 are shaped so that the mouth 26 tapers towards an outlet 144 arranged to direct the primary flow over the Coanda surface 28. The outlet 144 is in the form of an annular slot, preferably having a relatively constant width in the range from 0.5 to 5 mm. In this example the outlet 144 has a width of around 1.1 mm. Spacers may be spaced about the mouth 26 for urging apart the overlapping portions 140, 142 of the internal peripheral surface 128 of the outer casing section 120 and the external peripheral surface 124 of the inner casing section 122 to maintain the width of the outlet 144 at the desired level.

These spacers may be integral with either the internal peripheral surface 128 of the outer casing section 120 or the external peripheral surface 124 of the inner casing section 122.

Referring to Figures 3 and 4, to attach the air outlet 14 to the base 12, the air outlet 14 is inverted from the orientation illustrated in Figure 4 and the base 132 of the air outlet 14 is located over the open upper end of the upper base member 42. The air outlet 14 is aligned relative to the base 12 so that the lugs 136 of the base 132 of the air outlet 14 are located directly in line with the open upper end of the open grooves 66 of the upper base member 42. In this position the pair of ramps 138 of the base 132 is directly in line with the pair of wedge members 70 of the upper base member 42. The air outlet 14 is then pushed on to the base 12 so that the lugs 136 are located at the base of the open grooves 66. The sealing member 69 of the base 12 engages the inner surface 134 of the base 132 of the air outlet 14 to form an air-tight seal between the base 12 and the air outlet 14.

To secure the air outlet 14 to the base 12, the air outlet 14 is rotated in a clockwise direction relative to the base 12 so that the lugs 136 move along the circumferentially extending tracks 68 of the open grooves 66. The rotation of the air outlet 14 relative to the base 12 also forces the ramps 138 to run up and slide over the tapers 72 of the wedge member 70 through localised elastic deformation of the side wall 64 of the upper base member 42. With continued rotation of the air outlet 14 relative to the base 12, the ramps 138 are forced over the side walls 74 of the wedge members 70. The open upper end of the upper base member 42 relaxes so that the ramps 138 are generally radially aligned with the wedge members 70. Consequently, the side walls 74 of the wedge members 70 prevent accidental rotation of the air outlet 14 relative to the base 12, whereas the location the lugs 136 within the tracks 68 prevents lifting of the air outlet 14 away from the base 12. The rotation of the air outlet 14 relative to the base 12 does not require excessive rotational force and so the assembly of the fan 10 may be carried out by a user.

To operate the fan 10 the user depresses an appropriate one of the buttons 20 on the base 12, in response to which the controller 44 activates the motor 56 to rotate the impeller 52. The rotation of the impeller 52 causes a primary air flow to be drawn into the base 12 through the air inlet 18. Depending on the speed of the motor 56, the primary air flow generated by the impeller 52 may be between 20 and 30 litres per second. The pressure of the primary air flow at the outlet 92 of the base 12 may be at least 150 Pa, and is preferably in the range from 250 to 1.5 kPa. The primary air flow passes sequentially through the impeller housing 84, the upper end of the upper base member 42 and open upper end of the motor bucket retainer 62 to enter the interior passage 126 of the air outlet 14. The primary air flow emitted from the air outlet 92 of the base 12 is generally in an upward and forward direction.

Within the air outlet 14, the primary air flow is divided into two air streams which pass in opposite directions around the central opening 24 of the air outlet 14. Part of the primary air flow entering the air outlet 14 in a sideways direction (generally orthogonal to the axis X) passes into the interior passage 126 in a sideways direction without significant guidance, whereas another part of the primary air flow entering the air outlet 14 in a direction parallel to the axis X is guided by the curved vanes 76, 78 of the motor bucket retainer 62 to enable the air flow to pass into the interior passage 126 in a sideways direction. As the air streams pass through the interior passage 126, air enters the mouth 26 of the air outlet 14. The air flow into the mouth 26 is preferably substantially even about the opening 24 of the air outlet 14. Within each section of the mouth 26, the flow direction of the portion of the air stream is substantially reversed. The portion of the air stream is constricted by the tapering section of the mouth 26 and emitted through the outlet 98.

The primary air flow emitted from the mouth 26 is directed over the Coanda surface 28 of the air outlet 14, causing a secondary air flow to be generated by the entrainment of air from the external environment, specifically from the region around the outlet 98 of the mouth 26 and from around the rear of the air outlet 14. This secondary air flow passes through the central opening 24 of the air outlet 14, where it combines with the

primary air flow to produce a total air flow, or air current, projected forward from the air outlet 14. Depending on the speed of the motor 56, the mass flow rate of the air current projected forward from the fan 10 may be in the range from 300 to 400 litres per second, and the maximum speed of the air current may be in the range from 2.5 to 4 m/s.

The even distribution of the primary air flow along the mouth 26 of the air outlet 14 ensures that the air flow passes evenly over the diffuser surface 30. The diffuser surface 30 causes the mean speed of the air flow to be reduced by moving the air flow through a region of controlled expansion. The relatively shallow angle of the diffuser surface 30 to the axis X of the opening 24 allows the expansion of the air flow to occur gradually. A harsh or rapid divergence would otherwise cause the air flow to become disrupted, generating vortices in the expansion region. Such vortices can lead to an increase in turbulence and associated noise in the air flow which can be undesirable, particularly in a domestic product such as a fan. The air flow projected forwards beyond the diffuser surface 30 can tend to continue to diverge. The presence of the guide surface 32 extending substantially parallel to the central axis X of the opening 30 further converges the air flow. As a result, the air flow can travel efficiently out from the air outlet 14, enabling the air flow can be experienced rapidly at a distance of several metres from the fan 10.

Figure 7 to 9 illustrate an external accessory for the fan 10. The accessory is in the form of a filter unit 200 which is detachably attachable to the fan 10 to allow the filter unit 200 to be removed for cleaning or replacement.

The filter unit 200 is in the form of a generally cylindrical sleeve which is locatable around the upper base member 42 of the base 12 so that the filter unit 200 is located over the air inlet 18 of the fan 10, as illustrated in Figures 10 and 11. This allows the filter unit 200 to remove airborne particles from the primary air flow generated by the fan 10 before the primary air flow enters the base 12 of the fan 10.

The filter unit 200 comprises a generally annular filter 202 for removing airborne particles from the primary air flow. The filter 202 is preferably in the form of a radially pleated high energy particle arrester (HEPA) filter. The filter 202 has a surface area that is exposed to the incoming primary air flow generated by the fan which is in the range from 0.5 to 1.5 m^2, and in this example is around 1.1 m^2. The filter 202 is surrounded by a cylindrical outer cover 204, which is preferably formed from plastics material, to protect the filter 202 and thus allows a user to handle the filter unit 200 without contacting the filter 202. The cover 204 is preferably transparent to allow a user to examine the state of the filter 202 during use or after a period of use. The cover 204 comprises a plurality of apertures (not shown) through which the primary air flow enters the filter unit 200, and thus provides a relatively coarse first stage of filtration of the filter unit 200 to prevent relatively large airborne objects or insects from entering the filter unit 200. The filter unit 200 may further comprise additional filter media between the filter 202 and the cover 204, or downstream from the filter 202. For example, this additional filter media may comprise one or more of foam, carbon, paper, or fabric.

The filter 202 and the cover 204 are sandwiched between two annular plates 206, 208 of the filter unit 200. Each plate 206, 208 includes a circular inner rim 210 and a circular outer rim 212 which both extend partially towards the other plate 206, 208. The filter 202 and the cover 204 are located between the rims 210, 212 of the plates 206, 208, and are preferably secured to the plates 206, 208 using an adhesive.

The upper plate 206 comprises a lower collar 214 which is located radially inwardly from the inner rim 210 of the upper plate 206. The lower collar 214 extends axially downwards from the upper plate 206. The inner diameter of the lower collar 214 is substantially the same as the inner diameter of the base 132 of the air outlet 14 of the fan 10. Similar to the base 132 of the air outlet 14, the inner surface of the lower collar 214 comprises two pairs of lugs 216 and a pair of ramps (not shown) for connection to the upper end of the upper base member 42 of the base 12 of the fan 10. The shape of the lugs 216 and the ramps of the lower collar 214, and the angular spacing between the

lugs 216 and the ramps of the lower collar 214, are substantially identical to those of the lugs 136 and ramps 138 of the base 132 of the air outlet 14.

The upper plate 206 further comprises an upper collar 218 which is located radially inwardly from the lower collar 214. The upper collar 218 extends axially upwards from the inner circumferential periphery of the upper plate 208. The outer diameter of the upper collar 218 is substantially the same as the outer diameter of the side wall 64 of the open upper end of the upper base member 42. Similar to the upper base member 42, the upper collar 218 comprises two pairs of open grooves 220 and a pair of wedge members 222. The open grooves 220 are substantially identical to the open grooves 66 of the side wall 64 of the upper base member 42, and the spacing between the open grooves 220 is substantially the same as that between the open grooves 66. The wedge members 222 are substantially identical to the wedge members 70 of the side wall 64 of the upper base member 42, and the spacing between the wedge members 222 is substantially the same as that between the wedge members 70. A first annular sealing member 224 of the filter unit 200 extends about the outer surface of the upper collar 218, and is located beneath the circumferentially extending tracks 226 of the grooves 220.

The collars 214, 218 are preferably integral with the upper plate 206, which is preferably formed from plastics material.

The lower plate 208 includes a relatively small collar 228 which is extends axially downwardly from the inner rim 210 of the lower plate 208. The collar 228 comprises a circumferentially extending groove located on its inner surface. A second annular sealing member 230 of the filter unit 200 is located within this groove. The collar 228 is preferably integral with the lower plate 208, which also preferably formed from plastics material.

To attach the filter unit 200 to the fan 10, first the air outlet 14 is detached from the base 12. To detach the air outlet 14 from the base 12, the air outlet 14 is twisted relative the base 12 in the opposite direction (anti-clockwise) to that for attaching the air outlet 14 to

the base 12. With a suitable torque applied manually by the user, the side wall 66 of the upper end of the upper base member 42 is again caused to flex locally radially inwardly. This localised deformation of the upper base member 42 allows the ramp 138 to be rotated over the wedge members 70, while the lugs 136 are moved simultaneously along the tracks 68 of the grooves 66. Once the lugs 136 reach the ends of the tracks 68, the air outlet 14 may be lifted from the base 12.

Although the detachment of the air outlet 14 from the base 12 requires a greater force to be applied to the air outlet 14 than the force required for attachment, the resilience of the side wall 66 of the upper base member 42 is selected so that the detachment of the air outlet 14 may be performed manually

The user then attaches the filter unit 200 to the base 12. The technique for attaching the filter unit 200 to the base 12 is essentially the same as that for attaching the air outlet 14 to the base 12. The user locates the open lower end of the collar 228 of the lower plate 208 over the open upper end of the upper base member 42, and lowers the filter unit 200 around the base 12. When the bottom end of the lower collar 214 of the upper plate 206 is located immediately above the open upper end of the upper base member 42, the user rotates the filter unit 200 until the lugs 216 of the filter unit 200 are located directly in line with the open upper end of the open grooves 66 of the upper base member 42. In this position the pair of ramps of the filter unit is directly in line with the pair of wedge members 70 of the upper base member 42. The filter unit 200 is then pushed further on to the base 12 so that the lugs 216 of the filter unit 200 are located at the base of the open grooves 66 of the base 12. To secure the filter unit 200 to the base 12, the filter unit 200 is rotated in a clockwise direction relative to the base 12 so that the lugs 216 move along the circumferentially extending tracks 68 of the open grooves 66. The rotation of the filter unit 200 relative to the base 12 also forces the ramps to run up and slide over the tapers 72 of the wedge members 70 through localised elastic deformation of the side wall 64 of the upper base member 42. With continued rotation of the filter unit 200 relative to the base 12, the ramps are forced over the side walls 74 of the wedge members 70. The open upper end of the upper base member 42 relaxes so that the

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ramps are generally radially aligned with the wedge members 70. Consequently, the side walls 74 of the wedge members 70 prevent accidental rotation of the filter unit 200 relative to the base 12, whereas the location the lugs 216 within the tracks 68 prevents lifting of the filter unit 200 away from the base 12.

As shown in Figure 11, when the filter unit 200 is attached to the base 12 the second sealing member 230 of the filter unit 200 is located beneath the air inlet 18 of the base 12, and engages the outer surface of the base 12 to form an air-tight seal between the base 12 and the filter unit 200. As also shown in Figure 10, the buttons 22 and user operable dial 22 of the base 12 remain accessible by the user when the filter unit 200 is attached to the base 12.

The air outlet 14 is then attached to the filter unit 200. The attachment of the air outlet 14 to the filter unit 200 is essentially the same as the attachment of the air outlet 14 to the base 12. The base 132 of the air outlet 14 is located over the upper collar 218 of the filter unit 200, and the air outlet 14 is aligned relative to the base 12 so that the lugs 136 of the base 132 of the air outlet 14 are located directly in line with the open upper end of the open grooves 220 of the filter unit 200. The air outlet 14 is then pushed on to the filter unit 200 so that the lugs 136 are located at the base of the open grooves 220. The first sealing member 224 of the filter unit 200 engages the inner surface 134 of the base 132 of the air outlet 14 to form an air-tight seal between the filter unit 200 and the air outlet 14. Again, to secure the air outlet 14 to the filter unit 200 the air outlet 14 is rotated in a clockwise direction relative to the filter unit 200 so that the lugs 136 move along the circumferentially extending tracks 226 of the open grooves 220 of the filter unit 200. The rotation of the air outlet 14 relative to the filter unit 200 also forces the ramps 138 to run up and slide over the tapers of the wedge members 222 of the filter unit 200 through localised elastic deformation of the upper collar 218. With continued rotation of the air outlet 14 relative to the filter unit 200, the ramps 138 are forced over the side walls of the wedge members 220. The upper collar 218 relaxes so that the ramps 138 are generally radially aligned with the wedge members 220. Consequently, the side walls of the wedge members 200 prevent accidental rotation of the air outlet 14

relative to the filter unit 200, whereas the location the lugs 136 within the tracks 226 of the grooves 200 prevents lifting of the air outlet 14 away from the filter unit 200.

The assembled combination of the fan 10 and the filter unit 200 is shown in Figures 10 and 11. The air-tight seals that the filter unit 200 makes with the base 12 and the air outlet 14 force the primary air flow to pass through the filter 202 of the filter unit 200 to remove airborne particulates from the primary air flow before it enters the base 12. In addition to purifying the air in the local environment of the fan 10, the removal of airborne particulates from the primary air flow before it enters the base 12 can significantly reduce the rate at which dust and debris can build-up on the internal components of the fan 10, thereby reducing the frequency at which the fan 10 needs to be cleaned. The filter unit 200 may be easily replaced for cleaning or replacement by detaching the air outlet 14 from the filter unit 200, which is performed in the same manner as the removal of the air outlet 14 from the base 12, and subsequently detaching the filter unit 200 from the base 12. This can performed quickly and easily without the use of any tools. When the use of the filter unit 200 is no longer required, the filter unit 200 can be rapidly removed from the fan 10 by detaching the filter unit 200 from the base 12, and re-attaching the air outlet 14 directly to the base 12.

CLAIMS

1. A portable fan comprising a casing having an air inlet, a filter unit connected to the casing, the filter unit comprising a filter located upstream of the air inlet, and an air outlet connected to the filter unit.

2. A fan as claimed in claim 1, wherein the filter unit comprises means for connecting the filter unit to the base, and means for connecting the filter unit to the air outlet.

3. A fan as claimed in claim 2, wherein the air outlet comprises means for connecting the air outlet to the base, and wherein the means for connecting the filter unit to the base is substantially the same as the means for connecting the air outlet to the base.

4 A fan as claimed in claim 2 or claim 3, wherein the base comprises means for connecting the base to the air outlet, and the means for connecting the filter unit to the air outlet is substantially the same as the means for connecting the base to the air outlet.

5. A portable fan comprising a casing having an air inlet and first connecting means, a filter unit comprising second connecting means for connecting the filter unit to the first connecting means, a filter which is located upstream from the air inlet when the filter unit is connected to the casing, and third connecting means which is substantially the same as the first connecting means, and an air outlet comprising fourth connecting means which is substantially the same as the second connecting means of the filter unit.

6. A fan as claimed in any of the preceding claims, wherein the casing houses means for generating an air flow from the air inlet to the air outlet.

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7. A fan as claimed in any of the preceding claims, wherein the filter unit comprises at least one seal for engaging an outer surface of the casing.

8. A fan as claimed in any of the preceding claims, wherein the filter extends about the casing when the filter unit is connected to the casing.

9. A fan as claimed in any of the preceding claims, wherein the filter is substantially annular in shape.

10. A fan as claimed in claim 9, wherein the filter unit comprises two annular discs between which the filter is located.

11. A fan as claimed in claim 10, wherein each disc comprises a raised rim extending towards the other disc for retaining the filter between the discs.

12. A fan as claimed in claim 10 or claim 11, wherein the filter is adhered to the discs.

13. A fan as claimed in any of the preceding claims, wherein the filter unit comprises an outer cover comprising a plurality of apertures.

14. A fan as claimed in any of the preceding claims, wherein the air inlet extends at least partially about the casing.

15. A fan as claimed in any of the preceding claims, wherein the air inlet comprises an array of apertures.

16. A fan as claimed in any of the preceding claims, wherein the casing is substantially cylindrical in shape.

17. A fan as claimed in any of the preceding claims, wherein the filter unit comprises a first seal for engaging the casing, and a second seal for engaging the air outlet.

18. A fan as claimed in any of the preceding claims, wherein the air outlet comprises an interior passage for receiving an air flow from the casing, and a mouth for emitting the air flow.

19. A fan as claimed in claim 18, wherein the interior passage extends about an opening through which air is drawn by the air flow emitted from the mouth.

20. A portable fan substantially as herein described with reference to the accompanying drawings.

Application No: GB1004814.8 **Examiner:** Kingsley Robinson

Claims searched: 1-20 **Date of search:** 20 May 2010

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X,Y	X: 1, 2, 6-9, 13, 14, 16, 18. Y:19,	US4905340 A (GUTSCHMIT) See especially filter 12 shown on the figures.
X	1, 6, 7, 13, 16, 18,	US5094676 A (KARBACHER) See especially filter 40, 42, 44.
X	1, 6, 8, 9, 13, 14, 15.	JP11159499 A (NOMURA) See especially figures, EPODOC Abstract and WPI Abstract Accession No. 1999-401252 [34].
Y	19	JP56167897 A (TOKYO SHIBAURA ELECTRIC) See especially figures and EPODOC Abstract.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC[X] :

Worldwide search of patent documents classified in the following areas of the IPC

F04D; F24F

The following online and other databases have been used in the preparation of this search report

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(54) Nozzle for blow dryer

(57) A nozzle for mounting on a blow dryer includes a group of sleeves and a mounting base. Each of the sleeves has a hollow structure defining an air channel and a plurality of openings communicating with the air channel. The group of sleeves is lined up end to end so that the air channels within the sleeves are communicated with each other. The mounting base is constructed in circular shape, wherein the mounting base has a plurality of retention grooves provided on an inner surface at a first end thereof for detachably engaging with an outlet of the blow dryer, wherein a second end of the mounting base is connected to a proximal end of the group of sleeves and a clipper for clipping a bundle of hair, wherein the clipper is mounted to a distal end of the group of sleeves.

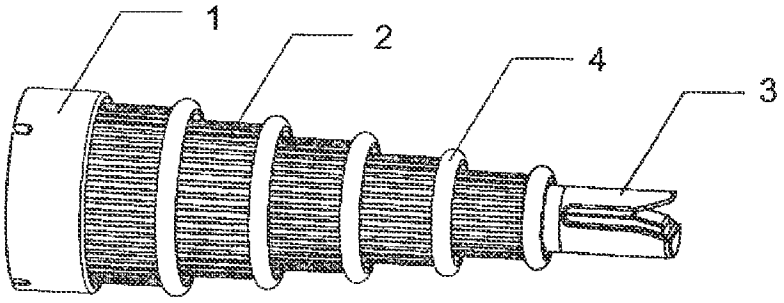


Fig. 1

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Description

Field of Invention

[0001] The present invention relates to a nozzle for a blow dryer, more particularly to a nozzle providing multi-direction air blow and preventing the hair from slipping off during application.

Description of Related Arts

[0002] A blow dryer or hair dryer is a necessity in our daily life; a conventional blow dryer consists essentially of a housing, a fan motor and a heating coil. The housing comprises a tubular body having an inlet provided at a first end thereof and an outlet provided at a second end thereof, wherein at the first end, the blow dryer further comprises a mesh filter for filtering a stream of air entering into the tubular body through the inlet. The air is drawn and blown by the rotation of the fan blades and is delivered along the hollow tubular body to the outlet, and the air can be heated by the heating coil provided at the outlet which is electrically connected to a switch. The switch is provided on the housing to control the alternation of cool air, hot air and volume speed. Generally, the conventional blow dryer is mounted with a nozzle, which has a flat outlet, a circular outlet, and the like, for diffusing the air, but the current nozzle hasn't solved the problem that the hair is easy to slip off during drying with the blow dryer.

[0003] When the blow dryer is in use, a user often has to grasp a bundle of hair with one hand, especially a root portion of the hair, and uses another hand to hold the blow dryer to blow air towards the bundle of hair. However when the user uses relatively hot air to dry the hair, the hot air will inevitably have contact with the hair grasping hand, resulting in a burnt to this hand. What's more, since the nozzle only has one outlet providing a stream of hot air in a single direction, the stream of hot air cannot dry a bundle of hair which is relatively heavy. And this disadvantage will be manifested particularly when the blow dryer is used for hairstyling that, since the hair cannot be dried quickly, the desired hairstyle is hard to achieve and the hair is also easy to slip off.

Summary of the Present Invention

[0004] The object of the present invention is to provide a nozzle for a blow dryer, wherein the nozzle comprises a group of sleeves having a plurality of openings provided along an outer surface thereof for providing multi-direction air blow, so that it is convenient to dry and style the hair of a user.

[0005] Another object of the present invention is to provide a nozzle for a blow dryer, wherein the nozzle comprises a clipper at an end thereof for clipping a bundle of hair or the root portion of the bundle of hair, so that a burnt to the hand of the user is prevented.

[0006] Another object of the present invention is to provide a nozzle for a blow dryer, wherein the nozzle comprises a retainer at the outer surface thereof so as to prevent the hair from slipping off.

[0007] Another object of the present invention is to provide a nozzle for a blow dryer, wherein the nozzle is detachably mounted to the blow dryer via a locker.

[0008] Additional advantages and features of the invention will become apparent from the description which follows, and may be realized by means of the instrumentalities and combinations particular point out in the appended claims.

[0009] According to the present invention, the foregoing and other objects and advantages are attained by a nozzle comprising:

[0010] a nozzle body having a group of sleeves, wherein the group of sleeves has gradually decreasing diameters thereof and each of the sleeves is construed in stepped or spiral shape, wherein two adjacent sleeves are sleeved together defining a circular cavity, wherein the plurality of circular cavities form an air channel; and

[0011] a retainer provided along an edge of the sleeves for retaining a bundle of hair in position when the nozzle is in use.

[0012] In accordance with another aspect of the invention, the present invention provides a nozzle for mounting on a blow dryer, wherein the nozzle comprises:

[0013] a group of sleeves, wherein each of the sleeves has a hollow structure defining an air channel and a plurality of openings communicating with the air channel, wherein the sleeves are lined up in an end to end manner so that the air channels within the sleeves are communicated with each other;

[0014] a mounting base constructed in circular shape, wherein the mounting base has a plurality of retention grooves provided on an inner surface at a first end thereof for detachably engaging with an outlet of the blow dryer, wherein a second end of the mounting base is connected to a proximal end of the group of sleeves; and

[0015] a clipper for clipping a bundle of hair, wherein the clipper is mounted to a distal end of the group of sleeves.

[0016] Still further objects and advantages will become apparent from a consideration of the ensuing description and drawings.

[0017] These and other objectives, features, and advantages of the present invention will become apparent from the following detailed description, the accompanying drawings, and the appended claims.

Brief Description of the Drawings

[0018] Fig. 1 is a perspective view of a nozzle according to a preferred embodiment of the present invention.

[0019] Fig. 2 is a perspective view of a nozzle according to an alternative mode of the above preferred embodiment of the present invention.

[0020] Fig. 3 is a perspective view of a nozzle according to a second preferred embodiment of the present in-

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vention.

[0021] Fig. 4 is a perspective view of a nozzle according to an alternative mode of the above preferred embodiment of the present invention.

[0022] Fig. 5 is a schematic view illustrating the locker of the nozzle according to the above preferred embodiment of the present invention.

Detailed Description of the Preferred Embodiment

[0023] Referring to Fig. 1 and Fig. 2 of the drawing, a nozzle for mounting on a blow dryer according to a preferred embodiment of the present invention is illustrated, wherein the nozzle comprises a nozzle body 1 having a group of cylindrical sleeves 2, wherein the group of sleeves has gradually decreasing diameters thereof and each of the sleeves is construed in stepped or spiral shape. Two adjacent sleeves are sleeved together defining a circular cavity, wherein the plurality of circular cavities forms an air channel of the nozzle. The nozzle further comprises a clipper 3 provided at an end thereof, a plurality of openings provide along an outer surface of the sleeves 2 and a retainer 4 provided along the edge of the sleeves 2.

[0024] Since the air channel is formed by a plurality of circular cavities between each two adjacent sleeves 2, a stream of air which is delivered to the nozzle will discharge through the circular cavities, so that the stream of air will not be easy to be directed towards the face of the user. The clipper 3 of the nozzle is able to clip a bundle of hair during drying, so that a user does not have to user his or her hand to grasp the bundle of hair. Therefore, a burnt to the hand of the user is avoided. Accordingly, when a bundle of heavy overlapping hair has to contact with the hot air through the nozzle, the openings of the nozzle effectively solve the problem. The retainer 4 on the edge of the sleeve 2 prevents the hair from slipping off during drying.

[0025] Referring to Fig. 3 of the drawings, a nozzle for detachably mounting to a blow dryer is illustrated, wherein the nozzle comprises a group of sleeves 1A, a mounting base 2A and a clipper 3A.Each of the sleeves 1A has a hollow structure defining an air channel 11A and a plurality of openings 12A communicating with the air channel 11A, wherein the sleeves 1A are lined up in an end to end manner so that the air channels 11A within the sleeves 1A are communicated with each other.

[0026] The mounting base 2A is constructed in circular shape, wherein the mounting base 2A has a plurality of retention grooves provided on an inner surface at a first end 21A thereof for detachably engaging with an outlet of the blow dryer, wherein a second end of the mounting base 2A is connected to a proximal end of the group of sleeves 1A.

[0027] The clipper 3A is adapted for clipping a bundle of hair, wherein the clipper 3A is mounted to a distal end of the group of sleeves 1A.

[0028] In a preferred embodiment, each of the sleeves 1A is embodied as a circular cylinder, wherein the group of the sleeves 1A has a gradually decreasing diameters and a same height. The plurality of openings 12A is provided along the outer surface of each of the sleeves 1A with respect to a center line of the group of the sleeves 1A.

[0029] Accordingly, the group of sleeves 1A is coaxially lined up end to end in an order of gradually decreasing diameters so as to construct a stepped structure. One of the sleeves 1A having the largest diameter has an end connected to the first end 22A of the mounting base 2A, wherein another one of the sleeves 1A having the smallest diameter has an end connected to the clipper 3A.

[0030] In another preferred embodiment, each of the sleeves 1A is embodied as a circular truncated cone, wherein the bottom surfaces 13 and the upper surfaces 14 of the group of the sleeves 1A have gradually decreasing diameters, wherein each of the circular truncated cones has the same height. The plurality of openings 12A is provided along the outer surface of each of the sleeves 1A with respect to the center line of the group of the sleeves 1A.

[0031] According to an order of gradually decreasing diameters of the bottom surfaces of the group of sleeves 1A, the upper surface of a first sleeve 1A of the group of sleeves 1A is connected to the bottom surface 13A of an adjacent second sleeve 1A of the group of sleeves 1A so as to construct a stepped structure. The sleeves 1A are coaxially aligned with each other and the diameter of the upper surface of the first sleeve 1A is larger than or equal to the diameter of the bottom surface of the adjacent second sleeve 1A. One of the sleeves 1A having a bottom surface 13A of the largest diameter is connected to the first end 22A of the mounting base 2A, wherein another one of the sleeves 1A having an upper surface 14A of the smallest diameter is connected to the clipper 3A.

[0032] Accordingly, no matter the sleeves 1A are embodied as circular cylinders or circular truncated cones, the group of the sleeves 1A forms a taper structure having gradually decreasing diameters. In other words, the diameters are gradually decreased from the mounting base 2A to the clipper 3A so as to provide a tubular air blow which is convenient for hairstyling. What's more, the sleeves 1A are coaxially aligned with each other, and the air channels 11A are communicated with each other, so that a stream of air coming from the blow dryer can pass through each of the air channels 11A and discharge from the plurality of openings 12A which is provided along the outer surface of each of the sleeves 1A.

[0033] Referring to Fig. 4 of the drawing, in order to prevent the hair from slipping off during drying, especially hair styling, the nozzle further comprise a retainer 4A which has a spiral structure, wherein the retainer 4A is spirally provided on the outer surfaces the group of sleeves 1A in such a manner that the retainer 4A is extended between the mounting base 2A and the clipper 3A.

[0034] Accordingly, the retainer 4A is spirally protrud-

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ed on the sleeves 1A, wherein the retainer 4A can be integrally and encircledly extended on each of the sleeves 1A, preferably, each of the sleeves 1A is provided with a spiral retainer 4A.

[0035] Referring to Fig. 4 and Fig. 5 of the drawings, the nozzle of the present invention is capable of being detachably mounted to a blow dryer, wherein the group of sleeves 1A is rotatably mounted on the mounting base 2A. When the nozzle is in use, a bundle of hair is clipped by the clipper 3A which rotates corresponding to the rotation of the sleeves 1A, so that the hot air from the nozzle can have full contact with the bundle of hair, and thus the hair can be completely dried. Furthermore, when the nozzle is employed for making a hairstyle for the hair of the user, the sleeves 1A should be static with respect to the bundle of hair. And thus the nozzle further comprises a locker 20A provided on the mounting base 2A, wherein the locker 20A firmly retains the sleeves 1A in position so as to prevent the sleeves 1A from rotating with respect to the mounting base 2A.

[0036] Accordingly, when the locker 20A is in an open position, the sleeves 1A with the clipper 3A will rotate with respect to the mounting base 2A when a rotating force is applied thereon, wherein when the locker 20A is in an closed position, the sleeves 1A will be firmly retained on the blow dryer, so that the sleeves 1A and the clipper 3A cannot rotate with respect to the mounting base 2A.

[0037] In other words, the nozzle is mounted to the blow dryer in a rotatable manner, for example, the mounting base 2A of the nozzle comprises a first thread portion on the inner surface thereof, while the outlet of the blow dryer comprises a second thread portion, wherein the first thread portion of the nozzle engages with the second thread portion of the blow dryer so that the nozzle is capable of being detachably mounted to the blow dryer by rotating the nozzle with respect to the blow dryer clockwise or counterclockwise.

[0038] Referring to Fig. 5 of the drawing, the locker 20A comprises a plurality of first teeth parallelly and spacedly provided on an end thereof, wherein the blow dryer comprises a plurality of second teeth parallelly and spacedly provided on the outlet thereof, wherein the first teeth engage with the second teeth so that the locker 20A is capable of moving between an open position and a closed position. Accordingly, when the nozzle is mounted to the blow dryer, the locker 20A is pushed away from the outlet of the blow dryer while the locker 20A is in the open position, so that the first teeth are detached from the second teeth, and thus the sleeves 1A can rotate with respect to the mounting base 2A when a rotating force is applied thereon on. When the locker 20A is in the closed position, the locker 20A is engaged with the outlet of the blow dryer in such a manner that the first teeth are coupled with the second teeth, so that the nozzle is retained on the blow dryer and cannot rotate with respect to the mounting base 2A, and thus the nozzle remains to be static with respect to the hair during hairstyling.

[0039] One skilled in the art will understand that the embodiment of the present invention as shown in the drawings and described above is exemplary only and not intended to be limiting.

[0040] It will thus be seen that the objects of the present invention have been fully and effectively accomplished. The embodiments have been shown and described for the purposes of illustrating the functional and structural principles of the present invention and is subject to change without departure from such principles. Therefore, this invention includes all modifications encompassed within the spirit and scope of the following claims.

Claims

1. A nozzle for mounting on a blow dryer, comprising:

   a nozzle body having a group of sleeves, wherein said group of sleeves has gradually decreasing diameters thereof and each of said sleeves is construed in stepped shape, wherein two adjacent sleeves are sleeved together defining a circular cavity, wherein said plurality of circular cavities forms an air channel; and
   a retainer provided along an edge of said sleeves for retaining a bundle of hair in position when said nozzle is in use.

2. A nozzle for mounting on a blow dryer, comprising:

   a nozzle body having a group of sleeves, wherein said group of sleeves has gradually decreasing diameters thereof and each of said sleeves is construed in spiral shape, wherein two adjacent sleeves are sleeved together defining a circular cavity, wherein said plurality of circular cavities forms an air channel; and
   a retainer provided along an edge of said sleeves for retaining a bundle of hair in position when said nozzle is in use.

3. A nozzle for mounting on a blow dryer, comprising:

   a group of sleeves, wherein each of said sleeves has a hollow structure defining an air channel and a plurality of openings communicating with said air channel, wherein said group of sleeves is lined up in an end to end manner so that said air channels within said sleeves are communicated with each other;
   a mounting base constructed in a circular shape, wherein said mounting base has a plurality of retention grooves provided on an inner surface at a first end thereof for detachably engaging with an outlet of said blow dryer, wherein a second end of said mounting base is connected to a proximal end of said group of sleeves; and
   a clipper for clipping a bundle of hair, wherein

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said clipper is mounted to a distal end of said group of sleeves.

4. The nozzle, as recited in claim 3, wherein each of said sleeves is a circular cylinder, wherein said group of said sleeves has a gradually decreasing diameters and said group of sleeves is coaxially lined up end to end in a order of gradually decreasing diameters so as to construct a stepped structure, wherein one of said sleeves having the largest diameter has an end connected to said first end of said mounting base while another one of said sleeves having the smallest diameter has an end connected to said clipper.

5. The nozzle, as recited in claim 4, wherein each of said sleeves has a same height.

6. The nozzle, as recited in claim 3, wherein each of said sleeves is a circular truncated cone, wherein bottom surfaces and upper surfaces of said group of said sleeves have gradually decreasing diameters, wherein according to an order of gradually decreasing diameters of said bottom surfaces of said group of sleeves, said upper surface of a first sleeve of said group of sleeves is connected to said bottom surface of an adjacent second sleeve of said group of sleeves so as to construct a stepped structure, wherein said sleeves are coaxially aligned with each other, wherein said diameter of said upper surface of said first sleeve is larger than said diameter of said bottom surface of said adjacent second sleeve, wherein one of said sleeves having a bottom surface of the largest diameter is connected to said first end of said mounting base, wherein another one of said sleeves having an upper surface of the smallest diameter is connected to said clipper.

7. The nozzle, as recited in claim 3, wherein each of said sleeves is a circular truncated cone, wherein bottom surfaces and upper surfaces of said group of said sleeves have gradually decreasing diameters, wherein according to an order of gradually decreasing diameters of said bottom surfaces of said group of sleeves, said upper surface of a first sleeve of said group of sleeves is connected to said bottom surface of an adjacent second sleeve of said group of sleeves so as to construct a stepped structure, wherein said sleeves are coaxially aligned with each other, wherein said diameter of said upper surface of said first sleeve is equal to said diameter of said bottom surface of said adjacent second sleeve, wherein one of said sleeves having a bottom surface of the largest diameter is connected to said first end of said mounting base, wherein another one of said sleeves having an upper surface of the smallest diameter is connected to said clipper.

8. The nozzle, as recited in claim 3, wherein each of said sleeves has a same height.

9. The nozzle, as recited in claim 5, further comprising a retainer which has a spiral structure, wherein said retainer is encircledly protruded on the outer surfaces of said group of sleeves in such a manner that said retainer is spirally extended between said mounting base and said clipper.

10. The nozzle, as recited in claim 7, further comprising a retainer which has a spiral structure, wherein said retainer is encircledly protruded on the outer surfaces of said group of sleeves in such a manner that said retainer is spirally extended between said mounting base and said clipper.

11. The nozzle, as recited in claim 9, wherein said group of sleeves is rotably mounted to said mounting base, so that said group of sleeves is capable of rotating with respect to said mounting base when a rotating force is applied thereon.

12. The nozzle, as recited in claim 10, wherein said group of sleeves is rotably mounted to said mounting base, so that said group of sleeves is capable of rotating with respect to said mounting base when a rotating force is applied thereon.

13. The nozzle, as recited in claim 11, wherein said mounting base further comprises a locker for retaining said group of sleeves in position.

14. The nozzle, as recited in claim 12, wherein said mounting base further comprises a locker for retaining said group of sleeves in position.

15. The nozzle, as recited in claim 14, wherein when said locker is in an open position, said group of sleeves rotates with respect to said mounting base when a rotating force is applied thereon on, wherein when said locker is in a closed position, said locker is retained on said blow dryer so that said group of sleeves is not able to rotate with respect to said mounting base.

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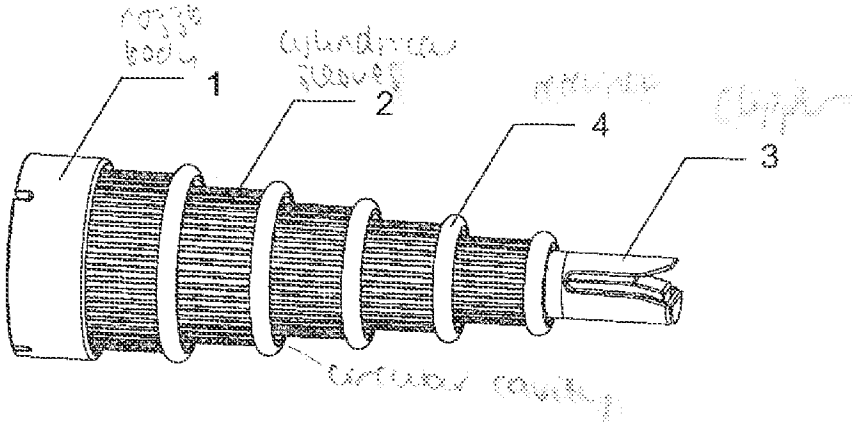


Fig. 1

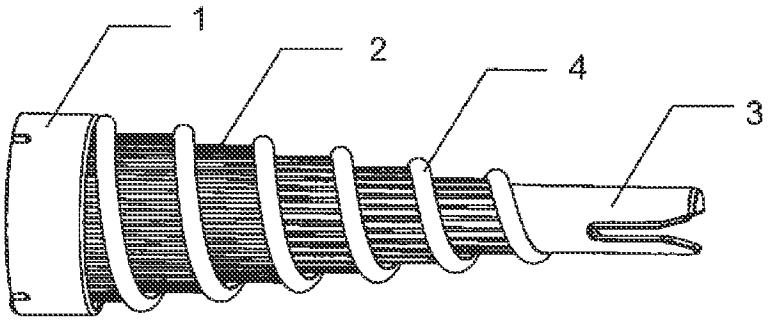


Fig. 2

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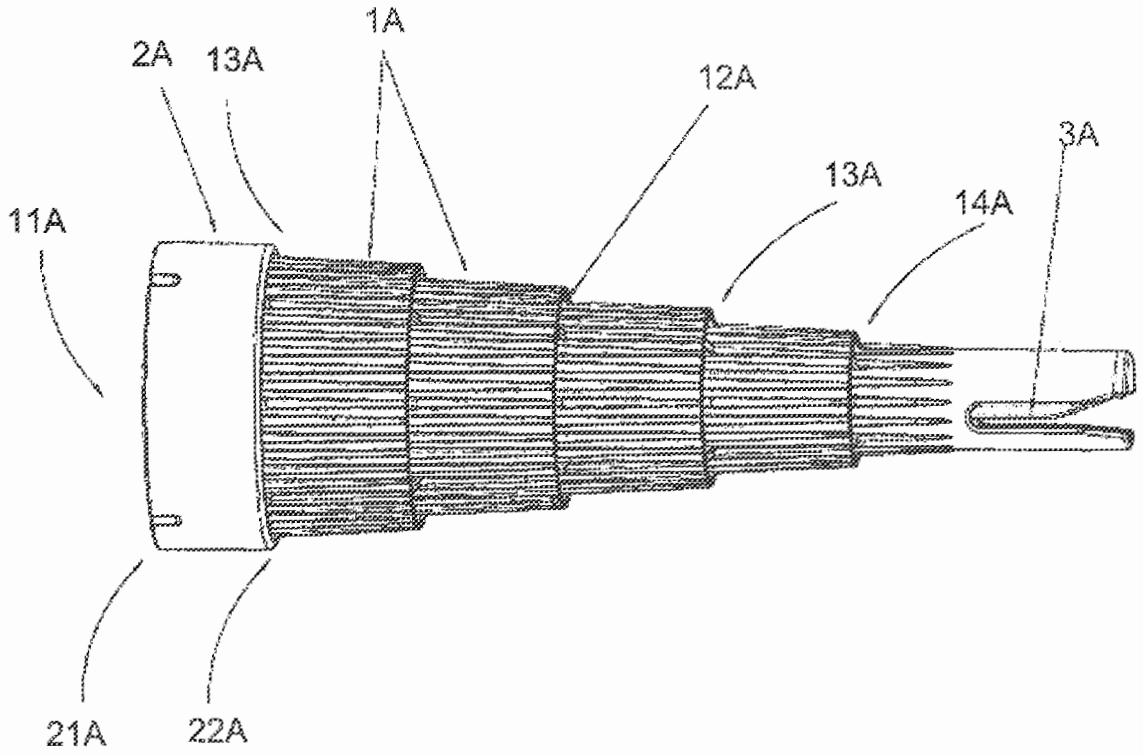


Fig. 3

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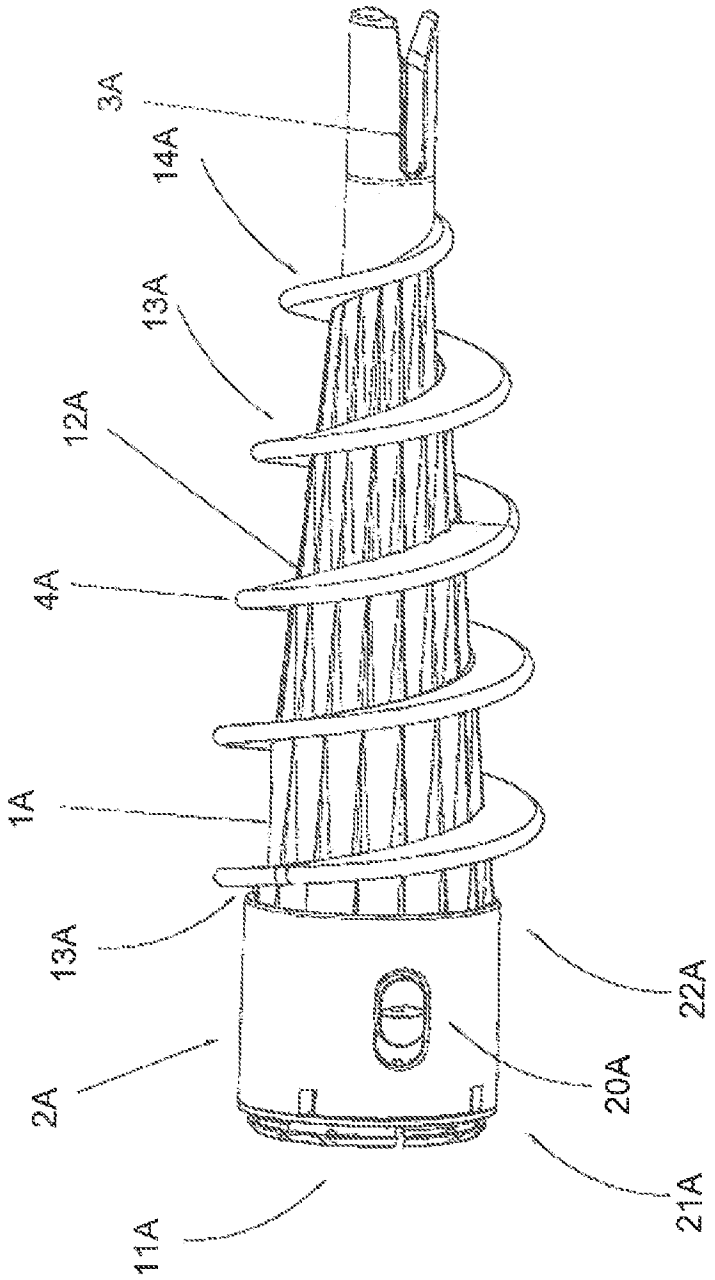


Fig. 4

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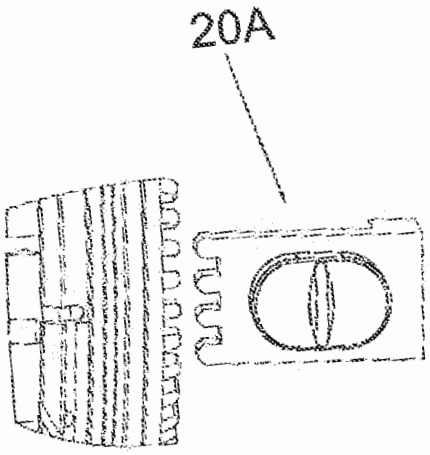


Fig. 5

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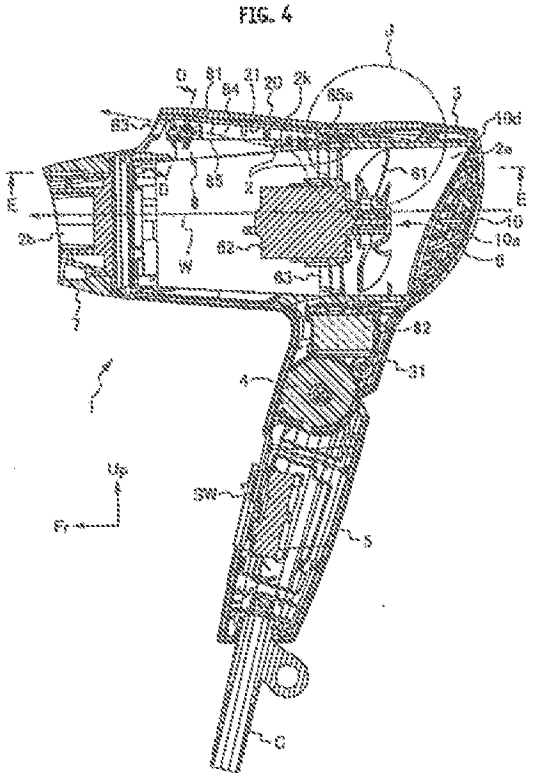
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(54) Hair care device

(57) To an air inlet port 2a of a hair dryer 1, a porous protection frame body 10 that finely divides an opening region of the air inlet port 2a is attached, and further, a mesh-like filter 11 that divides an opening region of the protection frame body 10 more finely is arranged on an outside of the protection frame body 10. In such a way, dust can be made less likely to deposit on the mesh-like filter 11. In addition, even if the dust adheres onto the filter 11, it becomes possible to easily remove the dust from outside, and maintenance of a portion of the air inlet port 2a can be simplified.

FIG. 4



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Description

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is based upon and claims the benefit of priority from prior Japanese Patent Application P2010-149088 filed on June 30, 2010; the entire contents of which are incorporated by reference herein.

BACKGROUND OF THE INVENTION

[0002] The present invention relates to a hair care device.

[0003] For example, in a hair care device such as a hair dryer, air sucked from an air inlet port is allowed to be discharged, from an air blower port, as a cold wind or a hot wind directly or by being heated. At that time, it is general to provide, in the air inlet port, a porous protection frame body, which finely divides an opening region of the air inlet port, in order to inhibit a finger and the like from entering the same by mistake. Moreover, for example as disclosed in Japanese Patent Laid-Open Publication No. 2008-307221, a device is known, in which the opening region of the protection frame body is divided more finely to thereby provide a mesh-like filter so that dirt, dust, hair and the like cannot be drawn therethrough.

SUMMARY OF THE INVENTION

[0004] However, in the above-described conventional hair dryer, the mesh-like filter is arranged in an inside of the protection frame body provided in the air inlet port, and accordingly, the dust becomes prone to accumulate on an edge of the filter. Moreover, in the case where the dust accumulates as described above, the dust deposits on the filter in the inside of the protection frame body, both of which form a step difference. Accordingly, there has been a problem that it is difficult to clean the filter, resulting in a complicated maintenance of a portion the air inlet port.

[0005] In this connection, it is an object of the present invention to provide a hair care device capable of further simplifying the maintenance of the portion of the air inlet port.

[0006] In order to achieve the foregoing object, a hair care device of the present invention includes: a housing in an inside of which an air flow passage is formed; an air inlet port provided on an upstream end portion of the air flow passage, and an air blower port provided on a downstream end portion of the air flow passage; an air blower unit that discharges air, which is sucked from the air inlet port, from the air blower port; a porous protection frame body, which is provided on the air inlet port, and finely divides an opening region of the air inlet port, ; and a mesh-like filter, which is arranged on an outside of the protection frame body, and divides the opening region of the protection frame body more finely.

[0007] In accordance with the hair care device of the present invention, the mesh-like filter is arranged on the outside of the protection frame body provided on the air inlet port. Accordingly, dust can be made less likely to deposit on an edge of the filter. In addition, even if the dust adheres onto the filter, it becomes possible to easily remove the dust from outside, and maintenance of a portion of the air inlet port can be simplified.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Fig. 1 is a side view of a hair dryer according to a first embodiment of the present invention.
Fig. 2 is a back view of the hair dryer shown in Fig. 1.
Fig. 3 is a plan view of the hair dryer shown in Fig. 1.
Fig. 4 is a cross-sectional view along a line A-A in Fig. 3.
Fig. 5 is a perspective view where a protection frame body and a mesh-like filter, which are attached to an air inlet port of the hair dryer shown in FIG. 1, are arrayed.
Fig. 6 is a cross-sectional view showing a relationship between an ion generation unit cover of an ion generation unit provided in the hair dryer shown in Fig. 1 and a decorative case provided thereon.
Fig. 7 is a cross-sectional view along a line B-B in Fig. 3.
Fig. 8 is an enlarged cross-sectional view of a portion C in Fig. 7.
Fig. 9 is a cross-sectional view along a line D-D in Fig. 4.
Fig. 10 is a cross-sectional view along a line E-E in Fig. 4.
Fig. 11 is a cross-sectional view along a line F-F in Fig. 3.
Fig. 12 is an enlarged cross-sectional view of a portion G in Fig. 11.
Fig. 13 is a cross-sectional view along a line H-H in Fig. 3.
Fig. 14 is an enlarged cross-sectional view of a portion I in Fig. 13.
Fig. 15 is an enlarged cross-sectional view of a portion J in Fig. 4.
Fig. 16 is a side of a hair dryer according to a second embodiment of the present invention.
Fig. 17 is a perspective view where a protection frame body, a mesh-like filter and a support frame body, which are attached to an air inlet port of the hair dryer shown in FIG. 16, are arrayed.
Fig. 18 is a plan view showing a body portion of a brush-added hair dryer according to a third embodiment of the present invention.
Fig. 19 is a cross-sectional view along a line L-L in Fig. 18.
Fig. 20 is a side view where the protection frame body, the mesh-like filter and the support frame body, which are attached to the air inlet port of the hair

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dryer shown in Fig. 18, are arrayed.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0009] A description is made below in detail of embodiments of the present invention while referring to the drawings.

[First Embodiment]

[0010] Fig. 1 to Fig. 15 are views showing a first embodiment of a hair care device according to the present invention. In this embodiment, the description is made while taking a hair dryer 1 as an example of the hair care device. Note that reference symbol Fr denotes a forward direction, and reference symbol Up denotes an upward direction.

[0011] As shown in Fig. 1 to Fig. 4, the hair dryer 1 is roughly composed by including: a housing 3 having a wind tunnel portion 2 in an inside of which an air flow passage W is formed; and a grip portion 5 coupled, so as to be freely foldable, to a grip attachment portion 31 protruded from a lower side of a rear end portion of the housing 3 while interposing a freely rotatable coupling portion 4 therebetween. The housing 3 is composed by combining and coupling housing parts, which are divided into right and left halves, to each other.

[0012] In the wind tunnel portion 2, on a rear end portion thereof (that is, an upstream end portion of the air flow passage W: a right side in Fig. 1) , an air inlet port 2a is provided, and on a front end portion thereof (that is, a downstream end portion of the air flow passage W: a left side in Fig. 1), an air blower port 2b is provided. In the inside of the wind tunnel portion 2, an air blower unit 6 and a heater (not shown) are arranged in series from the rear toward the front. Moreover, the wind tunnel portion 2 is set to the housing 3 in a state of ensuring the air flow passage W, which is cylindrical, with an inner surface of the housing 3, and these wind tunnel portion 2 and housing 3 are integrated with each other. Note that, in this embodiment, the air blower port 2b serves as a tip end of a nozzle 7 attached to the front end portion of the wind tunnel portion 2; however, in the case where this nozzle 7 is detached, such a tip end of the wind tunnel portion 2 serves as the wind blower port 2b.

[0013] The air blower unit 6 is composed of: a fan 61; a motor 62 that rotates this fan 61; flow adjustment stems 63 which support this motor 62 in the inside of the wind tunnel portion 2 and have a flow adjustment function for the air passing therethrough; and the like. Then, the fan 61 is rotationally driven by the motor 62, whereby the air flow is generated in the wind tunnel portion 2, and the air sucked from the air inlet port 2a is blown out from the air blower port 2b. That is to say, the air blower unit 6 is arranged in the air flow passage W and has a function to blow the air introduced into the air flow passage W. At this time, the above-described heater (not shown) is energized and heated, whereby the air blown from the air blower port 2b can be turned to a hot wind.

[0014] Moreover, on an upper part of the wind tunnel portion 2, an ion generation unit 8 that generates and discharges negative ions is provided. This ion generation unit 8 includes an ion generation block 81, which generates the negative ions. Then, a high voltage, which is generated in a high voltage generation unit 82 arranged in the grip attachment portion 31, is applied to the ion generation unit 8, and a corona discharge is caused, whereby the negative ions are generated.

[0015] The ion generation unit 8 introduces a part of the air, which flows in the wind tunnel portion 2, from an opening portion 2K formed by partially cutting away the upper part of the wind tunnel portion 2, and together with the introduced air, discharges the generated negative ions forward from an ion discharge port 83. It is known that the negative ions give hair a gloss and a moist feeling, and exert an effect thereof for taking out curl of the hair.

[0016] The ion generation unit 8 is provided with an ion generation unit cover 85, which holds the ion generation block 81 (refer to Fig. 9), and in addition, forms an air introduction passage 84 for introducing the air from the wind tunnel portion 2, and forms the above-mentioned ion discharge port 83. This ion generation unit cover 85 is formed of a synthetic resin material in this embodiment.

[0017] On a front center portion of the grip portion 5, a switch SW is provided so as to be freely switchable among a plurality of up and down stages. By this switch SW, ON/OFF of the motor 62 and the heater and adjustment of a quantity of the air are performed. Moreover, a cord C to be connected to a power supply is attached to a lower end of the grip portion 5.

[0018] As shown in Fig. 1 and Fig. 2, to the air inlet port 2a, a porous protection frame body 10 is attached, which finely divides an opening region of the air inlet port 2a concerned. By this protection frame body 10, a relatively large foreign object such as a finger is prevented from entering the wind tunnel portion 2 by mistake.

[0019] Here, in this embodiment, as shown in Fig. 5, more on the outside of the protection frame body 10, a mesh-like filter 11 is arranged, which divides the opening region of the protection frame body 10 more finely. Note that, in Fig. 1 to Fig. 4, the filter 11 is not illustrated for the sake of convenience. This is in order to illustrate an inside (the flow adjustment stems 63 and the like) of the protection frame body 10 and openings 10a (annular frame portions 10b and linear frame portions 10c, which will be described later) thereof.

[0020] The filter 11 has a function to suppress relatively small foreign objects such as dirt, dust and hair from entering the wind tunnel portion 2, and is formed of metal mesh or mesh composed of fire-resistant resin such as polyester. Preferably, the filter 11 has a mesh width as fine as 300 to 650 μm, in which an aperture ratio ranges from 50 to 90 percent (preferably, 50 to 75 percent). By using the filter 11 with the fine mesh width as described

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above, the small dust, hair and the like can be more effectively prevented from entering the fan 61, the motor 62 and the heater portion. Note that, in this filter 11, naturally, the filter 11 concerned is formed so that a thickness thereof can be thinner than a thickness of the protection frame body 10.

[0021] The protection frame body 10 is composed of: a plurality of the annular frame portions 10b arranged concentrically about a substantial center of the air inlet port 2a; and a plurality of the linear frame portions 10c extended radially from the substantial center of the air inlet port 2a so as to intersect the annular frame portions 10b. Hence, a plurality of the openings 10a of the protection frame body 10 are formed of the annular frame portions 10b and the linear frame portions 10c.

[0022] At this time, as shown in Fig. 5, with regard to the linear frame portions 10c, inside linear portions 10cA located in an inside of an annular frame portion 10bA, which serves as the innermost circumferential-side one among the plurality of annular frame portions 10b, and outside linear portions 10cB located on an outside of the annular frame portion 10bA are arranged so as to be shifted from each other with respect to linear directions as diameter directions.

[0023] The protection frame body 10 and the mesh-like filter 11 are molded integrally with each other by a synthetic resin material. At this time, among such synthetic resin materials for use in the molding, it is preferable to use ABS, which has a low melting point, in terms of preventing a deterioration of the filter 11 at the time of the molding. Note that, preferably, the thickness of the protection frame body 10 is approximately 1.5 mm.

[0024] Moreover, with regard to the linear frame portions 10c of the protection frame body 10, in this embodiment, first frames 10c1, which serve as main frames, and second frames 10c2 and third frames 10c3, which serve as sub-frames, are provided, and preferably, a width of the first frames 10c1 is approximately 2 mm, and a width of the second frames 10c2 and the third frames 10c3 is approximately 1.5 mm. At this time, preferably, the number of first frames 10c1, which serve as the main frames and have the largest width, is different from the number of flow adjustment stems 63 and the number of fins of the fan 61 in the air blower unit 6 in consideration also of a problem of noise caused by a resonance. In this embodiment, as shown in Fig. 2 and Fig. 7, the number of flow adjustment stems 63 is set at seven, the number of fins of the fan 61 is set at six, and the number of first frames 10c1 is set at eight.

[0025] Furthermore, the second frames 10c are arranged at intermediate points between the first frames 10c1, whereby strength of the protection frame body 10 can be further increased. The third frames 10c3 are made capable of ensuring strength of the mesh-like filter 11 at the time when the protection frame body 10 is molded integrally with the mesh-like filter 11.

[0026] Note that, in the protection frame body 10, strength of the air inlet port 2a is enhanced by increasing the arrangement number of bars such as the annular frame portions 10b and the linear frame portions 10c, and a breakage of the air inlet port 2a, which may be caused by droppage and an impact, can be further reduced. Meanwhile, in terms of performance, the quantity of the air is decreased by the increase of the bars. Therefore, in consideration of a balance among these factors, the number of annular frame portions 10b and the number of linear frame portions 10c are decided.

[0027] Moreover, in this embodiment, a shape of each of the openings 10a of the protection frame body 10 is a substantially trapezoidal shape by the annular frame portions 10b and the linear frame portions 10c; however, though not shown, without being limited to this, it is more preferable that the protection frame body 10 be formed, for example, so as to have a honeycomb structure in which each of the openings 10a becomes regular hexagonal.

[0028] Note that the protection frame body 10 of this embodiment is coupled integrally or tightly to the housing 3 so as to be undetachable therefrom. That is to say, in this embodiment, the matter that the protection frame body 10 is made undetachable as described above stands for that the mesh-like filter 11 molded integrally with the protection frame body 10 concerned is also made undetachable from the housing 3. Specifically, as shown in Fig. 4, attachment projections 10d are formed on a plurality of spots or entire circumference of a peripheral edge portion of the protection frame body 10, and the attachment projections 10d are fitted to an outer circumference of the rear end portion of the housing 3. At that time, the attachment projections 10d are adhered onto or inserted with pressure into the housing 3 in advance, whereby the detachment of the protection frame body 10 is not performed easily, and the protection frame body 10 can be made undetachable in a usual operation.

[0029] Incidentally, in the hair dryer 1 of this embodiment, at least a part of the housing 3, that is, a portion, which covers the ion generation unit 8 provided in an upper part of the housing 3 in this embodiment, is composed of a transparent or translucent decorative case 20 in which a decorative portion 21 is provided on a back side (a center direction side of the housing 33. This decorative case 20 is integrally molded of a transparent or translucent synthetic resin material. At this time, the decorative portion 21 provided on the decorative case 20 is formed into a diamond cut-like polyhedral shape formed out by a thickness change of the decorative case 20 as shown in Fig. 10.

[0030] Then, the decorative portion 21 with the polyhedral shape is coated with paint (an opaque material) having metallic gloss. Note that the decorative portion 21 may be subjected to impregnation of metal foil and printing by various colors besides such metallic painting. Moreover, an outer surface of the decorative case 20 may be subjected to such decoration by the printing.

[0031] As described above, the portion that covers the ion generation unit 8 is composed of the transparent or

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translucent decorative case 20 in which the decorative portion 21 is provided on the back side. In such a way, when the decorative case 20 is viewed from the outside, light is reflected on the polyhedral shape of the decorative portion 21, whereby light and shade, which are excellent in design, can be generated. In such a way, a profound decorative effect that has not been present heretofore can be produced, an exterior appearance of the hair dryer 1 can be further enhanced, and a commercial value thereof can be thereby further enhanced. Moreover, the decorative portion 21 is not provided separately but provided on the back side of the decorative case 20. Accordingly, the number of parts is reduced, whereby a cost increase, a weight increase and a deterioration of production efficiency can be suppressed.

[0032] As shown in Fig. 7 and Fig. 8, the decorative case 20 is attached to the housing 3 in such a manner that engagement pieces 23 provided on both sides of a substantial center portion thereof in a fore-and-aft direction are engaged with hook pieces 32 protruded from the inside of the housing 3. Moreover, as shown in Fig. 15, an engagement piece 24 provided on a rear end portions of the decorative case 20 is engaged with an engagement portion 2c that is located in the inside of the housing 3 and is protruded from the outside of the wind tunnel portion 2. Furthermore, as shown in Fig. 11 to Fig. 13, hook portions 22 provided on both sides of a front end portion of the decorative case 20 are allowed to sink into insides of connection portions 9, whereby the decorative case 20 is attached to the housing 3. At this time, the engagement pieces 23, the hook portions 22 and the engagement pieces 24 are allowed to individually perform the engagement at positions invisible from the outside.

[0033] Hence, in the transparent or translucent decorative case 20, the engagement portions thereof are adapted to be invisible from the outside, and accordingly, design of the decorative portion 21 of the decorative case 20 can be prevented from being damaged by the engagement portions. In such a way, the exterior appearance of the hair dryer 1 is made favorable, thus making it possible to further enhance the commercial value thereof.

[0034] Moreover, the ion generation unit cover 85 is arranged in the inside of the decorative case 20; however, this ion generation unit cover 85 is adapted not to be engaged with the decorative case 20. Specifically, as shown in Fig. 4 and Fig. 15, an engagement portion (a right end portion in Fig. 4) 85a of the ion generation unit cover 85 is engaged with an engagement piece 33 of the housing 3, and in addition, as shown in Fig. 13 and Fig. 14, engagement portions 85b formed on a front end of the ion generation unit cover 85 are allowed to sink into the insides of the connection portions 9 and to engage therewith. At this time, the engagement portions 85a and 85b of the ion generation unit cover 85 are set to state of being invisible from the outside through the transparent or translucent decorative case 20.

[0035] Hence, the ion generation unit cover 85 is not engaged with the decorative case 20, and the engagement portions of the ion generation unit cover 85 become invisible from the outside of the transparent or translucent decorative case 20. In such a way, the exterior appearance of the portion of the decorative case 20 is made favorable, whereby the commercial value thereof can be further enhanced.

[0036] In the hair dryer 1 with such a configuration, the fan 61 rotates by turning on the switch SW, and the air is introduced into the wind tunnel portion 2. Then, the air introduced from the air inlet port 2a is blown out toward the hair from the air blower port 2b. Note that such a blown wind can be switched between a hot wind and a cold wind by turning on and off the heater, whereby styling and drying of the hair can be arbitrarily performed. Moreover, the ion generation unit 8 is actuated, whereby the negative ions can be discharged toward the hair from the ion discharge port 83 of the ion generation unit 8. In such a way, the gloss and the moist feeling are given to the hair, and the curl of the hair is taken out effectively, and so on.

[0037] As described above in detail, in the hair dryer 1 of this embodiment, on the outside of the porous protection frame body 10 provided on the air inlet port 2a, the mesh-like filter 11 is provided, which divides the opening region (the plurality of openings 10a) of the protection frame body 10 concerned more finely. Therefore, the filter 11 is arranged on the outermost side, whereby the dust can be made less likely to deposit on an edge of the filter 11 concerned. In addition, even if the dust adheres onto the filter 11, it becomes possible to easily remove the dust from the outside, and maintenance of the portion of the air inlet port 2a can be simplified.

[0038] Moreover, in this embodiment, the filter 11 is formed so that the thickness thereof can be thinner than the thickness of the protection frame body 10. Therefore, in comparison with a configuration in which the filter 11 is arranged in the inside of the protection frame body 10 in such a configuration, a step difference between the filter 11 and the protection frame body 10 (in the above-described configuration, a step difference between the protection frame body 10 and the filter 11) can be reduced. Hence, it becomes possible to easily remove, from the outside, dust that accumulates on the step difference, and the dust can be further suppressed from depositing on a portion of the step difference.

[0039] Moreover, the protection frame body 10 of this embodiment is composed of: the plurality of annular frame portions 10b arranged concentrically; and the plurality of linear frame portions 10c extended radially from the substantial center of the air inlet port 2a so as to inter sect the annular frame portions 10b concerned. Therefore, the strength of the protection frame body 10 can be enhanced, and in addition, it becomes possible to also ensure the strength of the filter 11 arranged on the outside thereof by ensuring the strength of the protection frame body 10 as described above.

[0040] Furthermore, with regard to the linear frame portions 10c of the protection frame body 10, the inside

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linear portions 10cA located in the inside of the annular frame portion 10bA, which serves as the innermost circumferential-side one among the plurality of annular frame portions 10b, and the outside linear portions 10cB located on the outside of the annular frame portion 10bA are arranged so as to be shifted from each other with respect to the linear directions. Hence, an edge is not erected on an intersection of the center portion at the time of the molding, and accordingly, strength of a metal mold can be ensured, and in addition, it becomes possible to arrange the mesh like filter 11 also in the annular frame portion 10bA serving as the innermost circumferential-side one.

[0041] Still further, the honeycomb structure is adopted for the openings 10a of the protection frame body 10, whereby strength of such bar portions can be kept uniform. In addition, a total area of the openings 10a can be further increased. Accordingly, the quantity of the air can be further increased.

[0042] Moreover, in this embodiment, the protection frame body 10 and the mesh-like filter 11 are molded integrally with each other by the synthetic resin material. Accordingly, peeling off of the filter 11 at the time when the cleanup is performed can be prevented more surely. That is to say, in the case where the protection frame body 10 and the mesh-like filter 11 are joined to each other by thermal welding and the like, there is an apprehension that the filter 11 may be peeled off at the time when the cleanup is performed therefor; however, such peeling off can be suppressed in this embodiment. Moreover, the protection frame body 10 and the filter 11 are molded integrally with each other, whereby a sense of togetherness of both thereof is enhanced, thus making it possible to further enhance the exterior appearance thereof.

[0043] Furthermore, in this embodiment, the protection frame body 10 is coupled integrally or tightly to the housing 3 so as to be undetachable therefrom. Accordingly, in comparison with the case where a filter member such as the protection frame body 10 is freely detachably attached to the air inlet port 2a, the number of parts can be reduced, and cost reduction, weight reduction and size reduction can be thereby achieved. That is to say, when the above-described filter member is freely detachably attached to the air inlet port 2a, it is necessary to install still another filter on a depth side in order to prevent the finger and the like from entering the wind tunnel portion 2 in the case of detaching the filter member concerned. In the case where another filter is provided as described above, the filter member adopts a double structure, and accordingly, a cost increase, a weight increase and a size increase, which are caused by an increase of the number of parts, are brought about. However, in this embodiment, these increases can be suppressed. Moreover, the protection frame body 10 is made undetachable, whereby an apprehension is eliminated that the protection frame body 10 concerned may be lost.

[Second Embodiment]

[0044] Next, a description is made of a second embodiment of the present invention with reference to the drawings. Fig. 16 and Fig. 17 are views showing a hair dryer according to this embodiment. Note that, in the description of this embodiment, the same reference numerals are assigned to the same constituent portions as those of the hair dryer 1 of the above-mentioned first embodiment, and a duplicate description is omitted.

[0045] In a similar way to the above-mentioned first embodiment, in a hair dryer 1A of this embodiment, on the outside of the porous protection frame body 10 provided on the air inlet port 2a, the mesh-like filter 11 that divides the protection frame body 10 more finely is arranged.

[0046] Here, a main different point of the hair dryer 1A of this embodiment from the hair dryer 1 of the above-mentioned first embodiment is in that a support frame body 12 with substantially the same shape as that of the protection frame body 10 is further provided on the outside of the mesh-like filter 11. This support frame body 12 sandwiches the mesh-like filter 11 with the protection frame body 10, thereby prevents the filter 11 from being peeled off more surely, and in addition, is located on the outside of the filter 11 and does not allow the filter 11 to be located on the outermost surface, thereby prevents a breakage of the filter 11 owing to rubbing.

[0047] As shown in Fig. 17, with regard to the support frame body 12, openings 12a formed in the support frame body 12 concerned correspond to the openings 10a of the protection frame body 10, and a shape thereof is substantially the same as the shape of the openings 10a. That is to say, the support frame body 12 includes annular frame portions 12b and linear frame portions 12c, which are similar to those of the protection frame body 10. Then, the openings 10a and 12a of these protection frame body 10 and support frame body 12 are arranged so as to be allowed to substantially coincide with an inflow direction of the air.

[0048] In this embodiment, the support frame body 12 is formed of a synthetic resin material in a similar way to the protection frame body 10 and the mesh-like filter 11, and these protection frame body 10, filter 11 and support frame body 12 are adapted to be molded integrally with one another.

[0049] Moreover, the support frame body 12 is formed so that a thickness thereof can be thinner than the thickness of the protection frame body 10, and preferably, the support frame body 12 is formed at a thickness of approximately 0.2 mm while the thickness of the protection frame body 10 is approximately 1.5 mm. That is to say, in the case where the thickness of the support frame body 12 is set at 0.2 mm or less, or the support frame body 12 is not provided, the mesh-like filter 11 becomes prone to be broken owing to the rubbing. Meanwhile, if the thickness of the support frame body 12 is thickened too much, then the dust becomes prone to accumulate on the edge

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of the filter 11, and there is an apprehension that it may become impossible to obtain the effect unique to this application, in which the dust is less likely to deposit, and the dust can be easily removed even if the dust adheres. Hence, if the support frame body 12 is formed at the thickness of approximately 0.2 mm, then the hair dryer 1A can be provided, which is capable of obtaining the unique effect, that is, simplifying the maintenance of the portion of the air inlet port 2a while suppressing the breakage of the filter 11.

[0050] Note that, in a similar way to the above-mentioned first embodiment, the protection frame body 10 of this embodiment is coupled integrally or tightly to the housing 3 so as to be undetachable therefrom. That is to say, in this embodiment, the mesh-like filter 11 and the support frame body 12, which are molded integrally with the protection frame body 10, are also made undetachable from the housing 3.

[0051] With the configuration described above, in accordance with the hair dryer 1A of this embodiment, in a similar way to the above-mentioned first embodiment, the mesh-like filter 11 that divides the opening region (the plurality of openings 10a) of the porous protection frame body 10 more finely is arranged on the outside of the protection frame body 10 concerned. Accordingly, the dust can be made less likely to deposit on the edge of the filter 11.

[0052] Moreover, in this embodiment, more on the outside of the mesh-like filter 11, the porous support frame body 12 with substantially the same shape as that of the protection frame body 10 is provided. Accordingly, the protection frame body 10 can be reinforced by the support frame body 12. Then, the openings 10a and 12a of these protection frame body 10 and support frame body 12 are arranged so as to be allowed to substantially coincide with the inflow direction of the air. Accordingly, the quantity of the air can be suppressed from being reduced while increasing the strength of the protection frame body 10.

[0053] Still further, the support frame body 12 is formed so that the thickness thereof can be thinner than the thickness of the protection frame body 10. Accordingly, while suppressing the breakage of the filter 11, it can be facilitated to remove the dust from the outside of the support frame body 12 even if the dust adheres onto the filter 11. That is to say, though the dust deposits on the filter 11 in the inside of the support frame body 12, which becomes the step difference, the step difference concerned can be reduced more than the conventional one by the support frame body 12 formed thinner than the protection frame body 12, and it can be facilitated to remove the dust deposited on the filter 11.

[0054] Moreover, the support frame body 12 is molded integrally with the protection frame body 10 and the mesh-like filter 11, whereby the filter 11 can be prevented from being peeled off more surely. Furthermore, the outside of the filter 11 can be covered with the support frame body 12, and accordingly, the breakage of the filter 11 owing to the rubbing and the like can be suppressed, and durability of the filter 11 can be enhanced.

[Third Embodiment]

[0055] Fig. 18 to Fig. 20 are views showing a third embodiment of the hair care device according to the present invention. In this embodiment, a description is made by taking a hair dryer 100 as an example of the hair care device. Note that Fig. 18 and Fig. 19 only show a body portion of the hair dryer 100, from which a brush portion is detached, and in Fig. 19, reference symbol Fr denotes the forward direction, and reference symbol Up denotes the upward direction. Moreover, in the description of this embodiment, the same reference numerals are assigned to the same constituent portions as those of the hair dryer 1 of the above-mentioned first embodiment, and a duplicate description is omitted.

[0056] As shown in Fig. 18 and Fig. 19, the hair dryer 100 of this embodiment basically has a similar configuration to that of the hair dryer 1 of the first embodiment; however does not have the grip portion, and is used by being directly gripped. In the body portion, the wind tunnel portion 2 including the air blower unit 6 is provided in the inside of the housing 3, and on the air inlet port 2a provided on the rear end portion of the wind tunnel portion 2 concerned, the protection frame body 10, the mesh-like filter 11 and the support frame body 12 are provided as shown in Fig. 20. Note that these protection frame body 10, mesh-like filter 11 and support frame body 12 are formed into shapes matched with the air inlet port 2a of this embodiment.

[0057] Also in this case, preferably, the protection frame body 10, the mesh-like filter 11 and the support frame body 12 are molded integrally with one another by the synthetic resin material. Moreover, preferably, structures of the protection frame body 10 and the support frame body 12 are also made similar to those of the above-mentioned first embodiment, and further, the protection frame body 10 is made undetachable from the housing 3 in advance.

[0058] Moreover, in this embodiment, the cord C connected to the power supply penetrates the respective center portions of the protection frame body 10, the mesh-like filter 11 and the support frame body 12, and is then connected to the inside of the housing 3. Moreover, in Fig. 19, a heater device H is provided downstream of the air blower unit 6, and the switch SW that controls ON/OFF, the quantity of the air and a temperature of the hot wind is provided on a side surface of the body portion.

[0059] Then, in this embodiment, the air blower port 2b is provided on the front end portion of the wind tunnel portion 2 in a similar way to the above-mentioned first embodiment, and this air blower port 2b serves as an attachment hole to which a brush (not shown) is freely detachably fitted.

[0060] Moreover, also in this embodiment, the ion generation unit 8 is provided on the upper part of the wind tunnel portion 2 in a similar way to the above-mentioned

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first embodiment, and the portion that covers this ion generation unit 8 is composed of a decorative case 20A. As shown in the first embodiment, in this decorative case 20A, a decorative portion 21 formed into a diamond cut shape by a thickness change is naturally provided on a back surface thereof. The decorative portion 21 is subjected to metallic painting arbitrarily according to needs.

[0061] Hence, in order to use the brush-added hair dryer 1A of this embodiment, the brush (not shown) is attached to the air blower port 2b, and the switch SW is turned on. In such a way, the wind such as the cold wind and the hot wind is blown out from the air blower port 2b in a similar way to the hair dryer 1 of the first embodiment. The wind thus blown out passes through an inside of the brush, and is blown out from a surface on which bristles of the brush are formed. In such a way, the wind can be blown to the hair while combing the hair by the brush. Also in this case, the negative ions are discharged toward the hair from the ion generation unit 8, whereby the gloss and the moist feeling can be given to the hair, and the curl of the hair can be taken out effectively.

[0062] With the configuration described above, in accordance with the brush-added hair dryer 100 of this embodiment, in a similar way to the hair dryer 1 of the above-mentioned first embodiment, the protection frame body 10, the mesh-like filter 11 and the support frame body 12 are provided on the air inlet port 2a. In such a way, there can be exerted such functions and effects, which are similar to those of the first embodiment, that the dust can be made less likely to deposit, that it becomes possible to easily perform the cleanup, and so on.

[0063] Naturally, also in this embodiment, only the protection frame body 10 and the mesh-like filter 11 may be provided on the air inlet port 2a by excluding the support frame body 12.

[0064] The description has been made above of the preferred embodiments of the present invention; however, the present invention is not limited to the above-mentioned embodiments, and is modifiable in various ways.

[0065] For example, the present invention can also be applied to the hair dryers 1, 1A and 100 in which the ion generation unit. 8 is not provided. Moreover, the present invention can be applied to hair care devices other than the hair dryers 1 and 1A and the brush-added hair dryer 100 as long as the hair care devices concerned can perform the styling and maintenance of the hair.

Claims

1. A hair care device (1) comprising:

   a housing (3) in an inside of which an air flow passage (W) is formed;
   an air inlet port (2a) provided on an upstream end portion of the air flow passage (W), and an air blower port (2b) provided on a downstream end portion of the air flow passage (W) ;
   an air blower unit (6) that discharges air from the air blower port (2b), the air being sucked from the air inlet port (2a) ;
   a porous protection frame body (10) that finely divides an opening region of the air inlet port (2a), the protection frame body (10) being provided on the air inlet port (2a); and
   a mesh-like filter (11) that divides the opening region of the protection frame body (10) more finely, the filter (11) being arranged on an outside of the protection frame body (10) .

2. The hair care device (1) according to claim 1, wherein the filter (11) is formed so that a thickness thereof can be thinner than a thickness of the protection frame body (10).

3. The hair care device (1) according to claim 1, wherein the protection frame body (10) is composed of a plurality of annular frame portions (10b) arranged concentrically, and of a plurality of linear frame portions (10c) extended radially from a substantial center of the air inlet port (2a) to intersect the annular frame portions (10b).

4. The hair care device (1) according to claim 3, wherein, in the linear frame portions (10c), inside linear portions (10cA) located in an inside of the annular frame portion (10bA) serving as an innermost circumferential-side one among the plurality of annular frame portions (10b) and outside linear portions (10cB) located on an outside of the annular frame portion (10bA) are arranged to be shifted from each other with respect to linear directions.

5. The hair care device (1) according to claim 1, wherein the protection frame body (10) is formed so that an opening shape of the protection frame body (10) can adopt a honeycomb structure.

6. The hair care device (1) according to claim 1, wherein the protection frame body (10) and the filter (11) are molded integrally with each other by a synthetic resin material.

7. The hair care device (1A) according to claim 1,
   wherein a porous support frame body (12) with substantially a same shape as a shape of the protection frame body (10) is provided on an outside of the filter (11), and
   openings (10a, 12a) of the protection frame body (10) and the support frame body (12) are arranged to be allowed to substantially coincide with an inflow direction of the air.

8. The hair care device (1A) according to claim 7, wherein the support frame body (12) is formed so that a thickness thereof can be thinner than a thick-

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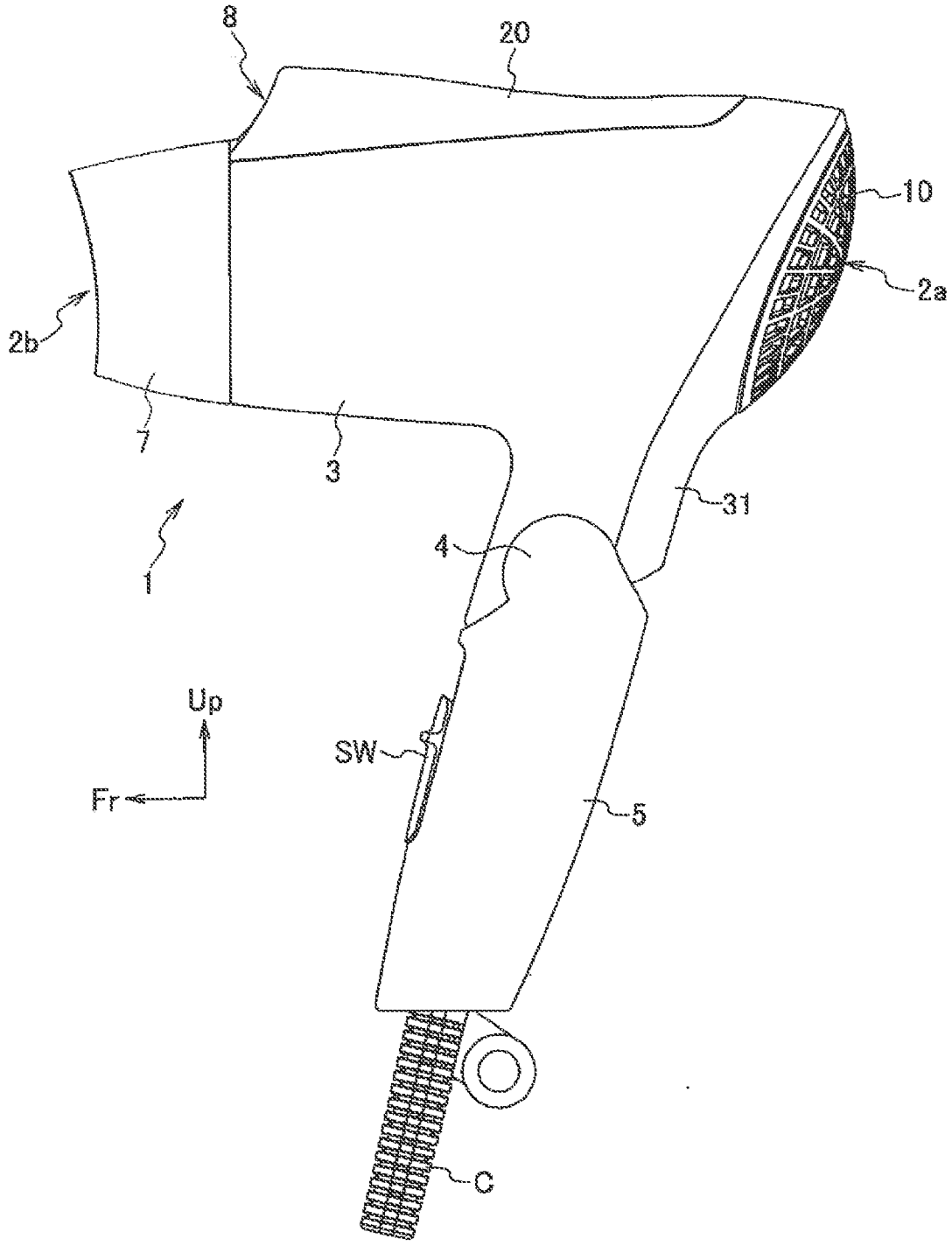
ness of the protection frame body (10) .

9. The hair care device (1A) according to claim 7, wherein the protection frame body (10), the filter (11) and the support frame body (12) are molded integrally with one another by a synthetic resin material.

10. The hair care device (1) according to claim 1, wherein the protection frame body (10) is coupled integrally or tightly to the housing (3) to be undetachable therefrom.

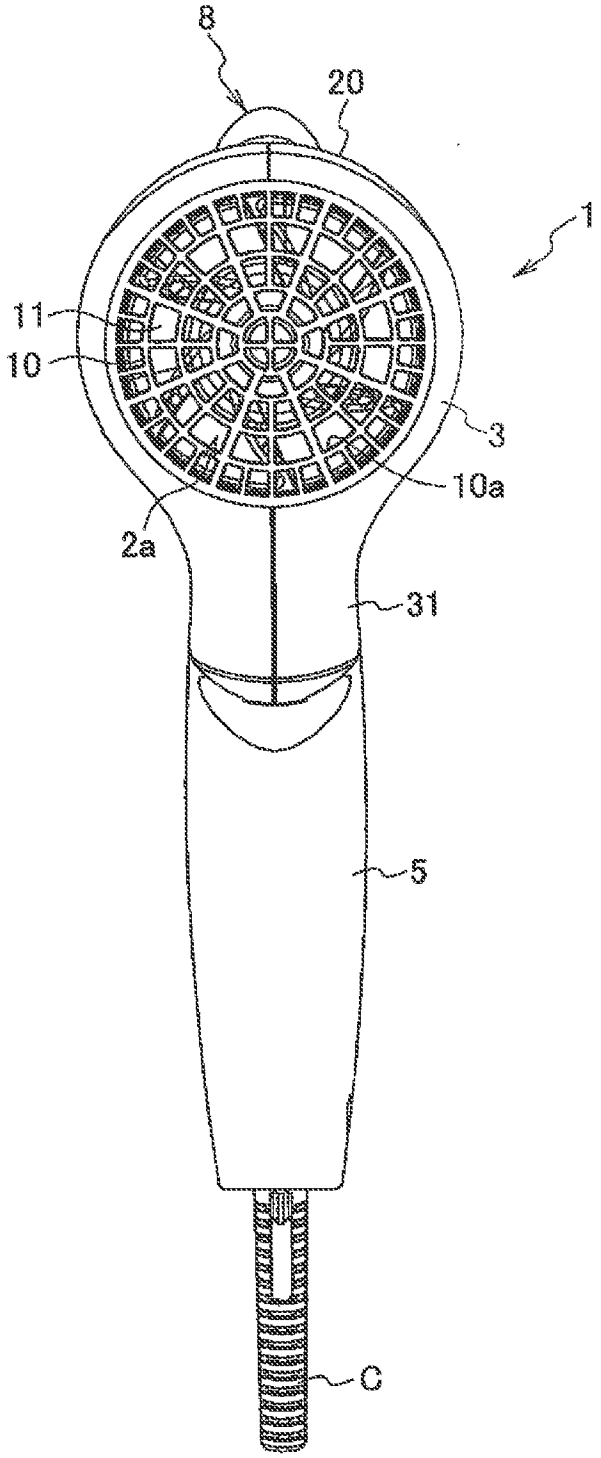
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FIG. 1



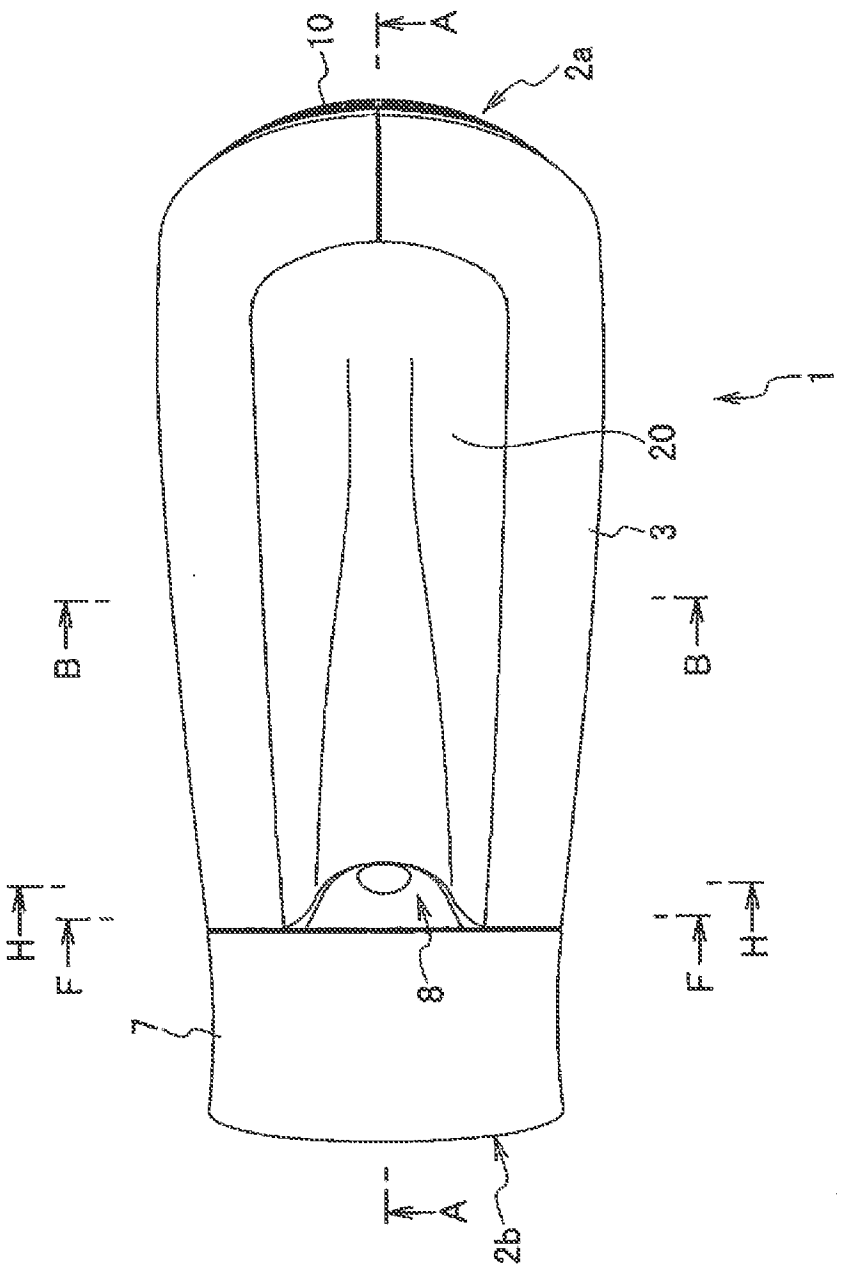
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FIG. 2



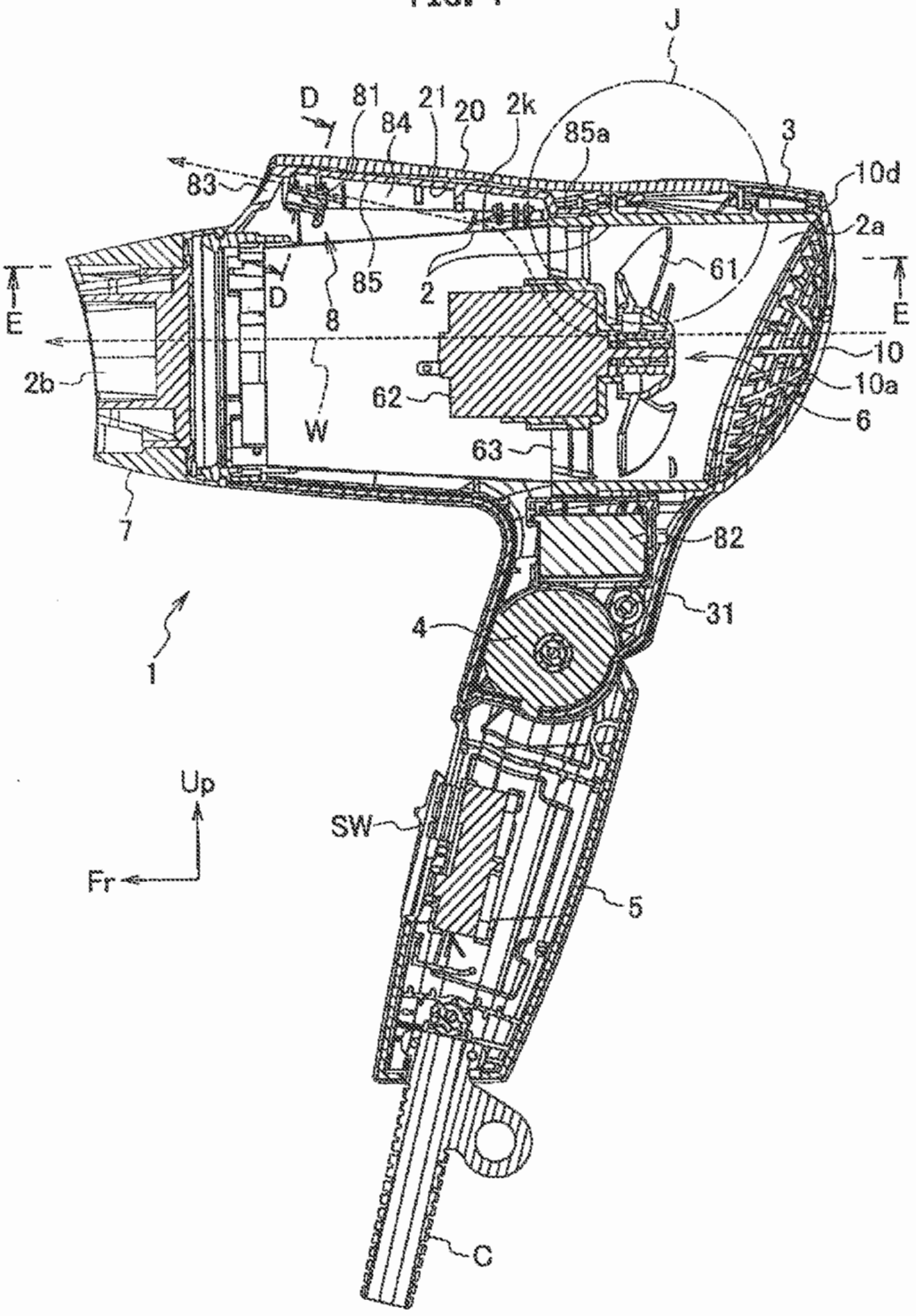
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FIG. 3



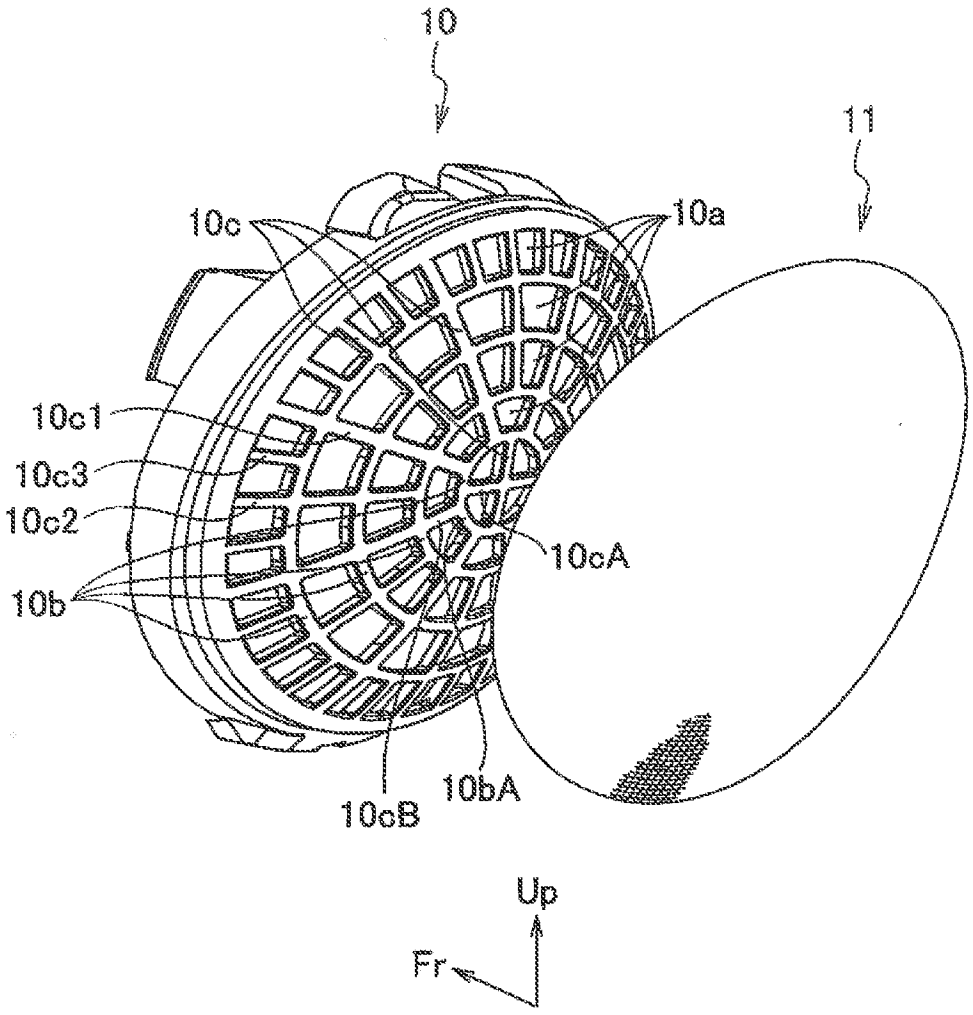
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FIG. 4



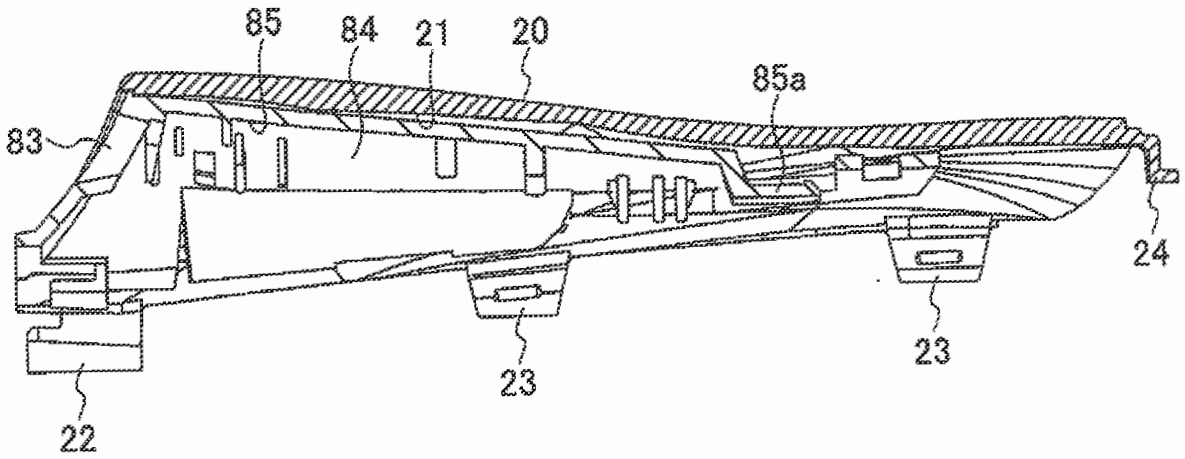
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FIG. 5



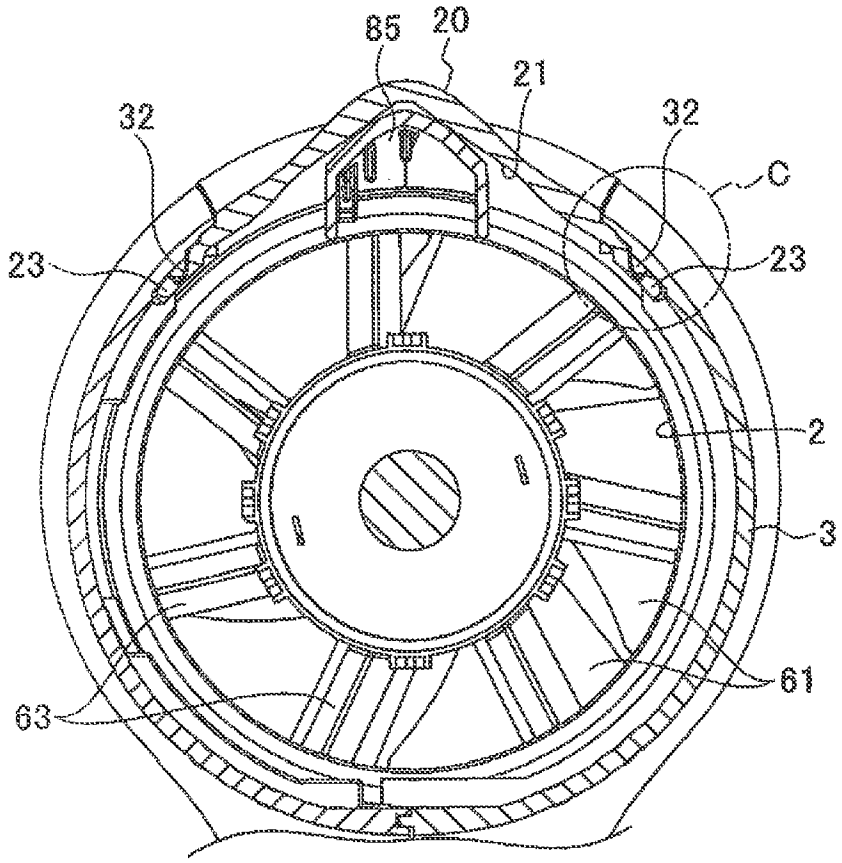
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FIG. 6



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FIG. 7



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FIG. 8

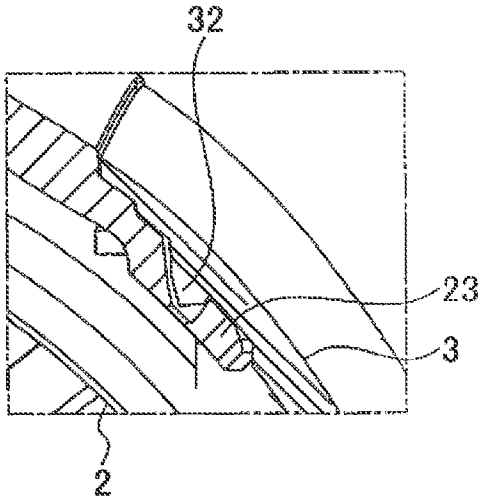
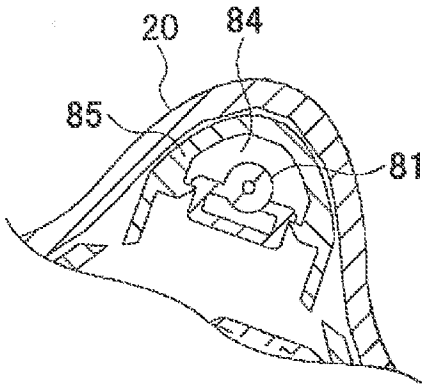
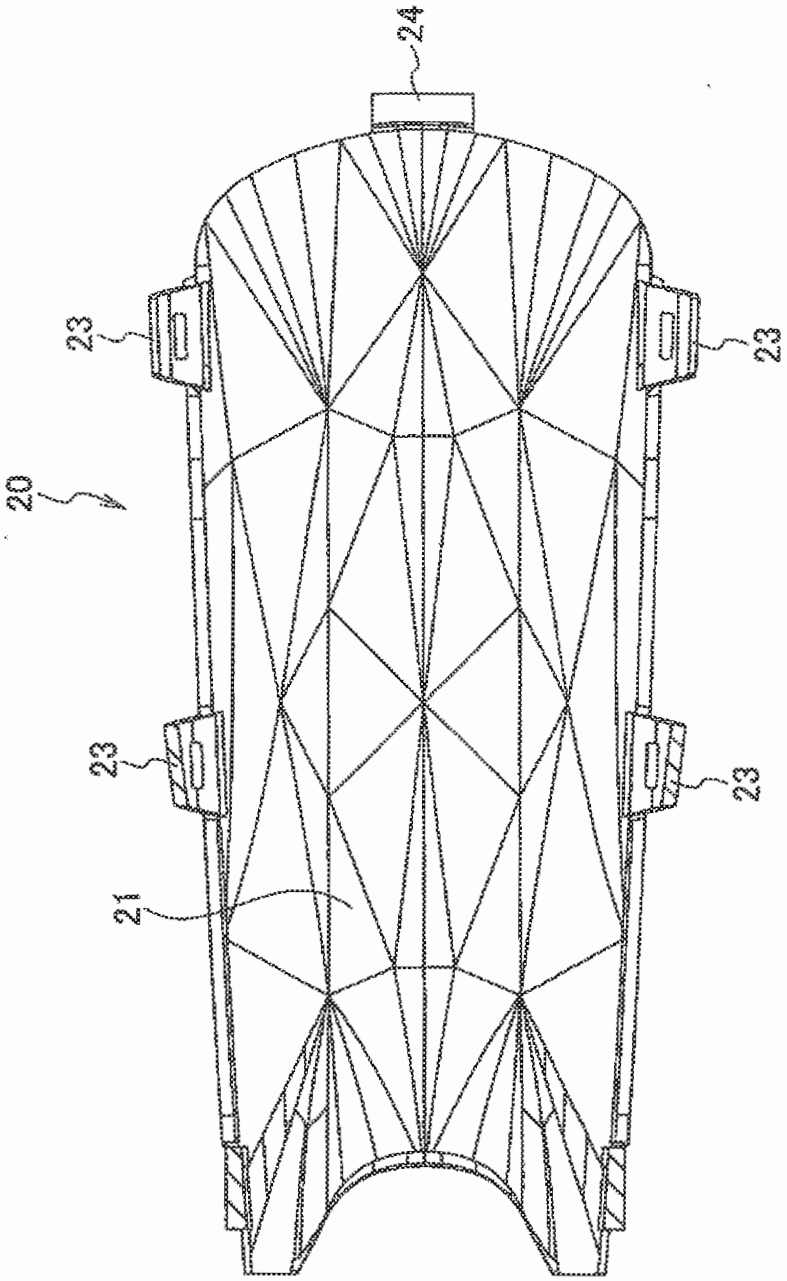


FIG. 9



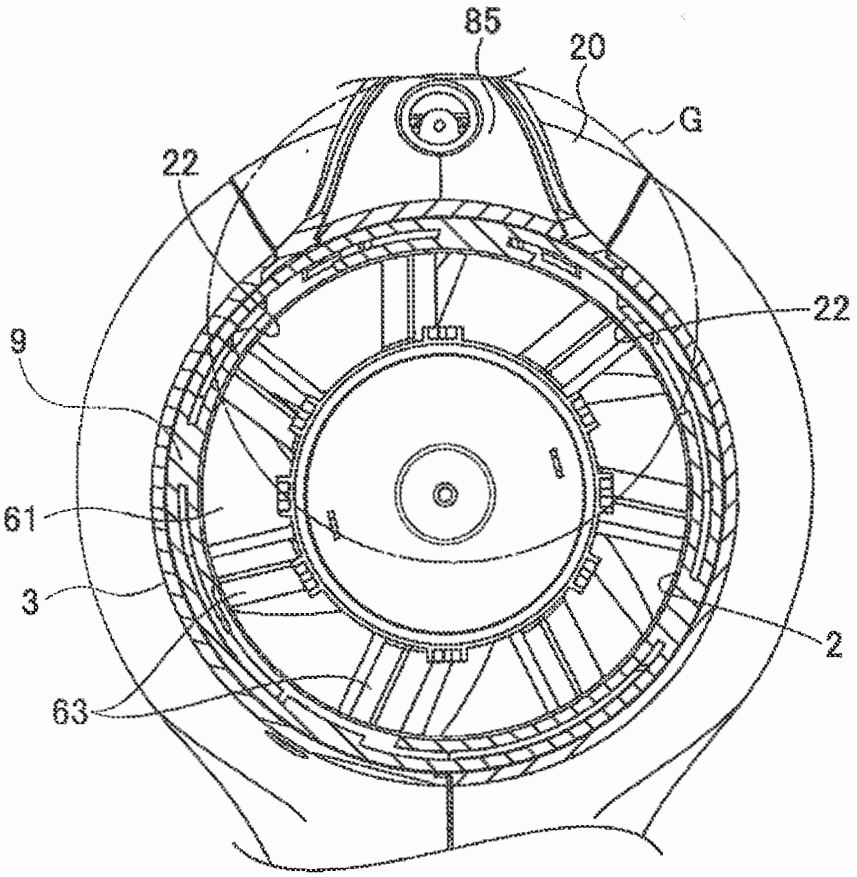
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FIG. 10



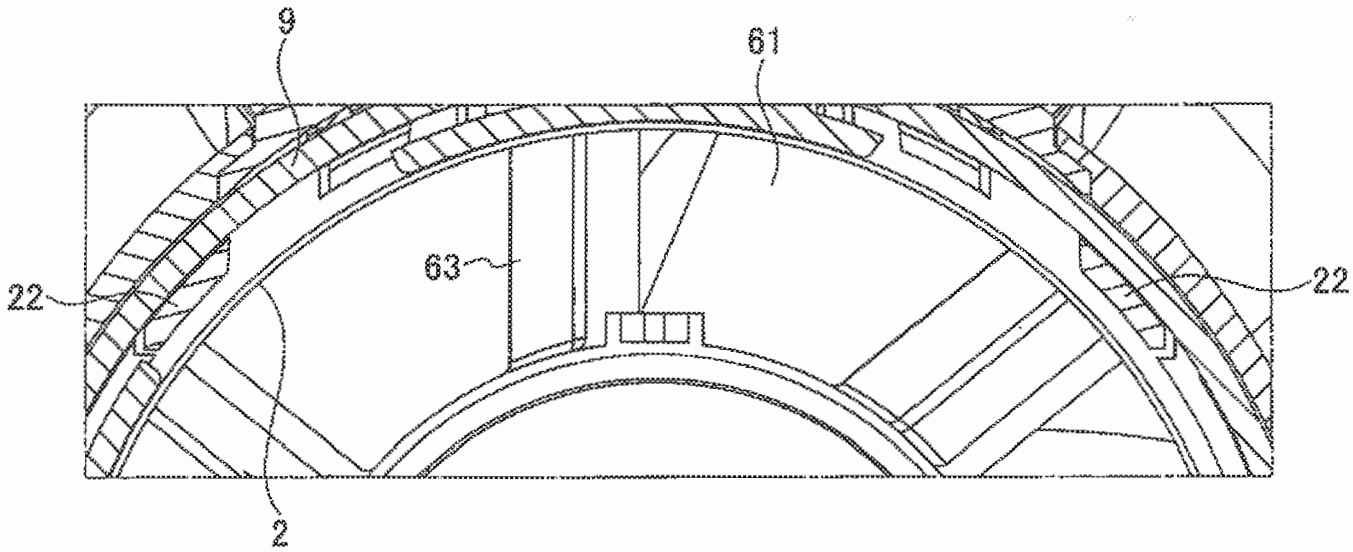
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FIG. 11



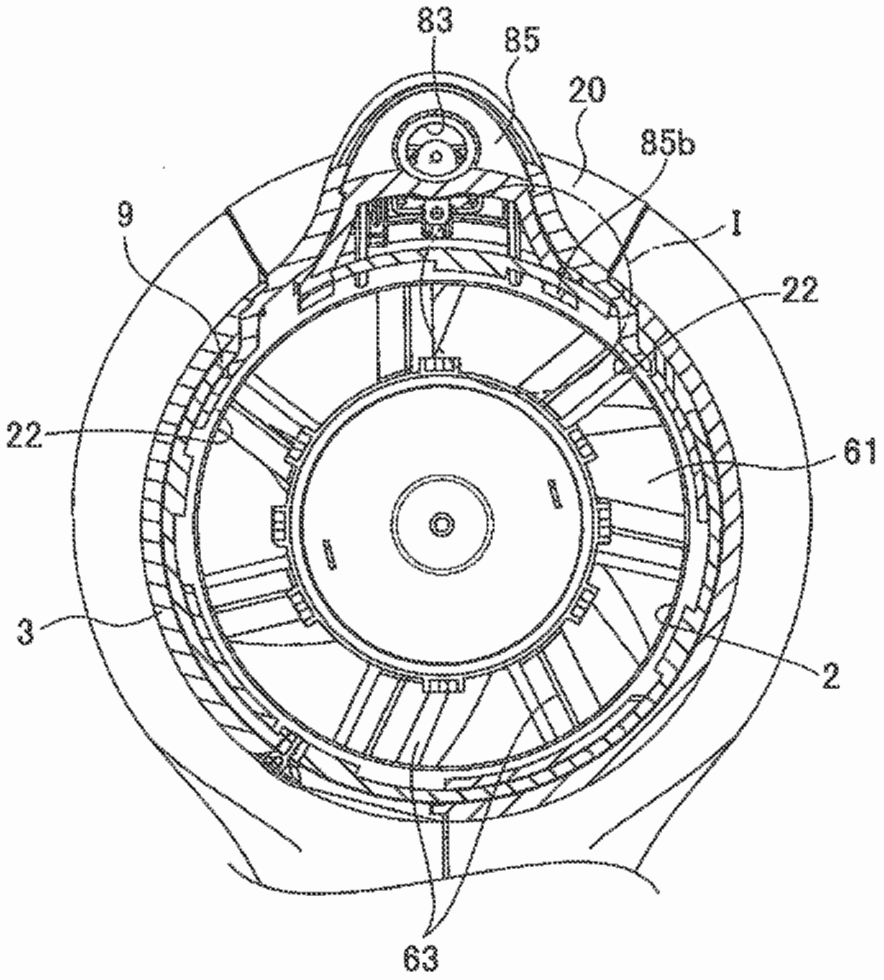
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FIG. 12



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FIG. 13



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FIG. 14

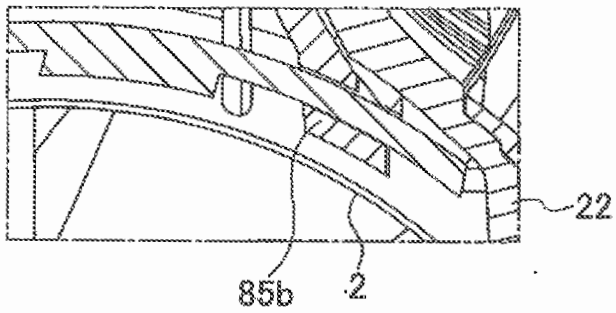
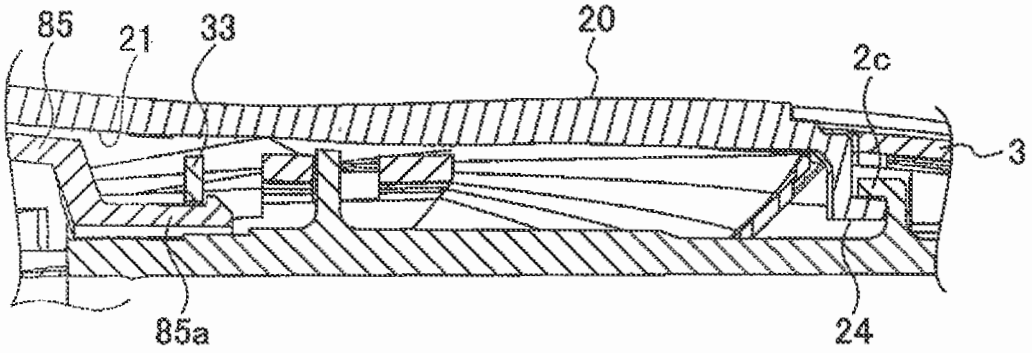
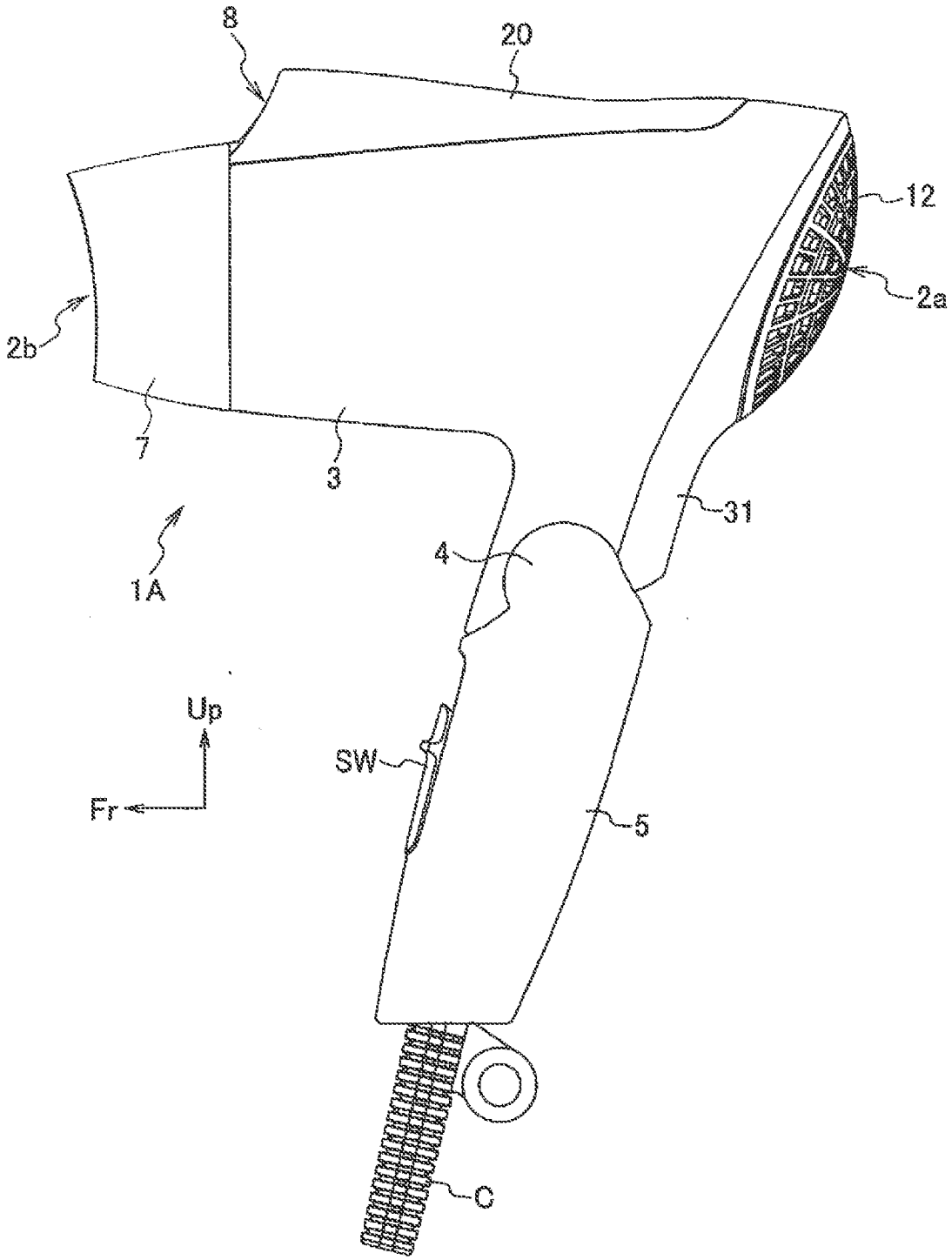


FIG. 15



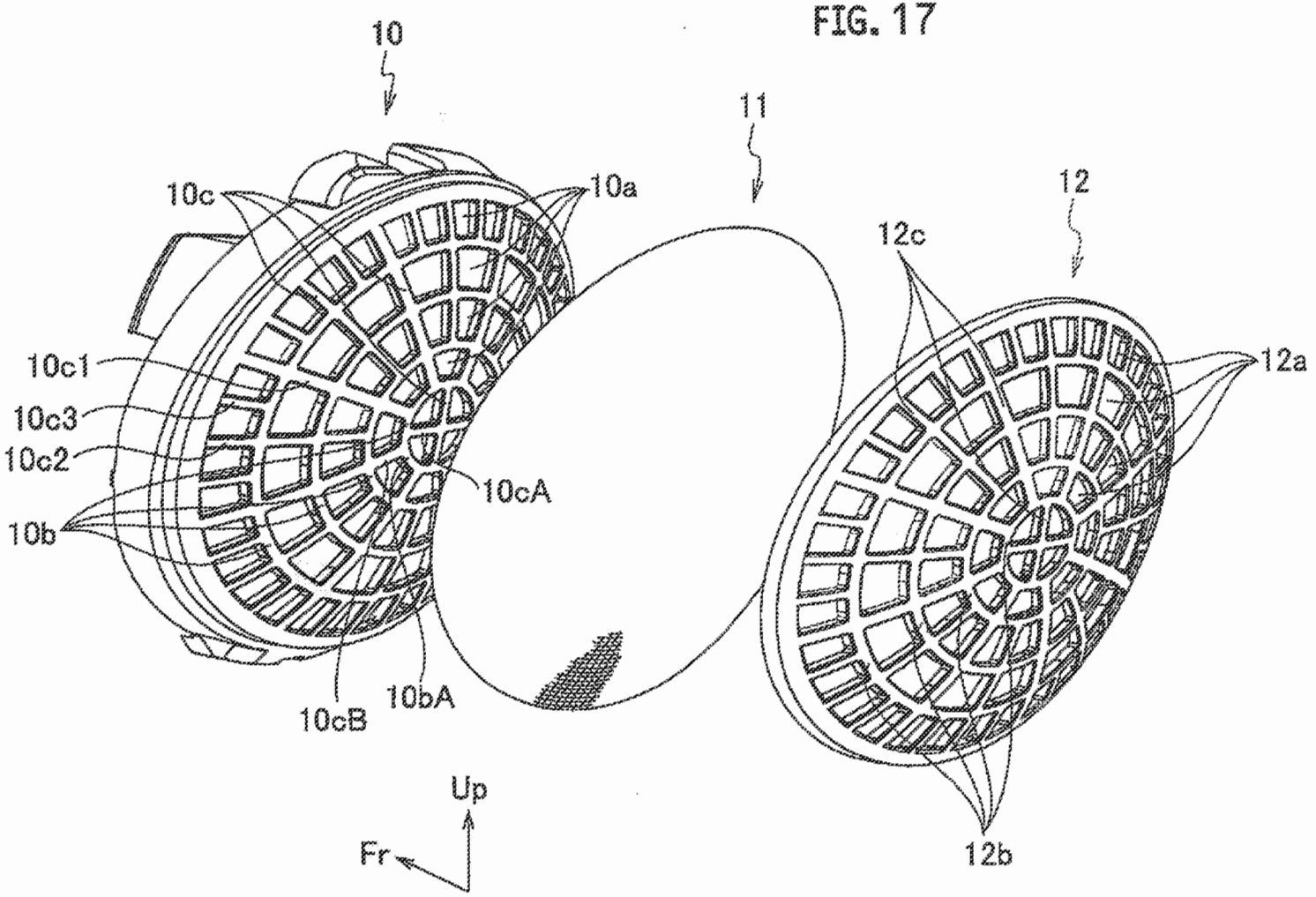
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FIG. 16



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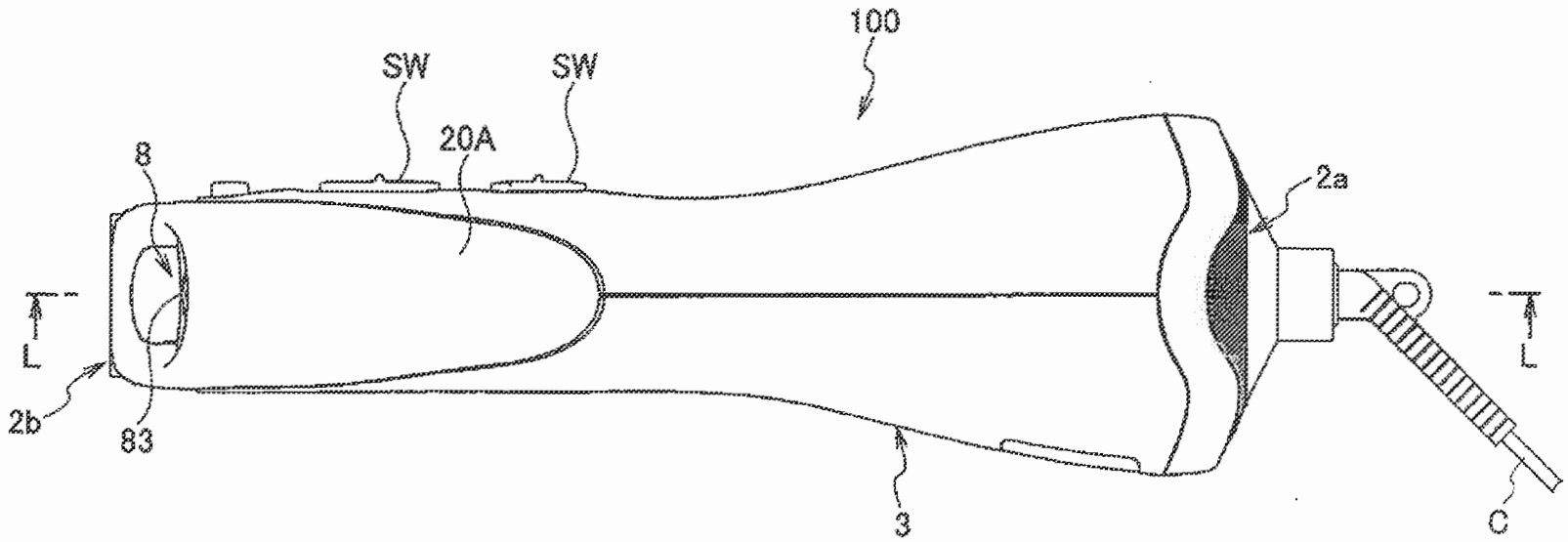
FIG. 17



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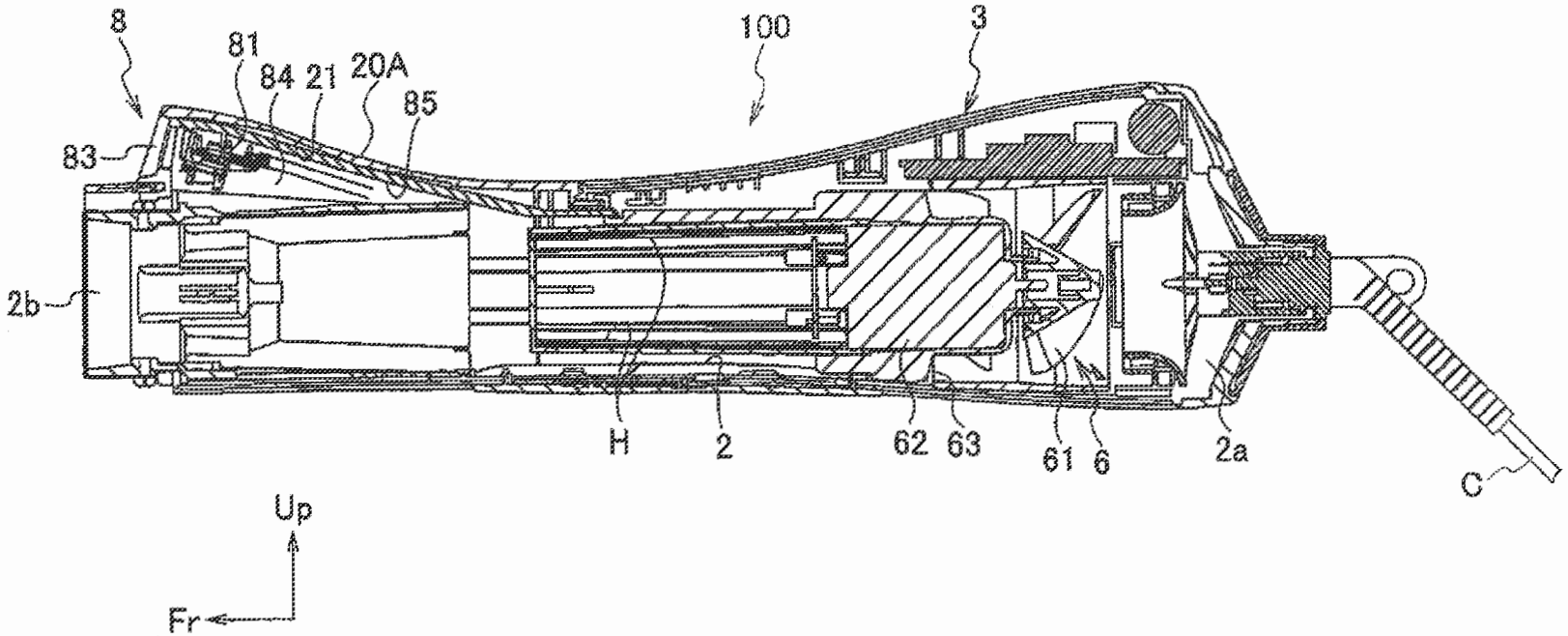
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FIG. 18



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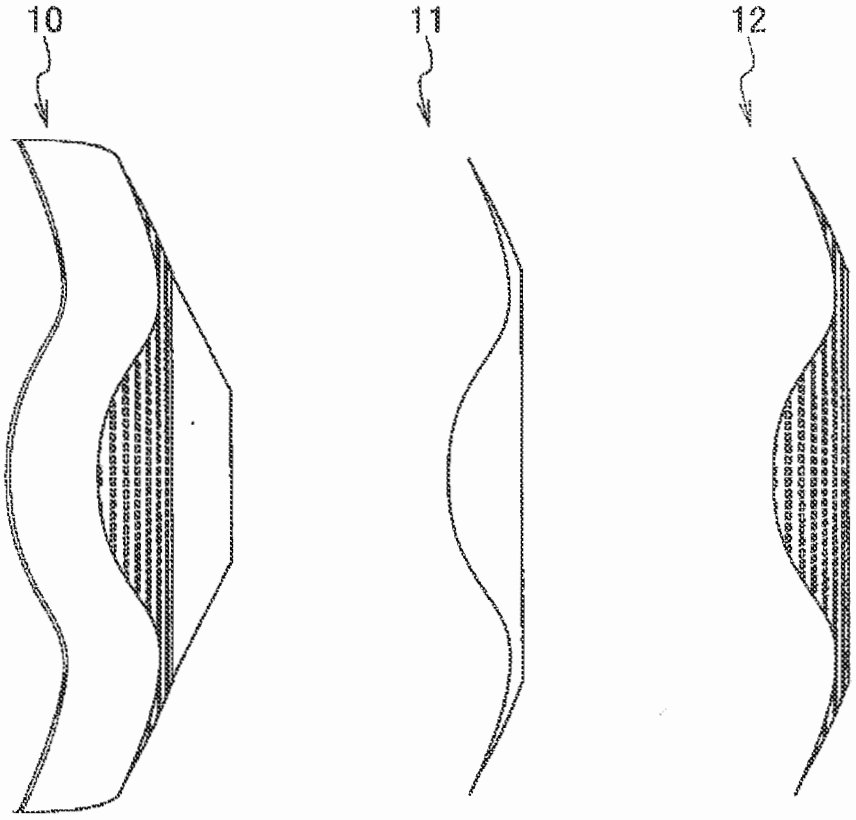
FIG. 19



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FIG. 20



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European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 11 16 6919

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 810 911 A (BEHRENDT JUERGEN [DE] ET AL) 22 September 1998 (1998-09-22) * column 1, line 64 - column 6, line 23; figures 1-3 * -----	1-10	INV. A45D20/12 B01D46/00 B01D46/10
X	DE 79 21 427 U1 (EURAS) 7 April 1983 (1983-04-07) * the whole document * -----	1-7,9	
X	US 4 634 839 A (GILBERTSON JOHN E [US]) 6 January 1987 (1987-01-06) * column 1, line 60 - column 2, line 43; figures 6,7 * -----	1,2,5,7, 8,10	
X	EP 2 002 752 A2 (MATSUSHITA ELECTRIC WORKS LTD [JP] PANASONIC ELEC WORKS CO LTD [JP]) 17 December 2008 (2008-12-17) * paragraphs [0007] - [0015], [0018] - [0020], [0022], [0023], [0028]; figures 1-8 * -----	1-5,7,8, 10	
			TECHNICAL FIELDS SEARCHED (IPC) A45D B01D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	13 July 2011	Ionescu, C

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EPO FORM 1503 03.82 (P04C01)

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 16 6919

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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13-07-2011

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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(51) INT CL:
F04D 25/08 (2006.01) *F24H 3/04* (2006.01)

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(58) Field of Search:
INT CL A45D, F04D, F24H
Other: ONLINE: WPI, EPODOC

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Chang Hin Choong

(74) Agent and/or Address for Service:
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Intellectual Property Department, Tetbury Hill, MALMESBURY, Wiltshire, SN16 0RP, United Kingdom

(54) Title of the Invention: A fan assembly
Abstract Title: A fan assembly with a heater

(57) A nozzle for a fan assembly and a fan assembly including said nozzle comprises; an interior passage for receiving air flow; a plurality of air outlets for emitting the air flow from the nozzle, the nozzle defining an opening through which air from outside the nozzle is drawn by the air flow emitted from the air outlets; at least one heater for heating a first portion of the air flow; means for diverting a second portion of the air flow away from the heater; a plurality of outlets includes at least one first air outlet for emitting the first portion of the air flow and at least one second air outlet for emitting the second portion of the air flow. The fan assembly also includes a motor-driven impeller for creating an air flow. Preferably the second portion of the air flow is directed over an external surface of the casing to keep that surface cool during use of the heater.

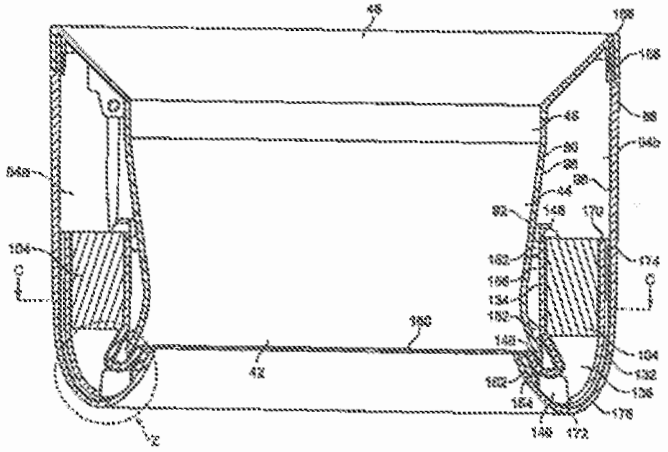


FIG. 9

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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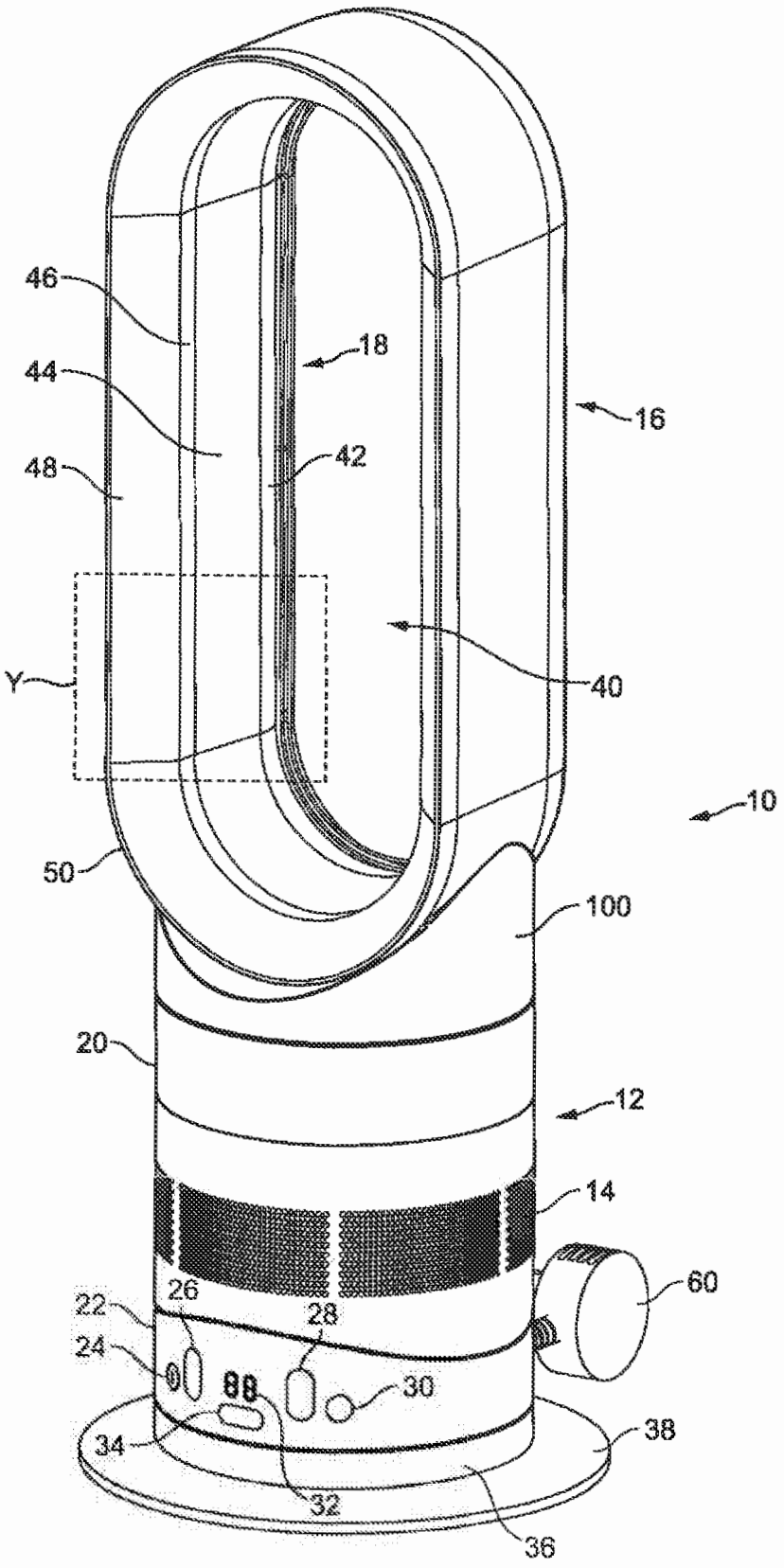


FIG. 1

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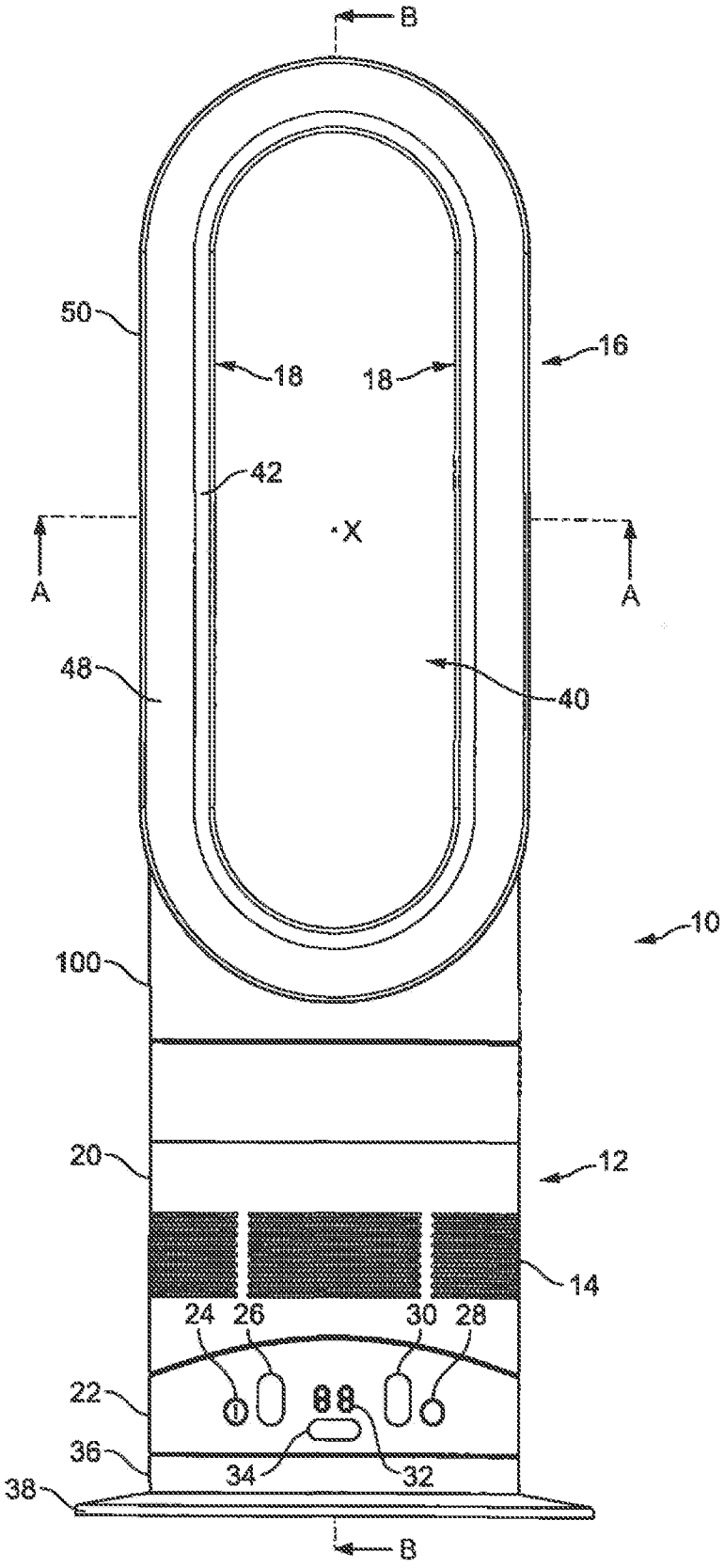


FIG. 2

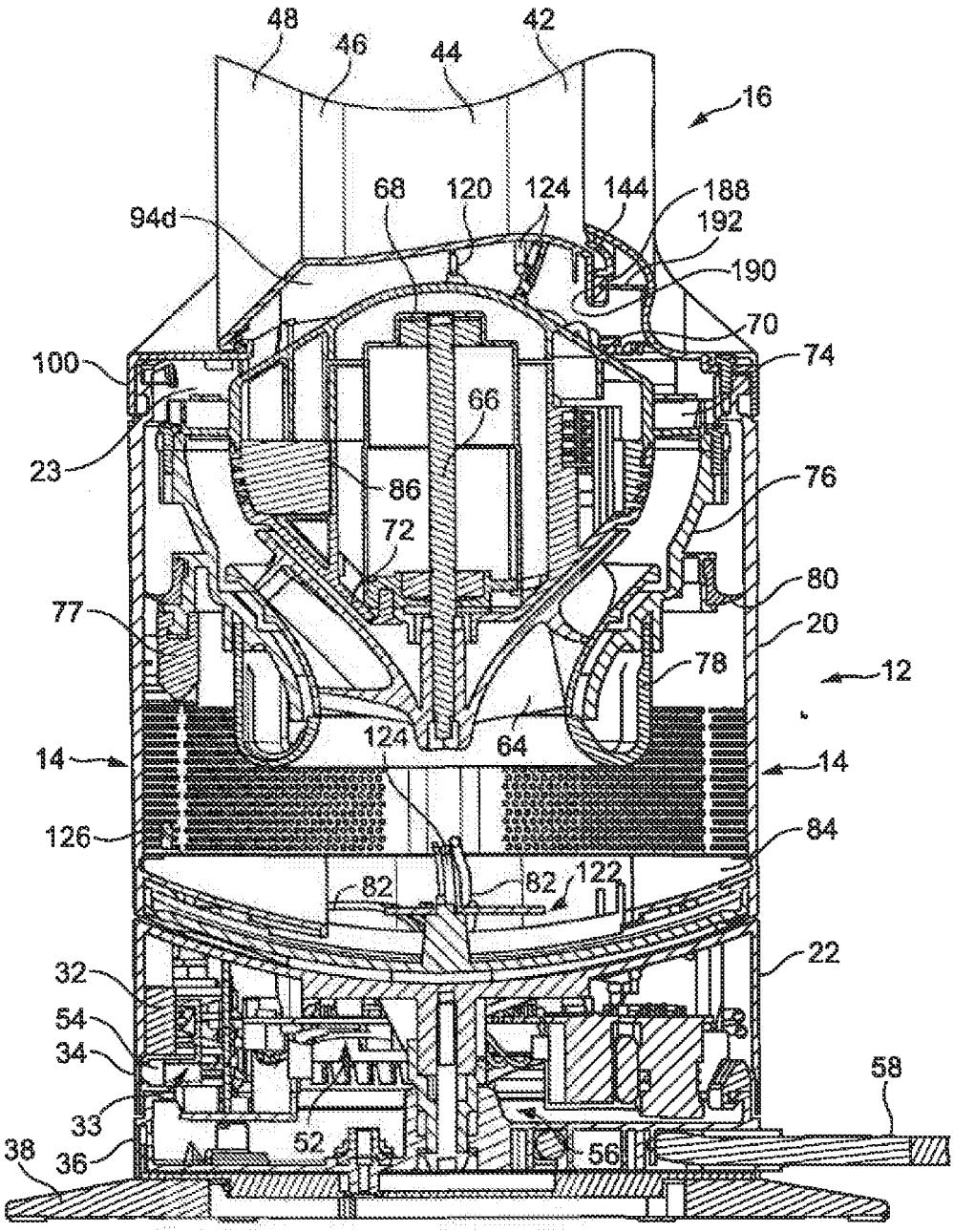

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FIG. 3

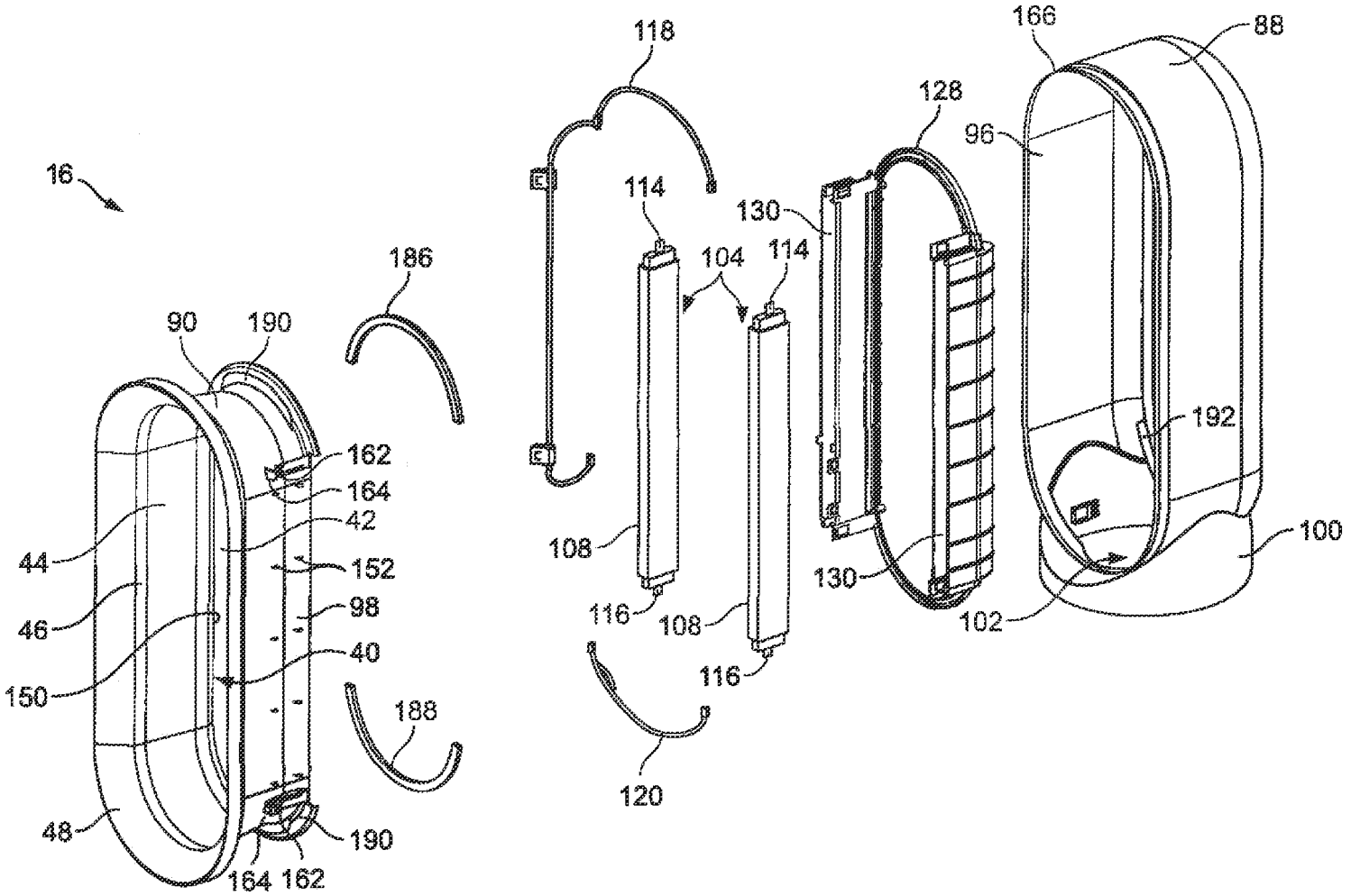


FIG. 4

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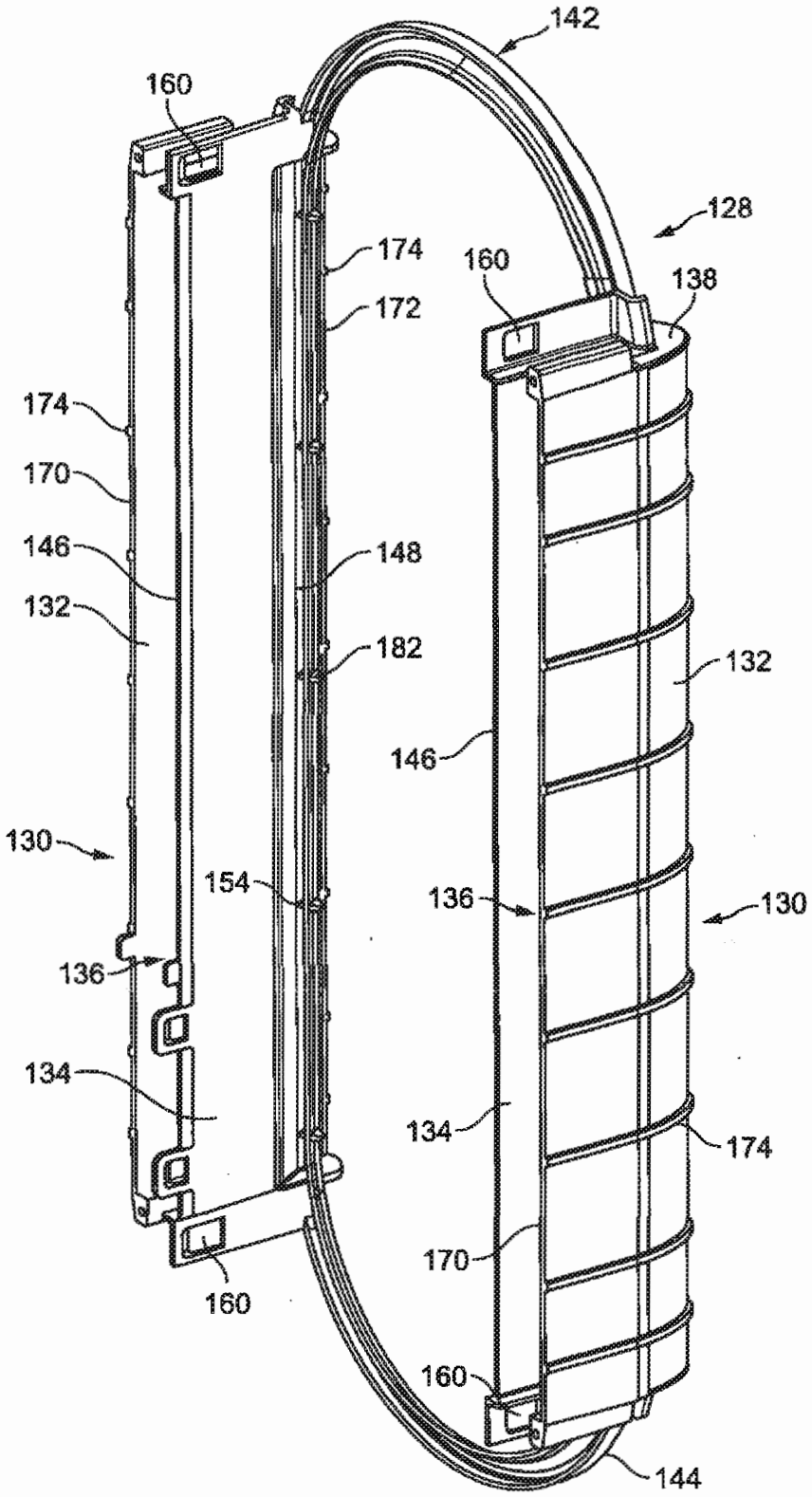

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FIG. 5

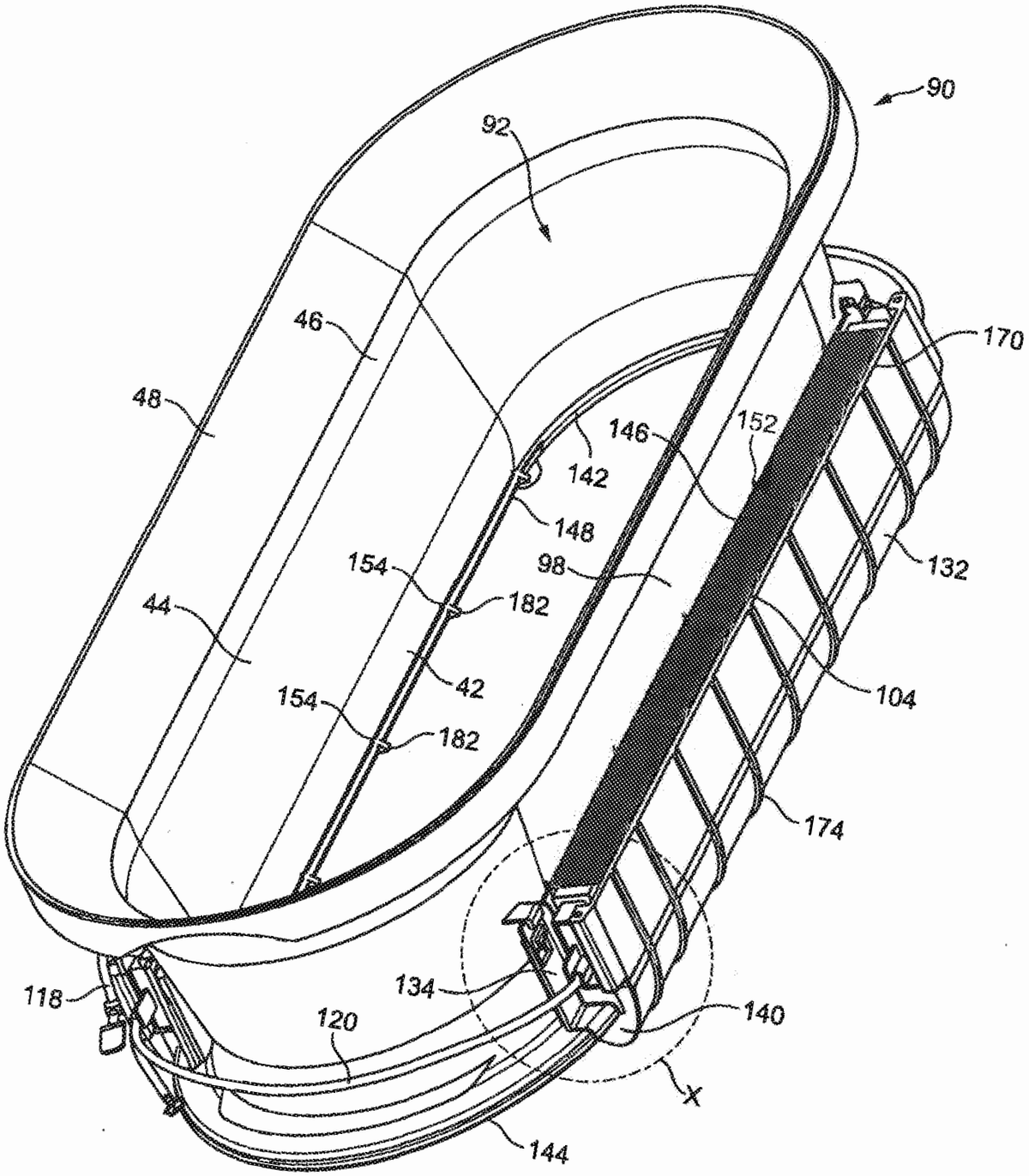

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FIG. 6

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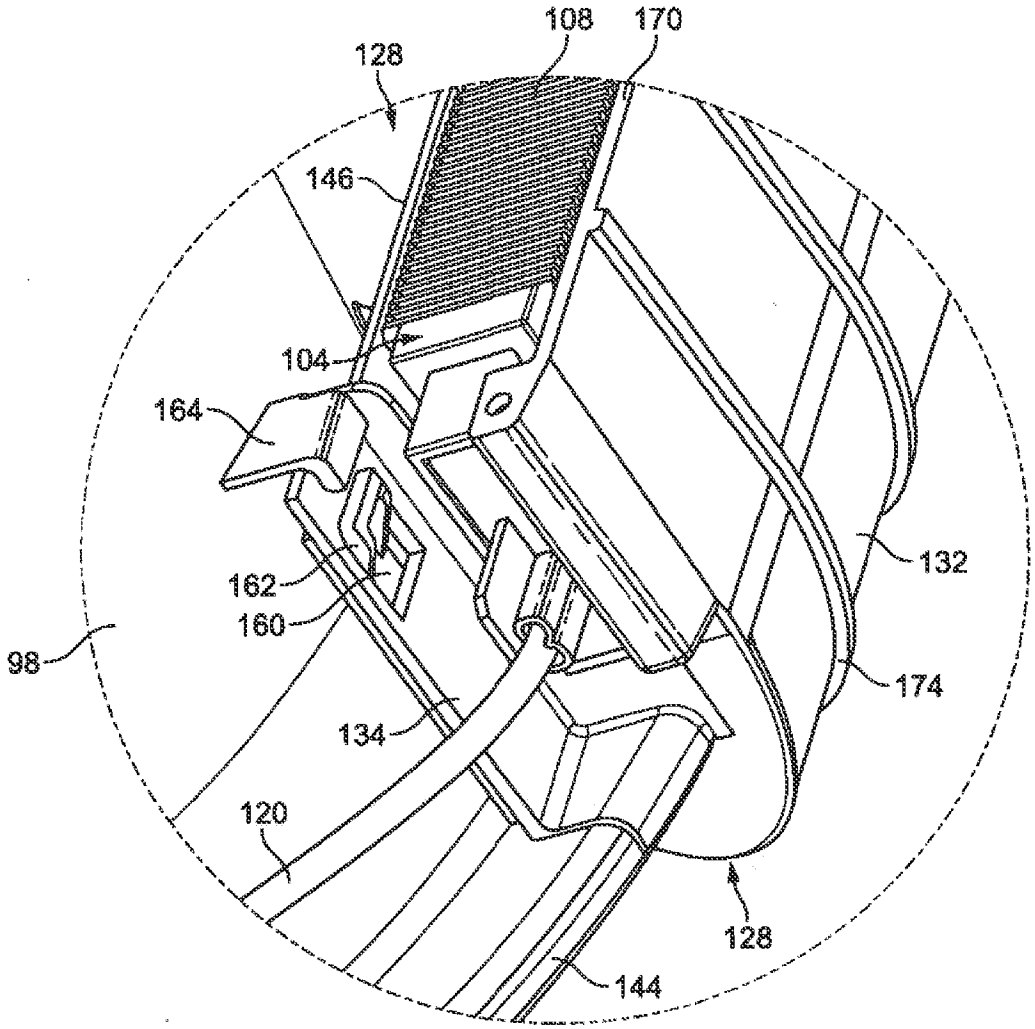


FIG. 7

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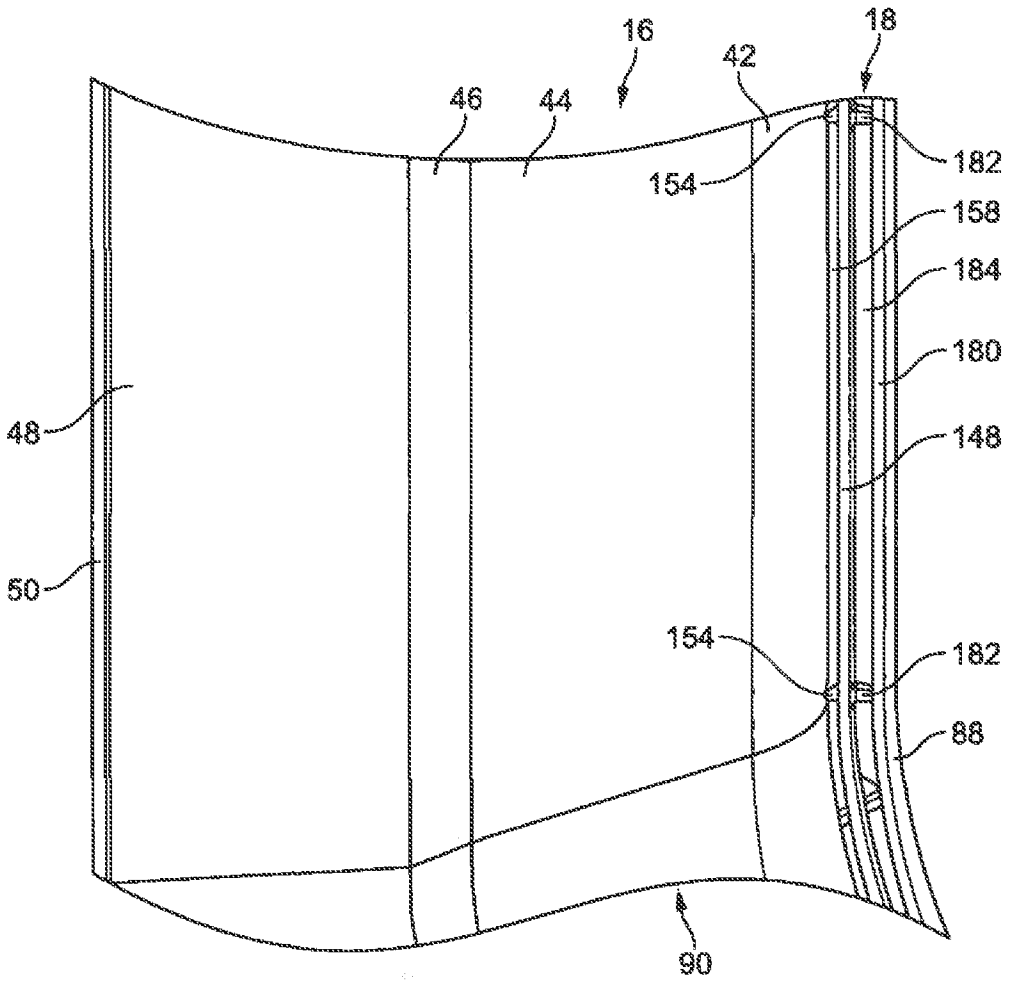


FIG. 8

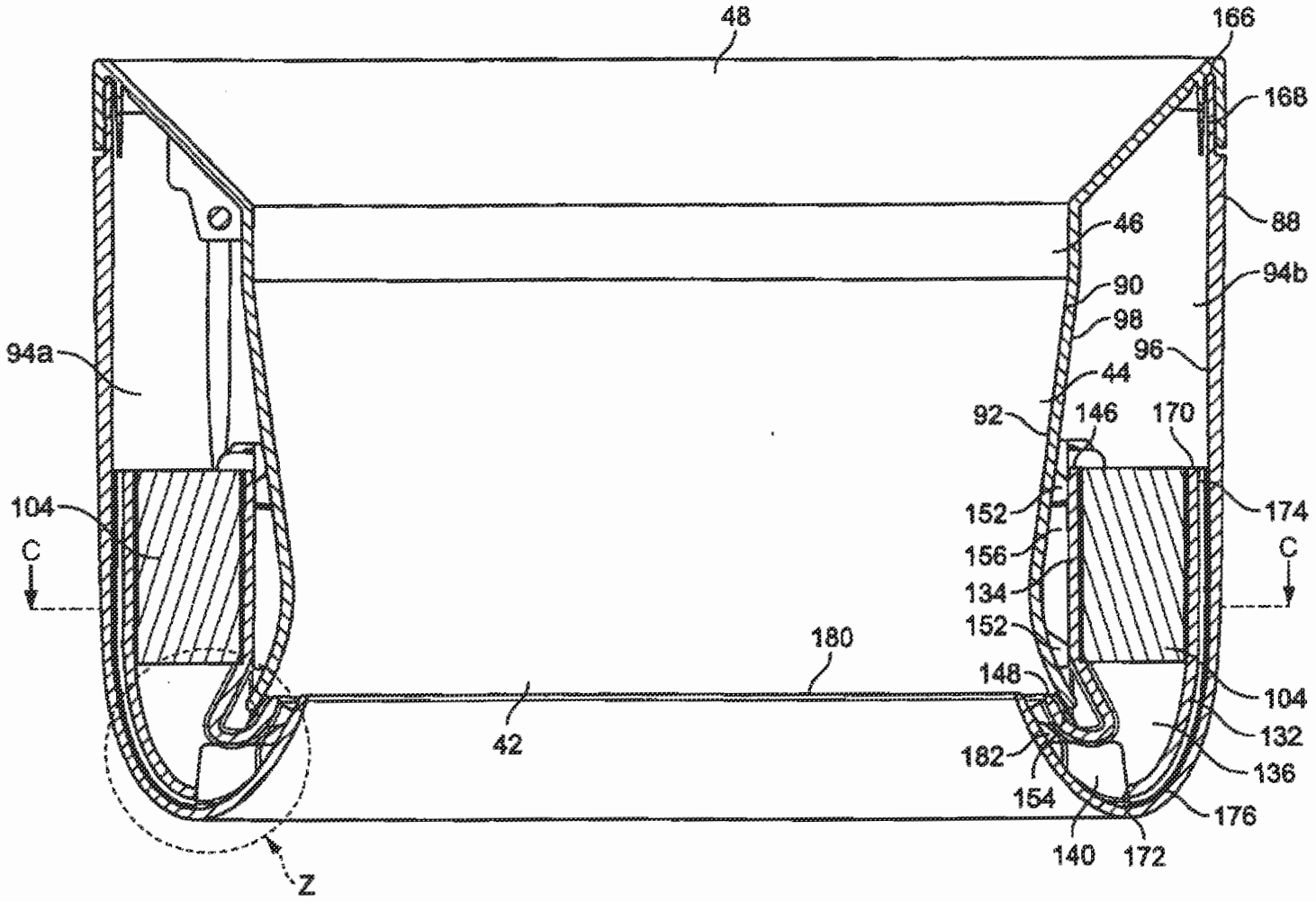


FIG. 9

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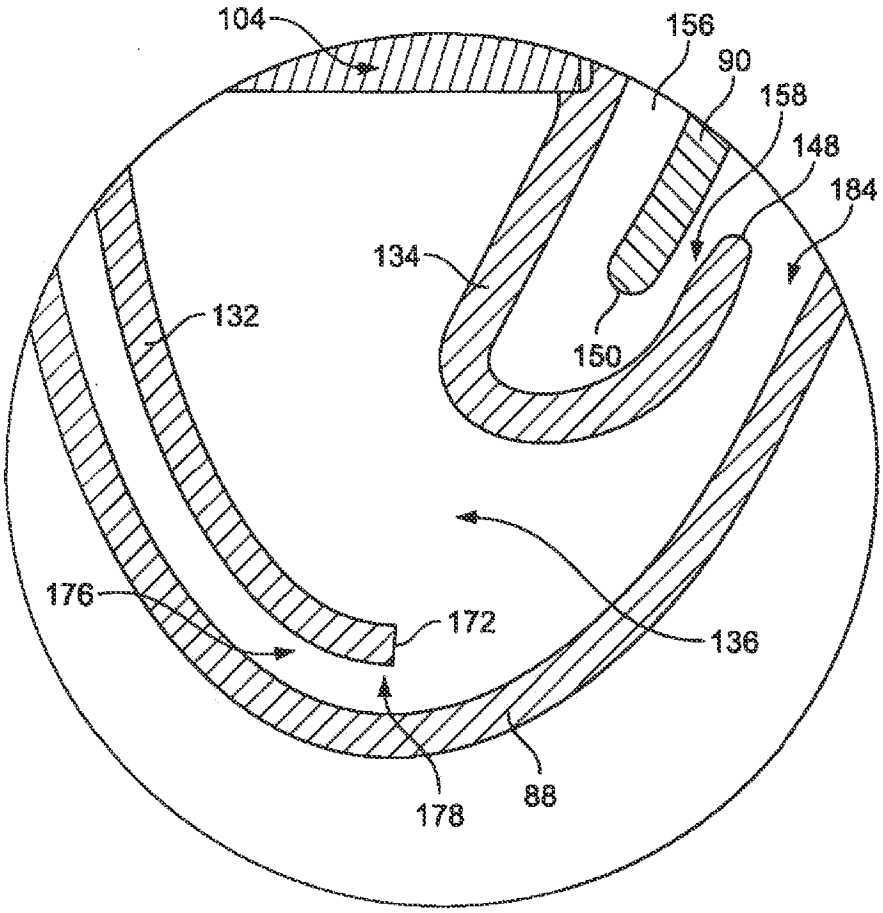


FIG. 10

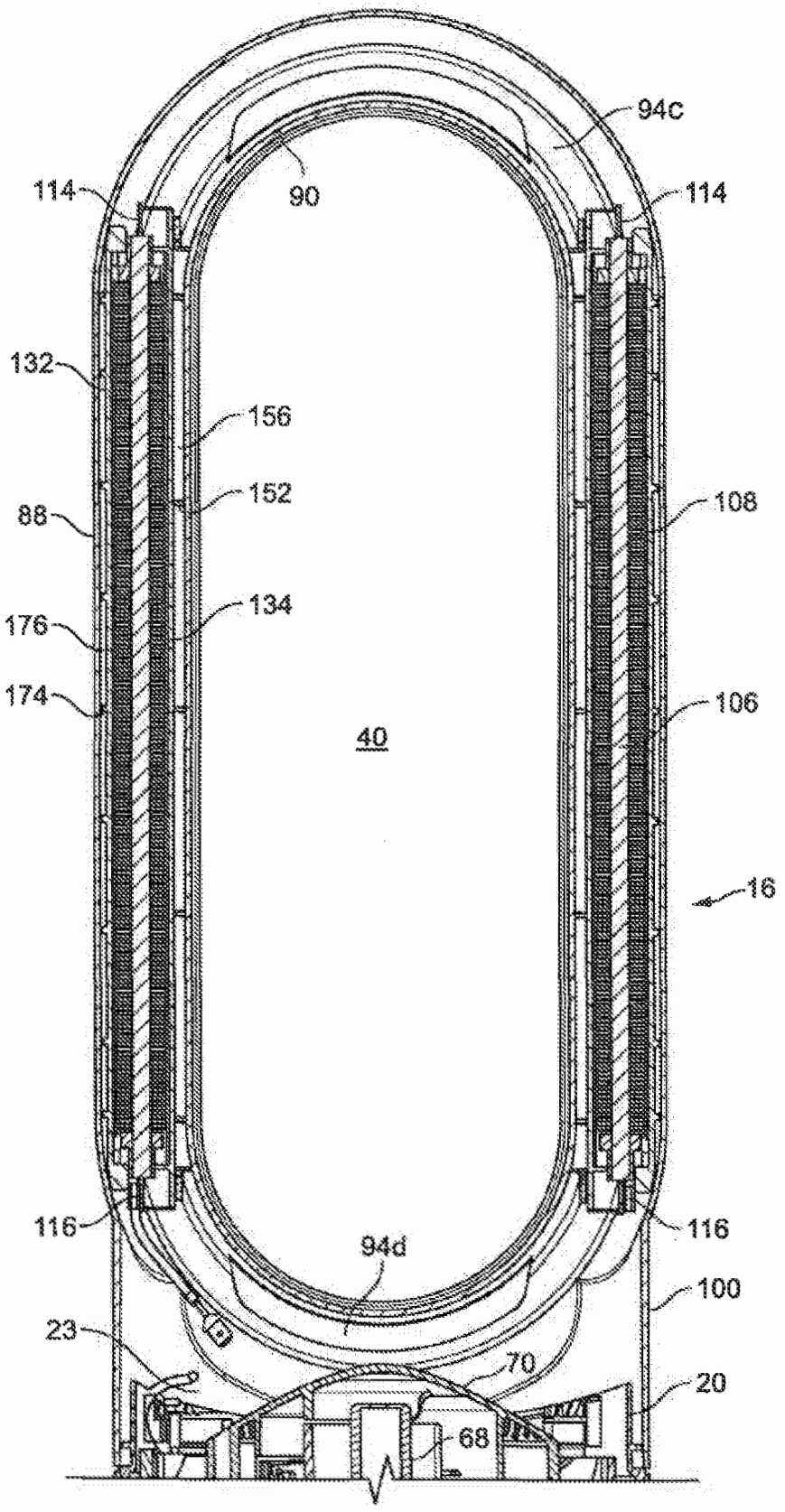


FIG. 11

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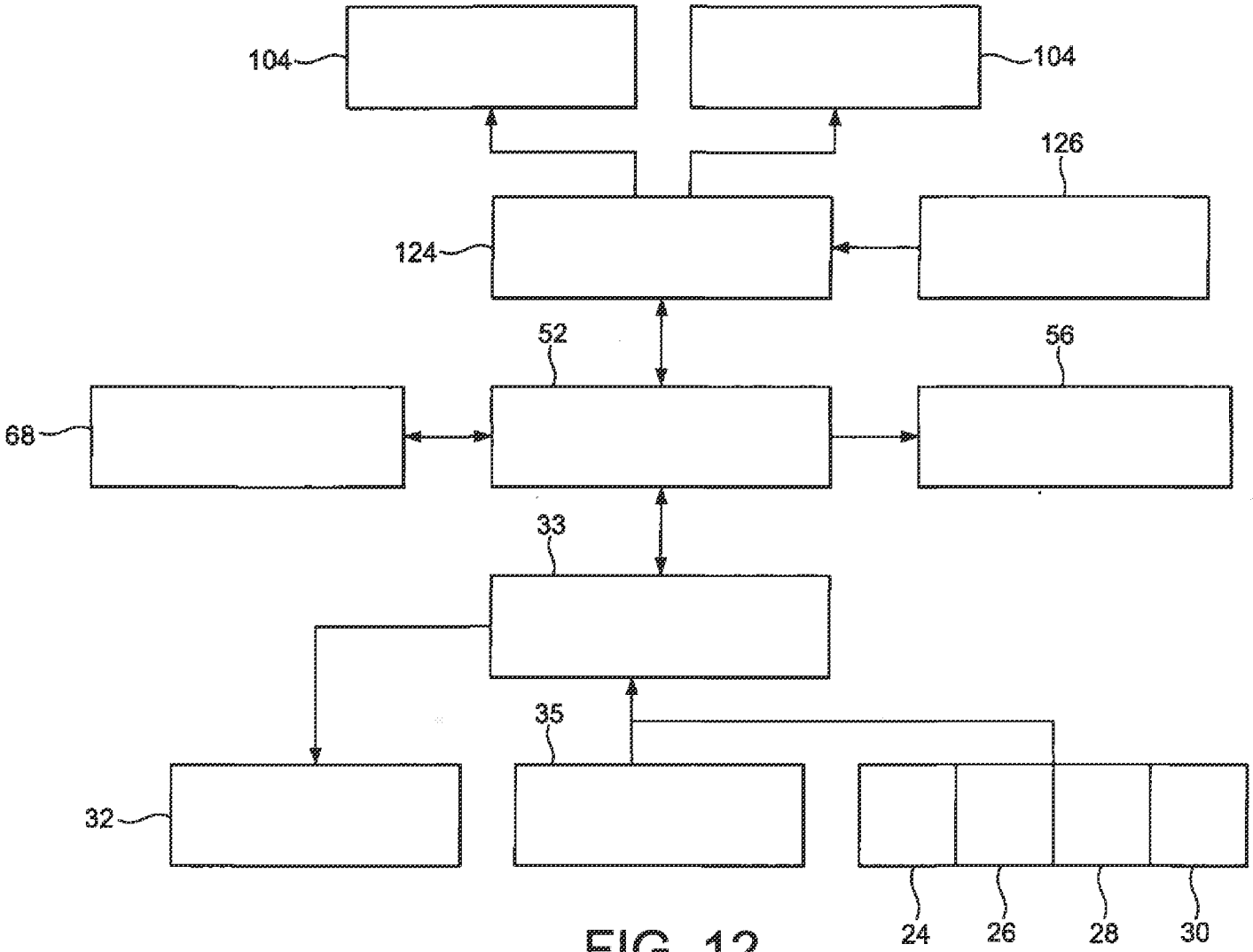


FIG. 12

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A FAN ASSEMBLY

FIELD OF THE INVENTION

The present invention relates to a fan assembly, and to a nozzle for a fan assembly. In a preferred embodiment, the present invention relates to a fan heater for creating a warm air current in a room, office or other domestic environment.

BACKGROUND OF THE INVENTION

A conventional domestic fan typically includes a set of blades or vanes mounted for rotation about an axis, and drive apparatus for rotating the set of blades to generate an air flow. The movement and circulation of the air flow creates a 'wind chill' or breeze and, as a result, the user experiences a cooling effect as heat is dissipated through convection and evaporation.

Such fans are available in a variety of sizes and shapes. For example, a ceiling fan can be at least 1 m in diameter, and is usually mounted in a suspended manner from the ceiling to provide a downward flow of air to cool a room. On the other hand, desk fans are often around 30 cm in diameter, and are usually free standing and portable. Floor-standing tower fans generally comprise an elongate, vertically extending casing around 1 m high and housing one or more sets of rotary blades for generating an air flow. An oscillating mechanism may be employed to rotate the outlet from the tower fan so that the air flow is swept over a wide area of a room.

Fan heaters generally comprise a number of heating elements located either behind or in front of the rotary blades to enable a user to heat the air flow generated by the rotating blades. The heating elements are commonly in the form of heat radiating coils or fins. A variable thermostat, or a number of predetermined output power settings, is usually provided to enable a user to control the temperature of the air flow emitted from the fan heater.

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A disadvantage of this type of arrangement is that the air flow produced by the rotating blades of the fan heater is generally not uniform. This is due to variations across the blade surface or across the outward facing surface of the fan heater. The extent of these variations can vary from product to product and even from one individual fan heater to another. These variations result in the generation of a turbulent, or 'choppy', air flow which can be felt as a series of pulses of air and which can be uncomfortable for a user. A further disadvantage resulting from the turbulence of the air flow is that the heating effect of the fan heater can diminish rapidly with distance.

In a domestic environment it is desirable for appliances to be as small and compact as possible due to space restrictions. It is undesirable for parts of the appliance to project outwardly, or for a user to be able to touch any moving parts, such as the blades. Fan heaters tend to house the blades and the heat radiating coils within a cage or apertured casing to prevent user injury from contact with either the moving blades or the hot heat radiating coils, but such enclosed parts can be difficult to clean. Consequently, an amount of dust or other detritus can accumulate within the casing and on the heat radiating coils between uses of the fan heater. When the heat radiating coils are activated, the temperature of the outer surfaces of the coils can rise rapidly, particularly when the power output from the coils is relatively high, to a value in excess of 700°C. Consequently, some of the dust which has settled on the coils between uses of the fan heater can be burnt, resulting in the emission of an unpleasant smell from the fan heater for a period of time.

Our co-pending patent application PCT/GB2010/050272 describes a fan heater which does not use caged blades to project air from the fan heater. Instead, the fan heater comprises a base which houses a motor-driven impeller for drawing a primary air flow into the base, and an annular nozzle connected to the base and comprising an annular mouth through which the primary air flow is emitted from the fan. The nozzle defines a central opening through which air in the local environment of the fan assembly is drawn by the primary air flow emitted from the mouth, amplifying the primary air flow to

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generate an air current. Without the use of a bladed fan to project the air current from the fan heater, a relatively uniform air current can be generated and guided into a room or towards a user. In one embodiment a heater is located within the nozzle to heat the primary air flow before it is emitted from the mouth. By housing the heater within the nozzle, the user is shielded from the hot external surfaces of the heater.

SUMMARY OF THE INVENTION

In a first aspect the present invention provides a nozzle for a fan assembly for creating an air current, the nozzle comprising:

an interior passage for receiving an air flow; and

a plurality of air outlets for emitting the air flow from the nozzle, the nozzle defining an opening through which air from outside the nozzle is drawn by the air flow emitted from the air outlets;

wherein the interior passage houses means for heating a first portion of the air flow, and means for diverting a second portion of the air flow away from the heating means;

and the plurality of air outlets comprises at least one first air outlet for emitting the first portion of the air flow, and at least one second air outlet for emitting the second portion of the air flow.

The present invention thus provides a nozzle having a plurality of air outlets for emitting air at different temperatures. One or more first air outlets are provided for emitting relatively hot air which has been heated by the heating means located within the interior passage, whereas one or more second air outlets are provided for emitting relatively cold air which has by-passed the heating means located within the interior passage.

The different air paths thus present within the interior passage may be selectively opened and closed by a user to vary the temperature of the air flow emitted from the fan assembly. The nozzle may include a valve, shutter or other means for selectively

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closing one of the air paths through the nozzle so that all of the air flow leaves the nozzle through either the first air outlet(s) or the second air outlet(s). For example, a shutter may be slidable or otherwise moveable over the outer surface of the nozzle to close selectively either the first air outlet(s) or the second air outlet(s), thereby forcing the air flow either to pass through the heating means or to by-pass the heating means. This can enable a user to change rapidly the temperature of the air flow emitted from the nozzle.

Alternatively, or additionally, the nozzle may be arranged to emit the first and second portions of the air flow simultaneously. In this case, at least one second air outlet may be arranged to direct at least part of the second portion of the air flow over an external surface of the nozzle. This can keep that external surface of the nozzle cool during use of the fan assembly. Where the nozzle comprises a plurality of second air outlets, the second air outlets may be arranged to direct substantially the entire second portion of the air flow over at least one external surface of the nozzle. The second air outlets may be arranged to direct the second portion of the air flow over a common external surface of the nozzle, or over a plurality of external surfaces of the nozzle, such as front and rear surfaces of the nozzle.

The, or each, first air outlet is preferably arranged to direct the first portion of the air flow over the second portion of the air flow so that the relatively cold second portion of the air flow is emitted between the relatively hot first portion of the air flow and the external surface of the casing, thereby providing a layer of thermal insulation between the relatively hot first portion of the air flow and the external surface of the casing.

All of the first and second air outlets are preferably arranged to emit the air flow through the opening in order to maximise the amplification of the air flow emitted from the nozzle through the entrainment of air external to the nozzle. Alternatively, at least one second air outlet may be arranged to direct the air flow over an external surface of the nozzle which is remote from the opening. For example, where the nozzle has an annular shape, one of the second air outlets may be arranged to direct a portion of the air

flow over the external surface of an inner annular section of the nozzle so that that portion of the air flow emitted from that second air outlet passes through the opening, whereas another one of the second air outlets may be arranged to direct another portion of the air flow over the external surface of an outer annular section of the nozzle.

In addition to, or as an alternative to, directing the air flow emitted from at least one of the second air outlets over an external surface of the nozzle, the interior passage may be arranged to convey the second portion of the air flow over or along at least one of the internal surfaces of the nozzle to keep that surface relatively cool during the use of the fan assembly. Alternatively, the dividing means may be arranged to divert both a second portion and a third portion of the air flow away from the heating means, and the interior passage may be arranged to convey the second portion of the air flow along a first internal surface of the nozzle, for example the internal surface of the inner annular section of the nozzle, and to convey the third portion of the air flow along a second internal surface of the nozzle, for example the internal surface of the outer annular section of the nozzle.

In this case, it may be found that, depending on the temperature of the first portion of the air flow, sufficient cooling of the external surfaces of the nozzle may be provided without having to emit the both the second and the third portions of the air flow through separate air outlets. For example, the first and the third portions of the air flow may be recombined downstream from the heating means, with the second portion of the air flow being directed separately over the external surface of the inner annular casing.

The diverting means may comprise at least one baffle, wall or other surface located within the interior passage for diverting the second portion of the air flow away from the heating means. The diverting means may be integral with or connected to one of the casing sections of the nozzle. The diverting means may conveniently form part of, or be connected to, a chassis for retaining the heating means within the interior passage. Where the diverting means is arranged to divert both a second portion of the air flow

and a third portion of the air flow away from the heating means, the diverting means may comprise two mutually spaced parts of the chassis.

Preferably, the interior passage comprises first channel means for conveying the first portion of the air flow to the first air outlet(s), second channel means for conveying the second portion of the air flow to the second air outlet(s), and means for separating the first channel means from the second channel means. The separating means may be integral with the diverting means for diverting the second portion of the air flow away from the heating means, and thus may comprise at least one wall of a chassis for retaining the heating means within the interior passage. This can reduce the number of separate components of the nozzle. The interior passage may also comprise third channel means for conveying a third portion of the air flow away from the heating means, and preferably along an internal surface of the nozzle. The second channel means may also be arranged to convey the second portion of the air flow along an internal surface of the nozzle.

The chassis may comprise first and second walls configured to retain a heating assembly therebetween. The first and second walls may form a first channel therebetween, which includes the heating assembly, for conveying the first portion of the air flow to a first air outlet of the nozzle. The first wall and a first internal surface of the nozzle may form a second channel for conveying the second portion of the air flow along the first internal surface to a second air outlet of the nozzle. The second wall and a second internal surface of the nozzle may optionally form a third channel for conveying a third portion of the air flow along the second internal surface. This third channel may merge with the first or second channel, or it may convey the third portion of the air flow to an air outlet of the nozzle.

As mentioned above, the nozzle may comprise an inner annular casing section and an outer annular casing section which define the interior passage and the opening, and so the separating means may be located between the casing sections. Each casing section is preferably formed from a respective annular member, but each casing section may be

provided by a plurality of members connected together or otherwise assembled to form that casing section. The inner casing section and the outer casing section may be formed from plastics material or other material having a relatively low thermal conductivity (less than 1 $Wm^{-1}K^{-1}$) to prevent the external surfaces of the nozzle from becoming excessively hot during use of the fan assembly.

The separating means may also define in part the first air outlet(s) and/or the second air outlet(s) of the casing. For example, the, or each, first air outlet may be located between an internal surface of the outer casing section and part of the separating means. Alternatively, or additionally, the, or each, second air outlet may be located between an external surface of the inner casing section and part of the separating means. Where the separating means comprises a wall for separating a first channel means from a second channel means, a first air outlet may be located between the internal surface of the outer casing section and a first side surface of the wall, and a second air outlet may be located between the external surface of the inner casing section and a second side surface of the wall.

The separating means may comprise a plurality of spacers for engaging at least one of the inner casing section and the outer casing section. This can enable the width of at least one of the second channel means and the third channel means to be controlled along the length thereof through engagement between the spacers and said at least one of the inner casing section and the outer casing section.

The direction in which air is emitted from the air outlets is preferably substantially at a right angle to the direction in which the air flow passes through at least part of the interior passage. Preferably, the air flow passes through at least part of the interior passage in a substantially vertical direction, and the air is emitted from the air outlets in a substantially horizontal direction. The interior passage is preferably located towards the front of the nozzle, whereas the air outlets are preferably located towards the rear of the nozzle and arranged to direct air towards the front of the nozzle and through the

opening. Consequently, each of the first and second channel means may be shaped so as substantially to reverse the flow direction of a respective portion of the air flow.

The interior passage is preferably annular, and is preferably shaped to divide the air flow into two air streams which flow in opposite directions around the opening. In this case the heating means is arranged to heat a first portion of each air stream and the diverting means is arranged to divert a second portion of each air stream away from the heating means. These first portions of the air streams may be emitted from a common first air outlet of the nozzle, or they may each be emitted from a respective first air outlet of the nozzle, and together form the first portion of the air flow. These first air outlets may be located on opposite sides of the opening. Similarly, the second portions of the two air streams may be emitted from a common second air outlet of the nozzle, or they may each be emitted from a respective second air outlet of the nozzle, and together form the second portion of the air flow. Again, these second air outlets may be located on opposite sides of the opening. Each air stream may thus be considered to be divided into a respective first sub-portion and a respective second sub-portion of the air flow by the diverting means.

At least part of the heating means may be arranged within the nozzle so as to extend about the opening. Where the nozzle defines a circular opening, the heating means may extend at least 270° about the opening and more preferably at least 300° about the opening. Where the nozzle defines an elongate opening, that is, an opening having a height greater than its width, the heating means is preferably located on at least the opposite sides of the opening.

The heating means may comprise at least one ceramic heater located within the interior passage. The ceramic heater may be porous so that the first portion of the air flow passes through pores in the heating means before being emitted from the first air outlet(s). The heater may be formed from a PTC (positive temperature coefficient) ceramic material which is capable of rapidly heating the air flow upon activation.

The ceramic material may be at least partially coated in metallic or other electrically conductive material to facilitate connection of the heating means to a controller within the fan assembly for activating the heating means. Alternatively, at least one non-porous, preferably ceramic, heater may be mounted within a metallic frame located within the interior passage and which is connectable to a controller of the fan assembly. The metallic frame preferably comprises a plurality of fins to provide a greater surface area and hence better heat transfer to the air flow, while also providing a means of electrical connection to the heating means.

The heating means preferably comprises at least one heater assembly. Where the air flow is divided into two air streams, the heating means preferably comprises a plurality of heater assemblies each for heating a respective first sub-portion of the air flow, and the diverting means preferably comprises a plurality of walls located within the interior passage each for diverting a respective second sub-portion of the air flow away from a heater assembly.

Each air outlet is preferably in the form of a slot, and which preferably has a width in the range from 0.5 to 5 mm. The width of the first air outlet(s) is preferably different from that of the second air outlet(s). In a preferred embodiment, the width of the first air outlet(s) is greater than the width of the second air outlet(s) so that the majority of the primary air flow passes through the heating means.

The nozzle may comprise a surface located adjacent the air outlets and over which the air outlets are arranged to direct the air flow emitted therefrom. Preferably, this surface is a curved surface, and more preferably is a Coanda surface. Preferably, the external surface of the inner casing section of the nozzle is shaped to define the Coanda surface. A Coanda surface is a known type of surface over which fluid flow exiting an output orifice close to the surface exhibits the Coanda effect. The fluid tends to flow over the surface closely, almost 'clinging to' or 'hugging' the surface. The Coanda effect is already a proven, well documented method of entrainment in which a primary air flow is directed over a Coanda surface. A description of the features of a Coanda surface,

and the effect of fluid flow over a Coanda surface, can be found in articles such as Reba, Scientific American, Volume 214, June 1966 pages 84 to 92. Through use of a Coanda surface, an increased amount of air from outside the fan assembly is drawn through the opening by the air emitted from the air outlets.

In a preferred embodiment an air flow is created through the nozzle of the fan assembly. In the following description this air flow will be referred to as the primary air flow. The primary air flow is emitted from the air outlets of the nozzle and preferably passes over a Coanda surface. The primary air flow entrains air surrounding the nozzle, which acts as an air amplifier to supply both the primary air flow and the entrained air to the user. The entrained air will be referred to here as a secondary air flow. The secondary air flow is drawn from the room space, region or external environment surrounding the mouth of the nozzle and, by displacement, from other regions around the fan assembly, and passes predominantly through the opening defined by the nozzle. The primary air flow directed over the Coanda surface combined with the entrained secondary air flow equates to a total air flow emitted or projected forward from the opening defined by the nozzle.

Preferably, the nozzle comprises a diffuser surface located downstream of the Coanda surface. The diffuser surface directs the air flow emitted towards a user's location while maintaining a smooth, even output. Preferably, the external surface of the inner casing section of the nozzle is shaped to define the diffuser surface.

This first aspect of the invention also provides a fan assembly comprising a nozzle as aforementioned. The fan assembly preferably also comprises a base housing said means for creating the air flow, with the nozzle being connected to the base. The base is preferably generally cylindrical in shape, and comprises a plurality of air inlets through which the air flow enters the fan assembly.

The means for creating an air flow through the nozzle preferably comprises an impeller driven by a motor. This can provide a fan assembly with efficient air flow generation.

The means for creating an air flow preferably comprises a DC brushless motor. This can avoid frictional losses and carbon debris from the brushes used in a traditional brushed motor. Reducing carbon debris and emissions is advantageous in a clean or pollutant sensitive environment such as a hospital or around those with allergies. While induction motors, which are generally used in bladed fans, also have no brushes, a DC brushless motor can provide a much wider range of operating speeds than an induction motor.

The nozzle is preferably in the form of a casing, preferably an annular casing, for receiving the air flow.

The heating means need not be located within the nozzle. For example, both the heating means and the diverting means may be located in the base, with the nozzle being arranged to receive a relatively hot first portion of the air flow and a relatively cold second portion of the air flow from the base, and to convey the first portion of the air flow to the first air outlet(s) and the second portion of the air flow to the second air outlet(s). The nozzle may comprise internal walls or baffles for defining the first channel means and second channel means.

Alternatively, the heating means may be located in the nozzle but the diverting means may be located in the base. In this case, the first channel means may be arranged both to convey the first portion of the air flow from the base to the first air outlet(s) and to house the heating means for heating the first portion of the air flow, while the second channel means may be arranged simply to convey the second portion of the air flow from the base to the second air outlet(s).

Therefore, in a second aspect the present invention provides a fan assembly comprising:

means for creating an air flow;

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a casing comprising a plurality of air outlets for emitting the air flow from the nozzle, the casing defining an opening through which air from outside the fan assembly is drawn by the air flow emitted from the air outlets;

means for heating a first portion of the air flow; and

means for diverting a second portion of the air flow away from the heating means;

wherein the plurality of air outlets comprises at least one first air outlet for emitting the first portion of the air flow, and at least one second air outlet for emitting the second portion of the air flow.

The fan assembly is preferably in the form of a portable fan heater.

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

An embodiment 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 front perspective view, from above, of a fan assembly;

Figure 2 is a front view of the fan assembly;

Figure 3 is a sectional view taken along line B-B of Figure 2;

Figure 4 is an exploded view of the nozzle of the fan assembly;

Figure 5 is a front perspective view of the heater chassis of the nozzle;

Figure 6 is a front perspective view, from below, of the heater chassis connected to an inner casing section of the nozzle;

Figure 7 is a close-up view of region X indicated in Figure 6;

Figure 8 is a close-up view of region Y indicated in Figure 1;

Figure 9 is a sectional view taken along line A-A of Figure 2;

Figure 10 is a close-up view of region Z indicated in Figure 9;

Figure 11 is a sectional view of the nozzle taken along line C-C of Figure 9; and

Figure 12 is a schematic illustration of a control system of the fan assembly.

DETAILED DESCRIPTION OF THE INVENTION

Figures 1 and 2 illustrate external views of a fan assembly 10. The fan assembly 10 is in the form of a portable fan heater. The fan assembly 10 comprises a body 12 comprising an air inlet 14 through which a primary air flow enters the fan assembly 10, and a nozzle 16 in the form of an annular casing mounted on the body 12, and which comprises at least one air outlet 18 for emitting the primary air flow from the fan assembly 10.

The body 12 comprises a substantially cylindrical main body section 20 mounted on a substantially cylindrical lower body section 22. The main body section 20 and the lower body section 22 preferably have substantially the same external diameter so that the external surface of the upper body section 20 is substantially flush with the external surface of the lower body section 22. In this embodiment the body 12 has a height in the range from 100 to 300 mm, and a diameter in the range from 100 to 200 mm.

The main body section 20 comprises the air inlet 14 through which the primary air flow enters the fan assembly 10. In this embodiment the air inlet 14 comprises an array of apertures formed in the main body section 20. Alternatively, the air inlet 14 may comprise one or more grilles or meshes mounted within windows formed in the main body section 20. The main body section 20 is open at the upper end (as illustrated) thereof to provide an air outlet 23 through which the primary air flow is exhausted from the body 12.

The main body section 20 may be tilted relative to the lower body section 22 to adjust the direction in which the primary air flow is emitted from the fan assembly 10. For example, the upper surface of the lower body section 22 and the lower surface of the main body section 20 may be provided with interconnecting features which allow the main body section 20 to move relative to the lower body section 22 while preventing the main body section 20 from being lifted from the lower body section 22. For example, the lower body section 22 and the main body section 20 may comprise interlocking L-shaped members.

The lower body section 22 comprises a user interface of the fan assembly 10. With reference also to Figure 12, the user interface comprises a plurality of user-operable buttons 24, 26, 28, 30 for enabling a user to control various functions of the fan assembly 10, a display 32 located between the buttons for providing the user with, for example, a visual indication of a temperature setting of the fan assembly 10, and a user interface control circuit 33 connected to the buttons 24, 26, 28, 30 and the display 32. The lower body section 22 also includes a window 34 through which signals from a remote control 35 (shown schematically in Figure 12) enter the fan assembly 10. The lower body section 22 is mounted on a base 36 for engaging a surface on which the fan assembly 10 is located. The base 36 includes an optional base plate 38, which preferably has a diameter in the range from 200 to 300 mm.

The nozzle 16 has an annular shape, extending about a central axis X to define an opening 40. The air outlets 18 for emitting the primary air flow from the fan assembly

10 are located towards the rear of the nozzle 16, and arranged to direct the primary air flow towards the front of the nozzle 16, through the opening 40. In this example, the nozzle 16 defines an elongate opening 40 having a height greater than its width, and the air outlets 18 are located on the opposite elongate sides of the opening 40. In this example the maximum height of the opening 40 is in the range from 300 to 400 mm, whereas the maximum width of the opening 40 is in the range from 100 to 200 mm.

The inner annular periphery of the nozzle 16 comprises a Coanda surface 42 located adjacent the air outlets 18, and over which at least some of the air outlets 18 are arranged to direct the air emitted from the fan assembly 10, a diffuser surface 44 located downstream of the Coanda surface 42 and a guide surface 46 located downstream of the diffuser surface 44. The diffuser surface 44 is arranged to taper away from the central axis X of the opening 38. The angle subtended between the diffuser surface 44 and the central axis X of the opening 40 is in the range from 5 to 25°, and in this example is around 7°. The guide surface 46 is preferably arranged substantially parallel to the central axis X of the opening 38 to present a substantially flat and substantially smooth face to the air flow emitted from the mouth 40. A visually appealing tapered surface 48 is located downstream from the guide surface 46, terminating at a tip surface 50 lying substantially perpendicular to the central axis X of the opening 40. The angle subtended between the tapered surface 48 and the central axis X of the opening 40 is preferably around 45°.

Figure 3 illustrates a sectional view through the body 12. The lower body section 22 houses a main control circuit, indicated generally at 52, connected to the user interface control circuit 33. The user interface control circuit 33 comprises a sensor 54 for receiving signals from the remote control 35. The sensor 54 is located behind the window 34. In response to operation of the buttons 24, 26, 28, 30 and the remote control 35, the user interface control circuit 33 is arranged to transmit appropriate signals to the main control circuit 52 to control various operations of the fan assembly 10. The display 32 is located within the lower body section 22, and is arranged to illuminate part of the lower body section 22. The lower body section 22 is preferably

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formed from a translucent plastics material which allows the display 32 to be seen by a user.

The lower body section 22 also houses a mechanism, indicated generally at 56, for oscillating the lower body section 22 relative to the base 36. The operation of the oscillating mechanism 56 is controlled by the main control circuit 52 upon receipt of an appropriate control signal from the remote control 35. The range of each oscillation cycle of the lower body section 22 relative to the base 36 is preferably between 60° and 120°, and in this embodiment is around 80°. In this embodiment, the oscillating mechanism 56 is arranged to perform around 3 to 5 oscillation cycles per minute. A mains power cable 58 for supplying electrical power to the fan assembly 10 extends through an aperture formed in the base 36. The cable 58 is connected to a plug 60.

The main body section 20 houses an impeller 64 for drawing the primary air flow through the air inlet 14 and into the body 12. Preferably, the impeller 64 is in the form of a mixed flow impeller. The impeller 64 is connected to a rotary shaft 66 extending outwardly from a motor 68. In this embodiment, the motor 68 is a DC brushless motor having a speed which is variable by the main control circuit 52 in response to user manipulation of the button 26 and/or a signal received from the remote control 35. The maximum speed of the motor 68 is preferably in the range from 5,000 to 10,000 rpm. The motor 68 is housed within a motor bucket comprising an upper portion 70 connected to a lower portion 72. The upper portion 70 of the motor bucket comprises a diffuser 74 in the form of a stationary disc having spiral blades.

The motor bucket is located within, and mounted on, a generally frusto-conical impeller housing 76. The impeller housing 76 is, in turn, mounted on a plurality of angularly spaced supports 77, in this example three supports, located within and connected to the main body section 20 of the base 12. The impeller 64 and the impeller housing 76 are shaped so that the impeller 64 is in close proximity to, but does not contact, the inner surface of the impeller housing 76. A substantially annular inlet member 78 is

connected to the bottom of the impeller housing 76 for guiding the primary air flow into the impeller housing 76.

A flexible sealing member 80 is mounted on the impeller housing 76. The flexible sealing member prevents air from passing around the outer surface of the impeller housing to the inlet member 78. The sealing member 80 preferably comprises an annular lip seal, preferably formed from rubber. The sealing member 80 further comprises a guide portion in the form of a grommet for guiding an electrical cable 82 to the motor 68. The electrical cable 82 passes from the main control circuit 52 to the motor 68 through apertures formed in the main body section 20 and the lower body section 22 of the body 12, and in the impeller housing 76 and the motor bucket.

Preferably, the body 12 includes silencing foam for reducing noise emissions from the body 12. In this embodiment, the main body section 20 of the body 12 comprises a first annular foam member 84 located beneath the air inlet 14, and a second annular foam member 86 located within the motor bucket.

The nozzle 16 will now be described in more detail with reference to Figures 4 to 11. With reference first to Figure 4, the nozzle 16 comprises an annular outer casing section 88 connected to and extending about an annular inner casing section 90. Each of these sections may be formed from a plurality of connected parts, but in this embodiment each of the casing sections 88, 90 is formed from a respective, single moulded part. The inner casing section 90 defines the central opening 40 of the nozzle 16, and has an external surface 92 which is shaped to define the Coanda surface 42, diffuser surface 44, guide surface 46 and tapered surface 48.

The outer casing section 88 and the inner casing section 90 together define an annular interior passage of the nozzle 16. As illustrated in Figures 9 and 11, the interior passage extends about the opening 40, and thus comprises two relatively straight sections 94a, 94b each adjacent a respective elongate side of the opening 40, an upper curved section 94c joining the upper ends of the straight sections 94a, 94b, and a lower curved section

94d joining the lower ends of the straight 94a, 94b. The interior passage is bounded by the internal surface 96 of the outer casing section 88 and the internal surface 98 of the inner casing section 90.

As also shown in Figures 1 to 3, the outer casing section 88 comprises a base 100 which is connected to, and over, the open upper end of the main body section 20 of the base 12. The base 100 of the outer casing section 88 comprises an air inlet 102 through which the primary air flow enters the lower curved section 94d of the interior passage from the air outlet 23 of the base 12. Within the lower curved section 94d, the primary air flow is divided into two air streams which each flow into a respective one of the straight sections 94a, 94b of the interior passage.

The nozzle 16 also comprises a pair of heater assemblies 104. Each heater assembly 104 comprises a row of heater elements 106 arranged side-by-side. The heater elements 106 are preferably formed from positive temperature coefficient (PTC) ceramic material. The row of heater elements is sandwiched between two heat radiating components 108, each of which comprises an array of heat radiating fins 110 located within a frame 112. The heat radiating components 108 are preferably formed from aluminium or other material with high thermal conductivity (around 200 to 400 W/mK), and may be attached to the row of heater elements 106 using beads of silicone adhesive, or by a clamping mechanism. The side surfaces of the heater elements 106 are preferably at least partially covered with a metallic film to provide an electrical contact between the heater elements 106 and the heat radiating components 108. This film may be formed from screen printed or sputtered aluminium. Returning to Figures 3 and 4, electrical terminals 114, 116 located at opposite ends of the heater assembly 104 are each connected to a respective heat radiating component 108. Each terminal 114 is connected to an upper part 118 of a loom for supplying electrical power to the heater assemblies 104, whereas each terminal 116 is connected to a lower part 120 of the loom. The loom is in turn connected to a heater control circuit 122 located in the main body section 20 of the base 12 by wires 124. The heater control circuit 122 is in turn

controlled by control signals supplied thereto by the main control circuit 52 in response to user operation of the buttons 28, 30 and/or use of the remote control 35.

Figure 12 illustrates schematically a control system of the fan assembly 10, which includes the control circuits 33, 52, 122, buttons 24, 26, 28, 30, and remote control 35. Two or more of the control circuits 33, 52, 122 may be combined to form a single control circuit. A thermistor 126 for providing an indication of the temperature of the primary air flow entering the fan assembly 10 is connected to the heater controller 122. The thermistor 126 may be located immediately behind the air inlet 14, as shown in Figure 3. The main control circuit 52 supplies control signals to the user interface control circuit 33, the oscillation mechanism 56, the motor 68, and the heater control circuit 124, whereas the heater control circuit 124 supplies control signals to the heater assemblies 104. The heater control circuit 124 may also provide the main control circuit 52 with a signal indicating the temperature detected by the thermistor 126, in response to which the main control circuit 52 may output a control signal to the user interface control circuit 33 indicating that the display 32 is to be changed, for example if the temperature of the primary air flow is at or above a user selected temperature. The heater assemblies 104 may be controlled simultaneously by a common control signal, or they may be controlled by respective control signals.

The heater assemblies 104 are each retained within a respective straight section 94a, 94b of the interior passage by a chassis 128. The chassis 128 is illustrated in more detail in Figure 5. The chassis 128 has a generally annular structure. The chassis 128 comprises a pair of heater housings 130 into which the heater assemblies 104 are inserted. Each heater housing 130 comprises an outer wall 132 and an inner wall 134. The inner wall 134 is connected to the outer wall 132 at the upper and lower ends 138, 140 of the heater housing 130 so that the heater housing 130 is open at the front and rear ends thereof. The walls 132, 134 thus define a first air flow channel 136 which passes through the heater assembly 104 located within the heater housing 130.

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The heater housings 130 are connected together by upper and lower curved portions 142, 144 of the chassis 128. Each curved portion 142, 144 also has an inwardly curved, generally U-shaped cross-section. The curved portions 142, 144 of the chassis 128 are connected to, and preferably integral with, the inner walls 134 of the heater housings 130. The inner walls 134 of the heater housings 130 have a front end 146 and a rear end 148. With reference also to Figures 6 to 9, the rear end 148 of each inner wall 134 also curves inwardly away from the adjacent outer wall 132 so that the rear ends 148 of the inner walls 134 are substantially continuous with the curved portions 142, 144 of the chassis 128.

During assembly of the nozzle 16, the chassis 128 is pushed over the rear end of the inner casing section 90 so that the curved portions 142, 144 of the chassis 128 and the rear ends 148 of the inner walls 134 of the heater housings 130 are wrapped around the rear end 150 of the inner casing section 90. The inner surface 98 of the inner casing section 90 comprises a first set of raised spacers 152 which engage the inner walls 134 of the heater housings 130 to space the inner walls 134 from the inner surface 98 of the inner casing section 90. The rear ends 148 of the inner walls 134 also comprise a second set of spacers 154 which engage the outer surface 92 of the inner casing section 90 to space the rear ends of the inner walls 134 from the outer surface 92 of the inner casing section 90.

The inner walls 134 of the heater housing 130 of the chassis 128 and the inner casing section 90 thus define two second air flow channels 156. Each of the second flow channels 156 extends along the inner surface 98 of the inner casing section 90, and around the rear end 150 of the inner casing section 90. Each second flow channel 156 is separated from a respective first flow channel 136 by the inner wall 134 of the heater housing 130. Each second flow channel 156 terminates at an air outlet 158 located between the outer surface 92 of the inner casing section 90 and the rear end 148 of the inner wall 134. Each air outlet 158 is thus in the form of a vertically-extending slot located on a respective side of the opening 40 of the assembled nozzle 16. Each air

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outlet 158 preferably has a width in the range from 0.5 to 5 mm, and in this example the air outlets 158 have a width of around 1 mm.

The chassis 128 is connected to the inner surface 98 of the inner casing section 90. With reference to Figures 5 to 7, each of the inner walls 134 of the heater housings 130 comprises a pair of apertures 160, each aperture 160 being located at or towards a respective one of the upper and lower ends of the inner wall 134. As the chassis 128 is pushed over the rear end of the inner casing section 90, the inner walls 134 of the heater housings 130 slide over resilient catches 162 mounted on, and preferably integral with, the inner surface 98 of the inner casing section 90, which subsequently protrude through the apertures 160. The position of the chassis 128 relative to the inner casing section 90 can then be adjusted so that the inner walls 134 are gripped by the catches 162. Stop members 164 mounted on, and preferably also integral with, the inner surface 98 of the inner casing section 90 may also serve to retain the chassis 128 on the inner casing section 90.

With the chassis 128 connected to the inner casing section 90, the heater assemblies 104 are inserted into the heater housings 130 of the chassis 128, and the loom connected to the heater assemblies 104. Of course, the heater assemblies 104 may be inserted into the heater housings 130 of the chassis 128 prior to the connection of the chassis 128 to the inner casing section 90. The inner casing section 90 of the nozzle 16 is then inserted into the outer casing section 88 of the nozzle 16 so that the front end 166 of the outer casing section 88 enters a slot 168 located at the front of the inner casing section 90, as illustrated in Figure 9. The outer and inner casing sections 88, 90 may be connected together using an adhesive introduced to the slot 168.

The outer casing section 88 is shaped so that part of the inner surface 96 of the outer casing section 88 extends around, and is substantially parallel to, the outer walls 132 of the heater housings 130 of the chassis 128. The outer walls 132 of the heater housings 130 have a front end 170 and a rear end 172, and a set of ribs 174 located on the outer side surfaces of the outer walls 132 and which extend between the ends 170, 172 of the

outer walls 132. The ribs 174 are configured to engage the inner surface 96 of the outer casing section 88 to space the outer walls 132 from the inner surface 96 of the outer casing section 88. The outer walls 132 of the heater housings 130 of the chassis 128 and the outer casing section 88 thus define two third air flow channels 176. Each of the third flow channels 176 is located adjacent and extends along the inner surface 96 of the outer casing section 88. Each third flow channel 176 is separated from a respective first flow channel 136 by the outer wall 132 of the heater housing 130. Each third flow channel 176 terminates at an air outlet 178 located within the interior passage, and between the rear end 172 of the outer wall 132 of the heater housing 130 and the outer casing section 88. Each air outlet 178 is also in the form of a vertically-extending slot located within the interior passage of the nozzle 16, and preferably has a width in the range from 0.5 to 5 mm. In this example the air outlets 178 have a width of around 1 mm.

The outer casing section 88 is shaped so as to curve inwardly around part of the rear ends 148 of the inner walls 134 of the heater housings 130. The rear ends 148 of the inner walls 134 comprise a third set of spacers 182 located on the opposite side of the inner walls 134 to the second set of spacers 154, and which are arranged to engage the inner surface 96 of the outer casing section 88 to space the rear ends of the inner walls 134 from the inner surface 96 of the outer casing section 88. The outer casing section 88 and the rear ends 148 of the inner walls 134 thus define a further two air outlets 184. Each air outlet 184 is located adjacent a respective one of the air outlets 158, with each air outlet 158 being located between a respective air outlet 184 and the outer surface 92 of the inner casing section 90. Similar to the air outlets 158, each air outlet 184 is in the form of a vertically-extending slot located on a respective side of the opening 40 of the assembled nozzle 16. The air outlets 184 preferably have the same length as the air outlets 158. Each air outlet 184 preferably has a width in the range from 0.5 to 5 mm, and in this example the air outlets 184 have a width of around 2 to 3 mm. Thus, the air outlets 18 for emitting the primary air flow from the fan assembly 10 comprise the two air outlets 158 and the two air outlets 184.

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Returning to Figures 3 and 4, the nozzle 16 preferably comprises two curved sealing members 186, 188 each for forming a seal between the outer casing section 88 and the inner casing section 90 so that there is substantially no leakage of air from the curved sections 94c, 94d of the interior passage of the nozzle 16. Each sealing member 186, 188 is sandwiched between two flanges 190, 192 located within the curved sections 94c, 94d of the interior passage. The flanges 190 are mounted on, and preferably integral with, the inner casing section 90, whereas the flanges 192 are mounted on, and preferably integral with, the outer casing section 88. As an alternative to preventing the air flow from leaking from the upper curved section 94c of the interior passage, the nozzle 16 may be arranged to prevent the air flow from entering this curved section 94c. For example, the upper ends of the straight sections 94a, 94b of the interior passage may be blocked by the chassis 128 or by inserts introduced between the inner and outer casing sections 88, 90 during assembly.

To operate the fan assembly 10 the user presses button 24 of the user interface, or presses a corresponding button of the remote control 35 to transmit a signal which is received by the sensor of the user interface circuit 33. The user interface control circuit 33 communicates this action to the main control circuit 52, in response to which the main control circuit 52 activates the motor 68 to rotate the impeller 64. The rotation of the impeller 64 causes a primary air flow to be drawn into the body 12 through the air inlet 14. The user may control the speed of the motor 68, and therefore the rate at which air is drawn into the body 12 through the air inlet 14, by pressing button 26 of the user interface or a corresponding button of the remote control 35. Depending on the speed of the motor 56, the primary air flow generated by the impeller 52 may be between 10 and 30 litres per second. The primary air flow passes sequentially through the impeller housing 76 and the open upper end of the main body portion 22 to enter the lower curved section 94d of the interior passage of the nozzle 16. The pressure of the primary air flow at the outlet 23 of the body 12 may be at least 150 Pa, and is preferably in the range from 250 to 1.5 kPa.

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The user may optionally activate the heater assemblies 104 located within the nozzle 16 to raise the temperature of the first portion of the primary air flow before it is emitted from the fan assembly 10, and thereby increase both the temperature of the primary air flow emitted by the fan assembly 10 and the temperature of the ambient air in a room or other environment in which the fan assembly 10 is located. In this example, the heater assemblies 104 are both activated and de-activated simultaneously, although alternatively the heater assemblies 104 may be activated and de-activated separately. To activate the heater assemblies 104, the user presses button 30 of the user interface, or presses a corresponding button of the remote control 35 to transmit a signal which is received by the sensor of the user interface circuit 33. The user interface control circuit 33 communicates this action to the main control circuit 52, in response to which the main control circuit 52 issues a command to the heater control circuit 124 to activate the heater assemblies 104. The user may set a desired room temperature or temperature setting by pressing button 28 of the user interface or a corresponding button of the remote control 35. The user interface circuit 33 is arranged to vary the temperature displayed by the display 34 in response to the operation of the button 28, or the corresponding button of the remote control 35. In this example, the display 34 is arranged to display a temperature setting selected by the user, which may correspond to a desired room air temperature. Alternatively, the display 34 may be arranged to display one of a number of different temperature settings which has been selected by the user.

Within the lower curved section 94d of the interior passage of the nozzle 16, the primary air flow is divided into two air streams which pass in opposite directions around the opening 40 of the nozzle 16. One of the air streams enters the straight section 94a of the interior passage located to one side of the opening 40, whereas the other air stream enters the straight section 94b of the interior passage located on the other side of the opening 40. As the air streams pass through the straight sections 94a, 94b, the air streams turn through around 90° towards the air outlets 18 of the nozzle 16. To direct the air streams evenly towards the air outlets 18 along the length of the straight section 94a, 94b, the nozzle 16 may comprises a plurality of stationary guide

vanes located within the straight sections 94a, 94b and each for directing part of the air stream towards the air outlets 18. The guide vanes are preferably integral with the internal surface 98 of the inner casing section 90. The guide vanes are preferably curved so that there is no significant loss in the velocity of the air flow as it is directed towards the air outlets 18. Within each straight section 94a, 94b, the guide vanes are preferably substantially vertically aligned and evenly spaced apart to define a plurality of passageways between the guide vanes and through which air is directed relatively evenly towards the air outlets 18.

As the air streams flow towards the air outlets 18, a first portion of the primary air flow enters the first air flow channels 136 located between the walls 132, 134 of the chassis 128. Due to the splitting of the primary air flow into two air streams within the interior passage, each first air flow channel 136 may be considered to receive a respective first sub-portion of the primary air flow. Each first sub-portion of the primary air flow passes through a respective heating assembly 104. The heat generated by the activated heating assemblies is transferred by convection to the first portion of the primary air flow to raise the temperature of the first portion of the primary air flow.

A second portion of the primary air flow is diverted away from the first air flow channels 136 by the front ends 146 of the inner walls 134 of the heater housings 130 so that this second portion of the primary air flow enters the second air flow channels 156 located between the inner casing section 90 and the inner walls of the heater housings 130. Again, with the splitting of the primary air flow into two air streams within the interior passage each second air flow channel 156 may be considered to receive a respective second sub-portion of the primary air flow. Each second sub-portion of the primary air flow passes along the internal surface 92 of the inner casing section 90, thereby acting as a thermal barrier between the relatively hot primary air flow and the inner casing section 90. The second air flow channels 156 are arranged to extend around the rear wall 150 of the inner casing section 90, thereby reversing the flow direction of the second portion of the air flow, so that it is emitted through the air outlets 158 towards the front of the fan assembly 10 and through the opening 40. The air

outlets 158 are arranged to direct the second portion of the primary air flow over the external surface 92 of the inner casing section 90 of the nozzle 16.

A third portion of the primary air flow is also diverted away from the first air flow channels 136. This third portion of the primary air flow by the front ends 170 of the outer walls 132 of the heater housings 130 so that the third portion of the primary air flow enters the third air flow channels 176 located between the outer casing section 88 and the outer walls 132 of the heater housings 130. Once again, with the splitting of the primary air flow into two air streams within the interior passage each third air flow channel 176 may be considered to receive a respective third sub-portion of the primary air flow. Each third sub-portion of the primary air flow passes along the internal surface 96 of the outer casing section 88, thereby acting as a thermal barrier between the relatively hot primary air flow and the outer casing section 88. The third air flow channels 176 are arranged to convey the third portion of the primary air flow to the air outlets 178 located within the interior passage. Upon emission from the air outlets 178, the third portion of the primary air flow merges with this first portion of the primary air flow. These merged portions of the primary air flow are conveyed between the inner surface 96 of the outer casing section 88 and the inner walls 134 of the heater housings to the air outlets 184, and so the flow directions of these portions of the primary air flow are also reversed within the interior passage. The air outlets 184 are arranged to direct the relatively hot, merged first and third portions of the primary air flow over the relatively cold second portion of the primary air flow emitted from the air outlets 158, which acts as a thermal barrier between the outer surface 92 of the inner casing section 90 and the relatively hot air emitted from the air outlets 184. Consequently, the majority of the internal and external surfaces of the nozzle 16 are shielded from the relatively hot air emitted from the fan assembly 10. This can enable the external surfaces of the nozzle 16 to be maintained at a temperature below 70°C during use of the fan assembly 10.

The primary air flow emitted from the air outlets 18 passes over the Coanda surface 42 of the nozzle 16, causing a secondary air flow to be generated by the entrainment of air

from the external environment, specifically from the region around the air outlets 18and from around the rear of the nozzle. This secondary air flow passes through the opening 40 of the nozzle 16, where it combines with the primary air flow to produce an overall air flow projected forward from the fan assembly 10 which has a lower temperature than the primary air flow emitted from the air outlets 18, but a higher temperature than the air entrained from the external environment. Consequently, a current of warm air is emitted from the fan assembly 10.

As the temperature of the air in the external environment increases, the temperature of the primary air flow drawn into the fan assembly 10 through the air inlet 14 also increases. A signal indicative of the temperature of this primary air flow is output from the thermistor 126 to the heater control circuit 124. When the temperature of the primary air flow is above the temperature set by the user, or a temperature associated with a user's temperature setting, by around 1°C, the heater control circuit 124 de-activates the heater assemblies 104. When the temperature of the primary air flow has fallen to a temperature around 1°C below that set by the user, the heater control circuit 124 re-activates the heater assemblies 104. This can allow a relatively constant temperature to be maintained in the room or other environment in which the fan assembly 10 is located.

CLAIMS

1. A nozzle for a fan assembly for creating an air current, the nozzle comprising:

an interior passage for receiving an air flow; and

a plurality of air outlets for emitting the air flow from the nozzle, the nozzle defining an opening through which air from outside the nozzle is drawn by the air flow emitted from the air outlets;

wherein the interior passage houses means for heating a first portion of the air flow, and means for diverting a second portion of the air flow away from the heating means;

and the plurality of air outlets comprises at least one first air outlet for emitting the first portion of the air flow, and at least one second air outlet for emitting the second portion of the air flow.

2. A nozzle as claimed in claim 1, arranged to emit the first and second portions of the air flow simultaneously.

3. A nozzle as claimed in claim 1 or claim 2, wherein the air outlets are arranged to emit the air flow through the opening.

4. A nozzle as claimed in any of the preceding claims, wherein the diverting means comprises at least one wall located within the interior passage for diverting the second portion of the air flow away from the heating means.

5. A nozzle as claimed in any of the preceding claims, comprising a chassis for retaining the heating means within the interior passage, and wherein the chassis comprises the means for diverting the second portion of the air flow away from the heating means.

6. A nozzle as claimed in any of the preceding claims, wherein the interior passage comprises first channel means for conveying the first portion of the air flow to said at

least one first air outlet, second channel means for conveying the second portion of the air flow to said at least one second air outlet, and means for separating the first channel means from the second channel means.

7. A nozzle as claimed in claim 6, wherein the separating means is integral with the diverting means for diverting the second portion of the air flow away from the heating means.

8. A nozzle as claimed in claim 6 or claim 7, comprising an inner annular casing section and an outer annular casing section which define the interior passage and the opening, and wherein the separating means is located between the casing sections.

9. A nozzle as claimed in claim 8, wherein the separating means is connected to one of the casing sections.

10. A nozzle as claimed in claim 8 or claim 9, wherein said at least one first air outlet is located between an internal surface of the outer casing section and the separating means.

11. A nozzle as claimed in any of claims 8 to 10, wherein said at least one second air outlet is located between an external surface of the inner casing section and the separating means.

12. A nozzle as claimed in any of claims 8 to 11, wherein the second channel means is arranged to convey the second portion of the air flow along an internal surface of one of the casing sections.

13. A nozzle as claimed in any of claims 8 to 12, wherein the separating means comprises a plurality of spacers for engaging at least one of the inner casing section and the outer casing section.

14. A nozzle as claimed in any of claims 6 to 13, wherein each of the first and second channel means is shaped so as substantially to reverse the flow direction of a respective portion of the air flow.

15. A nozzle as claimed in any of the preceding claims, wherein the first portion of the air flow comprises a plurality of first sub-portions, and the second portion of the air flow comprises a plurality of second sub-portions, and wherein the interior passage is shaped to divide a received air flow into a plurality of air streams, each air stream comprising a respective first sub-portion and a respective second sub-portion of the air stream.

16. A nozzle as claimed in claim 15, wherein the heating means comprises a plurality of heater assemblies each for heating a respective first sub-portion of the air flow.

17. A nozzle as claimed in claim 16, wherein the heater assemblies are located on opposite sides of the opening.

18. A nozzle as claimed in claim 16 or claim 17, wherein the diverting means comprises a plurality of walls located within the interior passage each for diverting a respective second sub-portion of the air flow away from a heater assembly.

19. A nozzle as claimed in any of claims 15 to 18, wherein said at least one first air outlet comprises a plurality of first air outlets each for emitting a respective first sub-portion of the air flow.

20. A nozzle as claimed in claim 19, wherein the first air outlets are located on opposite sides of the opening.

21. A nozzle as claimed in any of claims 17 to 20, wherein said at least one second air outlet comprises a plurality of second air outlets each located on a respective side of the opening for emitting the second portion of a respective air stream.

22. A nozzle as claimed in any of the preceding claims, wherein each air outlet is in the form of a slot.

23. A nozzle as claimed in claim 22, wherein each air outlet has a width in the range from 0.5 to 5 mm.

24. A nozzle as claimed in any of the preceding claims, wherein the heating means comprises at least one ceramic heater.

25. A fan assembly comprising a nozzle as claimed in any of the preceding claims.

26. A fan assembly as claimed in claim 25, comprising a base housing means for creating the air flow, and wherein the nozzle is connected to the base.

27. A fan assembly comprising:

means for creating an air flow;

a casing comprising a plurality of air outlets for emitting the air flow from the nozzle, the casing defining an opening through which air from outside the fan assembly is drawn by the air flow emitted from the air outlets;

means for heating a first portion of the air flow; and

means for diverting a second portion of the air flow away from the heating means;

wherein the plurality of air outlets comprises at least one first air outlet for emitting the first portion of the air flow, and at least one second air outlet for emitting the second portion of the air flow.

28. A fan assembly as claimed in claim 27, arranged to emit the first and second portions of the air flow simultaneously.

29. A fan assembly as claimed in claim 27 or claim 28, wherein the air outlets are arranged to emit the air flow through the opening.

30. A fan assembly as claimed in any of claims 27 to 29, wherein the diverting means comprises at least one wall for diverting the second portion of the air flow away from the heating means.

31. A fan assembly as claimed in any of claims 27 to 30, comprising a chassis for retaining the heating means within the fan assembly, and wherein the chassis comprises the means for diverting the second portion of the air flow away from the heating means.

32. A fan assembly as claimed in any of claims 27 to 31, wherein the casing comprises first channel means for conveying the first portion of the air flow to said at least one first air outlet, second channel means for conveying the second portion of the air flow to said at least one second air outlet, and means for separating the first channel means from the second channel means.

33. A fan assembly as claimed in claim 32, wherein the separating means is integral with the diverting means for diverting the second portion of the air flow away from the heating means.

34. A fan assembly as claimed in claim 32 or claim 33, wherein the casing comprises an inner annular casing section and an outer annular casing section which define the opening, and wherein the separating means is located between the casing sections.

35. A fan assembly as claimed in claim 34, wherein the separating means is connected to one of the casing sections.

36. A fan assembly as claimed in claim 34 or claim 35, wherein said at least one first air outlet is located between an internal surface of the outer casing section and the separating means.

37. A fan assembly as claimed in any of claims 34 to 36, wherein said at least one second air outlet is located between an external surface of the inner casing section and the separating means.

38. A fan assembly as claimed in any of claims 34 to 37, wherein the second channel means is arranged to convey the second portion of the air flow along an internal surface of one of the casing sections.

39. A fan assembly as claimed in any of claims 34 to 38, wherein the separating means comprises a plurality of spacers for engaging at least one of the inner casing section and the outer casing section.

40. A fan assembly as claimed in any of claims 34 to 39, wherein each of the first and second channel means is shaped so as substantially to reverse the flow direction of a respective portion of the air flow.

41. A fan assembly as claimed in any of claims 27 to 40, wherein the first portion of the air flow comprises a plurality of first sub-portions, and the second portion of the air flow comprises a plurality of second sub-portions, and wherein the casing is shaped to divide a received air flow into a plurality of air streams, each air stream comprising a respective first sub-portion and a respective second sub-portion of the air stream.

42. A fan assembly as claimed in claim 41, wherein the heating means comprises a plurality of heater assemblies each for heating a respective first sub-portion of the air flow.

43. A fan assembly as claimed in claim 42, wherein the heater assemblies are located on opposite sides of the opening.

44. A fan assembly as claimed in claim 42 or claim 43, wherein the diverting means comprises a plurality of walls located within the casing each for diverting a respective second sub-portion of the air flow away from a heater assembly.

45. A fan assembly as claimed in any of claims 41 to 44, wherein said at least one first air outlet comprises a plurality of first air outlets each for emitting a respective first sub-portion of the air flow.

46. A fan assembly as claimed in claim 45, wherein the first air outlets are located on opposite sides of the opening.

47. A fan assembly as claimed in any of claims 43 to 46, wherein said at least one second air outlet comprises a plurality of second air outlets each located on a respective side of the opening for emitting the second portion of a respective air stream.

48. A fan assembly as claimed in any of claims 27 to 47, wherein each air outlet is in the form of a slot.

49. A fan assembly as claimed in claim 48, wherein each air outlet has a width in the range from 0.5 to 5 mm.

50. A fan assembly as claimed in any of claims 27 to 49, wherein the heating means comprises at least one ceramic heater.

51. A fan assembly as claimed in claim 50, comprising a base housing said means for creating the air flow, and wherein the casing is connected to the base.

52. A nozzle for a fan assembly or a fan assembly substantially as herein described with reference to the accompanying drawings.

Application No:	GB1013263.7	**Examiner:**	Kingsley Robinson
Claims searched:	1-52	**Date of search:**	22 November 2010

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X,E	1- 3, 5, 22-29, 31, 48-51.	GB2468369 A (DYSON) When only one heater is activated as described in page 10, lines 14-15, airflow to the heated side of the duct can be considered the first portion and the airflow to the unheated side can be considered the second portion, note guide vanes 120 creating a plurality of first and second outlets.
Y	1-7, 25, 27-33.	JP2004208935 A (MATSUSHITA) See especially cool air path 2 surrounding hot air path 3 shown on figures.
Y	1-7, 25, 27-33.	US3943329 A (CLAIROL) See especially nozzle 30.
Y	1-7, 25, 27-33.	US5649370 A (RUSSO) See especially diffuser nozzle 12.
Y	1-7, 25, 27-33	JP2000201723 A (NAKANO) See especially first air portion 5 and second air portion 4.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

A45D; F04D; F24H

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC

International Classification:

Subclass	Subgroup	Valid From
F24H	0003/04	01/01/2006
F04D	0025/08	01/01/2006

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(51) INT CL:
F04D 25/08 (2006.01) *F24H 3/04* (2006.01)

(56) Documents Cited:
GB 2468369 A
FR 001387334 A
JP 2004208935 A
US 4790133 A

(58) Field of Search:
INT CL A45D, F04D, F24H
Other: ONLINE: WPI, EPODOC

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Chang Hin Choong

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(54) Title of the Invention: **A fan assembly**
Abstract Title: **A fan assembly with a heater**

(57) Fan assembly including a impeller for creating an air flow, at least one heater 104 for heating a first portion of the air flow, means for diverting a second portion of the air flow away from said at least one heater, and a casing with at least one first air outlet for emitting the first portion of the air flow and at least one second air outlet for emitting the second portion of the air flow, with at least part of the second portion of the air flow being directed over an external surface of the casing. Preferably the casing is shaped to divide the air flow into a plurality of air streams each of which comprises part of the first portion and part of the second portion. Each air outlet may be a slot and the heater may be ceramic.

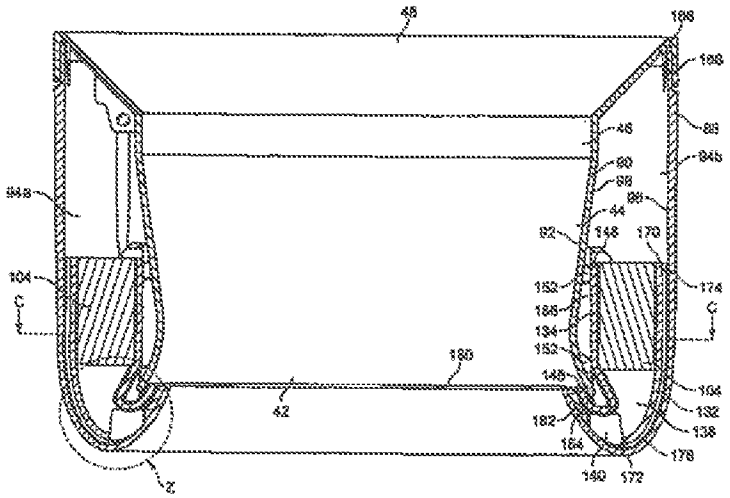


FIG. 9

GB 2482548 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

18 10 11

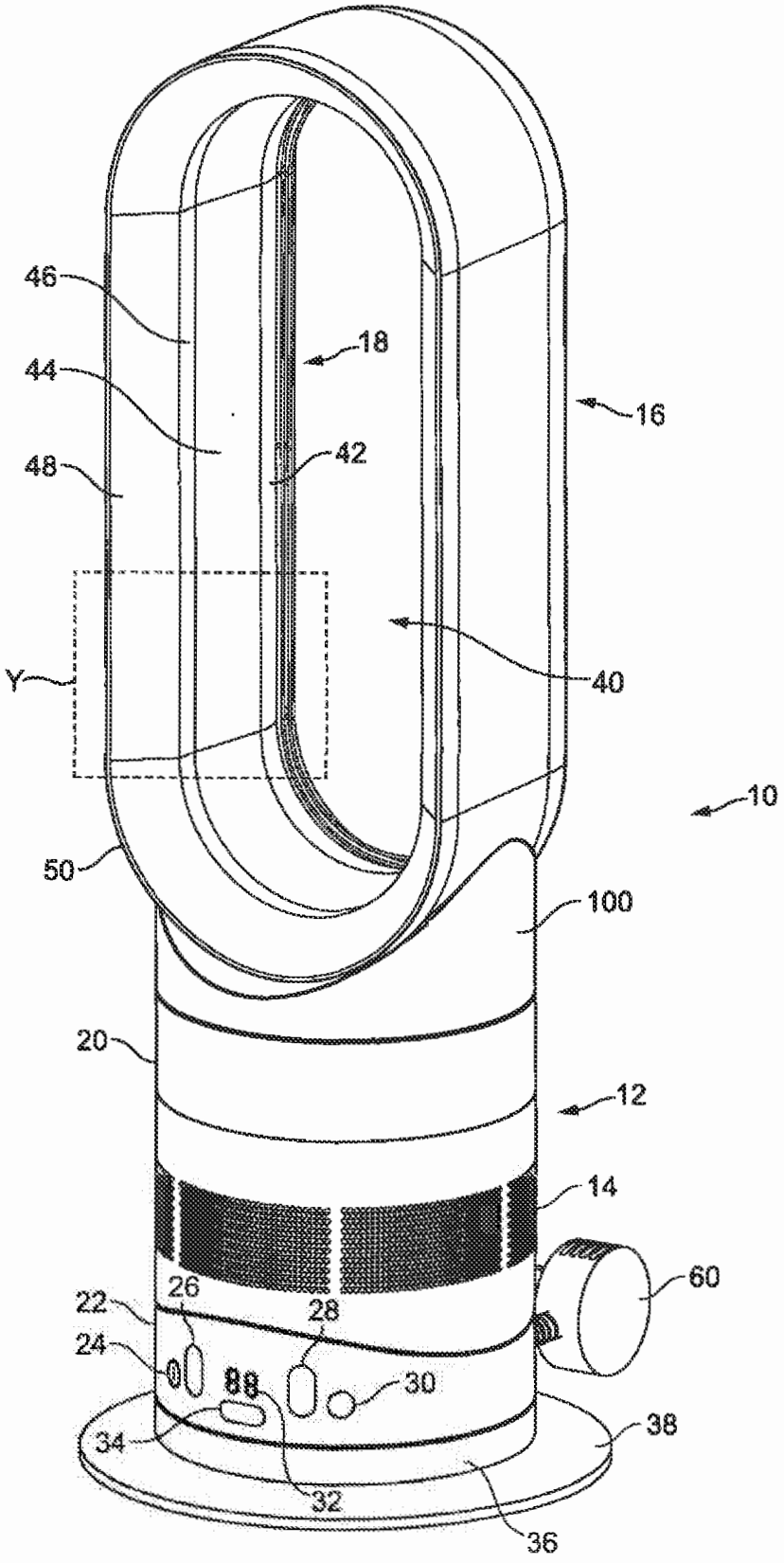


FIG. 1

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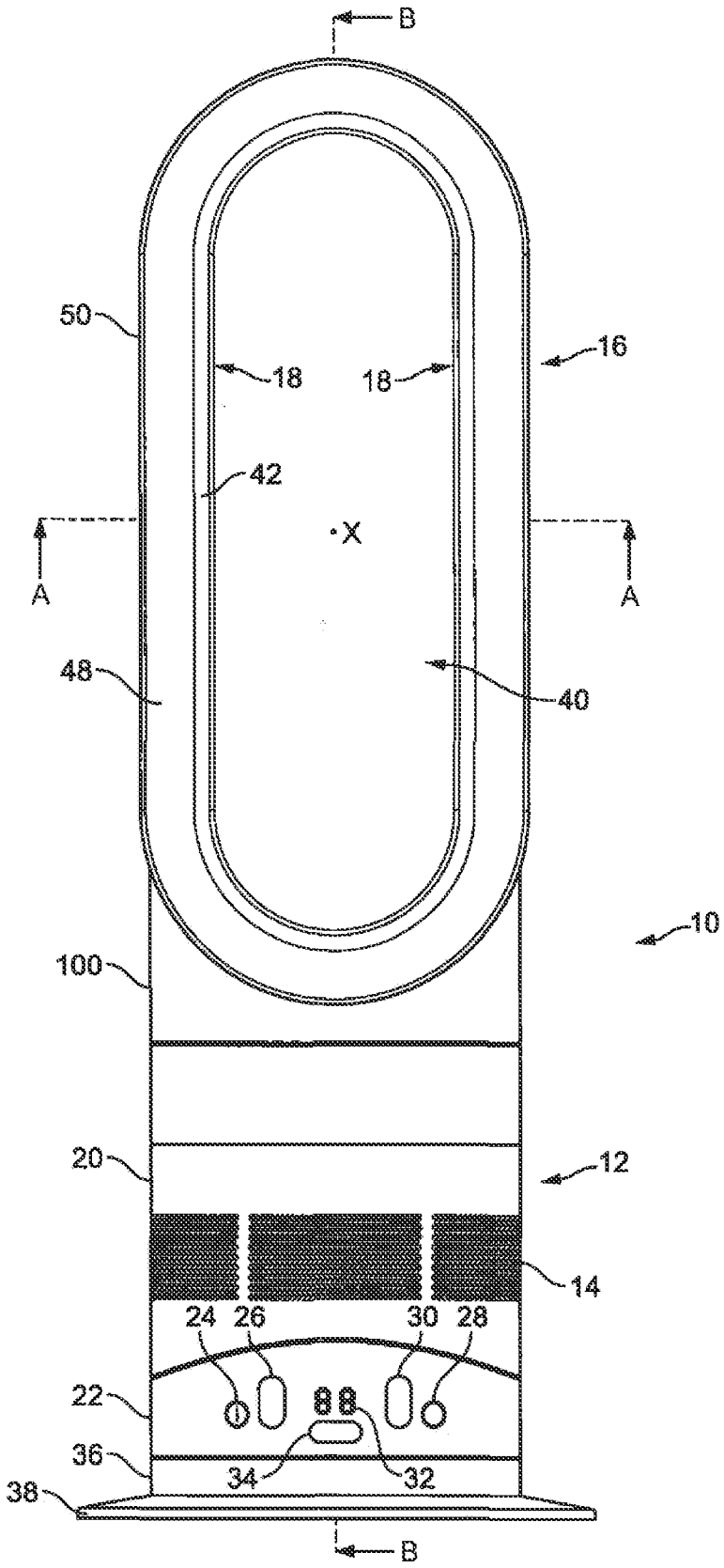


FIG. 2

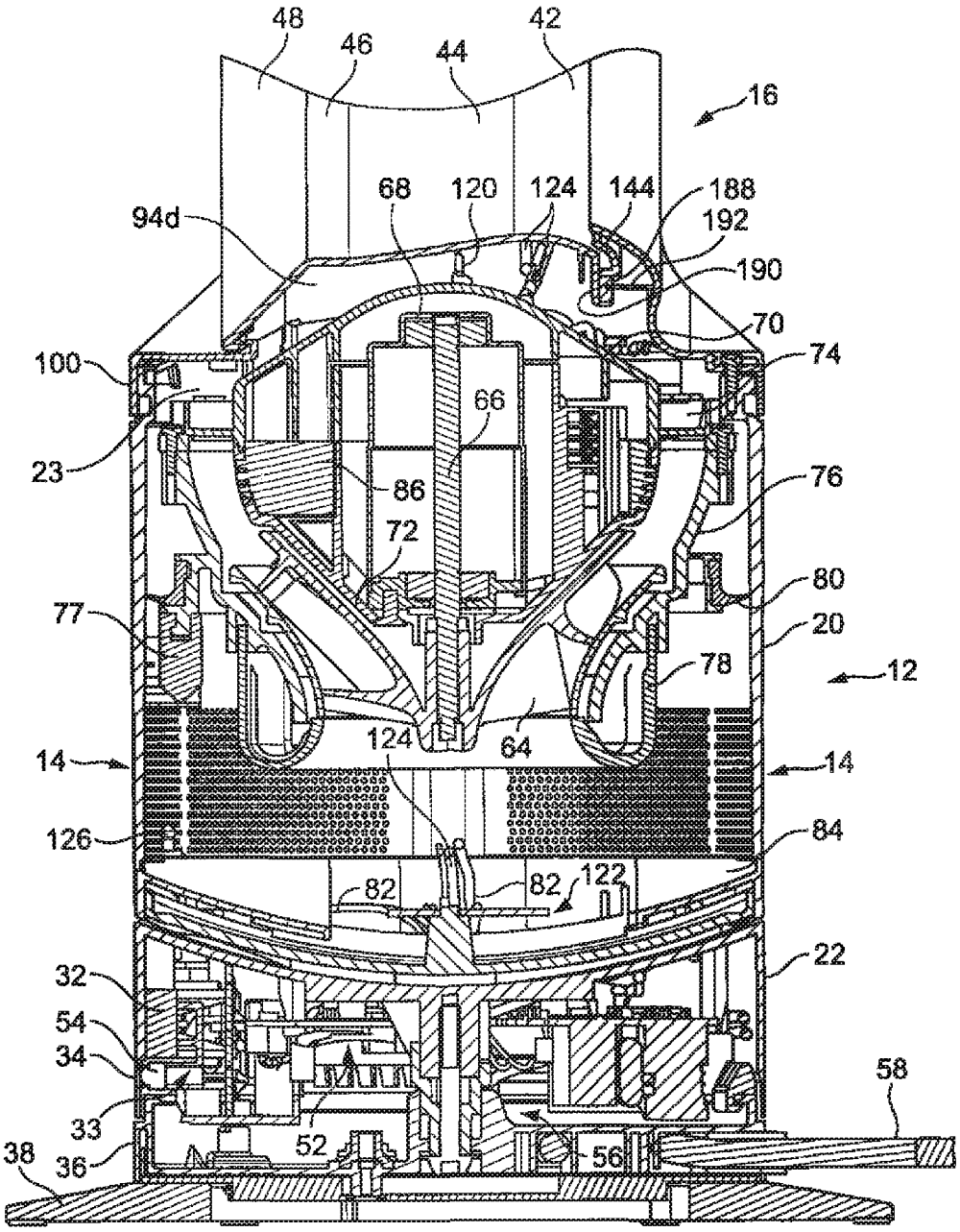

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FIG. 3

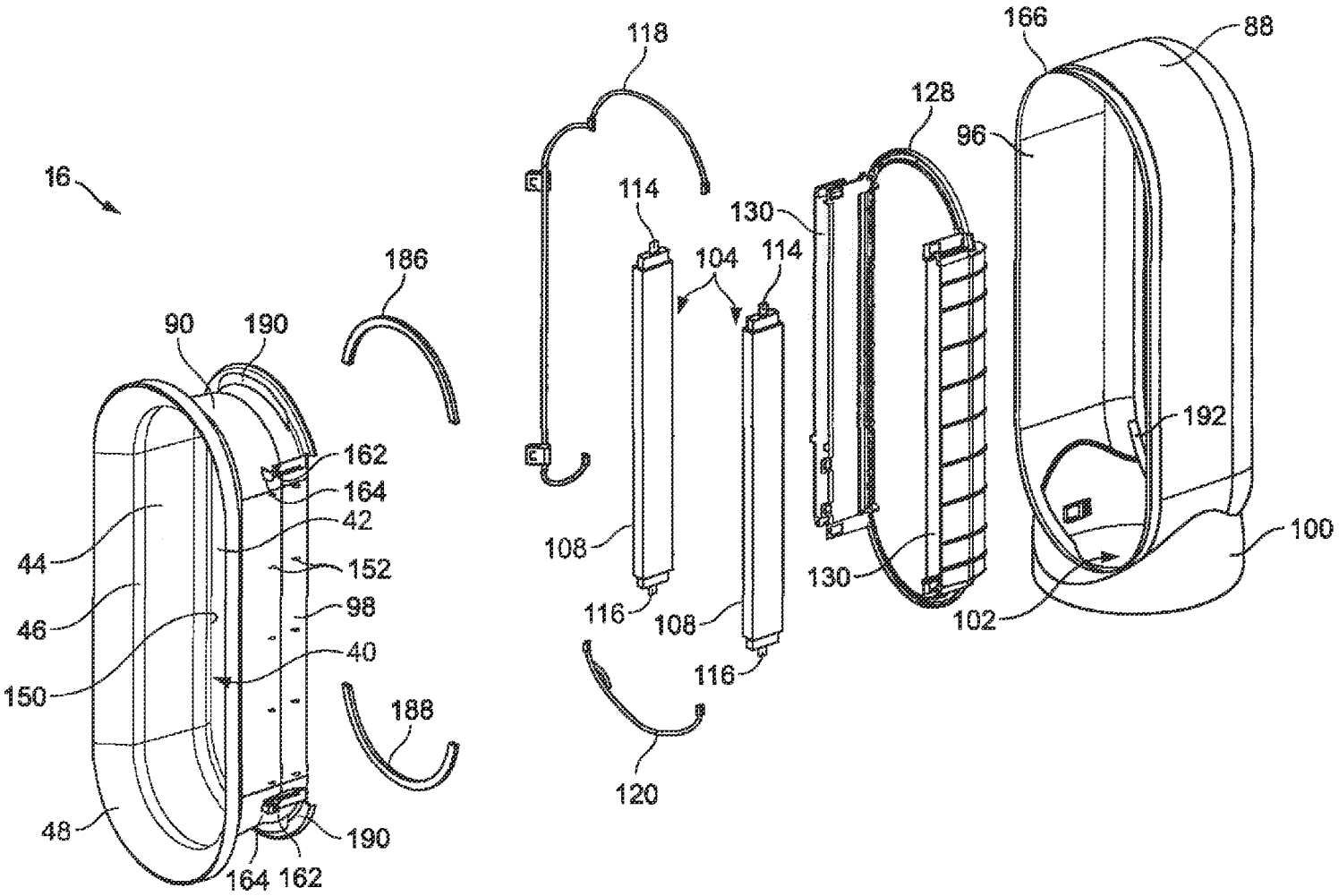


FIG. 4

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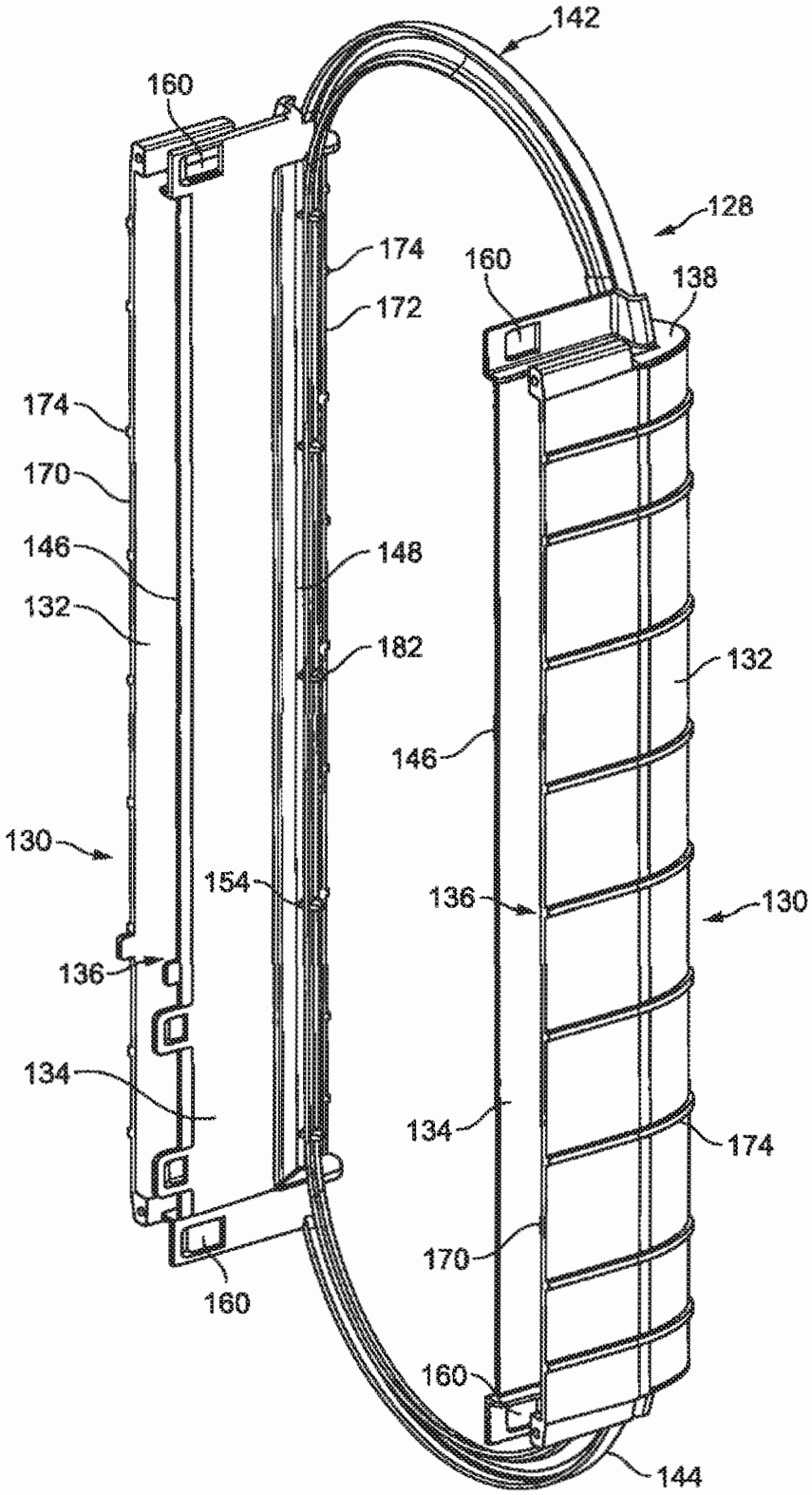

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FIG. 5

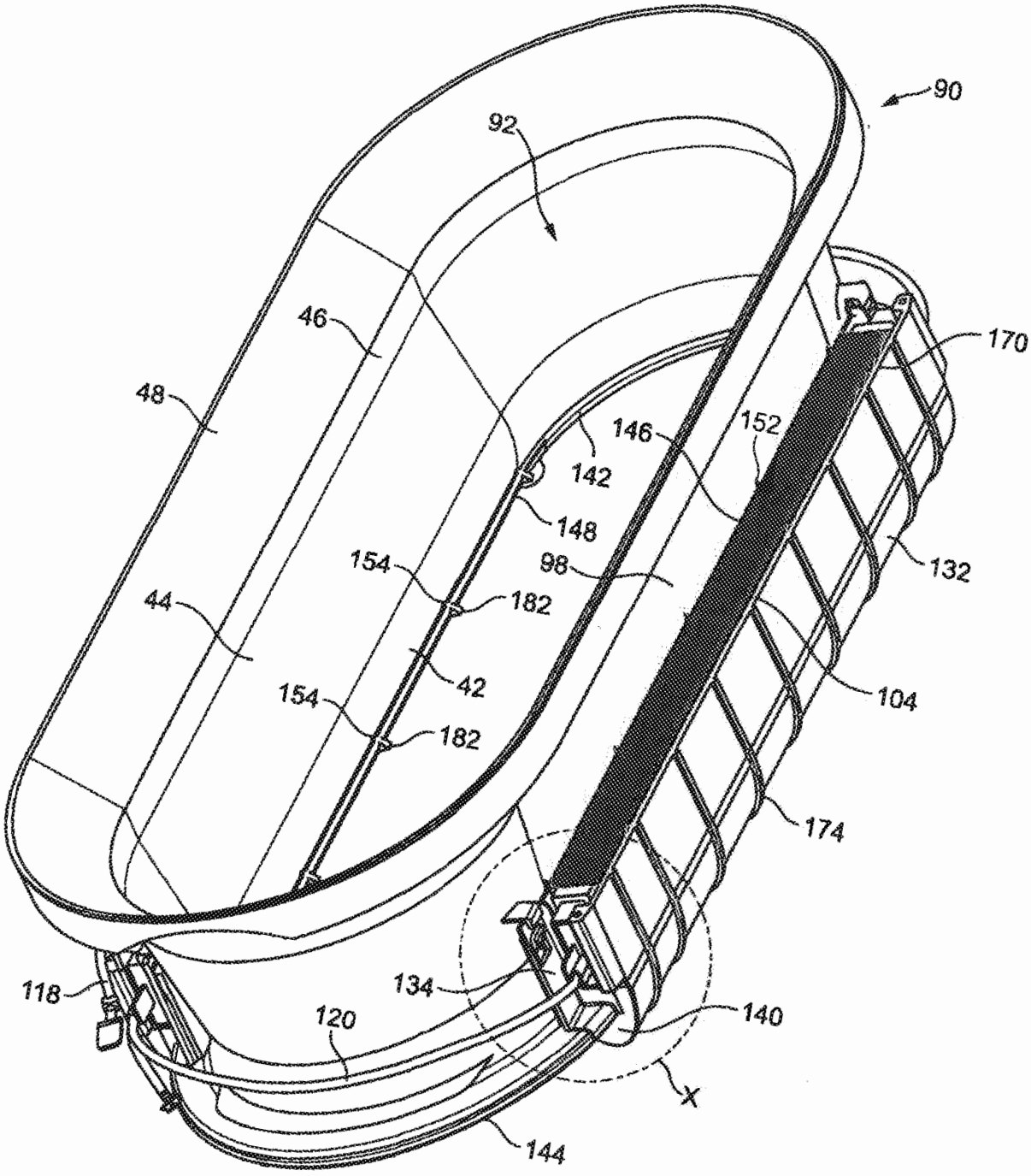

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FIG. 6

18 10 11

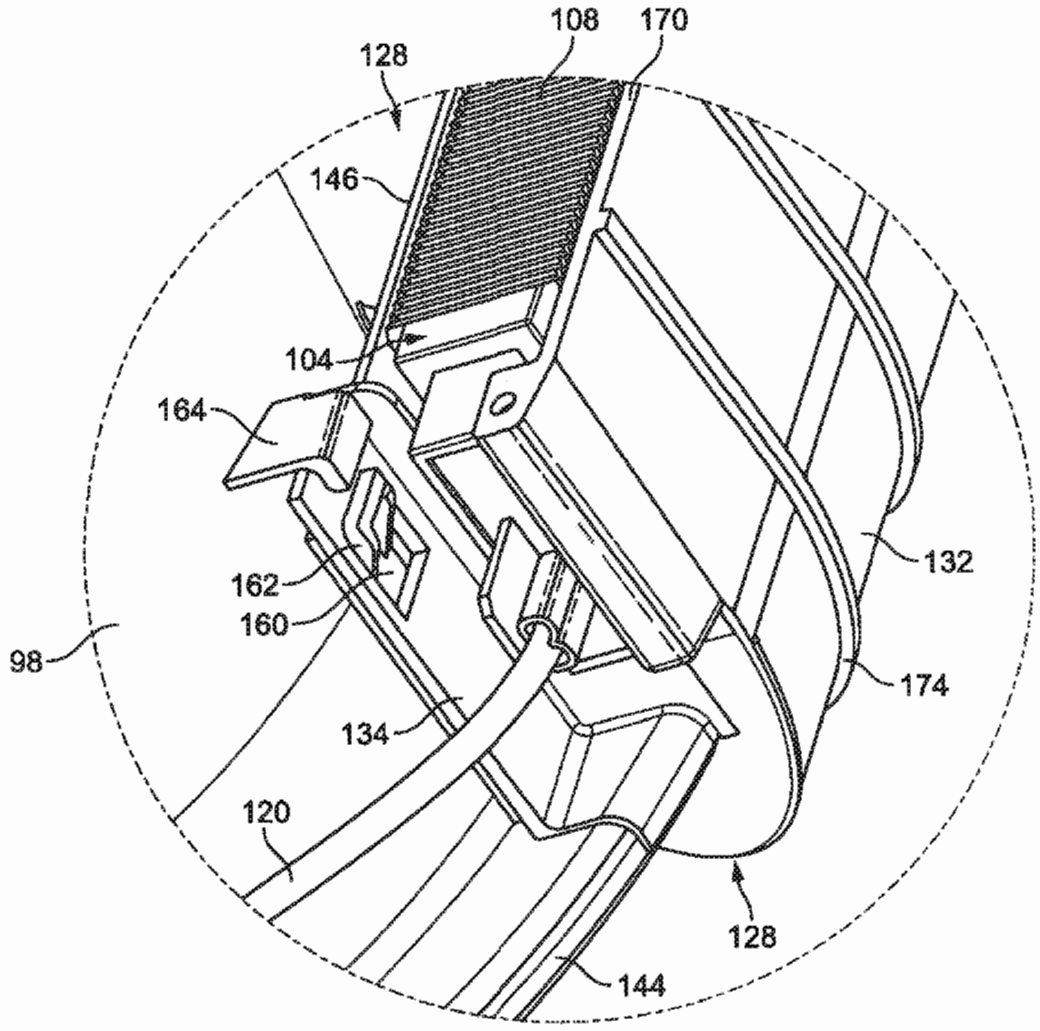


FIG. 7

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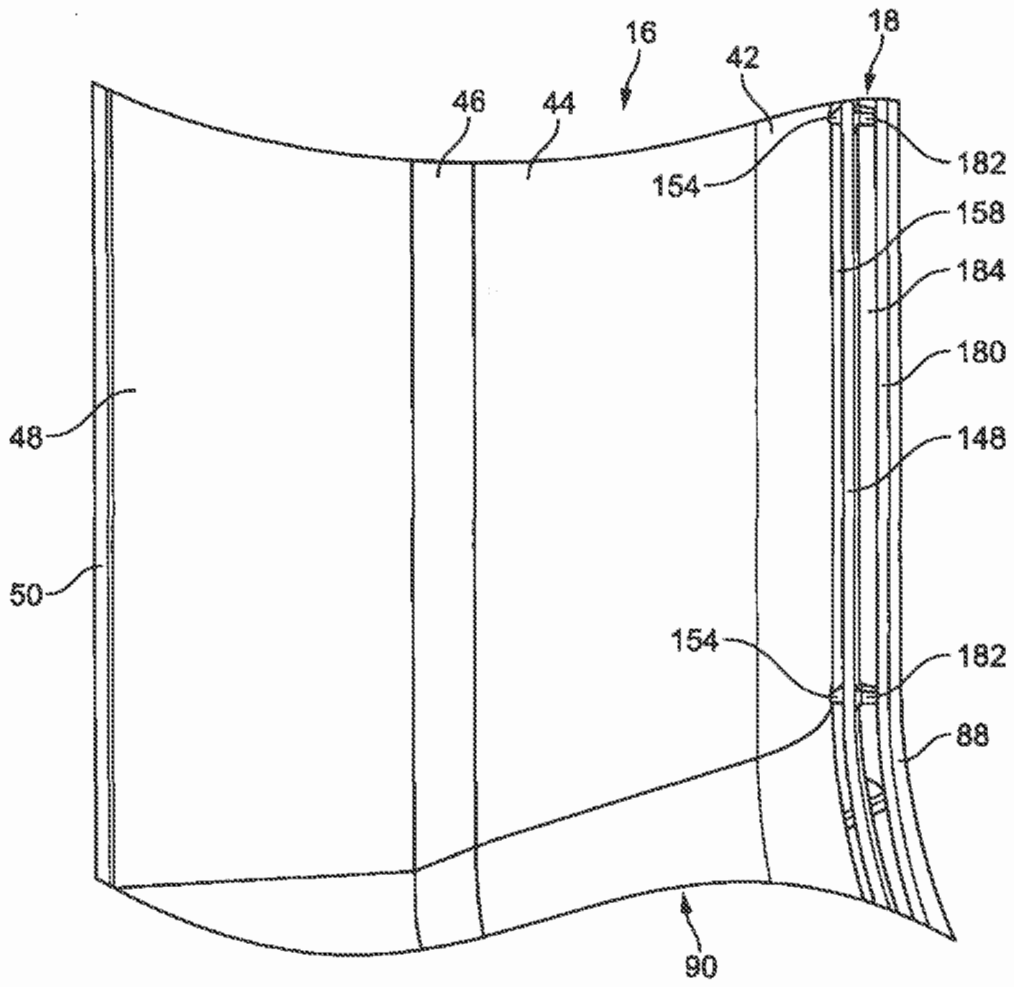


FIG. 8

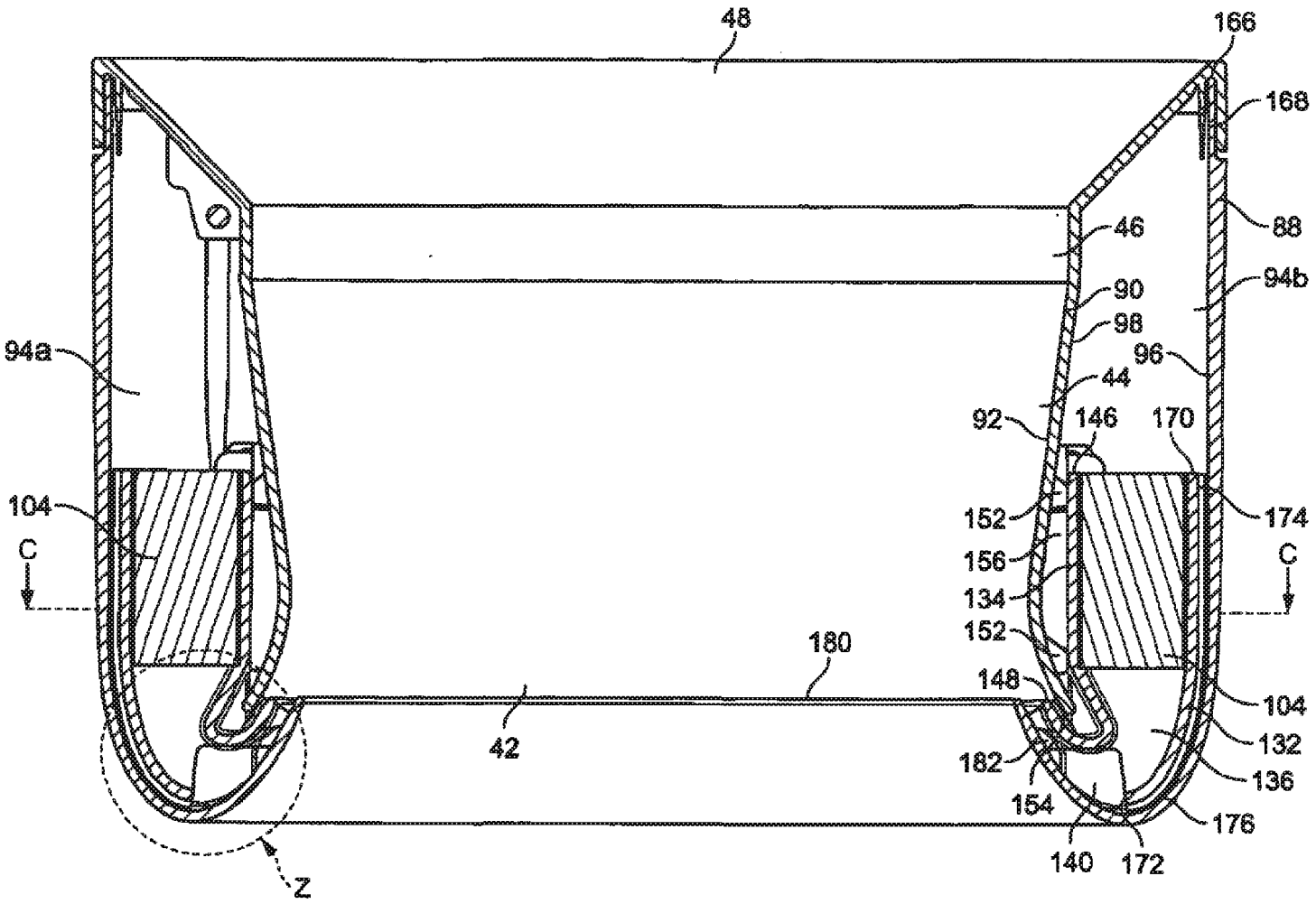


FIG. 9

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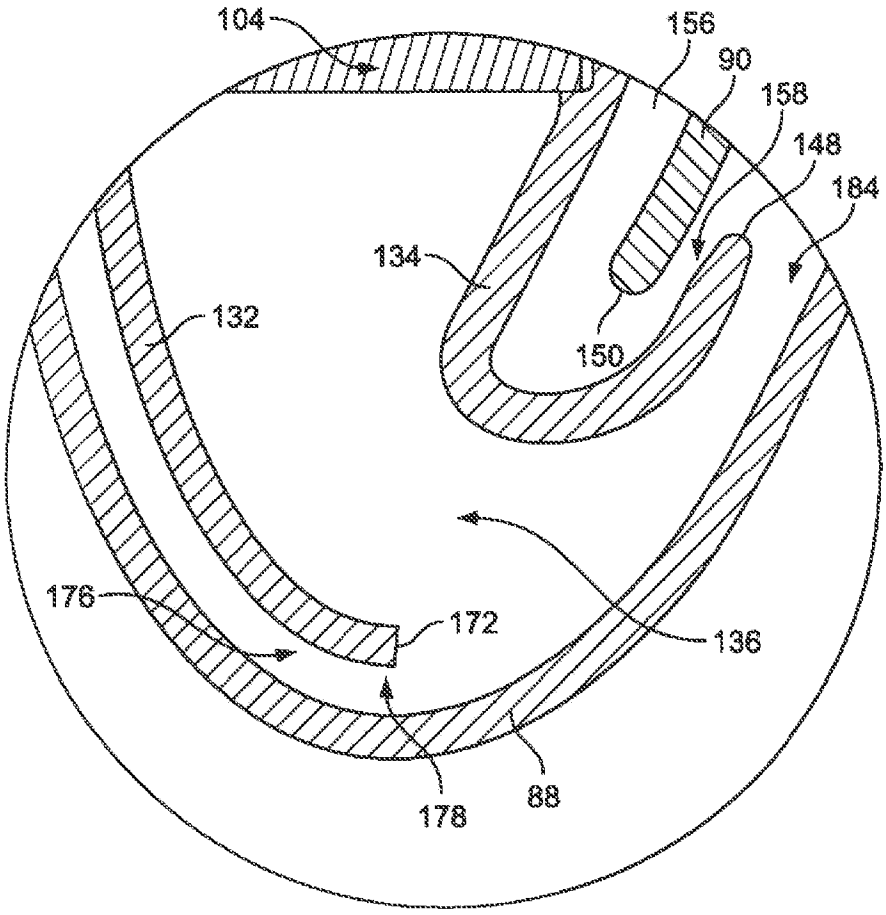


FIG. 10

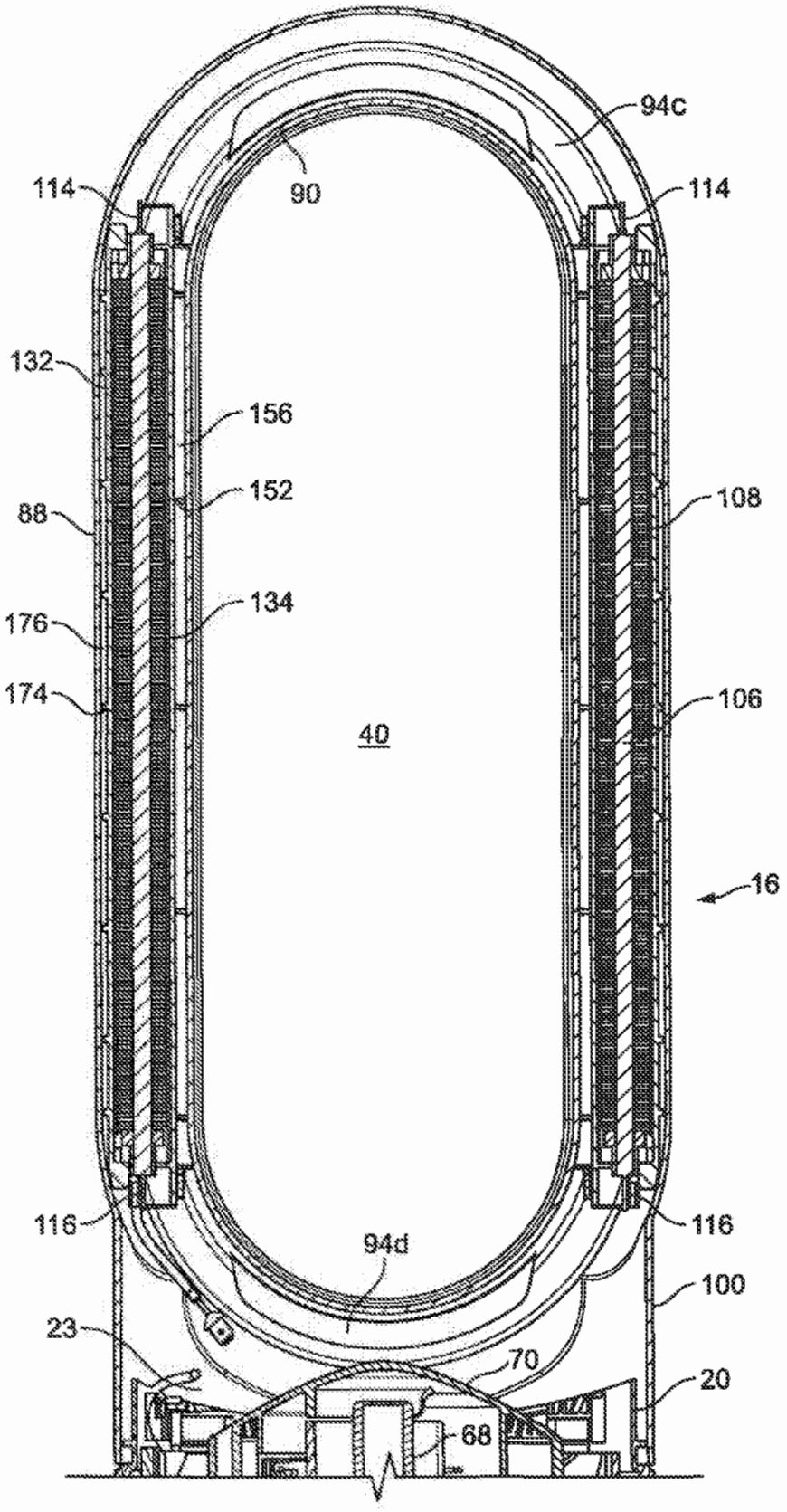


FIG. 11

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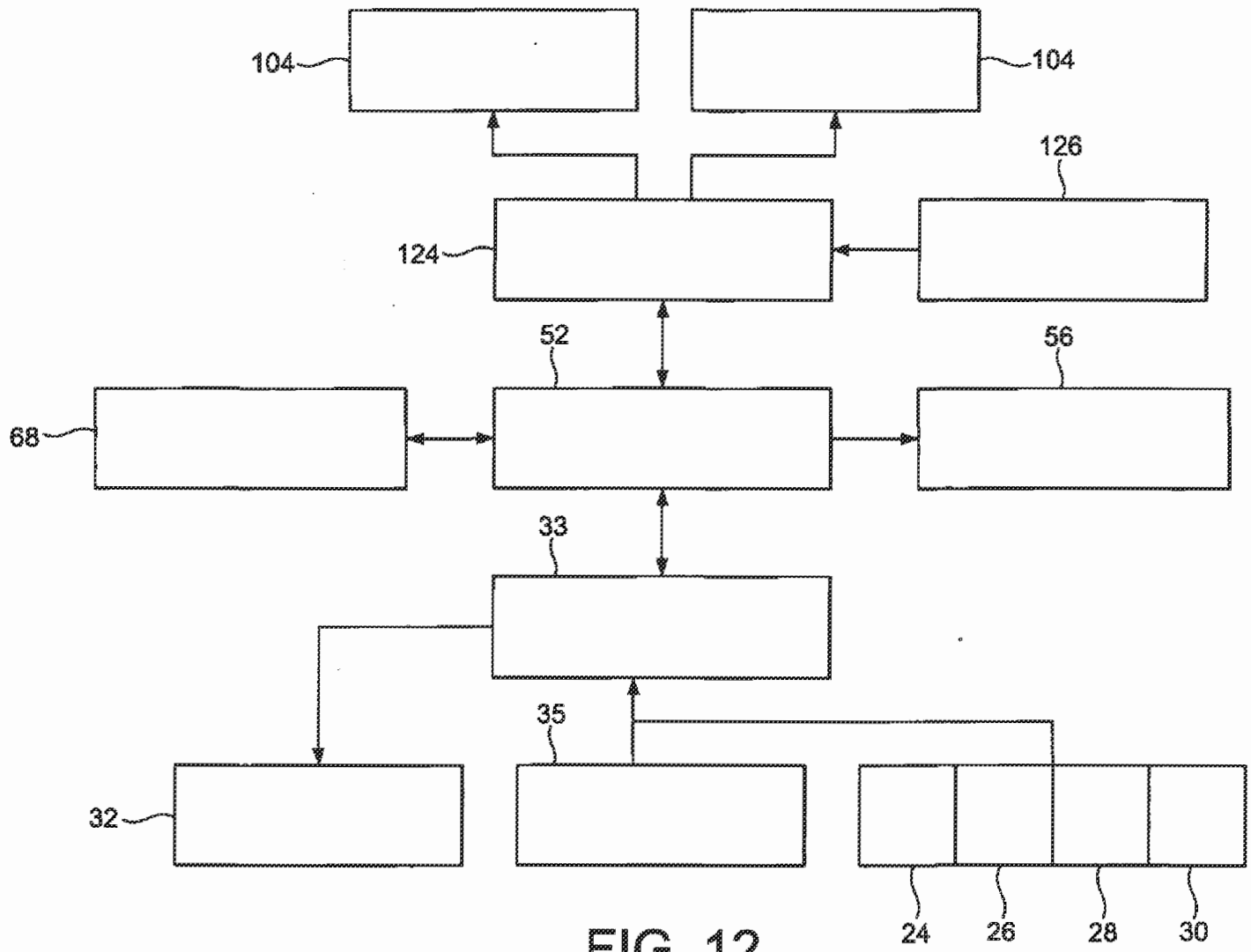


FIG. 12

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A FAN ASSEMBLY

FIELD OF THE INVENTION

The present invention relates to a fan assembly. In a preferred embodiment, the present invention relates to a fan heater for creating a warm air current in a room, office or other domestic environment.

BACKGROUND OF THE INVENTION

A conventional domestic fan typically includes a set of blades or vanes mounted for rotation about an axis, and drive apparatus for rotating the set of blades to generate an air flow. The movement and circulation of the air flow creates a 'wind chill' or breeze and, as a result, the user experiences a cooling effect as heat is dissipated through convection and evaporation.

Such fans are available in a variety of sizes and shapes. For example, a ceiling fan can be at least 1 m in diameter, and is usually mounted in a suspended manner from the ceiling to provide a downward flow of air to cool a room. On the other hand, desk fans are often around 30 cm in diameter, and are usually free standing and portable. Floor-standing tower fans generally comprise an elongate, vertically extending casing around 1 m high and housing one or more sets of rotary blades for generating an air flow. An oscillating mechanism may be employed to rotate the outlet from the tower fan so that the air flow is swept over a wide area of a room.

Fan heaters generally comprise a number of heating elements located either behind or in front of the rotary blades to enable a user to heat the air flow generated by the rotating blades. The heating elements are commonly in the form of heat radiating coils or fins. A variable thermostat, or a number of predetermined output power settings, is usually provided to enable a user to control the temperature of the air flow emitted from the fan heater.

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A disadvantage of this type of arrangement is that the air flow produced by the rotating blades of the fan heater is generally not uniform. This is due to variations across the blade surface or across the outward facing surface of the fan heater. The extent of these variations can vary from product to product and even from one individual fan heater to another. These variations result in the generation of a turbulent, or 'choppy', air flow which can be felt as a series of pulses of air and which can be uncomfortable for a user. A further disadvantage resulting from the turbulence of the air flow is that the heating effect of the fan heater can diminish rapidly with distance.

In a domestic environment it is desirable for appliances to be as small and compact as possible due to space restrictions. It is undesirable for parts of the appliance to project outwardly, or for a user to be able to touch any moving parts, such as the blades. Fan heaters tend to house the blades and the heat radiating coils within a cage or apertured casing to prevent user injury from contact with either the moving blades or the hot heat radiating coils, but such enclosed parts can be difficult to clean. Consequently, an amount of dust or other detritus can accumulate within the casing and on the heat radiating coils between uses of the fan heater. When the heat radiating coils are activated, the temperature of the outer surfaces of the coils can rise rapidly, particularly when the power output from the coils is relatively high, to a value in excess of 700°C. Consequently, some of the dust which has settled on the coils between uses of the fan heater can be burnt, resulting in the emission of an unpleasant smell from the fan heater for a period of time.

Our co-pending patent application PCT/GB2010/050272 describes a fan heater which does not use caged blades to project air from the fan heater. Instead, the fan heater comprises a base which houses a motor-driven impeller for drawing a primary air flow into the base, and an annular nozzle connected to the base and comprising an annular mouth through which the primary air flow is emitted from the fan. The nozzle defines a central opening through which air in the local environment of the fan assembly is drawn by the primary air flow emitted from the mouth, amplifying the primary air flow to

generate an air current. Without the use of a bladed fan to project the air current from the fan heater, a relatively uniform air current can be generated and guided into a room or towards a user. In one embodiment a heater is located within the nozzle to heat the primary air flow before it is emitted from the mouth. By housing the heater within the nozzle, the user is shielded from the hot external surfaces of the heater.

SUMMARY OF THE INVENTION

The present invention provides a fan assembly comprising:

means for creating an air flow;

means for heating a first portion of the air flow;

means for diverting a second portion of the air flow away from the heating means; and

a casing comprising at least one first air outlet for emitting the first portion of the air flow and at least one second air outlet from emitting the second portion of the air flow,

wherein at least one second air outlet is arranged to direct at least part of the second portion of the air flow over an external surface of the casing.

The present invention thus provides a fan assembly having a plurality of air outlets for emitting air at different temperatures. One or more first air outlets are provided for emitting relatively hot air which has been heated by the heating means, whereas one or more second air outlets are provided for emitting relatively cold air which has by-passed the heating means.

The different air paths thus present within the fan assembly may be selectively opened and closed by a user to vary the temperature of the air flow emitted from the fan assembly. The fan assembly may include a valve, shutter or other means for selectively closing one of the air paths so that all of the air flow leaves the fan assembly through either the first air outlet(s) or the second air outlet(s). For example, a shutter may be slidable or otherwise moveable over the outer surface of the casing to selectively close

either the first air outlet(s) or the second air outlet(s), thereby forcing the air flow either to pass through the heating means or to by-pass the heating means. This can enable a user to change rapidly the temperature of the air flow emitted from the casing.

Alternatively, or additionally, the casing may be arranged to emit the first and second portions of the air flow simultaneously.

As mentioned above, at least one second air outlet is arranged to direct at least part of the second portion of the air flow over an external surface of the casing. This can keep that external surface of the casing cool during use of the fan assembly. Where the casing comprises a plurality of second air outlets, the second air outlets may be arranged to direct substantially the entire second portion of the air flow over at least one external surface of the casing. The second air outlets may be arranged to direct the second portion of the air flow over a common external surface of the casing, or over a plurality of external surfaces of the casing, such as front and rear surfaces of the casing.

The, or each, first air outlet is preferably arranged to direct the first portion of the air flow over the second portion of the air flow so that the relatively cold second portion of the air flow is sandwiched between the relatively hot first portion of the air flow and an external surface of the casing, thereby providing a layer of thermal insulation between the relatively hot first portion of the air flow and the external surface of the casing.

The casing is preferably in the form of an annular casing which preferably defines an opening through which air from outside the casing is drawn by the air flow emitted from the air outlets. All of the first and second air outlets are preferably arranged to emit the air flow through the opening in order to maximise the amplification of the air flow emitted from the casing through the entrainment of air external to the casing. Alternatively, at least one second air outlet may be arranged to direct the air flow over an external surface of the casing which is remote from the opening. For example, where the casing has an annular shape, one of the second air outlets may be arranged to direct a portion of the air flow over the external surface of an inner annular section of the

casing so that that portion of the air flow emitted from that second air outlet passes through the opening, whereas another one of the second air outlets may be arranged to direct another portion of the air flow over the external surface of an outer annular section of the casing.

In addition to directing the air flow emitted from at least one of the second air outlets over an external surface of the casing, the casing may be arranged to convey the second portion of the air flow over or along at least one of the internal surfaces of the casing to keep that surface relatively cool during the use of the fan assembly. Alternatively, the dividing means may be arranged to divert both a second portion and a third portion of the air flow away from the heating means, and the interior passage may be arranged to convey the second portion of the air flow along a first internal surface of the casing, for example the internal surface of the inner annular section of the casing, and to convey the third portion of the air flow along a second internal surface of the casing, for example the internal surface of the outer annular section of the casing.

In this case, it may be found that, depending on the temperature of the first portion of the air flow, sufficient cooling of the external surfaces of the casing may be provided without having to emit the both the second and the third portions of the air flow separately from the first portion of the air flow. For example, the first and the third portions of the air flow may be recombined downstream from the heating means, whereas the second portion of the air flow may be directed over the external surface of the inner annular casing.

The diverting means may comprise at least one baffle, wall or other surface for diverting the second portion of the air flow away from the heating means. The diverting means may be integral with or connected to one of the casing sections. The diverting means may conveniently form part of, or be connected to, a chassis for retaining the heating means. Where the diverting means is arranged to divert both a second portion of the air flow and a third portion of the air flow away from the heating means, the diverting means may comprise two mutually spaced parts of the chassis.

Preferably, the casing comprises first channel means for conveying the first portion of the air flow to the first air outlet(s), second channel means for conveying the second portion of the air flow to the second air outlet(s), and means for separating the first channel means from the second channel means. The separating means may be integral with the diverting means for diverting the second portion of the air flow away from the heating means, and thus may comprise at least one side wall of a chassis for retaining the heating means. This can reduce the number of separate components of the fan assembly. The casing may also comprise third channel means for conveying a third portion of the air flow away from the heating means, and preferably along an internal surface of the casing. The second channel means may also be arranged to convey the second portion of the air flow along an internal surface of the casing.

The chassis may comprise first and second side walls configured to retain a heating assembly therebetween. The first and second side walls may form a first channel therebetween, which includes the heating assembly, for conveying the first portion of the air flow to a first air outlet of the casing. The first side wall and a first internal surface of the casing may form a second channel for conveying the second portion of the air flow along the first internal surface to a second air outlet of the casing. The second side wall and a second internal surface of the casing may optionally form a third channel for conveying a third portion of the air flow along the second internal surface. This third channel may merge with the first or second channel, or it may convey the third portion of the air flow to an air outlet of the casing.

As mentioned above, the casing may comprise an inner annular casing section and an outer annular casing section which define an interior passage therebetween for receiving the air flow, and the separating means may be located between the casing sections. Each casing section is preferably formed from a respective annular member, but each casing section may be provided by a plurality of members connected together or otherwise assembled to form that casing section. The inner casing section and the outer casing section may be formed from plastics material or other material having a

relatively low thermal conductivity (less than 1 $Wm^{-1}K^{-1}$), to prevent the external surfaces of the casing from becoming excessively hot during use of the fan assembly.

The separating means may also define in part the first air outlet(s) and/or the second air outlet(s) of the casing. For example, the first air outlet(s) may be located between an internal surface of the outer casing section and the separating means. Alternatively, or additionally, the at least one second air outlet may be located between an external surface of the inner casing section and the separating means. Where the separating means comprises a wall for separating the first channel means from a second channel means, a first air outlet may be located between the internal surface of the outer casing section and a first side surface of the wall, and a second air outlet may be located between the external surface of the inner casing section and a second side surface of the wall.

The separating means may comprise a plurality of spacers for engaging at least one of the inner casing section and the outer casing section. This can enable the width of at least one of the second channel means and the third channel means to be controlled along the length thereof through engagement between the spacers and said at least one of the inner casing section and the outer casing section.

The direction in which air is emitted from the air outlets is preferably substantially at a right angle to the direction in which the air flow passes through at least part of the interior passage. Preferably, the air flow passes through at least part of the interior passage in a substantially vertical direction, and the air is emitted from the air outlets in a substantially horizontal direction. The interior passage is preferably located towards the front of the casing, whereas the air outlets are preferably located towards the rear of the casing and arranged to direct air towards the front of the casing and through the opening. Consequently, each of the first and second channel means may be shaped so as substantially to reverse the flow direction of a respective portion of the air flow.

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The interior passage is preferably annular, and is preferably shaped to divide the air flow into two air streams which flow in opposite directions around the opening. In this case the heating means is preferably arranged to heat a first portion of each air stream and the diverting means is arranged to divert a second portion of each air stream away from the heating means. These first portions of the air streams may be emitted from a common first air outlet of the casing, or they may each be emitted from a respective first air outlet of the casing, and together form the first portion of the air flow. These first air outlets may be located on opposite sides of the opening. Similarly, the second portions of the two air streams may be emitted from a common second air outlet of the casing, or they may each be emitted from a respective second air outlet of the casing, and together form the second portion of the air flow. Again, these second air outlets may be located on opposite sides of the opening. Each air stream may thus be considered to be divided into a respective first sub-portion and a respective second sub-portion of the air flow by the diverting means.

At least part of the heating means may be arranged within the casing so as to extend about the opening. Where the casing defines a circular opening, the heating means preferably extends at least 270° about the opening and more preferably at least 300° about the opening. Where the casing defines an elongate opening, that is, an opening having a height greater than its width, the heating means is preferably located on at least the opposite sides of the opening.

The heating means may comprise at least one ceramic heater located within the interior passage. The ceramic heater may be porous so that the first portion of the air flow passes through pores in the heating means before being emitted from the first air outlet(s). The heater may be formed from a PTC (positive temperature coefficient) ceramic material which is capable of rapidly heating the air flow upon activation.

The ceramic material may be at least partially coated in metallic or other electrically conductive material to facilitate connection of the heating means to a controller within the fan assembly for activating the heating means. Alternatively, at least one non-

porous, preferably ceramic, heater may be mounted within a metallic frame located within the interior passage and which is connectable to a controller of the fan assembly. The metallic frame preferably comprises a plurality of fins to provide a greater surface area and hence better heat transfer to the air flow, while also providing a means of electrical connection to the heating means.

The heating means preferably comprises at least one heater assembly. Where the air flow is divided into two air streams, the heating means preferably comprises a plurality of heater assemblies each for heating a respective first sub-portion of the air flow, and the diverting means preferably comprises a plurality of walls each for diverting a respective second sub-portion of the air flow away from a heater assembly.

Each air outlet is preferably in the form of a slot, and which preferably has a width in the range from 0.5 to 5 mm. The width of the first air outlet(s) is preferably different from that of the second air outlet(s). In a preferred embodiment, the width of the first air outlet(s) is greater than the width of the second air outlet(s) so that the majority of the primary air flow passes through the heating means.

The casing may comprise a surface located adjacent the air outlets and over which the air outlets are arranged to direct the air flow emitted therefrom. Preferably, this surface is a curved surface, and more preferably is a Coanda surface. Preferably, the external surface of the inner casing section of the casing is shaped to define the Coanda surface. A Coanda surface is a known type of surface over which fluid flow exiting an output orifice close to the surface exhibits the Coanda effect. The fluid tends to flow over the surface closely, almost 'clinging to' or 'hugging' the surface. The Coanda effect is already a proven, well documented method of entrainment in which a primary air flow is directed over a Coanda surface. A description of the features of a Coanda surface, and the effect of fluid flow over a Coanda surface, can be found in articles such as Reba, Scientific American, Volume 214, June 1966 pages 84 to 92. Through use of a Coanda surface, an increased amount of air from outside the fan assembly is drawn through the opening by the air emitted from the air outlets.

In a preferred embodiment an air flow is created through the casing of the fan assembly. In the following description this air flow will be referred to as the primary air flow. The primary air flow is emitted from the air outlets of the casing and preferably passes over a Coanda surface. The primary air flow entrains air surrounding the casing, which acts as an air amplifier to supply both the primary air flow and the entrained air to the user. The entrained air will be referred to here as a secondary air flow. The secondary air flow is drawn from the room space, region or external environment surrounding the mouth of the casing and, by displacement, from other regions around the fan assembly, and passes predominantly through the opening defined by the casing. The primary air flow directed over the Coanda surface combined with the entrained secondary air flow equates to a total air flow emitted or projected forward from the opening defined by the casing.

Preferably, the casing comprises a diffuser surface located downstream of the Coanda surface. The diffuser surface directs the air flow emitted towards a user's location while maintaining a smooth, even output. Preferably, the external surface of the inner casing section of the casing is shaped to define the diffuser surface.

The fan assembly preferably also comprises a base housing said means for creating the air flow, with the casing being connected to the base. The base is preferably generally cylindrical in shape, and comprises a plurality of air inlets through which the air flow enters the fan assembly.

The means for creating an air flow through the casing preferably comprises an impeller driven by a motor. This can provide a fan assembly with efficient air flow generation. The means for creating an air flow preferably comprises a DC brushless motor. This can avoid frictional losses and carbon debris from the brushes used in a traditional brushed motor. Reducing carbon debris and emissions is advantageous in a clean or pollutant sensitive environment such as a hospital or around those with allergies. While induction motors, which are generally used in bladed fans, also have no brushes, a DC

brushless motor can provide a much wider range of operating speeds than an induction motor.

The heating means is preferably located in the casing. The diverting means may also be located in the casing. However, the heating means need not be located within the casing. For example, both the heating means and the diverting means may be located in the base, with the casing being arranged to receive a relatively hot first portion of the air flow and a relatively cold second portion of the air flow from the base, and to convey the first portion of the air flow to the first air outlet(s) and the second portion of the air flow to the second air outlet(s). The casing may comprise internal walls or baffles for defining the first channel means and second channel means.

Alternatively, the heating means may be located in the casing but the diverting means may be located in the base. In this case, the first channel means may be arranged both to convey the first portion of the air flow from the base to the at least one first air outlet and to house the heating means for heating the first portion of the air flow, while the second channel means may be arranged simply to convey the second portion of the air flow from the base to the at least one second air outlet.

The fan assembly is preferably in the form of a portable fan heater.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment 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 front perspective view, from above, of a fan assembly;

Figure 2 is a front view of the fan assembly;

Figure 3 is a sectional view taken along line B-B of Figure 2;

Figure 4 is an exploded view of the nozzle of the fan assembly;

Figure 5 is a front perspective view of the heater chassis of the nozzle;

Figure 6 is a front perspective view, from below, of the heater chassis connected to an inner casing section of the nozzle;

Figure 7 is a close-up view of region X indicated in Figure 6;

Figure 8 is a close-up view of region Y indicated in Figure 1;

Figure 9 is a sectional view taken along line A-A of Figure 2;

Figure 10 is a close-up view of region Z indicated in Figure 9;

Figure 11 is a sectional view of the nozzle taken along line C-C of Figure 9; and

Figure 12 is a schematic illustration of a control system of the fan assembly.

DETAILED DESCRIPTION OF THE INVENTION

Figures 1 and 2 illustrate external views of a fan assembly 10. The fan assembly 10 is in the form of a portable fan heater. The fan assembly 10 comprises a body 12 comprising an air inlet 14 through which a primary air flow enters the fan assembly 10, and a nozzle 16 in the form of an annular casing mounted on the body 12, and which comprises at least one air outlet 18 for emitting the primary air flow from the fan assembly 10.

The body 12 comprises a substantially cylindrical main body section 20 mounted on a substantially cylindrical lower body section 22. The main body section 20 and the

lower body section 22 preferably have substantially the same external diameter so that the external surface of the upper body section 20 is substantially flush with the external surface of the lower body section 22. In this embodiment the body 12 has a height in the range from 100 to 300 mm, and a diameter in the range from 100 to 200 mm.

The main body section 20 comprises the air inlet 14 through which the primary air flow enters the fan assembly 10. In this embodiment the air inlet 14 comprises an array of apertures formed in the main body section 20. Alternatively, the air inlet 14 may comprise one or more grilles or meshes mounted within windows formed in the main body section 20. The main body section 20 is open at the upper end (as illustrated) thereof to provide an air outlet 23 through which the primary air flow is exhausted from the body 12.

The main body section 20 may be tilted relative to the lower body section 22 to adjust the direction in which the primary air flow is emitted from the fan assembly 10. For example, the upper surface of the lower body section 22 and the lower surface of the main body section 20 may be provided with interconnecting features which allow the main body section 20 to move relative to the lower body section 22 while preventing the main body section 20 from being lifted from the lower body section 22. For example, the lower body section 22 and the main body section 20 may comprise interlocking L-shaped members.

The lower body section 22 comprises a user interface of the fan assembly 10. With reference also to Figure 12, the user interface comprises a plurality of user-operable buttons 24, 26, 28, 30 for enabling a user to control various functions of the fan assembly 10, a display 32 located between the buttons for providing the user with, for example, a visual indication of a temperature setting of the fan assembly 10, and a user interface control circuit 33 connected to the buttons 24, 26, 28, 30 and the display 32. The lower body section 22 also includes a window 34 through which signals from a remote control 35 (shown schematically in Figure 12) enter the fan assembly 10. The lower body section 22 is mounted on a base 36 for engaging a surface on which the fan

assembly 10 is located. The base 36 includes an optional base plate 38, which preferably has a diameter in the range from 200 to 300 mm.

The nozzle 16 has an annular shape, extending about a central axis X to define an opening 40. The air outlets 18 for emitting the primary air flow from the fan assembly 10 are located towards the rear of the nozzle 16, and arranged to direct the primary air flow towards the front of the nozzle 16, through the opening 40. In this example, the nozzle 16 defines an elongate opening 40 having a height greater than its width, and the air outlets 18 are located on the opposite elongate sides of the opening 40. In this example the maximum height of the opening 40 is in the range from 300 to 400 mm, whereas the maximum width of the opening 40 is in the range from 100 to 200 mm.

The inner annular periphery of the nozzle 16 comprises a Coanda surface 42 located adjacent the air outlets 18, and over which at least some of the air outlets 18 are arranged to direct the air emitted from the fan assembly 10, a diffuser surface 44 located downstream of the Coanda surface 42 and a guide surface 46 located downstream of the diffuser surface 44. The diffuser surface 44 is arranged to taper away from the central axis X of the opening 38. The angle subtended between the diffuser surface 44 and the central axis X of the opening 40 is in the range from 5 to 25°, and in this example is around 7°. The guide surface 46 is preferably arranged substantially parallel to the central axis X of the opening 38 to present a substantially flat and substantially smooth face to the air flow emitted from the mouth 40. A visually appealing tapered surface 48 is located downstream from the guide surface 46, terminating at a tip surface 50 lying substantially perpendicular to the central axis X of the opening 40. The angle subtended between the tapered surface 48 and the central axis X of the opening 40 is preferably around 45°.

Figure 3 illustrates a sectional view through the body 12. The lower body section 22 houses a main control circuit, indicated generally at 52, connected to the user interface control circuit 33. The user interface control circuit 33 comprises a sensor 54 for receiving signals from the remote control 35. The sensor 54 is located behind the

window 34. In response to operation of the buttons 24, 26, 28, 30 and the remote control 35, the user interface control circuit 33 is arranged to transmit appropriate signals to the main control circuit 52 to control various operations of the fan assembly 10. The display 32 is located within the lower body section 22, and is arranged to illuminate part of the lower body section 22. The lower body section 22 is preferably formed from a translucent plastics material which allows the display 32 to be seen by a user.

The lower body section 22 also houses a mechanism, indicated generally at 56, for oscillating the lower body section 22 relative to the base 36. The operation of the oscillating mechanism 56 is controlled by the main control circuit 52 upon receipt of an appropriate control signal from the remote control 35. The range of each oscillation cycle of the lower body section 22 relative to the base 36 is preferably between 60° and 120°, and in this embodiment is around 80°. In this embodiment, the oscillating mechanism 56 is arranged to perform around 3 to 5 oscillation cycles per minute. A mains power cable 58 for supplying electrical power to the fan assembly 10 extends through an aperture formed in the base 36. The cable 58 is connected to a plug 60.

The main body section 20 houses an impeller 64 for drawing the primary air flow through the air inlet 14 and into the body 12. Preferably, the impeller 64 is in the form of a mixed flow impeller. The impeller 64 is connected to a rotary shaft 66 extending outwardly from a motor 68. In this embodiment, the motor 68 is a DC brushless motor having a speed which is variable by the main control circuit 52 in response to user manipulation of the button 26 and/or a signal received from the remote control 35. The maximum speed of the motor 68 is preferably in the range from 5,000 to 10,000 rpm. The motor 68 is housed within a motor bucket comprising an upper portion 70 connected to a lower portion 72. The upper portion 70 of the motor bucket comprises a diffuser 74 in the form of a stationary disc having spiral blades.

The motor bucket is located within, and mounted on, a generally frusto-conical impeller housing 76. The impeller housing 76 is, in turn, mounted on a plurality of angularly

spaced supports 77, in this example three supports, located within and connected to the main body section 20 of the base 12. The impeller 64 and the impeller housing 76 are shaped so that the impeller 64 is in close proximity to, but does not contact, the inner surface of the impeller housing 76. A substantially annular inlet member 78 is connected to the bottom of the impeller housing 76 for guiding the primary air flow into the impeller housing 76.

A flexible sealing member 80 is mounted on the impeller housing 76. The flexible sealing member prevents air from passing around the outer surface of the impeller housing to the inlet member 78. The sealing member 80 preferably comprises an annular lip seal, preferably formed from rubber. The sealing member 80 further comprises a guide portion in the form of a grommet for guiding an electrical cable 82 to the motor 68. The electrical cable 82 passes from the main control circuit 52 to the motor 68 through apertures formed in the main body section 20 and the lower body section 22 of the body 12, and in the impeller housing 76 and the motor bucket.

Preferably, the body 12 includes silencing foam for reducing noise emissions from the body 12. In this embodiment, the main body section 20 of the body 12 comprises a first annular foam member 84 located beneath the air inlet 14, and a second annular foam member 86 located within the motor bucket.

The nozzle 16 will now be described in more detail with reference to Figures 4 to 11. With reference first to Figure 4, the nozzle 16 comprises an annular outer casing section 88 connected to and extending about an annular inner casing section 90. Each of these sections may be formed from a plurality of connected parts, but in this embodiment each of the casing sections 88, 90 is formed from a respective, single moulded part. The inner casing section 90 defines the central opening 40 of the nozzle 16, and has an external surface 92 which is shaped to define the Coanda surface 42, diffuser surface 44, guide surface 46 and tapered surface 48.

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The outer casing section 88 and the inner casing section 90 together define an annular interior passage of the nozzle 16. As illustrated in Figures 9 and 11, the interior passage extends about the opening 40, and thus comprises two relatively straight sections 94a, 94b each adjacent a respective elongate side of the opening 40, an upper curved section 94c joining the upper ends of the straight sections 94a, 94b, and a lower curved section 94d joining the lower ends of the straight 94a, 94b. The interior passage is bounded by the internal surface 96 of the outer casing section 88 and the internal surface 98 of the inner casing section 90.

As also shown in Figures 1 to 3, the outer casing section 88 comprises a base 100 which is connected to, and over, the open upper end of the main body section 20 of the base 12. The base 100 of the outer casing section 88 comprises an air inlet 102 through which the primary air flow enters the lower curved section 94d of the interior passage from the air outlet 23 of the base 12. Within the lower curved section 94d, the primary air flow is divided into two air streams which each flow into a respective one of the straight sections 94a, 94b of the interior passage.

The nozzle 16 also comprises a pair of heater assemblies 104. Each heater assembly 104 comprises a row of heater elements 106 arranged side-by-side. The heater elements 106 are preferably formed from positive temperature coefficient (PTC) ceramic material. The row of heater elements is sandwiched between two heat radiating components 108, each of which comprises an array of heat radiating fins 110 located within a frame 112. The heat radiating components 108 are preferably formed from aluminium or other material with high thermal conductivity (around 200 to 400 W/mK), and may be attached to the row of heater elements 106 using beads of silicone adhesive, or by a clamping mechanism. The side surfaces of the heater elements 106 are preferably at least partially covered with a metallic film to provide an electrical contact between the heater elements 106 and the heat radiating components 108. This film may be formed from screen printed or sputtered aluminium. Returning to Figures 3 and 4, electrical terminals 114, 116 located at opposite ends of the heater assembly 104 are each connected to a respective heat radiating component 108. Each terminal 114 is

connected to an upper part 118 of a loom for supplying electrical power to the heater assemblies 104, whereas each terminal 116 is connected to a lower part 120 of the loom. The loom is in turn connected to a heater control circuit 122 located in the main body section 20 of the base 12 by wires 124. The heater control circuit 122 is in turn controlled by control signals supplied thereto by the main control circuit 52 in response to user operation of the buttons 28, 30 and/or use of the remote control 35.

Figure 12 illustrates schematically a control system of the fan assembly 10, which includes the control circuits 33, 52, 122, buttons 24, 26, 28, 30, and remote control 35. Two or more of the control circuits 33, 52, 122 may be combined to form a single control circuit. A thermistor 126 for providing an indication of the temperature of the primary air flow entering the fan assembly 10 is connected to the heater controller 122. The thermistor 126 may be located immediately behind the air inlet 14, as shown in Figure 3. The main control circuit 52 supplies control signals to the user interface control circuit 33, the oscillation mechanism 56, the motor 68, and the heater control circuit 124, whereas the heater control circuit 124 supplies control signals to the heater assemblies 104. The heater control circuit 124 may also provide the main control circuit 52 with a signal indicating the temperature detected by the thermistor 126, in response to which the main control circuit 52 may output a control signal to the user interface control circuit 33 indicating that the display 32 is to be changed, for example if the temperature of the primary air flow is at or above a user selected temperature. The heater assemblies 104 may be controlled simultaneously by a common control signal, or they may be controlled by respective control signals.

The heater assemblies 104 are each retained within a respective straight section 94a, 94b of the interior passage by a chassis 128. The chassis 128 is illustrated in more detail in Figure 5. The chassis 128 has a generally annular structure. The chassis 128 comprises a pair of heater housings 130 into which the heater assemblies 104 are inserted. Each heater housing 130 comprises an outer wall 132 and an inner wall 134. The inner wall 134 is connected to the outer wall 132 at the upper and lower ends 138, 140 of the heater housing 130 so that the heater housing 130 is open at the front and rear ends

thereof. The walls 132, 134 thus define a first air flow channel 136 which passes through the heater assembly 104 located within the heater housing 130.

The heater housings 130 are connected together by upper and lower curved portions 142, 144 of the chassis 128. Each curved portion 142, 144 also has an inwardly curved, generally U-shaped cross-section. The curved portions 142, 144 of the chassis 128 are connected to, and preferably integral with, the inner walls 134 of the heater housings 130. The inner walls 134 of the heater housings 130 have a front end 146 and a rear end 148. With reference also to Figures 6 to 9, the rear end 148 of each inner wall 134 also curves inwardly away from the adjacent outer wall 132 so that the rear ends 148 of the inner walls 134 are substantially continuous with the curved portions 142, 144 of the chassis 128.

During assembly of the nozzle 16, the chassis 128 is pushed over the rear end of the inner casing section 90 so that the curved portions 142, 144 of the chassis 128 and the rear ends 148 of the inner walls 134 of the heater housings 130 are wrapped around the rear end 150 of the inner casing section 90. The inner surface 98 of the inner casing section 90 comprises a first set of raised spacers 152 which engage the inner walls 134 of the heater housings 130 to space the inner walls 134 from the inner surface 98 of the inner casing section 90. The rear ends 148 of the inner walls 134 also comprise a second set of spacers 154 which engage the outer surface 92 of the inner casing section 90 to space the rear ends of the inner walls 134 from the outer surface 92 of the inner casing section 90.

The inner walls 134 of the heater housing 130 of the chassis 128 and the inner casing section 90 thus define two second air flow channels 156. Each of the second flow channels 156 extends along the inner surface 98 of the inner casing section 90, and around the rear end 150 of the inner casing section 90. Each second flow channel 156 is separated from a respective first flow channel 136 by the inner wall 134 of the heater housing 130. Each second flow channel 156 terminates at an air outlet 158 located between the outer surface 92 of the inner casing section 90 and the rear end 148 of the

inner wall 134. Each air outlet 158 is thus in the form of a vertically-extending slot located on a respective side of the opening 40 of the assembled nozzle 16. Each air outlet 158 preferably has a width in the range from 0.5 to 5 mm, and in this example the air outlets 158 have a width of around 1 mm.

The chassis 128 is connected to the inner surface 98 of the inner casing section 90. With reference to Figures 5 to 7, each of the inner walls 134 of the heater housings 130 comprises a pair of apertures 160, each aperture 160 being located at or towards a respective one of the upper and lower ends of the inner wall 134. As the chassis 128 is pushed over the rear end of the inner casing section 90, the inner walls 134 of the heater housings 130 slide over resilient catches 162 mounted on, and preferably integral with, the inner surface 98 of the inner casing section 90, which subsequently protrude through the apertures 160. The position of the chassis 128 relative to the inner casing section 90 can then be adjusted so that the inner walls 134 are gripped by the catches 162. Stop members 164 mounted on, and preferably also integral with, the inner surface 98 of the inner casing section 90 may also serve to retain the chassis 128 on the inner casing section 90.

With the chassis 128 connected to the inner casing section 90, the heater assemblies 104 are inserted into the heater housings 130 of the chassis 128, and the loom connected to the heater assemblies 104. Of course, the heater assemblies 104 may be inserted into the heater housings 130 of the chassis 128 prior to the connection of the chassis 128 to the inner casing section 90. The inner casing section 90 of the nozzle 16 is then inserted into the outer casing section 88 of the nozzle 16 so that the front end 166 of the outer casing section 88 enters a slot 168 located at the front of the inner casing section 90, as illustrated in Figure 9. The outer and inner casing sections 88, 90 may be connected together using an adhesive introduced to the slot 168.

The outer casing section 88 is shaped so that part of the inner surface 96 of the outer casing section 88 extends around, and is substantially parallel to, the outer walls 132 of the heater housings 130 of the chassis 128. The outer walls 132 of the heater housings

130 have a front end 170 and a rear end 172, and a set of ribs 174 located on the outer side surfaces of the outer walls 132 and which extend between the ends 170, 172 of the outer walls 132. The ribs 174 are configured to engage the inner surface 96 of the outer casing section 88 to space the outer walls 132 from the inner surface 96 of the outer casing section 88. The outer walls 132 of the heater housings 130 of the chassis 128 and the outer casing section 88 thus define two third air flow channels 176. Each of the third flow channels 176 is located adjacent and extends along the inner surface 96 of the outer casing section 88. Each third flow channel 176 is separated from a respective first flow channel 136 by the outer wall 132 of the heater housing 130. Each third flow channel 176 terminates at an air outlet 178 located within the interior passage, and between the rear end 172 of the outer wall 132 of the heater housing 130 and the outer casing section 88. Each air outlet 178 is also in the form of a vertically-extending slot located within the interior passage of the nozzle 16, and preferably has a width in the range from 0.5 to 5 mm. In this example the air outlets 178 have a width of around 1 mm.

The outer casing section 88 is shaped so as to curve inwardly around part of the rear ends 148 of the inner walls 134 of the heater housings 130. The rear ends 148 of the inner walls 134 comprise a third set of spacers 182 located on the opposite side of the inner walls 134 to the second set of spacers 154, and which are arranged to engage the inner surface 96 of the outer casing section 88 to space the rear ends of the inner walls 134 from the inner surface 96 of the outer casing section 88. The outer casing section 88 and the rear ends 148 of the inner walls 134 thus define a further two air outlets 184. Each air outlet 184 is located adjacent a respective one of the air outlets 158, with each air outlet 158 being located between a respective air outlet 184 and the outer surface 92 of the inner casing section 90. Similar to the air outlets 158, each air outlet 184 is in the form of a vertically-extending slot located on a respective side of the opening 40 of the assembled nozzle 16. The air outlets 184 preferably have the same length as the air outlets 158. Each air outlet 184 preferably has a width in the range from 0.5 to 5 mm, and in this example the air outlets 184 have a width of around 2 to 3 mm. Thus, the air

outlets 18 for emitting the primary air flow from the fan assembly 10 comprise the two air outlets 158 and the two air outlets 184.

Returning to Figures 3 and 4, the nozzle 16 preferably comprises two curved sealing members 186, 188 each for forming a seal between the outer casing section 88 and the inner casing section 90 so that there is substantially no leakage of air from the curved sections 94c, 94d of the interior passage of the nozzle 16. Each sealing member 186, 188 is sandwiched between two flanges 190, 192 located within the curved sections 94c, 94d of the interior passage. The flanges 190 are mounted on, and preferably integral with, the inner casing section 90, whereas the flanges 192 are mounted on, and preferably integral with, the outer casing section 88. As an alternative to preventing the air flow from leaking from the upper curved section 94c of the interior passage, the nozzle 16 may be arranged to prevent the air flow from entering this curved section 94c. For example, the upper ends of the straight sections 94a, 94b of the interior passage may be blocked by the chassis 128 or by inserts introduced between the inner and outer casing sections 88, 90 during assembly.

To operate the fan assembly 10 the user presses button 24 of the user interface, or presses a corresponding button of the remote control 35 to transmit a signal which is received by the sensor of the user interface circuit 33. The user interface control circuit 33 communicates this action to the main control circuit 52, in response to which the main control circuit 52 activates the motor 68 to rotate the impeller 64. The rotation of the impeller 64 causes a primary air flow to be drawn into the body 12 through the air inlet 14. The user may control the speed of the motor 68, and therefore the rate at which air is drawn into the body 12 through the air inlet 14, by pressing button 26 of the user interface or a corresponding button of the remote control 35. Depending on the speed of the motor 56, the primary air flow generated by the impeller 52 may be between 10 and 30 litres per second. The primary air flow passes sequentially through the impeller housing 76 and the open upper end of the main body portion 22 to enter the lower curved section 94d of the interior passage of the nozzle 16. The pressure of the primary

air flow at the outlet 23 of the body 12 may be at least 150 Pa, and is preferably in the range from 250 to 1.5 kPa.

The user may optionally activate the heater assemblies 104 located within the nozzle 16 to raise the temperature of the first portion of the primary air flow before it is emitted from the fan assembly 10, and thereby increase both the temperature of the primary air flow emitted by the fan assembly 10 and the temperature of the ambient air in a room or other environment in which the fan assembly 10 is located. In this example, the heater assemblies 104 are both activated and de-activated simultaneously, although alternatively the heater assemblies 104 may be activated and de-activated separately. To activate the heater assemblies 104, the user presses button 30 of the user interface, or presses a corresponding button of the remote control 35 to transmit a signal which is received by the sensor of the user interface circuit 33. The user interface control circuit 33 communicates this action to the main control circuit 52, in response to which the main control circuit 52 issues a command to the heater control circuit 124 to activate the heater assemblies 104. The user may set a desired room temperature or temperature setting by pressing button 28 of the user interface or a corresponding button of the remote control 35. The user interface circuit 33 is arranged to vary the temperature displayed by the display 34 in response to the operation of the button 28, or the corresponding button of the remote control 35. In this example, the display 34 is arranged to display a temperature setting selected by the user, which may correspond to a desired room air temperature. Alternatively, the display 34 may be arranged to display one of a number of different temperature settings which has been selected by the user.

Within the lower curved section 94d of the interior passage of the nozzle 16, the primary air flow is divided into two air streams which pass in opposite directions around the opening 40 of the nozzle 16. One of the air streams enters the straight section 94a of the interior passage located to one side of the opening 40, whereas the other air stream enters the straight section 94b of the interior passage located on the other side of the opening 40. As the air streams pass through the straight sections 94a,

94b, the air streams turn through around 90° towards the air outlets 18 of the nozzle 16. To direct the air streams evenly towards the air outlets 18 along the length of the straight section 94a, 94b, the nozzle 16 may comprises a plurality of stationary guide vanes located within the straight sections 94a, 94b and each for directing part of the air stream towards the air outlets 18. The guide vanes are preferably integral with the internal surface 98 of the inner casing section 90. The guide vanes are preferably curved so that there is no significant loss in the velocity of the air flow as it is directed towards the air outlets 18. Within each straight section 94a, 94b, the guide vanes are preferably substantially vertically aligned and evenly spaced apart to define a plurality of passageways between the guide vanes and through which air is directed relatively evenly towards the air outlets 18.

As the air streams flow towards the air outlets 18, a first portion of the primary air flow enters the first air flow channels 136 located between the walls 132, 134 of the chassis 128. Due to the splitting of the primary air flow into two air streams within the interior passage, each first air flow channel 136 may be considered to receive a respective first sub-portion of the primary air flow. Each first sub-portion of the primary air flow passes through a respective heating assembly 104. The heat generated by the activated heating assemblies is transferred by convection to the first portion of the primary air flow to raise the temperature of the first portion of the primary air flow.

A second portion of the primary air flow is diverted away from the first air flow channels 136 by the front ends 146 of the inner walls 134 of the heater housings 130 so that this second portion of the primary air flow enters the second air flow channels 156 located between the inner casing section 90 and the inner walls of the heater housings 130. Again, with the splitting of the primary air flow into two air streams within the interior passage each second air flow channel 156 may be considered to receive a respective second sub-portion of the primary air flow. Each second sub-portion of the primary air flow passes along the internal surface 92 of the inner casing section 90, thereby acting as a thermal barrier between the relatively hot primary air flow and the inner casing section 90. The second air flow channels 156 are arranged to extend

around the rear wall 150 of the inner casing section 90, thereby reversing the flow direction of the second portion of the air flow, so that it is emitted through the air outlets 158 towards the front of the fan assembly 10 and through the opening 40. The air outlets 158 are arranged to direct the second portion of the primary air flow over the external surface 92 of the inner casing section 90 of the nozzle 16.

A third portion of the primary air flow is also diverted away from the first air flow channels 136. This third portion of the primary air flow by the front ends 170 of the outer walls 132 of the heater housings 130 so that the third portion of the primary air flow enters the third air flow channels 176 located between the outer casing section 88 and the outer walls 132 of the heater housings 130. Once again, with the splitting of the primary air flow into two air streams within the interior passage each third air flow channel 176 may be considered to receive a respective third sub-portion of the primary air flow. Each third sub-portion of the primary air flow passes along the internal surface 96 of the outer casing section 88, thereby acting as a thermal barrier between the relatively hot primary air flow and the outer casing section 88. The third air flow channels 176 are arranged to convey the third portion of the primary air flow to the air outlets 178 located within the interior passage. Upon emission from the air outlets 178, the third portion of the primary air flow merges with this first portion of the primary air flow. These merged portions of the primary air flow are conveyed between the inner surface 96 of the outer casing section 88 and the inner walls 134 of the heater housings to the air outlets 184, and so the flow directions of these portions of the primary air flow are also reversed within the interior passage. The air outlets 184 are arranged to direct the relatively hot, merged first and third portions of the primary air flow over the relatively cold second portion of the primary air flow emitted from the air outlets 158, which acts as a thermal barrier between the outer surface 92 of the inner casing section 90 and the relatively hot air emitted from the air outlets 184. Consequently, the majority of the internal and external surfaces of the nozzle 16 are shielded from the relatively hot air emitted from the fan assembly 10. This can enable the external surfaces of the nozzle 16 to be maintained at a temperature below 70°C during use of the fan assembly 10.

The primary air flow emitted from the air outlets 18 passes over the Coanda surface 42 of the nozzle 16, causing a secondary air flow to be generated by the entrainment of air from the external environment, specifically from the region around the air outlets 18and from around the rear of the nozzle. This secondary air flow passes through the opening 40 of the nozzle 16, where it combines with the primary air flow to produce an overall air flow projected forward from the fan assembly 10 which has a lower temperature than the primary air flow emitted from the air outlets 18, but a higher temperature than the air entrained from the external environment. Consequently, a current of warm air is emitted from the fan assembly 10.

As the temperature of the air in the external environment increases, the temperature of the primary air flow drawn into the fan assembly 10 through the air inlet 14 also increases. A signal indicative of the temperature of this primary air flow is output from the thermistor 126 to the heater control circuit 124. When the temperature of the primary air flow is above the temperature set by the user, or a temperature associated with a user's temperature setting, by around 1°C, the heater control circuit 124 de-activates the heater assemblies 104. When the temperature of the primary air flow has fallen to a temperature around 1°C below that set by the user, the heater control circuit 124 re-activates the heater assemblies 104. This can allow a relatively constant temperature to be maintained in the room or other environment in which the fan assembly 10 is located.

CLAIMS

1. A fan assembly comprising:

means for creating an air flow;

means for heating a first portion of the air flow;

means for diverting a second portion of the air flow away from the heating means; and

a casing comprising at least one first air outlet for emitting the first portion of the air flow and at least one second air outlet from emitting the second portion of the air flow,

wherein at least one second air outlet is arranged to direct at least part of the second portion of the air flow over an external surface of the casing.

2. A fan assembly as claimed in claim 1, wherein the casing comprises a plurality of second air outlets arranged to direct substantially the entire second portion of the air flow over at least one external surface of the casing.

3. A fan assembly as claimed in claim 2, wherein the second air outlets are arranged to direct the second portion of the air flow over a common external surface of the casing.

4. A fan assembly as claimed in any of the preceding claims, wherein the at least one first air outlet is arranged to direct the first portion of the air flow over the second portion of the air flow.

5. A fan assembly as claimed in any of the preceding claims, arranged to emit the first and second portions of the air flow simultaneously.

6. A fan assembly as claimed in any of the preceding claims, wherein the diverting means comprises at least one wall for diverting the second portion of the air flow away from the heating means.

7. A fan assembly as claimed in any of the preceding claims, comprising a chassis for retaining the heating means within the fan assembly, and wherein the chassis comprises the means for diverting the second portion of the air flow away from the heating means.

8. A fan assembly as claimed in any of the preceding claims, wherein the casing comprises first channel means for conveying the first portion of the air flow to said at least one first air outlet, second channel means for conveying the second portion of the air flow to said at least one second air outlet, and means for separating the first channel means from the second channel means.

9. A fan assembly as claimed in claim 8, wherein the separating means is integral with the diverting means for diverting the second portion of the air flow away from the heating means.

10. A fan assembly as claimed in claim 8 or claim 9, wherein the casing comprises an inner casing section and an outer casing section surrounding the inner casing section, and wherein the separating means is located between the casing sections.

11. A fan assembly as claimed in claim 10, wherein the separating means is connected to one of the casing sections.

12. A fan assembly as claimed in claim 10 or claim 11, wherein said at least one first air outlet is located between an internal surface of the outer casing section and the separating means.

13. A fan assembly as claimed in any of claims 10 to 12, wherein said at least one second air outlet is located between an external surface of the inner casing section and the separating means.

14. A fan assembly as claimed in any of claims 11 to 13, wherein the second channel means is arranged to convey the second portion of the air flow along an internal surface of one of the casing sections.

15. A fan assembly as claimed in any of claims 10 to 14, wherein the separating means comprises a plurality of spacers for engaging at least one of the inner casing section and the outer casing section.

16. A fan assembly as claimed in any of claims 10 to 15, wherein each of the first and second channel means is shaped so as substantially to reverse the flow direction of a respective portion of the air flow.

17. A fan assembly as claimed in any of the preceding claims, wherein the heating means is located within the casing.

18. A fan assembly as claimed in claim 17, wherein the diverting means is located within the casing.

19. A fan assembly as claimed in any of the preceding claims, wherein the casing is annular in shape.

20. A fan assembly as claimed in any of the preceding claims, comprising a base housing said means for creating the air flow, and wherein the casing is connected to the base.

21. A fan assembly as claimed in any of the preceding claims, wherein the first portion of the air flow comprises a plurality of first sub-portions, and the second portion of the air flow comprises a plurality of second sub-portions, and wherein the casing is shaped to divide a received air flow into a plurality of air streams, each air stream comprising a respective first sub-portion and a respective second sub-portion of the air stream.

22. A fan assembly as claimed in claim 21, wherein the heating means comprises a plurality of heater assemblies each for heating a respective first sub-portion of the air flow.

23. A fan assembly as claimed in claim 22, wherein the heater assemblies are located on opposite sides of the casing.

24. A fan assembly as claimed in claim 22 or claim 23, wherein the diverting means comprises a plurality of walls located within the casing each for diverting a respective second sub-portion of the air flow away from a heater assembly.

25. A fan assembly as claimed in any of claims 21 to 24, wherein said at least one first air outlet comprises a plurality of first air outlets each for emitting a respective first sub-portion of the air flow.

26. A fan assembly as claimed in claim 25, wherein the first air outlets are located on opposite sides of the casing.

27. A fan assembly as claimed in any of claims 21 to 26, wherein said at least one second air outlet comprises a plurality of second air outlets each located on a respective side of the casing for emitting the second portion of a respective air stream.

28. A fan assembly as claimed in any of the preceding claims, wherein each air outlet is in the form of a slot.

29. A fan assembly as claimed in claim 28, wherein each air outlet has a width in the range from 0.5 to 5 mm.

30. A fan assembly as claimed in any of the preceding claims, wherein the heating means comprises at least one ceramic heater.

Application No:	GB1013265.2	**Examiner:**	Kingsley Robinson
Claims searched:	1-30	**Date of search:**	22 November 2010

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X,E	1-3, 5-10, 15, 17-20, 28-30.	GB2468369 A (DYSON) When only one heater is activated as described in page 10, lines 14-15, airflow to the heated side of the duct can be considered the first portion and the airflow to the unheated side can be considered the second portion.
X	1, 4-9, 17, 19, 28-30.	JP2004208935 A (MATSUSHITA) See especially figure 11 noting cool air path through ion-flow 16 and over the exterior surface of the casing.
X	1-11, 14, 15, 17, 18.	FR1387334 A (TERANISHI) See especially cool airflow over external surface 4 and spacers 7.
X	1-11, 14, 15, 17, 18.	US4790133 A (GEN ELECTRIC) See especially first portion passing through the core of the engine and second portion bypassing the core and flowing over the casing.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC[X] :

Worldwide search of patent documents classified in the following areas of the IPC

A45D; F04D; F24H

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC

International Classification:

Subclass	Subgroup	Valid From
F24H	0003/04	01/01/2006
F04D	0025/08	01/01/2006

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(51) INT CL:
F04D 25/08 (2006.01) *F24H 3/04* (2006.01)

(56) Documents Cited:
GB 2466369 A
JP 2004208935 A
JP 2000201723 A
US 5649370 A
US 3943329 A

(58) Field of Search:
INT CL A45D, F04D, F24H
Other: ONLINE: WPI, EPODOC

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MALMESBURY, Wiltshire, SN16 0RP, United Kingdom

(54) Title of the Invention: **A fan assembly**
Abstract Title: **A fan assembly with a heater**

(57) A nozzle for a fan assembly and a fan assembly including said nozzle, comprises an air inlet, a heater 104 for heating a first portion of the air flow, a means for diverting a second portion of the air flow away from the heater, a first channel for conveying the first portion of the air flow to an air outlet, the nozzle defines an opening though which air from outside the nozzle is drawn by the airflow emitted from the air outlet and a second channel for conveying the second portion of the airflow along an internal surface of the nozzle. The fan assembly also includes a device for creating airflow, such as a motor-driven impeller. Preferably the nozzle is shaped to divide the air flow into a plurality of air streams each of which comprises part of the first portion and part of the second portion. Each air outlet may be a slot and the heater may be ceramic.

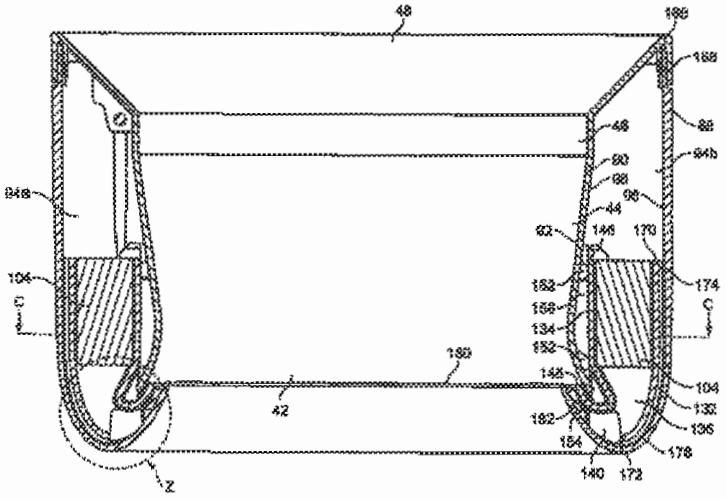


FIG. 9

GB 2482549 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

18 10 11

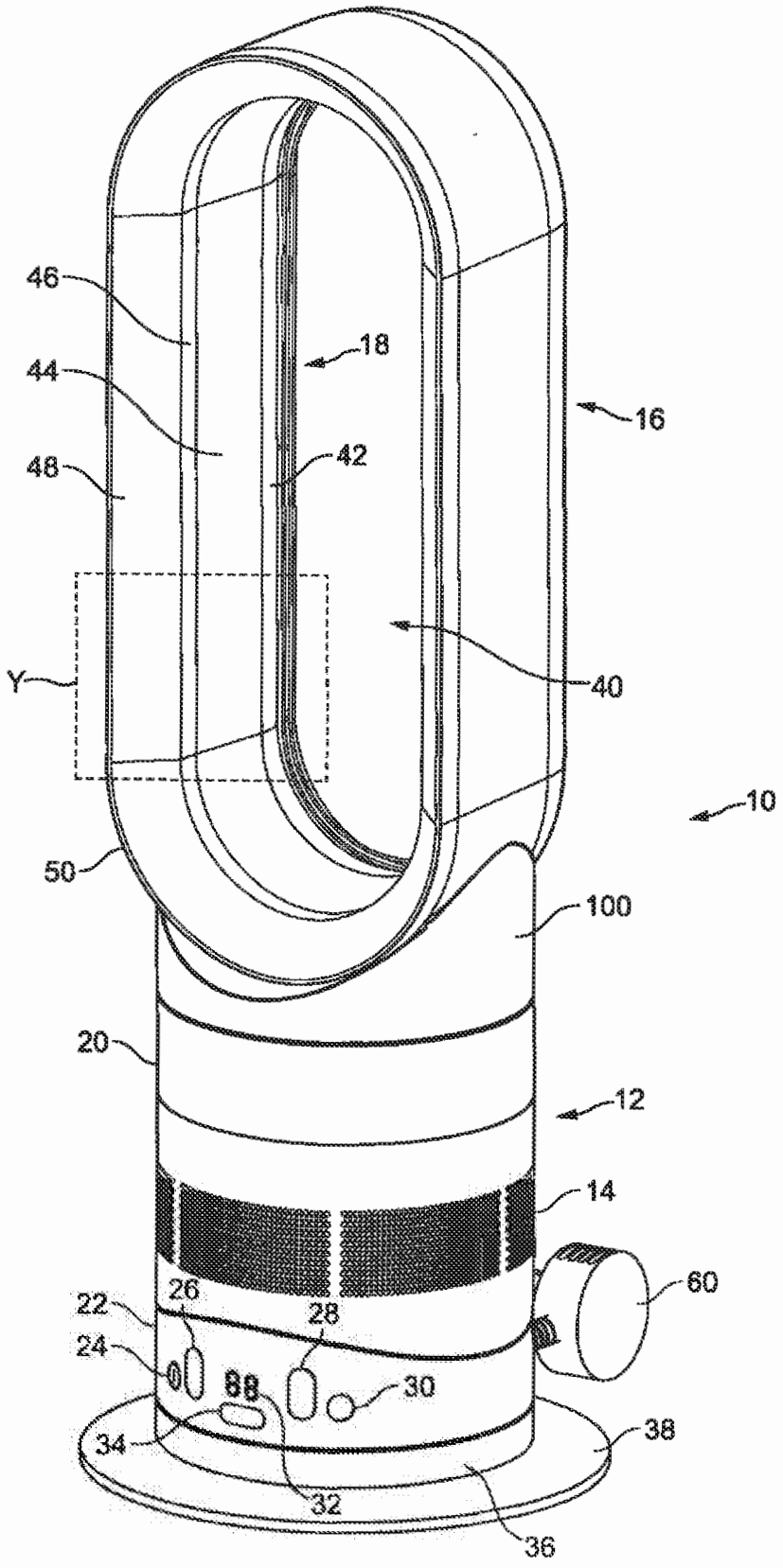


FIG. 1

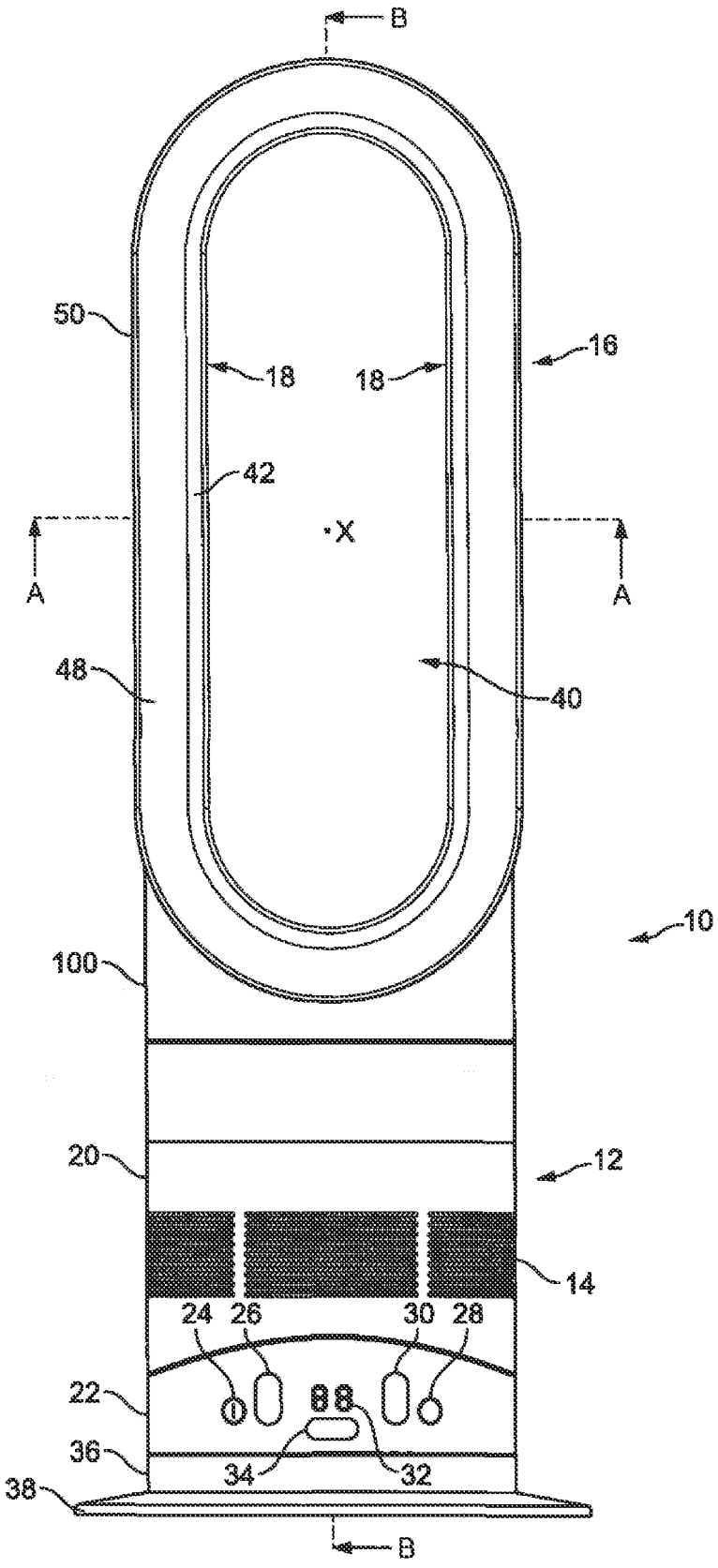


FIG. 2

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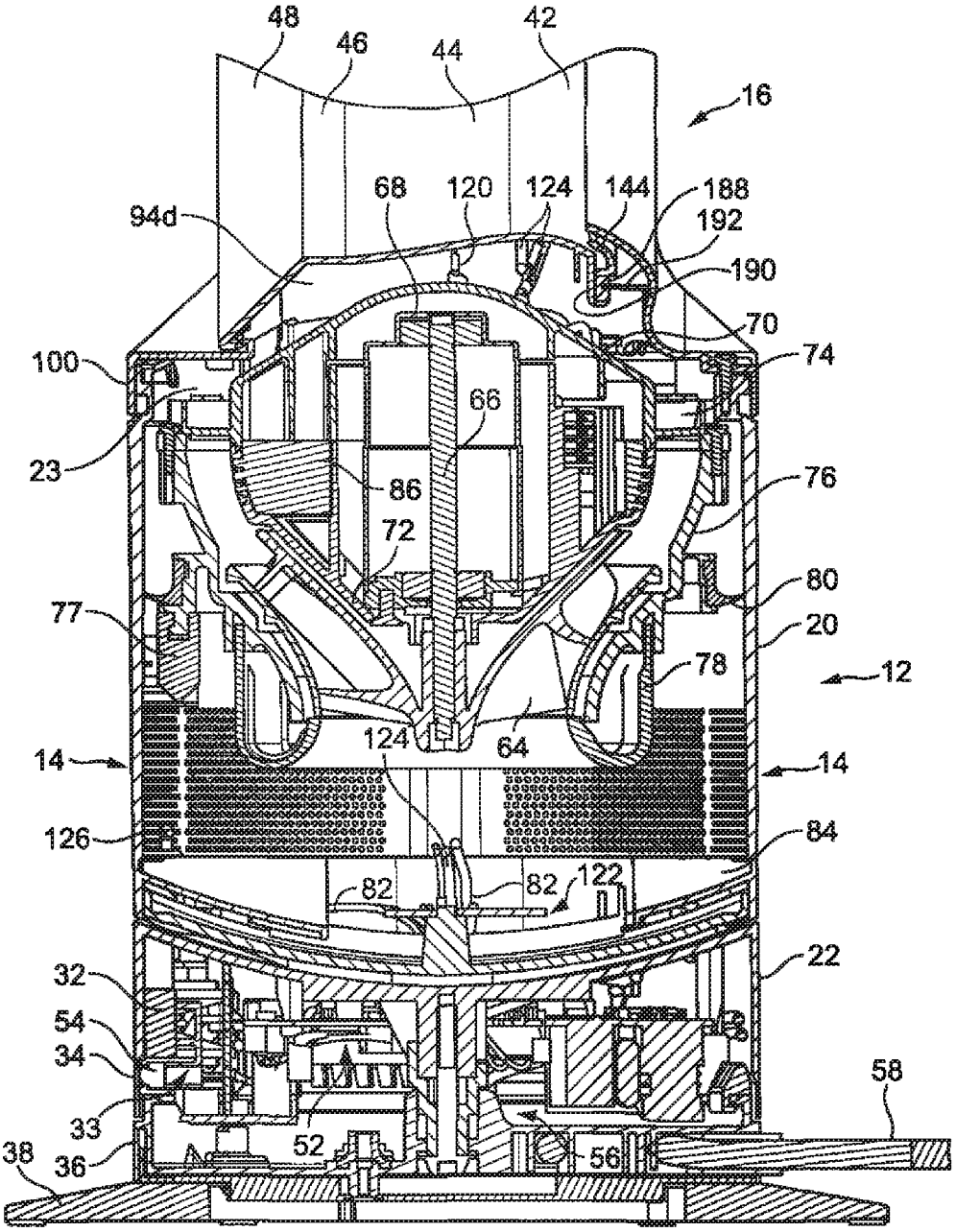

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FIG. 3

18 10 11

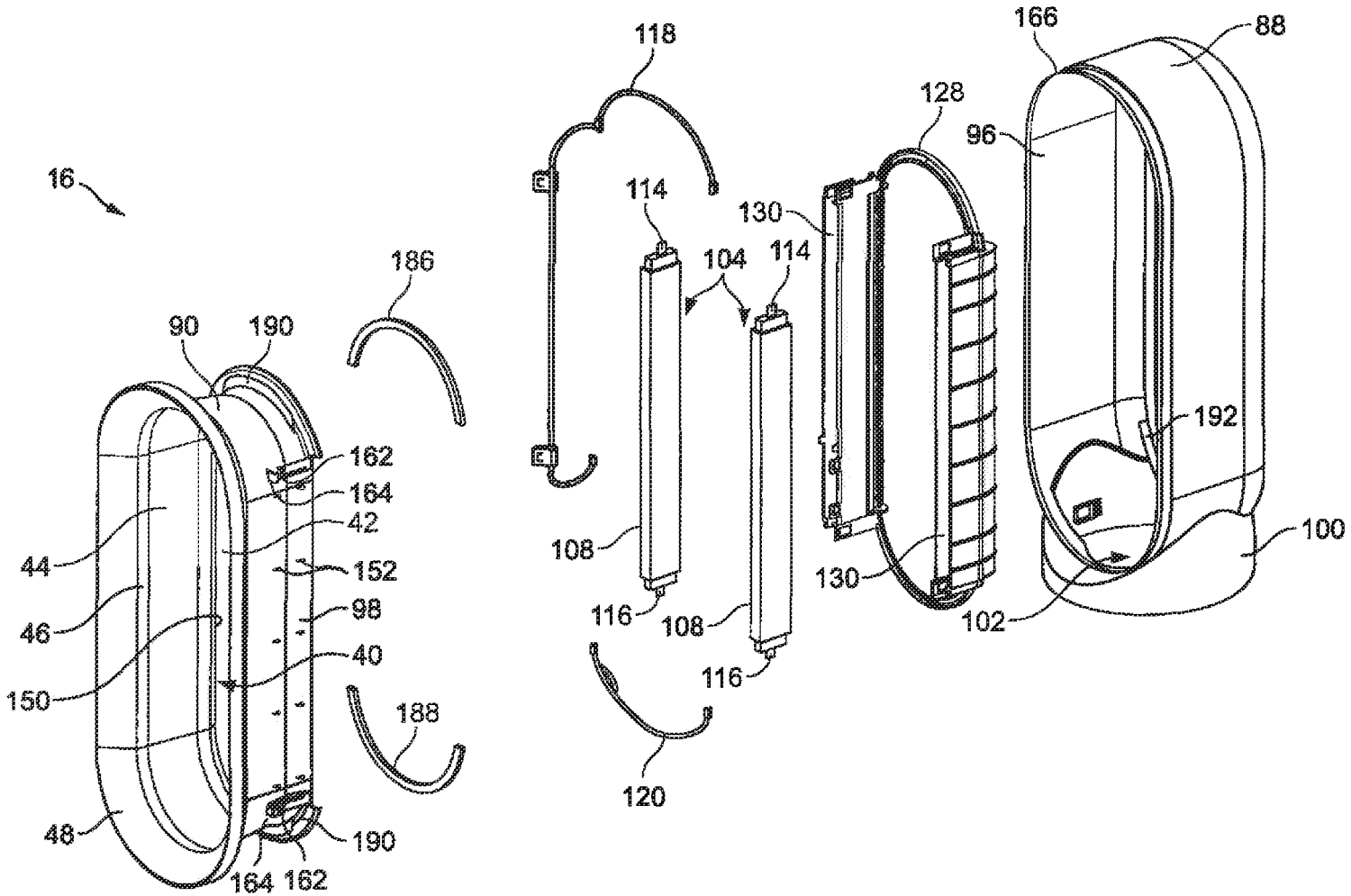


FIG. 4

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18 10 11

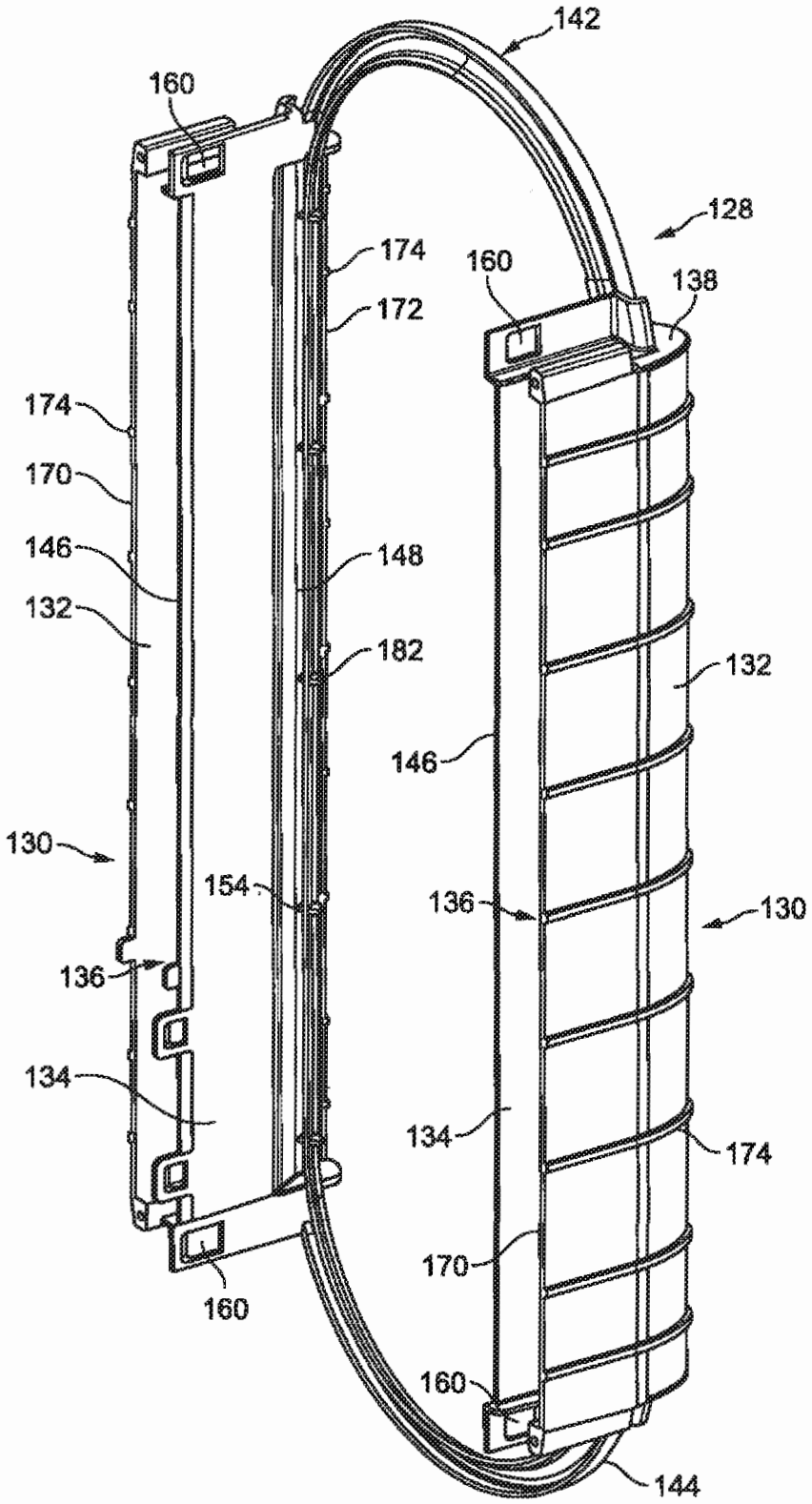

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FIG. 5

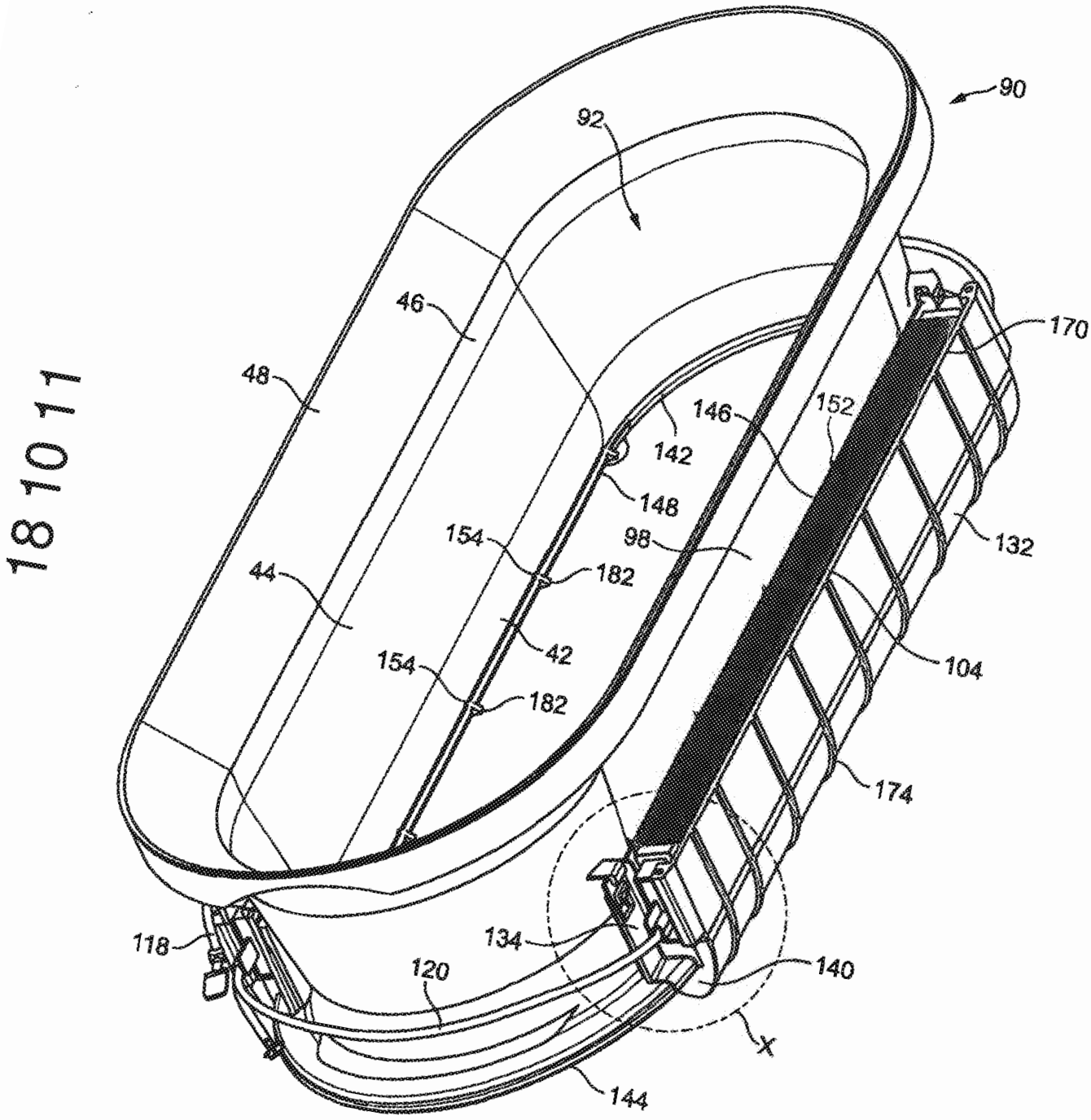

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FIG. 6

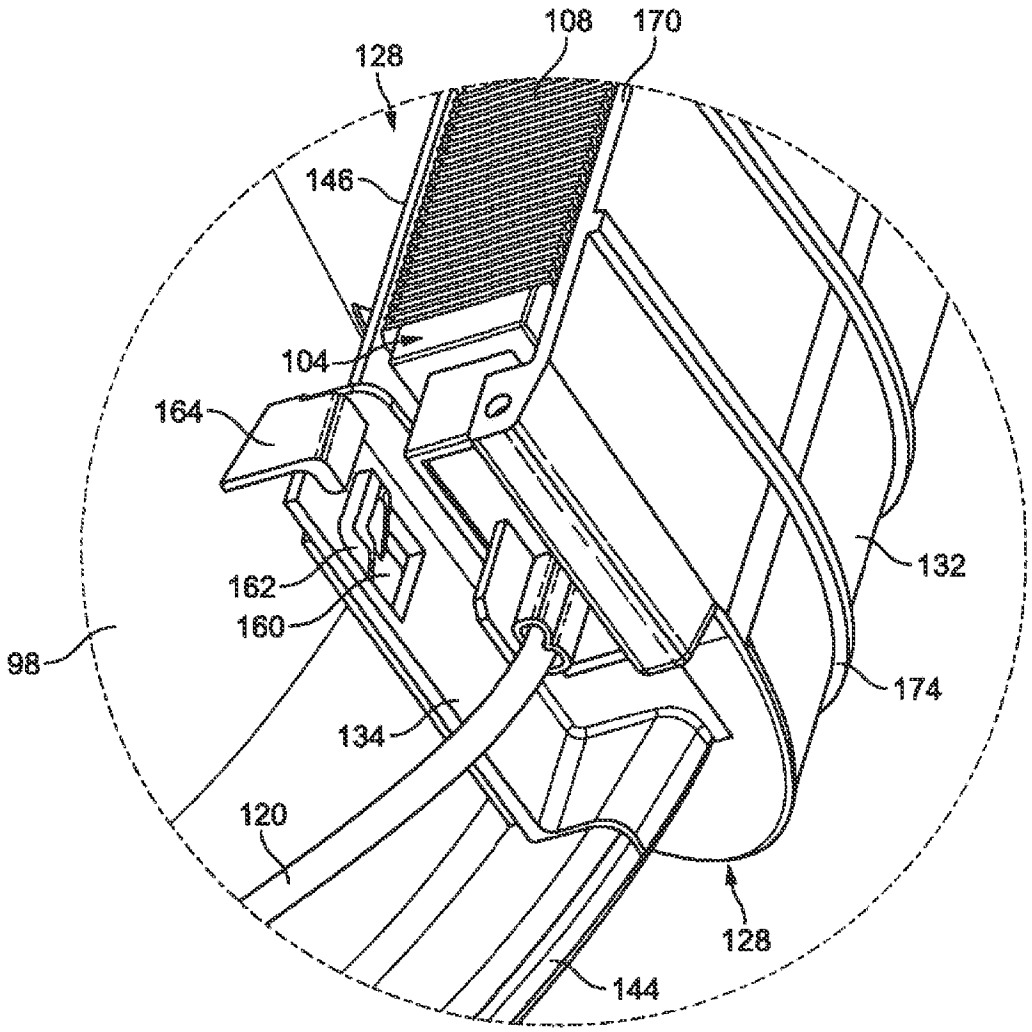


FIG. 7

18 10 11

18 10 11

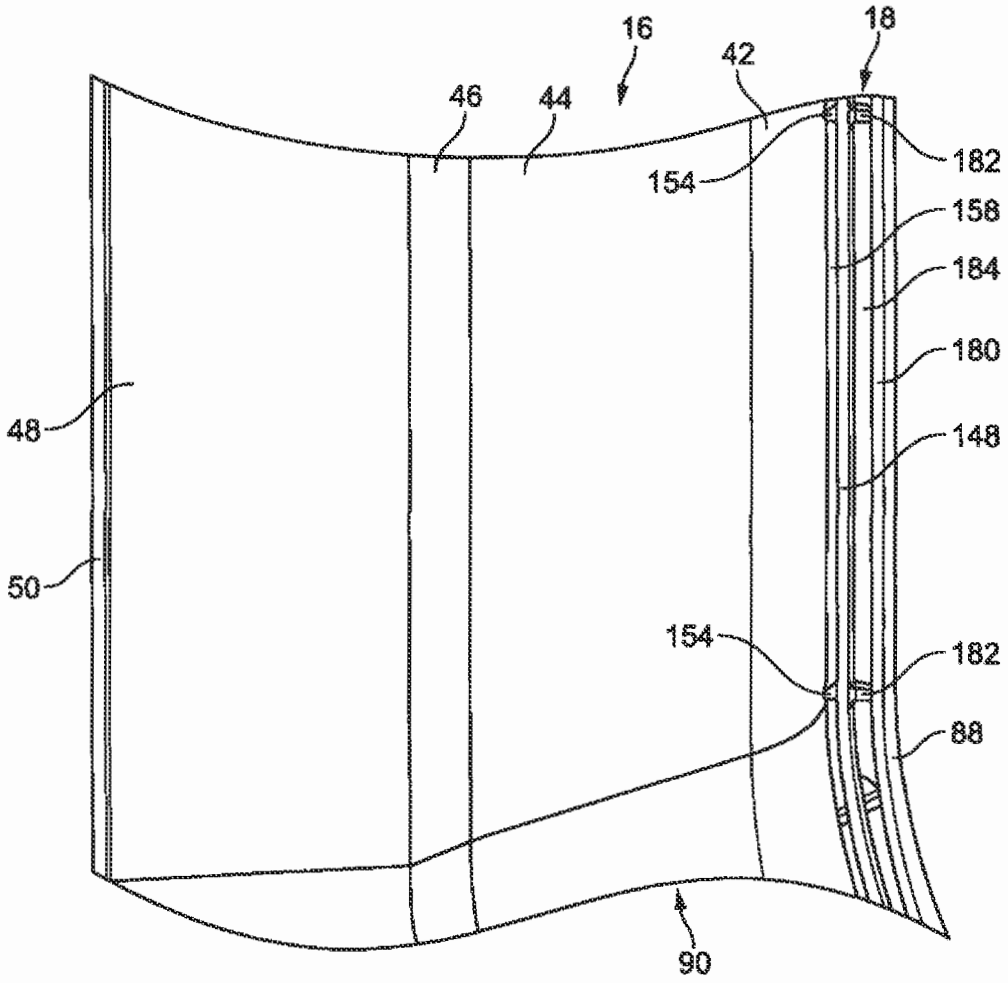


FIG. 8

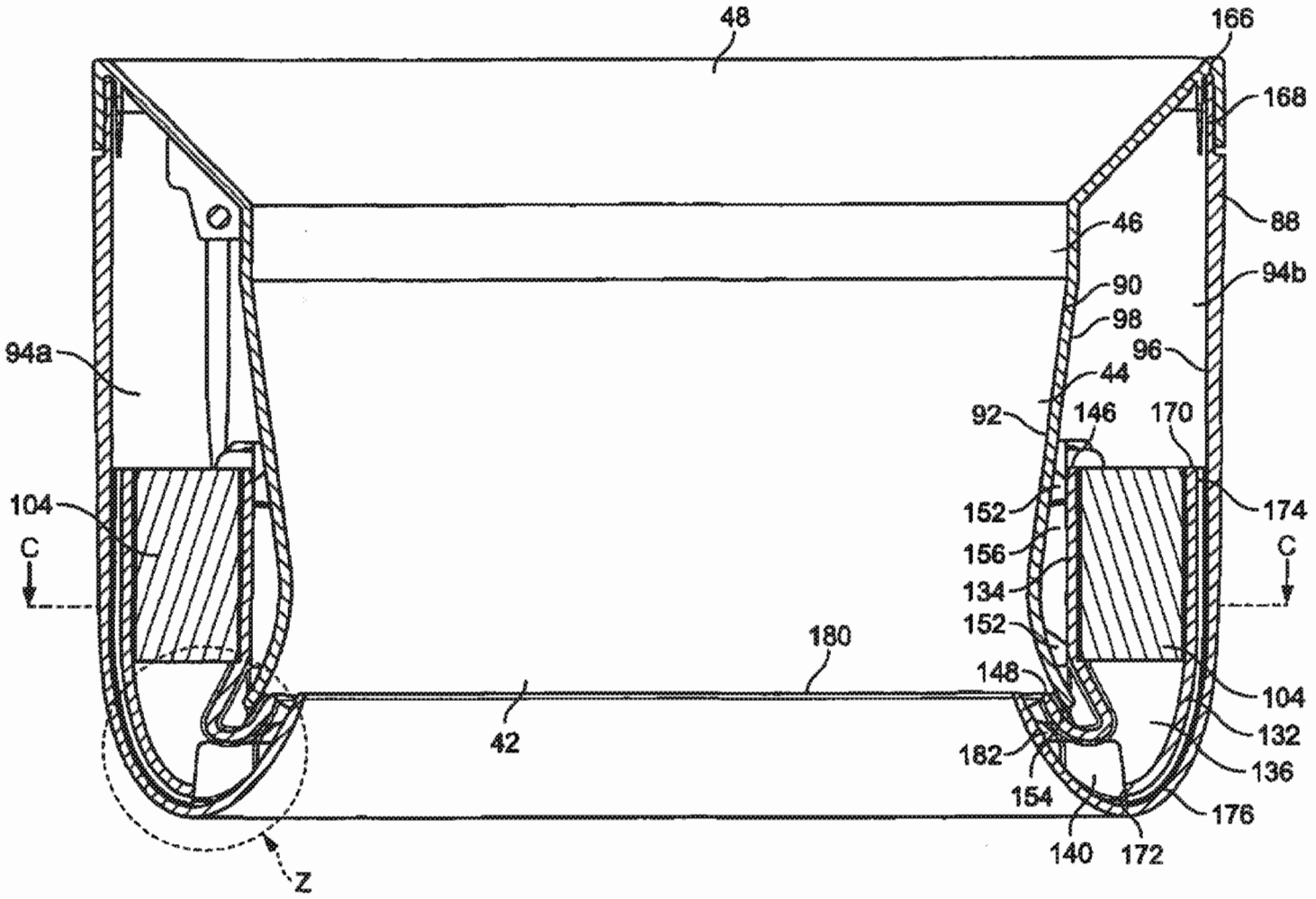


FIG. 9

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18 10 11

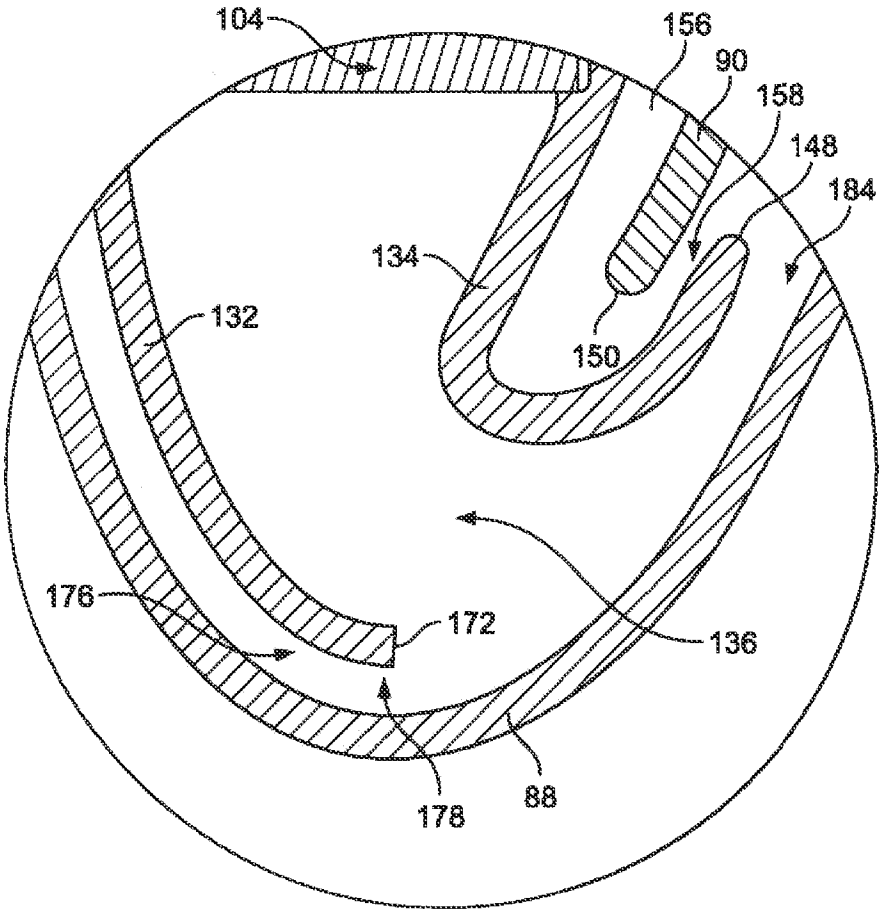


FIG. 10

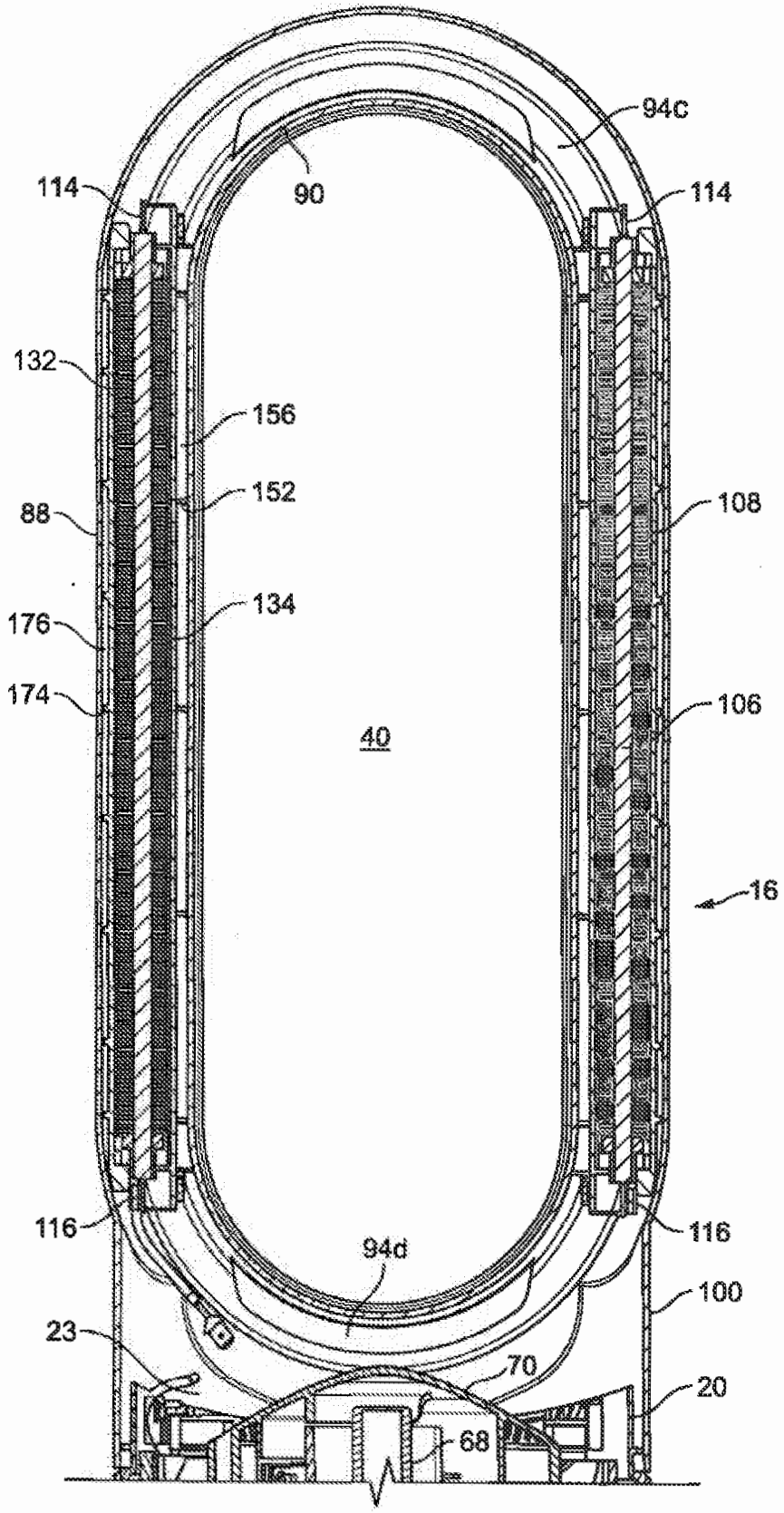

94c
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FIG. 11

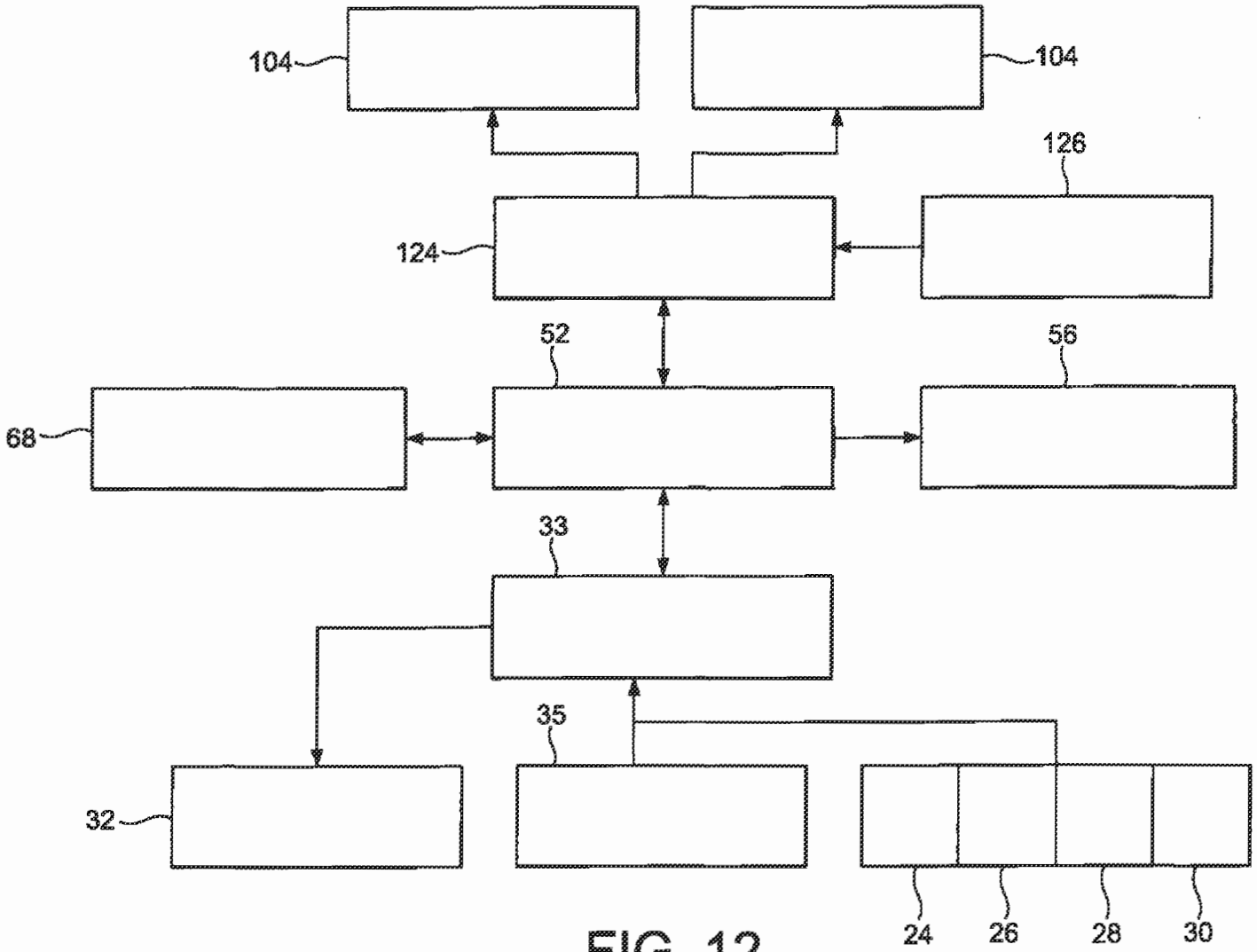


FIG. 12

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A FAN ASSEMBLY

FIELD OF THE INVENTION

The present invention relates to a fan assembly. In a preferred embodiment, the present invention relates to a fan heater for creating a warm air current in a room, office or other domestic environment.

BACKGROUND OF THE INVENTION

A conventional domestic fan typically includes a set of blades or vanes mounted for rotation about an axis, and drive apparatus for rotating the set of blades to generate an air flow. The movement and circulation of the air flow creates a 'wind chill' or breeze and, as a result, the user experiences a cooling effect as heat is dissipated through convection and evaporation.

Such fans are available in a variety of sizes and shapes. For example, a ceiling fan can be at least 1 m in diameter, and is usually mounted in a suspended manner from the ceiling to provide a downward flow of air to cool a room. On the other hand, desk fans are often around 30 cm in diameter, and are usually free standing and portable. Floor-standing tower fans generally comprise an elongate, vertically extending casing around 1 m high and housing one or more sets of rotary blades for generating an air flow. An oscillating mechanism may be employed to rotate the outlet from the tower fan so that the air flow is swept over a wide area of a room.

Fan heaters generally comprise a number of heating elements located either behind or in front of the rotary blades to enable a user to heat the air flow generated by the rotating blades. The heating elements are commonly in the form of heat radiating coils or fins. A variable thermostat, or a number of predetermined output power settings, is usually provided to enable a user to control the temperature of the air flow emitted from the fan heater.

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A disadvantage of this type of arrangement is that the air flow produced by the rotating blades of the fan heater is generally not uniform. This is due to variations across the blade surface or across the outward facing surface of the fan heater. The extent of these variations can vary from product to product and even from one individual fan heater to another. These variations result in the generation of a turbulent, or 'choppy', air flow which can be felt as a series of pulses of air and which can be uncomfortable for a user. A further disadvantage resulting from the turbulence of the air flow is that the heating effect of the fan heater can diminish rapidly with distance.

In a domestic environment it is desirable for appliances to be as small and compact as possible due to space restrictions. It is undesirable for parts of the appliance to project outwardly, or for a user to be able to touch any moving parts, such as the blades. Fan heaters tend to house the blades and the heat radiating coils within a cage or apertured casing to prevent user injury from contact with either the moving blades or the hot heat radiating coils, but such enclosed parts can be difficult to clean. Consequently, an amount of dust or other detritus can accumulate within the casing and on the heat radiating coils between uses of the fan heater. When the heat radiating coils are activated, the temperature of the outer surfaces of the coils can rise rapidly, particularly when the power output from the coils is relatively high, to a value in excess of 700°C. Consequently, some of the dust which has settled on the coils between uses of the fan heater can be burnt, resulting in the emission of an unpleasant smell from the fan heater for a period of time.

Our co-pending patent application PCT/GB2010/050272 describes a fan heater which does not use caged blades to project air from the fan heater. Instead, the fan heater comprises a base which houses a motor-driven impeller for drawing a primary air flow into the base, and an annular nozzle connected to the base and comprising an annular mouth through which the primary air flow is emitted from the fan. The nozzle defines a central opening through which air in the local environment of the fan assembly is drawn by the primary air flow emitted from the mouth, amplifying the primary air flow to

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generate an air current. Without the use of a bladed fan to project the air current from the fan heater, a relatively uniform air current can be generated and guided into a room or towards a user. In one embodiment a heater is located within the nozzle to heat the primary air flow before it is emitted from the mouth. By housing the heater within the nozzle, the user is shielded from the hot external surfaces of the heater.

SUMMARY OF THE INVENTION

In a first aspect the present invention provides a nozzle for a fan assembly for creating an air current, the nozzle comprising:

an air inlet for receiving an air flow;

means for heating a first portion of the air flow;

means for diverting a second portion of the air flow away from the heating means,

first channel means for conveying the first portion of the air flow to at least one air outlet of the nozzle, the nozzle defining an opening through which air from outside the nozzle is drawn by the air flow emitted from the at least one air outlet; and

second channel means for conveying the second portion of the air flow along an internal surface of the nozzle.

To cool part of the casing, the casing includes means for diverting a second portion of the air flow away from said at least one heater, and second channel means for conveying the second portion of the air flow along an internal surface of the casing.

The dividing means may be arranged to divert both a second portion and a third portion of the air flow away from the heating means. The second channel means may be arranged to convey the second portion of the air flow along a first internal surface of the nozzle, for example the internal surface of an inner annular section of the nozzle, whereas third channel means may be arranged to convey the third portion of the air flow along a second internal surface of the nozzle, for example the internal surface of the outer annular section of the nozzle.

In this case, it may be found that, depending on the temperature of the first portion of the air flow, sufficient cooling of the external surfaces of the nozzle may be provided without having to emit the both the second and the third portions of the air flow through separate air outlets. For example, the first and the third portions of the air flow may be recombined downstream from the heating means.

This second portion of the air flow may also merge with the first portion of the air flow within the casing, or it may be emitted through at least one air outlet of the casing. Thus, the nozzle may have a plurality of air outlets for emitting air at different temperatures. One or more first air outlets may be provided for emitting the relatively hot first portion of the air flow which has been heated by the heating means, whereas one or more second air outlets may be provided for emitting relatively cold second portion of the air flow which has by-passed the heating means.

The different air paths thus present within the nozzle may be selectively opened and closed by a user to vary the temperature of the air flow emitted from the fan assembly. The nozzle may include a valve, shutter or other means for selectively closing one of the air paths through the nozzle so that all of the air flow leaves the nozzle through either the first air outlet(s) or the second air outlet(s). For example, a shutter may be slidable or otherwise moveable over the outer surface of the nozzle to selectively close either the first air outlet(s) or the second air outlet(s), thereby forcing the air flow either to pass through the heating means or to by-pass the heating means. This can enable a user to change rapidly the temperature of the air flow emitted from the nozzle.

Alternatively, or additionally, the nozzle may be arranged to emit the first and second portions of the air flow simultaneously. In this case, at least one second air outlet may be arranged to direct at least part of the second portion of the air flow over an external surface of the nozzle. This can keep that external surface of the nozzle cool during use of the fan assembly. Where the nozzle comprises a plurality of second air outlets, the second air outlets may be arranged to direct substantially the entire second portion of

the air flow over at least one external surface of the nozzle. The second air outlets may be arranged to direct the second portion of the air flow over a common external surface of the nozzle, or over a plurality of external surfaces of the nozzle, such as front and rear surfaces of the nozzle.

The, or each, first air outlet is preferably arranged to direct the first portion of the air flow over the second portion of the air flow so that the relatively cold second portion of the air flow is sandwiched between the relatively hot first portion of the air flow and the external surface of the casing, thereby providing a layer of thermal insulation between the relatively hot first portion of the air flow and the external surface of the casing.

All of the first and second air outlets are preferably arranged to emit the air flow through the opening in order to maximise the amplification of the air flow emitted from the nozzle through the entrainment of air external to the nozzle. Alternatively, at least one second air outlet may be arranged to direct the air flow over an external surface of the nozzle which is remote from the opening. For example, where the nozzle has an annular shape, one of the second air outlets may be arranged to direct a portion of the air flow over the external surface of an inner annular section of the nozzle so that that portion of the air flow emitted from that second air outlet passes through the opening, whereas another one of the second air outlets may be arranged to direct another portion of the air flow over the external surface of an outer annular section of the nozzle.

The diverting means may comprise at least one baffle, wall or other surface located within the nozzle for diverting the second portion of the air flow away from the heating means. The diverting means may be integral with or connected to one of the casing sections of the nozzle. The diverting means may conveniently form part of, or be connected to, a chassis for retaining the heating means within the nozzle. Where the diverting means is arranged to divert both a second portion of the air flow and a third portion of the air flow away from the heating means, the diverting means may comprise two mutually spaced parts of the chassis.

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Preferably, the nozzle comprises means for separating the first channel means from the second channel means. The separating means may be integral with the diverting means for diverting the second portion of the air flow away from the heating means, and thus may comprise at least one side wall of a chassis for retaining the heating means within the nozzle. This can reduce the number of separate components of the nozzle. The nozzle may also comprise third channel means for conveying a third portion of the air flow away from the heating means, and along a second internal surface of the nozzle.

The chassis may comprise first and second side walls configured to retain a heating assembly therebetween. The first and second side walls may form a first channel therebetween, which includes the heating assembly, for conveying the first portion of the air flow to an air outlet of the nozzle. The first side wall and a first internal surface of the nozzle may form a second channel for conveying the second portion of the air flow along the first internal surface, preferably to a second air outlet of the nozzle. The second side wall and a second internal surface of the nozzle may optionally form a third channel for conveying a third portion of the air flow along the second internal surface. This third channel may merge with the first or second channel, or it may convey the third portion of the air flow to an air outlet of the nozzle.

As mentioned above, the nozzle may comprise an inner annular casing section and an outer annular casing section surrounding the inner casing section, and which together define the opening, and so the separating means may be located between the casing sections. Each casing section is preferably formed from a respective annular member, but each casing section may be provided by a plurality of members connected together or otherwise assembled to form that casing section. The inner casing section and the outer casing section may be formed from plastics material or other material having a relatively low thermal conductivity (less than 1 $Wm^{-1}K^{-1}$), to prevent the external surfaces of the nozzle from becoming excessively hot during use of the fan assembly.

The separating means may also define in part one or more air outlets of the casing. For example, the, or each, first air outlet for emitting the first portion of the air flow from

the nozzle may be located between an internal surface of the outer casing section and part of the separating means. Alternatively, or additionally, the, or each, second air outlet for emitting the second portion of the air flow from the nozzle may be located between an external surface of the inner casing section and part of the separating means. Where the separating means comprises a wall for separating a first channel means from a second channel means, a first air outlet may be located between the internal surface of the outer casing section and a first side surface of the wall, and a second air outlet may be located between the external surface of the inner casing section and a second side surface of the wall.

The separating means may comprise a plurality of spacers for engaging at least one of the inner casing section and the outer casing section. This can enable the width of at least one of the second channel means and the third channel means to be controlled along the length thereof through engagement between the spacers and said at least one of the inner casing section and the outer casing section.

The direction in which air is emitted from the air outlet(s) is preferably substantially at a right angle to the direction in which the air flow passes through at least part of the nozzle. Preferably, the air flow passes through at least part of the nozzle in a substantially vertical direction, and the air is emitted from the air outlet(s) in a substantially horizontal direction. The, or each, air outlet is preferably located towards the rear of the nozzle and arranged to direct air towards the front of the nozzle and through the opening. Consequently, each of the first and second channel means may be shaped so as substantially to reverse the flow direction of a respective portion of the air flow.

The nozzle is preferably annular, and is preferably shaped to divide the air flow into two air streams which flow in opposite directions around the opening. In this case the heating means is arranged to heat a first portion of each air stream and the diverting means is arranged to divert a second portion of each air stream away from the heating means. These first portions of the air streams may be emitted from a common first air

outlet of the nozzle, or they may each be emitted from a respective first air outlet of the nozzle, and together form the first portion of the air flow. These first air outlets may be located on opposite sides of the opening. The second portions of the two air streams may be conveyed along a common internal surface of the nozzle, for example the internal surface of the inner casing section of the nozzle, and emitted either from a common second air outlet of the nozzle, or from a respective second air outlet of the nozzle, and together form the second portion of the air flow. Again, these second air outlets may be located on opposite sides of the opening. Each air stream may thus be considered to be divided into a respective first sub-portion and a respective second sub-portion of the air flow by the diverting means.

At least part of the heating means may be arranged within the nozzle so as to extend about the opening. Where the nozzle defines a circular opening, the heating means preferably extends at least 270° about the opening and more preferably at least 300° about the opening. Where the nozzle defines an elongate opening, that is, an opening having a height greater than its width, the heating means is preferably located on at least the opposite sides of the opening.

The heating means may comprise at least one ceramic heater located within the interior passage. The ceramic heater may be porous so that the first portion of the air flow passes through pores in the heating means before being emitted from the first air outlet(s). The heater may be formed from a PTC (positive temperature coefficient) ceramic material which is capable of rapidly heating the air flow upon activation.

The ceramic material may be at least partially coated in metallic or other electrically conductive material to facilitate connection of the heating means to a controller within the fan assembly for activating the heating means. Alternatively, at least one non-porous, preferably ceramic, heater may be mounted within a metallic frame located within the interior passage and which is connectable to a controller of the fan assembly. The metallic frame preferably comprises a plurality of fins to provide a greater surface

area and hence better heat transfer to the air flow, while also providing a means of electrical connection to the heating means.

The heating means preferably comprises at least one heater assembly. Where the air flow is divided into two air streams, the heating means preferably comprises a plurality of heater assemblies each for heating a respective first sub-portion of the air flow, and the diverting means preferably comprises a plurality of walls each for diverting a respective second sub-portion of the air flow away from a heater assembly.

Each air outlet is preferably in the form of a slot, and which preferably has a width in the range from 0.5 to 5 mm. The width of the first air outlet(s) is preferably different from that of the second air outlet(s). In a preferred embodiment, the width of the first air outlet(s) is greater than the width of the second air outlet(s) so that the majority of the primary air flow passes through the heating means.

The nozzle may comprise a surface located adjacent the air outlet(s) and over which the air outlet(s) are arranged to direct the air flow emitted therefrom. Preferably, this surface is a curved surface, and more preferably is a Coanda surface. Preferably, the external surface of the inner casing section of the nozzle is shaped to define the Coanda surface. A Coanda surface is a known type of surface over which fluid flow exiting an output orifice close to the surface exhibits the Coanda effect. The fluid tends to flow over the surface closely, almost 'clinging to' or 'hugging' the surface. The Coanda effect is already a proven, well documented method of entrainment in which a primary air flow is directed over a Coanda surface. A description of the features of a Coanda surface, and the effect of fluid flow over a Coanda surface, can be found in articles such as Reba, Scientific American, Volume 214, June 1966 pages 84 to 92. Through use of a Coanda surface, an increased amount of air from outside the fan assembly is drawn through the opening by the air emitted from the air outlets.

In a preferred embodiment an air flow is created through the nozzle of the fan assembly. In the following description this air flow will be referred to as the primary air flow. The

primary air flow is emitted from the air outlet(s) of the nozzle and preferably passes over a Coanda surface. The primary air flow entrains air surrounding the nozzle, which acts as an air amplifier to supply both the primary air flow and the entrained air to the user. The entrained air will be referred to here as a secondary air flow. The secondary air flow is drawn from the room space, region or external environment surrounding the mouth of the nozzle and, by displacement, from other regions around the fan assembly, and passes predominantly through the opening defined by the nozzle. The primary air flow directed over the Coanda surface combined with the entrained secondary air flow equates to a total air flow emitted or projected forward from the opening defined by the nozzle.

Preferably, the nozzle comprises a diffuser surface located downstream of the Coanda surface. The diffuser surface directs the air flow emitted towards a user's location while maintaining a smooth, even output. Preferably, the external surface of the inner casing section of the nozzle is shaped to define the diffuser surface.

This first aspect of the invention also provides a fan assembly comprising a nozzle as aforementioned. The fan assembly preferably comprises a base housing said means for creating the air flow, with the nozzle being connected to the base. The base is preferably generally cylindrical in shape, and comprises a plurality of air inlets through which the air flow enters the fan assembly.

The means for creating an air flow through the nozzle preferably comprises an impeller driven by a motor. This can provide a fan assembly with efficient air flow generation. The motor is preferably a DC brushless motor. This can avoid frictional losses and carbon debris from the brushes used in a traditional brushed motor. Reducing carbon debris and emissions is advantageous in a clean or pollutant sensitive environment such as a hospital or around those with allergies. While induction motors, which are generally used in bladed fans, also have no brushes, a DC brushless motor can provide a much wider range of operating speeds than an induction motor.

The nozzle is preferably in the form of a casing, preferably an annular casing, for receiving the air flow.

The heating means need not be located within the nozzle. For example, both the heating means and the diverting means may be located in the base, with the first channel means being arranged to receive a relatively hot first portion of the air flow and to convey the first portion of the air flow to the at least one air outlet, and the second channel means being arranged to receive a relatively cold second portion of the air flow from the base, and to convey the second portion of the air flow over an internal surface of the nozzle. The nozzle may comprise internal walls or baffles for defining the first channel means and second channel means.

Alternatively, the heating means may be located in the nozzle but the diverting means may be located in the base. In this case, the first channel means may be arranged both to convey the first portion of the air flow from the base to the at least one air outlet and to house the heating means for heating the first portion of the air flow, while the second channel means may be arranged simply to convey the second portion of the air flow from the base over the internal surface of the nozzle.

Therefore, in a second aspect the present invention provides a fan assembly for creating an air current, the fan assembly comprising:

means for creating an air flow;

a casing comprising at least one air outlet, the casing defining an opening through which air from outside the fan assembly is drawn by the air flow emitted from the at least one air outlet;

means for heating a first portion of the air flow;

means for diverting a second portion of the air flow away from the heating means,

first channel means for conveying the first portion of the air flow to said at least one air outlet; and

second channel means for conveying the second portion of the air flow along an internal surface of the casing.

The fan assembly is preferably in the form of a portable fan heater.

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

An embodiment 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 front perspective view, from above, of a fan assembly;

Figure 2 is a front view of the fan assembly;

Figure 3 is a sectional view taken along line B-B of Figure 2;

Figure 4 is an exploded view of the nozzle of the fan assembly;

Figure 5 is a front perspective view of the heater chassis of the nozzle;

Figure 6 is a front perspective view, from below, of the heater chassis connected to an inner casing section of the nozzle;

Figure 7 is a close-up view of region X indicated in Figure 6;

Figure 8 is a close-up view of region Y indicated in Figure 1;

Figure 9 is a sectional view taken along line A-A of Figure 2;

Figure 10 is a close-up view of region Z indicated in Figure 9;

Figure 11 is a sectional view of the nozzle taken along line C-C of Figure 9; and

Figure 12 is a schematic illustration of a control system of the fan assembly.

DETAILED DESCRIPTION OF THE INVENTION

Figures 1 and 2 illustrate external views of a fan assembly 10. The fan assembly 10 is in the form of a portable fan heater. The fan assembly 10 comprises a body 12 comprising an air inlet 14 through which a primary air flow enters the fan assembly 10, and a nozzle 16 in the form of an annular casing mounted on the body 12, and which comprises at least one air outlet 18 for emitting the primary air flow from the fan assembly 10.

The body 12 comprises a substantially cylindrical main body section 20 mounted on a substantially cylindrical lower body section 22. The main body section 20 and the lower body section 22 preferably have substantially the same external diameter so that the external surface of the upper body section 20 is substantially flush with the external surface of the lower body section 22. In this embodiment the body 12 has a height in the range from 100 to 300 mm, and a diameter in the range from 100 to 200 mm.

The main body section 20 comprises the air inlet 14 through which the primary air flow enters the fan assembly 10. In this embodiment the air inlet 14 comprises an array of apertures formed in the main body section 20. Alternatively, the air inlet 14 may comprise one or more grilles or meshes mounted within windows formed in the main body section 20. The main body section 20 is open at the upper end (as illustrated) thereof to provide an air outlet 23 through which the primary air flow is exhausted from the body 12.

The main body section 20 may be tilted relative to the lower body section 22 to adjust the direction in which the primary air flow is emitted from the fan assembly 10. For example, the upper surface of the lower body section 22 and the lower surface of the main body section 20 may be provided with interconnecting features which allow the main body section 20 to move relative to the lower body section 22 while preventing the main body section 20 from being lifted from the lower body section 22. For example, the lower body section 22 and the main body section 20 may comprise interlocking L-shaped members.

The lower body section 22 comprises a user interface of the fan assembly 10. With reference also to Figure 12, the user interface comprises a plurality of user-operable buttons 24, 26, 28, 30 for enabling a user to control various functions of the fan assembly 10, a display 32 located between the buttons for providing the user with, for example, a visual indication of a temperature setting of the fan assembly 10, and a user interface control circuit 33 connected to the buttons 24, 26, 28, 30 and the display 32. The lower body section 22 also includes a window 34 through which signals from a remote control 35 (shown schematically in Figure 12) enter the fan assembly 10. The lower body section 22 is mounted on a base 36 for engaging a surface on which the fan assembly 10 is located. The base 36 includes an optional base plate 38, which preferably has a diameter in the range from 200 to 300 mm.

The nozzle 16 has an annular shape, extending about a central axis X to define an opening 40. The air outlets 18 for emitting the primary air flow from the fan assembly 10 are located towards the rear of the nozzle 16, and arranged to direct the primary air flow towards the front of the nozzle 16, through the opening 40. In this example, the nozzle 16 defines an elongate opening 40 having a height greater than its width, and the air outlets 18 are located on the opposite elongate sides of the opening 40. In this example the maximum height of the opening 40 is in the range from 300 to 400 mm, whereas the maximum width of the opening 40 is in the range from 100 to 200 mm.

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The inner annular periphery of the nozzle 16 comprises a Coanda surface 42 located adjacent the air outlets 18, and over which at least some of the air outlets 18 are arranged to direct the air emitted from the fan assembly 10, a diffuser surface 44 located downstream of the Coanda surface 42 and a guide surface 46 located downstream of the diffuser surface 44. The diffuser surface 44 is arranged to taper away from the central axis X of the opening 38. The angle subtended between the diffuser surface 44 and the central axis X of the opening 40 is in the range from 5 to 25°, and in this example is around 7°. The guide surface 46 is preferably arranged substantially parallel to the central axis X of the opening 38 to present a substantially flat and substantially smooth face to the air flow emitted from the mouth 40. A visually appealing tapered surface 48 is located downstream from the guide surface 46, terminating at a tip surface 50 lying substantially perpendicular to the central axis X of the opening 40. The angle subtended between the tapered surface 48 and the central axis X of the opening 40 is preferably around 45°.

Figure 3 illustrates a sectional view through the body 12. The lower body section 22 houses a main control circuit, indicated generally at 52, connected to the user interface control circuit 33. The user interface control circuit 33 comprises a sensor 54 for receiving signals from the remote control 35. The sensor 54 is located behind the window 34. In response to operation of the buttons 24, 26, 28, 30 and the remote control 35, the user interface control circuit 33 is arranged to transmit appropriate signals to the main control circuit 52 to control various operations of the fan assembly 10. The display 32 is located within the lower body section 22, and is arranged to illuminate part of the lower body section 22. The lower body section 22 is preferably formed from a translucent plastics material which allows the display 32 to be seen by a user.

The lower body section 22 also houses a mechanism, indicated generally at 56, for oscillating the lower body section 22 relative to the base 36. The operation of the oscillating mechanism 56 is controlled by the main control circuit 52 upon receipt of an appropriate control signal from the remote control 35. The range of each oscillation

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cycle of the lower body section 22 relative to the base 36 is preferably between 60° and 120°, and in this embodiment is around 80°. In this embodiment, the oscillating mechanism 56 is arranged to perform around 3 to 5 oscillation cycles per minute. A mains power cable 58 for supplying electrical power to the fan assembly 10 extends through an aperture formed in the base 36. The cable 58 is connected to a plug 60.

The main body section 20 houses an impeller 64 for drawing the primary air flow through the air inlet 14 and into the body 12. Preferably, the impeller 64 is in the form of a mixed flow impeller. The impeller 64 is connected to a rotary shaft 66 extending outwardly from a motor 68. In this embodiment, the motor 68 is a DC brushless motor having a speed which is variable by the main control circuit 52 in response to user manipulation of the button 26 and/or a signal received from the remote control 35. The maximum speed of the motor 68 is preferably in the range from 5,000 to 10,000 rpm. The motor 68 is housed within a motor bucket comprising an upper portion 70 connected to a lower portion 72. The upper portion 70 of the motor bucket comprises a diffuser 74 in the form of a stationary disc having spiral blades.

The motor bucket is located within, and mounted on, a generally frusto-conical impeller housing 76. The impeller housing 76 is, in turn, mounted on a plurality of angularly spaced supports 77, in this example three supports, located within and connected to the main body section 20 of the base 12. The impeller 64 and the impeller housing 76 are shaped so that the impeller 64 is in close proximity to, but does not contact, the inner surface of the impeller housing 76. A substantially annular inlet member 78 is connected to the bottom of the impeller housing 76 for guiding the primary air flow into the impeller housing 76.

A flexible sealing member 80 is mounted on the impeller housing 76. The flexible sealing member prevents air from passing around the outer surface of the impeller housing to the inlet member 78. The sealing member 80 preferably comprises an annular lip seal, preferably formed from rubber. The sealing member 80 further comprises a guide portion in the form of a grommet for guiding an electrical cable 82 to

the motor 68. The electrical cable 82 passes from the main control circuit 52 to the motor 68 through apertures formed in the main body section 20 and the lower body section 22 of the body 12, and in the impeller housing 76 and the motor bucket.

Preferably, the body 12 includes silencing foam for reducing noise emissions from the body 12. In this embodiment, the main body section 20 of the body 12 comprises a first annular foam member 84 located beneath the air inlet 14, and a second annular foam member 86 located within the motor bucket.

The nozzle 16 will now be described in more detail with reference to Figures 4 to 11. With reference first to Figure 4, the nozzle 16 comprises an annular outer casing section 88 connected to and extending about an annular inner casing section 90. Each of these sections may be formed from a plurality of connected parts, but in this embodiment each of the casing sections 88, 90 is formed from a respective, single moulded part. The inner casing section 90 defines the central opening 40 of the nozzle 16, and has an external surface 92 which is shaped to define the Coanda surface 42, diffuser surface 44, guide surface 46 and tapered surface 48.

The outer casing section 88 and the inner casing section 90 together define an annular interior passage of the nozzle 16. As illustrated in Figures 9 and 11, the interior passage extends about the opening 40, and thus comprises two relatively straight sections 94a, 94b each adjacent a respective elongate side of the opening 40, an upper curved section 94c joining the upper ends of the straight sections 94a, 94b, and a lower curved section 94d joining the lower ends of the straight 94a, 94b. The interior passage is bounded by the internal surface 96 of the outer casing section 88 and the internal surface 98 of the inner casing section 90.

As also shown in Figures 1 to 3, the outer casing section 88 comprises a base 100 which is connected to, and over, the open upper end of the main body section 20 of the base 12. The base 100 of the outer casing section 88 comprises an air inlet 102 through which the primary air flow enters the lower curved section 94d of the interior passage

from the air outlet 23 of the base 12. Within the lower curved section 94d, the primary air flow is divided into two air streams which each flow into a respective one of the straight sections 94a, 94b of the interior passage.

The nozzle 16 also comprises a pair of heater assemblies 104. Each heater assembly 104 comprises a row of heater elements 106 arranged side-by-side. The heater elements 106 are preferably formed from positive temperature coefficient (PTC) ceramic material. The row of heater elements is sandwiched between two heat radiating components 108, each of which comprises an array of heat radiating fins 110 located within a frame 112. The heat radiating components 108 are preferably formed from aluminium or other material with high thermal conductivity (around 200 to 400 W/mK), and may be attached to the row of heater elements 106 using beads of silicone adhesive, or by a clamping mechanism. The side surfaces of the heater elements 106 are preferably at least partially covered with a metallic film to provide an electrical contact between the heater elements 106 and the heat radiating components 108. This film may be formed from screen printed or sputtered aluminium. Returning to Figures 3 and 4, electrical terminals 114, 116 located at opposite ends of the heater assembly 104 are each connected to a respective heat radiating component 108. Each terminal 114 is connected to an upper part 118 of a loom for supplying electrical power to the heater assemblies 104, whereas each terminal 116 is connected to a lower part 120 of the loom. The loom is in turn connected to a heater control circuit 122 located in the main body section 20 of the base 12 by wires 124. The heater control circuit 122 is in turn controlled by control signals supplied thereto by the main control circuit 52 in response to user operation of the buttons 28, 30 and/or use of the remote control 35.

Figure 12 illustrates schematically a control system of the fan assembly 10, which includes the control circuits 33, 52, 122, buttons 24, 26, 28, 30, and remote control 35. Two or more of the control circuits 33, 52, 122 may be combined to form a single control circuit. A thermistor 126 for providing an indication of the temperature of the primary air flow entering the fan assembly 10 is connected to the heater controller 122. The thermistor 126 may be located immediately behind the air inlet 14, as shown in

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Figure 3. The main control circuit 52 supplies control signals to the user interface control circuit 33, the oscillation mechanism 56, the motor 68, and the heater control circuit 124, whereas the heater control circuit 124 supplies control signals to the heater assemblies 104. The heater control circuit 124 may also provide the main control circuit 52 with a signal indicating the temperature detected by the thermistor 126, in response to which the main control circuit 52 may output a control signal to the user interface control circuit 33 indicating that the display 32 is to be changed, for example if the temperature of the primary air flow is at or above a user selected temperature. The heater assemblies 104 may be controlled simultaneously by a common control signal, or they may be controlled by respective control signals.

The heater assemblies 104 are each retained within a respective straight section 94a, 94b of the interior passage by a chassis 128. The chassis 128 is illustrated in more detail in Figure 5. The chassis 128 has a generally annular structure. The chassis 128 comprises a pair of heater housings 130 into which the heater assemblies 104 are inserted. Each heater housing 130 comprises an outer wall 132 and an inner wall 134. The inner wall 134 is connected to the outer wall 132 at the upper and lower ends 138, 140 of the heater housing 130 so that the heater housing 130 is open at the front and rear ends thereof. The walls 132, 134 thus define a first air flow channel 136 which passes through the heater assembly 104 located within the heater housing 130.

The heater housings 130 are connected together by upper and lower curved portions 142, 144 of the chassis 128. Each curved portion 142, 144 also has an inwardly curved, generally U-shaped cross-section. The curved portions 142, 144 of the chassis 128 are connected to, and preferably integral with, the inner walls 134 of the heater housings 130. The inner walls 134 of the heater housings 130 have a front end 146 and a rear end 148. With reference also to Figures 6 to 9, the rear end 148 of each inner wall 134 also curves inwardly away from the adjacent outer wall 132 so that the rear ends 148 of the inner walls 134 are substantially continuous with the curved portions 142, 144 of the chassis 128.

During assembly of the nozzle 16, the chassis 128 is pushed over the rear end of the inner casing section 90 so that the curved portions 142, 144 of the chassis 128 and the rear ends 148 of the inner walls 134 of the heater housings 130 are wrapped around the rear end 150 of the inner casing section 90. The inner surface 98 of the inner casing section 90 comprises a first set of raised spacers 152 which engage the inner walls 134 of the heater housings 130 to space the inner walls 134 from the inner surface 98 of the inner casing section 90. The rear ends 148 of the inner walls 134 also comprise a second set of spacers 154 which engage the outer surface 92 of the inner casing section 90 to space the rear ends of the inner walls 134 from the outer surface 92 of the inner casing section 90.

The inner walls 134 of the heater housing 130 of the chassis 128 and the inner casing section 90 thus define two second air flow channels 156. Each of the second flow channels 156 extends along the inner surface 98 of the inner casing section 90, and around the rear end 150 of the inner casing section 90. Each second flow channel 156 is separated from a respective first flow channel 136 by the inner wall 134 of the heater housing 130. Each second flow channel 156 terminates at an air outlet 158 located between the outer surface 92 of the inner casing section 90 and the rear end 148 of the inner wall 134. Each air outlet 158 is thus in the form of a vertically-extending slot located on a respective side of the opening 40 of the assembled nozzle 16. Each air outlet 158 preferably has a width in the range from 0.5 to 5 mm, and in this example the air outlets 158 have a width of around 1 mm.

The chassis 128 is connected to the inner surface 98 of the inner casing section 90. With reference to Figures 5 to 7, each of the inner walls 134 of the heater housings 130 comprises a pair of apertures 160, each aperture 160 being located at or towards a respective one of the upper and lower ends of the inner wall 134. As the chassis 128 is pushed over the rear end of the inner casing section 90, the inner walls 134 of the heater housings 130 slide over resilient catches 162 mounted on, and preferably integral with, the inner surface 98 of the inner casing section 90, which subsequently protrude through the apertures 160. The position of the chassis 128 relative to the inner casing section 90

can then be adjusted so that the inner walls 134 are gripped by the catches 162. Stop members 164 mounted on, and preferably also integral with, the inner surface 98 of the inner casing section 90 may also serve to retain the chassis 128 on the inner casing section 90.

With the chassis 128 connected to the inner casing section 90, the heater assemblies 104 are inserted into the heater housings 130 of the chassis 128, and the loom connected to the heater assemblies 104. Of course, the heater assemblies 104 may be inserted into the heater housings 130 of the chassis 128 prior to the connection of the chassis 128 to the inner casing section 90. The inner casing section 90 of the nozzle 16 is then inserted into the outer casing section 88 of the nozzle 16 so that the front end 166 of the outer casing section 88 enters a slot 168 located at the front of the inner casing section 90, as illustrated in Figure 9. The outer and inner casing sections 88, 90 may be connected together using an adhesive introduced to the slot 168.

The outer casing section 88 is shaped so that part of the inner surface 96 of the outer casing section 88 extends around, and is substantially parallel to, the outer walls 132 of the heater housings 130 of the chassis 128. The outer walls 132 of the heater housings 130 have a front end 170 and a rear end 172, and a set of ribs 174 located on the outer side surfaces of the outer walls 132 and which extend between the ends 170, 172 of the outer walls 132. The ribs 174 are configured to engage the inner surface 96 of the outer casing section 88 to space the outer walls 132 from the inner surface 96 of the outer casing section 88. The outer walls 132 of the heater housings 130 of the chassis 128 and the outer casing section 88 thus define two third air flow channels 176. Each of the third flow channels 176 is located adjacent and extends along the inner surface 96 of the outer casing section 88. Each third flow channel 176 is separated from a respective first flow channel 136 by the outer wall 132 of the heater housing 130. Each third flow channel 176 terminates at an air outlet 178 located within the interior passage, and between the rear end 172 of the outer wall 132 of the heater housing 130 and the outer casing section 88. Each air outlet 178 is also in the form of a vertically-extending slot located within the interior passage of the nozzle 16, and preferably has a width in the

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range from 0.5 to 5 mm. In this example the air outlets 178 have a width of around 1 mm.

The outer casing section 88 is shaped so as to curve inwardly around part of the rear ends 148 of the inner walls 134 of the heater housings 130. The rear ends 148 of the inner walls 134 comprise a third set of spacers 182 located on the opposite side of the inner walls 134 to the second set of spacers 154, and which are arranged to engage the inner surface 96 of the outer casing section 88 to space the rear ends of the inner walls 134 from the inner surface 96 of the outer casing section 88. The outer casing section 88 and the rear ends 148 of the inner walls 134 thus define a further two air outlets 184. Each air outlet 184 is located adjacent a respective one of the air outlets 158, with each air outlet 158 being located between a respective air outlet 184 and the outer surface 92 of the inner casing section 90. Similar to the air outlets 158, each air outlet 184 is in the form of a vertically-extending slot located on a respective side of the opening 40 of the assembled nozzle 16. The air outlets 184 preferably have the same length as the air outlets 158. Each air outlet 184 preferably has a width in the range from 0.5 to 5 mm, and in this example the air outlets 184 have a width of around 2 to 3 mm. Thus, the air outlets 18 for emitting the primary air flow from the fan assembly 10 comprise the two air outlets 158 and the two air outlets 184.

Returning to Figures 3 and 4, the nozzle 16 preferably comprises two curved sealing members 186, 188 each for forming a seal between the outer casing section 88 and the inner casing section 90 so that there is substantially no leakage of air from the curved sections 94c, 94d of the interior passage of the nozzle 16. Each sealing member 186, 188 is sandwiched between two flanges 190, 192 located within the curved sections 94c, 94d of the interior passage. The flanges 190 are mounted on, and preferably integral with, the inner casing section 90, whereas the flanges 192 are mounted on, and preferably integral with, the outer casing section 88. As an alternative to preventing the air flow from leaking from the upper curved section 94c of the interior passage, the nozzle 16 may be arranged to prevent the air flow from entering this curved section 94c. For example, the upper ends of the straight sections 94a, 94b of the interior passage may

be blocked by the chassis 128 or by inserts introduced between the inner and outer casing sections 88, 90 during assembly.

To operate the fan assembly 10 the user presses button 24 of the user interface, or presses a corresponding button of the remote control 35 to transmit a signal which is received by the sensor of the user interface circuit 33. The user interface control circuit 33 communicates this action to the main control circuit 52, in response to which the main control circuit 52 activates the motor 68 to rotate the impeller 64. The rotation of the impeller 64 causes a primary air flow to be drawn into the body 12 through the air inlet 14. The user may control the speed of the motor 68, and therefore the rate at which air is drawn into the body 12 through the air inlet 14, by pressing button 26 of the user interface or a corresponding button of the remote control 35. Depending on the speed of the motor 56, the primary air flow generated by the impeller 52 may be between 10 and 30 litres per second. The primary air flow passes sequentially through the impeller housing 76 and the open upper end of the main body portion 22 to enter the lower curved section 94d of the interior passage of the nozzle 16. The pressure of the primary air flow at the outlet 23 of the body 12 may be at least 150 Pa, and is preferably in the range from 250 to 1.5 kPa.

The user may optionally activate the heater assemblies 104 located within the nozzle 16 to raise the temperature of the first portion of the primary air flow before it is emitted from the fan assembly 10, and thereby increase both the temperature of the primary air flow emitted by the fan assembly 10 and the temperature of the ambient air in a room or other environment in which the fan assembly 10 is located. In this example, the heater assemblies 104 are both activated and de-activated simultaneously, although alternatively the heater assemblies 104 may be activated and de-activated separately. To activate the heater assemblies 104, the user presses button 30 of the user interface, or presses a corresponding button of the remote control 35 to transmit a signal which is received by the sensor of the user interface circuit 33. The user interface control circuit 33 communicates this action to the main control circuit 52, in response to which the main control circuit 52 issues a command to the heater control circuit 124 to activate the

heater assemblies 104. The user may set a desired room temperature or temperature setting by pressing button 28 of the user interface or a corresponding button of the remote control 35. The user interface circuit 33 is arranged to vary the temperature displayed by the display 34 in response to the operation of the button 28, or the corresponding button of the remote control 35. In this example, the display 34 is arranged to display a temperature setting selected by the user, which may correspond to a desired room air temperature. Alternatively, the display 34 may be arranged to display one of a number of different temperature settings which has been selected by the user.

Within the lower curved section 94d of the interior passage of the nozzle 16, the primary air flow is divided into two air streams which pass in opposite directions around the opening 40 of the nozzle 16. One of the air streams enters the straight section 94a of the interior passage located to one side of the opening 40, whereas the other air stream enters the straight section 94b of the interior passage located on the other side of the opening 40. As the air streams pass through the straight sections 94a, 94b, the air streams turn through around 90° towards the air outlets 18 of the nozzle 16. To direct the air streams evenly towards the air outlets 18 along the length of the straight section 94a, 94b, the nozzle 16 may comprises a plurality of stationary guide vanes located within the straight sections 94a, 94b and each for directing part of the air stream towards the air outlets 18. The guide vanes are preferably integral with the internal surface 98 of the inner casing section 90. The guide vanes are preferably curved so that there is no significant loss in the velocity of the air flow as it is directed towards the air outlets 18. Within each straight section 94a, 94b, the guide vanes are preferably substantially vertically aligned and evenly spaced apart to define a plurality of passageways between the guide vanes and through which air is directed relatively evenly towards the air outlets 18.

As the air streams flow towards the air outlets 18, a first portion of the primary air flow enters the first air flow channels 136 located between the walls 132, 134 of the chassis 128. Due to the splitting of the primary air flow into two air streams within the interior

passage, each first air flow channel 136 may be considered to receive a respective first sub-portion of the primary air flow. Each first sub-portion of the primary air flow passes through a respective heating assembly 104. The heat generated by the activated heating assemblies is transferred by convection to the first portion of the primary air flow to raise the temperature of the first portion of the primary air flow.

A second portion of the primary air flow is diverted away from the first air flow channels 136 by the front ends 146 of the inner walls 134 of the heater housings 130 so that this second portion of the primary air flow enters the second air flow channels 156 located between the inner casing section 90 and the inner walls of the heater housings 130. Again, with the splitting of the primary air flow into two air streams within the interior passage each second air flow channel 156 may be considered to receive a respective second sub-portion of the primary air flow. Each second sub-portion of the primary air flow passes along the internal surface 92 of the inner casing section 90, thereby acting as a thermal barrier between the relatively hot primary air flow and the inner casing section 90. The second air flow channels 156 are arranged to extend around the rear wall 150 of the inner casing section 90, thereby reversing the flow direction of the second portion of the air flow, so that it is emitted through the air outlets 158 towards the front of the fan assembly 10 and through the opening 40. The air outlets 158 are arranged to direct the second portion of the primary air flow over the external surface 92 of the inner casing section 90 of the nozzle 16.

A third portion of the primary air flow is also diverted away from the first air flow channels 136. This third portion of the primary air flow by the front ends 170 of the outer walls 132 of the heater housings 130 so that the third portion of the primary air flow enters the third air flow channels 176 located between the outer casing section 88 and the outer walls 132 of the heater housings 130. Once again, with the splitting of the primary air flow into two air streams within the interior passage each third air flow channel 176 may be considered to receive a respective third sub-portion of the primary air flow. Each third sub-portion of the primary air flow passes along the internal surface 96 of the outer casing section 88, thereby acting as a thermal barrier between the

relatively hot primary air flow and the outer casing section 88. The third air flow channels 176 are arranged to convey the third portion of the primary air flow to the air outlets 178 located within the interior passage. Upon emission from the air outlets 178, the third portion of the primary air flow merges with this first portion of the primary air flow. These merged portions of the primary air flow are conveyed between the inner surface 96 of the outer casing section 88 and the inner walls 134 of the heater housings to the air outlets 184, and so the flow directions of these portions of the primary air flow are also reversed within the interior passage. The air outlets 184 are arranged to direct the relatively hot, merged first and third portions of the primary air flow over the relatively cold second portion of the primary air flow emitted from the air outlets 158, which acts as a thermal barrier between the outer surface 92 of the inner casing section 90 and the relatively hot air emitted from the air outlets 184. Consequently, the majority of the internal and external surfaces of the nozzle 16 are shielded from the relatively hot air emitted from the fan assembly 10. This can enable the external surfaces of the nozzle 16 to be maintained at a temperature below 70°C during use of the fan assembly 10.

The primary air flow emitted from the air outlets 18 passes over the Coanda surface 42 of the nozzle 16, causing a secondary air flow to be generated by the entrainment of air from the external environment, specifically from the region around the air outlets 18and from around the rear of the nozzle. This secondary air flow passes through the opening 40 of the nozzle 16, where it combines with the primary air flow to produce an overall air flow projected forward from the fan assembly 10 which has a lower temperature than the primary air flow emitted from the air outlets 18, but a higher temperature than the air entrained from the external environment. Consequently, a current of warm air is emitted from the fan assembly 10.

As the temperature of the air in the external environment increases, the temperature of the primary air flow drawn into the fan assembly 10 through the air inlet 14 also increases. A signal indicative of the temperature of this primary air flow is output from the thermistor 126 to the heater control circuit 124. When the temperature of the

primary air flow is above the temperature set by the user, or a temperature associated with a user's temperature setting, by around 1°C, the heater control circuit 124 de-activates the heater assemblies 104. When the temperature of the primary air flow has fallen to a temperature around 1°C below that set by the user, the heater control circuit 124 re-activates the heater assemblies 104. This can allow a relatively constant temperature to be maintained in the room or other environment in which the fan assembly 10 is located.

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CLAIMS

1. A nozzle for a fan assembly for creating an air current, the nozzle comprising:

an air inlet for receiving an air flow;

means for heating a first portion of the air flow;

means for diverting a second portion of the air flow away from the heating means,

first channel means for conveying the first portion of the air flow to at least one air outlet of the nozzle, the nozzle defining an opening through which air from outside the nozzle is drawn by the air flow emitted from the at least one air outlet; and

second channel means for conveying the second portion of the air flow along an internal surface of the nozzle.

2. A nozzle as claimed in claim 1, wherein the channel means are arranged to merge the first and second portions of the air flow upstream from said at least one air outlet.

3. A nozzle as claimed in any of the preceding claims, wherein the diverting means comprises at least one wall for diverting the second portion of the air flow away from the heating means.

4. A nozzle as claimed in any of the preceding claims, comprising a chassis for retaining the heating means, and wherein the chassis comprises the means for diverting the second portion of the air flow away from the heating means.

5. A nozzle as claimed in any of the preceding claims, wherein the first portion of the air flow comprises a plurality of first sub-portions, and the second portion of the air flow comprises a plurality of second sub-portions, and wherein the nozzle is shaped to divide a received air flow into a plurality of air streams, each air stream comprising a respective first sub-portion and a respective second sub-portion of the air stream.

6. A nozzle as claimed in claim 5, wherein the heating means comprises a plurality of heater assemblies each for heating a respective first sub-portion of the air flow.

7. A nozzle as claimed in claim 6, wherein the heater assemblies are located on opposite sides of the opening.

8. A nozzle as claimed in claim 6 or claim 7, wherein the diverting means comprises a plurality of walls each for diverting a respective second sub-portion of the air flow away from a heater assembly.

9. A nozzle as claimed in any of claims 5 to 8, wherein said at least one air outlet comprises a plurality of air outlets each for emitting a respective first sub-portion of the air flow.

10. A nozzle as claimed in claim 9, wherein the air outlets are located on opposite sides of the opening.

11. A nozzle as claimed in any of the preceding claims, comprising an inner annular casing section and an outer annular casing section surrounding the inner casing section, and wherein the second channel means is arranged to convey the second portion of the air flow along an internal surface of one of the casing sections.

12. A nozzle as claimed in claim 11, comprising means located between the casing sections for separating the first channel means from the second channel means.

13. A nozzle as claimed in claim 12, wherein the separating means is integral with the diverting means for diverting the second portion of the air flow away from the heating means.

14. A nozzle as claimed in claim 12 or claim 13, wherein the separating means is connected to one of the casing sections.

15. A nozzle as claimed in any of claims 12 to 14, wherein said at least one air outlet is located between an internal surface of the outer casing section and the separating means.

16. A nozzle as claimed in any of claims 12 to 15, wherein said at least one air outlet is located between an external surface of the inner casing section and the separating means.

17. A nozzle as claimed in any of claims 12 to 16, wherein the separating means comprises a plurality of spacers for engaging at least one of the inner casing section and the outer casing section.

18. A nozzle as claimed in any of claims 1 to 10, wherein the diverting means is arranged to divert a third portion of the air flow away from the heating means, and the nozzle comprises third channel means for conveying the third portion of the air flow along a second internal surface of the nozzle.

19. A nozzle as claimed in claim 18, wherein the first and third channel means are arranged to merge the first and third portions of the air flow upstream from said at least one air outlet.

20. A nozzle as claimed in claim 18 or claim 19, wherein the first channel means is located between the second channel means and the third channel means.

21. A nozzle as claimed in any of claims 18 to 20, comprising an inner annular casing section and an outer annular casing section surrounding the inner casing section, and wherein the second channel means is arranged to convey the second portion of the air flow along an internal surface of one of the casing sections and the third channel means is arranged to convey the third portion of the air flow along an internal surface of the other casing section.

22. A nozzle as claimed in claim 21, comprising means located between the casing sections for separating the first channel means from the second channel means and the third channel means.

23. A nozzle as claimed in claim 22, wherein the separating means is integral with the diverting means for diverting the second portion and the third portion of the air flow away from the heating means.

24. A nozzle as claimed in claim 22 or claim 23, wherein the separating comprises a plurality of walls for retaining the heating means therebetween.

25. A nozzle as claimed in any of claims 22 to 24, wherein said at least one air outlet is located between an internal surface of the outer casing section and the separating means.

26. A nozzle as claimed in any of claims 22 to 25, wherein said at least one air outlet is located between an external surface of the inner casing section and the separating means.

27. A nozzle as claimed in any of claims 22 to 26, wherein the separating means comprises a plurality of spacers for engaging at least one of the inner casing section and the outer casing section.

28. A nozzle as claimed in any of the preceding claims, wherein each air outlet is in the form of a slot.

29. A nozzle as claimed in claim 28, wherein each air outlet has a width in the range from 0.5 to 5 mm.

30. A nozzle as claimed in any of the preceding claims, wherein the heating means comprises at least one ceramic heater.

31. A fan assembly comprising a nozzle as claimed in any of the preceding claims.

32. A fan assembly for creating an air current, the fan assembly comprising:

means for creating an air flow;

a casing comprising at least one air outlet, the casing defining an opening through which air from outside the fan assembly is drawn by the air flow emitted from the at least one air outlet;

means for heating a first portion of the air flow;

means for diverting a second portion of the air flow away from the heating means,

first channel means for conveying the first portion of the air flow to said at least one air outlet; and

second channel means for conveying the second portion of the air flow along an internal surface of the casing.

33. A fan assembly as claimed in claim 32, wherein the channel means are arranged to merge the first and second portions of the air flow upstream from said at least one air outlet.

34. A fan assembly as claimed in claim 32 or claim 33, wherein the diverting means comprises at least one wall for diverting the second portion of the air flow away from the heating means.

35. A fan assembly as claimed in any of claims 32 to 34, comprising a chassis for retaining the heating means, and wherein the chassis comprises the means for diverting the second portion of the air flow away from the heating means.

36. A fan assembly as claimed in any of claims 32 to 35, wherein the first portion of the air flow comprises a plurality of first sub-portions, and the second portion of the air flow comprises a plurality of second sub-portions, and wherein the casing is shaped to divide a received air flow into a plurality of air streams, each air stream comprising a respective first sub-portion and a respective second sub-portion of the air stream.

37. A fan assembly as claimed in claim 36, wherein the heating means comprises a plurality of heater assemblies each for heating a respective first sub-portion of the air flow.

38. A fan assembly as claimed in claim 37, wherein the heater assemblies are located on opposite sides of the opening.

39. A fan assembly as claimed in claim 37 or claim 38, wherein the diverting means comprises a plurality of walls located within the casing each for diverting a respective second sub-portion of the air flow away from a heater assembly.

40. A fan assembly as claimed in any of claims 36 to 39, wherein said at least one air outlet comprises a plurality of air outlets each for emitting a respective first sub-portion of the air flow.

41. A fan assembly as claimed in claim 40, wherein the air outlets are located on opposite sides of the opening.

42. A fan assembly as claimed in any of claims 32 to 41, wherein the casing comprises an inner annular casing section and an outer annular casing section surrounding the inner casing section, and wherein the second channel means is arranged to convey the second portion of the air flow along an internal surface of one of the casing sections.

43. A fan assembly as claimed in claim 42, comprising means located between the casing sections for separating the first channel means from the second channel means.

44. A fan assembly as claimed in claim 43, wherein the separating means is integral with the diverting means for diverting the second portion of the air flow away from the heating means.

45. A fan assembly as claimed in claim 43 or claim 44, wherein the separating means is connected to one of the casing sections.

46. A fan assembly as claimed in any of claims 43 to 45, wherein said at least one air outlet is located between an internal surface of the outer casing section and the separating means.

47. A fan assembly as claimed in any of claims 43 to 46, wherein said at least one air outlet is located between an external surface of the inner casing section and the separating means.

48. A fan assembly as claimed in any of claims 43 to 47, wherein the separating means comprises a plurality of spacers for engaging at least one of the inner casing section and the outer casing section.

49. A fan assembly as claimed in any of claims 27 to 37, wherein the diverting means is arranged to divert a third portion of the air flow away from the heating means, and the fan assembly comprises third channel means for conveying the third portion of the air flow along a second internal surface of the casing.

50. A fan assembly as claimed in claim 49, wherein the first and third channel means are arranged to merge the first and third portions of the air flow upstream from said at least one air outlet.

51. A fan assembly as claimed in claim 49 or claim 50, wherein the first channel means is located between the second channel means and the third channel means.

52. A fan assembly as claimed in any of claims 49 to 51, wherein the casing comprises an inner annular casing section and an outer annular casing section surrounding the inner casing section, and wherein the second channel means is arranged to convey the second portion of the air flow along an internal surface of one of the casing sections and the third channel means is arranged to convey the third portion of the air flow along an internal surface of the other casing section.

53. A fan assembly as claimed in claim 52, comprising means located between the casing sections for separating the first channel means from the second channel means and the third channel means.

54. A fan assembly as claimed in claim 53, wherein the separating means is integral with the diverting means for diverting the second portion and the third portion of the air flow away from the heating means.

55. A fan assembly as claimed in claim 53 or claim 54, wherein the separating comprises a plurality of walls for retaining the heating means therebetween.

56. A fan assembly as claimed in any of claims 53 to 55, wherein said at least one air outlet is located between an internal surface of the outer casing section and the separating means.

57. A fan assembly as claimed in any of claims 53 to 56, wherein said at least one air outlet is located between an external surface of the inner casing section and the separating means.

58. A fan assembly as claimed in any of claims 53 to 57, wherein the separating means comprises a plurality of spacers for engaging at least one of the inner casing section and the outer casing section.

59. A fan assembly as claimed in of the claims 32 to 58, wherein each air outlet is in the form of a slot.

60. A fan assembly as claimed in claim 60, wherein each air outlet has a width in the range from 0.5 to 5 mm.

61. A fan assembly as claimed in any of claims 32 to 60, wherein the heating means comprises at least one ceramic heater.

Application No:	GB1013266.0	**Examiner:**	Kingsley Robinson
Claims searched:	1-61	**Date of search:**	22 November 2010

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X,E	1, 3, 4, 11, 28-32, 34, 35, 42, 59-61	GB2468369 A (DYSON) When only one heater is activated as described in page 10, lines 14-15, airflow to the heated side of the duct can be considered the first portion and the airflow to the unheated side can be considered the second portion.
Y	1-4, 11, 31-35, 42.	JP2004208935 A (MATSUSHITA) See especially cool air path 2 surrounding hot air path 3 shown on figures.
Y	1-4, 11, 31-35, 42.	JP2000201723 A (NAKANO) See especially first air portion 5 and second air portion 4.
Y	1-4, 11, 31-35, 42.	US3943329 A (CLAIROL) See especially nozzle 30.
Y	1-4, 11, 31-35, 42.	US5649370 A (RUSSO) See especially diffuser nozzle 12.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

A45D; F04D; F24H

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC

International Classification:

Subclass	Subgroup	Valid From
F24H	0003/04	01/01/2006
F04D	0025/08	01/01/2006

Espacenet

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Circumfluence type hair dryer

Inventor(s): FENG YU ± (YU FENG)

Applicant(s): FENG YU ± (YU FENG)

Classification: **- international:** ***A45D20/10; A45D20/12***
- cooperative:

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Abstract of CN202146022 (U)

A circumfluence type hair dryer comprises a casing, fan blades, a heating element and a handle, and is characterized in that a motor, the fan blades and the heating element are mounted in the handle; the casing is a cylinder body with a hollow ring-shaped inner chamber formed by an inner side wall and an outer side wall; an air inlet is formed on the outer side wall of the casing and is communicated with the hollow ring-shaped inner chamber; an air inlet groove communicated with the air inlet is formed on the handle; one end of the outer side wall of the casing is hermetically connected with the inside wall of the casing completely; and the other end of the outer side wall of the casing is turned over inwards along the axial line of the casing and forms a spaced and overlapped staggered structure with a corresponding end of the inner side wall of the casing so as to form a ring-shaped gap. In the utility model, the an air outlet adopting a ring-shaped gap structure is adopted, and the diameter of a ring surrounded by the air outlet is far larger than that of a ring surrounded by the air outlet of a traditional hair dryer, so that the area covered by air flow is wider, and the air outlet efficiency is high; and air entering the hair drier is under the action of the hollow ring-shaped inner chamber, so that air flow of higher speed can be obtained, and the strength of air blown out is gentler and more uniform.

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DESCRIPTION CN202146022

[0001]

Technical field

[0002]

The utility model relates to a hair dryer.

[0003]

BACKGROUND

[0004]

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Although there are significant differences in the dryer on the type, style and size, but they are much the same internal structure, mainly by the motor, fan, heating element and electrical control switch these parts.

Hair Dryer directly driven by the electric motor drives the rotor blades rotate when the blades rotate, the air from the suction inlet centrifugal airflow thus formed then blown by mouth before duct.

[0005]

Generally, the prior art hair dryer air inlet and outlet are set up and transversely therethrough, and the outlet is a straight-shaped multi-made structures, such as the Chinese invention patent application number "201,010,607,883.4 an improved hair dryer "Patent No. ZL201020265837.6 of utility model patents," a hair-dryer wind mouth ", Patent No. ZL200920024934.3 the Chinese utility model patents," a hair dryer, "etc., although these patents hairdryer structure is not entirely the same, but they basically the same way out of the wind, the shape of the outlet is independent of the use of a cylindrical nozzle, the nozzle is more or installed separately in the housing and the housing is integrally formed, but in order to ensure that the concentrator, the outlet diameter is generally smaller than the outer diameter of the housing, the airflow is not possible to cover a larger area, but also in the use, because the outlet is entirely open tubular structure, the air discharge outlet is more dispersed, non-uniform wind , thereby affecting the comfort level.

[0006]

SUMMARY OF THE INVENTION

[0007]

The utility model technical problem to be solved is for the existing state of the art airflow above and provide a wider coverage area, wind and heat more evenly gentle circulation type hair dryer.

[0008]

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The utility of new technical solutions to solve the technical problem was adopted: a circulation-type hair dryer, including a housing having inlet and outlet;

[0009]

Fan, driven by the motor of the air from the inlet to the outlet;

[0010]

Heat generating elements disposed on said portion of the blades of the wind;

[0011]

A handle connected to said housing is provided with a control controlling the motor to stop rotation of said heat generating element and the power loss through the switch assembly to the handle;

[0012]

Characterized in that: said motor, fan and the heat generating element is mounted within the handle, wherein the housing by inner and outer annular side wall forming a hollow cylindrical cavity, said air inlet in said housing The outer annular wall of said hollow inner chamber and communicating said inlet and said outlet opening is connected with the air intake through the groove on the handle; sidewall and the inner end of the outer side wall of the casing and the housing of the completely close the connection between the other end of the outer side wall of the housing inwardly of the housing along the axis between the folding and the corresponding end of the inner wall of the casing and spaced, superimposed to form an annular gap dislocation structures, the said annular gap is the housing outlet.

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[0013]

The cross section of the housing can be a variety of shapes, a preferred cross-section of the housing is circular or oval in shape being preferred.

[0014]

In order to achieve rotation of the blades, as is preferred, the motor is disposed within said handle, said blade has a central drive shaft aperture opening, the motor output shaft and the drive shaft is connected to the hole of the fixed blade.

[0015]

In order to achieve the connection between the handle and the housing, as a further preferable that the handle comprises a journal, the journal of the blades housed within said housing at said inlet is provided with said energy and mating spigot projecting neck connected to the connection and disconnection of the handle neck projections.

[0016]

Handle can be fixed in the connector housing can be connected by means of screws or bolts, in order to improve the reliability of the connection between the handle and easy assembly and disassembly of the housing, as is preferred, the first connecting hole opened a spigot said projection and said neck opening has a first connection hole connected to the corresponding second aperture, between the housing and the handle through the through hole provided in said first connection and the second connection hole of the screw connection.

[0017]

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Compared with the prior art, the utility model has the advantage: the use of air outlet annular gap structure, exports compared with the traditional straight-shaped transverse through the wind, the utility model annular ring surrounded outlet diameter than traditional hair dryers The larger the diameter of the outlet, covering a wider area of airflow, high efficiency wind; inlet and outlet of each other vertically into the hair-dryer wind through acting hollow annular cavity, can obtain a higher flow rate, wind blowing through the annular gap is more soft, uniform, thus allowing users to feel more comfortable and secure.

[0018]

Brief Description

[0019]

Figure 1 is a perspective view of an embodiment of the utility model the structure of Fig.

[0020]

The utility model FIG 2 is a perspective exploded view of the embodiment.

[0021]

Figure 3 is an embodiment of the utility model cross-sectional view.

[0022]

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Figure 4 is a sectional view of the housing shown in Fig.

[0023]

Embodiment

[0024]

The following examples further describe the accompanying drawings in detail as the present utility model.

[0025]

Figure 1 to 3, the hair dryer of the present embodiment 4 as a circulation-type hair dryer, the hair dryer comprises a housing 1, blade 2, a motor 3, the heating element 4 and a handle 5, wherein the heat generating element 4, air leaf 2 and the motor 3 is provided in the handle 5, the handle 5 is also provided with a control of the motor 3 is stopped and the control power on and off the heating element 4, the switching unit 6.

[0026]

The air outlet structure of the present embodiment differs from the conventional hair dryer, for example a hair dryer 1 in this embodiment is a case of a hollow cylindrical body 11 has an annular inner cavity, which is lying on top of the handle 5, the housing 1 a hollow bore 11 by an annular outer wall 111 and inner wall 112 of the housing 1 surrounded by the cross section of the housing 1 may be a circular ring-shaped or oval cross-section, wherein the bottom of the outer side wall 111 of the housing 1 along the vertically with the inlet opening 121, the inlet 121 is also formed in the side wall projections with the handle neck 5 with one end connected to the outer wall 111 and the housing 12, the housing 1 of the first connector 112 is completely enclosed between the shells the other end of the outer side wall 111 along the axis of the body 1, the casing 1 and inwardly folding the inner side wall and between the respective end 112 of the housing 1 in spaced, dislocation structures superimposed annular

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gap 13 is formed, the annular gap 13 becomes housing an outlet, and housing an air inlet 121, interconnected channels formed between the 11 outlet and a hollow annular cavity;

[0027]

The top of the handle 5 is formed a journal 51 can be inserted into the projection 12 within the neck, through a tapered surface 52 of the spigot 51 is connected between the grip and the grip portion 5, and the intake opening of the housing 1 has a tapered surface 52 121 air inlet relative and set slot 521, Blade 2 housed within the handle journal 51 5 Blade 2 center opened a drive shaft hole 21, the motor 3 is set in the handle grip portion 5, the motor 3 output shaft 31 and the drive shaft hole 21 of the fixed blade 2 is connected to and drives the fan 2 is rotated, the heat generating element 4 is provided between the fan 2 and the outlet, the heat generating element 4 may be ceramic heating element 4, the heating wire may be used, etc. Other heat generating element 4.

[0028]

Between the handle 5 and the housing 1 for the threaded connection, of course, can be directly fixed to the plug tightly fitted in order to be informed in time of both the connection is in place, the projection on the inner wall of the neck 12 of the housing 1 is also formed with a rim 122 circle , when the spigot 51 is screwed into the handle housing 5, the projection 12 of the neck, the top portion 51 touches the journal 122 to the inner rim.

Meanwhile, in order to improve the connection reliability of the handle 5 in the circumferential wall of the spigot (51) has a first coupling hole 511 opened, the projection 12 of the neck opening with the housing 1 and the first connection hole 511 corresponding to the second connection hole 123 in the circumferential wall can be pierced by the screw (screws or rivets) of the first connection hole 511 and the second connection hole 123 is a fixed connection between the housing and the handle 5.

[0029]

Hair dryer inlet embodiment 121 of the present embodiment is set perpendicular to each other and the air outlet, the air inlet 121, an outlet and the housing is integrally formed without the use of additional air nozzle is installed, the structure is simple; To prevent overheating of the housing 1, the housing 1 can be made of high temperature

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materials, both to ensure safety, but also can reduce heat dissipation, improve air temperature.

In use, air enters from the bottom of the housing 1 and then through the lumen of a hollow annular ring 11 is blown from the slits 13, since the annular gap 13 to the outlet structure, so that a large outlet diameter surrounded by the annular outlet diameter than conventional much, not only the high-speed air flow, and the area covered by the wider flow, improve the efficiency of the wind, and that the annular gap 13 from the air blown out of the wind and heat more uniform, soft, and further improve the performance, to improve the Use of comfort and safety.

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CLAIMS CN202146022

[0001]

One kind of circulation blowers, including

A housing having inlet and outlet;

Fan, driven by the motor of the air from the inlet to the outlet;

Heat generating elements disposed on said portion of the blades of the wind;

A handle connected to said housing is provided with a control controlling the motor to stop rotation of said heat generating element and the power loss through the switch assembly to the handle;

Characterized in that: said motor, fan and the heat generating element is mounted within the handle, wherein the housing by inner and outer annular side wall forming a hollow cylindrical cavity, said air inlet in said housing The outer annular wall of said hollow inner chamber and communicating said inlet and said outlet opening is connected with the air intake through the groove on the handle; sidewall and the inner end of the outer side wall of the casing and the housing of the completely close the connection between the other end of the outer side wall

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of the housing inwardly of the housing along the axis between the folding and the corresponding end of the inner wall of the casing and spaced, superimposed to form an annular gap dislocation structures, the said annular gap is the housing outlet.

[0002]

Cable according to claim 1, wherein the circulation type, which is characterized in that: said housing cross-section circular or oval.

[0003]

The motor drive shaft is disposed within said handle, said blade has a central drive shaft aperture opening, the output shaft of said motor and said fan: The circulation type according to claim 1, wherein the hair dryer, characterized in that Kong fixedly connected.

[0004]

The hair dryer in accordance with the circulation of formula 2 or 3, wherein the preceding claims, characterized in that: said handle comprises a journal, the journal of the blades housed within said housing at said inlet is provided with a energy and projecting said journal cooperating neck connected to the connection and disconnection of the handle neck projections.

[0005]

Circulation of formula according to claim 4, wherein the hair dryer, wherein: a first opening journalled on said connecting hole, said projection and said neck opening has a first connection hole connected to the corresponding second hole, the through said through hole provided in said first connection and the second connection hole of the screw connection between the housing and the handle.

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For information purposes only

Description

Air blower of annular flow type

Technical field

[0001] The present utility model relates to an air blower.

Background art

[0002] Electric air blowers are quite different in make, type and size, however, their internal structures are generally the same, being mainly composed of such parts as an electric motor, blades, a heat generating element and an electrical control switch. Electric air blowers directly relay on the electric motor to drive a rotor so as to bring the blades into rotation. When the blades are rotating air is sucked in via an air inlet opening, thereby forming a centrifugal air flow which is then blown out via a front nozzle of an air flow tube.

[0003] Commonly, both the air inlet opening and the air outlet opening of an air blower in prior art are presenting an arrangement in transverse direction and are in communication with each other. Furthermore the air outlet opening is usually made into a structure of a straight cylindrical shape, such as those in the Chinese patent titled “An improved electric air blower” with the application number of 201010607883.4, the utility model patent titled “An air blower nozzle” with the patent no of ZL201020265837.6, and the Chinese utility model patent titled “An air blower” with the patent no of ZL200920024934.3, etc., although the structures of the air blowers in the above patents are not exactly the same, but their methods to outlet the air flow are substantially the same, with the air outlet openings thereof all adopting an individual nozzle of a cylindrical shape; nozzles of this type are mostly fitted onto the housing individually or formed in one piece with the housing, but in order to ensure the concentration of the air flow power, the diameters of the air outlet openings are normally smaller than the outer diameter of the housing, thus the covering area of the air flow cannot be made to a relatively larger value, furthermore, during use, due to the fact that the air outlet opening is a cylindrical

structure of a fully open type, the air flow from the air outlet opening is relatively decentralized with an uneven air flow power, so that comfort during use is affected.

Contents of the Invention

[0004] The technical issue to be solved by the present utility model is, in response to the situation of the prior art mentioned above, to provide an air blower of annular flow type which has broader air flow coverage and more uniform and gentle air flow power and heat.

[0005] The technical solution adopted by the present utility model to solve the technical issue mentioned above is an air blower of annular flow type, comprising a housing having an air inlet opening and an air outlet opening;

[0006] blades driven by an electric motor to feed the air flow from the air inlet opening mentioned above to the air outlet opening;

[0007] a heat generating element arranged on the air outlet portion of said blades;

[0008] a handle connected to said housing, which the handle is arranged with a switch assembly controlling the stop of said electric motor and the power-on/off of said heat generating element;

[0009] It is characterized in that said electric motor, the blades and the heat generating element are mounted in said handle, said housing is a cylindrical body with a hollow ring shaped inner cavity formed by the inner side wall and the outer side wall, said air inlet opening is positioned on the outer side wall of said housing and in communication with said hollow ring shaped inner cavity, and said handle is opened thereon with an air inlet slot being in communication with said air inlet opening; and one end of the outer side wall of said housing and the inner side wall of the housing is in a completely closed connection therebetween, and the other end thereof folds inwards along the axis of the housing and forms a space apart and overlying misalignment structure with the corresponding end of the inner side wall of said housing so as to form an annular slit, thus said annular slit is said air outlet opening of said housing.

[0010] The cross section of said housing can be in various shapes, preferably, the cross section of said housing is better in a circle or an oval shape.

[0011] To realize the rotation of the blades, preferably, said electric motor is

arranged within said handle, said blades are opened with a transmission shaft hole in the center, the output shaft of said electric motor and the transmission shaft hole of said blades are in fixed connection with each other.

[0012] To realize the connection between the handle and the housing, it is even more preferable that said handle is composed of a shaft journal, said blades are accommodated and arranged inside the shaft journal, said housing is arranged with a convexed neck in fit connection to said shaft journal at said air inlet opening, and said handle is in removable connection to the inside of said convexed neck.

[0013] The handle can be inserted and secured into the housing, can also be connected by way of a screw or bolt, and in order to improve the reliability of the connection and facilitate the assembling and disassembling between the handle and the housing, preferably, said shaft journal is opened with a first connecting hole, said convexed neck is opened with a second connecting hole being in correspondence to said first connecting hole, and said housing and the handle are fixed and connected via a screw being provided passing through said first connecting hole and said second connecting hole.

[0014] Comparing with the prior art, the advantages of the present utility model is in that an air outlet opening in a structure of an annular slit shape is adopted, comparing with the conventional straight cylinder shaped air outlet opening, which communicates in transverse direction, the diameter of the ring surrounded by the annular shaped air outlet opening of the present utility model is much larger than the diameter of the air outlet opening of the conventional air blower, such that the covering area of air flow is broader and the air outlet efficiency is high; with the air inlet opening and the air outlet opening being perpendicularly arranged to each other, the air flow entered the air blower is subject to the affection of the hollow ring shaped inner cavity, thus a relatively higher speed of the air flow can be obtained, the power of the air flow blown via the annular slit is gentler and evener so as to make users feel more comfortable and secure.

Description of the accompanying drawings

[0015] Fig. 1 is the three-dimensional structure schematic diagram of an embodiment of the present utility model.

[0016] Fig. 2 is the three-dimensional decomposition diagram of an embodiment of the present utility model.

[0017] Fig. 3 is the sectional view of an embodiment of the present utility model.

[0018] Fig. 4 is the sectional view of the machine housing shown in Fig. 3.

Particular embodiments

[0019] In combination with attached drawings and embodiments, the present utility model will be further detailed below.

[0020] As shown in Fig. 1 - 4, the air blower of the present embodiment is an air blower of annular flow type, the air blower comprises a housing 1, blades 2, an electric motor 3, a heat generating element 4 and a handle 5, wherein, the heat generating element 4, the blades 2 and the electric motor 3 are arranged inside the handle 5, and the handle 5 is arranged thereon with a switch assembly 6 which controls the stop of electric motor 3 and the power on/off of the heat generating element 4.

[0021] The air outlet opening structure of the present embodiment is different from that of the conventional air blower, the housing 1 of the air blower of the present embodiment is a cylindrical body having a hollow ring shaped inner cavity 11, it horizontally lies above the handle 5, the hollow ring shaped inner cavity 11 of the housing 1 is formed by the surrounding of the outer side wall 111 of housing 1 and the inner side wall 112 of housing 1, the cross section of the housing 1 can be of a circle shaped or an oval shaped ring section, wherein, the bottom of the outer side wall 111 of the housing 1 is opened with an air inlet opening 121 along vertical direction, at the air inlet opening 121 there is also a convexed neck 12 being formed in fit connection to the handle 5, one end of the outer side wall 111 of the housing 1 and the inner side wall of the housing 1 is in completely closed connection therebetween, and the other end of the outer side wall 111 of housing 1 folds inward along the axis of the housing 1 and forms a space apart and overlying misalignment structure with the corresponding end of the inner side wall 112 of the housing 1 so as to form an annular slit 13, and the annular slit 13 is the air outlet opening of the housing 1, furthermore, a channel is formed by the air inlet opening 121 of the housing 1, the air outlet opening, and the hollow ring shaped inner cavity 11 for the

communication to each other;

[0022] the neck portion of the handle 5 is formed with a shaft journal 51 which can be inserted into the convexed neck 12, with the shaft journal 51 and the holding portion of handle 5 being connected via a conical face 52, the conical face 52 is opened with air inlet slots 521 provided opposite to the air inlet opening 121 of the housing 1, the blades 2 are accommodated and arranged within the shaft journal 51 of the handle 5, the center of the blades 2 is opened with a transmission shaft hole 21, an electric motor 3 is arranged in the holding portion of the handle 5, with the output shaft 31 of the electric motor 3 being in fixed connection with the transmission shaft hole 21 of the blades 2, and driving blades 2 into rotation, the heat generating element 4 is arranged between the blades 2 and the air outlet opening, where the heat generating element 4 can be a ceramic heat generating element 4, or other heat generating element 4 adopting a heater strip, etc.

[0023] Between the handle 5 and the housing 1 is a threaded connection, of cause it can also be a direct connection with a tight fit insertion connection, in order to timely detect whether the connection of these two parts are in place, a circle of inner projecting ring 122 is further formed on the inner wall of the convexed neck 12 of the housing 1, and it will be appropriate when the shaft journal 51 of the handle 5 has screwed into the convexed neck 12 of the housing 1 and the top of the shaft journal 51 has contacted to the inner projecting ring 122. Meanwhile to improve the reliability of the connection, the shaft journal 51 of the handle 5 is opened with a first connecting hole 511 on its circumference wall, the convexed neck 12 of the housing 1 is opened on its circumference wall with a second connecting hole 123 which is in correspondence to the first connecting hole 511, the housing 1 and the handle 5 can be fixed and connected via a screw (bolt or rivet) being provided passing through the first connecting hole 511 and the second connecting hole 123.

[0024] The air inlet opening 121 and the air outlet opening of the air blower of the present embodiment are perpendicularly arranged to each other, the air inlet opening 121, the air outlet opening, and the housing 1 are formed into one piece, such that there is no need to install an extra nozzle in use, so the structure is simple; in addition, in order to prevent the housing 1 from being overheated, the housing 1 can

be made from a high temperature resistance material, such that not only the safety use can be guaranteed, but also the heat radiation loss can be reduced so as to increase the temperature of the air flow. In use, air enters the housing 1 from the bottom and then is passed through the hollow ring shaped inner cavity 11 and is finally blown out from annular slit 13, because the air outlet opening is of a structure of annular slit 13, the diameter of the ring shape being surrounded by the air outlet opening is much larger than that of a conventional air outlet opening, such that not only the speed of air flow is high, but also the covering area of the air flow is broader, the air outlet efficiency is increased, furthermore the power and heat blown via the air outlet opening of the annular slit 13 are evener and gentler, therefore the product performance is further improved, the comfort and safety use are improved.

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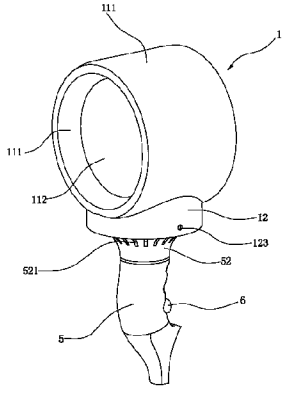
权利要求书 1 页 说明书 3 页 附图 4 页

(54)实用新型名称

环流式吹风机

(57)摘要

一种环流式吹风机，包括有壳体；风叶；发热元件；手柄；其特征在于：所述电机、风叶和发热元件安装在手柄内，壳体为由内、外侧壁形成有中空环形内腔的筒体，进风口位于壳体的外侧壁上并与中空环形内腔相连通，手柄上开设有和进风口相连通的进风槽；壳体的外侧壁一端和壳体的内侧壁之间完全封闭连接，壳体的外侧壁另一端沿该壳体的轴线向内翻折并和壳体的内侧壁相应端之间成间隔、叠加的错位结构而形成环形缝隙。本实用新型的采用环形缝隙结构的风出口，其所围绕的圆环直径比传统吹风机的出风口直径大得多，气流覆盖的面积更广，出风效率高；进入吹风机的风经过中空环形内腔的作用，能够获得较高速度的气流，吹出的风力更加柔和、均匀。



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1. 一种环流式吹风机，包括有

壳体，具有进风口和出风口；

风叶，由电机驱动而将风从上述的进风口送至出风口；

发热元件，设置于所述风叶的出风部位；

手柄，连接在所述壳体上，该手柄上设置有控制所述电动机停转和控制所述发热元件通断电的开关组件；

其特征在于：所述电机、风叶和发热元件安装在所述的手柄内，所述壳体为由内、外侧壁形成有中空环形内腔的筒体，所述进风口位于所述壳体的外侧壁上并与所述中空环形内腔相连通，所述手柄上开设有和所述进风口相连通的进风槽；并且所述壳体的外侧壁一端和该壳体的内侧壁之间完全封闭连接，所述壳体的外侧壁另一端沿该壳体的轴线向内翻折并和所述壳体的内侧壁相应端之间成间隔、叠加的错位结构而形成环形缝隙，所述环形缝隙即为所述壳体的出风口。

2. 根据权利要求 1 所述的环流式吹风机，其特征在于：所述壳体的横截面呈圆形或椭圆形。

3. 根据权利要求 1 所述的环流式吹风机，其特征在于：所述电动机设置于所述手柄内，所述风叶中心开设有传动轴孔，所述电动机的输出轴和所述风叶的传动轴孔固定相连。

4. 根据权利要求 1 或 2 或 3 所述的环流式吹风机，其特征在于：所述手柄包括有轴颈，所述风叶容置于该轴颈内，所述壳体在所述进风口设置有能和所述轴颈相配合连接的凸颈，所述手柄拆卸连接于所述凸颈中。

5. 根据权利要求 4 所述的环流式吹风机，其特征在于：所述轴颈上开设有第一连接孔，所述凸颈上开设有和所述第一连接孔相对应的第二连接孔，所述壳体和手柄之间通过穿设于所述第一连接孔和第二连接孔内的螺钉固定连接。

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环流式吹风机

技术领域

[0001] 本实用新型涉及一种吹风机。

背景技术

[0002] 电吹风虽然在型式、款式和大小上有很大差别，但它们的内在结构大体相同，主要由电动机、风叶、发热元件及电器控制开关这几部分组成。电吹风直接靠电动机驱动转子带动风叶旋转，当风叶旋转时，空气从进风口吸入，由此形成的离心气流再由风筒前嘴吹出。

[0003] 通常，现有技术中电吹风的进风口和出风口都是呈横向设置并贯通的，而且出风口多做成是直筒形结构，如申请号为 201010607883.4 的中国发明专利《一种改进的电吹风机》、专利号为 ZL201020265837.6 的实用新型专利《一种吹风机风嘴》、专利号为 ZL200920024934.3 的中国实用新型专利《一种吹风机》等等，上述这些专利中的吹风机结构虽然并不完全相同，但是它们的出风方式基本相同，出风口的形状都是采用独立的筒形风嘴，这种风嘴多为单独安装在壳体上或者和壳体一体成型，但是为了保证风力集中，出风口的直径一般要小于壳体的外径，气流覆盖面积无法做到较大，而且在使用时，因为出风口是完全敞开式的筒状结构，出风口排出的风较为分散，风力不均匀，进而影响使用舒适度。

发明内容

[0004] 本实用新型所要解决的技术问题是针对上述现有技术现状而提供一种气流覆盖面积更广、风力和热力更加均匀柔和的环流式吹风机。

[0005] 本实用新型解决上述技术问题所采用的技术方案为：一种环流式吹风机，包括有壳体，具有进风口和出风口；

[0006] 风叶，由电机驱动而将风从上述的进风口送至出风口；

[0007] 发热元件，设置于所述风叶的出风部位；

[0008] 手柄，连接在所述壳体上，该手柄上设置有控制所述电动机停转和控制所述发热元件通断电的开关组件；

[0009] 其特征在于：所述电机、风叶和发热元件安装在所述的手柄内，所述壳体为由内、外侧壁形成有中空环形内腔的筒体，所述进风口位于所述壳体的外侧壁上并与所述中空环形内腔相连通，所述手柄上开设有和所述进风口相连通的进风槽；并且所述壳体的外侧壁一端和该壳体的内侧壁之间完全封闭连接，所述壳体的外侧壁另一端沿该壳体的轴线向内翻折并和所述壳体的内侧壁相应端之间成间隔、叠加的错位结构而形成环形缝隙，所述环形缝隙即为所述壳体的出风口。

[0010] 所述壳体的横截面可以为各种形状，作为优选，所述壳体的横截面以呈圆形或椭圆形为佳。

[0011] 为了实现风叶的转动，作为优选，所述电动机设置于所述手柄内，所述风叶中心开设有传动轴孔，所述电动机的输出轴和所述风叶的传动轴孔固定相连。

[0012] 为了实现手柄和壳体之间的连接，作为进一步优选，所述手柄包括有轴颈，所述风

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叶容置于该轴颈内，所述壳体在所述进风口设置有能和所述轴颈相配合连接的凸颈，所述手柄拆卸连接于所述凸颈中。

[0013] 手柄可以插接固定于壳体内，也可以通过螺钉或螺栓的方式相连，为了提高连接可靠性并且方便手柄和壳体之间的装配拆卸，作为优选，所述轴颈上开设有第一连接孔，所述凸颈上开设有和所述第一连接孔相对应的第二连接孔，所述壳体和手柄之间通过穿设于所述第一连接孔和第二连接孔内的螺钉固定连接。

[0014] 与现有技术相比，本实用新型的优点在于：采用环形缝隙结构的风出口，与传统横向贯通的直筒形风出口相比，本实用新型的环形出风口所围绕的圆环直径比传统吹风机的出风口直径大得多，气流覆盖的面积更广，出风效率高；进风口和出风口为相互垂直设置，进入吹风机的风经过中空环形内腔的作用，能够获得较高速度的气流，通过环形缝隙吹出的风力更加柔和、均匀，从而让使用者感到更加舒适、安全。

附图说明

[0015] 图 1 为本实用新型实施例的立体结构示意图。

[0016] 图 2 为本实用新型实施例的立体分解图。

[0017] 图 3 为本实用新型实施例的剖视图。

[0018] 图 4 为图 3 所示的机壳剖视图。

具体实施方式

[0019] 以下结合附图实施例对本实用新型作进一步详细描述。

[0020] 如图 1 ～图 4 所示，本实施例的吹风机为一种环流式吹风机，该吹风机包括有壳体 1、风叶 2、电动机 3、发热元件 4 和手柄 5，其中，发热元件 4、风叶 2 和电动机 3 设置于手柄 5 中，手柄 5 上还设置有控制电动机 3 停转以及控制发热元件 4 电源通断的开关组件 6。

[0021] 本实施例的出风口结构和出风方式不同于传统的吹风机，本实施例吹风机的壳体 1 为一个具有中空环形内腔 11 的筒体，它横卧在手柄 5 的上方，该壳体 1 的中空环形内腔 11 由壳体 1 的外侧壁 111 和内侧壁 112 围成，壳体 1 的横截面可以为呈圆形或椭圆形的环形截面，其中，壳体 1 的外侧壁 111 底部沿垂直方向开设有进风口 121，该进风口 121 处还形成有能与手柄 5 配合连接的凸颈 12，壳体 1 的外侧壁 111 一端和壳体 1 的内侧壁 112 之间完全封闭连接，壳体 1 的外侧壁 111 另一端沿该壳体 1 的轴线向内翻折并和壳体 1 的内侧壁 112 相应端之间成间隔、叠加的错位结构而形成环形缝隙 13，环形缝隙 13 即成为壳体 1 的出风口，并且，壳体 1 的进风口 121、出风口和中空环形内腔 11 之间形成相互连通的通道；

[0022] 手柄 5 的顶部成型有能插入凸颈 12 内的轴颈 51，该轴颈 51 和手柄 5 的握持部之间通过锥形面 52 相连，锥形面 52 上开设有和壳体 1 的进风口 121 相对而设的进风槽 521，风叶 2 容置于手柄 5 的轴颈 51 内，风叶 2 中心开设有传动轴孔 21，电动机 3 设置于手柄 5 的握持部内，电动机 3 的输出轴 31 和风叶 2 的传动轴孔 21 固定相连并驱动风叶 2 旋转，发热元件 4 设置于风叶 2 和出风口之间，发热元件 4 可以采用陶瓷发热元件 4，也可以采用电热丝等其他发热元件 4。

[0023] 手柄 5 和壳体 1 之间为螺纹连接，当然也可以直接紧配插接固定，为了及时获知两

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者连接是否到位，在壳体 1 的凸颈 12 的内壁上还形成有一圈内凸环 122，当手柄 5 的轴颈 51 旋入壳体 1 的凸颈 12 中，轴颈 51 的顶部碰到内凸环 122 时即可。同时为了提高连接可靠性，手柄 5 在轴颈 51 的周壁上开设有第一连接孔 511，壳体 1 的凸颈 12 在周壁上开设有和第一连接孔 511 相对应的第二连接孔 123，壳体 1 和手柄 5 之间可以通过穿设于第一连接孔 511 和第二连接孔 123 内的螺钉（螺栓或铆钉）固定连接。

[0024] 本实施例吹风机的进风口 121 和出风口相互垂直设置，进风口 121、出风口和壳体 1 一体成型，使用时无需另外安装风嘴，结构简单；另外，为了防止壳体 1 过热，壳体 1 可以采用耐高温材料制成，既确保使用安全，又能够减少热量散发，提高气流温度。使用时，风从底部进入壳体 1 后再经过中空环形内腔 11 从环形缝隙 13 中吹出，由于出风口为环形缝隙 13 结构，使得出风口所围成的环形直径比传统出风口的直径大得多，不但气流的速度高，而且气流覆盖的面积更广，提高了出风效率，而且，从环形缝隙 13 出风口吹出的风力和热力也更加均匀、柔和，进一步改善了产品性能，提高了使用舒适度和安全性。

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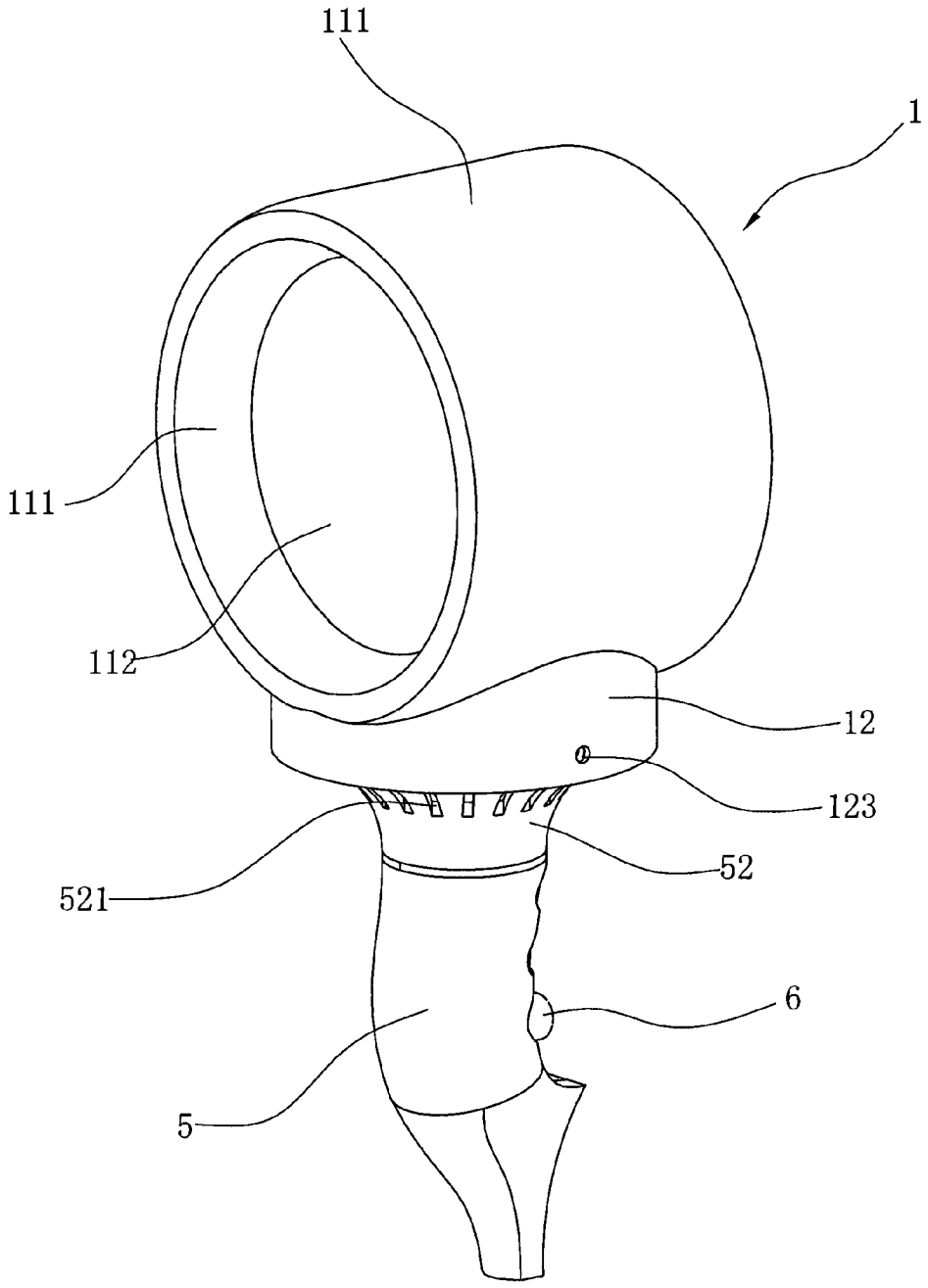


图 1

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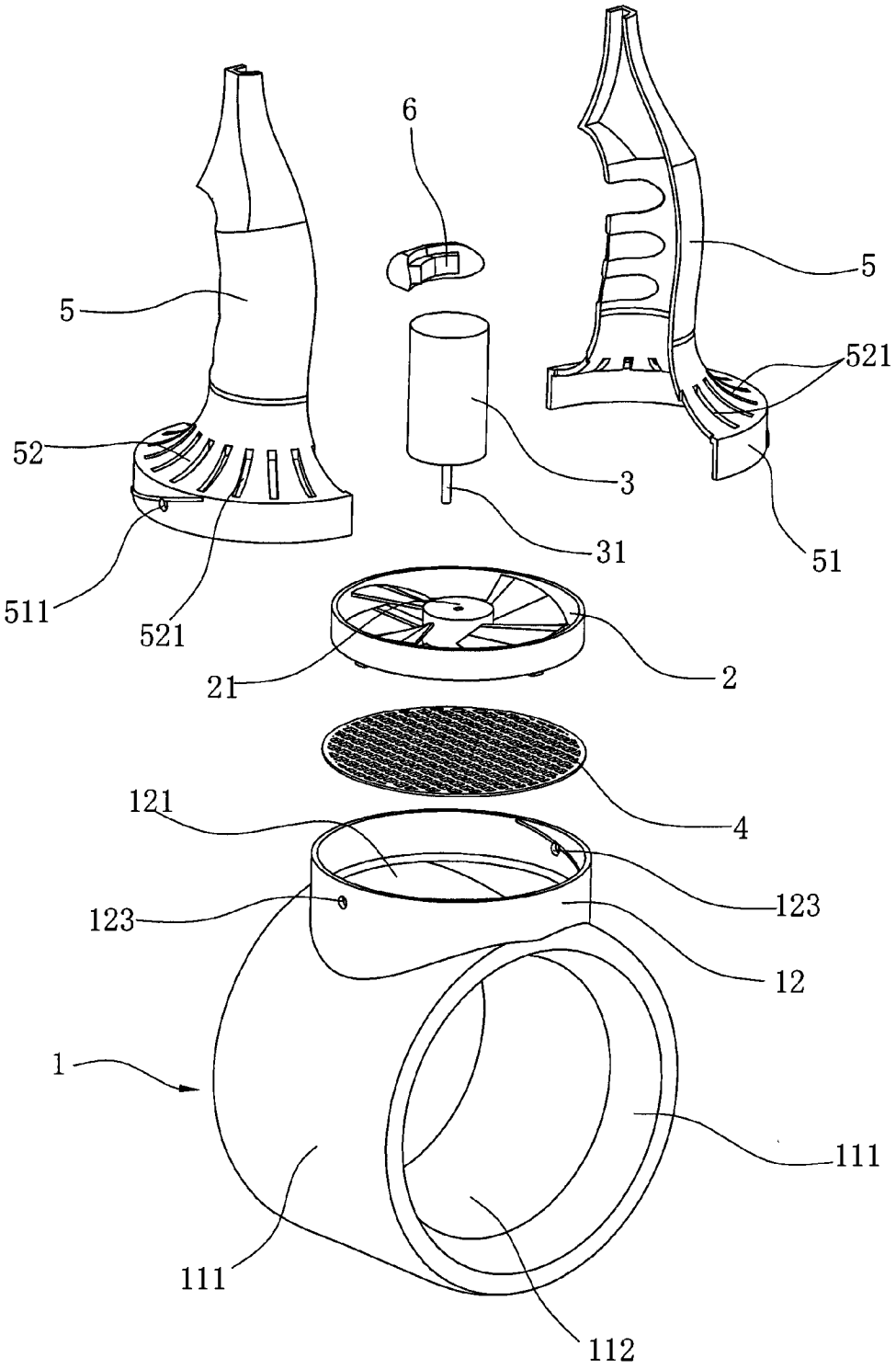


图 2

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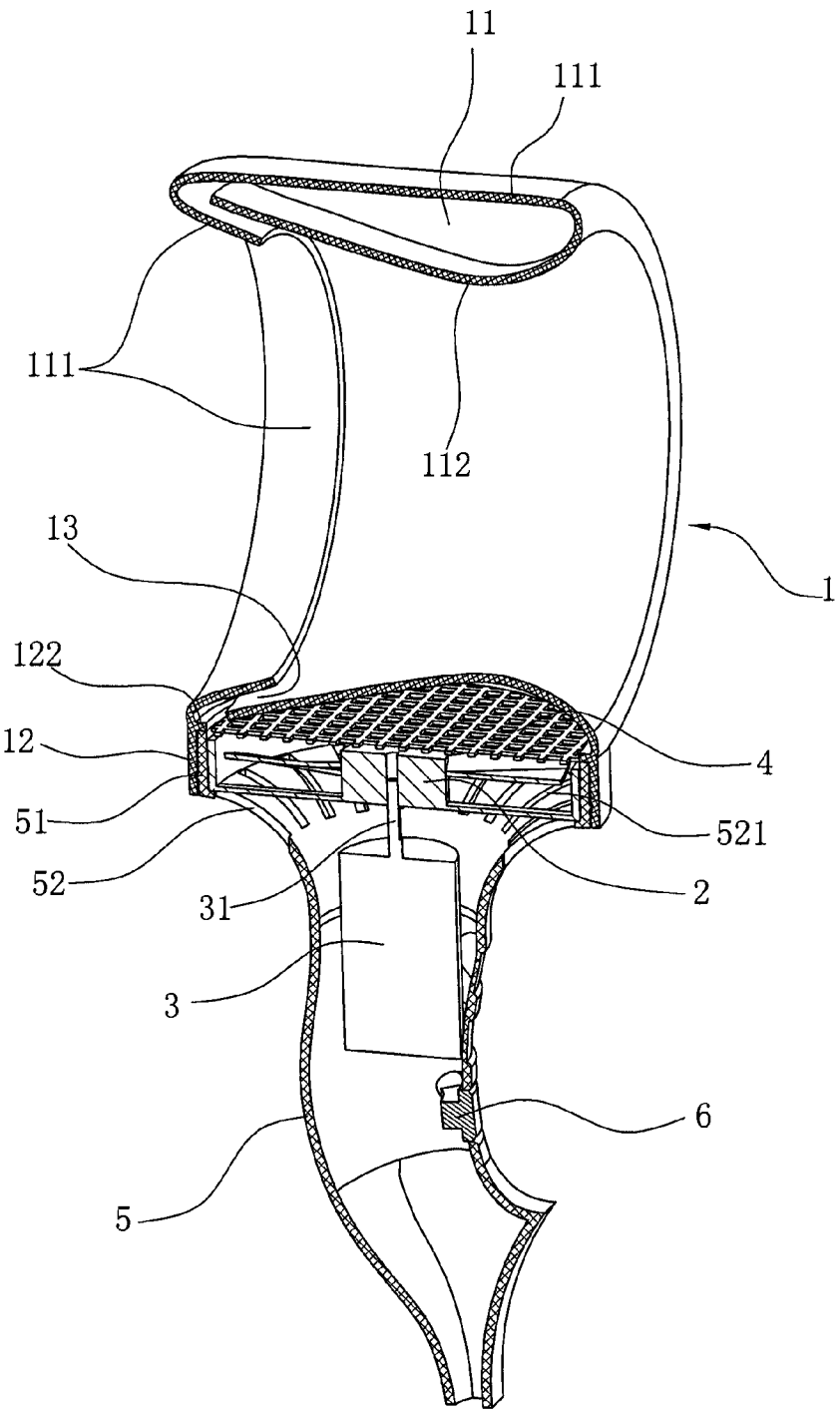


图 3

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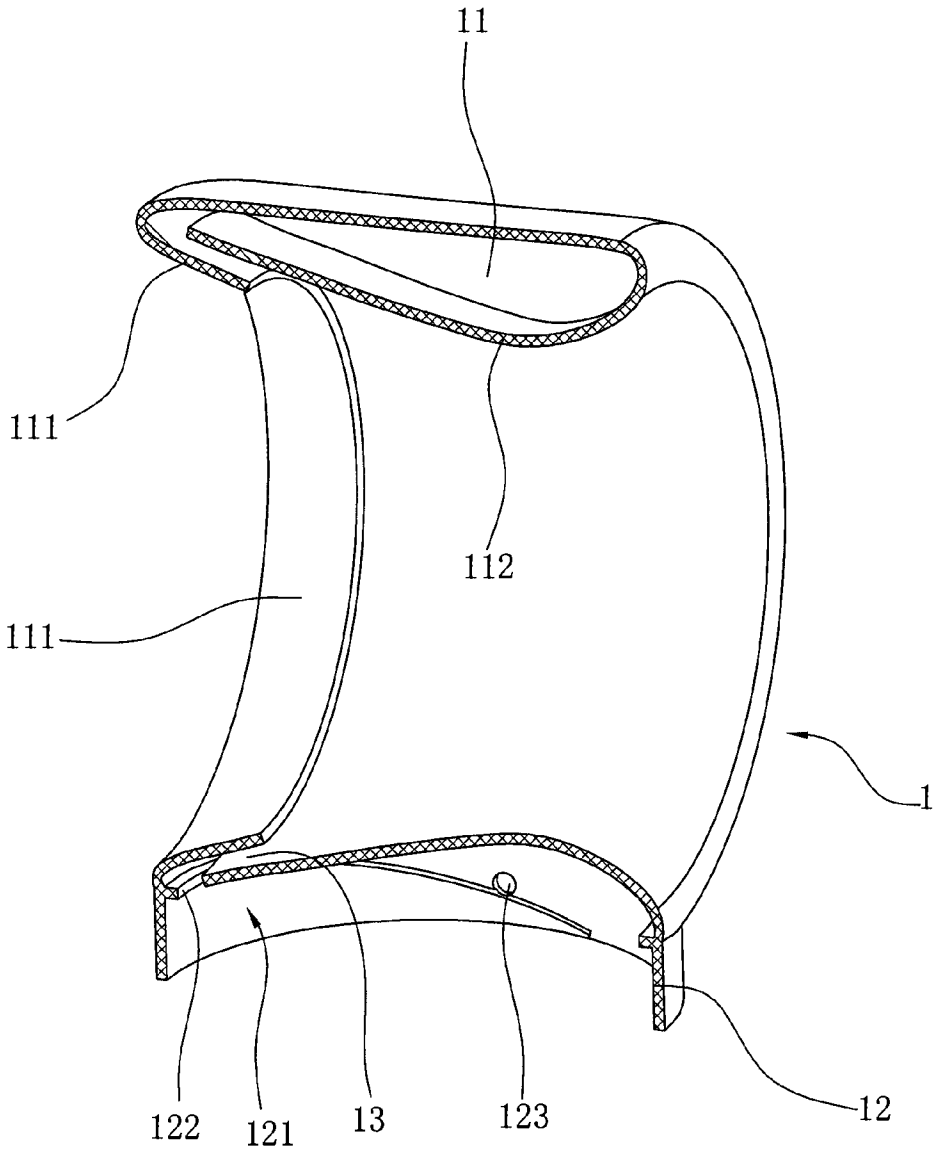


图 4

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OPD - 2010-08-26

TI - VACUUM CLEANER AND METHOD FOR MANUFACTURING THE SAME

AB - PROBLEM TO BE SOLVED: To provide a method for manufacturing a vacuum cleaner which can reduce in number of manufacturing steps while preventing deterioration in vibration-proof performance and airtight performance.

- SOLUTION: The method for manufacturing a vacuum cleaner 1 in which an electric fan 6 covered with a fan case 9 having an inlet port 9a provided in an end face 9d, is arranged in a body 2, includes: a housing 16 formed into a cup shape with an opening face and having a hole part 16a opposite to the opening face, a cushion body 18 having an annular part 18a and a plurality of projection parts 18b projecting radially from the annular part 18a. The method includes the steps of: holding the electric fan 6 in the housing 16 by elasticity of the projection parts 18b bent toward the annular part 18a held the peripheral surface of the fan case 9 and the peripheral wall of the housing 16 after inserting the end face 9d of the fan case 9 interleaved with the annular part 18a into the opening face of the housing 16 the end face 9d of the fan case 9 is inserted into the opening face of the housing 16; and mounting the housing holding the electric fan 6 in the body 2.

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AN - JP-2010190134-A

AP - JP20100190134 20100826

FI - A47L9/22

FT - 3B057/AA03; 3B057/AA12; 3B057/AA14; 3B057/AA24; 3B057/AA27; 3B057/DE01

PA - SHARP KK

PR - JP20100190134 20100826

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PN - JP2012045178 A 20120308 DW201218

TI - Manufacturing method of vacuum cleaner, involves holding electric blower at device housing with elasticity of protruding pieces of buffer, and bending with respect to annular portion of buffer

OPD - 2010-08-26

AB - NOVELTY :

The end surface of the fan case is pressed in a cup-shaped housing on both sides of the annular portion (18a) of the buffer (18) equipped in the opposing surface of the opening surface of device housing. The electric blower is held at the housing with the elasticity of the protruding pieces (18b) pinched between the surrounding surface of the fan case and the surrounding wall of the housing, and bent with respect to the annular portion. The housing that holds the electric blower is attached to the device housing.

- DETAILED DESCRIPTION :

An INDEPENDENT CLAIM is included for vacuum cleaner.

- USE :

Manufacturing method of vacuum cleaner (claimed).

- ADVANTAGE :

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The electric blower can be easily mounted with the housing and the buffer, as any position deviation of the buffer can be corrected easily. Thus, the number of processes involved in the manufacture of the vacuum cleaner can be reduced. The fall of the anti-vibration performance by buffer changing in quality with an adhesive agent or air leakage efficiency can be prevented, since the buffer does not adhere.

- DESCRIPTION OF DRAWINGS :

The drawing shows a top view of the buffer provided in the vacuum cleaner.

18 : Buffer

18a : Annular portion

18b : Protruding pieces

IW - MANUFACTURE METHOD VACUUM CLEAN HOLD ELECTRIC BLOW DEVICE HOUSING ELASTIC PROTRUDE PIECE BUFFER BEND RESPECT ANNULAR PORTION

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IN - HORIMOTO S

ICAI - A47L9/22

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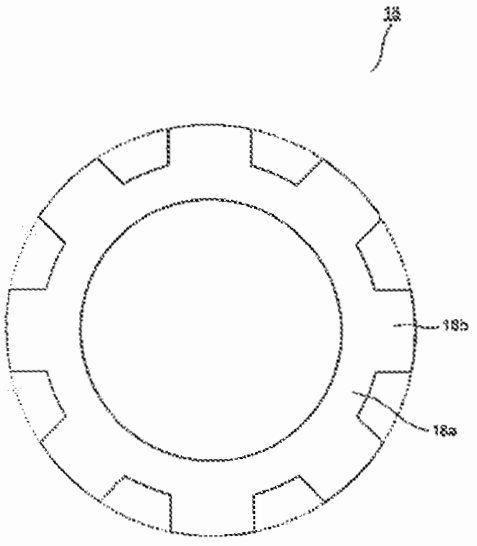
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Fターム(参考)　3B057 AA03 AA12 AA14 AA24 AA27
DB01

(54)【発明の名称】電気掃除機及びその製造方法

(57)【要約】
【課題】製造工数を削減するとともに防振性能や気密性能の低下を防止できる電気掃除機の製造方法を提供する。
【解決手段】吸気口９ａを端面９ｄに開口したファンケース９により覆われる電動送風機６を本体部２に配置した電気掃除機１の製造方法において、開口面を有するカップ状に形成されるとともに該開口面の対向面に孔部１６ａを有するハウジング１６と、環状の環状部１８ａと環状部１８ａから放射状に突出する複数の突出部１８ｂとを有する緩衝体１８とを備え、環状部１８ａを挟んでファンケース９の端面９ｄをハウジング１６の開口面に押入し、ファンケース９の周面とハウジング１６の周壁との間に挟まれて環状部１８ａに対して折曲した突出部１８ｂの弾性によって電動送風機６をハウジング１６に保持する工程と、電動送風機６を保持したハウジング１６を本体部２に取り付ける工程とを設けた。
【選択図】図４



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【特許請求の範囲】
【請求項１】
塵埃を集塵する集塵部を備えた本体部内に、吸気口を一端面に開口したファンケースにより覆われる電動送風機を配置した電気掃除機の製造方法において、一面に開口面を有するカップ状に形成されるとともに前記開口面の対向面に孔部を有するハウジングと、環状の環状部と前記環状部から放射状に突出する複数の突出部とを有する緩衝体とを備え、
前記環状部を挟んで前記ファンケースの前記端面を前記ハウジングの前記開口面に押入し、前記ファンケースの周面と前記ハウジングの周壁との間に挟まれて前記環状部に対して折曲した前記突出部の弾性によって前記電動送風機を前記ハウジングに保持する工程と、
前記電動送風機を保持した前記ハウジングを前記本体部に取り付ける工程と、
を設けたことを特徴とする電気掃除機の製造方法。
【請求項２】
前記ファンケースが前記吸気口の周囲に突出する突起部を有し、前記環状部を前記突起部に嵌合させて前記ファンケースを前記ハウジングに押入したことを特徴とする請求項１に記載の電気掃除機の製造方法。
【請求項３】
前記突出部を３箇所以上に設け、周方向に等間隔に配置したことを特徴とする請求項１または請求項２に記載の電気掃除機の製造方法。
【請求項４】
前記突出部の面積の合計が前記突出部間の空間の面積の合計よりも大きいことを特徴とする請求項３に記載の電気掃除機の製造方法。
【請求項５】
塵埃を集塵する集塵部を備えた本体部内に、吸気口を一端面に開口したファンケースにより覆われる電動送風機を配置した電気掃除機において、一面に開口面を有するカップ状に形成されるとともに前記開口面の対向面に孔部を有するハウジングと、環状の環状部と前記環状部から放射状に突出する複数の突出部とを有する緩衝体とを備え、
前記環状部を挟んで前記ファンケースの前記端面を前記ハウジングの前記開口面に押入し、前記ファンケースの周面と前記ハウジングの周壁との間に挟まれて前記環状部に対して折曲した前記突出部の弾性によって前記電動送風機を前記ハウジングに保持したことを特徴とする電気掃除機。
【発明の詳細な説明】
【技術分野】
【０００１】
本発明は、本体部内に電動送風機を備えた電気掃除機及びその製造方法に関する。
【背景技術】
【０００２】
従来の電気掃除機は特許文献１に開示されている。この電気掃除機は本体部の前部に塵埃を集塵する集塵部が設けられ、集塵部の後方に電動送風機が配される。電動送風機はファン及びモータをファンケースにより覆って構成される。ファンケースの前面には集塵部に臨む吸気口が開口し、周面には排気口が開口する。
【０００３】
電動送風機の駆動によって集塵部内に負圧が発生し、塵埃を含む気流が集塵部に流入する。塵埃は集塵部で集塵され、塵埃を除去された気流が吸気口からファンケースに流入して排気口から排気される。
【０００４】
ファンケースの前部には合成ゴムや発泡樹脂等の緩衝体が接着される。緩衝体は吸気口の周囲に接着される環状部と、ファンケースの周面に接着される帯状部とを有している。帯状部は本体部内に設けられる環状の支持片に嵌合し、電動送風機が緩衝保持される。これにより、緩衝体によって電動送風機の振動吸収及び気流路の気密性向上が図られる。

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【先行技術文献】
【特許文献】
【０００５】
【特許文献１】特開平８－１５４８７６号公報（第２頁－第３頁、第１図）
【発明の概要】
【発明が解決しようとする課題】
【０００６】
上記従来の電気掃除機によると、電動送風機のファンケースに緩衝体を接着した後、電動送風機が本体部に取り付けられる。しかしながら、緩衝体の接着位置がずれると位置修正できないため接着作業を慎重に行う必要があり、電気掃除機の製造工数が大きくなる問題があった。また、接着剤によって緩衝体が変質して緩衝体の防振性能や気密性能が低下する問題もあった。
【０００７】
本発明は、製造工数を削減するとともに防振性能や気密性能の低下を防止できる電気掃除機及びその製造方法を提供することを目的とする。
【課題を解決するための手段】
【０００８】
上記目的を達成するために本発明は、塵埃を集塵する集塵部を備えた本体部内に、吸気口を一端面に開口したファンケースにより覆われる電動送風機を配置した電気掃除機の製造方法において、一面に開口面を有するカップ状に形成されるとともに前記開口面の対向面に孔部を有するハウジングと、環状の環状部と前記環状部から放射状に突出する複数の突出部とを有する緩衝体とを備え、
前記環状部を挟んで前記ファンケースの前記端面を前記ハウジングの前記開口面に押入し、前記ファンケースの周面と前記ハウジングの周壁との間に挟まれて前記環状部に対して折曲した前記突出部の弾性によって前記電動送風機を前記ハウジングに保持する工程と、
前記電動送風機を保持した前記ハウジングを前記本体部に取り付ける工程と、
を設けたことを特徴としている。
【０００９】
この構成によると、電動送風機がファンケースにより覆われ、ファンケースの吸気口を開口した端面が緩衝体の環状部を挟んでカップ状のハウジングの開口面に押入される。これにより、緩衝体の突出部が折曲され、ファンケースの周面とハウジングの周壁との間に挟まれて電動送風機がハウジングに保持される。そして、電動送風機を保持したハウジングが本体部に取り付けられる。電動送風機の駆動によって集塵部に負圧が発生し、塵埃を含む気流が集塵部に流入する。塵埃は集塵部で集塵され、塵埃を除去された気流が孔部及び吸気口を介してファンケース内に流入して排気される。
【００１０】
また本発明は、上記構成の電気掃除機の製造方法において、前記ファンケースが前記吸気口の周囲に突出する突起部を有し、前記環状部を前記突起部に嵌合させて前記ファンケースを前記ハウジングに押入したことを特徴としている。
【００１１】
また本発明は、上記構成の電気掃除機の製造方法において、前記突出部を３箇所以上に設け、周方向に等間隔に配置したことを特徴としている。
【００１２】
また本発明は、上記構成の電気掃除機の製造方法において、前記突出部の面積の合計が前記突出部間の空間の面積の合計よりも大きいことを特徴としている。
【００１３】
また本発明は、塵埃を集塵する集塵部を備えた本体部内に、吸気口を一端面に開口したファンケースにより覆われる電動送風機を配置した電気掃除機において、底面に孔部を有したカップ状に形成されるとともに前記本体部に取り付けられるハウジングと、環状の環

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状部と前記環状部から放射状に突出する複数の突出部とを有する緩衝体とを備え、
前記環状部を挟んで前記ファンケースの前記端面を前記ハウジングに押入し、前記ファンケースの周面と前記ハウジングの周壁との間に挟まれて前記環状部に対して折曲した前記突出部の弾性によって前記電動送風機を前記ハウジングに保持したことを特徴としている。

【発明の効果】

【００１４】

本発明によると、緩衝体の環状部を挟んでファンケースの端面をカップ状のハウジングに押入し、ファンケースの周面とハウジングの周壁との間に挟まれて環状部に対して折曲した突出部の弾性によって電動送風機がハウジングに保持される。そして、電動送風機を保持したハウジングが本体部に取り付けられる。これにより、緩衝体の装着位置がずれても位置修正ができるため、ハウジング及び緩衝体を容易に電動送風機に装着することができる。従って、電気掃除機の製造工数を削減することができる。また、従来例のように緩衝体が接着されないため、緩衝体が接着剤により変質することによる防振性能や気密性能の低下を防止することができる。

【図面の簡単な説明】

【００１５】

【図１】本発明の実施形態の電気掃除機を示す斜視図
【図２】本発明の実施形態の電気掃除機の本体部を示す側面断面図
【図３】本発明の実施形態の電気掃除機の電動送風機を示す概略側面断面図
【図４】本発明の実施形態の電気掃除機の緩衝体を示す平面図

【発明を実施するための形態】

【００１６】

以下に本発明の実施形態を図面を参照して説明する。図１は一実施形態の電気掃除機を示す斜視図である。電気掃除機１は電動送風機６（図２参照）を内装する本体部２を備えている。本体部２の背面には引き出し及び収納が可能な電源コード８が設けられる。電源コード８は電源プラグ９を先端に有し、商用電源のコンセントに差し込んで本体部２に電力供給される。

【００１７】

本体部２の前面には可撓性の接続ホース３が接続され、接続ホース３の先端には延長パイプ４が接続される。延長パイプ４の先端には床面に対峙する吸込口（不図示）を有した吸込口体５が設けられる。また、延長パイプ４にはパイプ把持部１３及び操作部１４が設けられる。使用者により操作部１４を操作して掃除運転が実行され、パイプ把持部１３を把持して吸込口体５を移動させる。

【００１８】

図２は本体部２の側面断面図を示している。本体部２は本体カバー１０により覆われる。本体カバー１０の前面には接続ホース３（図１参照）を接続する接続口１０ａが開口し、背面には排気口１０ｂが開口する。

【００１９】

本体部２０の前部には塵埃を集塵する集塵部２０が配される。集塵部２０は集塵容器２２及びフィルタ３７を備え、把持部４１を把持して本体カバー１０から着脱自在に形成される。集塵容器２２の周面には接続口１０ａに連通する流入口２２ａが設けられる。流入口２２ａは集塵容器２２内に旋回気流を形成するように気流を流入させる。集塵部２０の上部には背面に集塵部排気口４２ａを開口する排気流路４２が設けられる。

【００２０】

本体部２の後部には電動送風機６が配される。図３は電動送風機６の概略側面断面図を示している。電動送風機６はモータ７のモータ軸７ａに羽根車８が接続され、ファンケース９により覆われる。羽根車８を収納するファンケース９の上部はモータ７を収納する下部に対して径方向に大きく形成される。ファンケース９の軸方向の端面９ｄには吸気口９ａが開口し、下部の周面９ｅには排気口９ｂが開口する。また、吸気口９ａの周囲には環

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状の突起部９ｃが突設される。

【００２１】

前述の図２において、電動送風機６の上部には緩衝体１８を介して開口面を下方に配したカップ状のハウジング１６が被嵌される。ハウジング１６は開口面の対向面（上面）に孔部１６ａが設けられる。ハウジング１６の前部には本体カバー１０の内面に設けたリブ１０ｄに係合する係合部１６ｂが形成される。ハウジング１６の後部には本体カバー１０にネジ止めされるネジ部１６ｃが形成される。尚、孔部１６ａと集塵部排気口４２ａとを連結するダクト１５が本体部２内に設けられる。

【００２２】

ハウジング１６には電動送風機６の下方を覆うハウジング１７が係着される。ハウジング１７は電動送風機６の下端を支持し、前部に設けた係合部１７ａが本体カバー１０の内面に係合する。

【００２３】

図４は緩衝体１８の平面図を示している。緩衝体１８はクロロプレンゴム等の合成ゴムや発泡樹脂等によって形成される。緩衝体１８は環状の環状部１８ａと、環状部１８ａから放射状に突出する複数の突出部１８ｂとを備えている。環状部１８ａの内径はファンケース９の突起部９ｃ（図３参照）に嵌合する大きさに形成される。本実施形態では８箇所の突出部１８ｂを周方向に等間隔に設けている。この時、突出部１８ｂの合計の面積が突出部１８ｂ間の空間の面積の合計よりも大きく形成される。

【００２４】

電動送風機６は緩衝体１８の環状部１８ａを突起部９ｃに嵌合し、環状部１８ａを挟んで端面９ｄ（図３参照）がハウジング１６の開口面に押入される。これにより、緩衝体１８の突出部１８ｂが折曲され、ファンケース９の周面とハウジング１６の周壁との間に挟まれる。また、環状部１８ａがハウジング１６の内面に当接する。これにより、電動送風機６が環状部１８ａ及び突出部１８ｂの弾性によってハウジング１６に緩衝保持される。

【００２５】

次に、ハウジング１６にハウジング１７が係着される。そして、電動送風機６を保持したハウジング１６、１７が係合部１６ｂ、１７ａの係合及びネジ部１６ｃのネジ止めによって本体部２に取り付けられる。これにより、電動送風機６が本体部２内に装着され、緩衝体１８によって電動送風機６の振動吸収及び気流路の気密性向上が図られる。

【００２６】

上記構成の電気掃除機１において、電動送風機６の駆動によって集塵部２０に負圧が発生し、吸込口体５から床面の塵埃が吸い込まれて延長パイプ４及び接続ホース３を流通する。塵埃を含む気流は接続口１０ａ及び流入口２２ａを介して集塵部２０の集塵容器２２に流入し、集塵容器２２内に旋回気流を形成する。旋回気流の遠心力によって気流に含まれる比較的大きな塵埃が除去され、集塵容器２２内に堆積する。

【００２７】

大きな塵埃が除去された気流は上昇し、フィルタ３７により細かい塵埃が捕集される。フィルタ３７を通過した気流は排気流路４２を流通し、集塵部排気口４２ａを介して集塵部２０から流出する。集塵部２０から流出した気流はダクト１５を流通し、電動送風機６を介して排気口１０ｂから排気される。

【００２８】

本実施形態によると、緩衝体１８の環状部１８ａを挟んでファンケース９の端面９ｄがカップ状のハウジング１６に押入される。これにより、ファンケース９の周面とハウジング１６の周壁との間に挟まれて環状部１８ａに対して折曲した突出部１８ｂの弾性によって電動送風機６がハウジング１６により保持される。そして、ハウジング１６が本体部２に取り付けられ、電動送風機６が本体部２に装着される。

【００２９】

これにより、緩衝体１８の装着位置がずれてもハウジング１６を外して位置修正ができるため、ハウジング１６及び緩衝体１８を容易に電動送風機６に装着することができる。

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従って、電気掃除機１の製造工数を削減することができる。また、従来例のように緩衝体１８が接着されないため、緩衝体１８が接着剤により変質することによる防振性能や気密性能の低下を防止することができる。

【００３０】

また、ファンケース９の吸気口９ａの周囲に突出する突起部９ｃに環状部１８ａを嵌合させてファンケース９をハウジング１６に押入するので、緩衝体１８を容易に位置決めして作業性を向上することができる。

【００３１】

また、緩衝体１８の突出部１８ｂが８箇所に設けられ、周方向に等間隔に配置されるので、電動送風機６を安定して保持することができる。尚、突出部１８ｂが３箇所以上に設けられていれば、電動送風機６を安定して保持することができる。

【００３２】

また、突出部１８ｂの面積の合計が突出部１８ｂ間の空間の面積の合計よりも大きいので、電動送風機６をより安定して保持できるとともに防振性能を向上させることができる。

【００３３】

本実施形態において、電気掃除機１が電動送風機６を内装する本体部２に吸込口体５が接続ホース３を介して接続されるキャニスター型に形成されるが、本体部２に吸込口体５を一体に設けた縦型の電気掃除機であってもよい。

【産業上の利用可能性】

【００３４】

本発明によると、電動送風機を備えた電気掃除機に利用することができる。

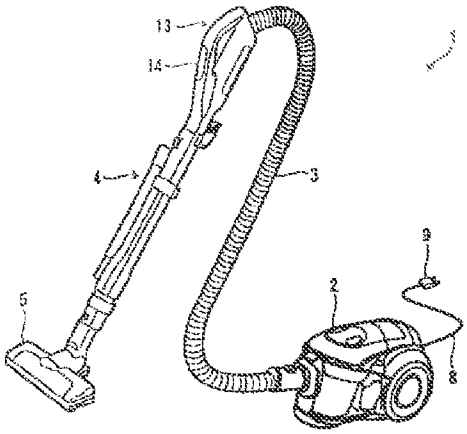
【符号の説明】

【００３５】

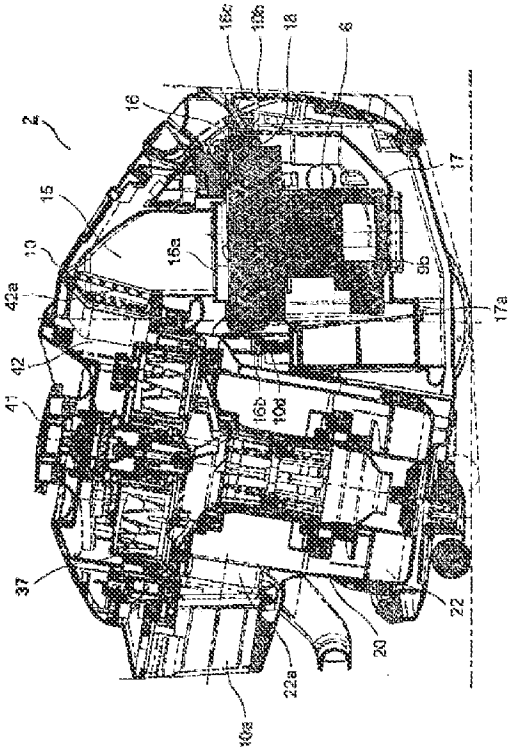
１　電気掃除機
２　本体部
３　接続ホース
４　延長パイプ
５　吸込口体
６　電動送風機
９　ファンケース
１０　本体カバー
１６、１７　ハウジング
１８　緩衝体
１８ａ　環状部
１８ｂ　突出部
１９　集塵室
２０　集塵部
２２　集塵容器
２２ａ　流入口
４２　排気流路
４２ａ　集塵部排気口

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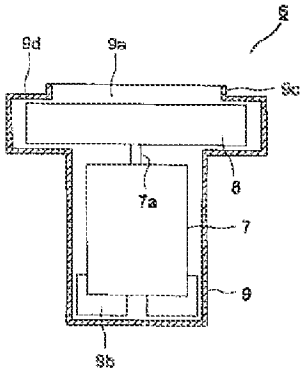
【図１】



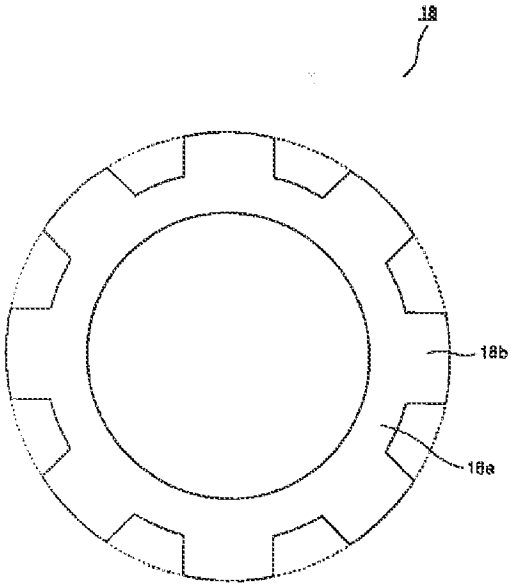
【図２】



【図３】



【図４】



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(54) Title : COMPACT HAIR DRYER AND REMOVABLE BARREL EXTENSION

(54) Titre : Sèche-cheveux compact et prolongateur amovible

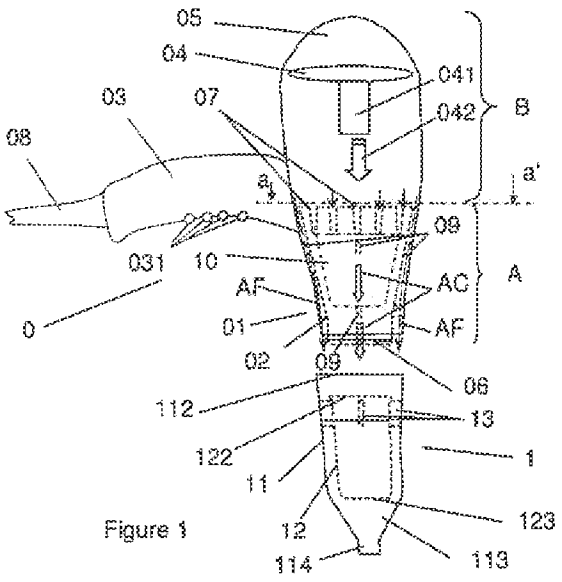


Figure 1

(57) Abstract : The invention relates to a compact hair dryer (0) comprising at least one main body having a front portion (A) and a rear portion. The hair dryer (0) comprises a front portion (A) comprising a first duct (01) surrounding a second duct (02), the air flow (AC) passing through the second duct being heated by a heating means (10), the air flow (AF) passing through the space between the first (01) and second (02) ducts being insulated from the heated air flow (AC) in the second duct (02). The second duct (02) is shaped like a truncated cone of revolution, wherein a distribution means is arranged at the base (022) of the cone such as to determine the amount of air flow (AF) passing through the space between the first (01) and second (02) ducts. A barrel extension comprising at least one peripheral tube (11) surrounding a central tube (12) can be connected to the outlet of the hair dryer (0). The second duct (02) of the hair dryer, at the air outlet (06) of the hair dryer (0), is arranged such as to be able to connect to the central tube (12) of a barrel extension (1).

(57) Abrégé : L'invention concerne un sèche-cheveux (0) compact comportant au moins un corps principal

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présentant une partie avant (A) et une partie arrière. Le sèche-cheveux (0) comporte une partie avant (A) comportant un premier conduit (01) entourant un deuxième conduit (02), le flux (AC) d'air traversant le deuxième conduit étant chauffé par un moyen (10) de chauffage, le flux (AF) d'air traversant l'espace entre le premier (01) et le deuxième (02) conduit étant isolé du flux (AC) d'air chauffé dans le deuxième conduit (02). Le deuxième conduit (02) a la forme d'un cône de révolution tronqué, des moyens de répartition étant agencés à la base (022) du cône pour déterminer la quantité de flux (AF) d'air traversant l'espace entre le premier (01) et le deuxième (02) conduit. Un prolongateur comportant au moins un tube (1 1) périphérique entourant un tube (12) central peut se raccorder à la sortie du sèche-cheveux (0). Le deuxième conduit (02) du sèche-cheveux, à la sortie (06) d'air du sèche-cheveux (0), est agencé pour pouvoir se raccorder au tube (12) central d'un prolongateur (1).

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Sèche-cheveux compact et prolongateur amovible

La présente invention concerne le domaine de la coiffure. La présente invention propose plus particulièrement un sèche-cheveux compact et ergonomique.

Un sèche-cheveux comporte habituellement un corps principal et une poignée fixée au corps principal. Un flux d'air frais est aspiré par une entrée d'air agencée dans la partie arrière du corps principal pour être chauffé par un système de chauffage et être canalisé vers la partie avant du corps principal ayant généralement une forme générale de révolution et comportant une sortie d'air. La sortie d'air est généralement munie à son extrémité d'un embout. Certains sèche-cheveux sont dits sèche-cheveux compacts qui ont des dimensions réduites les rendant plus faciles d'utilisation, comme par exemple une longueur de l'ordre de la largeur totale de deux mains côte à côte et/ou une partie avant de longueur de l'ordre de la largeur d'une main avec une partie arrière généralement de longueur encore plus restreinte. Cette configuration plus ergonomique a plusieurs avantages. Elle permet d'abord d'utiliser moins de matière et par conséquent d'être plus léger que les sèche-cheveux non compacts. De plus, comme la distance entre la poignée et la sortie d'air est petite, son utilisation en est moins difficile et plus précise car la distance entre la main qui maintien le sèche-cheveux par la poignée et les cheveux peut être plus courte. Par exemple, l'utilisateur du sèche-cheveux n'aura pas à tendre le bras excessivement pour l'utiliser pour se sécher les cheveux. De même, le professionnel de la coiffure sera plus précis s'il a la possibilité de pouvoir tenir le sèche-cheveux par la poignée proche des cheveux de la personne à coiffer. D'ailleurs, de nombreux coiffeurs ont l'habitude pour des raisons pratiques de tenir le sèche-cheveux par la partie avant du sèche-cheveux entre la poignée et la sortie d'air, souvent pour réduire les troubles musculo-squelettiques et la difficulté de tenir le sèche-cheveux pendant des heures et/ou pour permettre plus de précision. Or, la distance entre la sortie d'air et la poignée pour un sèche-

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cheveux compact est généralement plus petite que la largeur de la main du coiffeur dont une partie peut alors se trouver sur le chemin du flux d'air sortant du sèche-cheveux. L'air d'un sèche-cheveux pouvant être très chaud, la partie de la main sur le chemin du flux d'air sortant risque d'être brûlée. Même si la main n'est pas sur le chemin du flux d'air sortant, si l'utilisateur tient le sèche-cheveux par la partie avant, la coque du sèche-cheveux est en général trop chaude à cet endroit pour être tenu à main nue.

La présente invention a donc pour objet de pallier un ou plusieurs des inconvénients de l'art antérieur en proposant un sèche-cheveux compact permettant sa préhension par sa partie avant sans risque de se brûler.

À cet effet, l'invention concerne un sèche-cheveux compact, caractérisé en ce qu'il comporte au moins un corps principal présentant une partie avant et une partie arrière et contenant un moteur entrainant un dispositif produisant un flux d'air, aspiré par une entrée d'air agencée dans la partie arrière, le flux d'air étant canalisé dans la partie avant du corps principal vers une sortie d'air agencée dans la partie avant, la partie avant comportant un premier conduit entourant un deuxième conduit, les conduits étant traversés par le flux d'air, la partie du flux d'air traversant le deuxième conduit étant chauffé par un moyen de chauffage, la sortie d'air du sèche-cheveux étant prolongée par un prolongateur comportant au moins un tube périphérique préhensible entourant un tube central, chaque tube comportant une extrémité d'entrée et une extrémité libre, au moins l'extrémité d'entrée du tube central étant agencée selon une forme complémentaire à l'extrémité du deuxième conduit du sèche-cheveux pour pouvoir se raccorder au deuxième conduit du sèche-cheveux.

Selon une autre particularité, le deuxième conduit a la forme d'un cône de révolution tronqué, une pluralité de fentes longitudinales étant répartie à la base du cône pour permettre le passage d'une partie du flux d'air.

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Selon une autre particularité, le prolongateur a une longueur supérieure ou égale à la largeur de deux ou trois doigts et inférieure ou égale à la largeur de quatre ou cinq doigts.

Selon une autre particularité, le prolongateur est amovible.

Selon une autre particularité, la pluralité fentes longitudinales réparties à la base du cône pour détermine le rapport de quantité d'air entre l'air chauffé traversant le deuxième conduit et l'air non chauffé traversant l'espace entre le premier et le deuxième conduit de telle manière que la quantité de flux d'air traversant l'espace entre le premier et le deuxième conduit soit comprise dans une plage allant de 5% à 20%.

L'invention concerne également un prolongateur pour prolonger la sortie d'air d'un sèche-cheveux, le sèche-cheveux comportant au moins un premier conduit entourant un deuxième conduit, le prolongateur étant caractérisé en ce qu'il comporte au moins un tube périphérique préhensible entourant un tube central, chaque tube comportant une extrémité d'entrée et une extrémité libre, au moins l'extrémité d'entrée du tube central étant agencée selon une forme complémentaire à l'extrémité du deuxième conduit du sèche-cheveux pour pouvoir se raccorder au deuxième conduit du sèche-cheveux soufflant de l'air chaud entouré par le deuxième conduit soufflant de l'air froid.

Selon une autre particularité, le raccordement entre le tube central du prolongateur et le deuxième conduit du sèche-cheveux est un raccordement conique.

Selon une autre particularité, l'extrémité d'entrée du tube périphérique est agencée selon une forme complémentaire à l'extrémité du premier conduit du sèche-cheveux pour pouvoir s'emboîter au premier conduit du sèche-cheveux.

Selon une autre particularité, le tube périphérique est coaxial au tube central.

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Selon une autre particularité, l'extrémité libre du tube périphérique du prolongateur s'étend au-delà de l'extrémité libre de sortie du tube central pour former un concentrateur d'air ou un diffuseur d'air.

Selon une autre particularité, l'extrémité libre du tube central du prolongateur s'étend au-delà de l'extrémité libre de sortie du tube périphérique pour former un concentrateur d'air ou un diffuseur d'air.

Selon une autre particularité, le prolongateur est amovible.

Selon une autre particularité, le prolongateur a une longueur supérieure ou égale à la largeur de deux ou trois doigts et inférieure ou égale à la largeur de quatre ou cinq doigts.

L'invention concerne également un sèche-cheveux comportant au moins un corps principal présentant une partie avant et une partie arrière et contenant un moteur entrainant un dispositif produisant un flux d'air, aspiré par une entrée d'air agencée dans la partie arrière, le flux d'air étant canalisé dans la partie avant du corps principal vers une sortie d'air agencée dans la partie avant, le sèche-cheveux étant caractérisé en ce que la partie avant comporte un premier conduit entourant un deuxième conduit, les conduits étant traversés par le flux d'air, la partie du flux d'air traversant le deuxième conduit étant chauffé par un moyen de chauffage.

Selon une autre particularité, un prolongateur prolonge la sortie d'air du sèche-cheveux, le prolongateur comportant au moins un tube périphérique préhensible entourant un tube central, chaque tube comportant une extrémité d'entrée et une extrémité libre, au moins l'extrémité d'entrée du tube central étant agencée selon une forme complémentaire à l'extrémité du deuxième conduit du sèche-cheveux pour pouvoir se raccorder au deuxième conduit du sèche-cheveux.

L'invention concerne également un sèche-cheveux compact comportant au moins un corps principal présentant une partie avant et une partie arrière et contenant un moteur entrainant un dispositif produisant un flux d'air, aspiré par une entrée d'air agencée dans la partie arrière, le flux

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d'air étant canalisé dans la partie avant du corps principal vers une sortie d'air agencée dans la partie avant, la partie avant comportant un premier conduit entourant un deuxième conduit, une partie du flux d'air, amené par le dispositif produisant un flux d'air, traversant le deuxième conduit étant chauffée par un moyen de chauffage, une autre partie du flux d'air, amené par le dispositif produisant un flux d'air, traversant l'espace entre le premier et le deuxième conduit étant isolée de la partie du flux d'air chauffé dans le deuxième conduit, le sèche-cheveux étant caractérisé en ce que le deuxième conduit comporte au moins une partie ayant la forme d'un cône de révolution tronqué, pour canaliser une partie du flux vers le centre et des moyens de répartition étant agencés à la base du cône pour déterminer la proportion entre, d'une part, la quantité de flux d'air traversant l'espace entre le premier et le deuxième conduit et, d'autre part, celle passant dans le deuxième conduit comportant le moyen de chauffage.

Selon une autre particularité, les moyens de répartition déterminent la proportion entre, d'une part, la quantité de flux d'air traversant l'espace entre le premier et le deuxième conduit et, d'autre part, celle passant dans le deuxième conduit comportant le moyen de chauffage de telle manière que la quantité de flux d'air traversant l'espace entre le premier et le deuxième conduit est comprise dans une plage allant de 5% à 20% du flux d'air amené par le dispositif produisant un flux d'air.

Selon une autre particularité, les moyens de répartition sont au moins une fente longitudinale répartie à la base du cône.

Selon une autre particularité, les moyens de répartition sont au moins un passage annulaire à proximité de la base du cône, le centre de chaque fente annulaire étant compris dans l'axe du cône.

Selon une autre particularité, la pluralité de fentes déterminent la proportion entre, d'une part, la quantité de flux d'air traversant l'espace entre le premier et le deuxième conduit et, d'autre part, celle passant dans le deuxième conduit comportant le moyen de chauffage de telle manière que la

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quantité de flux d'air traversant l'espace entre le premier et le deuxième conduit est comprise dans une plage allant de 5% à 20% du flux d'air amené par le dispositif produisant un flux d'air.

Selon une autre particularité, le diamètre du cercle à la base du cône est ajusté au diamètre intérieur du premier conduit.

Selon une autre particularité, les moyens de répartition sont formés par l'espace agencé entre la base du cône et la surface intérieure du premier conduit, le diamètre du cercle à la base du cône étant inférieur au diamètre intérieur du premier conduit dans la zone la plus proche de la base du cône.

D'autres particularités et avantages de la présente invention apparaîtront plus clairement à la lecture de la description ci-après, faite en référence aux dessins annexés :

- la figure 1 représente une vue de profil schématique du sèche-cheveux et du prolongateur détaché du sèche-cheveux ;
- la figure 1a représente une vue de profil schématique du sèche-cheveux et du prolongateur attaché au sèche-cheveux ;
- la figure 2 représente une vue schématique du sèche-cheveux selon une coupe a-a' ;
- la figure 3 représente une vue schématique de profil du deuxième conduit ;
- la figure 3a représente une vue en perspective du deuxième conduit.

L'invention va être décrite en référence aux figures 1, 1a, 2, 3 et 3a.

La présente invention propose une solution pour la préhension à main nue sans se brûler de la partie avant d'un sèche-cheveux (0), notamment compact.

Dans certains modes de réalisation, le sèche-cheveux (0) comporte au moins un corps principal présentant une partie avant (A) et une partie arrière (B). La partie arrière (B) contient, par exemple, un moteur (041) entrainant un dispositif (04) produisant un flux (042) d'air aspiré par une

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entrée (05) d'air agencée dans la partie arrière (B). Le flux (042) d'air est canalisé dans la partie avant (A) du corps principal vers une sortie (06) d'air agencée dans la partie avant (A). Le sèche-cheveux (0) comporte en outre un moyen (10) de chauffage permettant de chauffer au moins une partie du flux (042) d'air.

Dans certains modes de réalisation, le sèche-cheveux (0) comporte en outre une poignée (03) de préhension, qui de façon non limitative, possède au moins un bouton (031) de marche-arrêt du sèche-cheveux (0). La poignée (08) de préhension comporte aussi, par exemple, un bouton (031) de contrôle de la vitesse du dispositif (04) de production du flux (042) d'air et/ou un bouton (031) marche-arrêt d'un dispositif de production d'ions et/ou un bouton de régulation de la chaleur produit par le moyen (10) de chauffage.

Dans certains modes de réalisation, le sèche-cheveux est compact.

Dans certains de ces modes, la distance entre la poignée et la sortie d'air est courte.

Dans d'autres modes, le sèche-cheveux est agencé de telle manière que le centre de gravité de celui-ci est situé au niveau ou à proximité de la poignée (03).

On comprend donc que la notion de compacité est utilisée ici en référence à la facilité de manipulation du sèche-cheveux qui évite des troubles musculo-squelettiques qu'il soit effectivement court ou non. L'invention propose d'ailleurs un prolongateur qui allonge le sèche-cheveux sans en alourdir la partie avant de façon trop importante et qu'il reste utilisable par la poignée mais surtout le rendant préhensible par l'avant.

Dans certains modes de réalisation, la partie avant (A) du sèche-cheveux (0) comporte un premier conduit (01) entourant un deuxième conduit (02) dont les axes principaux sont parallèles. Le flux (042) d'air produit par le dispositif entrainé par le moteur (041) traverse les conduits et est réparti entre le deuxième conduit (02) et l'espace entre le premier (01) et le deuxième (02) conduit. La partie (AC) du flux d'air traversant le deuxième

conduit (02) est chauffée par un moyen (10) de chauffage, par exemple une résistance chauffante, disposé, par exemple, dans le deuxième conduit (02).

Dans certains modes de réalisation, la température et le fonctionnement du moyen (10) de chauffage est contrôlé par un ou plusieurs boutons situés sur la poignée (03) de préhension. La partie (AF) du flux d'air traversant l'espace entre le premier (01) et le deuxième (02) conduit est isolée du flux (AC) d'air chauffé dans le deuxième conduit (02) et ne passant pas par le moteur (041) ou la zone comportant le moyen (10) de chauffage du flux (AC) d'air chaud. Ainsi le sèche-cheveux (0) peut produire un flux (AC) d'air chaud et un flux (AF) d'air froid simultanément. L'air (AC) chaud est produit et canalisé dans le second conduit (02) et l'air froid (AF), non chauffé, est canalisé dans l'espace formé entre le premier conduit (01) et le deuxième conduit (02).

Dans certains modes de réalisation, le deuxième conduit (02) comporte au moins une partie ayant la forme d'un cône de révolution tronqué. L'extrémité (023) du deuxième conduit (02) opposée à la base (022) du cône correspond à la sortie d'air.

Dans certains modes de réalisation, la longueur du tronc du cône est déterminée pour que l'extrémité correspondant à la sortie d'air soit saillante par rapport à l'extrémité du premier conduit (01).

Il est connu des sèche-cheveux qui tendent à répartir les flux d'air frais et chaud pour différents buts pratiques comme les demandes US 7412781, EP 0970633 et US 5701681. Cependant, ces sèche-cheveux ne donnent pas la possibilité de répartir les flux d'air de façon optimale afin de permettre un bon séchage des cheveux par le flux d'air chaud tout en garantissant un refroidissement suffisant du conduit externe.

Dans certains modes de réalisation, pour répartir l'air correctement, des moyens de répartition agencés à la base (022) du cône déterminent la proportion entre, d'une part, la quantité de flux (AF) d'air traversant l'espace entre le premier (01) et le deuxième (02) conduit et, d'autre part, celle passant dans le deuxième conduit (02) comportant le moyen (10) de chauffage. La configuration des moyens de répartition sont déterminés pour

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que la quantité de flux (AF) d'air traversant l'espace entre le premier (01) et le deuxième (02) conduit soit comprise dans une plage allant de 5% à 20%, de préférence 10%, du flux (042) d'air amené par le dispositif (04) produisant un flux (042) d'air. Ainsi, 80% à 95%, de préférence 90%, du flux (042) d'air amené par le dispositif (04) produisant un flux (042) d'air traverse le deuxième conduit (02).

Dans d'autres modes de réalisation, les moyens de répartition sont au moins un passage annulaire à proximité de la base (022) du cône, le centre de chaque passage annulaire étant compris dans l'axe du cône. La forme et le nombre de passages (07) sont déterminés pour que la quantité de flux (AF) d'air traversant l'espace entre le premier (01) et le deuxième (02) conduit soit comprise dans une plage allant de 5% à 20%, de préférence 10%, du flux (042) d'air amené par le dispositif (04) produisant un flux (042) d'air. Ainsi, 80% à 95%, de préférence 90%, du flux (042) d'air amené par le dispositif (04) produisant un flux (042) d'air traverse le deuxième conduit (02).

Dans d'autres modes de réalisation, les moyens de répartition sont formés par un espace agencé entre la base du cône et la surface intérieure du premier conduit (01), le diamètre du cercle à la base (022) du cône étant, dans ces modes de réalisation, inférieur au diamètre intérieur du premier conduit (01) dans la zone la plus proche de la base du cône. Le diamètre du cercle à la base du cône et le diamètre intérieur du premier conduit sont déterminés pour que la quantité de flux (AF) d'air traversant l'espace entre le premier (01) et le deuxième (02) conduit soit comprise dans une plage allant de 5% à 20%, de préférence 10%, du flux (042) d'air amené par le dispositif (04) produisant un flux (042) d'air. Ainsi, 80% à 95%, de préférence 90%, du flux (042) d'air amené par le dispositif (04) produisant un flux (042) d'air traverse le deuxième conduit (02).

Dans certains modes préférés, les moyens de répartition sont une pluralité fentes (07) longitudinales réparties à la base (022) du cône pour déterminer la quantité de flux (AF) d'air traversant l'espace entre le premier (01) et le deuxième (02) conduit. La forme et le nombre de fentes (07)

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déterminent le rapport de quantité d'air entre l'air (AC) chauffé traversant le deuxième conduit et l'air (AF) non chauffé traversant l'espace entre le premier (01) et le deuxième (02) conduit. Par exemple, la forme et le nombre de fentes (07) sont déterminés pour que la quantité de flux (AF) d'air traversant l'espace entre le premier (01) et le deuxième (02) conduit soit comprise dans une plage allant de 5% à 20%, de préférence 10%, du flux (042) d'air amené par le dispositif (04) produisant un flux (042) d'air. Ainsi, 80% à 95%, de préférence 90%, du flux (042) d'air amené par le dispositif (04) produisant un flux (042) d'air traverse le deuxième conduit (02). Dans cette configuration, les fentes longitudinales ne risquent pas d'être bouchées par des cheveux ou des poussières, par exemple, comme, par exemple au moins un passage annulaire. De plus, la répartition du flux dans la plage préférée est plus facile à obtenir.

Dans les modes où les moyens de répartition sont au moins un passage annulaire à proximité de la base (022) du cône ou sont une pluralité fentes (07) longitudinales, le diamètre du cercle à la base (022) du cône est ajusté au diamètre intérieur du premier conduit (01).

Dans les modes de réalisation où les moyens de répartition sont formés par l'espace agencé entre la base du cône et la surface intérieure du premier conduit (01), le diamètre du cercle à la base (022) du cône est inférieur au diamètre intérieur du premier conduit (01).

De manière générale et de façon non limitative, des entretoises (09) joignent le deuxième conduit (02) et le premier conduit (01) ensembles en les maintenant à distance l'un de l'autre.

Le dispositif (04) produisant un flux (042) d'air est, de préférence, une turbine centrifuge disposée en amont du moteur (041) par rapport au sens de circulation du flux d'air dans le sèche-cheveux (0). Mais le dispositif (04) produisant un flux (042) d'air peut être une turbine axiale ou tout autre moyen équivalent. La turbine centrifuge est préférée car le flux centrifuge est

plus facile à canaliser dans les deux conduits, notamment avec les moyens de répartition décrits ci-avant.

Un autre avantage d'une turbine centrifuge par rapport, par exemple à une turbine axiale, est qu'elle présente une meilleure efficacité et permet d'obtenir une pression élevée.

Dans certains modes de réalisation, la turbine centrifuge comporte à proximité de son axe de révolution une chicane anti-cheveux qui empêche les cheveux d'être aspirés dans le moteur (041) et/ou entraînés par la turbine.

On comprend qu'on obtient un sèche-cheveux avec deux conduits dont le premier, canalise un flux d'air froid entre le premier et le second conduit alors que le flux d'air chauffé par un moyen chauffant est canalisé à l'intérieur par le second conduit. Le conduit extérieur et les parois extérieures du sèche-cheveux sont donc froids.

De plus, dans les modes de réalisation préférés, une répartition optimale des flux d'air permet un bon séchage par le flux d'air chaud tout en garantissant un refroidissement suffisant du conduit par le flux d'air froid.

Selon une configuration, le premier conduit (01) a la forme d'un cylindre.

Selon une autre configuration, le premier conduit (01) a la forme d'un cône dont la surface est sensiblement parallèle à la surface du deuxième conduit (02).

Selon une configuration, le premier conduit (01) est préférentiellement coaxial au deuxième conduit (02).

Selon une configuration, la surface extérieure du premier conduit (01) possède un agencement sur sa surface pour améliorer la préhension par au moins une main d'un utilisateur. Un tel agencement peut mettre en œuvre différents moyens tels que ceux détaillés ci-après pour le prolongateur.

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Selon une configuration, le sèche-cheveux (0) est agencé pour supporter au niveau de sa partie (B) arrière un dispositif silencieux, fixe ou démontable.

L'invention concerne en outre un prolongateur (1) amovible pour prolonger la sortie d'air du sèche-cheveux (0). Le prolongateur (1) permet notamment d'éviter qu'une partie de la main de l'utilisateur ne soit sur le chemin du flux d'air sortant du sèche-cheveux (0), lorsque, par exemple, la partie avant d'un sèche-cheveux compact n'est pas assez longue pour la largeur d'une main ou de quatre doigts de l'utilisateur.

Le prolongateur peut contribuer à la préhension du sèche-cheveux compact à main nue par la partie avant sans risque de se brûler.

Dans certains modes de réalisation, le prolongateur peut avoir au moins la longueur de la largeur d'une main ou de quatre doigts de l'utilisateur. Pour ces modes de réalisation, l'utilisateur pourra tenir le sèche-cheveux par le prolongateur seulement ou avec une partie de ses doigts sur le prolongateur et une autre partie de ses doigts sur la partie avant du sèche-cheveux.

Dans d'autres modes de réalisation, le prolongateur peut avoir une longueur inférieure à la largeur d'une main ou de quatre doigts de l'utilisateur. Pour ces modes de réalisation, l'utilisateur pourra tenir le sèche-cheveux avec une partie de ses doigts sur le prolongateur et une autre partie de ses doigts sur la partie avant du sèche-cheveux. La longueur du prolongateur n'est donc pas être inférieure à la largeur de deux ou trois doigts pour que le prolongateur ou l'ensemble prolongateur-sèche-cheveux soit préhensible à la main. La longueur du prolongateur est de préférence inférieure ou égale à la largeur de quatre ou cinq doigts.

Ce prolongateur (1) comporte au moins un tube (11) périphérique entourant un tube (12) central dont les axes principaux sont parallèles. De façon non limitative, des entretoises (13) joignent ensemble le tube (11) périphérique et le tube (12) central. Chaque tube comporte une extrémité

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(112, 122) d'entrée et une extrémité (113, 123) libre. Au moins l'extrémité (122) d'entrée du tube (12) central est agencée selon une forme complémentaire à l'extrémité du deuxième conduit (02) du sèche-cheveux (0) pour pouvoir se raccorder au deuxième conduit (02) du sèche-cheveux (0). L'amovibilité du prolongateur (1) permet de conserver la compacité du sèche-cheveux (0) sans changer le centre de gravité du sèche-cheveux (0) et/ou par le fait qu'il n'allonge pas trop et qu'il n'alourdit par trop l'avant du sèche-cheveux et surtout qu'il rend le sèche-cheveux utilisable par la préhension à main nue de l'avant du sèche-cheveux.

On comprend ainsi que le prolongateur peut contribuer à la préhension de la partie avant du sèche-cheveux à main nue sans se brûler. Le tube central canalise le flux d'air chaud et le tube périphérique canalise le flux d'air froid entre le tube central et le tube périphérique. Le tube périphérique et les parois extérieures du tube périphérique sont donc froids.

Dans certains modes de réalisation, le tube (11) périphérique est coaxial au tube (12) central.

Selon une configuration, le tube (11) périphérique du prolongateur est coaxial au premier conduit (01) du sèche-cheveux (0) et le tube (12) central est coaxial au deuxième conduit (02) du sèche-cheveux (0).

Le sèche-cheveux et le prolongateur comportent des moyens de connexion réciproques.

Selon une configuration, les moyens de connexion comportent des moyens d'emboîtement. Par exemple, l'extrémité d'entrée du tube (11) périphérique est agencé selon une forme complémentaire à l'extrémité du premier conduit (01) du sèche-cheveux (0) pour pouvoir s'emboîter au premier conduit (01) du sèche-cheveux (0).

Selon une configuration préférée de moyens d'emboîtement, le raccordement entre le tube (12) central du prolongateur (1) et le deuxième conduit (02) du sèche-cheveux (0) et/ou le tube (11) périphérique et le

premier conduit (01) du sèche-cheveux (0) est un raccordement conique. Les extrémités en regard du tube (12) central du prolongateur (1) et du deuxième conduit (02) du sèche-cheveux (0), saillante par rapport à l'extrémité du premier conduit (01), présentent des surfaces d'appui complémentaires de forme conique.

Selon une configuration les moyens de connexion comportent des moyens de fixation, afin de fixer le prolongateur à la sortie du sèche-cheveux (0). Dans certaines configurations, afin de maintenir le raccordement conique, de façon non limitative, l'extrémité (112) d'entrée du tube (11) périphérique du prolongateur (1) comporte au moins une découpe de façon à former au moins une languette élastique. L'extrémité libre de la ou des languettes possède une nervure apte à s'insérer dans une rainure annulaire située sur la surface intérieure du premier conduit (01). Lors de l'emboîtement du prolongateur (1) sur le sèche-cheveux (0), la ou les languettes élastiques se déforment légèrement pour que la nervure ne gène pas l'introduction du tube (11) périphérique du prolongateur (1) dans le premier conduit (01), car dans cette configuration, le diamètre extérieur du tube (11) périphérique est sensiblement égale au diamètre intérieur du premier conduit (01). Dès que la nervure de la ou des languettes atteint la rainure et s'y insère, la ou les languettes reprennent leur forme initiale. Afin d'avoir la possibilité de retirer le prolongateur (1) du sèche-cheveux (0), la ou les languettes comportent des protubérances qui permettent le désengagement des nervures dans la rainure lorsqu'une pression est appliquée dessus.

Selon une configuration, la sortie du sèche-cheveux (0) est configurée pour fixer éventuellement un embout, par exemple un concentrateur ou un diffuseur, à la place du prolongateur (1). Cette fixation peut être configurée de la même manière que le prolongateur (1) : l'extrémité (112) d'entrée de l'embout comporte au moins une découpe de façon à former au moins une languette élastique. L'extrémité libre de la ou des languettes possède une nervure apte à s'insérer dans une rainure annulaire située sur la surface intérieure du premier conduit (01) du sèche-cheveux (0).

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Dans certains modes de réalisation, l'extrémité (023) du cône correspondant à la sortie d'air est terminée par un cylindre (021) de même diamètre que le diamètre du cercle de l'extrémité (023) du cône correspondant à la sortie d'air et est adapté pour un raccordement du prolongateur (1).

Selon une configuration, l'extrémité (113) libre du tube (11) périphérique du prolongateur (1) s'étend au-delà de l'extrémité (123) libre de sortie du tube (12) central pour former, par exemples un concentrateur (114) d'air ou un diffuseur d'air.

Selon une autre configuration, l'extrémité libre (123) du tube central du prolongateur (1) s'étend au-delà de l'extrémité (113) libre de sortie du tube (11) périphérique pour former un concentrateur d'air ou un diffuseur d'air.

Selon certains modes de réalisation, le prolongateur peut être orienté axialement, c'est-à-dire par une rotation autour de son axe longitudinal. Ainsi, il est, par exemple, possible d'orienter axialement le diffuseur ou le concentrateur. On comprend que cette rotation peut être faites à main nue.

Selon une autre configuration, un embout amovible, tel qu'un concentrateur ou un diffuseur, peut être adapté à l'extrémité (113) libre de sortie du tube (11) périphérique.

Dans certains modes de réalisation, le prolongateur (1) est remplaçable par un embout concentrateur ou diffuseur de l'art antérieur.

Dans certains modes de réalisation, le prolongateur (1) peut être interposable entre la partie avant du sèche-cheveux et l'embout concentrateur ou diffuseur.

Selon une autre configuration, un embout amovible, tel qu'un concentrateur ou un diffuseur, peut être adapté à l'extrémité (113) libre de sortie du tube (12) central.

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Le concentrateur et/ou le diffuseur peuvent être manipulés par une rotation axiale à main nue même sans prolongateur.

Dans certains modes de réalisation, afin que le prolongateur (1) puisse être facilement préhensible, la surface extérieure du tube (11) périphérique du prolongateur (1) possède, par exemple, un agencement sur sa surface cylindrique pour améliorer la préhension par au moins une main d'un utilisateur. Comme mentionné précédemment, la longueur du prolongateur est, dans un mode préféré préférence, supérieure ou égale à deux ou trois doigts et de préférence pour ne pas trop allonger et alourdir le sèche-cheveux.

Selon une configuration, la surface périphérique a une forme d'empreinte de main(s) ou, selon une autre configuration, des picots ou des stries permettent une adhérence entre le prolongateur (1) et la ou les mains. Selon une autre configuration, le prolongateur possède fixé sur sa surface externe un matériau agrippant.

Selon une autre configuration, la surface externe du tube (11) périphérique a une forme particulière adaptée à la main de l'utilisateur.

Selon une autre configuration, la surface externe du tube (11) périphérique possède des évidements ayant une forme adaptée une main et/ou aux doigts.

Dans certains modes de réalisation, le deuxième conduit (02) du sèche-cheveux (0) et le tube (12) central du prolongateur (1) peuvent être fabriqués en matériaux résistants à de hautes températures, 200°C par exemple. À titre d'exemple, ils sont fabriqués en polyamide 4-6 avec 50% de fibres de verre ou en polyamide 6-6 avec 30% de fibres de verre. Les fibres de verre peuvent être remplacées par des billes de verre.

Dans certains modes de réalisation, ce sèche-cheveux (0) et/ou le prolongateur (1) peuvent également permettre l'utilisation de matières bon marché ou qui ne demandent pas une résistance importante à la chaleur

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pour la fabrication du premier conduit (01) du sèche-cheveux (0) ou du tube (11) périphérique du prolongateur (1).

Dans certains modes de réalisation, un prolongateur (1) permettant d'obtenir une lame d'air froid parallèle à une lame d'air chaud peut être adapté à la sortie du sèche-cheveux (0). Dans ces modes de réalisation, l'extrémité libre du prolongateur peut posséder deux buses parallèles, par exemple rectangulaires. La buse produisant la lame d'air froid est en communication avec l'espace compris entre le tube (11) périphérique et le tube (12) central. La buse produisant la lame d'air chaud est en communication avec l'espace compris dans le tube (12) central.

La présente description détaille différents modes de réalisation et configuration en référence à des figures et/ou des caractéristiques techniques. L'homme du métier comprendra que les diverses caractéristiques techniques des divers modes ou configurations peuvent être combinées entre elles à moins que l'inverse ne soit explicitement mentionné ou que ces caractéristiques techniques ne soient incompatibles. De même, une caractéristique technique d'un mode de réalisation ou d'une configuration peut être isolée des autres caractéristiques techniques de ce mode de réalisation à moins que l'inverse ne soit mentionné, les adaptations structurelles étant à la portée de l'homme du métier notamment grâce aux considérations fonctionnelles décrites. Dans la présente description, de nombreux détails spécifiques sont fournis à titre illustratif et nullement limitatif, de façon à détailler précisément l'invention, en particulier au niveau aussi bien structurel que fonctionnel. L'homme de métier comprendra cependant que l'invention peut être réalisée en l'absence d'un ou plusieurs de ces détails spécifiques ou avec des variantes, notamment grâce aux considérations fonctionnelles décrites. À d'autres occasions, certains aspects ne sont pas détaillés de façon à éviter d'obscurcir et alourdir la présente description et l'homme de métier comprendra que des moyens divers et variés pourront être utilisés et que l'invention n'est pas limitée aux seuls exemples décrits.

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Il doit être évident pour les personnes versées dans l'art que la présente invention permet des modes de réalisation sous de nombreuses autres formes spécifiques sans l'éloigner du domaine d'application de l'invention comme revendiqué. Par conséquent, les présents modes de réalisation doivent être considérés à titre d'illustration, mais peuvent être modifiés dans le domaine défini par la portée des revendications jointes, et l'invention ne doit pas être limitée aux détails donnés ci-dessus.

REVENDICATIONS

1. Sèche-cheveux (0) compact, caractérisé en ce qu'il comporte au moins un corps principal présentant une partie avant (A) et une partie arrière et contenant un moteur (041) entrainant un dispositif (04) produisant un flux (042) d'air, aspiré par une entrée (05) d'air agencée dans la partie arrière (B), le flux (042) d'air étant canalisé dans la partie avant (A) du corps principal vers une sortie (06) d'air agencée dans la partie avant (A), la partie avant (A) comportant un premier conduit (01) entourant un deuxième conduit (02), les conduits étant traversés par le flux d'air, la partie (AC) du flux d'air traversant le deuxième conduit étant chauffé par un moyen (10) de chauffage, la sortie (06) d'air du sèche-cheveux (0) étant prolongée par un prolongateur (1) comportant au moins un tube (11) périphérique préhensible entourant un tube (12) central, chaque tube (11, 12) comportant une extrémité (112, 122) d'entrée et une extrémité (113, 123) libre, au moins l'extrémité (123) d'entrée du tube (12) central étant agencée selon une forme complémentaire à l'extrémité du deuxième conduit (02) du sèche-cheveux (0) pour pouvoir se raccorder au deuxième conduit (02) du sèche-cheveux (0).

2. Sèche-cheveux (0) selon la revendication 1 étant caractérisé en ce que le deuxième conduit (02) a la forme d'un cône de révolution tronqué, une pluralité de fentes (07) longitudinales étant répartie à la base (022) du cône pour permettre le passage d'une partie du flux (042) d'air.

3. Sèche-cheveux (0) selon la revendication 1, caractérisé en ce que le prolongateur a une longueur supérieure ou égale à la largeur de deux ou trois doigts et inférieure ou égale à la largeur de quatre ou cinq doigts.

4. Sèche-cheveux (0) selon la revendication 1, caractérisé en ce que le prolongateur est amovible.

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5. Sèche-cheveux selon une des revendications 1 et 2, caractérisé en ce que la pluralité fentes (07) longitudinales réparties à la base (022) du cône pour détermine le rapport de quantité d'air entre l'air (AC) chauffé traversant le deuxième conduit et l'air (AF) non chauffé traversant l'espace entre le premier (01) et le deuxième (02) conduit de telle manière que la quantité de flux (AF) d'air traversant l'espace entre le premier (01) et le deuxième (02) conduit soit comprise dans une plage allant de 5% à 20%.

6. Prolongateur (1) pour prolonger la sortie d'air d'un sèche-cheveux (0), le sèche-cheveux (0) comportant au moins un premier conduit (01) entourant un deuxième conduit (02), le prolongateur étant caractérisé en ce qu'il comporte au moins un tube (11) périphérique préhensible entourant un tube (12) central, chaque tube (11, 12) comportant une extrémité (112, 122) d'entrée et une extrémité (113, 123) libre, au moins l'extrémité (123) d'entrée du tube (12) central étant agencée selon une forme complémentaire à l'extrémité du deuxième conduit (02) du sèche-cheveux (0) pour pouvoir se raccorder au deuxième conduit (02) du sèche-cheveux (0) soufflant de l'air chaud entouré par le deuxième conduit soufflant de l'air froid.

7. Prolongateur (1) selon la revendication 6, caractérisé en ce que le raccordement entre le tube (12) central du prolongateur (1) et le deuxième conduit (02) du sèche-cheveux (0) est un raccordement conique.

8. Prolongateur (1) selon la revendication 6, caractérisé en ce que l'extrémité (112) d'entrée du tube (11) périphérique est agencée selon une forme complémentaire à l'extrémité du premier conduit (01) du sèche-cheveux (0) pour pouvoir s'emboîter au premier conduit (01) du sèche-cheveux (0).

9. Prolongateur (1) selon une des revendications 6 à 8, caractérisé en ce que le tube (11) périphérique est coaxial au tube (12) central.

10. Prolongateur (1) selon une des revendications 6 à 9, caractérisé en ce que l'extrémité (113) libre du tube (11) périphérique du prolongateur

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(1) s'étend au-delà de l'extrémité (123) libre de sortie du tube (12) central pour former un concentrateur (114) d'air ou un diffuseur d'air.

11. Prolongateur (1) selon une des revendications 6 à 9, caractérisé en ce que l'extrémité (123) libre du tube (12) central du prolongateur (1) s'étend au-delà de l'extrémité (113) libre de sortie du tube (11) périphérique pour former un concentrateur d'air ou un diffuseur d'air.

12. Prolongateur (1) selon au moins une des revendications 6 à 11, caractérisé en ce qu'il est amovible.

13. Prolongateur(1) selon au moins une des revendications 6 à 12, caractérisé en ce que le prolongateur a une longueur supérieure ou égale à la largeur de deux ou trois doigts et inférieure ou égale à la largeur de quatre ou cinq doigts.

14. Sèche-cheveux (0) comportant au moins un corps principal présentant une partie avant (A) et une partie arrière et contenant un moteur (041) entrainant un dispositif (04) produisant un flux (042) d'air, aspiré par une entrée (05) d'air agencée dans la partie arrière (B), le flux (042) d'air étant canalisé dans la partie avant (A) du corps principal vers une sortie (06) d'air agencée dans la partie avant (A), le sèche-cheveux (0) étant caractérisé en ce que la partie avant (A) comporte un premier conduit (01) entourant un deuxième conduit (02), les conduits étant traversés par le flux d'air, la partie (AC) du flux d'air traversant le deuxième conduit étant chauffé par un moyen (10) de chauffage.

15. Sèche-cheveux (0) selon la revendication 14, caractérisé en ce qu'un prolongateur prolonge la sortie d'air du sèche-cheveux, le prolongateur comportant au moins un tube (11) périphérique préhensible entourant un tube (12) central, chaque tube (11, 12) comportant une extrémité (112, 122) d'entrée et une extrémité (113, 123) libre, au moins l'extrémité (123) d'entrée du tube (12) central étant agencée selon une forme complémentaire à

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l'extrémité du deuxième conduit (02) du sèche-cheveux (0) pour pouvoir se raccorder au deuxième conduit (02) du sèche-cheveux (0).

16. Sèche-cheveux (0) compact comportant au moins un corps principal présentant une partie avant (A) et une partie arrière et contenant un moteur (041) entrainant un dispositif (04) produisant un flux (042) d'air, aspiré par une entrée (05) d'air agencée dans la partie arrière (B), le flux (042) d'air étant canalisé dans la partie avant (A) du corps principal vers une sortie (06) d'air agencée dans la partie avant (A), la partie avant (A) comportant un premier conduit (01) entourant un deuxième conduit (02), une partie (AC) du flux d'air, amené par le dispositif (04) produisant un flux (042) d'air, traversant le deuxième conduit étant chauffée par un moyen (10) de chauffage, une autre partie (AF) du flux d'air, amené par le dispositif (04) produisant un flux (042) d'air, traversant l'espace entre le premier (01) et le deuxième (02) conduit étant isolée de la partie du flux (AC) d'air chauffé dans le deuxième conduit (02), le sèche-cheveux (0) étant caractérisé en ce que le deuxième conduit (02) comporte au moins une partie ayant la forme d'un cône de révolution tronqué, pour canaliser une partie du flux (042) vers le centre et des moyens de répartition étant agencés à la base (022) du cône pour déterminer la proportion entre, d'une part, la quantité de flux (AF) d'air traversant l'espace entre le premier (01) et le deuxième (02) conduit et, d'autre part, celle passant dans le deuxième conduit (02) comportant le moyen (10) de chauffage.

17. Sèche-cheveux (0) compact selon la revendication 16, caractérisé en ce que les moyens de répartition déterminent la proportion entre, d'une part, la quantité de flux (AF) d'air traversant l'espace entre le premier (01) et le deuxième (02) conduit et, d'autre part, celle passant dans le deuxième conduit (02) comportant le moyen (10) de chauffage de telle manière que la quantité de flux (AF) d'air traversant l'espace entre le premier (01) et le deuxième (02) conduit est comprise dans une plage allant de 5% à

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20% du flux (042) d'air amené par le dispositif (04) produisant un flux (042) d'air.

18. Sèche-cheveux (0) compact selon les revendications 16 ou 17, caractérisé en ce que les moyens de répartition sont au moins une fente (07) longitudinale répartie à la base (022) du cône.

19. Sèche-cheveux (0) compact selon les revendications 16 ou 17, caractérisé en ce que les moyens de répartition sont au moins un passage annulaire à proximité de la base (022) du cône, le centre de chaque fente annulaire étant compris dans l'axe du cône.

20. Sèche-cheveux (0) compact selon la revendication 18, caractérisé en ce que la pluralité de fentes (07) déterminent la proportion entre, d'une part, la quantité de flux (AF) d'air traversant l'espace entre le premier (01) et le deuxième (02) conduit et, d'autre part, celle passant dans le deuxième conduit (02) comportant le moyen (10) de chauffage de telle manière que la quantité de flux (AF) d'air traversant l'espace entre le premier (01) et le deuxième (02) conduit est comprise dans une plage allant de 5% à 20% du flux (042) d'air amené par le dispositif (04) produisant un flux (042) d'air.

21. Sèche-cheveux (0) compact selon les revendications 16, caractérisé en ce que le diamètre du cercle à la base (022) du cône est ajusté au diamètre intérieur du premier conduit (01).

22. Sèche-cheveux (0) compact selon les revendications 16 ou 17, caractérisé en ce que les moyens de répartition sont formés par l'espace agencé entre la base du cône et la surface intérieure du premier conduit (01), le diamètre du cercle à la base (022) du cône étant inférieur au diamètre intérieur du premier conduit (01) dans la zone la plus proche de la base du cône.

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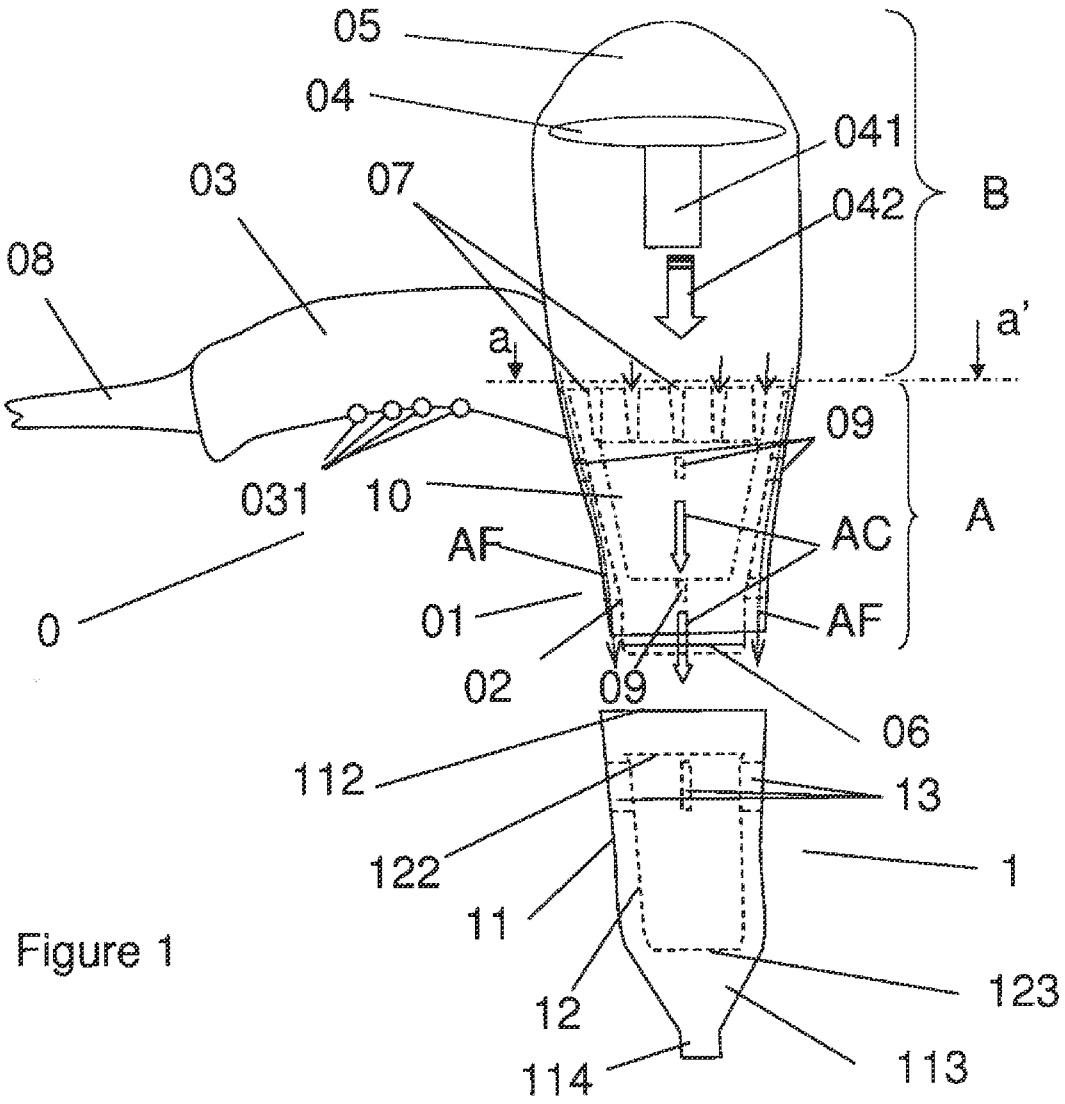


Figure 1

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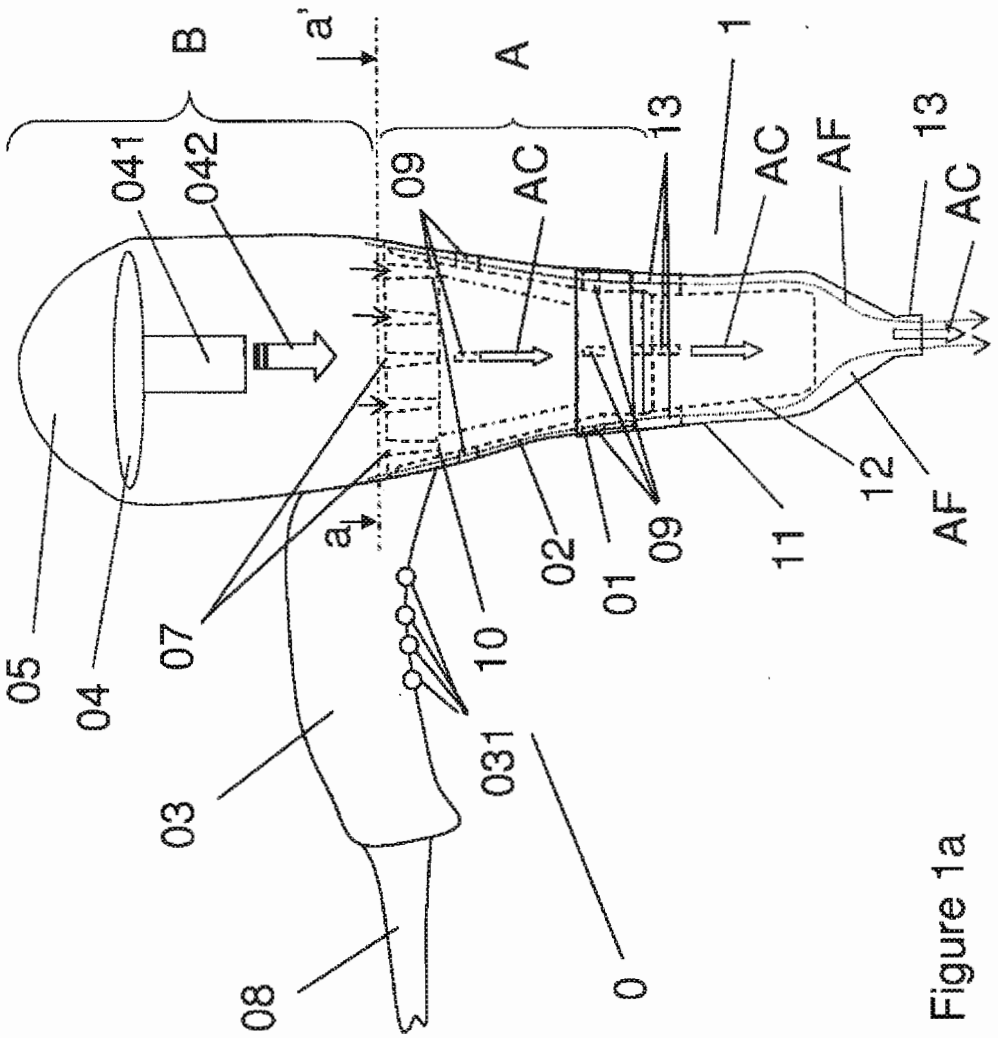


Figure 1a

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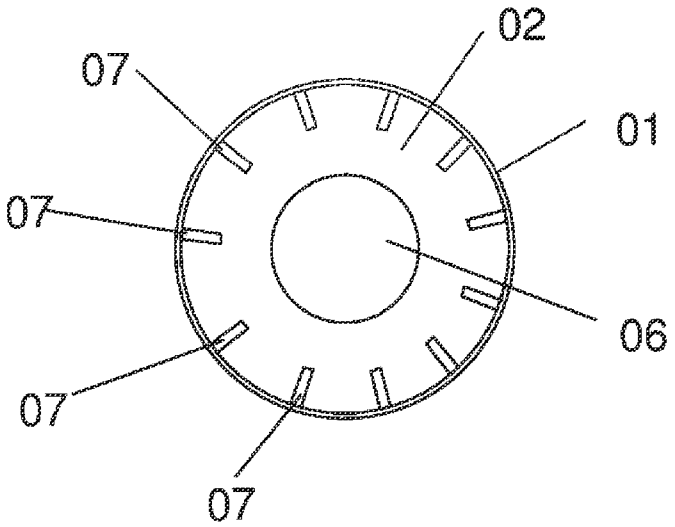


Figure 2
Vue selon a-a'

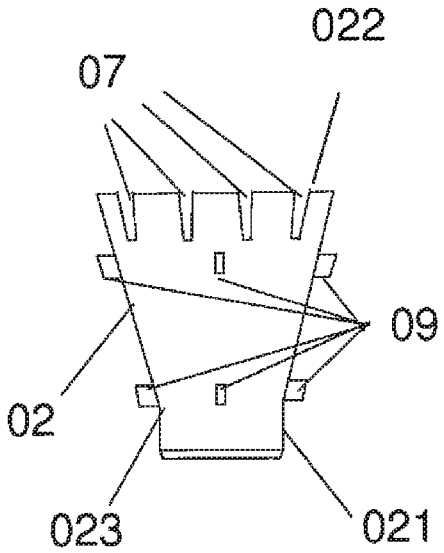


Figure 3

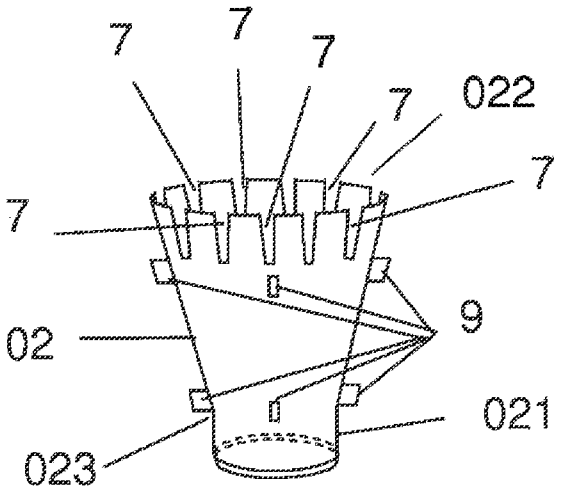


Figure 3a

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(81) États désignés *(sauf indication contraire, pour tout titre de protection nationale disponible)* : AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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[Suite sur la page suivante]

(54) Title : COMPACT HAIR DRYER AND REMOVABLE BARREL EXTENSION

(54) Titre : SÈCHE-CHEVEUX COMPACT ET PROLONGATEUR AMOVIBLE

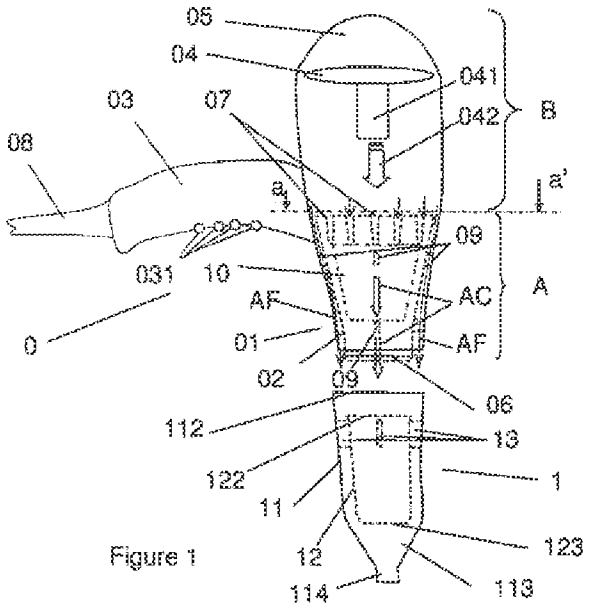


Figure 1

(57) Abstract : The invention relates to a compact hair dryer (0) comprising at least one main body having a front portion (A) and a rear portion. The hair dryer (0) comprises a front portion (A) comprising a first duct (01) surrounding a second duct (02), the air flow (AC) passing through the second duct being heated by a heating means (10), the air flow (AF) passing through the space between the first (01) and second (02) ducts being insulated from the heated air flow (AC) in the second duct (02). The second duct (02) is shaped like a truncated cone of revolution, wherein a distribution means is arranged at the base (022) of the cone such as to determine the amount of air flow (AF) passing through the space between the first (01) and second (02) ducts. A barrel extension comprising at least one peripheral tube (11) surrounding a central tube (12) can be connected to the outlet of the hair dryer (0). The second duct (02) of the hair dryer, at the air outlet (06) of the hair dryer (0), is arranged such as to be able to connect to the central tube (12) of a barrel extension (1).

(57) Abrégé : L'invention concerne un sèche-cheveux (0) compact

[Suite sur la page suivante]

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(88) Date de publication du rapport de recherche internationale : 30 août 2012

comportant au moins un corps principal présentant une partie avant (A) et une partie arrière. Le sèche-cheveux (0) comporte une partie avant (A) comportant un premier conduit (01) entourant un deuxième conduit (02), le flux (AC) d'air traversant le deuxième conduit étant chauffé par un moyen (10) de chauffage, le flux (AF) d'air traversant l'espace entre le premier (01) et le deuxième (02) conduit étant isolé du flux (AC) d'air chauffé dans le deuxième conduit (02). Le deuxième conduit (02) a la forme d'un cône de révolution tronqué, des moyens de répartition étant agencés à la base (022) du cône pour déterminer la quantité de flux (AF) d'air traversant l'espace entre le premier (01) et le deuxième (02) conduit. Un prolongateur comportant au moins un tube (1 1) périphérique entourant un tube (12) central peut se raccorder à la sortie du sèche-cheveux (0). Le deuxième conduit (02) du sèche-cheveux, à la sortie (06) d'air du sèche-cheveux (0), est agencé pour pouvoir se raccorder au tube (12) central d'un prolongateur (1).

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INTERNATIONAL SEARCH REPORT

International application No
PCT/FR2011/052582

A. CLASSIFICATION OF SUBJECT MATTER
INV. A45D20/12 A45D20/10
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 7 412 781 B2 (MATTINGER DETLEF [DE] ET AL) 19 August 2008 (2008-08-19) cited in the application column 1, line 23 - column 2, line 61; figures 1-6	1-22
X	EP 0 064 405 A1 (FRIEDA JOHN ALAN HOWARD [GB]) 10 November 1982 (1982-11-10) page 9, line 4 - page 10, line 3; figures 3-5	1,3,4, 6-15
X	EP 1 415 566 A2 (WAHL CLIPPER CORP [US]) 6 May 2004 (2004-05-06) paragraph [0020] - paragraph [0024]; figures 8-12	6-13

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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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	Date of mailing of the international search report
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Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Ionescu, C

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/FR2011/052582

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7412781 B2	19-08-2008	AT 365480 T	15-07-2007
		AU 2003215674 A1	02-02-2004
		BR 0305428 A	24-08-2004
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		JP 2005532131 A	27-10-2005
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		CA 2448013 A1	01-05-2004
		CN 1500421 A	02-06-2004
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RAPPORT DE RECHERCHE INTERNATIONALE

Demande internationale n°
PCT/FR2011/052582

A. CLASSEMENT DE L'OBJET DE LA DEMANDE
INV. A45D20/12 A45D20/10
ADD.

Selon la classification internationale des brevets (CIB) ou à la fois selon la classification nationale et la CIB

B. DOMAINES SUR LESQUELS LA RECHERCHE A PORTE

Documentation minimale consultée (système de classification suivi des symboles de classement)
A45D

Documentation consultée autre que la documentation minimale dans la mesure où ces documents relèvent des domaines sur lesquels a porté la recherche

Base de données électronique consultée au cours de la recherche internationale (nom de la base de données, et si cela est réalisable, termes de recherche utilisés)
EPO-Internal

C. DOCUMENTS CONSIDERES COMME PERTINENTS

Catégorie*	Identification des documents cités, avec, le cas échéant, l'indication des passages pertinents	no. des revendications visées
X	US 7 412 781 B2 (MATTINGER DETLEF [DE] ET AL) 19 août 2008 (2008-08-19) cité dans la demande colonne 1, ligne 23 - colonne 2, ligne 61; figures 1-6	1-22
X	EP 0 064 405 A1 (FRIEDA JOHN ALAN HOWARD [GB]) 10 novembre 1982 (1982-11-10) page 9, ligne 4 - page 10, ligne 3; figures 3-5	1,3,4, 6-15
X	EP 1 415 566 A2 (WAHL CLIPPER CORP [US]) 6 mai 2004 (2004-05-06) alinéa [0020] - alinéa [0024]; figures 8-12	6-13

☐ Voir la suite du cadre C pour la fin de la liste des documents

☒ Les documents de familles de brevets sont indiqués en annexe

* Catégories spéciales de documents cités:

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"T" document ultérieur publié après la date de dépôt international ou la date de priorité et n'appartenant pas à l'état de la technique pertinent, mais cité pour comprendre le principe ou la théorie constituant la base de l'invention

"X" document particulièrement pertinent; l'invention revendiquée ne peut être considérée comme nouvelle ou comme impliquant une activité inventive par rapport au document considéré isolément

"Y" document particulièrement pertinent; l'invention revendiquée ne peut être considérée comme impliquant une activité inventive lorsque le document est associé à un ou plusieurs autres documents de même nature, cette combinaison étant évidente pour une personne du métier

"&" document qui fait partie de la même famille de brevets

Date à laquelle la recherche internationale a été effectivement achevée	Date d'expédition du présent rapport de recherche internationale
25 mai 2012	04/06/2012

Nom et adresse postale de l'administration chargée de la recherche internationale	Fonctionnaire autorisé
Office Européen des Brevets, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Ionescu, C

Formulaire PCT/ISA/210 (deuxième feuille) (avril 2005)

RAPPORT DE RECHERCHE INTERNATIONALE

Renseignements relatifs aux membres de familles de brevets

Demande internationale n°
PCT/FR2011/052582

Document brevet cité au rapport de recherche	Date de publication	Membre(s) de la famille de brevet(s)	Date de publication
US 7412781 B2	19-08-2008	AT 365480 T	15-07-2007
		AU 2003215674 A1	02-02-2004
		BR 0305428 A	24-08-2004
		CN 1665426 A	07-09-2005
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		EP 1519663 A1	06-04-2005
		ES 2289330 T3	01-02-2008
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		WO 2004006712 A1	22-01-2004
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		BR 0306766 A	08-09-2004
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(74) Agents: DALL'OLIO, Daniele et al.; Invention S.r.l., Via Delle Armi 1, I-40137 Bologna (IT).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(54) Title: HAIR -DRYING DEVICE

FIG. 2a

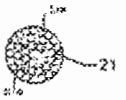
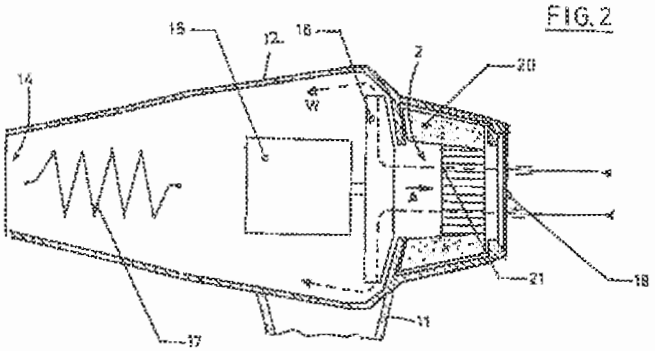


FIG. 2



(57) Abstract: The improved hair-drying device 1 comprises, in known ways, a grip (11) suitable for supporting a casing (12) which extends perpendicularly thereto and which is provided with a rear section (13) for ambient air inlet and a front section (14) for dispensing the treated air; an electric motor (15) is comprised internally of the casing (12), to an axis of which at least a fan (16) is keyed that is able to create an air flow from the rear section (13) to the front section (14), and electric means (17) interposed between the fan (16) and the front section (14) able to provide at least heating of the air coming from the rear section (13) and dispensed through the front section (14); the grip (11) is provided with an electric supply cable and buttons for command of the electric motor (15) and the electric means (17); means (18) being associated to the rear section (13) for filtering the extraneous elements conveyed by the ambient air in inlet. The improved hair-drying device (1)1 comprises, in a novel way, first sound- absorbent means (2) or sound-insulating means (200) positioned internally of the casing (12), interposed between the rear section (13) and the fan (16).

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HAIR-DRYING DEVICE

FIELD OF THE INVENTION

The present invention relates to the technical sector relating to hair-drying devices, with special reference to an improved hair-drying particularly applicable to both professional and domestic use.

DESCRIPTION OF THE PRIOR ART

Figure 1 illustrates a hair-drying device of known type, denoted in its entirety with reference numeral 100, comprising a grip 101 for supporting an elongate casing 102 provided with a rear section 103 for inlet of environmental air and a front section 104 for dispensing the treated air (for example heated, ionized, etc.).

Inside the elongate casing 102, lodging is afforded for an electric motor 105, to the axis of which a fan 106 is keyed, which fan 106 can create a flow of air from the rear section 103 to the front section 104, and electric means 107 interposed between the fan 106 and the front section 104 able to provide at least heating of the dispensed air, possibly also ionising it.

The grip 101 is provided with buttons (not illustrated for the sake of simplicity) for commanding both the electric motor 105 (ON/OFF, speed variation) and the electric means 107 (temperature variation, ionisation etc); it is further provided with a cable for supplying the motor 105 and the electric means 107.

Accessories are generally fixed to the front section 104, for treatment of hair or for conveying the dispensed air flow, with diverging geometry.

The rear section 103 is provided with a protective netting 108, snap-fitted, for filtering the inlet of extraneous bodies (for example hair and dust) internally of the casing 102, such as to preserve the integrity of the fan 106 and the electric

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motor 105.

The greatest drawback of a like hair-drying device 100 of known type is represented by its noisiness during functioning, also for reduced functioning velocity, due mostly to the turbulence in the air flow created between the rear section 103 and the front section 104.

In the professional field this drawback is exacerbated by the presence of several hair-drying devices which function over a long time period and often contemporaneously, which factors lead to annoyance both to the operators and the client.

As far as the operators are concerned, the noisiness of the work environment can lead to the onset of professional illnesses connected with the hearing apparatus.

SUMMARY OF THE INVENTION

The aim of the present invention is to obviate the above-mentioned drawbacks by providing an improved hair-drying device able to guarantee a particularly low noise level with respect to the solutions at present on the market.

A further aim of the invention is to provide an improved hair-drying device which is particularly applicable for professional use, being able to prevent any feeling of discomfort both for the customer and the operator, especially in order to prevent onset of professional illnesses connected with the hearing.

The above-indicated aims are obtained by means of an improved hair-drying device, in accordance with claim 8.

Further, the above aims are obtained by means of a second version of the hair-drying device, realised in accordance with claim 1.

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BRIEF DESCRIPTION OF THE DRAWINGS

The characteristics of the invention will emerge in the following, in which some preferred but not exclusive embodiments of the invention are described purely by way of non-exclusive example, with reference to the accompanying figures of the drawings, in which:

figure 1 is a schematic view of a lateral view in partial section of a hair-drying device of known type;

figures from 2 to 5 show lateral views in partial section of four embodiments of the improved hair-drying device, in a first version thereof;

figures 2a, 5a show corresponding views of the element, denoted by the arrows A, B shown in figures 2, 5;

figure 6 illustrates a lateral view of the hair-drying device according to both versions; and

figures from 7 to 10 are the same view as in figures from 2 to 5, concerning the second embodiment rather than the first.

DESCRIPTION OF PREFERRED EMBODIMENTS

With reference to the tables of the drawings, generic reference numeral 1 relates to the improved hair-dryer in its entirety, which comprises, in known ways set out in the introductory preamble:

- a grip 11 designed to support a casing 12 which extends perpendicularly thereto and which is provided with a rear section 13 for ambient air inlet and a front section 14 for dispensing of treated air;
- there being provided, internally of the casing 12, an electric motor 15, to an axis of which at least a fan 16 is keyed, which fan 16 is capable of creating an air flow from the rear section 13 to the front section 14, and electric means 17 interposed between the fan 16 and the front section 14, which

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electric means 17 are able to heat the air coming from the rear section 13 and dispensed via the front section 14;

- means for electrical supply and for command of the electric motor 15 and the electrical means 17 being associated to the grip 11;
- means 18 for filtering extraneous elements (for example dust, hair etc.) conveyed by the ambient air in inlet being associated to the rear section 13.

The improved hair-drying device 1 comprises, in a novel way, according to the first version, first sound-absorbing means 2 positioned internally of the casing 12, interposed between the rear section 13 and the fan 16, destined to reduce the noise level and/or the turbulence associated to the air flow W which is created between the rear section 13 and the front section 14.

The first sound-absorbing means 2 comprise at least a sleeve 20, realised in a spongy sound-absorbing material, internally passed-through by the air flow W which is created between the rear section 13 and the front section 14.

The sleeve 20 is positioned preferably coaxial to the rear section 13 of the casing 12, in line with the fan 16.

The sleeve 20 is advantageously shaped in to a hollow conical structure having a divergent internal section proceeding from the rear section 13 towards the fan 16.

In a preferred embodiment, illustrated in figure 2, the first sound-absorbing means 2 further comprise a tubular insert 21, positioned coaxially internally of the sleeve 20, having a honeycomb celled structure interested by the air flow W which is created between the rear section 13 and the front section 14.

The tubular insert 21 advantageously exhibits an external profile which is complementary to an internal profile of the sleeve 20.

Preferably, the tubular insert 21, as shown in the figures of the drawings, comprises a plurality of parallel honeycombs, substantially tubular, having parallel axes to the axis of symmetry of the insert 21.

According to further embodiments, illustrated in figures from 3 to 6, the

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improved hair-drying device 1 comprises a closing capsule 3 suitable for removably coupling with the casing 12 in proximity of the rear section 13, and provided with a plurality of peripheral holes 30 able to allow inlet of the ambient air and conveying the air to the rear section 13 through a hollow space 4 identified between the casing 12 and the closing capsule 3.

The peripheral holes 30 are distributed aligned on a peripheral crown of the capsule 3 lying on a plane that is perpendicular to the longitudinal axis of the casing 12, preferably in proximity of the coupling section with the casing 12.

In detail, the holes 30 are radial with respect to the longitudinal axis of the casing 12 and are preferably circular with the centre on axes which are arranged radially with respect to the longitudinal axis, such that the holes are facing in different directions from one another.

Once more preferably, the rear part of the device 1 comprising the rear section 13 and destined to couple with the capsule 3 is axialsymmetric with respect to the longitudinal axis and so is the closing capsule 3 too.

In practice, the rear part has lateral annular walls covered by the annular lateral walls of the capsule 3 (when coupled), such as to define, between them, the hollow space 4 which has at least a partly annular shape, with a conical progression, and is symmetrical with respect to the previously-cited longitudinal axis of the casing 12.

The hollow space 4 can taper in a distancing direction from the coupling section and can terminate in an internal chamber.

In a different embodiment, the capsule 3 is integrated to the casing or, in other words, is coupled thereto unremovably.

To minimise the noisiness and/or the turbulence associated to the air flow Z coming from the hollow space 4, the improved hair-drying device 1 comprises second sound-absorbing means 5, associated to the bottom 31 of the closing capsule 3, comprising at least a plate 50 realised with spongy sound-absorbing material and arranged facing the rear section 13 of the casing 12.

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By way of example, in figure 3 the plate 50 and the bottom 31 of the capsule 3 are profiled in a planar geometry, while in figure 4 the plate 50 and the bottom 31 are profiled concave with respect to the air flow Z coming from the hollow space 4.

In a further embodiment, illustrated in figure 5, a conical appendage 51 emerges from the plate 50, which appendage 51 projects towards the facing rear section 13 of the casing 12, still with the aim of reducing noisiness and/or the turbulence associated to the air flow Z coming from the hollow space 4.

From the above it is clear how the proposed improved hair-drying device is able to guarantee especially lower levels of noise with respect to the solutions at present available on the market, thanks to the presence of the first sound-absorbing means positioned internally of the casing, interposed between the rear section and the fan, possibly acting in combination with the second sound-absorbing means associated to the bottom of the closing capsule, if present.

The first and/or second sound-absorbing means are advantageously made of a spongy material having a predetermined porosity.

The improved hair-drying device is therefore particularly useful for professional use, being able to prevent any sensation of discomfort and annoyance due to the working noise level, both for the customer and the operator.

As far as the operator is concerned, in particular, the improved hair-drying device enables preventing the onset of professional illnesses connected to the hearing apparatus.

The same advantages are obtained with the second version of the hair-drying device, in which in place of the first sound-absorbing means 20, sound-insulating means 200, 21 are provided, positioned internally of the casing 12, interposed between the rear section 13 and the fan 16, provided for reducing the noisiness associated to the air flow W which is created between the rear section 13 and the front section 14, which sound-insulating means comprise a sound-insulating element 200 having an internal passage 22 for enabling the

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flow W to cross it, and conforming a plurality of small fins 201, the respective free edges of which at least partially define the internal passage 22, the fins being distanced from one another such that between one and the other there is an empty space (see figures from 7 to 10).

The sound-insulating element 200 is preferably made of PVC, although other materials, such as plastic materials, can be used.

The fins 201 are preferably annular, parallel and coaxial.

In the preferred embodiment of this second version, the internal edges of the fins 201 are located on the lateral surface of an ideal cone diverging from the rear section 13 towards the fan 16.

The cone can be regular, i.e. a circular cone, or not.

In a similar way to the first version, the sound-insulating means further comprise a tubular insert 21, positioned in the internal passage 22 of the sound-insulating element 200, having a honeycomb structure suitable for being interested by the air flow W.

This tubular insert 21 can be like the insert of the first version.

In detail, preferably the sound-insulating element 200 has an axialsymmetric annular shape and comprises an engaging section 202 the internal lateral surface of which partly defines the internal passage 22.

In this case, as can be seen in the figures, the tubular insert 21 has an axialsymmetric form, is located in the engaging section 202 such as to occupy a part of the internal passage 22, and has an external lateral surface located in contact with the internal lateral surface of the engaging section 202, the two surfaces having complementary shapes.

The coupling between the tubular insert 21 and the engaging section 202 can be a friction coupling or can be achieved by gluing or known fixing means.

In particular, in this version too, the insert 21 comprises a plurality of parallel

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honeycombs 210, the axis of which is parallel to the axis of symmetry of the insert and the axis of symmetry of the sound-insulating element 200.

The second version of the invention can comprise embodiments in which it comprises the closing capsule 3 made exactly like the one in the first version, in all its variants.

It is understood that the improved hair-drying device, though being particularly designed for professional use, is very effective also in simple and sporadic domestic use.

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CLAIMS

1) An improved hair-drying device, comprising:

- a grip (11) designed to support a casing (12) which extends perpendicularly thereto and which is provided with a rear section (13) for ambient air inlet and a front section (14) for dispensing of treated air;
- an electric motor (15), located internally of the casing (12), to an axis of which at least a fan (16) is keyed, which fan (16) is also located in the casing, able to create a flow of air from the rear section (13) to the front section (14);
- electric means (17), located in the casing (12) and interposed between the fan (16) and the front section (14) able to provide at least heating of the air coming from the rear section (13) and dispensed through the front section (14);
- electric supply and command means of the electric motor (15) and electric means (17) associated to the grip (11); and
- means (18) for filtering extraneous elements conveyed by the ambient air in inlet, associated to the rear section (13):

the device being characterised in that it further comprises sounding-insulating means (200, 21), positioned internally of the casing (12), interposed between the rear section (13) and the fan (16), provided for reducing the noise associated to the air flow (W) which is created between the rear section (13) and the front section (14), which sound-insulating means comprise a sound-insulating element (200) having an internal passage (22) for enabling the flow (W) to cross through it, and conforming a plurality of fins (201), the respective free edges of which at least partly define the internal passage (22), the fines being distanced from one another such that an empty space is afforded between one and the other.

2) The device of the preceding claim, wherein the fins (201) are annular, parallel and coaxial.

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3) The device of any one of the preceding claims, wherein the internal edges of the fins (201) are located on the lateral surface of an ideal cone diverging from the rear section (13) towards the fan (16).

4) The device of any one of the preceding claims, wherein the sound-insulating means further comprise a tubular insert (21), positioned in the internal passage (22) of the sound-insulating element (200), having a honeycomb structure suitable for being interested by and crossed by the air flow (W).

5) The device of the preceding claim, wherein the sound-insulating element (200) has an annular axial-symmetric shape and comprises an engaging section (202), the internal lateral surface of which partly defines the internal passage (22), and wherein the tubular insert (21) has an axialsymmetric shape, is located in the engaging section (202) such as to occupy a part of the internal passage (22) and has an external lateral surface located in contact with the internal lateral side of the engaging section (202), the two surfaces having a complementary shape.

6) The device of the preceding claim, wherein the insert (21) comprises a parallel plurality of honeycombs (210), an axis of which is parallel to the axis of symmetry of the insert and to the axis of the sound-insulating element (200).

7) The device of any one of the preceding claims, wherein the sound-insulating element (200) is made of PVC.

8) An improved hair-drying device, comprising:

- a grip (11) designed to support a casing (12) which extends perpendicularly thereto and which is provided with a rear section (13) for ambient air inlet and a front section (14) for dispensing of treated air;
- there being provided, internally of the casing (12), an electric motor (15), to an axis of which at least a fan (16) is keyed, which fan (16) is capable of creating an air flow from the rear section (13) to the front section (14), and electric means (17) interposed between the fan (16) and the front

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section (14), which electric means (17) are able to heat the air coming from the rear section (13) and dispensed via the front section (14);

- means for electrical supply and for command of the electric motor (15) and the electrical means (17) being associated to the grip (11);
- means (18) for filtering extraneous elements conveyed by the ambient air in inlet being associated to the rear section (13);

characterised in that it comprises first sound-absorbing means (2) positioned internally of the casing (12), interposed between the rear section (13) and the fan (16), which first sound-absorbing means (2) are destined to reduce a noise level and/or a turbulence associated to the air flow (W) which is created between the rear section (13) and the front section (14).

9). The hair-drying device of the preceding claim, characterised in that the first sound-absorbing means (2) comprise at least a sleeve (20), realised in a spongy sound-absorbing material, internally interested by the air flow (W) which is created between the rear section (13) and the front section (14); the sleeve (20) being preferably coaxial to the rear section (13) of the casing (12).

10). The hair-drying device of the preceding claim, characterised in that the sleeve (20) is shaped according to a hollow conical structure having a diverging internal section proceeding from the rear section (13) towards the fan (16).

11). The hair-drying device of one of the two preceding claims, characterised in that the first sound-absorbing means (2) further comprise a tubular insert (21), positioned coaxially internally of the sleeve (20), having a honeycomb celled structure interested by the air flow (W) which is created between the rear section (13) and the front section (14).

12). The hair-drying device of the preceding claim, characterised in that the tubular insert (21) exhibits an external profile which is complementary to an internal profile of the sleeve (20).

13). The hair-drying device of any one of the preceding claims, characterised in

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that it comprises a closing capsule (3) destined to couple removably with the casing (12) in proximity of the rear section (13) and provided with a plurality of peripheral holes (30) able to admit access of the ambient air and to convey the ambient air to the rear section (13) through a hollow space (4) identified between the casing (12) and the closing capsule (3).

14). The hair-drying device of one of the two preceding claims, characterised in that the peripheral holes (30) are distributed in an aligned fashion on a peripheral crown of the capsule (3) lying on a plane that is perpendicular to the longitudinal axis of the casing (12), preferably in proximity of the coupling section with the casing (12).

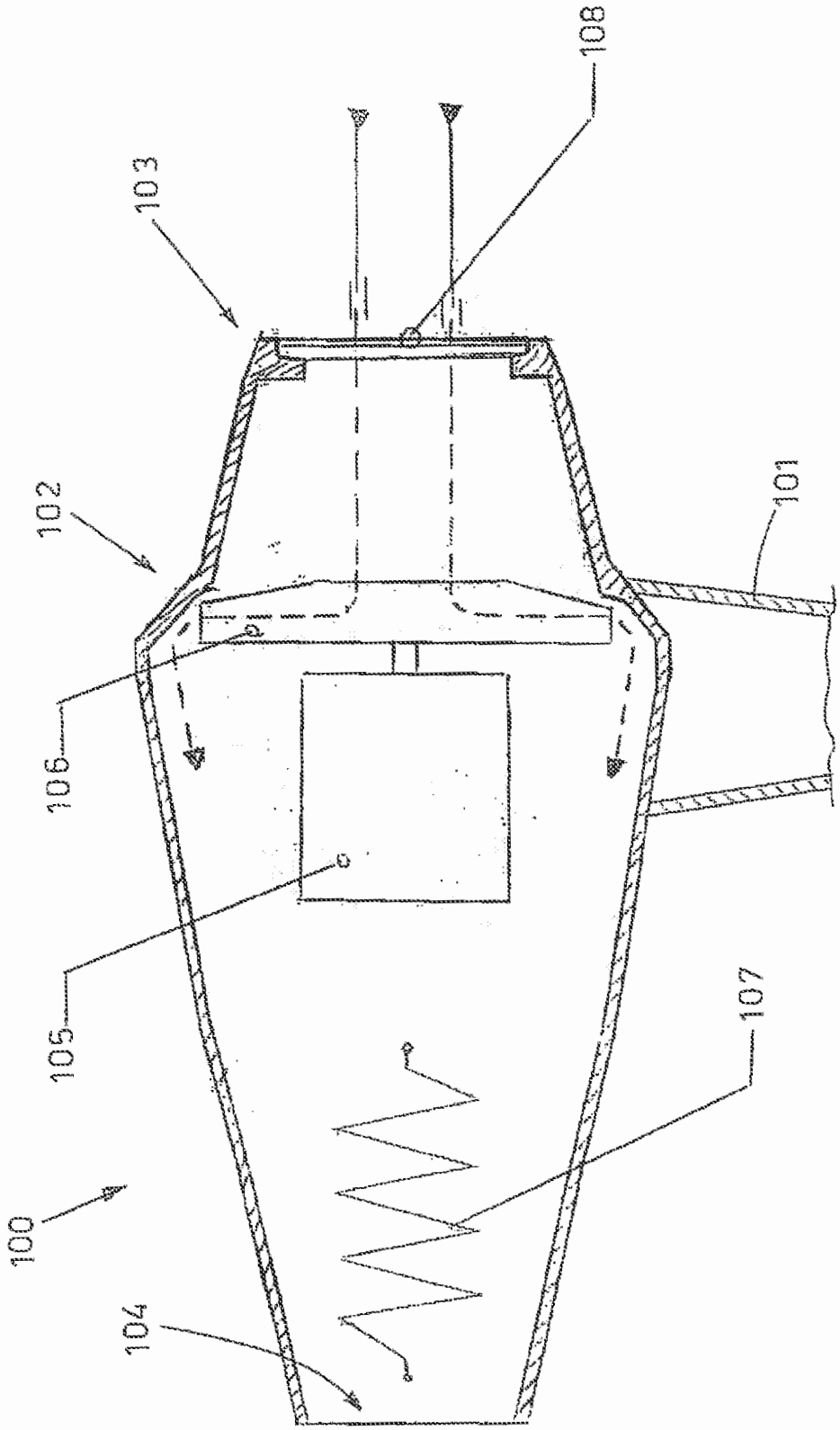
15). The hair-drying device of one of the two preceding claims, characterised in that it comprises second sound-absorbing means (5), associated to a bottom (31) of the closing capsule (3), comprising at least a plate (50) realised in sound-absorbing spongy material and arranged facing the rear section (13) of the casing (12).

16). The hair-drying device of the preceding claim, characterised in that the plate (50) and the bottom (31) of the capsule (3) are concavely shaped with respect to the air flow (Z) coming from the hollow space (4).

17). The hair-drying device of one of the two preceding claims, characterised in that a conical appendage (51) emerges from the plate (50) and projects towards the facing posterior section (13) of the casing (12).

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FIG.1
PRIOR ART



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FIG.2

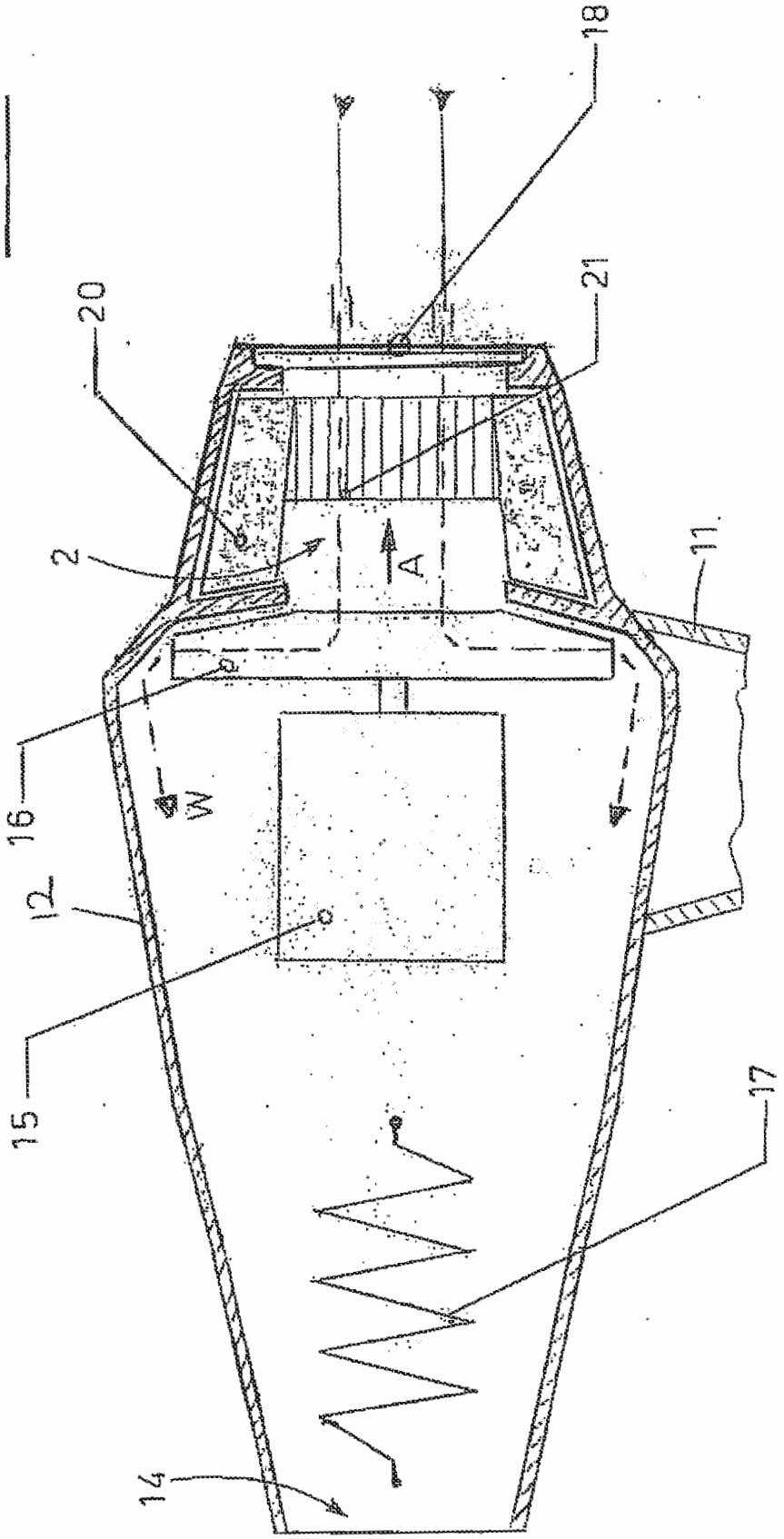
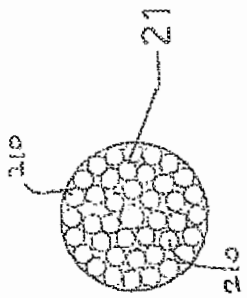


FIG.2a



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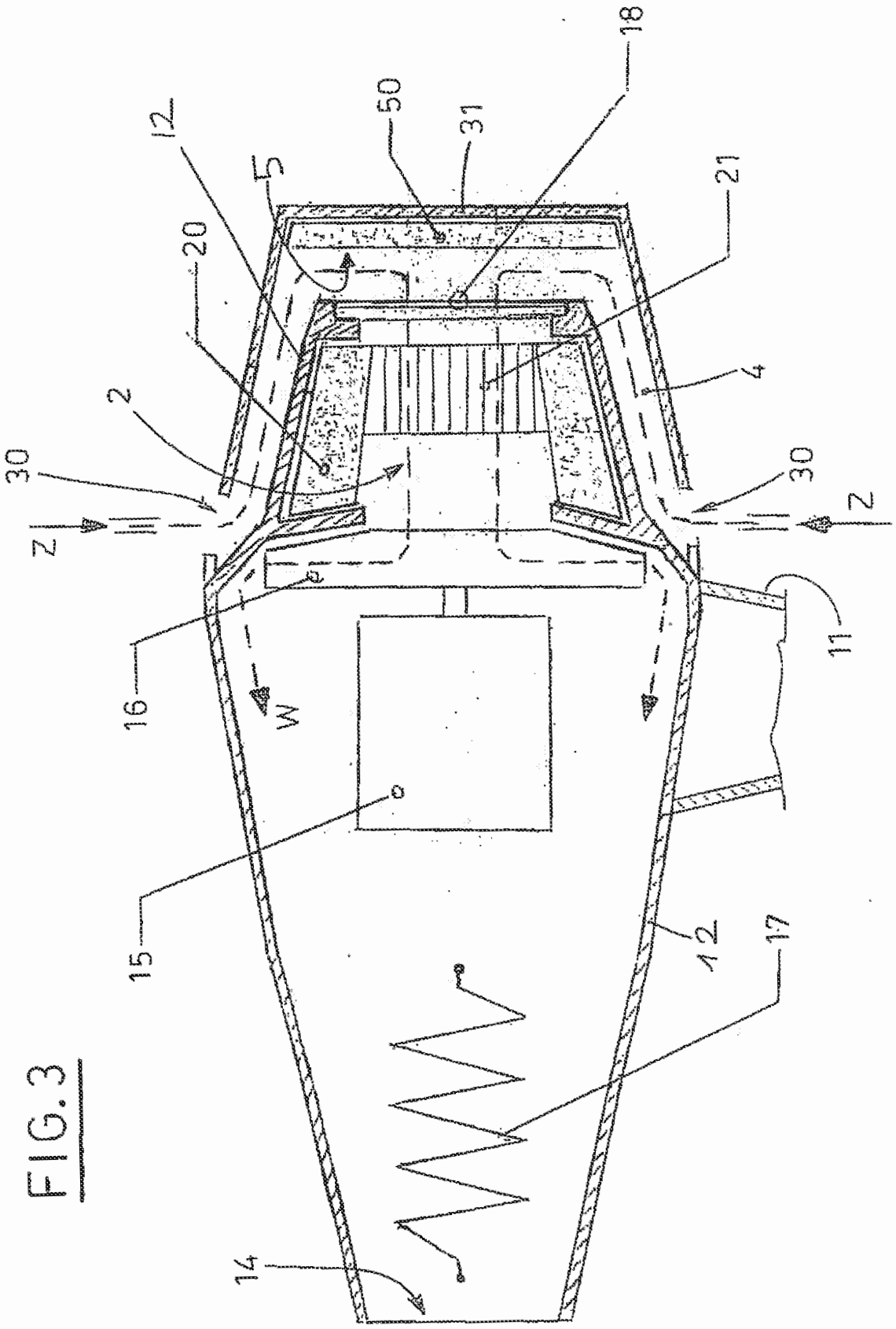


FIG.3

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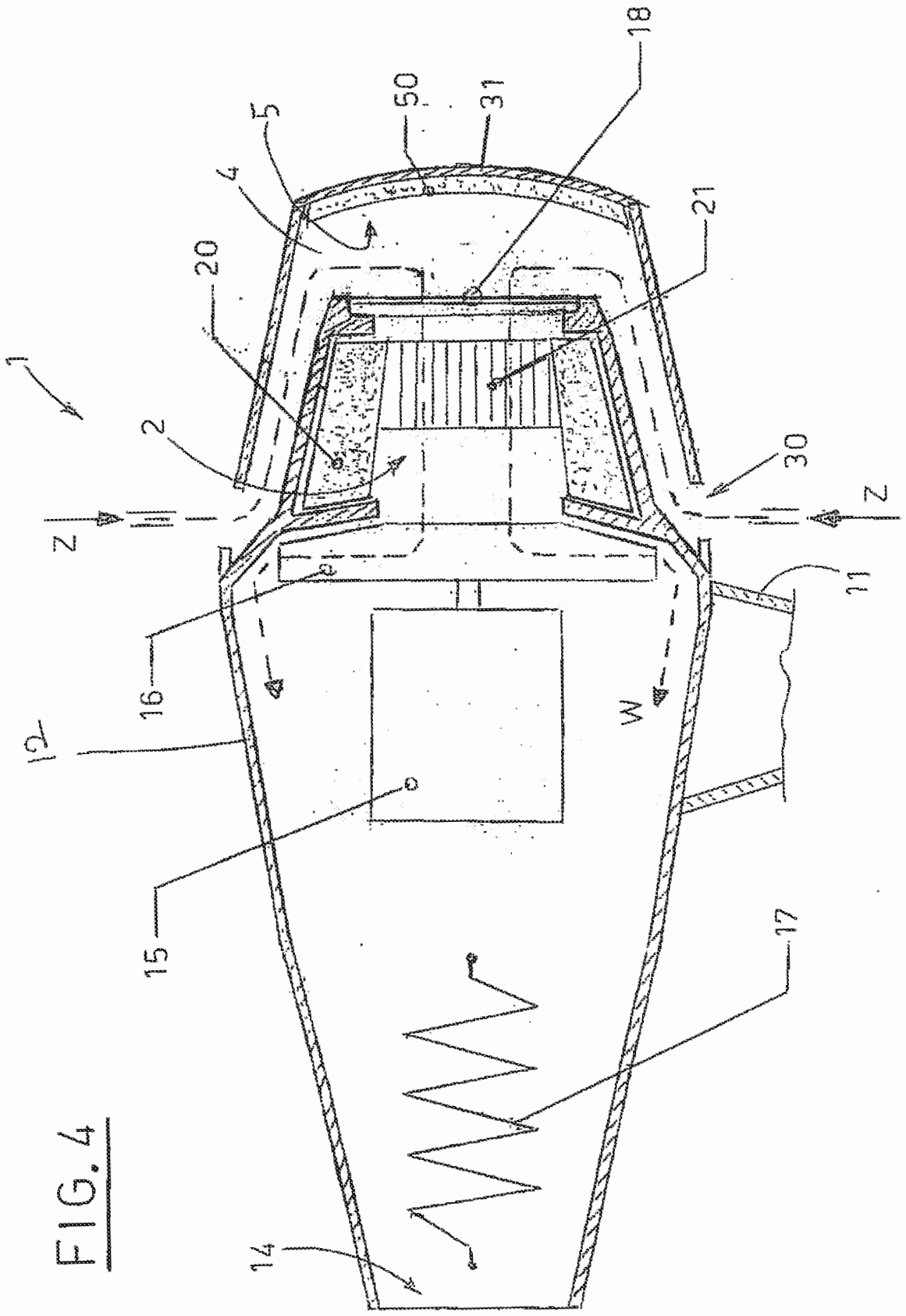


FIG. 4

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FIG.5

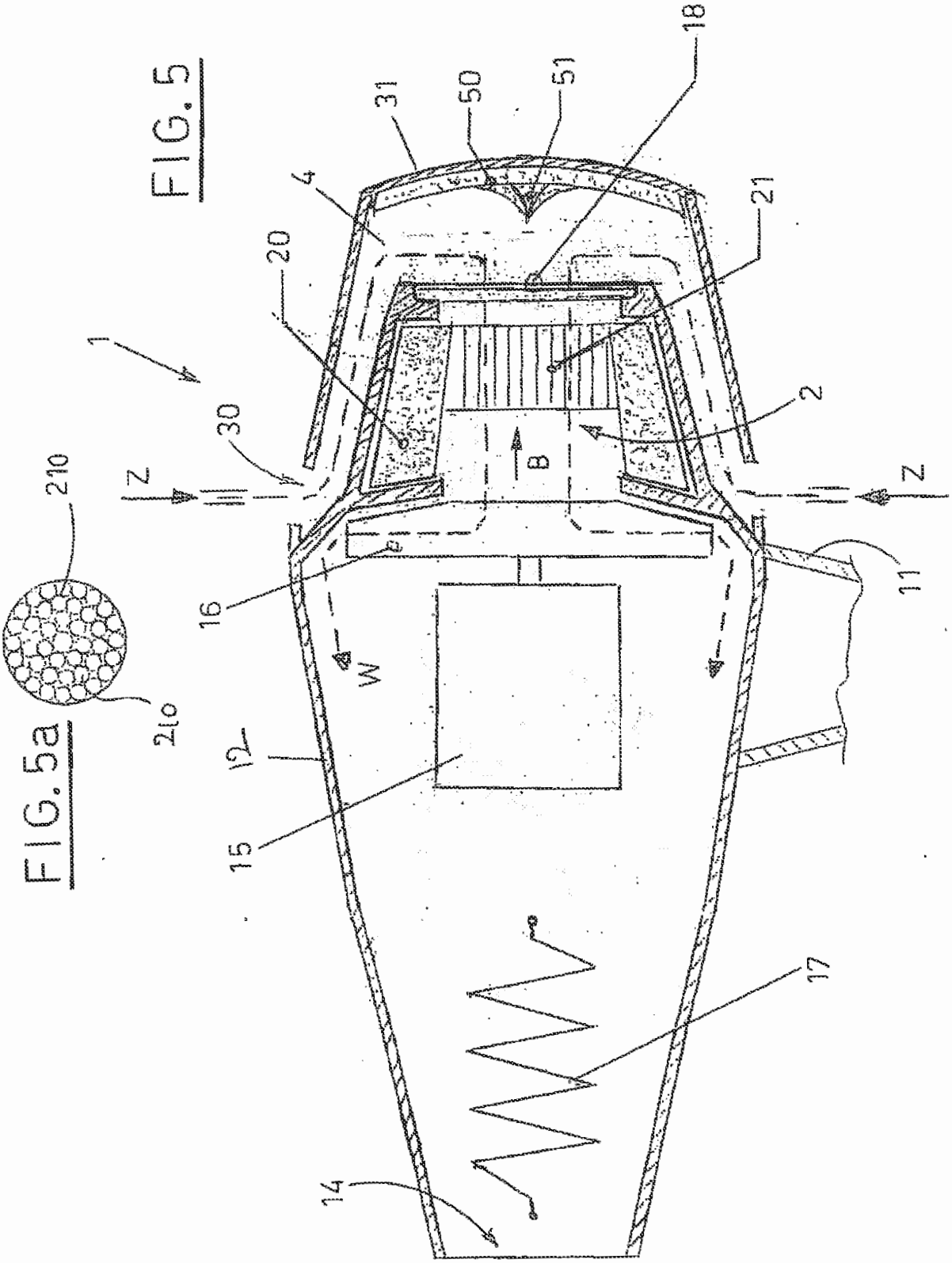
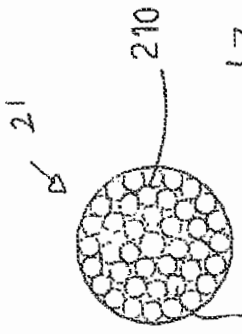


FIG.5a



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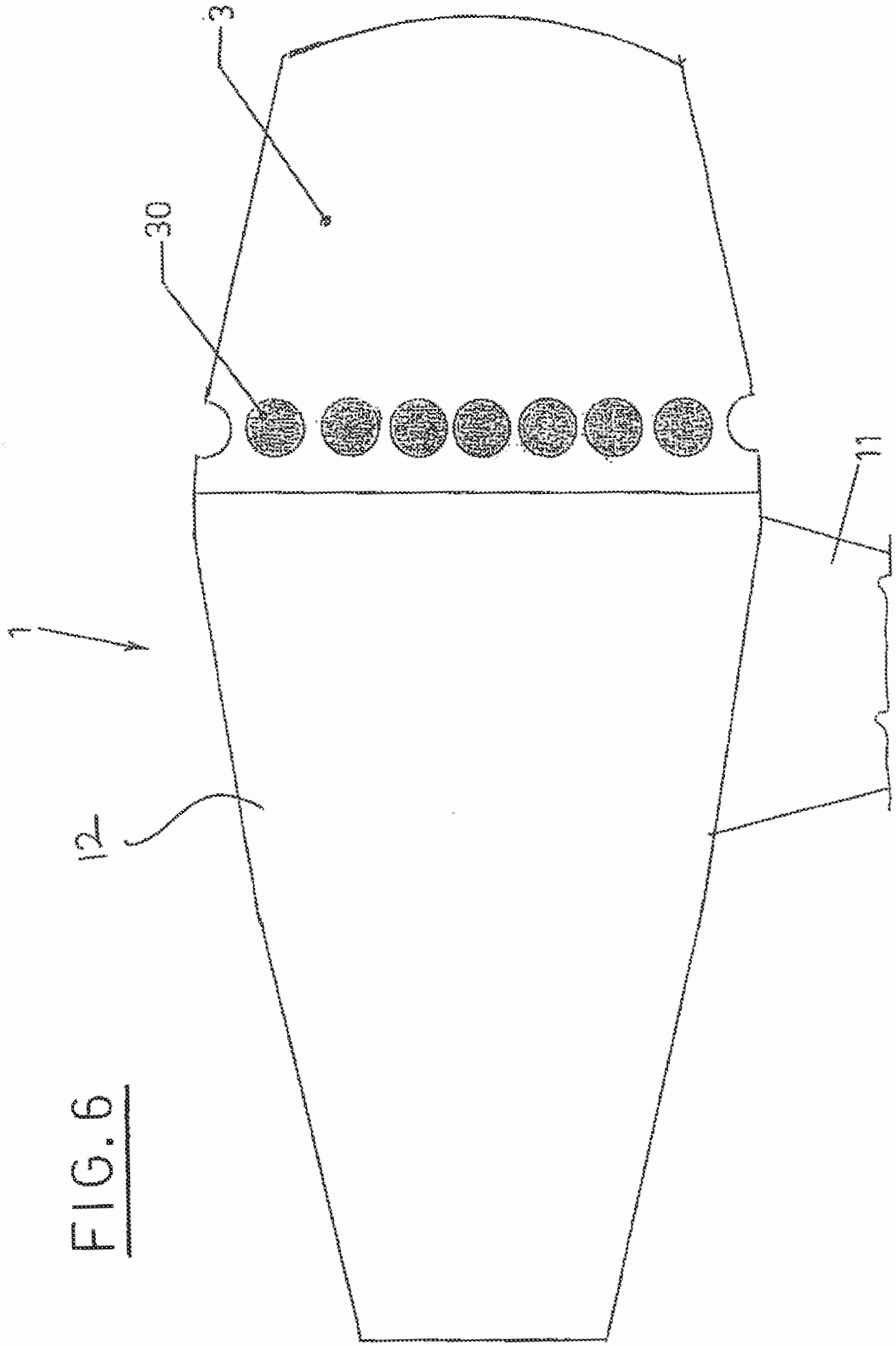
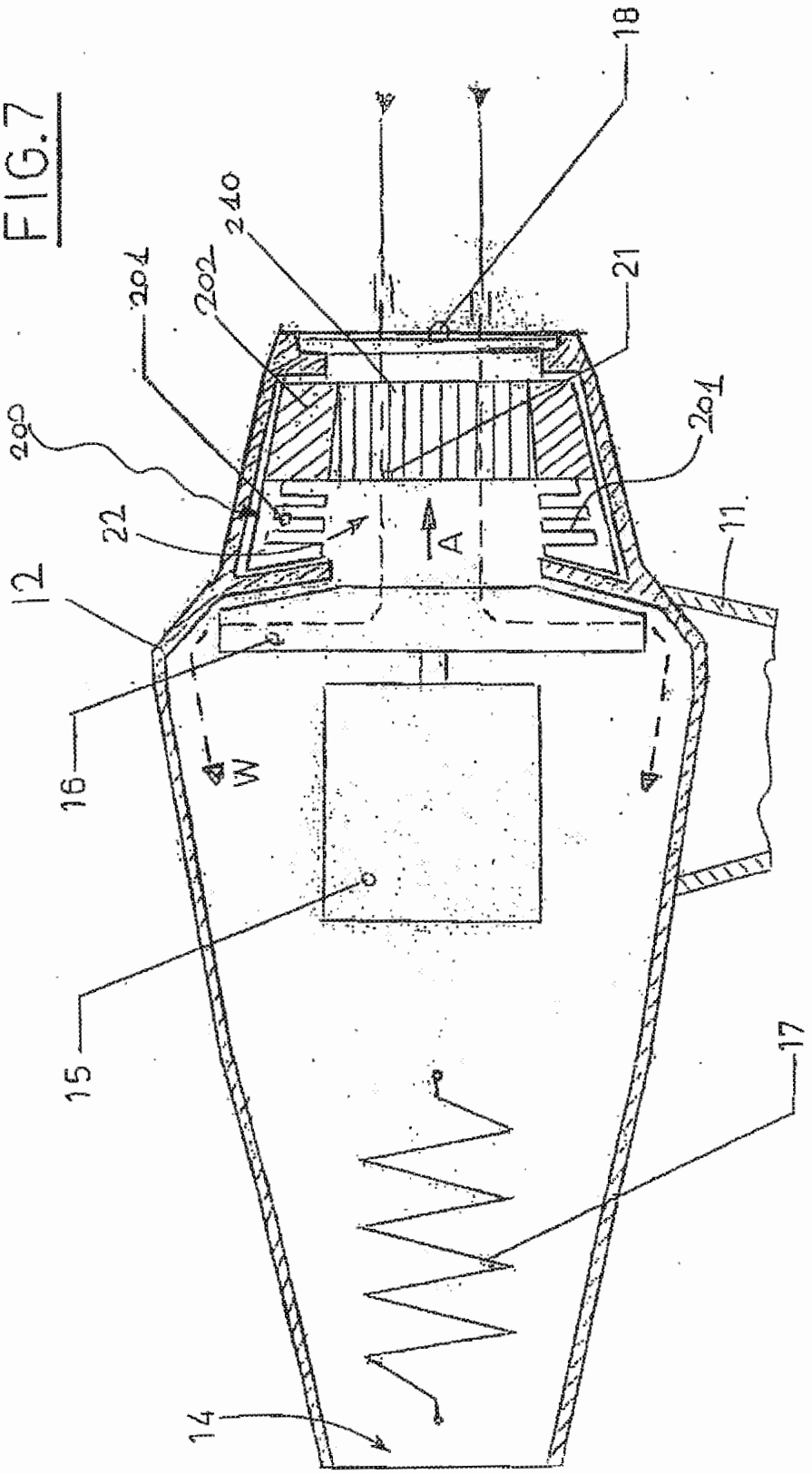


FIG.6

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FIG.7



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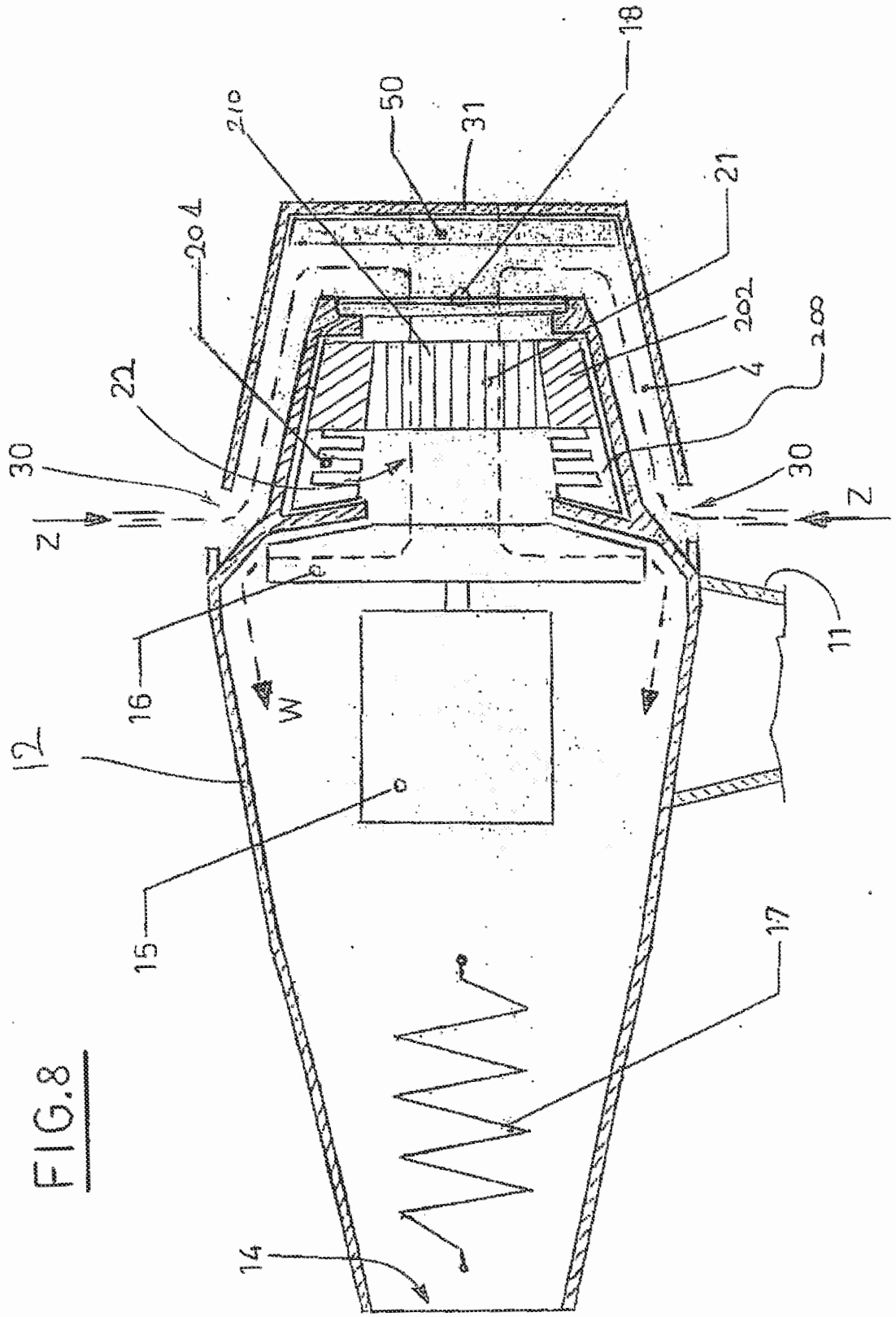


FIG.8

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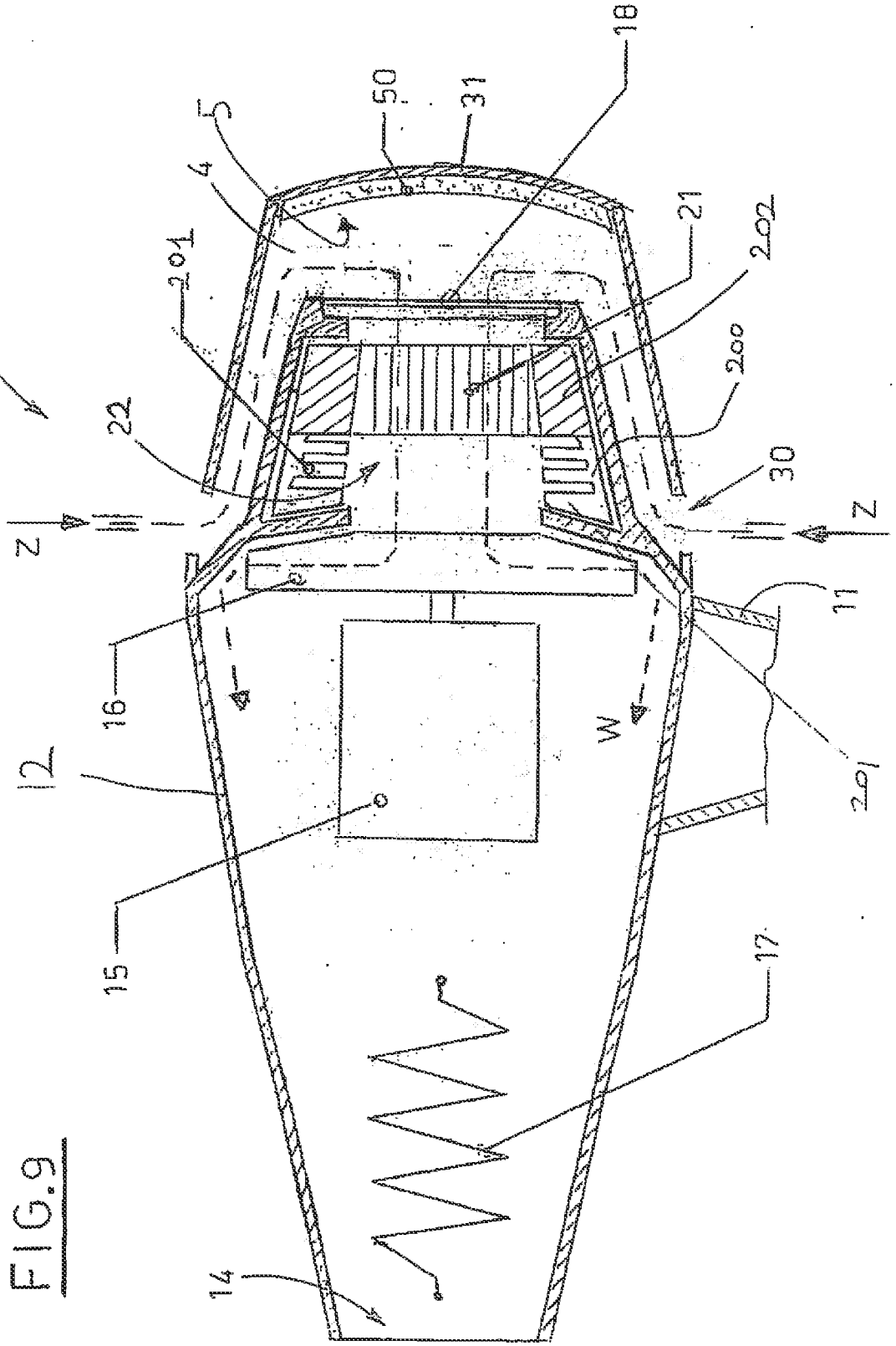
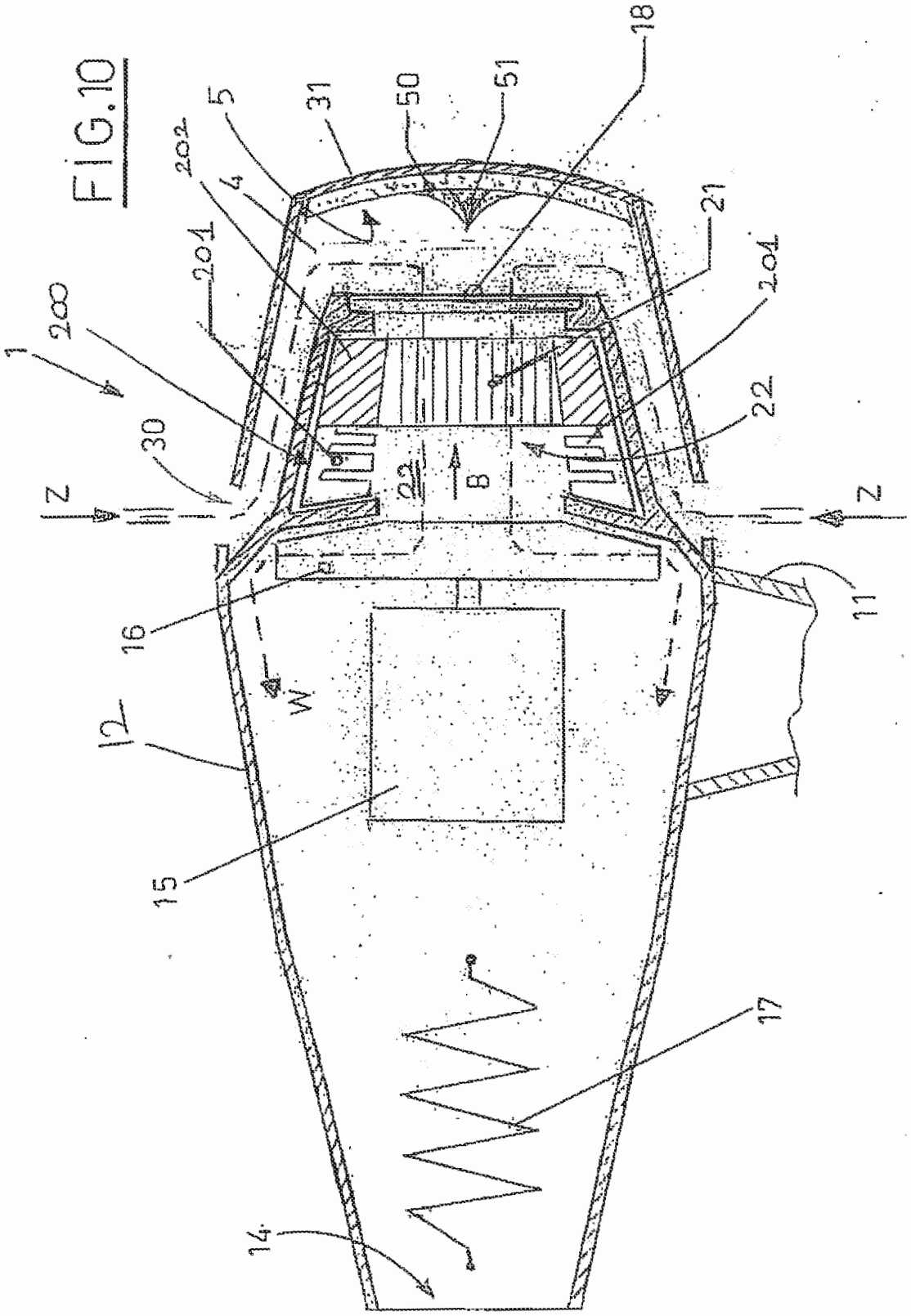


FIG.9

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FIG.10



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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2011/055218

A. CLASSIFICATION OF SUBJECT MATTER
INV. 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 practical, 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 2010/064542 A1 (MULVANEY PATRICK T [US] ET AL) 18 March 2010 (2010-03-18)	8
Y	the whole document	1-3,7, 11,12, 15-17
X	US 4 596 921 A (HERSH ALAN S [US] ET AL) 24 June 1986 (1986-06-24)	9-11
Y	the whole document	13,14
X	US 2009/188126 A1 (GAILLARD CHRISTOPHE [FR] ET AL) 30 July 2009 (2009-07-30)	8-10
Y	the whole document	11-14
X	BR PI0 804 541 A (OSCAR JOSE RODRIGUES) 29 June 2010 (2010-06-29) page 7, lines 8-20; figures 1-5	8-10,13, 14

-/--

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
9 March 2012	16/03/2012

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Nicolás, Carlos

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2011/055218

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2010/045698 A1 (RODRIGUES OSCAR JOSE [BR]) 29 April 2010 (2010-04-29) page 12, line 18 - page 17, line 12; figures 17-18	1-3,7, 15-17

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2011/055218

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		WO 2010045698 A1	29-04-2010

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(74) Agent: MARKS & CLERK LLP; 62-68 Hills Road, Cambridge, Cambridgeshire CB2 1LA (GB).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

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(54) Title: A HAIR DRYER

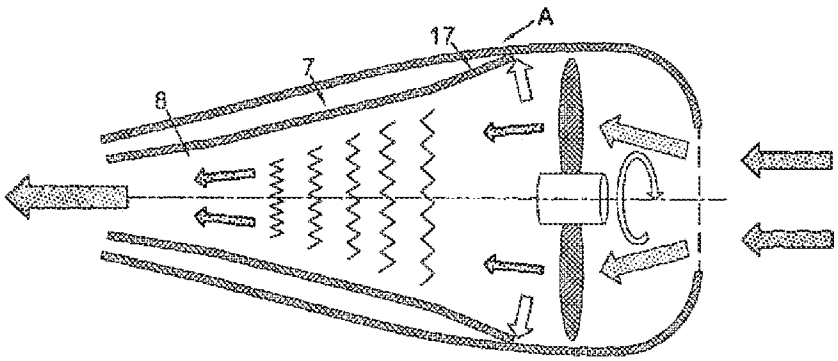


Fig.1a

(57) Abstract: A hair dryer comprising: a housing defining a first air flow channel and a second air flow channel, whereby the first air flow channel at least substantially circumscribes the second air flow channel; an air flow regulation means to regulate the flow of air along the first air flow channel and/or the second air flow channel.

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A HAIR DRYER

FIELD OF INVENTION

The invention relates to hair dryers.

BACKGROUND TO THE INVENTION

A hair dryer provides a stream of air. The stream of air may be used to remove moisture from hair and/or style hair.

A hair dryer typically comprises a main body comprising an air inlet, an air outlet, a fan and a heating means. The fan draws external air into the main body via the air inlet and blows out a stream of air through the air outlet. The heating means are arranged to heat the air flow so as to provide a hot stream of air.

A hair dryer may comprise a nozzle to control the stream of air from the air outlet. The nozzle may be releasably mounted at the air outlet of the main body.

A hand-held hair dryer comprises a handle. The handle is typically located on the underside of the main body and extends substantially perpendicularly to the longitudinal axis of the main body.

Background prior art can be found in: FR1387334, EP1371302 A1, WO94/23611, JP2004-113402 and JP2006-130181A.

SUMMARY OF THE INVENTION

The invention seeks to provide a new or otherwise improved hair dryer.

According to an aspect of the invention, there is provided a hair dryer comprising: a housing defining a first air flow channel and a second air flow channel, whereby the first air flow channel at least substantially circumscribes the second air flow channel; an air flow regulation means to regulate the flow of air along the first air flow channel and/or the second air flow channel.

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The air flow regulation means preferably comprise a member movable between a first position and a second position, whereby in the first position the member is arranged to at least substantially close an inlet aperture of the first air flow channel and in the second position the member is arranged to at least minimise an inlet aperture of the second air flow channel.

Typically, the hair dryer comprises a housing having an air inlet at one end of the housing and an air outlet at the opposed end of the housing. A fan unit and its associated motor unit are mounted within the housing for drawing air through the air inlet, through the housing and out the air outlet. A heating element is mounted downstream from the fan unit for warming air which passes over the heating element. A nozzle is often fitted to the housing at the air inlet to direct air flow.

The first air flow channel may be defined between an inner surface of the housing and an outer surface of the second air flow channel. A heater may be mounted in the second air flow channel and the first air flow channel may be insulated from the heater. The air flow regulation means may be configured to instantaneously redirect the flow of air from the second air flow channel to the first air flow channel whereby a cold shot of air is provided.

Such "cool shots" of air allow a user to "fix" a hairstyle. Typically, "fixing" a hairstyle created with the heat from an existing hair dryer takes around 30 seconds per section of hair and needs to be done quickly after heating. With existing hair dryers, switching off the power to the heating means may provide a "cool shot". However, the air takes a long time to cool. The use of air flow regulation means as described above instantaneously redirects the flow of air and therefore improves the function of the hair dryer as a means to "fix" a hairstyle. This is because it is capable of switching from hot to cold air instantly.

The first air flow channel preferably circumscribes the second air flow channel along its length. In this way, the heated parts are insulated from a user. Moreover, the "cool shot" is delivered direct to a user's hair. The first air flow channel may extend at least substantially along the length of the housing and may further extend to a nozzle region of the housing. The first air flow channel may extend beyond the second air flow channel at the air inlet. Alternatively, the first air flow channel and second air flow channel may terminate together. The moveable member may be

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activated by user operated control means, e.g. a button on the handle of the hair dryer.

The air flow regulation means may comprise a moveable member connected to actuation means whereby movement of said actuation means moves said moveable member. The actuation means may slide along a shaft connected to a motor which draws air into the hair dryer. The actuation means may be in the form of a piezo motor, solenoid actuator, mechanism taking movement from activating the "cool shot" button on the handle, a magnetic clutch driven off the main motor, a wax actuator or a shape-memory alloy.

In the first position the moveable member may taper downstream and in the second position the moveable member may taper upstream. In other words, the moveable member may have a greater cross-section towards the air inlet of the hair dryer in the first position and a greater cross-section towards the air outlet of the hair dryer in the second position. Since the first air flow channel substantially circumscribes the second air flow channel, this is a simple arrangement to close the first air flow channel in the first position and to at least substantially close the second air flow channel in the second position.

The moveable member may be formed from a plurality of panels. This may provide greater flexibility of movement and also provide for ease of manufacture.

The air flow regulation means may further comprise at least one fixed element which co-operates with the moveable member to close at least one of said first and said second air flow channels. By co-operate it is meant that the moveable member and said at least one fixed element are in contact or at least proximate, whereby closure is achieved.

The at least one fixed element may comprise an outer fixed element which protrudes from an outer surface of the housing and co-operates with the moveable member to close said first air flow channel in said first position. The outer fixed element may be angled downstream or may be angled upstream. The outer fixed element may substantially circumscribe the moveable member and/or second air flow channel. The outer fixed element may generally be a hollow frusto conical shape.

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The at least one fixed element may comprise a central fixed element which is concentrically mounted within the housing and which co-operates with the moveable member to close said second air flow channel in said second position. The moveable member and the central fixed element may be in the form of perforate plates each having offset perforations whereby when the moveable member and the central fixed element are in contact, the second air flow channel is closed. Alternatively, the moveable member may be generally cylindrical inwardly projecting flange which contacts the central fixed element in the second position.

There may be both a central fixed element and an outer fixed element.

The moveable member and at least one fixed member may be made from a ferro-magnetic material. The regulation means may comprise actuation means configured to change a polarity of at least one of said moveable member and said at least one fixed member to move said moveable member relative to said at least one fixed member.

We also describe several other hairdryer arrangements which may be used alone or in conjunction with the first aspect of the invention above.

A first arrangement relates to a hair dryer comprising: a housing defining a first air flow channel and a second air flow channel, whereby the first air flow channel is configured to at least substantially circumscribe the second air flow channel and the first air flow channel is configured to form a venturi effect for driving air along the first air flow channel from a first air inlet to a first air outlet, a fan for driving air along the second air flow channel from a second air inlet to second air outlet; and a heating means for heating the air flow in the second air flow channel;

Such an arrangement provides cooling of the hair dryer, particularly the nozzle.

The first air flow channel may comprise a third air inlet and the fan may be configured to drive air along the first air flow channel via the third air inlet.

A second arrangement relates to a hair dryer comprising a heating means comprising multiple heating elements supported by a support means. The support means comprises a front region whereby air is separated into multiple air flow streams and a

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rear region configured to combine the multiple air flow streams so as to form an air flow stream having a substantially uniform temperature profile.

Such an arrangement thus provides a reduction in temperature change across the air stream.

The support means may comprise multiple fins. Each fin may have a front portion and a rear portion. The fins may be configured such that the front portions of the fins define multiple air flow channels and the rear portions of the fins define the rear region.

A third arrangement relates to a hair dryer comprising: a fan for blowing air through an air outlet; and control means for automatically controlling the operation of the fan so as to at least substantially maintain a constant air flow volume during use.

Such an arrangement thus provides an adjustment of air flow volume.

The control means may control the rotational speed of the fan so as to at least substantially maintain a constant air flow volume.

If the hair dryer is operable at one of several pre-selected air flow volumes, the control means may automatically control the rotational speed of the fan so as to at least substantially maintain the pre-selected air flow volume.

A fourth arrangement relates to a hair dryer comprising: a housing defining a first air flow channel and a second air flow channel, whereby the first air flow channel at least substantially circumscribes the second air flow channel; a fan for driving air along the air flow channels; and a heating means for heating the air flow in the second air flow channel.

Such an arrangement provides cooling of the hair dryer.

The first air flow channel may extend at least substantially along the length of a nozzle region of the housing.

A fifth arrangement relates to a hair dryer comprising: a stator to generate a smooth flow of air; and a heating means to heat the flow of air; whereby the stator and

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heating means are arranged in a substantially same location in a housing of the hair dryer.

Such an arrangement thus provides combined heating and flow control.

The stator and heating means may be integrally formed.

A sixth arrangement relates to a hair dryer comprising: a rear wall having a first rear air inlet; a baffle member spaced from the rear wall so as to define a second rear air inlet between the baffle member and the rear wall; wherein, in use, air is drawn into the hair dryer through the second rear air inlet and first rear air inlet.

Such an arrangement provides acoustic attenuation.

The baffle member may be generally planar and located substantially perpendicular to a longitudinal axis of the hair dryer such that air enters the second air inlet at an angle to the longitudinal axis. The angle may be substantially 90 degrees. The baffle member may comprise acoustic absorbing material.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is illustrated by way of example in the following figures in which:

Figs 1a to 1h are cross-sections of a hairdryer incorporating moving components to regulate airflow;

Figs 2a and 2b are perspective views of a known heating component which may be incorporated in the hairdryer of Fig 1a;

Figs 2c and 2d are perspective views of a variation of the known heating component which may be incorporated in the hairdryer of Fig 1a;

Fig 3 is a graph of Pfa in Pa against volume in m^3/h showing a typical constant volume curve;

Fig 4 is a cross-section of a hairdryer incorporating co-axial airflows;

Figs 5a and 5b are cross-sections of a hairdryer incorporating a venturi effect airflow;

Figs 6 and 7 are cross-sections of a hairdryer incorporating integrated heated flow control;

Fig 8 is a cross-section of one end of a known hairdryer;

Figs 9a to 9d are cross-sections showing baffling of the hairdryer of Fig 8.

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DETAILED DESCRIPTION OF THE DRAWINGS

Various features are shown in the drawings. These features are applicable to all aspects of the invention and may be used in any combination.

In each variation, the hair dryer comprises a housing having an air inlet at one end of the housing and an air outlet at the opposed end of the housing. A fan unit and its associated motor unit are mounted within the housing for drawing air through the air inlet, through the housing and out the air outlet. A heating element is mounted downstream from the fan unit for warming air which passes over the heating element. By considering the direction of air flow, the rear of the heating element may be considered to be the end of the heating element closest to the air outlet. As with conventional hair dryers, the hair dryer also comprises a handle for a user to hold the hairdryer.

Regulation of air flow along an air flow channel

We describe how to provide air flow regulation means to control the flow of air along one or more air flow channels of the hair dryer.

The air flow regulation means may comprise a movable member to control the geometry of an inlet aperture of the air flow channel. The movable member may be movable so as to open and close the inlet aperture of the air flow channel. The movable member may be movable to an intermediate position whereby the geometry of the inlet aperture is reduced so as to impede (restrict) the flow of air into the air flow channel.

Figures 1a and 1b depict an embodiment where the hair dryer comprises an outer air flow channel (7), an inner air flow channel (8) and a movable member (17) to control the flow of air along the outer air flow channel and the inner air flow channel. The movable member is movable between a first position and second position. The inner air flow channel (8) is circumscribed by, i.e. mounted within, the outer air flow channel (7). The outer air flow channel (7) is defined between the inner wall of the housing and the outer wall of the inner air flow channel (8). A heater is mounted within the inner air flow channel (8) and is insulated from the outer air flow channel (8) by the wall of the inner air flow channel (8).

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In the first position (A) the inlet of the outer air flow channel is closed and the inlet of the inner air flow channel is open (see Figure 1a) to provide a passage connecting the air inlet and the air outlet. As shown by the arrows, air is drawn by the fan unit through the air inlet into the interior of the hair dryer. The heating element is mounted within the inner air flow channel and thus the air is warmed. The warm air then passes out through the air outlet.

In the second position (B), the inlet of the outer air flow channel is open and the inlet of the inner air flow channel is at least restricted (see Figure 1b). As shown by the arrows, air is drawn by the fan unit through the air inlet into the interior of the hair dryer. The majority of the air flows down the outer air flow channel bypassing the heating element mounted within the inner air flow channel. Thus, a simple mechanical air flow regulator redirects air away from the heater (ranging from 0-100%), enabling the air temperature exiting the air outlet to change from hot to ambient temperature almost instantly. Thus, when the moveable member is located in the second position, the hair dryer is configured to provide a "cool shot" of air. Such "cool shots" are used for "fixing" a hair style.

Using a moveable member or air flow regulation device to control the flow of air through the inner and outer channels allows the air temperature exiting the nozzle to change from hot to ambient temperature almost instantly. In addition, regulating the balance of air flow between each channel can be used to adjust the air flow temperature. For example, the moveable member may be arranged in an intermediate position whereby the inlet of the outer air flow channel and the inlet of the inner air flow channel are open.

In both Figures 1a and 1b, at the air outlet, the inner air flow channel terminates before the outer air flow channel. In this way, no heated component extends beyond the cooler component, thus minimising injury to a user.

The moveable member may be activated using any suitable control means such as a magnetic clutch or breaking system. The mechanism may work by force applied by the user or by force applied by the motor system which drives the fan unit.

The hairdryer shown in Figures 1c and 1d is generally similar to that shown in Figures 1a and 1b and thus the elements in common have the same numbering. In

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the hair dryer depicted in Figures 1c and 1d, the hair dryer comprises a housing defining an outer air flow channel (7), an inner air flow channel (8), a moveable member (17) to control the flow of air along the outer air flow channel and the inner air flow channel, a "cool shot" button (13) and actuation means (14). The actuation means (14) is slidably located on a fixed shaft extending concentrically from the main motor (54). In this embodiment, the actuation means is in the form of a piezo motor but may be formed from any one of the following devices to provide the actuation movement: solenoid actuator, mechanism taking movement from activating the "cool shot" button (13) on the handle, a magnetic clutch driven off the main motor, a wax actuator or a shape-memory alloy. The actuation means (14) is connected to the moveable member (17) via a plurality of regulation members (140) which are generally rod-like struts. The actuation means, regulation member and moveable member co-operate to control the opening and closing of the air flow channels and thus form the air flow regulation means. In variants, the actuator may be fixed and the shaft may move around the actuator. The shaft then moves relative to the actuator to control the moveable member and provide the air flow regulation means.

Figure 1c shows a first position in which the inlet into the outer air flow channel (7) is closed and thus, air is drawn in by the fan (9) through the inner air flow channel (8). The air is heated by a heater located within the inner air flow channel so as to provide a hot stream of air. Figure 1c also shows a schematic end cross-section (1401) without the motor and actuation means. The annular cross-section of the outer air flow channel (7) is closed by the moveable member (17). As shown, the moveable member (17) is formed from a plurality of panels. The moveable member (17) may be made from a combination of flexible materials such as, but not limited to, rubber, and supported by panels or a ridged endoskeleton structure made of plastics or metals. The moveable member (17) forms a hollow frusto-conical shape having its narrower end at the downstream end, i.e. closer to the air outlet. The moveable member is concentrically mounted within the housing, e.g. with respect to the motor, so that the hollow portion is aligned with the inner air channel, so that air may flow through the inner air channel.

The moveable member (17) is held in this open, expanded state by the plurality of regulation members (140) which pushes the moveable member (17) so that the moveable member is in contact with the inner wall of the housing, thereby closing the outer air flow channel and preventing air flow through it. The open, expanded state is achieved when the actuation means is located on the end of the fixed shaft furthest

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away from the main motor (54). In this position, the actuation means pushes the regulation device into the expanded state.

If a user wishes a "cool shot", they depress the "cool shot" button (13) which activates the actuation means and hence moves the moveable member. As shown in Figure 1d, the moveable member is positioned to direct air only down the outer air flow channel (7), thereby bypassing the heater and exiting the hair dryer as a "cool shot" of air. Activation of the actuation means (14) causes it to slide along the fixed shaft towards the motor (54). This causes the regulation members (140) to be drawn along with the actuation means. The movement of the regulation members (140) reduces the force on the moveable member (17), which repositions the moveable member such that access to the outer air channel is possible but access to the inner air channel is not. The movement of the regulation members (140) draws the moveable member into a collapsed or closed state. In other words, the moveable member can expand and collapse in the same way as a conventional umbrella opens and closes.

Figure 1d also shows a schematic end cross-section (1402) without the motor and actuation means. The annular cross-section of the inner air flow channel (8) is closed by the moveable member (17). In this arrangement, the moveable member (17) also forms a hollow frusto-conical shape tapering upstream, e.g. having its narrower end at the upstream end, i.e. closer to the air inlet. The moveable member is concentrically mounted within the housing, e.g. with respect to the motor, so that its hollow portion is aligned with the motor, so that air may not flow through the inner air channel.

The hairdryer shown in Figures 1e and 1f is generally similar to that shown in Figures 1c to 1d. As above the actuation means (14) is slidably located on a fixed shaft extending concentrically from the main motor (54). In this embodiment, the air flow regulation means comprises a moveable member (17), a central fixed element (1403) and an outer fixed element (15). In this arrangement, the actuation means (14) is connected to the moveable member (17) which is in the form of a convex perforate panel (with the perforations schematically illustrated by the dashed lines). The moveable member has an upstanding flange which extends around its circumference. The central fixed element is also a perforate convex panel (1403) which covers the inlet to the inner air channel (8). The outer fixed element is a protruding element (15) projecting at an angle from the inner surface of the housing

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to at least partially cover the inlet to the outer air channel (7). The protruding element may be a single piece or formed from a plurality of elements and is angled (or tapers) towards the air inlet of the hair dryer.

The actuation means moves the moveable member (17) between a first position in which the moveable member (17) is in contact with the protruding element (15) (Figure 1e), and a second position in which the moveable member (17) is in contact with the second perforate panel (1403) (Figure 1f). In the configuration shown in Figure 1e, air is prevented from flowing down the outer air channel by the combination of the flange on the moveable member and the protruding element (15) which co-operate to close the outer air channel. Air is blown by the fan through the perforations of the moveable member, on through the perforations in the second perforate panel and into the inner air channel. The air exits the hair dryer as hot air.

In Figure 1f, the two perforate panels are in contact and the flange on the moveable member nests within the inner air flow channel, thus allowing air blown by the fan to flow through the outer air channel. This air bypasses the heating elements and exits as a "cool shot" of air. Air is prevented from flowing through the inner air channel by the offsetting of the perforations of the two panels. When the two panels are in contact, perforated sections of the moveable member align with unperforated sections of the other panel and vice versa, thereby forming a solid impenetrable barrier to the inner channel.

The embodiment shown in Figures 1g and 1h is generally similar to that shown in Figures 1e and 1f. In this embodiment, the air flow regulation means comprises a moveable member (17), a central fixed element (1404) and an outer fixed element (15). The moveable member is generally cylindrical with a flange projecting inwards around the upstream circumference, and comprises a perforate section (with the perforations schematically illustrated by the dashed lines). The central fixed element (1404) is in the form of a shallow circular cone having its apex attached to the shaft on which the actuation means (14) is mounted. The other fixed element (15) protrudes at an angle to the inner wall of the housing. The protruding element (15) tapers away from the air outlet, i.e. is angled back towards the air inlet. Accordingly, the protruding element (15) connects to a generally cup shaped cover for the fan which prevents air becoming trapped upstream of the protruding element. The moveable member and central fixed element may be constructed from ferromagnetic

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other magnetic materials and the actuation means may be a device to change the polarity of one of them, e.g. the central fixed element.

In the first configuration shown in Figure 1g, the moveable member is in contact with the protruding element (15) and the wall defining the outer air channel, thereby blocking access to the outer air channel. Air is blown by the fan through the perforate section of the moveable member (17) into the inner air channel (8) and exits the hair dryer as warm air. The moveable member (17) is kept in this configuration by the magnetic polarity of the moveable member with respect to the fixed element (1404). Here, the moveable member and fixed element are of like polarity and therefore, magnetic repulsion forces the moveable member away from the fixed element and into contact with the protruding element.

In the second configuration of Figure 1h, the "cool shot" button has been depressed and the actuation means activated. The actuation means changes the polarity of the fixed element to the opposite of the polarity of the moveable element. Magnetic attraction forces the moveable member (17) to come into contact with the fixed element (1404). The flange of the moveable member closes the annular gap between the central fixed element and the wall of the hot air channel and the perforate section is in contact with the central fixed element, thereby forming a solid impenetrable barrier to the inner channel. The movement also open the outer air channel. Air is now blown by the fan into the outer air channel and exits as a "cool shot" of air.

Reduction in temperature change across the air stream

The stream of air produced by a hair dryer typically comprises hot spots and cool spots. For example, the stream of air may comprise a central cool spot. We describe below one way of minimising the temperature differential across the air flow of a hair dryer. This seeks to provide a hair dryer whereby the stream of air has a substantially constant temperature profile across the air flow.

The heating means for a hair dryer typically comprises multiple heating elements supported by a support means. The heating elements may be resistive heating elements such as, for example, resistor windings comprising resistive heating wire wound in the form of a coil.

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Figures 2a and 2b depict a perspective view of an example of a conventional support means (1) for a heating means. The support means is arranged at the rear of the heating elements (4) and adjacent the air outlet mesh (2) of the hair dryer. The support means comprises multiple support fins (3) whereby each support fin is configured to support a resistive heating element (4). The support fins extend radially from a central support in a star formation. Adjacent support fins define air flow channels (5) that separate the heated air into multiple air flow streams. Accordingly, the air flow exiting the conventional heating means, and thereby the air outlet, has a circumferential zone at a high temperature and a central zone at a lower (reduced) temperature.

We seek to address the central cool spot problem by providing a support means that is configured to combine (merge) the multiple air flow streams exiting the air flow channels. The combining of the multiple air streams flow mixes the heated air so as to form an air flow having a reduced temperature differential.

Figures 2c and 2d depict an example of a support means that is configured to combine the multiple air flow streams. The support means comprises a region (6) arranged at the rear of the heating element support where multiple air flows streams exiting the air flow channels combine to form an air flow stream having a substantially uniform temperature profile.

In this example, the fins are configured to define the region. The rear end portion of each fin (16) is configured to have an arcuate form so as to define a substantially semi-circular region. By removing the central end section of the heating element supports, the heated air can merge before passing through the outlet mesh. This leads to an improved mixture of heated air and results in a reduced temperature differential across the airflow.

Alternative arrangements in which the rear end portion of each fin are configured such that the multiple air flow streams are directed towards one another in the region may also be used.

Adjustment of air flow volume

When a hair dryer is located close to a user's hair, e.g. when a hair stylist uses a hair dryer to force hot air into the hair fibres by placing the nozzle of the hair dryer against

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the fibres; air pressure builds up which restricts the flow of air from the hair dryer. The fan has to overcome this pressure. Conventional hair dryers run continuously at a defined speed regardless of the pressure applied by the user. This uses more energy, creates more noise and blows excessive air volume which can ruin a section of hair already styled (or blow other things around the room).

We describe control means to provide automatic control of the air flow of the hair dryer.

The control means automatically control the operation of the fan so as to at least substantially maintain a constant air flow volume during use. Therefore, the control means is able to automatically compensate for any changes in applied air pressure, for example as the hair dryer is moved with respect to a user's hair.

Preferably, the control means control the rotational speed of the fan so as to at least substantially maintain a constant air flow volume. Accordingly, if an air pressure is applied, the control means automatically increases the rotational speed of the fan so as to at least substantially maintain a constant air flow volume. In other words, the solution is a fan motor which automatically adjusts to compensate for changes to system pressure to ensure that the air volume is kept constant giving the user more control.

As shown in Figure 3, a hair dryer may comprise means to manually select a particular air flow volume. If a hair dryer can be operated at one of several preset air flow volumes, the control means may be configured to control the rotational speed of the fan so as to at least substantially maintain the air flow volume at the desired preset level. Lines 24 show constant volumes of approx 50 and 140 respectively. The preset flow rates are achieved by increasing the rpm of the motor to over come the pressure applied. Line 26 shows the variation in pressure with volume, i.e. without constant volume.

The fan can determine its current duty point from its own motor speed and electrical current data. No external sensors or controls are required because the built in microprocessor's algorithm calculates the fan speed needed to maintain the required air volume at any workload. If the duty point changes due to external influences, the fan compares the actual values against its preset values and adjusts the speed of the motor accordingly to ensure the same volume of airflow is maintained.

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Cooling of Hair Dryer

During use, the housing of a hair dryer may become heated by the heating means and hot air stream. Indeed, the heating effect may be sufficient for the housing and nozzle to become too hot to touch. Most dryers currently on the market do not address this issue. There are some dryers which use methods of insulation with materials or air cavities to maintain a cool air temperature.

We describe cooling means to at least minimise the transfer of heat to the housing of the hair dryer. The cooling means may comprise an air flow channel along which ambient air (unheated air) may flow. This active cooling assisted by movement of ambient air is different to the passive insulation mentioned above.

The air flow channel may be configured to at least minimise the transfer of heat to at least a region of the main body of the hair dryer. The outer air flow channel may be alternatively or additionally configured to at least minimise the transfer of heat to the housing of a nozzle of the hair dryer.

As depicted in Figure 4, 5a and 5b, the air flow channel may be an outer air flow channel (7) configured to at least substantially circumscribe an inner air flow channel (8).

In the hair dryer depicted in Figure 4, the hair dryer comprises a housing defining an outer air flow channel (7) having ducts (7') in the housing and ducts (7'') in the nozzle, an inner air flow channel (8), an air inlet (10) and an air outlet (11). The outer air flow channel and inner air flow channel are configured such that a fan (9) located in the housing can drive air along both air flow channels from the air inlet to the air outlet (11). The air flow along the inner air flow channel is heated by heating means so as to provide a hot stream of air. The air flow along the outer air flow channel acts as an insulator and thereby minimises the transfer of heat from the heating means and hot stream of air to the outer housing wall. Arrow A indicates the portion of the air that bypasses the heater element. The hairdryer is thus a co-axial airflow design. The airflow channelled from the fan down the outer air flow channel provides active cooling of the housing and nozzle.

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As shown in Figures 5a and 5b, the air flow channel (5) may be a venturi tube configuration whereby the diameter of the air flow channel varies so as to reduce air pressure along the length of the channel. The high pressure fast moving air exiting the nozzle (12) creates a pressure drop. Accordingly, this venturi effect drives ambient air along the flow channel from an air inlet (10) to the air outlet (11) so as to provide a cooling effect on the outer housing wall (25) and the nozzle (12). The air flow channel (5) may extend along at least a substantial part of the housing as shown in Figure 5a or may just extend along the nozzle as shown in Figure 5b.

So as to maximise the cooling effect, the air flow channel having a venturi tube configuration may comprise a secondary air inlet so as to allow the fan of the hair dryer to drive further ambient air along the air flow channel.

Combined heating and flow control

A hair dryer typically comprises an air flow stator to generate a smooth flow of air. The smooth flow of air is a substantially straight flow of air.

We describe a hair dryer whereby an air flow stator and heating means are located in substantially the same location in a housing of the hair dryer.

This arrangement minimises the overall size of the hair dryer. The arrangement reduces the resonating regions within housing of the hair dryer and thereby minimises the noise of the hair dryer. The arrangement also helps to maximise the differential temperature ΔT between the air outlet and air inlet of the hair dryer within the smallest volume possible.

Figures 6 and 7 depict an example of a hair dryer where the air flow stator (18) and heating means (4) are located in substantially the same location between the fan (9) and air outlet (11).

The air flow stator and heating means may be integrally formed. For example, the heating means may comprise resistive heating tracks printed on an inner surface of the stator. It is desirable to have a substantially uniform temperature profile across the air flow. Accordingly, the inner surface of the stator may have a toothed configuration so as to help provide a substantially uniform heating effect across the flow of air.

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The air flow stator and heating means may be integrally formed as shown Figures 6 and 7 whereby the heating means comprise resistive heating elements (22) supported by support means (1) and the support means is configured to function as the stator. This ensures that swirl is removed from the airflow and that the airflow is heated in a more efficient way. The integrated component may be made from a ceramic and/or high temperature material.

As shown in Figure 6, fan is spaced away from the support means. Thus air leaving the fan (50) swirls and is straightened by the stator (18). The stator (18) is formed support means (1) which are straight and three-dimensional. These support means (1) are thus air straightening blades which remove the swirl from the air flow. In Figure 7, the motor (54) is mounted on and within the heater support means (1).

Alternatively, the heating means may be supported by supporting means provided at substantially the same location as the stator, whereby the heating means and supporting means are configured so as not to impart any rotational movement to the air flow.

Acoustic attenuation

Figure 8 depicts an example of a conventional hair dryer whereby the air inlet (10) is configured to allow for air to be drawn into the housing and for noise (44) to be emitted from the housing. Such a product has a direct sound path to the motor and fan. Thus, motor and aerodynamic noise is released.

We described a hair dryer comprising an air inlet system that is configured to attenuate noise generated by the hair dryer.

As shown in Figures 9a to 9d, the hair dryer may comprise a housing having a rear wall (23) with a first air inlet (10) and a baffle member (27) spaced from the rear wall so as to define a second air inlet (28) between the baffle member and the rear wall. The normal air path (43) is thus blocked by the baffle member and is redirected. This may be considered an acoustic labyrinth.

In use, air is drawn into the hair dryer through the second air inlet and then the first air inlet. The first air inlet (10) may be covered by a protective mesh (42).

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The baffle may be releasably coupled (see Figure 9c) or integrally formed with the housing of the hair dryer. The baffle may be releasably coupled using releasable coupling means such as clipping means or magnetic means.

The baffle member is generally planar and is arranged to extend at least substantially perpendicular to the longitudinal axis of the housing. Hence, air enters the second air inlet at an angle to the longitudinal axis of the housing. The air is preferably drawn into the second air inlet at an angle of 90 degrees with respect to the longitudinal axis of the housing.

The arrangement of the baffle helps to attenuate noise emitted by the hair dryer. As shown in Figure 9d, the baffle is arranged such that noise emitted via the first air inlet is reflected between the baffle member and rear wall, and thereby looses energy, before reaching the second air inlet.

So as to maximise the attenuation of noise, the baffle member may comprise an acoustic absorbing material so as to absorb noise emitted from first air inlet. For example, the baffle member may comprise a layer of acoustic absorbing material (29) arranged on an inner surface of the baffle member as shown in Figures 9a to 9d. Thus, in the configured of Figure 9d, noise is absorbed through reflection into the absorbent material and released over a larger air inlet area.

The hair dryer may comprise one or more baffle members. For example, the hair dryer may comprise multiple baffle members arranged in a stepped formation at the rear of the housing.

Through out the description and claims of this specification, the words "comprise" and "contain" and variations of the words, for example "comprising" and "comprise", means "including but not limited to, and is not intended to (and does not) exclude other moieties, additives, components, integers or steps.

Throughout the description and claims, the singular encompasses the plural unless the context otherwise requires. In particular, where the indefinite article is used, the specification is to be understood as contemplating plurality as well as singularity, unless the context requires otherwise.

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Features, integers, characteristics or groups described in conjunction with a particular aspect, embodiment or example, of the invention are to be understood to be applicable to any other aspect, embodiment or example described herein unless incompatible therewith.

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CLAIMS

1. A hair dryer comprising:

a housing defining a first air flow channel and a second air flow channel, whereby the first air flow channel at least substantially circumscribes the second air flow channel;

an air flow regulation means to regulate the flow of air along the first air flow channel and/or the second air flow channel.

2. A hair dryer according to claim 1, wherein the first air flow channel is defined between an inner surface of the housing and an outer surface of the second air flow channel.

3. A hair dryer according to claim 1 or claim 2, wherein a heater is mounted in the second air flow channel and the air flow regulation means is configured to instantaneously redirect the flow of air from the second air flow channel to the first air flow channel whereby a cold shot of air is provided.

4. A hair dryer according any one of the preceding claims, whereby the air flow regulation means comprises a member movable between a first position and a second position, wherein in the first position the member is arranged to at least substantially close an inlet aperture of the first air flow channel and in the second position the member is arranged to at least minimise an inlet aperture of the second air flow channel.

5. A hair dryer according to claim 4, wherein the moveable member is activated by user operated control means.

6. A hair dryer according to claim 4 or claim 5, wherein the air flow regulation means comprises a moveable member connected to actuation means whereby movement of said actuation means moves said moveable member.

7. A hair dryer according to claim 6, wherein the actuation means slides along a shaft connected to a motor which draws air into the hair dryer.

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8. A hair dryer according to any one of claims 4 to 7, wherein in the first position the moveable member tapers downstream and in the second position the moveable member tapers upstream.

9. A hair dryer according to any one of claims 4 to 8, wherein the moveable member is formed from a plurality of panels.

10. A hair dryer according to any one of claims 4 to 9, wherein the air flow regulation means further comprises at least one fixed element which co-operates with the moveable member to close at least one of said first and said second air flow channels.

11. A hair dryer according to claim 10, wherein the at least one fixed element comprises an outer fixed element which protrudes from an outer surface of the housing and co-operates with the moveable member to close said first air flow channel in said first position.

12. A hair dryer according to claim 10 or claim 11, wherein the at least one fixed element comprises a central fixed element which is concentrically mounted within the housing and which co-operates with the moveable member to close said second air flow channel in said second position.

13. A hair dryer according to claim 12, wherein the moveable member and the central fixed element are in the form of perforate plates each having offset perforations whereby when the moveable member and the central fixed element are in contact, the second air flow channel is closed.

14. A hair dryer according to any one of claims 10 to 13, wherein the moveable member and at least one fixed member are made from a ferro-magnetic material and the regulation means comprises actuation means configured to change a polarity of at least one of said moveable member and said at least one fixed member to move said moveable member relative to said at least one fixed member.

15. A hair dryer according to any one of the preceding claims, whereby the first air flow channel extends at least substantially along the length of a nozzle region of the housing.

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16. A hair dryer according to any one of the preceding claims wherein the first air flow channel is configured to form a venturi effect for driving air along the first air flow channel from a first air inlet to a first air outlet; and wherein the hair dryer further comprises

a fan for driving air along the second air flow channel from a second air inlet to second air outlet; and

a heating means for heating the air flow in the second air flow channel;

17. A hair dryer according to claim 16, whereby the first air flow channel comprises a third air inlet and the fan is configured to drive air along the first air flow channel via the third air inlet.

18. A hair dryer according to claim 16 or claim 17, whereby the first air flow channel extends at least substantially along the length of the housing.

19. A hair dryer according to any one of the preceding claims comprising multiple heating elements supported by a support means; whereby the support means comprises

a front region where air is separated into multiple air flow streams and

a rear region configured to combine the multiple air flow streams so as to form an air flow stream having a substantially uniform temperature profile.

20. A hair dryer according to claim 19, whereby the support means comprises multiple fins, each fin having a front portion and a rear portion and configured such that the front portion of the fins define multiple air flow channels and the rear portions of the fins define the rear region.

21. A hair dryer according to claim 20, whereby the rear portion of each fin has an arcuate form so as to define a substantially semi-circular rear region.

22. A hair dryer according to any one of the preceding claims further comprising:

a fan for blowing air through an air outlet; and

control means for automatically controlling the operation of the fan so as to at least substantially maintain a constant air flow volume during use.

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23. A hair dryer according to claim 22 wherein the control means is configured to control the rotational speed of the fan so as to at least substantially maintain a constant air flow volume.

24. A hair dryer according to 23, wherein the hair dryer is operable at one of several pre-selected air flow volumes and the control means is configured to automatically control the rotational speed of the fan so as to at least substantially maintain the pre-selected air flow volume.

25. A hair dryer according to any one of the preceding claims further comprising:

a stator to generate a smooth flow of air; and

a heating means to heat the flow of air;

whereby the stator and heating means are arranged in a substantially same location in a housing of the hair dryer.

26. A hair dryer according to claim 25, wherein the stator and heating means are integrally formed.

27. A hair dryer according to any one of the preceding claims comprising:

a rear wall having a first rear air inlet;

a baffle member spaced from the rear wall so as to define a second rear air inlet between the baffle member and the rear wall;

wherein, in use, air is drawn into the hair dryer through the second rear air inlet and first rear air inlet.

28. A hair dryer according to claim 27, whereby the baffle member is generally planar and located substantially perpendicular to a longitudinal axis of the hair dryer such that air enters the second air inlet at an angle to the longitudinal axis.

29. A hair dryer according to claim 28, whereby the angle is substantially 90 degrees.

30. A hair dryer according to any one of claims 27 to 29, whereby the baffle member comprises acoustic absorbing material.

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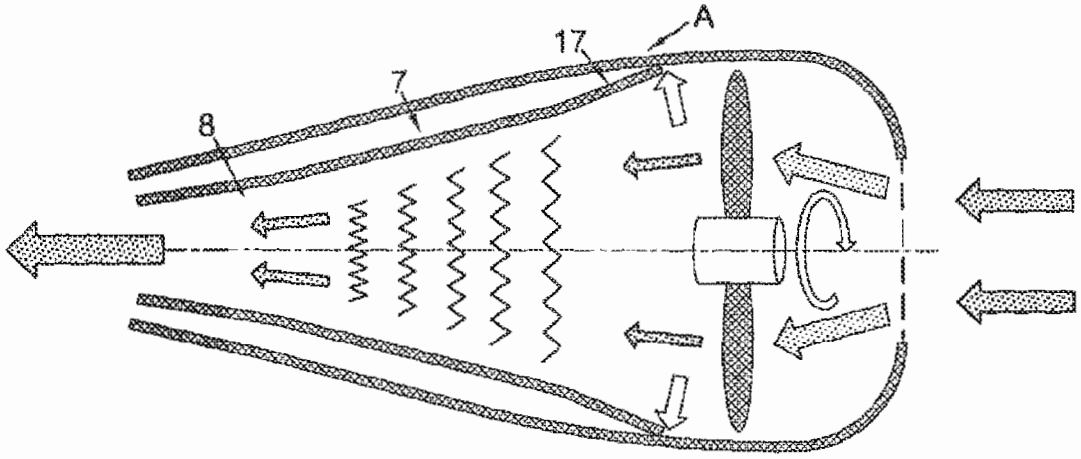


Fig.1a

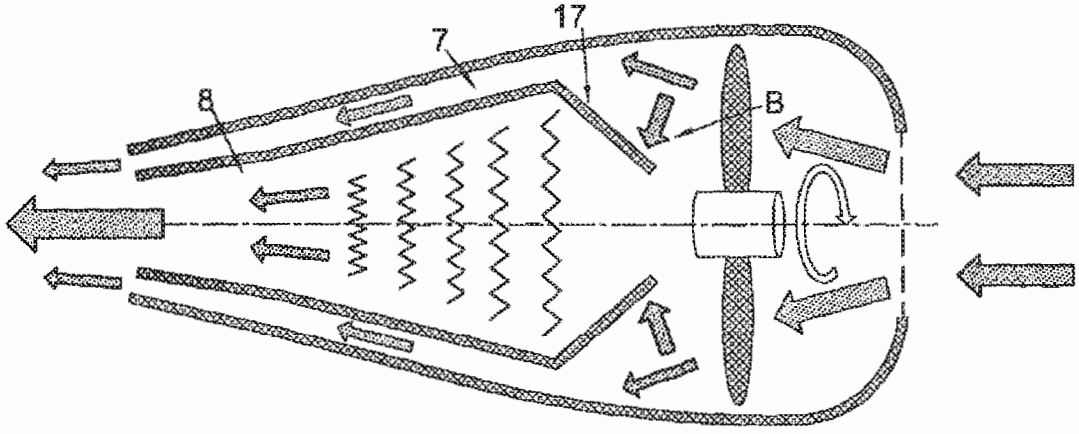


Fig.1b

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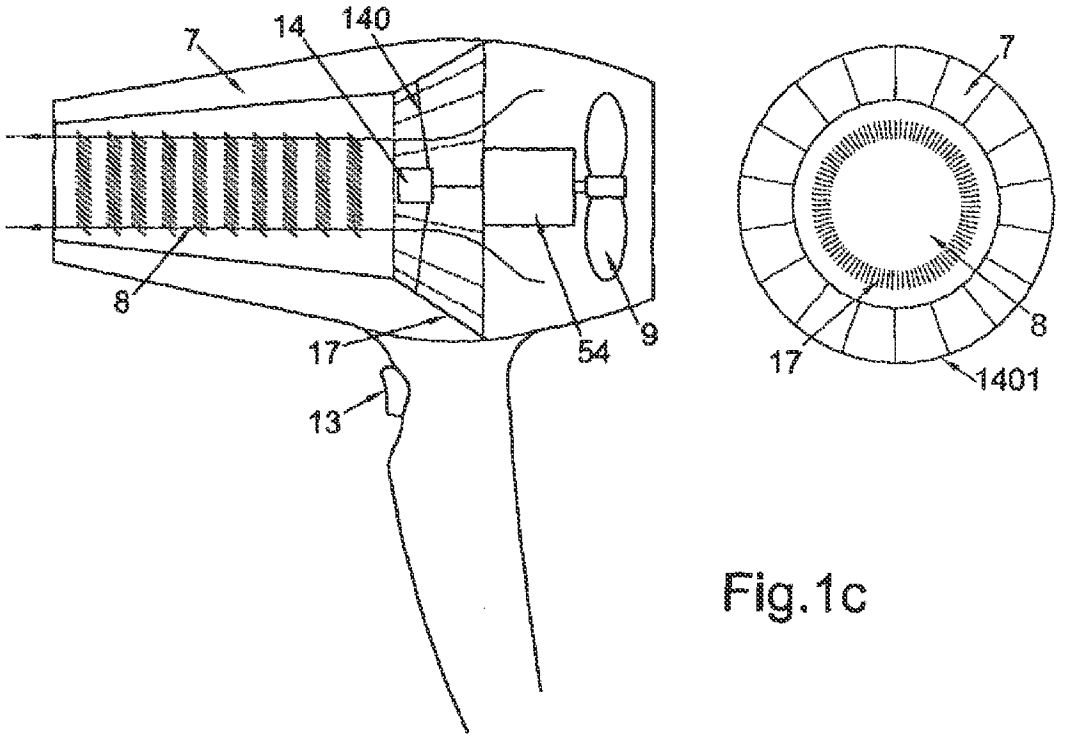


Fig.1c

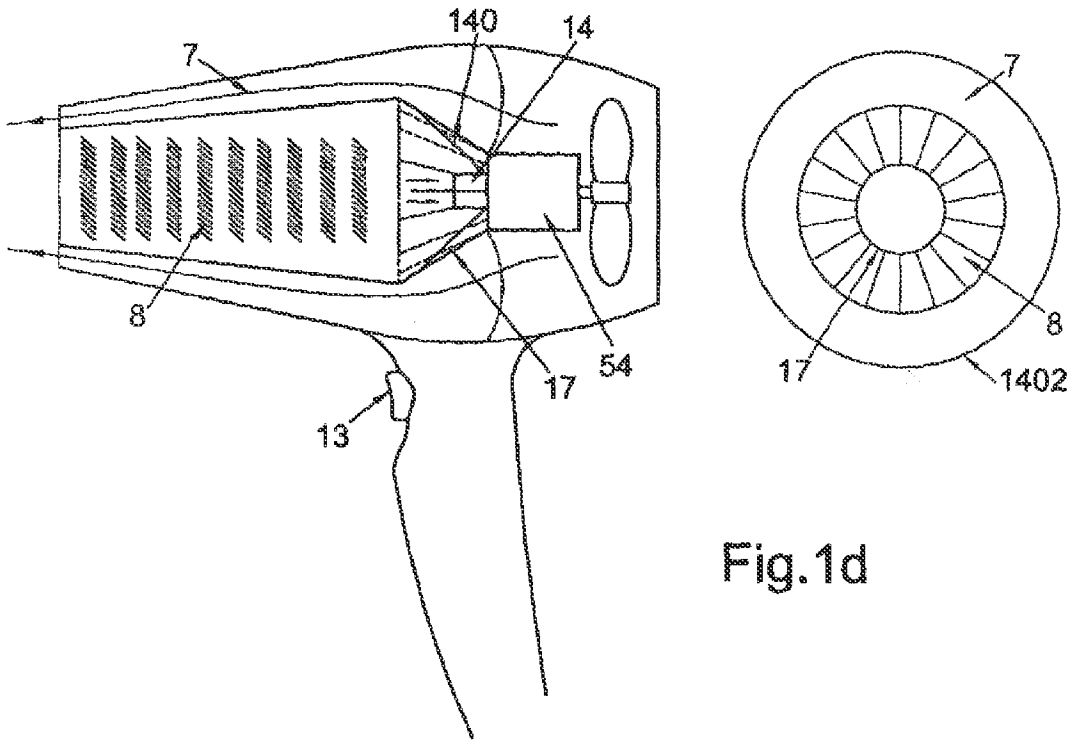


Fig.1d

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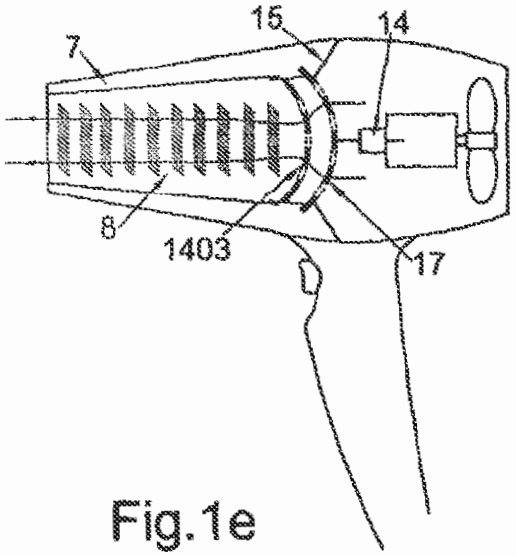


Fig.1e

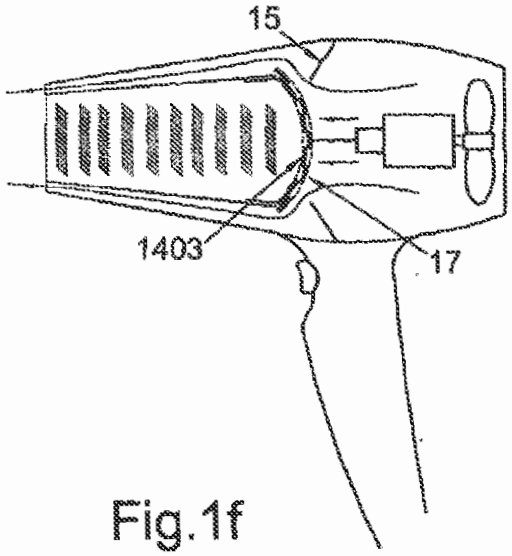


Fig.1f

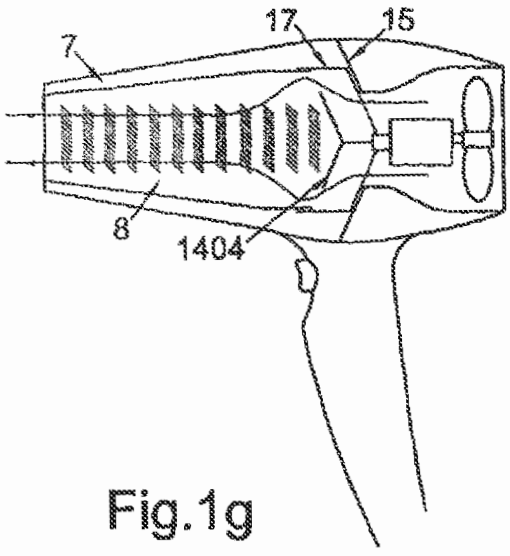


Fig.1g

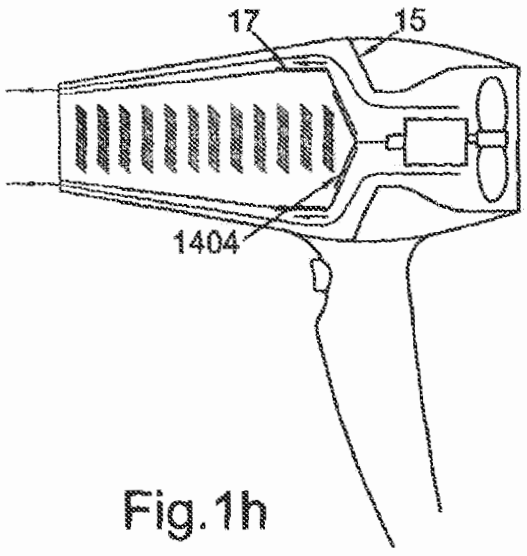


Fig.1h

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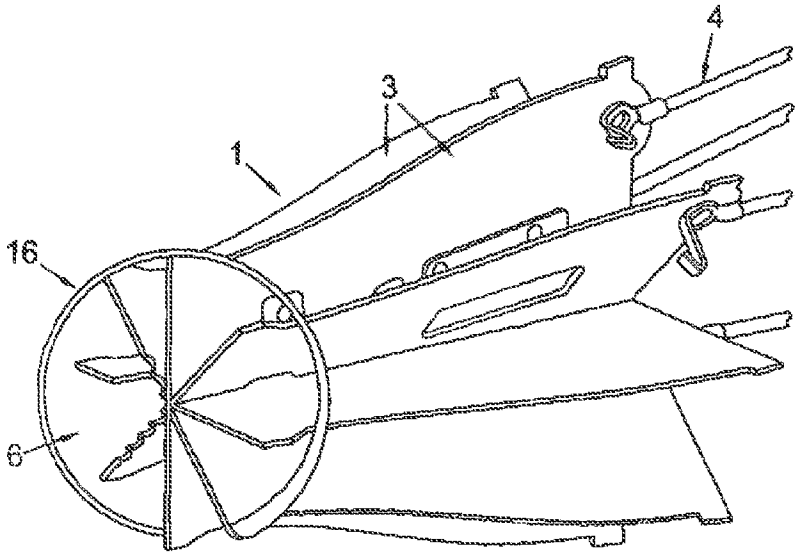


Fig.2a
(Prior Art)

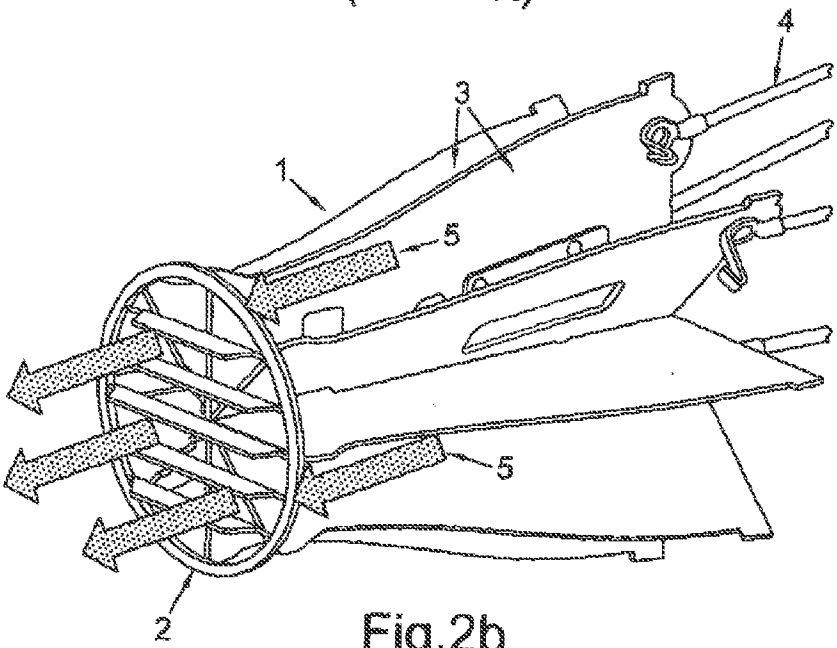


Fig.2b
(Prior Art)

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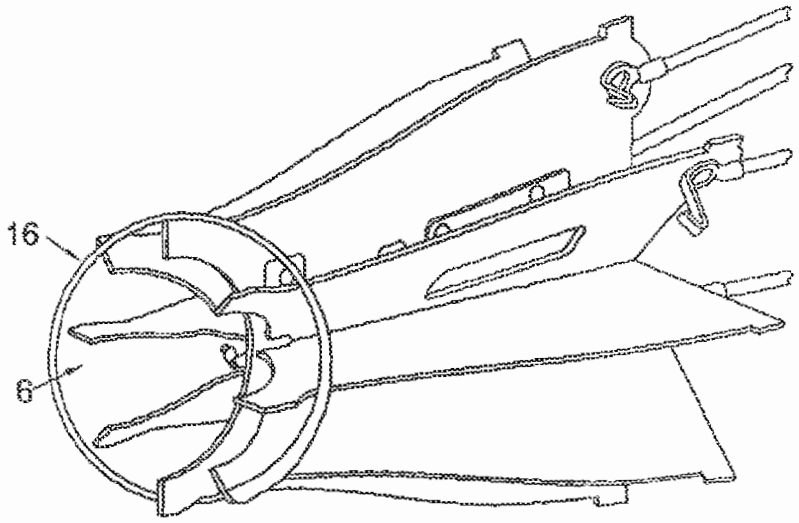


Fig.2c

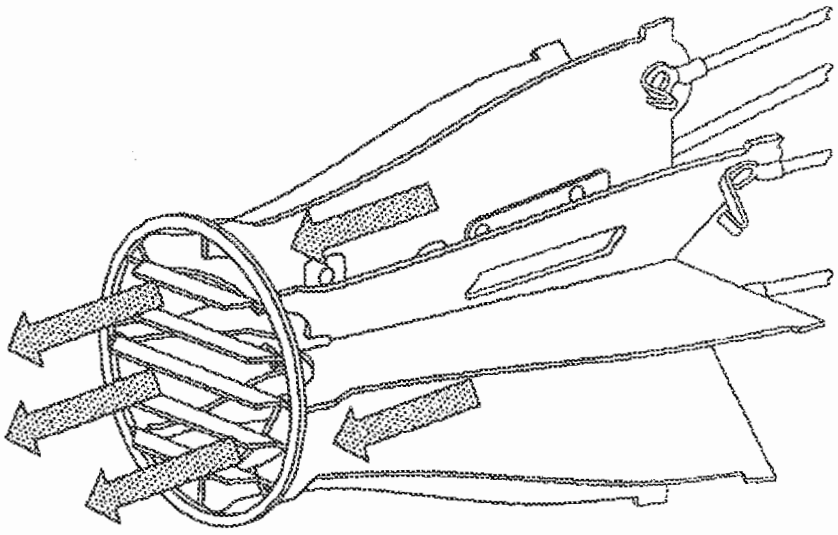


Fig.2d

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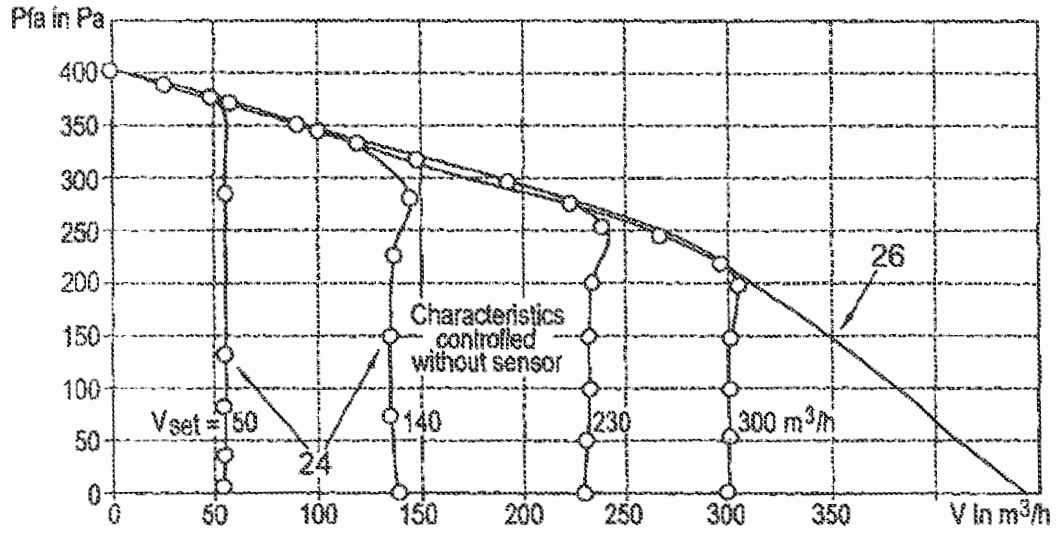


Fig.3

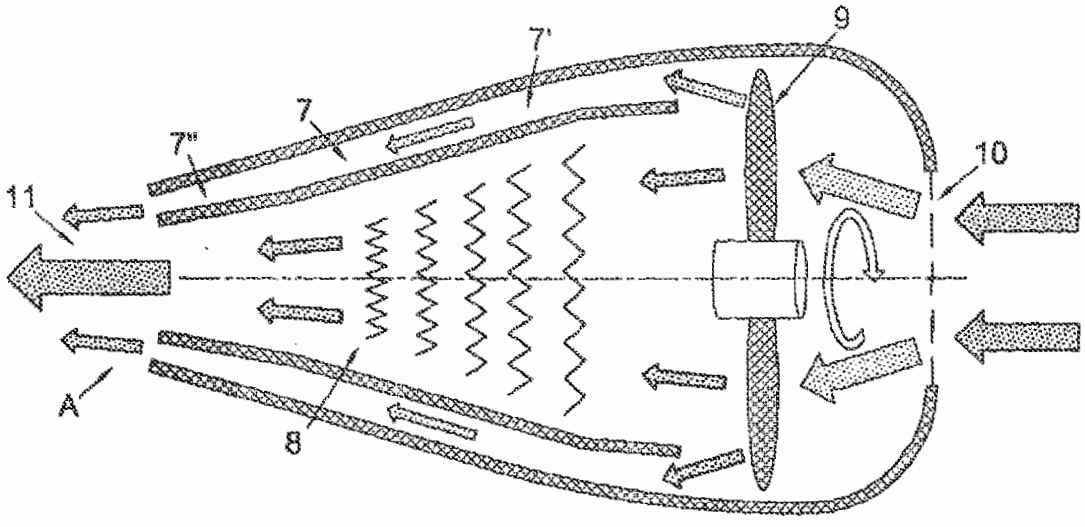


Fig.4

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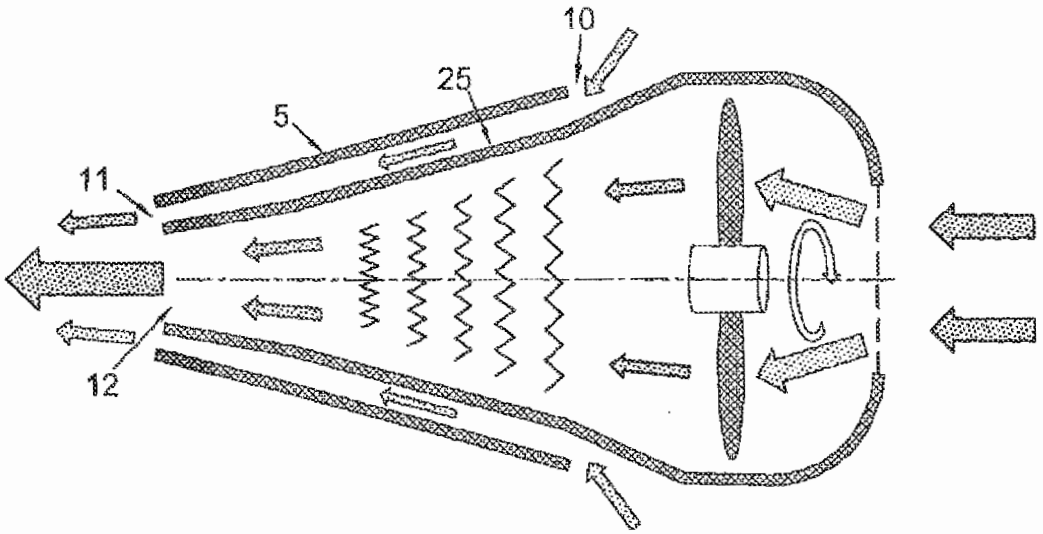


Fig.5a

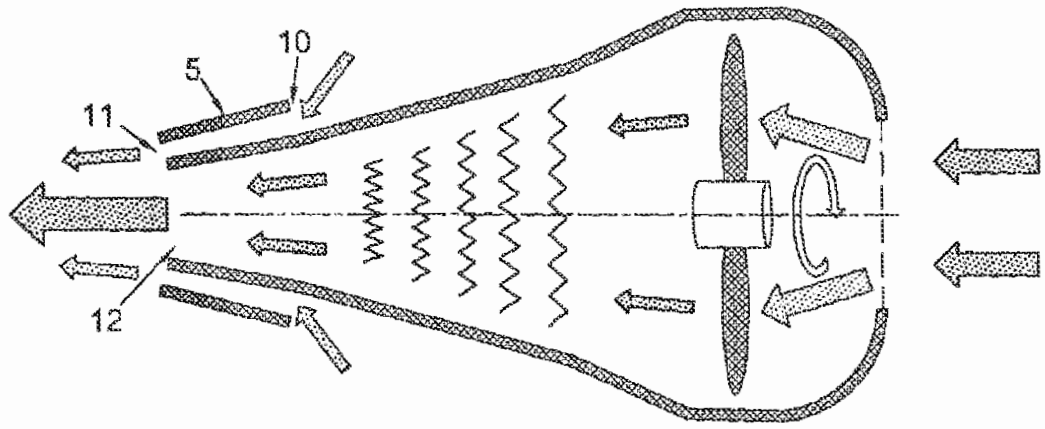


Fig.5b

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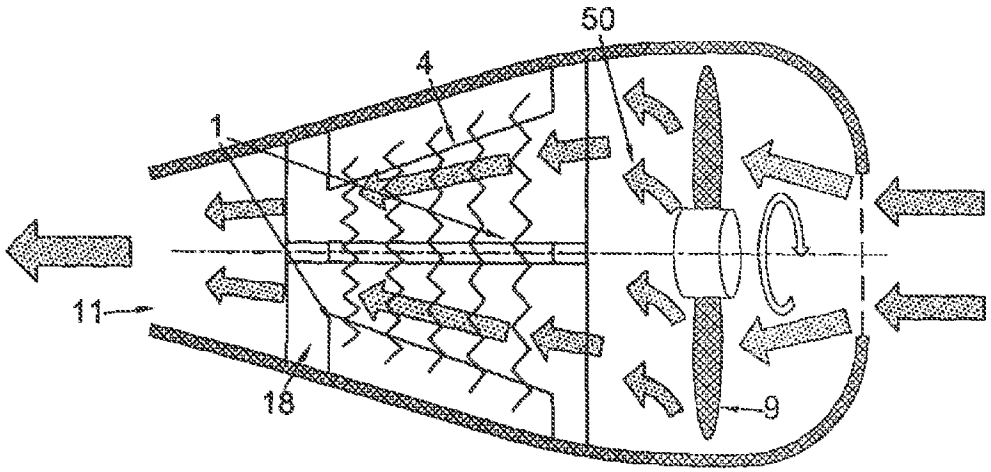


Fig.6

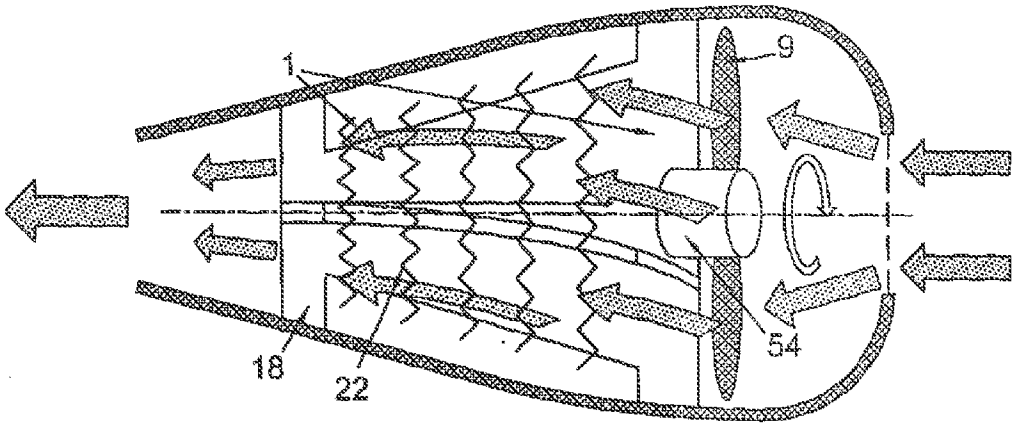


Fig.7

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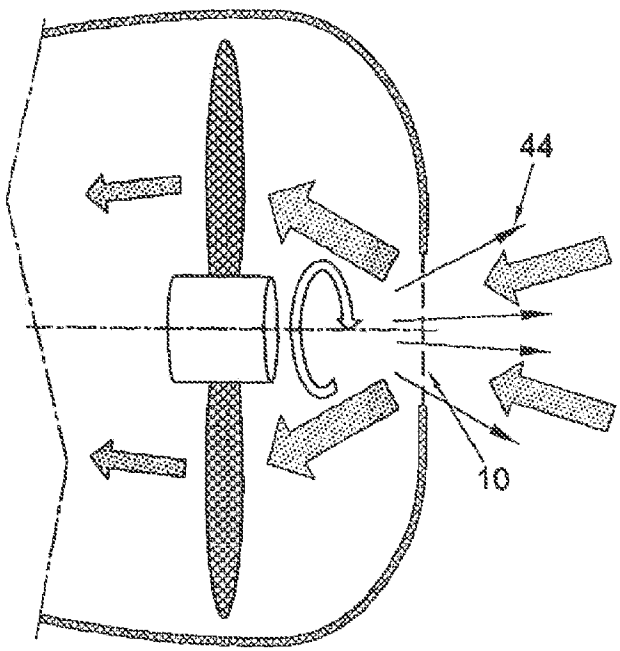


Fig.8 (Prior Art)

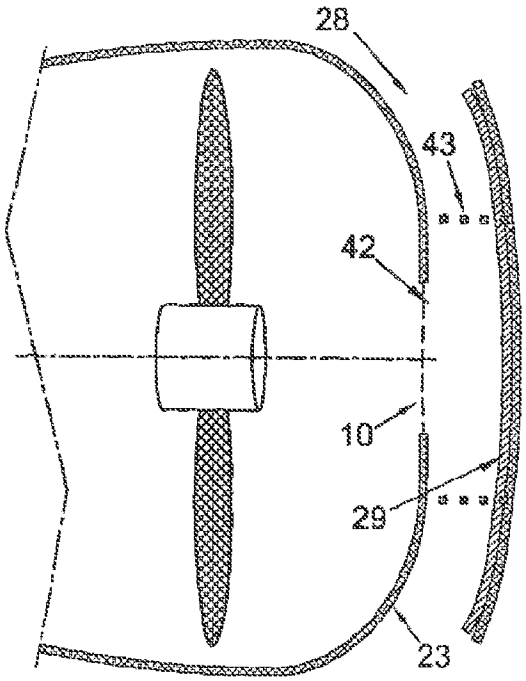


Fig.9a

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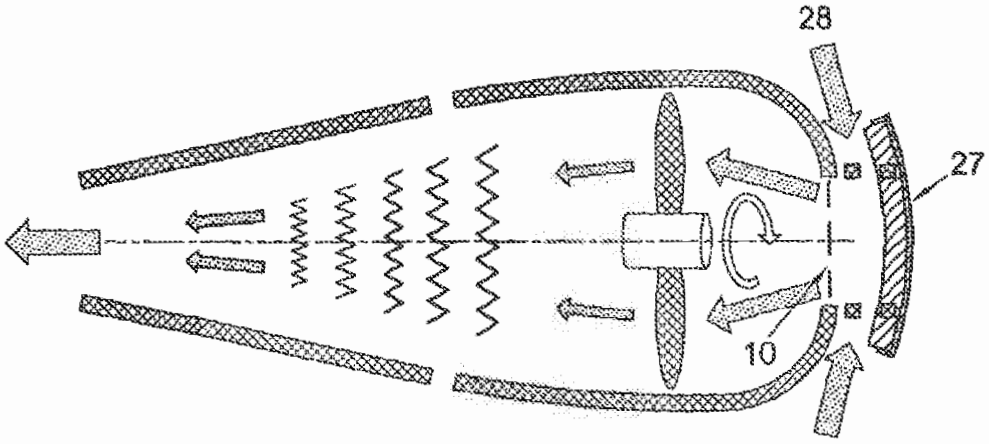


Fig.9b

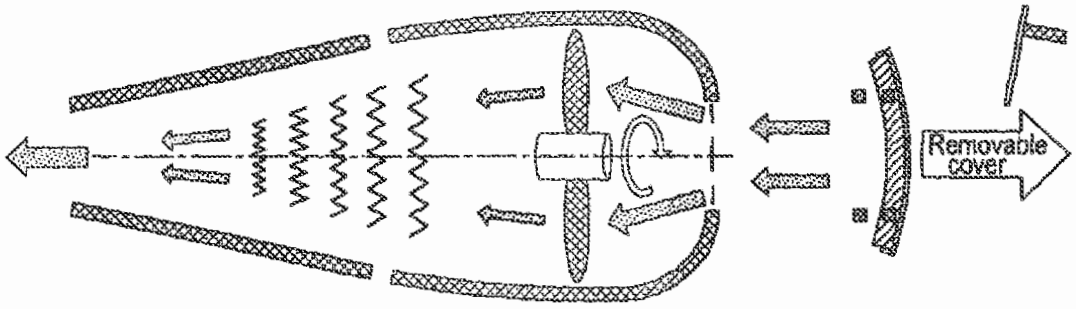


Fig.9c

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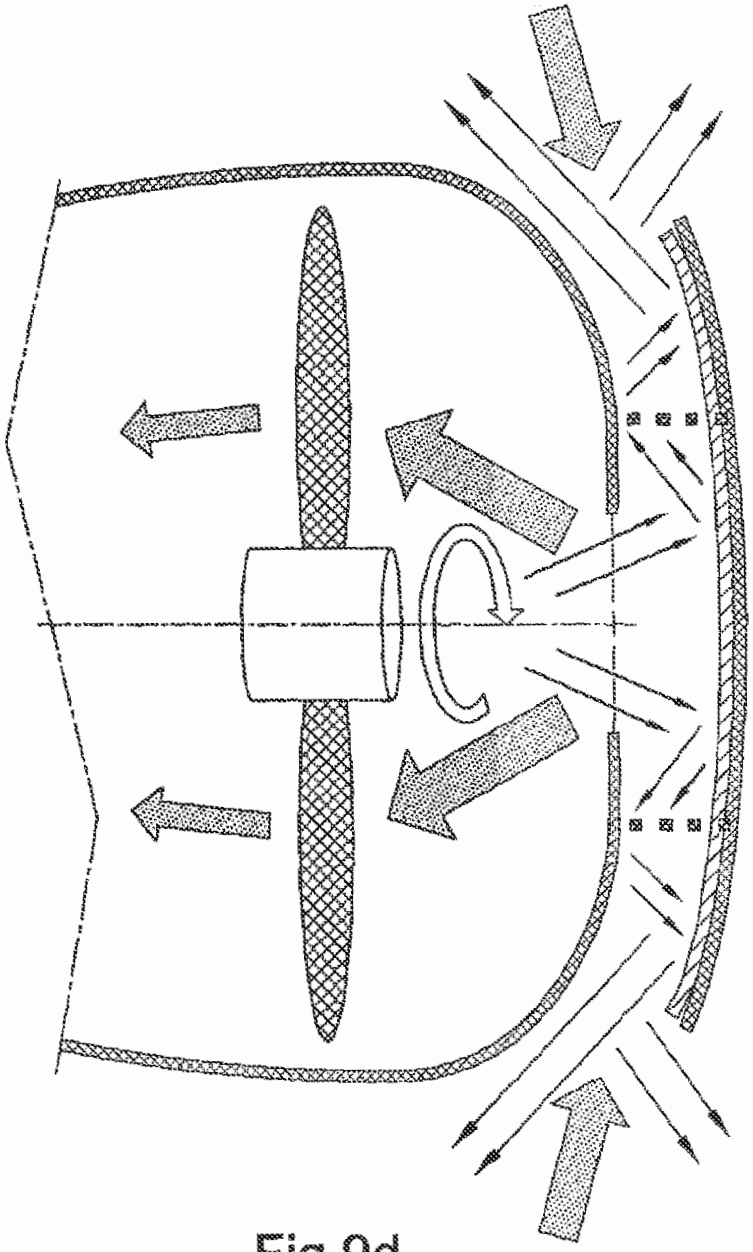


Fig.9d

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Espacenet

Bibliographic data: CN202386031 (U) — 2012-08-22

Noise reducing structure of hairdryer

Inventor(s): RUIHONG YANG ± (YANG RUIHONG)

Applicant(s): RUIHONG YANG ± (YANG RUIHONG)

Classification: **- international:** ***A45D20/12***
- cooperative:

Application number: CN20112499363U 20111205

Priority number(s): CN20112499363U 20111205

Abstract of CN202386031 (U)

The utility model discloses a noise reducing structure of a hairdryer. The noise reducing structure comprises a shell, an electric heating mechanism, a fan, an air duct and a sound-absorbing body, wherein a containing chamber is arranged in the center of the shell; an air outlet and an air inlet are respectively arranged at the front and rear ends of the shell; the electric heating mechanism is arranged at the front position in the containing chamber of the shell; the fan is linked by a motor and arranged at the back position in the containing chamber of the shell; the air duct is provided with an air guide hole axially corresponding to the air inlet; one end of the air duct is connected with the air inlet while the other end of the air duct is arranged at a position closed to the fan; an interval part is arranged between the outer wall of the air duct and the inner wall of the shell; and the hollow ring-shaped sound-absorbing body is made from sponge, sound-absorbing foam or other materials capable of absorbing sound, provided with a hollow part in the center and fixedly arranged on the inner wall of the air guide hole of the air duct by means of an adhesion way or other appropriate ways. Therefore, the noise reducing structure disclosed by the utility model has the efficacies of noise reduction and preferable air outlet efficiency.

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DESCRIPTION CN202386031

[0001]

Technical field

[0002]

The utility model relates to a hair dryer, in particular refers to a hair dryer to reduce noise structure.

[0003]

BACKGROUND

[0004]

Hair dryer to dry hair for people to be one of electrical equipment shown in Figure 11 is one configuration of a conventional hair dryer, having a main housing 1 ', an electric body 2', a fan 3 ', the housing 1' having a receiving chamber 11 ' in accommodating electric mechanism 2 ', fans 3', and in front and rear ends were set outlet 12 'into the air 13' into the air 13 'location settings gate cover 14', the heating mechanism 2 'and the fan 3' They are located at accommodating chamber 11 'front, rear position, making the fan 3' actions may be outside air from the air inlet 13 'import volume chamber 11' inside, and 're-heated air generated by the air outlet 12' via an electric

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mechanism 2 export.

[0005]

However, the direction of the arrow shown in Figure 11, the aforementioned large-scale structure when the outside air forced into the air by a smaller diameter 13 'when you import it will directly impact air outlet 13' peripheral edge, resulting in a significant position in Figure 11 into gas position impact noise, and import volume chamber 11 'also generate turbulence and air tight shell hit a' wall, and thus result in increased noise missing hair dryer, located close to the human head position when using the hair dryer will result in the use of non- lack of comfort, beauty salon and other business premises for more impact in terms of hearing officers occupational injury.

[0006]

To improve the above situation, the structure shown and hairdryer China Taiwan Publication No. 566,114 as shown in Figure 12, with the casing 4 ', 5', the housing 4 'of heating mechanism 42 having a' by the hand grip and, at the same time having the outlet 41 ', and the other housing 5' having the air inlet 51 ', the internal fan 52', the two casing 4 ', 5' may be provided connected between the air flow guide conduit 6 ', so that the fan 52 may be outside the operation air into the casing 5 'inside, and then through the conduit 6' import shell 'and by the heating mechanism 42' heated again by the outlet 41 'export, the aforementioned design by conduit 6' 4 segments into wind noise, so that when a vent 41 'casing 4' will not feel discomfort caused by large noise near the body.

[0007]

However, due to the aforementioned design with a catheter 6 ', causing the user handheld casing 4' will be subject to the operation of the catheter 6 'influence inconvenience, and that the duct 6' will cause an increase in wind stroke efficiency and reduce the lack of wind, and the hair dryer components increased significantly, will increase the cost of a hair dryer.

[0008]

Another example of another conventional hair dryer to improve the structure shown in Figure 13, its composition and structure similar to the structure shown in Figure 10, the difference in the air inlet 13 'is

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provided with a position of a breathable foam 7', so that air from the outside into the 13 in order to reduce air noise with the effect of 'sponge 7 via the import' acoustic.

[0009]

However, because of the aforementioned design sponge 7 'cause the wind resistance while, resulting in the hair dryer air volume was significantly attenuated, resulting in the hair dryer efficiency does not meet the needs of poor efficacy missing.

[0010]

In view of this, the design for a lot of people missing and inconvenience these hair dryers structural design resulting imperfect, and in-depth ideas and actively try to do research and the development of improved design of this utility model.

[0011]

Utility Model Content

[0012]

The utility model aims to provide a hair dryer can effectively reduce intake noise generated by the operation, and at the same time make the hair dryer has better wind efficiency.

[0013]

To achieve the above purpose, the utility model solutions are:

[0014]

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One kind of hair dryer to reduce noise structure, comprising:

[0015]

A shell, its center has a capacity room, front and rear ends are provided with the outlet and into the air;

[0016]

A heating mechanism provided in the container chamber of the front position of the housing;

[0017]

A fan, which linked by a motor, the housing accommodating chamber provided in a rear position;

[0018]

I. duct, into the outlet position located in the housing, the air duct with a wind hole;

[0019]

A sound absorbing body as a hollow annular body having a central axial bore corresponding to the air guide portion through the air, and fixed on the inner wall of the air guide hole in the air duct.

[0020]

The sound-absorbing body is absorbing sponge or foam, adhesive fixed on the guide duct.

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[0021]

Air duct is provided with a sound-absorbing body abuts one end of the block edge.

[0022]

The wind pipe and casing forming one, the corresponding axial air guide hole into the air, and the air duct located near one end of the fan location, wind pipe outer wall and the inner wall of the shell with an interval part.

[0023]

The shell of the air inlet position setting a gate cover, wind pipe and casing for external components connected or grid cover group.

[0024]

Corresponds to the outlet of the housing is provided with a threaded portion position, wind pipe threaded portion of the outer wall is set, the wind pipe threaded portion and a threaded portion screwed housing group located in the housing capacity indoor air guide duct toward the hole guide correspondence into the air, and the air duct near the end of the fan.

[0025]

The outlet of the housing corresponding to the position of the engaging portion is provided, the air guide pipe is provided with the engaging portion of the air duct housing engaging portion engaging with the engaging portion which is located at the housing container chamber, the air guide hole toward the correspondence into the air, and the air duct near the end of the fan.

[0026]

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The air duct and cover combination of the gate, the gate cover and housing outlet location engagement.

[0027]

The air duct located in the external shell, the shell into the air duct toward the outlet end of the engagement with the outlet position.

[0028]

With the above structure, when the fan action of the utility model hair dryer can be outside air into the vent position by first introducing the air guide hole guide duct and then guided to the fan location, outside a large range of air into a smaller diameter guide When the wind pipe will first impact absorbing body by absorbing shock absorption silencer body, does not directly impact wind pipe wall, which can significantly reduce the intake air suction action noise, because the inner wall of wind pipe and casing with an interval Department , can reduce airflow and import shell wall impact noise, and may have focused on the effect of air navigation, should the wind bore through the air flow is through the Ministry of sound-absorbing body is not absorbing body penetration, thus introducing air will not significantly attenuation, making the utility model can better keep out of the wind hair dryer efficiency and the utility model of sound-absorbing body guided air flow is not located in an electric mechanism position corresponding volume chamber, which can not worry about sound-absorbing body and burned due to high fever, prolonged use still with good security.

[0029]

Brief Description

[0030]

Figure 1 is a first embodiment of the utility model is an exploded view.

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[0031]

Figure 2 is a combination of a first example embodiment of the utility model sectional view of Fig.

[0032]

Figure 3 is a combination of a first example embodiment of the utility model sectional view of Fig.

[0033]

Figure 4 is a schematic diagram of a utility model first case action implemented.

[0034]

Figure 5 is a second embodiment of a utility model partial solution map.

[0035]

Figure 6 is a sectional view showing a second practical example of the new combination thereof.

[0036]

Figure 7 is a third example of the utility model sectional view of the combination embodiment of FIG.

[0037]

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Figure 8 is an exploded fourth embodiment of the utility model FIG.

[0038]

Figure 9 is a schematic sectional view of a fourth practical example of the new combination thereof.

[0039]

Figure 10 is a fifth embodiment of the utility model cross-sectional view showing the combination.

[0040]

Figure 11 is a cross-sectional view showing conventional hair dryer.

[0041]

Figure 12 is a sectional view of another conventional hair dryer FIG.

[0042]

Figure 13 is a conventional schematic view of a hair dryer set sponge.

[0043]

Embodiment

[0044]

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To further explain the technical solution of the utility model, the following specific examples through the elaboration of the utility model be.

[0045]

In case diagram in which the components of the utility model are the same or similar functions in the same figure number following examples represent, see Figures 1 to 3, the utility model of the first embodiment includes a housing 1, a heating mechanism 2, a fan 3, an air duct 4, a sound absorbing member 5, wherein the housing 1 comprises a front portion 101, a rear portion 102 butt composition, having a receiving chamber 11, the central and the front, the rear end of the air outlet 12 are respectively provided, into the outlet 13, which Set the air inlet 13 position grid cover 14, the gate cover 14 prevents hair or foreign body aspiration volume chamber 11.

[0046]

Heating mechanism 2 is provided in the accommodation chamber 11 inside the housing 1 the forward position; 3, the fan motor 31 by a linkage, and an accommodating chamber provided in the housing 11 rearward position.

[0047]

4 integrally molded air duct located at the rear of 102 housing a corresponding fan 3 and the 13 of outlet position, a front portion of the housing 101, 102, respectively, forming the rear design of the components can be easily assembled.

The air duct 4 into the corresponding axial outlet 41 of the air guide hole 13, the air duct 4 and the air inlet 42 at one end portion of the molding 13 and the other end portion 43 located close to the position of the fan 3, 4 and the outer wall of the air duct the inner wall of the housing 1 with the spacer portion 111, the air guide tube 4 provided at one end near the fan 3 stop edge 44.

[0048]

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Sound-absorbing body 5 sponge, absorbing foam or other sound-absorbing materials manufactured by and the sound-absorbing body 5 is a hollow annular body, central air guide hole with a corresponding portion 51 41 axially through the air, and the sound-absorbing body 5 is fixed on bonding the inner wall of the air guide tube 41 of the air guide hole 4, one end of which abuts the ledge 44.

[0049]

Refer to Figure 4, the utility model hairdryer fan 3 action may be outside air from the air inlet 13 to import smaller diameter air guide hole 41 and then guided to the fan position 3, when the outside diameter of a large range of air into the more Small wind pipe 4:00, will first impact absorbing body 5 by a shock absorbing body 5 silencer, its intake major impact absorbing body position for five and does not directly impact air duct 4 wall, so that the air duct 4 does not become the noise components can be greatly reduced hair dryer intake airflow noise in the operation of the suction, so that the position shown in Figure 4 b of the noise can be greatly reduced, because the air guide pipe 4 and the casing inner wall portion 111 with an interval, can reduce the air flow introduced into the housing inner wall and the impact noise, and the concentrated stream can be guided with the effect of the air flow within the air guide hole 41 is passed through the hollow portion 51 through the sound absorbing member 5, rather than through the sound absorbing member 5, which Import air will not significantly attenuated, and the utility model as a whole actuation noise can be greatly reduced, and hair dryers can be maintained better efficiency out of the wind, the wind hole ledge 41 of 44 available abuts the edge of sound-absorbing body 5, to ensure long-term use because of the sound absorbing member 5 does not move as the suction fan 3 and the air from the guide hole 41 can be assembled with better stability.

[0050]

The utility model air duct 4 with a one-piece shell or external design, please refer shown in Figures 5 and 6, the utility model is similar to the second embodiment of the first embodiment, the difference lies in a corresponding housing position of the air inlet 13 is provided with a threaded portion 131 and the outer wall of the guide duct 4, the threaded portion 45 so that the air duct 4 can be accomplished by the threaded portion 45 of the housing 1 is screwed into a threaded portion 131 disposed in the accommodation chamber 11 groups within, and near the end of the guide duct 4 fan 3 in order to achieve the requirements of the utility model to reduce the noise effect.

[0051]

Another example is shown in FIG, 7 of the utility model of the third embodiment similar to the first embodiment, second embodiment, the difference lies in the position of the housing 1 correspond to the air inlet

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13 is provided with a button hole engaging portion 132, and the air duct 4 the outer wall of the engaging portion 46 of a fastening member, such that the air duct 4 can be accomplished by engaging the engaging portion 46 of the housing engaging portion 132 is provided in the container 1 is set inside the chamber 11, and near the end of the guide duct 4 Fan 3 to achieve the purpose of the utility model to reduce noise, and the add-in is designed to facilitate the dismantling of clean air duct 4, sound-absorbing body 5 has a cleaning and convenience.

[0052]

Another example is shown in Figure 8 and Figure 9, a fourth embodiment of the present utility model similar to the first embodiment, the main difference in the air duct 4 is provided a threaded portion 45 and the lid 14 is provided to the gate of the guide duct 4 may be screwed The threaded portion 141 together, wind pipe 4 and the gate cap 14 after the first combination of the gate and into the outlet cover 14 engages the housing 1 13 position, the utility model also has the effect of reducing the noise requirements, and the utility model aforementioned design The utility model is not easy to set up a hair dryer air duct 4 and 5, together with sound-absorbing body mounted use, and also has easy dismantling cleaning efficacy.

[0053]

The utility model wind pipe and gate fastening lid can borrow or otherwise connected group, and with the new requirements of the utility function, also see Figure 10, a fifth embodiment of the utility model similar to the fourth embodiment, the Differences in air duct 4 located in the external enclosure, and toward the end of the set screw into the outlet 13 and the threaded portion 47 and the outlet 13 into engagement position 131, and the structure can significantly reduce a wide range of outside air into the intake within a hair dryer wind noise and better efficiency with effectiveness.

[0054]

From the above, the utility model may have lower noise, better efficiency of the wind effect, and the utility model does not need to be increased if the existing hair dryer shell and another catheter, relatively low cost, the above described embodiments of the present utility model illustrative, not limiting the utility model of product form and style, any affiliated person of ordinary skill in the field of technical changes or modifications made to its proper, and all shall be deemed made without departing from the scope of the utility model patents.

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CLAIMS CN202386031

[0001]

One kind of hair dryer to reduce noise structure, comprising:

A shell, its center has a capacity room, front and rear ends are provided with the outlet and into the air;

A heating mechanism provided in the container chamber of the front position of the housing;

A fan, which linked by a motor, the housing accommodating chamber provided in a rear position;

Characterized by further comprising:

I. duct, into the outlet position located in the housing, the air duct with a wind hole;

A sound absorbing body as a hollow annular body having a central axial bore corresponding to the air guide portion through the air, and fixed on the inner wall of the air guide hole in the air duct.

[0002]

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Hair dryer according to claim 1, wherein the noise-reducing structure, wherein: the sound absorbing and sound absorbing body is a sponge or foam, adhesive disposed on the fixed air duct.

[0003]

Hair dryer according to claim 2, wherein the noise-reducing structure, wherein: the guide duct is provided with a sound absorbing member abutting against an end edge of the block.

[0004]

Hair dryer 1, 2 or 3, wherein any one of claims to reduce noise structure characterized in that: said air duct integrally formed with the housing, corresponding to the axial direction of the air guide hole into the air, and the air duct end located close to the fan position, wind pipe outer wall and the inner wall of the shell with an interval part.

[0005]

1, 2 or 3 in any one of claim hairdryer noise abatement structure, wherein: said air inlet position of the housing is provided with a gate cover, wind pipe and casing for external components connected or grid cover group .

[0006]

Hair dryer according to claim 5, wherein the noise-reducing structure, wherein: said housing corresponding to the location of the outlet is provided with a threaded portion, the outer wall of the air guide pipe threaded portion, the threaded portion of the screw threaded portion of the air guide pipe and the shell combined group located in the housing capacity indoor air guide hole toward the corresponding air duct into the air, and the air duct near the end of the fan.

[0007]

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Hair dryer according to claim 5, wherein the noise-reducing structure, wherein: said housing corresponding to the position of the outlet is provided with the engaging portion, the air guide pipe is provided with the engaging portion, the engaging portion of the guide duct and the shell engaging portion engaging group located in the housing interior capacity, wind direction corresponding hole into the air, and the air duct near the end of the fan.

[0008]

Hair dryer of claim 5, wherein the noise abatement structure, wherein: the guide duct and cover combination of the gate, the gate cover and the housing outlet location engagement.

[0009]

Hair dryer of claim 5, wherein the noise abatement structure, wherein: said guide duct located in the external shell, the shell into the air duct toward the outlet end of the engagement with the outlet position.

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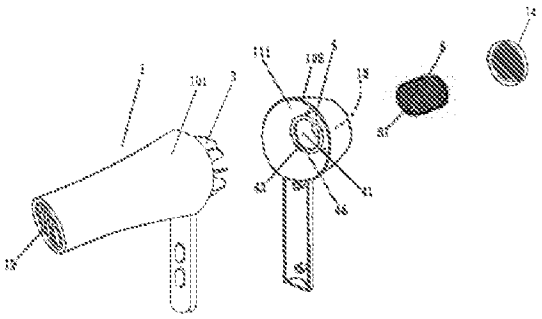
权利要求书 1 页 说明书 4 页 附图 11 页

(54)实用新型名称

吹风机减低噪音结构

(57)摘要

本实用新型公开了一种吹风机减低噪音结构，包括一外壳、一电热机构、一风扇、一导风管、一吸音体，其中该外壳中央具有容室，并前、后端分别设置出风口、入风口；该电热机构设于外壳容室内前方位置；又该风扇由马达连动，设于外壳容室后方位置；导风管具轴向对应入风口的导风孔，并该导风管一端部与入风口连接，另一端部位于靠近风扇位置，且导风管外壁与外壳内壁具有间隔部；该吸音体由海棉、吸音泡棉或其他可吸音材质制造，并该吸音体为中空环形体，中央具透空部，并藉由黏合式或其他适当方式固设于导风管的导风孔内壁；藉此本实用新型具有减低噪音及较佳出风效率的功效。



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1. 一种吹风机减低噪音结构，包括：

一外壳，其中央具有容室，前、后端分别设置有出风口及入风口；

一电热机构，设于外壳容室的前方位置；

一风扇，其由马达连动，设于外壳容室后方的位置；

其特征在于，还包括：

一导风管，设于外壳的入风口位置，该导风管具有导风孔；

一吸音体，为中空环形体，中央具对应导风孔轴向的透空部，并圈设于导风管的导风孔内壁。

2. 如权利要求 1 所述的吹风机减低噪音结构，其特征在于：所述吸音体为海棉或吸音泡棉，黏合圈设于导风管上。

3. 如权利要求 2 所述的吹风机减低噪音结构，其特征在于：导风管设置有与吸音体一端抵靠的挡缘。

4. 如权利要求 1、2 或 3 中任一项所述的吹风机减低噪音结构，其特征在于：所述导风管与外壳一体成型，所述导风孔轴向对应入风口，且导风管一端部位于靠近风扇位置，导风管外壁与外壳内壁具有间隔部。

5. 如权利要求 1、2 或 3 中任意一项所述的吹风机减低噪音结构，其特征在于：所述外壳的入风口位置设置有栅盖，导风管为外接式组件与外壳或栅盖组接。

6. 如权利要求 5 所述的吹风机减低噪音结构，其特征在于：所述外壳对应出风口位置设置有螺纹部，导风管的外壁设置螺纹部，该导风管的螺纹部与外壳的螺纹部螺合组设于外壳容室内，导风管的导风孔朝向对应入风口，且导风管一端靠近风扇。

7. 如权利要求 5 所述的吹风机减低噪音结构，其特征在于：所述外壳对应出风口的位置设置有扣合部，导风管设置有扣合部，该导风管的扣合部与外壳的扣合部扣合组设于外壳容室内，导风孔朝向对应入风口，且导风管一端靠近风扇。

8. 如权利要求 5 所述的吹风机减低噪音结构，其特征在于：该导风管与所述栅盖组合，该栅盖与外壳的出风口位置接合。

9. 如权利要求 5 所述的吹风机减低噪音结构，其特征在于：所述导风管设于外壳外部，该导风管朝向外壳入风口一端与入风口位置接合。

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吹风机减低噪音结构

技术领域

[0001] 本实用新型涉及一种吹风机，尤其是指一种吹风机减低噪音结构。

背景技术

[0002] 吹风机为人们吹干头发必须的电器设备之一，如图 11 所示为现有吹风机结构之一，主要具有外壳 1'、电热机构 2'、风扇 3'，该外壳 1' 具有容室 11' 以容置电热机构 2'、风扇 3'，并于前、后端分别设置出风口 12'、入风口 13'，入风口 13' 位置设置栅盖 14'，该电热机构 2' 及风扇 3' 分别设于容室 11' 前、后方位置，使得风扇 3' 动作可将外界气流由入风口 13' 导入容室 11' 内，并经由电热机构 2' 加热产生气流再由出风口 12' 导出。

[0003] 然而如图 11 箭头方向所示，前述结构当外界大范围的气流强制由直径较小的入风口 13' 导入时其气流将直接冲击出风口 13' 周缘，造成如图 11 中 a 位置产生明显进气位置撞击噪音，且导入容室 11' 的气流亦产生乱流并撞紧外壳 1' 内壁，因而会造成吹风机噪音增大的缺失，该吹风机使用时位于靠近人体头部位置，将造成使用不舒适的缺失，对美容院等营业场所人员而言更易造成影响听力的职业伤害。

[0004] 为改进前述情形，如图 12 所示及中国台湾公告第 566114 号所示的吹风机结构，具有外壳 4'、5'，该外壳 4' 内具有电热机构 42' 且可由手部握持，同时具有出风口 41'，另一外壳 5' 具有入风口 51'，内部具有风扇 52'，两外壳 4'、5' 之间连设可导引气流的导管 6'，使得风扇 52' 动作可将外界气流导入外壳 5' 内，再经由导管 6' 导入外壳 4' 内并经电热机构 42' 加热再由出风口 41' 导出，前述设计可由导管 6' 区隔入风的噪音，使得当具出风口 41' 的外壳 4' 靠近人体时不会感受较大噪音造成不适。

[0005] 然而前述设计因具有导管 6'，造成使用者手持外壳 4' 操作时将受该导管 6' 影响不便，且该导管 6' 更会造成导风行程增加及减低出风效率的缺失，该吹风机的组件明显增加，将增加吹风机成本。

[0006] 又如图 13 所示的另一现有吹风机改进结构，其组成结构与图 10 所示结构类同，差异是在入风口 13' 位置设置有可透气的海棉 7'，使得外界气流由入风口 13' 导入时可经由该海棉 7' 吸音以具减小噪音功效。

[0007] 然而前述设计因该海棉 7' 同时将造成入风阻力，因而造成该吹风机出风量明显大幅衰减，造成该吹风机效率不佳不符合使用需求功效缺失。

[0008] 有鉴于此，本设计人针对上述吹风机结构设计上未臻完善所导致的诸多缺失及不便，而深入构思，且积极研究改良试做而开发设计出本实用新型。

实用新型内容

[0009] 本实用新型的目的在于提供一种可有效减小吹风机动作进气产生的噪音，并同时可令吹风机具有较佳出风效率。

[0010] 为了达成上述目的，本实用新型的解决方案是：

[0011] 一种吹风机减低噪音结构，包括：

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[0012] 一外壳，其中央具有容室，前、后端分别设置有出风口及入风口；

[0013] 一电热机构，设于外壳容室的前方位置；

[0014] 一风扇，其由马达连动，设于外壳容室后方的位置；

[0015] 一导风管，设于外壳的入风口位置，该导风管具有导风孔；

[0016] 一吸音体，为中空环形体，中央具对应导风孔轴向的透空部，并固设于导风管的导风孔内壁。

[0017] 所述吸音体为海棉或吸音泡棉，黏合固设于导风管上。

[0018] 导风管设置有与吸音体一端抵靠的挡缘。

[0019] 所述导风管与外壳一体成型，所述导风孔轴向对应入风口，且导风管一端部位于靠近风扇位置，导风管外壁与外壳内壁具有间隔部。

[0020] 所述外壳的入风口位置设置有栅盖，导风管为外接式组件与外壳或栅盖组接。

[0021] 所述外壳对应出风口位置设置有螺纹部，导风管的外壁设置螺纹部，该导风管的螺纹部与外壳的螺纹部螺合组设于外壳容室内，导风管的导风孔朝向对应入风口，且导风管一端靠近风扇。

[0022] 所述外壳对应出风口的位置设置有扣合部，导风管设置有扣合部，该导风管的扣合部与外壳的扣合部扣合组设于外壳容室内，导风孔朝向对应入风口，且导风管一端靠近风扇。

[0023] 该导风管与所述栅盖组合，该栅盖与外壳的出风口位置接合。

[0024] 所述导风管设于外壳外部，该导风管朝向外壳入风口一端与入风口位置接合。

[0025] 采用上述结构后，当本实用新型吹风机的风扇动作时，可将外界气流由入风口位置先导入导风管的导风孔再导引至风扇位置，外界大范围的气流导入直径较小的导风管时会先撞击吸音体并由吸音体减震消音，不会直接撞击导风管内壁，因而可大幅减小进气动作时吸入气流的噪音，又因导风管与外壳内壁具有间隔部，可降低导入气流与外壳内壁撞击的噪音，并可具有集中气流导引效果，又该导风孔内的气流是穿过吸音体的透空部并非穿透吸音体，因而导入气流不会明显衰减，使得本实用新型可保持吹风机较佳出风效率，且本实用新型的吸音体导引冷气流，并非设于容室对应电热机构位置，因而可不虞吸音体因高热而烧毁，长时间使用仍可具良好安全性。

附图说明

[0026] 图 1 为本实用新型的第一实施例分解图。

[0027] 图 2 为本实用新型第一实施例组合剖视示意图。

[0028] 图 3 为本实用新型第一实施例组合剖视示意图。

[0029] 图 4 为本实用新型第一实施例动作示意图。

[0030] 图 5 为本实用新型第二实施例部分解图。

[0031] 图 6 为本实用新型第二实施例组合剖视示意图。

[0032] 图 7 为本实用新型第三实施例组合剖视示意图。

[0033] 图 8 为本实用新型第四实施例分解图。

[0034] 图 9 为本实用新型第四实施例组合剖视示意图。

[0035] 图 10 为本实用新型第五实施例组合剖视示意图。

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[0036] 图 11 为现有吹风机剖视示意图。

[0037] 图 12 为另一现有吹风机剖视示意图。

[0038] 图 13 为现有吹风机设置海棉的示意图。

具体实施方式

[0039] 为了进一步解释本实用新型的技术方案，下面通过具体实施例来对本实用新型进行详细阐述。

[0040] 在以下实施例图式中本实用新型相同或类同功能的组件以相同图号表示，请参阅图 1 至图 3，本实用新型第一实施例包括一外壳 1、一电热机构 2、一风扇 3、一导风管 4、一吸音体 5，其中该外壳 1 由前部 101、后部 102 对接组合，中央具有容室 11，并前、后端分别设置出风口 12、入风口 13，该入风口 13 位置设置栅盖 14，该栅盖 14 可防止头发或异物吸入容室 11 内。

[0041] 电热机构 2 设于外壳 1 容室 11 内前方位置；该风扇 3 由马达 31 连动，并设于外壳 1 容室 11 后方位置。

[0042] 导风管 4 一体成型设于外壳 1 后部 102 对应风扇 3 与入风口 13 间的位置，该外壳 1 前部 101、后部 102 分别成型设计可便于组装各组件。该导风管 4 具轴向对应入风口 13 的导风孔 41，该导风管 4 一端部 42 与入风口 13 成型连接，另一端部 43 位于靠近风扇 3 位置，且导风管 4 外壁与外壳 1 内壁具间隔部 111，在导风管 4 靠近风扇 3 一端设置挡缘 44。

[0043] 吸音体 5 由海棉、吸音泡棉或其他可吸音材质制造，并该吸音体 5 为中空环形体，中央具对应导风孔 41 轴向的透空部 51，该吸音体 5 黏合固设于导风管 4 的导风孔 41 内壁，其一端与挡缘 44 抵靠。

[0044] 请参阅图 4，本实用新型吹风机的风扇 3 动作时可将外界气流由入风口 13 先导入直径较小的导风孔 41 再导引至风扇 3 的位置，当外界大范围的气流导入直径较小的导风管 4 时，会先撞击吸音体 5 并由吸音体 5 减震消音，其进气主要撞击位置为吸音体 5 而不会直接撞击导风管 4 内壁，因而该导风管 4 不会成为噪音组件，可大幅减小吹风机进气动作吸入气流时的噪音，使得如图 4 中 b 位置所示的噪音可大幅降低，又因导风管 4 与外壳 1 内壁具有间隔部 111，可降低导入气流与外壳 1 内壁撞击的噪音，且可具集中气流导引效果，该导风孔 41 内的气流是穿过吸音体 5 的透空部 51，而非穿透吸音体 5，因而导入气流不会有明显衰减，并使本实用新型整体作动噪音可大幅降低，且可保持吹风机较佳出风效率，该导风孔 41 的挡缘 44 可提供抵靠吸音体 5 端缘，可确保长时间使用时吸音体 5 不会因风扇 3 作动的吸力而脱离导风孔 41，可具有较佳组装稳定性。

[0045] 本实用新型的导风管 4 可与外壳 1 一体成型或外接式设计，请参阅图 5 及图 6 所示，本实用新型的第二实施例类同第一实施例，其差异在于外壳 1 对应入风口 13 的位置设置有螺纹部 131，并导风管 4 的外壁设置螺纹部 45，使得该导风管 4 可藉由螺纹部 45 与外壳 1 的螺纹部 131 螺合组设于容室 11 内，并使导风管 4 一端靠近风扇 3 以达到本实用新型减低噪音要求的功效。

[0046] 又如图 7 所示，本实用新型第三实施例类同第一、二实施例，其差异在于外壳 1 对应入风口 13 的位置设置具有扣孔的扣合部 132，并导风管 4 的外壁设置具有扣体的扣合部 46，使得该导风管 4 可藉由扣合部 46 与外壳 1 的扣合部 132 扣合组设于容室 11 内，并使导

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风管 4 一端靠近风扇 3 以达到本实用新型减低噪音的目的，并且该外接式设计可便于拆解清洁导风管 4、吸音体 5 具有清洁及便利性。

[0047] 又如图 8 及图 9 所示，本实用新型第四实施例类同第一实施例，其主要差异在导风管 4 设置螺纹部 45，并于栅盖 14 设置可与导风管 4 螺合的螺纹部 141，导风管 4 与栅盖 14 先组合后再使栅盖 14 与外壳 1 的入风口 13 位置接合，同样具有本实用新型减低噪音要求的功效，而本实用新型前述设计可便于未设置本实用新型导风管 4 及吸音体 5 的吹风机再加装使用，并亦可具有易拆解清洁功效。

[0048] 本实用新型导风管与栅盖亦可藉扣合或其他方式组接，并可具本实用新型要求功效，又请参阅图 10，本实用新型第五实施例类同第四实施例，其差异在导风管 4 设于外壳外部，并朝向入风口 13 一端设置螺纹部 47 并与入风口 13 位置的螺纹部 131 接合，并该结构亦可大幅减低外界大范围气流进入吹风机内的进气噪音及具较佳出风效率功效。

[0049] 由以上所述，本实用新型可具有减低噪音、较佳出风效率功效，且本实用新型不须如现有吹风机须增加另一外壳及导管，成本相对低，前述实施例为阐述本实用新型例示，并非限定本实用新型的产品形态和式样，任何所属技术领域的普通技术人员对其所做的适当变化或修饰，皆应视为不脱离本实用新型的专利范畴。

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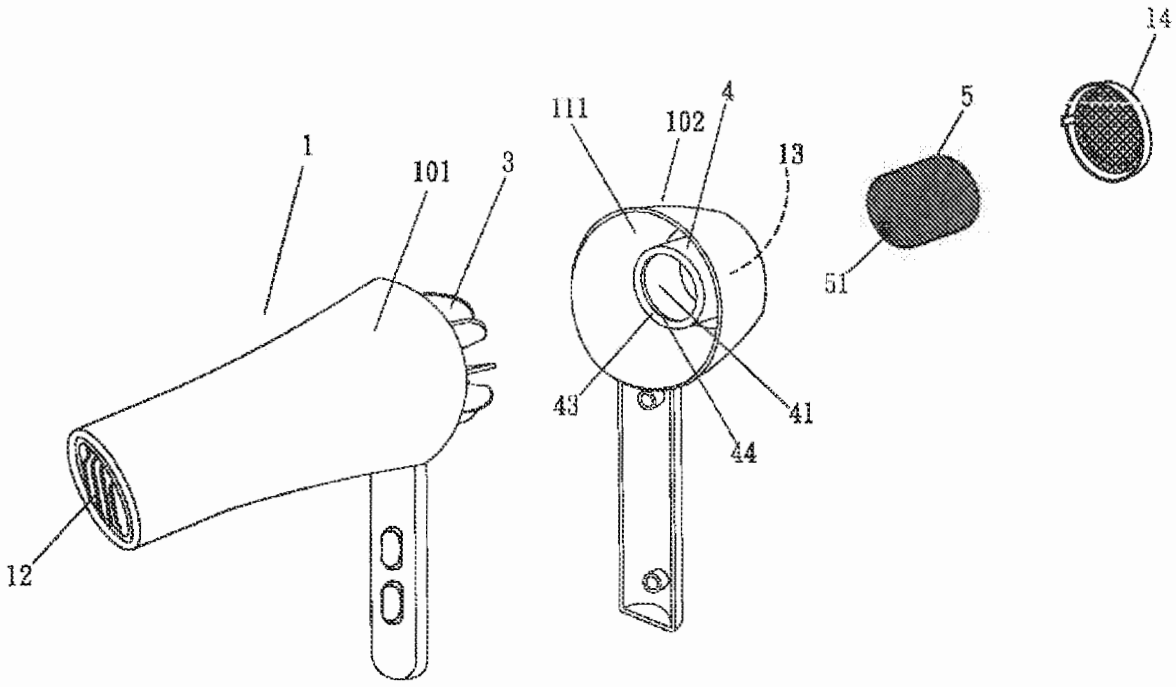


图 1

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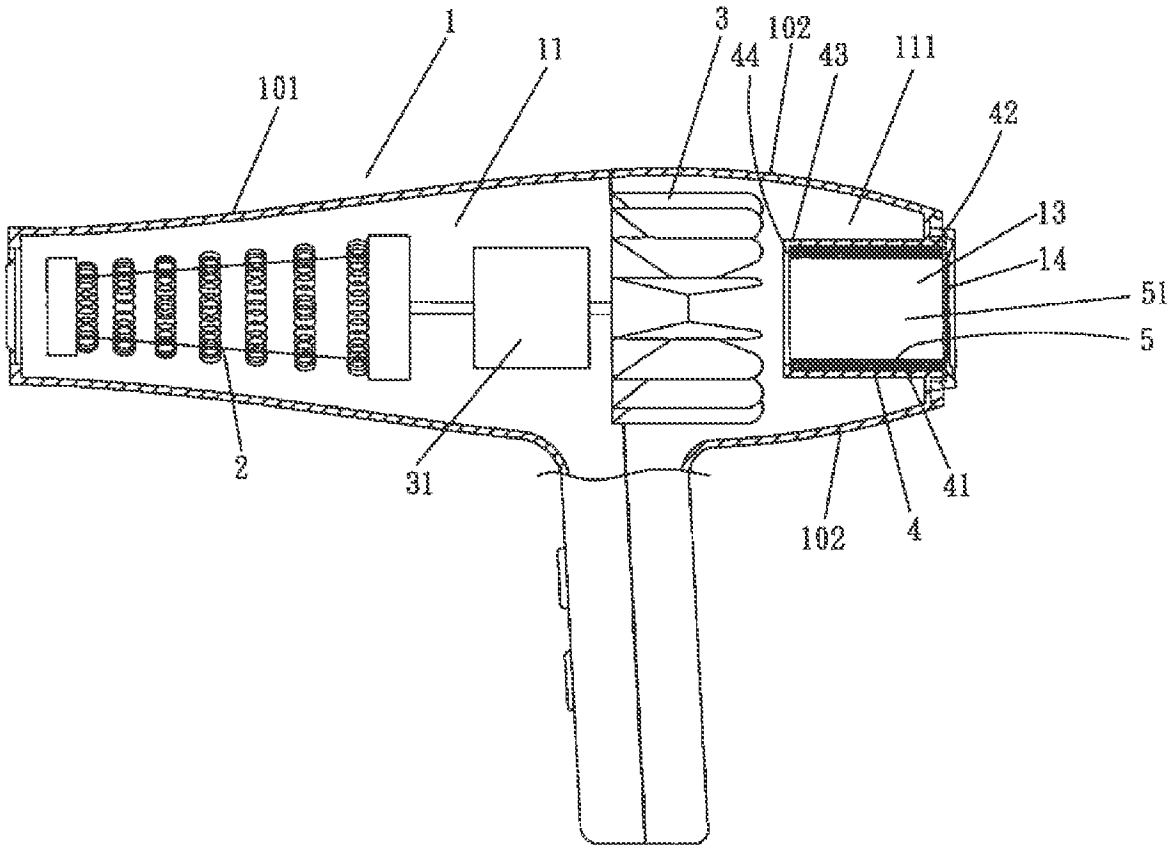


图 2

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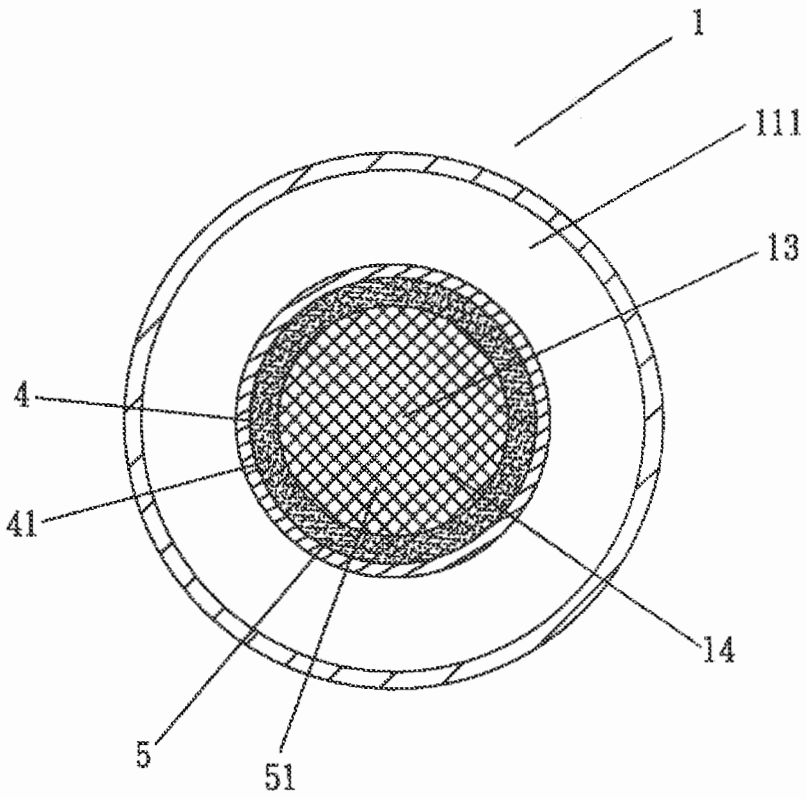


图 3

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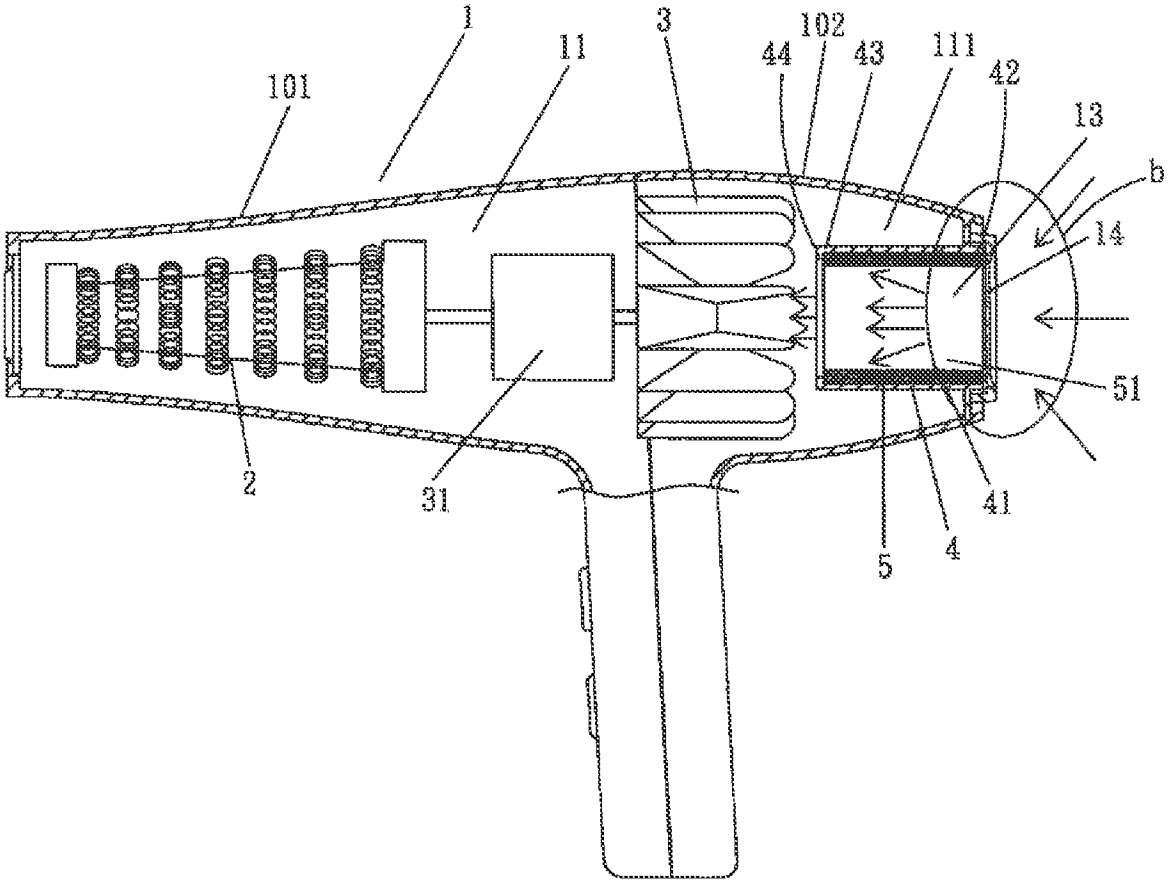


图 4

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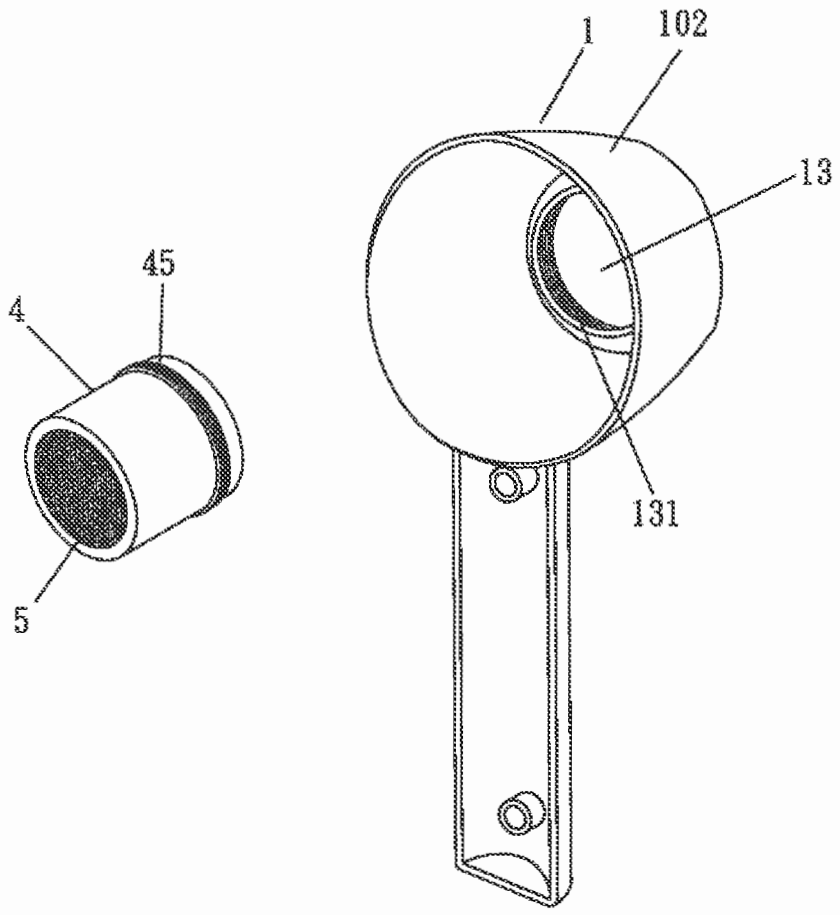


图 5

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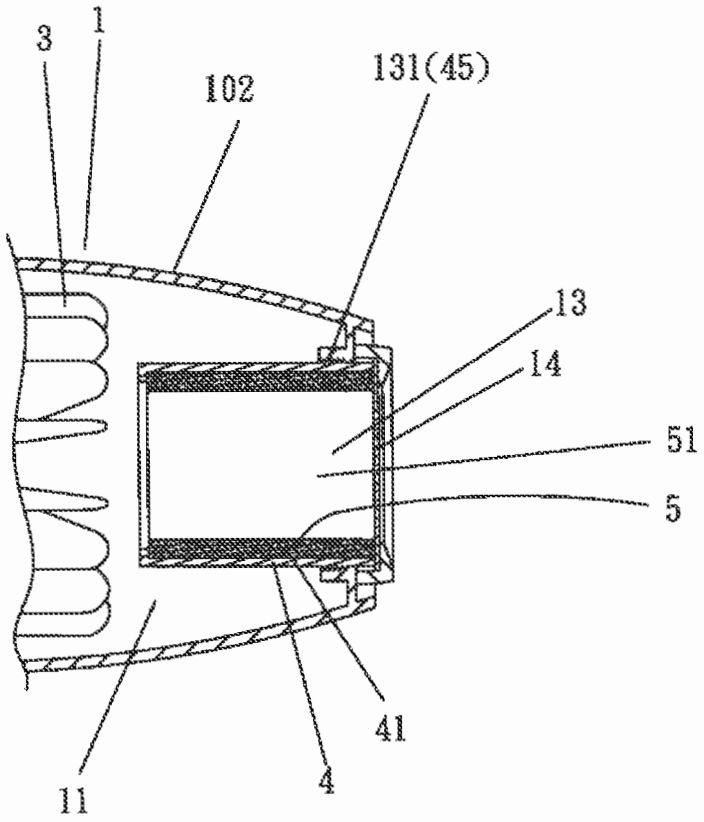


图 6

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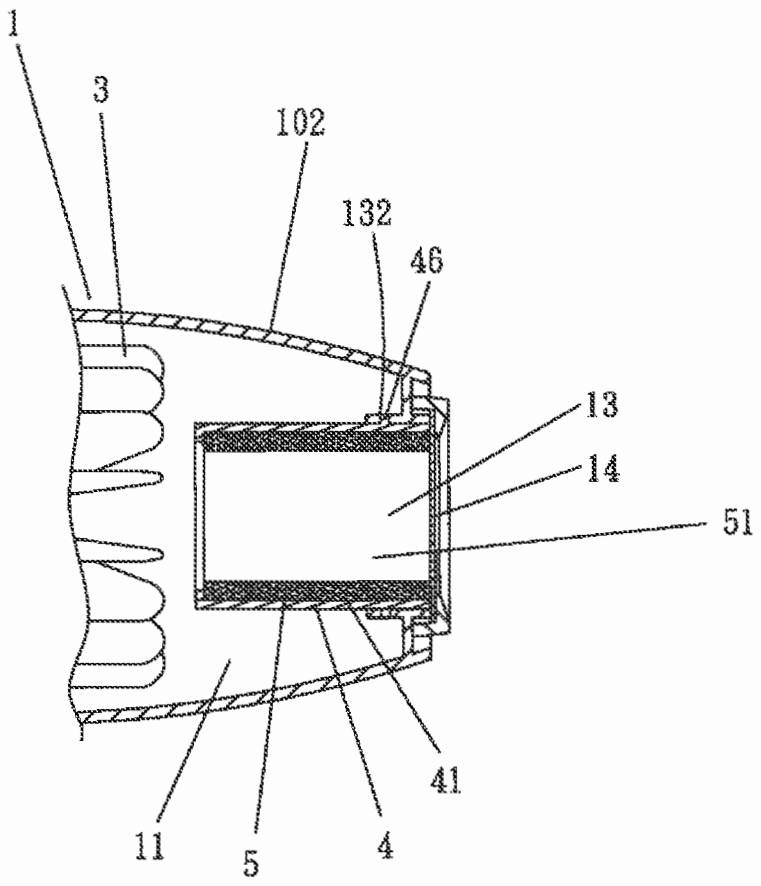


图 7

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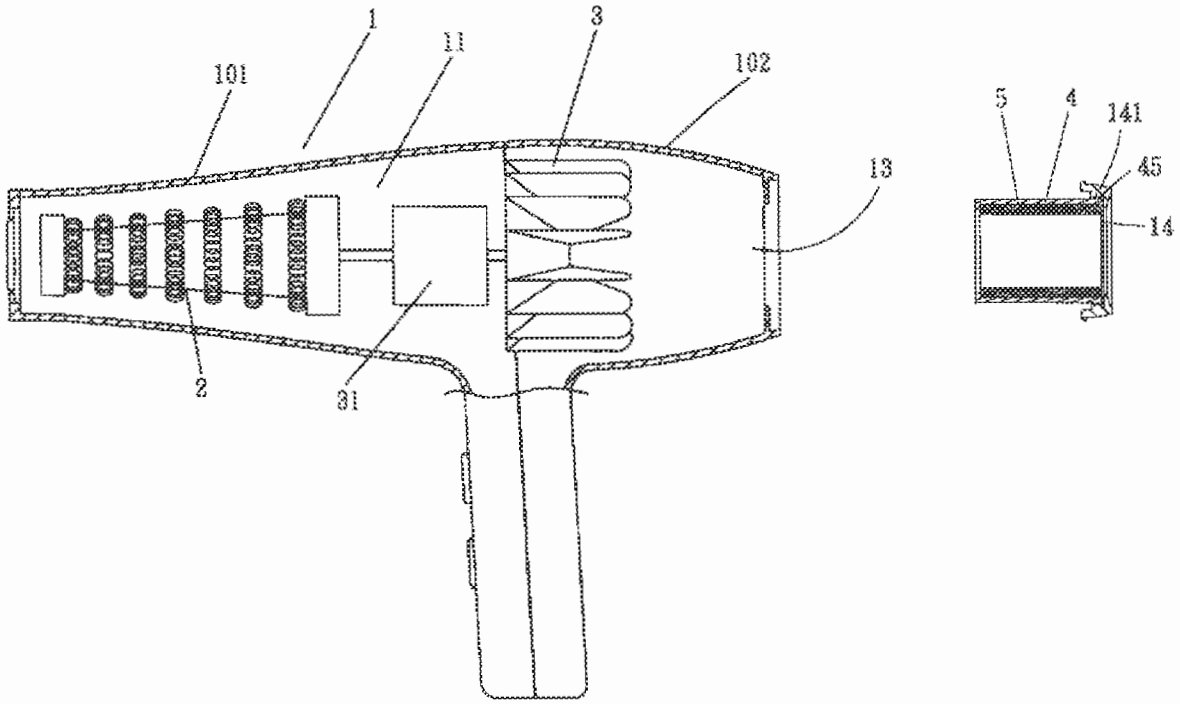


图 8

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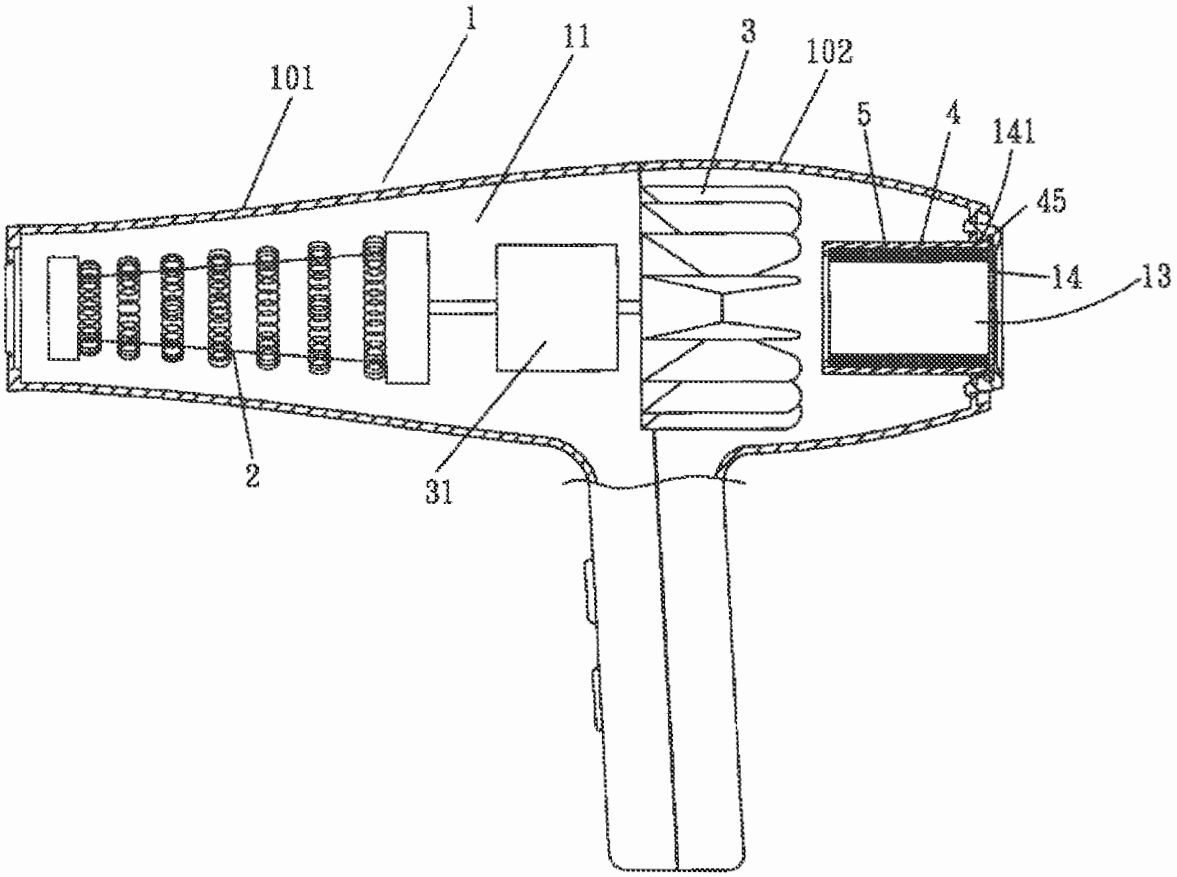


图 9

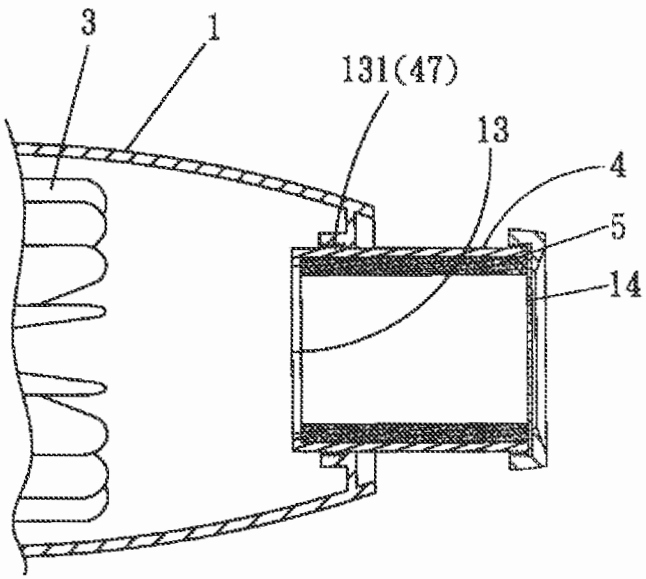


图 10

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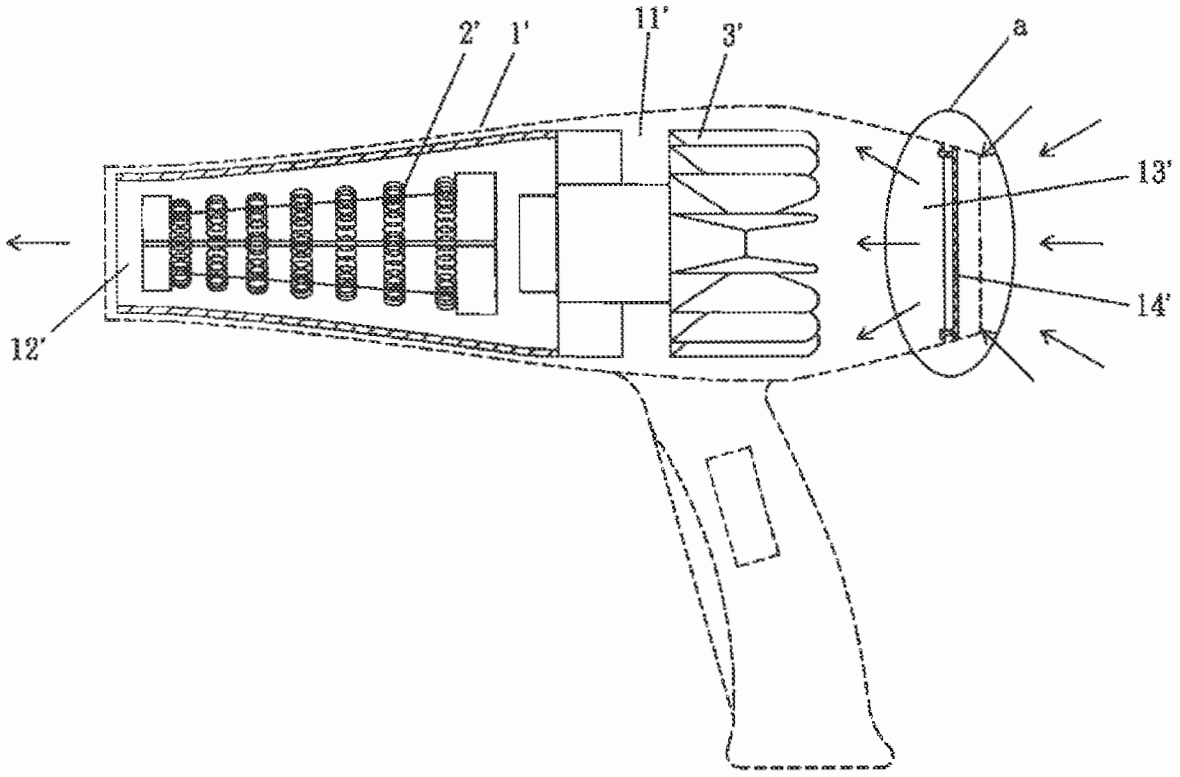


图 11

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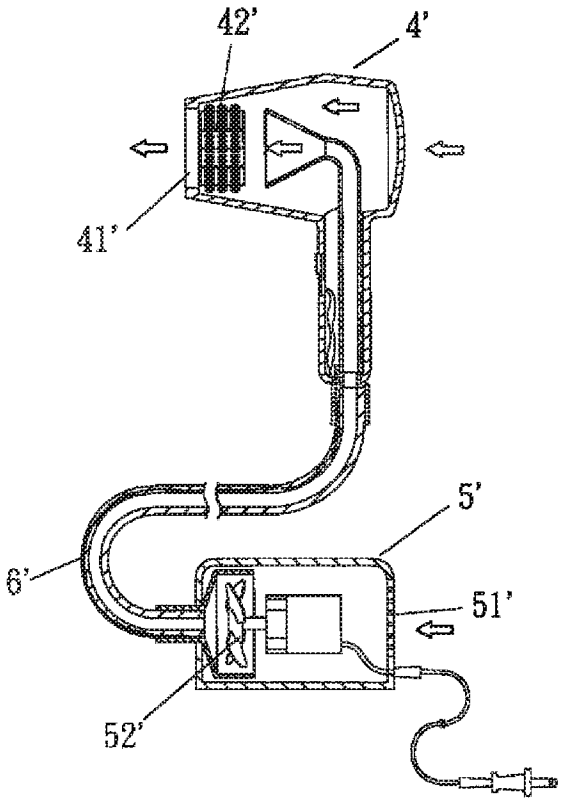


图 12

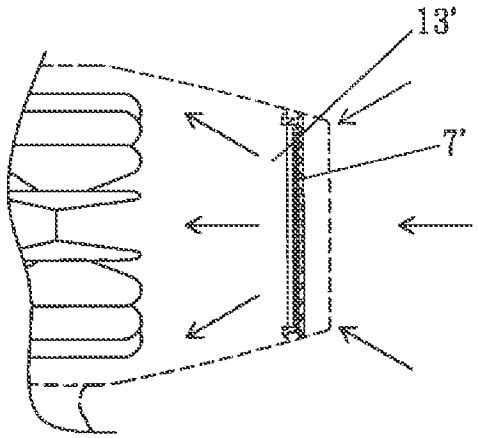


图 13

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Bibliographic data: CN202536440 (U) — 2012-11-21

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Multifunctional air blower

Page bookmark	CN202536440 (U) - Multifunctional air blower
Inventor(s):	JIANKANG LANG; SHENGLI LIU ±
Applicant(s):	UNIV NINGBO ±
Classification:	**- international:** ***A45D20/10; A45D20/12; A47L5/12; A47L9/10***
	- cooperative:
Application number:	CN2012217804U 20120116
Priority number(s):	CN2012217804U 20120116

Abstract of CN202536440 (U)

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The utility model discloses a multifunctional air blower. The multifunctional air blower comprises an air duct and a handle. Fans are arranged inside the air duct; the air duct comprises an air inlet and an air outlet; a filtration device and a dust collection head are arranged at the front end of the air inlet; and the filtration device is arranged between the dust collection head and the air inlet. The multifunctional air blower has the advantages that the filtration device and the dust collection head are added to the original structure of the conventional blower; and as a miniature dust collector, the multifunctional air blower can be used to clean keyboards and dead angles of furniture.

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Dictionary

DESCRIPTION CN202536440

Technical field

The utility model relates to a household appliance, in particular to a multifunctional hair dryer.

BACKGROUND

Hair dryers are commonly used in small home appliances, which has a handle and a hairdryer, electric wire disposed within the duct and fan, the fan will blow air through the heating wire heating after.

The current function of a single hair dryers.

SUMMARY OF THE INVENTION

The utility model technical problem to be solved is to provide a multi-functional hair dryer.

The technical solution to solve the technical problem of utility model used is: a versatile hair dryer, including duct and handle set with a fan inside the duct, the duct includes inlet and outlet, characterized provided that the front air intake filters and vacuum head filtration device is provided between the vacuum head and intake vents.

Said filter means is a filter.

Vacuum head provided with the head, is provided on the brush head.

It also includes a power cord and plug, said handle having a lumen, the end of the handle is provided with a lid, and plug the power cord to the handle collapsible lumen

Compared with the prior art, the practical advantages of the new hair dryer on the basis of the original structure, increasing the filter and cleaning the head, as a small vacuum cleaner used to clean computer keyboards and furniture corner.

Brief Description

Figure 1 is a block diagram of a vacuum cleaner when the utility model;

Figure 2 is a block diagram of a utility model as a hair dryer;

Figure 3 is a block diagram of the utility model.

Embodiment

The following examples further described in conjunction with the drawings in detail as to the utility model.

A versatile hair dryer, including duct 12 and the handle 3, the duct 12 is provided with a fan, including air inlet duct outlet 6 and 4, the front end of the air inlet 6, 9 and vacuuming head filtration device, filtration devices Set the inlet suction head between 1 and 6.

Filtration devices to filter.

A suction head provided with a head 10, the head 11 is provided with a brush 10.

It also includes a power line 8 and the plug 7, the handle having a lumen 3, the end of the handle 3 is provided with a cover, the power line 8 and the plug 9 can be folded within the lumen of the handle 3.

A hairdryer are provided with dust blowing function function switch 2 and switch 5.

When used as a hair dryer: Remove the filter and cleaning the head, can be used alone as a hair dryer, hair dryer are divided into two tranches of hot and cold air from blowing function control switch 5.

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Use as a vacuum cleaner: vacuum filtration apparatus and turn heads mounted on a hair dryer can be used as a small vacuum cleaner.

Open the vacuum function switch 2, open cleaning function.

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Dictionary

CLAIMS CN202536440

1.

A versatile hair dryer, including duct and handle is provided inside the duct fan, hairdryer, including the inlet and outlet, characterized in that the front air inlet is provided with a filter and vacuum head, the filter means disposed between said suction head and the air inlet filter of the filter device.

2.

According to claim 1, wherein a multifunctional hair dryer, characterized in that said suction head is provided with a brush, the brush is provided on said head.

3.

A hair dryer according to a multi-function claim, characterized in that it further comprises a power cord and plug, said handle having a lumen end of the handle is provided with a cover, and plug the power cord in the collapsible said cavity in the handle.

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PN - CN202536440U U 20121121
TI - Multifunctional air blower
AB - The utility model discloses a multifunctional air blower. The multifunctional air blower comprises an air duct and a handle. Fans are arranged inside the air duct; the air duct comprises an air inlet and an air outlet; a filtration device and a dust collection head are arranged at the front end of the air inlet; and the filtration device is arranged between the dust collection head and the air inlet. The multifunctional air blower has the advantages that the filtration device and the dust collection head are added to the original structure of the conventional blower; and as a miniature dust collector, the multifunctional air blower can be used to clean keyboards and dead angles of furniture.
PA - UNIV NINGBO

© WPI / Thomson

AN - 2013-C69741
TI - Multi-functional dust blower for cleaning e.g. computer keyboard, has fan arranged in air cylinder and formed with air inlet and air outlet, where air outlet is matched with filter device that is provided with filter screen
AB - NOVELTY :
The blower has an air cylinder provided with a fan that is formed with an air inlet and an air outlet. A front end of the air inlet is arranged with a filter device and a dust absorption head. The air outlet is matched with the filter device that is provided with a filter screen.
- USE :
Multi-functional dust blower for cleaning a computer keyboard and a furniture.
- ADVANTAGE :
The blower is simple in structure, and has high filtering efficiency, and utilizes the dust absorption head for cleaning a computer keyboard and a furniture.
PN - CN202536440U U 20121121 DW201318
PA - (UYNB) UNIV NINGBO

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(12)实用新型专利

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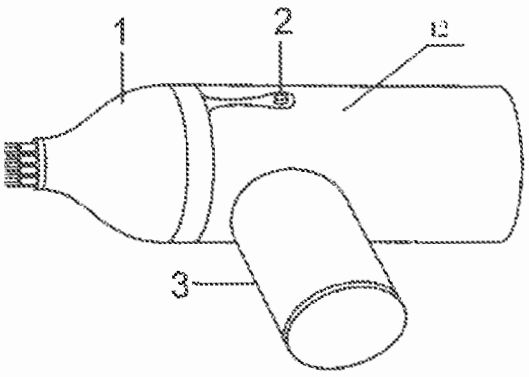
权利要求书 1 页 说明书 1 页 附图 1 页

(54)实用新型名称

一种多功能吹风机

(57)摘要

本实用新型公开了一种多功能吹风机，包括风筒和把手，风筒内设置有风扇，风筒包括进风口和出风口，进风口前端设置有过滤装置和吸尘头，过滤装置设置吸尘头与进风口之间，其优点是在吹风机原有结构基础上，增加了过滤装置和吸尘头，作为一个小型吸尘器，用于清理电脑键盘和家具死角。



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1. 一种多功能吹风机，包括风筒和把手，所述的风筒内设置有风扇，所述的风筒包括进风口和出风口，其特征在于进风口前端设置有过滤装置和吸尘头，所述的过滤装置设置吸尘头与进风口之间，所述的过滤装置为过滤网。

2. 根据权利要求 1 所述的一种多功能吹风机，其特征在于所述的吸尘头上设置有刷头，所述的刷头上设置有毛刷。

3. 根据权利要求 1 所述的一种多功能吹风机，其特征在于它还包括有电源线和插头，所述的把手具有内腔，把手末端设置有盖子，所述的电源线和插头可收拢于所述的把手内腔中。

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一种多功能吹风机

技术领域

[0001] 本实用新型涉及一种家用电器，尤其涉及一种多功能吹风机。

背景技术

[0002] 吹风机是家庭常用小电器，其具有把手和风筒，风筒内设置有电热丝和风扇，风扇将经电热丝加热后的空气吹出。目前的吹风机功能单一。

发明内容

[0003] 本实用新型所要解决的技术问题是提供一种多功能吹风机。

[0004] 本实用新型解决上述技术问题所采用的技术方案为：一种多功能吹风机，包括风筒和把手，所述的风筒内设置有风扇，所述的风筒包括进风口和出风口，其特征在于进风口前端设置有过滤装置和吸尘头，所述的过滤装置设置吸尘头与进风口之间。

[0005] 所述的过滤装置为过滤网。

[0006] 所述的吸尘头上设置有刷头，所述的刷头上设置有毛刷。

[0007] 它还包括有电源线和插头，所述的把手具有内腔，把手末端设置有盖子，所述的电源线和插头可收拢于所述的把手内腔中

[0008] 与现有技术相比，本实用新型的优点在吹风机原有结构基础上，增加了过滤装置和吸尘头，作为一个小型吸尘器，用于清理电脑键盘和家具死角。

附图说明

[0009] 图 1 为本实用新型作为吸尘器时的结构图；

[0010] 图 2 为本实用新型作为吹风机时的结构图；

[0011] 图 3 为本实用新型的结构图。

具体实施方式

[0012] 以下结合附图实施例对本实用新型作进一步详细描述。

[0013] 一种多功能吹风机，包括风筒 12 和把手 3，风筒 12 内设置有风扇，风筒包括进风口 6 和出风口 4，进风口 6 前端设置有过滤装置 9 和吸尘头 1，过滤装置设置吸尘头 1 与进风口 6 之间。过滤装置为过滤网。吸尘头 1 上设置有刷头 10，刷头 10 上设置有毛刷 11。它还包括有电源线 8 和插头 7，把手 3 具有内腔，把手 3 末端设置有盖子，电源线 8 和插头 9 可收拢于把手 3 内腔中。风筒上分别设置有吸尘功能开关 2 和吹风功能开关 5。作为吹风机使用时：取下过滤和吸尘头，可作为吹风机单独使用，吹风机分为热风和冷风两档，由吹风功能开关 5 控制。

[0014] 作为吸尘器使用时：将过滤装置和吸尘头依次装在吹风机上，可作为小型吸尘器使用。打开吸尘功能开关 2，开启吸尘功能。

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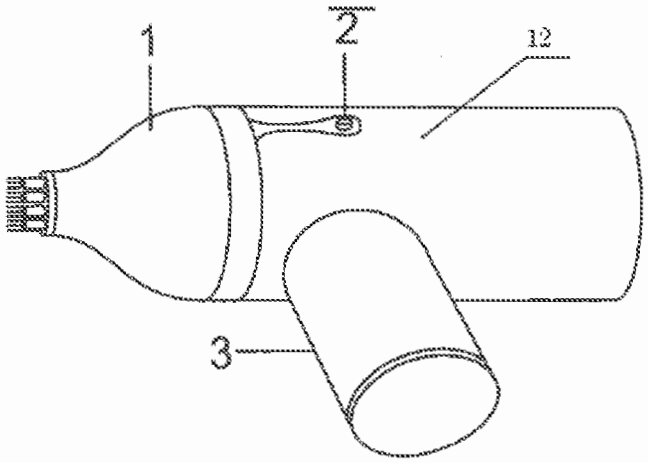


图 1

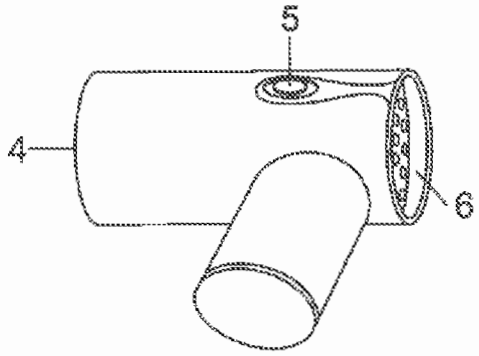


图 2

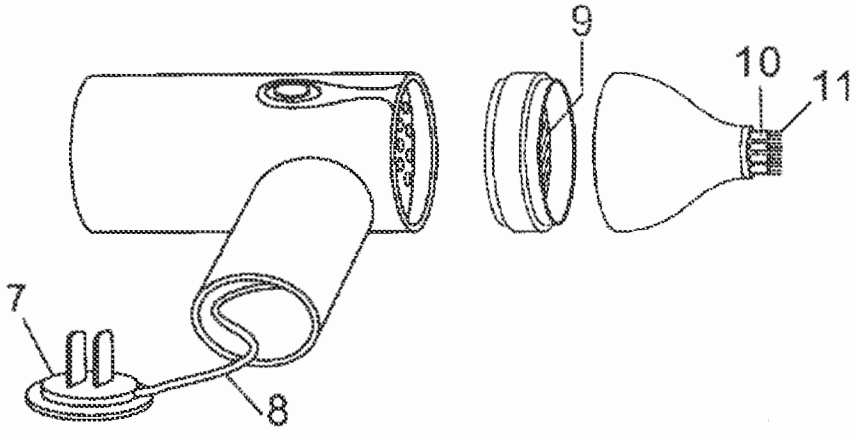


图 3

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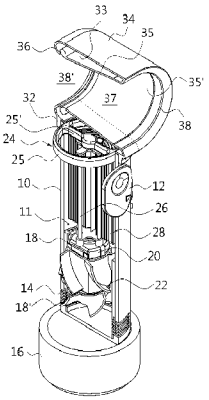
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(54) 발명의 명칭 **헤어 드라이어**

(57) 요 약

본 발명은 헤어 드라이어에 관한 것이다. 본 발명의 헤어 드라이어는 하우징(10)의 내부에 기류를 형성하기 위한 모터(20)와 팬(22)이 구비되고, 상기 팬(22)에 의해 하우징(10)의 외부에서 유입된 공기에 선택적으로 열을 제공하는 발열체(28)가 구비된다. 상기 하우징(10)의 일단부에는 토출노즐(30)이 설치되는데, 상기 토출노즐(30)에는 코안다면(35')이 구비되어 상기 하우징(10)을 통과해온 공기가 코안다면(35')을 따라 유동되면서 토출노즐(30) 외부의 공기를 토출노즐(30)의 중앙유로부(37)로 흡입하여 상기 하우징(10)을 통과해 온 공기와 혼합되게 한다. 상기 중앙유로부(37)에서 혼합된 공기는 상기 토출노즐(30)의 토출구(38')를 통해 토출된다. 이와 같은 본 발명에서는 코안다면(35')을 통과하는 공기가 토출노즐(30) 외부의 공기를 흡입할 수 있도록 하므로 상기 모터(20)의 용량을 상대적으로 줄일 수 있다. 그리고, 토출노즐(30)의 구조상 토출노즐(30)을 통해 외부에서 하우징(10)의 내부로 수분이 유입되는 것이 방지되어 방수와 소음차단 효과가 상대적으로 큰 이점이 있으며, 전자파차폐 효과도 매우 크게 되는 이점이 있다.

대 표 도 - 도2



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특허청구의 범위

청구항 1

내부공간이 내부에 형성되고 일측 외면에 상기 내부공간으로 외부의 공기가 유입되도록 하는 유입슬롯이 형성된 하우징과,

상기 하우징의 내부공간에 위치되고 상기 유입슬롯을 통해 하우징 외부에서 공기가 유입되어 하우징을 통과하도록 하는 기류형성부와,

상기 하우징의 내부공간에 위치되어 상기 하우징을 통과하는 공기에 열을 선택적으로 공급하는 발열체와,

상기 하우징의 일단부에 결합되고 상기 하우징의 내부를 통과하여 온 공기가 통과하는 코안다면을 구비하여 코안다면을 지나는 공기에 의해 외부의 공기를 흡입하여 함께 배출하는 토출노즐을 포함하여 구성됨을 특징으로 하는 헤어 드라이어.

청구항 2

제 1 항에 있어서, 상기 하우징의 타단부에는 상기 발열체와 기류형성부의 구동을 위한 전원을 공급하는 전원부가 구비됨을 특징으로 하는 헤어 드라이어.

청구항 3

제 2 항에 있어서, 상기 기류형성부는 모터와 상기 모터에 의해 회전되어 기류를 형성하는 팬을 포함하여 구성됨을 특징으로 하는 헤어 드라이어.

청구항 4

제 3 항에 있어서, 상기 모터는 상기 하우징의 내부공간에 고정되는 모터하우징에 조립됨을 특징으로 하는 헤어 드라이어.

청구항 5

제 1 항 내지 제 4 항중 어느 한 항에 있어서, 상기 토출노즐은 적어도 일부가 원형으로 되는 통형상으로, 중앙을 전후로 관통하여서는 외부공기가 유입되는 2차유입구와 하우징을 거쳐온 공기와 외부공기를 섞어서 토출하는 토출구가 양단에 구비되는 중앙유로부가 형성됨을 특징으로 하는 헤어 드라이어.

청구항 6

제 5 항에 있어서, 상기 토출노즐의 내부에는 상기 하우징을 지나온 공기가 유동되는 내부유로가 환형상으로 형성되고, 상기 내부유로의 하류부에 상기 코안다면으로 공기를 배출하는 토출슬릿이 환형상으로 형성됨을 특징으로 하는 헤어 드라이어.

청구항 7

제 6 항에 있어서, 상기 토출노즐의 내면을 내면벽이 형성하는데, 상기 내면벽에는 상기 토출슬릿을 나온 공기를 안내하는 코안다면과 상기 중앙유로부의 유동단면적을 상기 토출구로 가면서 점차 커지도록 하는 확산면이 연속적으로 형성됨을 특징으로 하는 헤어 드라이어.

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청구항 8

제 7 항에 있어서, 상기 토출노즐의 외면에는 내면에 나사부가 형성된 결합링부가 구비되고, 상기 하우징의 일단부 외면에는 상기 나사부에 대응되는 나사부가 형성되어 상기 토출노즐이 하우징의 일단부에 결합됨을 특징으로 하는 헤어 드라이어.

청구항 9

제 8 항에 있어서, 상기 기류형성부는 상기 하우징 내부를 유동하는 기류의 상류부에 위치되고 상기 발열체는 상기 기류형성부보다 기류의 하류부에 위치됨을 특징으로 하는 헤어 드라이어.

청구항 10

내부에 내부공간이 형성되고 일측 외면에 상기 내부공간으로 외부의 공기가 유입되도록 하는 유입슬롯이 형성된 하우징과,

상기 하우징의 내부공간에 위치되고 상기 유입슬롯을 통해 하우징 외부에서 공기가 유입되어 하우징을 통과하도록 하는 기류를 형성하는 팬을 회전시키는 모터와,

상기 하우징의 내부공간에 위치되어 상기 하우징을 통과하는 공기에 열을 선택적으로 공급하는 발열체와,

상기 하우징의 일단부에 결합되고 상기 하우징의 내부를 통과하여 온 공기가 통과하는 내부유로와 상기 내부유로를 나온 공기를 안내하는 코안다면을 구비하여 코안다면을 지나는 공기에 의해 외부의 공기를 흡입하여 함께 배출하는 토출노즐을 포함하여 구성됨을 특징으로 하는 헤어 드라이어.

청구항 11

제 10 항에 있어서, 상기 토출노즐은 적어도 일부가 원형으로 되는 통형상으로 외면을 외면벽이 형성하고 내면을 내면벽이 형성하며, 상기 외면벽과 내면벽의 사이에 내부유로가 형성되어 상기 하우징을 지나온 공기가 유동되며, 상기 내부유로를 거쳐온 공기가 토출되는 토출슬릿이 후단 내부를 둘러 구비되어 상기 내면벽에 형성된 상기 코안다면으로 공기를 안내하며, 상기 토출노즐의 중앙을 전후로 관통하여서는 외부공기가 유입되는 2차유입구와 상기 하우징을 거쳐온 공기와 외부공기를 섞어서 토출하는 토출구가 양단에 각각 구비되는 중앙유로부가 형성됨을 특징으로 하는 헤어 드라이어.

청구항 12

제 10 항 또는 제 11 항에 있어서, 상기 토출노즐의 내면벽에는 상기 토출슬릿을 나온 공기를 안내하는 코안다면과 상기 중앙유로부의 유동단면적이 상기 토출구로 가면서 점차 커지도록 하는 확산면이 연속적으로 형성됨을 특징으로 하는 헤어 드라이어.

명 세 서

기 술 분 야

[0001] 본 발명은 헤어 드라이어에 관한 것으로, 더욱 상세하게는 코안다효과를 사용하여 기류를 형성하도록 한 헤어 드라이어에 관한 것이다.

배 경 기 술

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[0002] 일반적인 헤어 드라이어는 모터로 구동되는 팬에 의해 만들어진 기류가 외부로 토출되면서 사용자의 모발을 말리거나 단정히 하게 된다. 헤어 드라이어에서 토출되는 공기의 온도는 필요에 따라 달리되는데, 상대적으로 높은 온도의 공기를 토출하기 위해 내부에 발열체가 구비된다.

[0003] 하지만, 종래의 헤어 드라이어에서는 토출구를 통해 토출되는 공기의 양이 상기 모터와 팬의 용량에 따라 결정된다. 따라서, 원하는 유량을 제공하기 위해서는 상기 모터와 팬이 일정 이상의 용량을 가져야 하므로, 상대적으로 헤어 드라이어의 크기가 커지는 문제점이 있다.

[0004] 그리고, 상기 모터의 구동에 의해 팬이 회전되고, 팬의 회전에 의해 외부에서 흡입된 공기는 상기 발열체를 통과하여 헤어 드라이어의 외부로 배출되는데, 상기 발열체가 헤어 드라이어에서 공기가 토출되는 부분에 인접하여 있다.

[0005] 따라서, 상기 발열체에서 발생하는 전자파가 직접 사용자의 머리로 전달될 수 있어, 사용자의 건강에 좋지 않은 영향을 미치는 문제점이 있다.

[0006] 또한, 발열체가 토출구에 인접하여 있음으로 해서, 상기 토출구를 통해 외부에서 물이 내부로 들어가면 쉽게 발열체에 전달되어 감전 사고 등의 위험이 큰 문제점도 있다.

발명의 내용

해결하려는 과제

[0007] 따라서, 본 발명의 목적은 상기한 바와 같은 종래의 문제점을 해결하기 위한 것으로, 모터의 구동에 의해 회전되는 팬이 만든 기류의 유량을 코안다 효과를 사용하여 늘려서 사용자의 모발로 전달할 수 있도록 헤어 드라이어를 설계하는 것이다.

[0008] 본 발명의 다른 목적은 전기부품을 유동되는 공기흐름의 상류부에 해당되는 토출부에서 멀리 떨어진 헤어 드라이어의 내부에 위치하도록 하여 직접 전기부품으로 수분이 전달되는 것을 차단할 수 있도록 하는 것이다.

과제의 해결 수단

[0009] 상기한 바와 같은 목적을 달성하기 위한 본 발명의 특징에 따르면, 본 발명은 내부공간이 내부에 형성되고 일측 외면에 상기 내부공간으로 외부의 공기가 유입되도록 하는 유입슬롯이 형성된 하우징과, 상기 하우징의 내부공간에 위치되고 상기 유입슬롯을 통해 하우징 외부에서 공기가 유입되어 하우징을 통과하도록 하는 기류형성부와, 상기 하우징의 내부공간에 위치되어 상기 하우징을 통과하는 공기에 열을 선택적으로 공급하는 발열체와, 상기 하우징의 일단부에 결합되고 상기 하우징의 내부를 통과하여 온 공기가 통과하는 코안다면을 구비하여 코안다면을 지나는 공기에 의해 외부의 공기를 흡입하여 함께 배출하는 토출노즐을 포함하여 구성된다.

[0010] 상기 하우징의 타단부에는 상기 발열체와 기류형성부의 구동을 위한 전원을 공급하는 전원부가 구비된다.

[0011] 상기 기류형성부는 모터와 상기 모터에 의해 회전되어 기류를 형성하는 팬을 포함하여 구성된다.

[0012] 상기 모터는 상기 하우징의 내부공간에 고정되는 모터하우징에 조립된다.

[0013] 상기 토출노즐은 적어도 일부가 원형으로 되는 통형상으로, 중앙을 전후로 관통하여서는 외부공기가 유입되는 2차유입구와 하우징을 거쳐온 공기와 외부공기를 섞어서 토출하는 토출구가 양단에 구비되는 중앙유로부가 형성된다.

[0014] 상기 토출노즐의 내부에는 상기 하우징을 지나온 공기가 유동되는 내부유로가 환형상으로 형성되고, 상기 내부유로의 하류부에 상기 코안다면으로 공기를 배출하는 토출슬릿이 환형상으로 형성된다.

[0015] 상기 토출노즐의 내면을 내면벽이 형성하는데, 상기 내면벽에는 상기 토출슬릿을 나온 공기를 안내하는 코안다면과 상기 중앙유로부의 유동단면적을 상기 토출구로 가면서 점차 커지도록 하는 확산면이 연속적으로 형성된다.

[0016] 상기 토출노즐의 외면에는 내면에 나사부가 형성된 결합링부가 구비되고, 상기 하우징의 일단부 외면에는 상기

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나사부에 대응되는 나사부가 형성되어 상기 토출노즐이 하우징의 일단부에 결합된다.

[0017] 상기 기류형성부는 상기 하우징 내부를 유동하는 기류의 상류부에 위치되고 상기 발열체는 상기 기류형성부보다 기류의 하류부에 위치된다.

[0018] 본 발명의 다른 특징에 따르면, 본 발명은 내부에 내부공간이 형성되고 일측 외면에 상기 내부공간으로 외부의 공기가 유입되도록 하는 유입슬롯이 형성된 하우징과, 상기 하우징의 내부공간에 위치되고 상기 유입슬롯을 통해 하우징 외부에서 공기가 유입되어 하우징을 통과하도록 하는 기류를 형성하는 팬을 회전시키는 모터와, 상기 하우징의 내부공간에 위치되어 상기 하우징을 통과하는 공기에 열을 선택적으로 공급하는 발열체와, 상기 하우징의 일단부에 결합되고 상기 하우징의 내부를 통과하여 온 공기가 통과하는 내부유로와 상기 내부유로를 나온 공기를 안내하는 코안다면을 구비하여 코안다면을 지나는 공기에 의해 외부의 공기를 흡입하여 함께 배출하는 토출노즐을 포함하여 구성된다.

[0019] 상기 토출노즐은 적어도 일부가 원형으로 되는 통형상으로 외면을 외면벽이 형성하고 내면을 내면벽이 형성하며, 상기 외면벽과 내면벽의 사이에 내부유로가 형성되어 상기 하우징을 지나온 공기가 유동되며, 상기 내부유로를 거쳐온 공기가 토출되는 토출슬릿이 후단 내부를 둘러 구비되어 상기 내면벽에 형성된 상기 코안다면으로 공기를 안내하며, 상기 토출노즐의 중앙을 전후로 관통하여서는 외부공기가 유입되는 2차유입구와 상기 하우징을 거쳐온 공기와 외부공기를 섞어서 토출하는 토출구가 양단에 각각 구비되는 중앙유로부가 형성된다.

[0020] 상기 토출노즐의 내면벽에는 상기 토출슬릿을 나온 공기를 안내하는 코안다면과 상기 중앙유로부의 유동단면적이 상기 토출구로 가면서 점차 커지도록 하는 확산면이 연속적으로 형성된다.

발명의 효과

[0021] 본 발명에 의한 헤어 드라이어에서는 다음과 같은 효과를 얻을 수 있다.

[0022] 본 발명에서는 헤어 드라이어의 내부로 팬의 구동에 의해 흡입된 공기에 더해 코안다 효과에 의해 토출노즐 외부에서 공급된 공기가 혼합되어 전체 유량이 증폭되어 토출되므로 동일한 유량을 토출하는 종래의 헤어 드라이어에 비해 상대적으로 용량이 작은 모터와 팬을 사용하여도 된다. 따라서 전체 헤어 드라이어의 크기가 소형화되고 원가를 줄일 수 있는 효과가 있다.

[0023] 그리고, 본 발명에서는 하우징의 내부에서 나온 공기가 토출노즐을 통과하는 유로의 길이가 상대적으로 길게 형성됨과 동시에 토출슬릿이 매우 좁게 형성되므로, 하우징 자체의 방수성능을 높일 수 있어 외부에서 수분이 하우징의 내부로 전달되는 것이 방지되어 하우징 내부의 전기부품에 수분이 전달되는 것을 방지할 수 있는 효과도 있다.

[0024] 이에 더해, 발열체가 상대적으로 토출노즐의 토출구에서 상대적으로 기류의 상류부에 있어 발열체에서 발생하는 전자파를 충분히 차폐할 수 있는 구조가 되므로 사용자에게 직접 전달되는 전자파를 최소화할 수 있게 되는 효과가 있다.

[0025] 또한, 발열체 등의 부품이 토출구에서 상대적으로 멀리 떨어져 있고 구조적으로 외부와 차폐될 수 있어 하우징 자체의 방수성능을 높일 수 있으므로 방수성능 뿐만 아니라 소음에 대한 차폐성능도 좋아지고, 모터와 팬을 상대적으로 소형의 것을 사용하므로 전체적으로 소음을 저감시킬 수 있는 효과도 있다.

[0026] 그리고, 모터의 용량을 상대적으로 줄일 수 있으므로 전원소모량이 또한 줄어들게 되어 배터리를 사용하여도 상대적으로 사용시간을 일정 이상으로 유지할 수 있어 헤어 드라이어를 휴대용으로 만들 수 있게 되는 효과도 있다.

도면의 간단한 설명

[0027] 도 1은 본 발명에 의한 헤어 드라이어의 바람직한 실시예의 구성을 보인 사시도.

도 2는 본 발명 실시예의 내부 구성을 보인 부분단면 사시도.

도 3은 본 발명 실시예를 구성하는 모터와 팬의 구성을 보인 분해사시도.

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도 4는 본 발명 실시예를 구성하는 토출노즐의 상세 구성을 보인 단면도.

도 5는 본 발명 실시예에서 기류가 형성되는 것을 보인 동작상태도.

발명을 실시하기 위한 구체적인 내용

[0028] 이하 본 발명에 의한 헤어 드라이어의 바람직한 실시예를 첨부된 도면을 참고하여 상세하게 설명한다.

[0029] 도면들에 도시된 바에 따르면, 하우징(10)이 헤어 드라이어의 외관 일부를 형성한다. 상기 하우징(10)은 본 실시예에서 원통형상이고 내부에 아래에서 설명될 부품들이 설치되는 내부공간(11)이 형성된다. 상기 하우징(10)의 형상은 횡단면이 사각형 등의 다각형이나 타원형이 될 수도 있다.

[0030] 상기 하우징(10)의 외면 일측에는 조작버튼(12)이 구비된다. 상기 조작버튼(12)은 헤어 드라이어의 동작을 조작하는 역할을 한다. 상기 하우징(10)의 하단부에는 다수개의 유입슬롯(14)이 형성되어 있다. 상기 유입슬롯(14)은 상기 하우징(10)의 하부 외면을 둘러 다수 개가 나란히 형성되어 있다. 상기 유입슬롯(14)은 하우징(10)의 외부에서 내부로 공기가 유입되는 통로 역할을 한다.

[0031] 상기 하우징(10)의 하단부에는 전원부(16)가 구비된다. 상기 전원부(16)는 헤어 드라이어의 구동을 위한 전원을 공급하는 부분이다. 상기 전원부(16)는 충전가능한 배터리이거나 건전지를 삽입할 수 있는 부분 또는 전원과의 연결을 위한 전원선 및 플러그가 구비되는 부분일 수 있다.

[0032] 상기 하우징(10)의 내부에는 모터하우징(18)이 구비된다. 상기 모터하우징(18)은 상기 하우징(10)의 내면에 그 외면이 거의 밀착되어 설치되는 것이다. 상기 모터하우징(18)에는 상기 유입슬롯(14)과 대응되는 위치에 내부유입슬롯(18')이 형성되어 외부의 공기가 모터하우징(18)의 내부로 유입되도록 한다.

[0033] 상기 모터하우징(18)에는 모터(20)가 설치된다. 상기 모터(20)는 상기 전원부(16)에서 전원을 공급받아 구동되어 회전력을 제공한다. 상기 모터(20)의 회전축(도면부호 부여 않음)에는 팬(22)이 설치된다. 상기 팬(22)은 상기 모터하우징(18)의 내부에서 회전되어 하우징(10)의 외부에서 공기를 상기 유입슬롯(14)과 내부유입슬롯(18')을 통해 모터하우징(18)의 내부로 유입시키고 아래에서 설명될 토출노즐(30)로 유동시킨다.

[0034] 상기 팬(22)은 상기 모터하우징(18)의 내부에서 회전되면서 공기를 유동시키는 것으로, 상기 모터하우징(18)의 내면에 형성된 공기의 유동을 안내하는 구성과 간섭되지 않도록 설계된다. 상기 모터하우징(18), 모터(20) 및 팬(22)은 하나의 조립체로 만들어져 상기 하우징(10)의 내부에 삽입되어 조립된다.

[0035] 상기 하우징(10)의 상단 내면에는 캡(24)이 설치된다. 상기 캡(24)은 링형상의 캡몸체(25)와 상기 캡몸체(25)를 지름 방향으로 가로지르는 연결바(25')로 구성된다. 상기 캡(24)은 상기 하우징(10)의 내면에 압입이나 나사결합되어 상기 하우징(10)의 내부에 설치되는 부품을 고정하는 역할을 한다.

[0036] 상기 캡(24)과 상기 모터(20)의 사이에는 다수개의 고정바(26)가 구비되어 상기 모터(20)를 상기 하우징(10)의 내부에 고정시킨다. 상기 고정바(26)는 본 실시예에서 4개가 하나로 만들어져 있다. 물론, 상기 캡(24)과 고정바(26)는 상기 모터하우징(18)이 상기 하우징(10)의 내부에 견고하게 고정될 수 있다면 반드시 사용되어야 하는 것은 아니다.

[0037] 상기 하우징(10)의 내부 상단, 즉 상기 모터(20)의 상부에 해당되는 위치에는 발열체(28)가 설치된다. 상기 발열체(28)는 다수개의 발열판이 상기 하우징(10)의 길이방향으로 나란히 놓여져 있는 것으로, 상기 발열판 사이를 공기가 통과하면서 열교환이 이루어진다. 상기 발열체(28)를 통과한 공기는 열을 전달받아 온도가 상대적으로 높아지게 된다. 상기 발열체(28)는 상기 전원부(16)에서 전원을 공급받아 열을 발생시키게 된다.

[0038] 상기 하우징(10)의 상단에는 토출노즐(30)이 설치된다. 상기 토출노즐(30)은 상기 하우징(10)을 통과한 공기와 외부공기가 합쳐져서 토출되도록 구성된다. 상기 토출노즐(30)은 횡단면의 적어도 일부가 원형으로 된다. 본 실시예에서는 상기 토출노즐(30)의 횡단면이 타원으로 되는 타원통형상이다. 하지만, 상기 토출노즐(30)의 횡단면은 원으로 될 수도 있다.

[0039] 상기 토출노즐(30)의 외면 일측에는 결합링부(32)가 형성된다. 상기 결합링부(32)는 상기 하우징(10)의 상단과 결합된다. 상기 결합링부(32)의 내면에 나사부가 형성되고 상기 하우징(10)의 상단 외면에 대응되는 나사부가 형성되어 상기 토출노즐(30)이 상기 하우징(10)에 결합되도록 한다.

[0040] 상기 토출노즐(30)의 내부에는 내부유로(33)가 형성된다. 상기 내부유로(33)는 상기 토출노즐(30)의 내부를 둘러 환형상으로 만들어지는데, 상기 내부유로(33)의 전체 형상은 상기 토출노즐(30)의 형상과 상관이 있다. 상기

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내부유로(33)는 상기 하우징(10)에서 빠져나온 공기가 유동되는 부분으로, 상기 결합링부(32)가 입구가 된다.

[0041] 상기 내부유로(33)는 외면벽(34)과 내면벽(35)이 협력하여 형성하는데, 상기 외면벽(34)은 상기 토출노즐(30)의 외면을 형성하고, 상기 내면벽(35)은 상기 토출노즐(30)의 내면을 형성한다.

[0042] 상기 내면벽(35)의 표면중 내부유로(33)에서 빠져나온 기류의 상류부, 즉 아래에서 설명될 토출슬릿(36)을 벗어난 위치에서 일정 구간이 코안다면(Coanda surface)(35')으로 된다. 상기 코안다면(35')은 유체가 유동될 때, 표면을 따라 흐르도록 되어 코안다효과를 발생시킬 수 있는 것으로, 코안다 효과는 공지된 것이므로 더 이상의 설명을 생략한다. 상기 코안다면(35')과 연결되어 상기 내면벽(35)을 따라서는 확산면(35")이 구비된다. 상기 확산면(35")은 상기 내면벽(35)이 형성하는 유동단면적이 점차 넓어지도록 구성된다.

[0043] 상기 내부유로(33)의 하류부에는 토출슬릿(36)이 형성된다. 상기 토출슬릿(36)은 상기 토출노즐(30)의 후단 내면을 둘러 형성되는 것으로, 상기 내면벽(35)과 외면벽(34)의 끝부분이 서로 인접하여 소정의 틈새를 형성함에 의해 만들어진다. 따라서, 상기 토출슬릿(36)의 형상은 상기 토출노즐(30)의 횡단면 형상과 대응된다. 상기 토출슬릿(36)은 상기 내부유로(33)를 따라 유동된 공기가 토출되어 상기 코안다면(35')으로 유동되게 한다. 상기 토출슬릿(36)을 형성하는 상기 외면벽(34)은 그 종단면이 반원형상으로 되어 상기 내면벽(35)의 후단 끝부분과 소정의 틈새를 가지도록 된다. 상기 틈새가 상기 토출슬릿(36)으로서 상기 토출슬릿(36)의 폭과 코안다면(35')의 각도 등이 토출슬릿(36)을 통해 토출되는 유량을 결정한다. 상기 내부유로(33)에서 상기 토출슬릿(36)으로는 점차 그 유동단면적이 좁아지도록 상기 외면벽(34)과 내면벽(36)의 형상이 만들어진다.

[0044] 상기 토출노즐(30)의 내부를 전후로 관통하여서는 중앙유로부(37)가 형성되는데, 상기 중앙유로부(37)의 내면은 상기 내면벽(35)의 표면인 상기 코안다면(35')과 확산면(35")이 형성하게 된다. 따라서, 상기 중앙유로부(37)는 토출노즐(30)의 후단에서 선단을 향해 그 유동단면적이 점차 커지도록 된다.

[0045] 상기 중앙유로부(37)의 선단, 즉 상기 토출노즐(30)에서 최종적으로 공기가 토출되는 부분을 토출구(38)라 하고, 상기 중앙유로부(37)의 후단, 즉 상기 토출노즐(30) 외부에서 상기 중앙유로부(37)로 공기가 유입되는 부분을 2차유입구(38')라고 한다. 상기 2차유입구(38')를 통해서는 상기 토출슬릿(36)을 통해 나온 공기가 코안다면(35')을 따라 유동되면서 만들어낸 저압영역에 의해 토출노즐(30) 외부에서 공기가 유입된다. 이와 같이 2차유입구(38')를 통해 유입된 공기는 상기 토출슬릿(36)을 통해 나온 공기와 상기 확산면(35")에 해당되는 영역을 통과하면서 섞여 상기 토출구(38)를 통해 배출된다.

[0046] 이하 상기한 바와 같은 구성을 가지는 본 발명에 의한 헤어 드라이어가 조립되는 것과 사용되는 것을 상세하게 설명한다.

[0047] 본 발명의 헤어 드라이어는 상기 하우징(10)의 하단에 전원부(16)가 장착된다. 상기 전원부(16) 또는 별도의 구조에 의해 상기 하우징(10)의 하단부는 폐쇄되어 있고, 상기 하우징(10)의 상단부를 통해 내부로 상기 모터하우징(18)이 삽입된다. 상기 모터하우징(18)에는 이미 상기 모터(20)와 팬(22)이 조립된 상태이다. 즉, 모터하우징(18), 모터(20) 그리고 팬(22)이 하나의 조립체로 만들어진 것이다. 이와 같은 구성은 상기 하우징(10)의 내부로 외부의 공기를 흡입하여 하우징(10)의 내부를 통과하는 기류를 만드는 것으로 기류형성부로 생각할 수 있다.

[0048] 상기 모터(20)가 삽입된 후에는 발열체(28)가 상기 하우징(10)의 내부공간(11)에 삽입되어 고정된다. 상기 발열체(28)가 삽입된 상기 하우징(10)의 상단 내부로는 상기 바아(26)가 삽입되어 일단부는 상기 모터(20)의 일면에 안착된다. 다음으로, 상기 캡(24)이 상기 하우징(10)의 상단부 입구에 압입되어 고정됨에 의해 상기 하우징(10) 내부의 부품이 임의로 이동되거나 하우징(10) 외부로 빠지는 것이 방지된다.

[0049] 다음으로, 상기 하우징(10)의 상단 외면에 형성된 나사부에 상기 토출노즐(30)의 결합링부(32) 내면에 형성된 나사부가 결합되도록 한다. 이와 같이 함에 의해 상기 하우징(10)에 상기 토출노즐(30)이 결합되고, 상기 하우징(10)의 내부와 상기 토출노즐(30)의 내부유로(33)가 서로 연통된다.

[0050] 위와 같이 조립된, 본 발명 실시예의 헤어 드라이어가 동작하기 위해서는 사용자가 상기 조작버튼(12)을 조작하여야 한다. 예를 들어 상기 조작버튼(12)을 조작하여 열풍모드와 상온풍모드를 선택할 수 있다. 열풍모드인 경우에는 상기 발열체(28)가 열을 발생시켜 상기 토출구(38)로 토출되는 공기의 온도를 정해진 값으로 만든다. 그리고 상온풍모드인 경우에는 상기 발열체(28)가 열을 발생시키지 않아 하우징(10)의 내부로 흡입된 공기가 발열체(28)와 열교환이 없이 그냥 통과하여 상기 토출구(38)로 상온의 공기가 토출된다.

[0051] 상기 하우징(10)의 내부로 공기가 흡입되는 것은 상기 모터(20)가 구동되어 상기 팬(22)을 회전시킴에 의해 이루어진다. 상기 팬(22)이 회전됨에 의해 상기 하우징(10)의 내부에서는 상기 발열체(28) 방향으로 기류가 형성

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되는데, 이와 같은 기류에 의해 상기 하우징(10)의 유입슬롯(14) 내측에 해당되는 내부공간(11)은 상대적으로 저압이 되면서 하우징(10)의 외부로부터 유입슬롯(14)과 내부유입슬롯(18')을 통해 도 5의 화살표 i와 같이 공기가 유입된다.

[0052] 상기 하우징(10)의 내부로 유입된 공기는 상기 팬(22)과 모터(20)의 외부를 통과해서 상기 발열체(28)의 발열판 사이를 지나게 된다. 열풍모드인 경우에는 상기 발열판과 공기 사이에서 열교환이 이루어져 상기 공기의 온도가 올라가게 된다.

[0053] 상기 발열체(28)를 통과한 공기는 도 5에 화살표 e로 표시한 바와 같이 상기 결합링부(32)를 지나 토출노즐(30)의 내부유로(33)로 유동된다. 상기 내부유로(33)로 전달된 공기는 상기 환형상의 내부유로(33) 전체로 전달되고 상기 토출슬릿(36)을 통해 내부유로(33)를 빠져나가게 된다.

[0054] 상기 토출슬릿(36)을 빠져나간 공기는 도 5의 화살표 A와 같이 상기 코안다면(35')을 따라 유동하게 된다. 이와 같이 공기가 상기 코안다면(35')을 따라 유동하면서 속도가 빨라지게 되면 상기 코안다면(35') 주변은 상대적으로 압력이 낮아지면서 도 5의 화살표 B로 표시한 바와 같이 토출노즐(30) 외부의 공기가 상기 2차유입구(38)를 통해 중앙유로부(32)로 유입된다.

[0055] 상기 중앙유로부(32)로 2차유입구(38)를 통해 유입된 외부공기와 상기 토출슬릿(36)을 빠져나온 공기는 상기 확산면(35")에 해당되는 중앙유로부(32)의 구간을 통과하면서 혼합되어 최종적으로 상기 토출구(38)를 통해 토출되어 사용자의 모발에 전달된다.

[0056] 본 발명의 권리범위는 위에서 설명된 실시예에 한정되지 않고 청구범위에 기재된 바에 의해 정의되며, 본 발명의 기술분야에서 통상의 지식을 가진 자가 청구범위에 기재된 권리범위 내에서 다양한 변형과 개작을 할 수 있다는 것은 자명하다.

[0057] 예를 들면, 본 실시예에서 하우징(10) 내부로 공기가 흡입되도록 하는 상기 모터(20)와 팬(22)의 구성을 달리할 수 있다. 즉, 팬(22)의 위치를 모터(20)보다 기류의 하류에 있도록 할 수도 있다. 그리고, 팬(22)의 형상도 다양한 형태의 것이 채용될 수 있다.

[0058] 그리고, 상기 모터(20)는 반드시 모터하우징(18)에 설치된 상태로 하우징(10)에 삽입되어야 하는 것은 아니다. 상기 모터(20)가 직접 상기 하우징(10)의 내부공간(11)에 장착될 수도 있다. 이와 같은 경우에 상기 하우징(10)의 내부공간(11) 내면에는 상기 모터(20)를 고정하기 위한 구조물이 형성될 수 있다.

[0059] 또한, 상기 발열체(28)와 상기 모터(20)를 포함하는 기류형성부의 위치는 도시된 실시예와 달리 발열체(28)가 상기 유입슬롯(14)에 가까이 있고, 상기 모터(20)를 포함하는 기류형성부가 토출노즐(30)에 인접하여 있을 수도 있다.

부호의 설명

[0060]

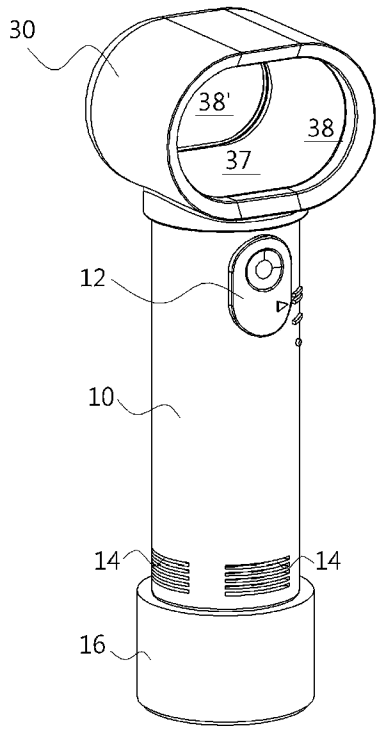
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12: 조작버튼	14: 유입슬롯
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18': 내부유입슬롯	20: 모터
22: 팬	24: 캡
26: 바아	28: 발열체
30: 토출노즐	32: 결합링부
33: 내부유로	34: 외면벽
35: 내면벽	35': 코안다면
35": 확산면	36: 토출슬릿
37: 중앙유로부	38: 토출구

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38' : 2차유입구

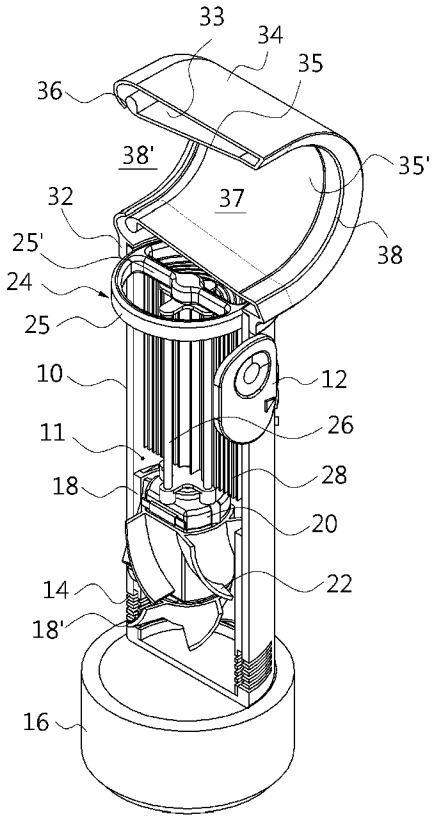
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도면1



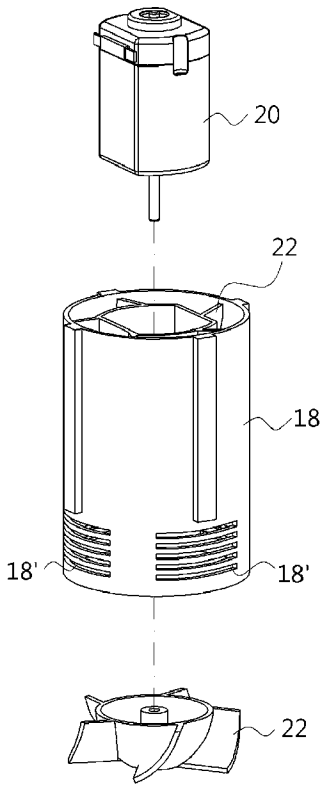
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도면2

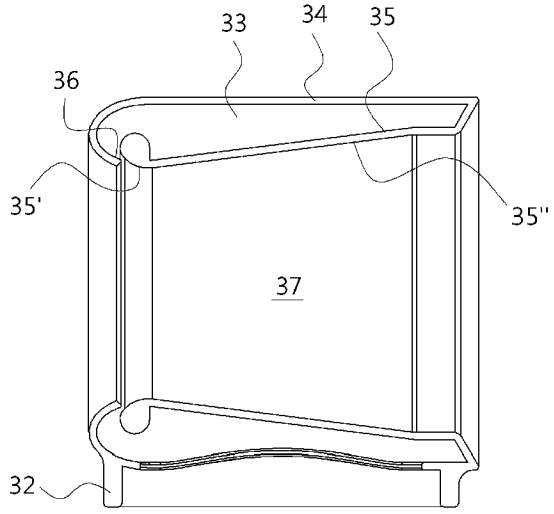


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도면3

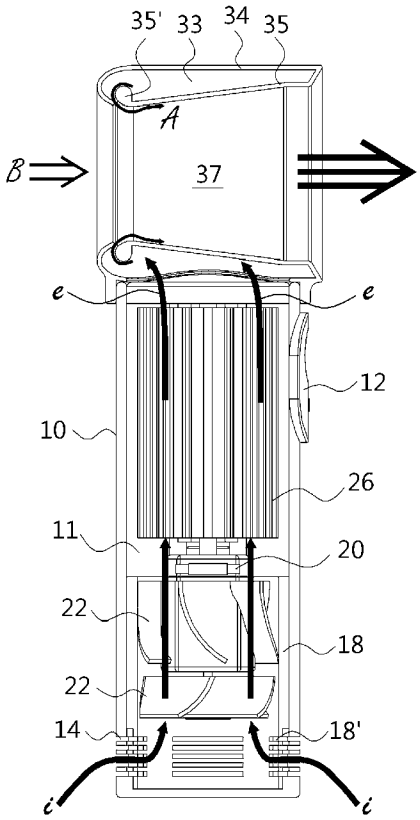


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Machine Translation - CN202774786 U

Title:
A rotary electric Wind Comb

Abstract:
The utility model relates to a rotary electric Wind Comb, including mutual plug handle and comb body, the interior of the handle has a rear motor, rear right side of the motor connected to the fan, provided the right end of the handle into the hood, right side of the inlet cover is provided with a rear motor attached power cord, the left rear of the motor has a mica, handle left plug comb body, left comb precursor provided cover, inside front cover by shaft connecting reducer, reducer to connect the front right side of the motor, pre-motor and gear fixed on the motor bracket, front right side of the motor is fixed to the motor frame, front motor is connected by a metal pin and power cord. The utility model is simple rotary electric wind comb structure has two main functions, the right of the power switch is on the left side hair dryer, electric wind power switch is comb, comb body can replace a variety of combs, comb body and handle with plug-in connection structure, extremely easy to use, suitable for a wide range of application.

Claim (s):

CN 1. A rotary electric wind combs, each connector comprising a handle (1) and the comb body (2), characterized in that: the handle (1) is internally provided with the rear motor (3), rear motor (3) the right to connect the fan (4), the handle (1) is provided with the right air intake cover (5), the right into the hood (5) is provided with a rear electric motor (3) attached power cord (6), the left rear motor (3) is provided with the mica sheet (7), the handle (1) of the left end of the comb connector body (2), a comb member (2) is provided with the left end of the front lid (8), the former inside of the cover (8) is connected reducer (10) by turning the shaft (9), reducers (10) connected to the front right side of the motor (11), pre-motor (11) and gear (10) fixed to the motor bracket (12), the pre-motor (11) is fixed to the right end of the motor frame (. 13), the pre-motor (11) connected to the power source line by a metal pin (6).

2. The rotary electric wind one of the comb, characterized in that the claim: the handle (1) and the comb body (2) of the plug at the motor bracket is provided with a fixed housing (14) fixed to the front cover and the housing (15), housing fixed front cover (15) is provided with an outer wall for the first button.

According to claim 1, wherein the rotary electric wind comb, characterized in that: the handle (1) an outer wall provided with a power switch (16), the side of the power switch (16) is provided with comb body clockwise rotation of the key (17) and counter-clockwise rotation button comb body (18).

According to claim 1, wherein the rotary electric wind comb, characterized in that: the left side of the mica sheet (7) is provided with a metal mesh (19).

Description:

CN A rotary electric wind comb art [0001] The utility model relates to a rotary electric wind comb.

[0002] appear on the market all kinds of electrical Wind Comb, for people's lives to bring great convenience, but there are existing power Wind Comb Wind Comb the front rotary power and versatility of the rotary electric Wind Comb , front rotary electric wind comb comb can not be replaced, more relatively simple. The multi-function rotary electric wind comb is rear-mounted motor, increasing the size of the grip portion, inconvenient to use.

Utility Model Content [0003] In order to solve the above problems, the present utility model provides a simple structure, easy to use rotary electric wind comb.

[0004] This utility model rotary electric Wind Comb, including mutual plug handle and comb body, the interior of the handle has a rear motor, rear right side of the motor connected to the fan, the right end of the handle is provided with inlet cover right into the hood is provided with a rear motor attached power cord, the left rear of the motor has a mica, handle left plug comb body, left comb precursor provided cover, inside front cover By rotating shaft connected reducer, reducer to connect the front right side of the motor, pre-motor and gear fixed on the motor bracket, front right side of the motor is fixed to the motor frame, front motor is connected by a metal pin and power lines .

[0005] This utility model rotary electric Wind Comb, docked at the handle is provided with a comb body shell and chassis motor mount fixed fixed front cover, chassis fixed outer wall of the front cover is provided for the first button.

[0006] This utility model rotary electric wind comb, the outer wall of the handle has a power switch, power switch on the side of the body is provided with a comb and comb body clockwise button counterclockwise rotation button.

[0007] This utility model rotary electric wind comb the left side of the mica has a metal mesh.

[0008] The utility model compared to the beneficial effects of the prior art is: has simple rotary electric wind comb structure has two main functions, the right of the power switch is on the left side hair dryer, the power switch is Electric Wind Comb, comb body can replace a variety of combs, comb body and handle plug-in connection structure, extremely easy to use, suitable for a wide range of application.

BRIEF DESCRIPTION [0009] FIG. 1 is a cross-sectional view of a rotary electric wind comb-type embodiment of the present utility model; and [0010] Figure 2 is a rotary electric wind embodiment of the present utility model, said comb structure One schematic view; [0011] Figure 3 is a structure for a rotary electric wind embodiment of the present utility model is a schematic diagram of the two combs.

[0012] in which: [0013] a handle; 2, comb body; 3, the rear motor; 4, fans; 5, into the hood; 6, power cord; 7, mica; 8, the front cover; 9 rotating shaft; 10, reducer; 11, front motor; 12, motor bracket; 13 motor frame; 14, the motor frame fixed shell; 15, chassis fixed front cover; 16, a power switch; 17, comb body along clockwise rotation keys; 18, comb body counterclockwise rotation keys; 19, the metal mesh.

DETAILED DESCRIPTION [0014] below in conjunction with the accompanying drawings and examples of the utility model specific embodiments described in further detail. 3 CN following examples serve to illustrate the utility model, but not to limit the scope of the utility model.

[0015] Figure 1-2 shows a rotary electric Wind Comb, including mutual docked handle 1 and the comb body 2, the handle is provided inside a rear motor 3, the right rear motor 3 Connect the fan 4, the right end of the handle is provided with a cover 5 into the wind, into the right side of the hood is provided with a rear 5 3 attached power cord motor 6, the left rear motor 3 has a mica sheet 7, the handle 1 The left end of the plug body 2 comb, comb body 2 is provided with the left front cover 8, 8 is connected inside the front cover 10 by rotating the shaft 9 reducer, reducer 10 is connected to the right end of the front motor 11, the front motor 11 and deceleration 10 is fixed on the motor bracket 12, the right end of the front motor 11 attached to the motor frame 13, the front motor 11 is connected by a metal pin and the power supply line 6.

[0016] This utility model rotary electric wind comb, comb body of the handle 1 and 2, a plug at the motor housing 14 and the chassis frame fixed fixed front cover 15, the outer wall of the cabinet fixed front cover set 15 There for the first button.

[0017] This utility model rotary electric wind comb, the handle is provided with an outer wall of a power switch 16, the side of the power switch 16, a comb body clockwise buttons 17 and 18 comb body counterclockwise rotation button.

[0018] This utility model rotary electric wind comb the left side of the mica sheet 7 has a metal mesh 19.

[0019] This utility model rotary electric wind comb specific use, turn on the power switch, the power, the rear motor starts to work, drive fan rotates clockwise rotation toggle key comb body, then the current through the metal pins , and then to the front motor drive comb clockwise rotation axis work, if the toggle button comb body rotates counterclockwise, then comb body is driven counterclockwise rotation job. On the front of a motor load reducer, the main function is to reduce the rotational speed. Pressing the button can be replaced for the first several Comb. Tease out the different styles of hair. Simple structure, has two main functions, the right of the power switch is on the left side hair dryer, electric wind power switch is comb, comb body can replace a variety of combs, comb body and handle plug-in connection structure, the use of extremely convenient, suitable for a wide range of application.

[0020] The above-described is only preferred embodiments of the utility model, it should be noted that those of ordinary skill in the art that, without departing from the principles of the

present utility model premise, but also can be made a number of modifications and variations These modifications and variations can be seen as a utility model of the scope of the protection.

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Rotary type electric wind comb

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Page bookmark	CN202774786 (U) - Rotary type electric wind comb
Inventor(s):	ZHOU LEISHENG ± (ZHOU LEISHENG)
Applicant(s):	NINGBO SHUNSHUAI ELECTRICAL APPLIANCES CO LTD ± (NINGBO SHUNSHUAI ELECTRICAL APPLIANCES CO., LTD)
Classification:	**- international:** ***A45D20/10; A45D24/10*** **- cooperative:**
Application number:	CN20122394746U 20120810
Priority number (s):	CN20122394746U 20120810

Abstract of CN202774786 (U)

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The utility model relates to a rotary type electric wind comb which comprises a handle and a comb body which are connected in an inserted mode. A postposition motor is arranged in the handle, the right end of the postposition motor is connected with a fan, the right end of the handle is provided with an air inlet cover, the right side of the air inlet cover is provided with a power line connected with the postposition motor, the left side of the postposition motor is provided with a mica plate, the left end of the handle is connected with the comb body in an inserted mode, the left end of the comb body is provided with a front cover, the inner side of the front cover is connected with a reduction gear through a rotary shaft, the right end of the reduction gear is connected with a preposition motor, the preposition motor and the reduction gear are fixed on a motor support, the right end of the preposition motor is fixed on a motor frame, and the preposition motor is connected with the power line through a metal contact pin. The rotary type electric wind comb is simple in structure and has two functions; and the right side of a power switch is provided with a hair drier, the left side of the power switch is provided with the electric wind comb, the comb body can be replaced with various combs, the comb body and the handle are in an inserted connection structure, and accordingly the rotary type electric wind comb is convenient to use and suitable for being widely used in a large range.

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(19)中华人民共和国国家知识产权局

(12)实用新型专利

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(51)Int.Cl.
A45D 20/10(2006.01)
A45D 24/10(2006.01)

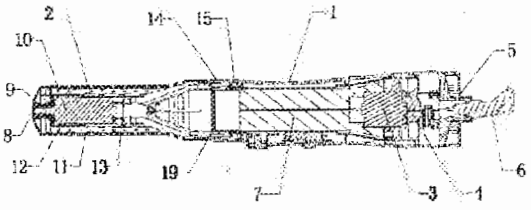
权利要求书 1 页 说明书 2 页 附图 1 页

(54)实用新型名称

一种旋转式电风梳

(57)摘要

本实用新型涉及一种旋转式电风梳，包括相互插接的手柄和梳体，所述手柄的内部设有后置电机，后置电机的右端连接风扇，手柄的右端设有进风罩，进风罩的右侧设有与后置电机连接的电源线，后置电机的左侧设有云母片，手柄的左端插接梳体，梳体的左端设有前盖，前盖的内侧通过转动轴连接减速器，减速器的右端连接前置电机，前置电机和减速器固定在电机支架上，前置电机的右端固定在电机架上，前置电机通过金属插针与电源线连接。本实用新型的旋转式电风梳结构简单，主要有两个功能，电源开关的右侧是电吹风，电源开关的左侧是电风梳，梳体可以更换多种梳子，梳体与手柄采用插拔式的连接结构，使用极其方便，适宜大范围推广应用。



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1. 一种旋转式电风梳，包括相互插接的手柄 (1) 和梳体 (2)，其特征在于：所述手柄 (1) 的内部设有后置电机 (3)，后置电机 (3) 的右端连接风扇 (4)，手柄 (1) 的右端设有进风罩 (5)，进风罩 (5) 的右侧设有与后置电机 (3) 连接的电源线 (6)，后置电机 (3) 的左侧设有云母片 (7)，手柄 (1) 的左端插接梳体 (2)，梳体 (2) 的左端设有前盖 (8)，前盖 (8) 的内侧通过转动轴 (9) 连接减速器 (10)，减速器 (10) 的右端连接前置电机 (11)，前置电机 (11) 和减速器 (10) 固定在电机支架 (12) 上，前置电机 (11) 的右端固定在电机架 (13) 上，前置电机 (11) 通过金属插针与电源线 (6) 连接。

2. 根据权利要求 1 所述的旋转式电风梳，其特征在于：所述手柄 (1) 与梳体 (2) 的插接处设有电机架固定壳 (14) 和机壳固定前盖 (15)，机壳固定前盖 (15) 的外壁上设有换头按钮。

3. 根据权利要求 1 所述的旋转式电风梳，其特征在于：所述手柄 (1) 的外壁上设有电源开关 (16)，电源开关 (16) 的一侧设有梳体顺时针旋转按键 (17) 和梳体逆时针旋转按键 (18)。

4. 根据权利要求 1 所述的旋转式电风梳，其特征在于：所述云母片 (7) 的左侧设有金属网片 (19)。

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一种旋转式电风梳

技术领域

[0001] 本实用新型涉及一种旋转式电风梳。

背景技术

[0002] 目前市场上出现了各类电风梳，为人们的生活带来极大的便利，但是现有电风梳主要有前置旋转式电风梳和多功能旋转式电风梳，前置旋转式电风梳的梳形不可更换，更能比较单一。而多功能旋转式电风梳的电机是后置式，增大了手握部的尺寸，使用不便。

实用新型内容

[0003] 为解决上述技术问题，本实用新型提供一种结构简单、使用方便的旋转式电风梳。

[0004] 本实用新型的旋转式电风梳，包括相互插接的手柄和梳体，所述手柄的内部设有后置电机，后置电机的右端连接风扇，手柄的右端设有进风罩，进风罩的右侧设有与后置电机连接的电源线，后置电机的左侧设有云母片，手柄的左端插接梳体，梳体的左端设有前盖，前盖的内侧通过转动轴连接减速器，减速器的右端连接前置电机，前置电机和减速器固定在电机支架上，前置电机的右端固定在电机架上，前置电机通过金属插针与电源线连接。

[0005] 本实用新型的旋转式电风梳，所述手柄与梳体的插接处设有电机架固定壳和机壳固定前盖，机壳固定前盖的外壁上设有换头按钮。

[0006] 本实用新型的旋转式电风梳，所述手柄的外壁上设有电源开关，电源开关的一侧设有梳体顺时针旋转按键和梳体逆时针旋转按键。

[0007] 本实用新型的旋转式电风梳，所述云母片的左侧设有金属网片。

[0008] 与现有技术相比本实用新型的有益效果为：本实用新型的旋转式电风梳结构简单，主要有两个功能，电源开关的右侧是电吹风，电源开关的左侧是电风梳，梳体可以更换多种梳子，梳体与手柄采用插拔式的连接结构，使用极其方便，适宜大范围推广应用。

附图说明

[0009] 图 1 是本实用新型实施例所述的一种旋转式电风梳的剖视图；

[0010] 图 2 是本实用新型实施例所述的一种旋转式电风梳的结构示意图之一；

[0011] 图 3 是本实用新型实施例所述的一种旋转式电风梳的结构示意图之二。

[0012] 图中：

[0013] 1、手柄；2、梳体；3、后置电机；4、风扇；5、进风罩；6、电源线；7、云母片；8、前盖；9、转动轴；10、减速器；11、前置电机；12、电机支架；13、电机架；14、电机架固定壳；15、机壳固定前盖；16、电源开关；17、梳体顺时针旋转按键；18、梳体逆时针旋转按键；19、金属网片。

具体实施方式

[0014] 下面结合附图和实施例，对本实用新型的具体实施方式作进一步详细描述。以下

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实施例用于说明本实用新型，但不用来限制本实用新型的范围。

[0015] 如图 1-2 所示，一种旋转式电风梳，包括相互插接的手柄 1 和梳体 2，所述手柄 1 的内部设有后置电机 3，后置电机 3 的右端连接风扇 4，手柄 1 的右端设有进风罩 5，进风罩 5 的右侧设有与后置电机 3 连接的电源线 6，后置电机 3 的左侧设有云母片 7，手柄 1 的左端插接梳体 2，梳体 2 的左端设有前盖 8，前盖 8 的内侧通过转动轴 9 连接减速器 10，减速器 10 的右端连接前置电机 11，前置电机 11 和减速器 10 固定在电机支架 12 上，前置电机 11 的右端固定在电机架 13 上，前置电机 11 通过金属插针与电源线 6 连接。

[0016] 本实用新型的旋转式电风梳，所述手柄 1 与梳体 2 的插接处设有电机架固定壳 14 和机壳固定前盖 15，机壳固定前盖 15 的外壁上设有换头按钮。

[0017] 本实用新型的旋转式电风梳，所述手柄 1 的外壁上设有电源开关 16，电源开关 16 的一侧设有梳体顺时针旋转按键 17 和梳体逆时针旋转按键 18。

[0018] 本实用新型的旋转式电风梳，所述云母片 7 的左侧设有金属网片 19。

[0019] 本实用新型的旋转式电风梳在具体使用时，启动电源开关，通电后，后置电机开始工作，带动风扇旋转，拨动梳体顺时针旋转键，此时电流通过金属插针，再到前置电机，旋转轴带动梳子顺时针旋转工作，如果拨动梳体逆时针旋转键，那么就是带动梳体逆时针旋转工作。在前置电机上负载一个减速器，主要功能就是降低旋转速度。按动换头按钮可以更换多种梳型。梳理出不同风格发型。结构简单，主要有两个功能，电源开关的右侧是电吹风，电源开关的左侧是电风梳，梳体可以更换多种梳子，梳体与手柄采用插拔式的连接结构，使用极其方便，适宜大范围推广应用。

[0020] 以上所述仅是本实用新型的优选实施方式，应当指出，对于本技术领域的普通技术人员来说，在不脱离本实用新型技术原理的前提下，还可以做出若干改进和变型，这些改进和变型也应视为本实用新型的保护范围。

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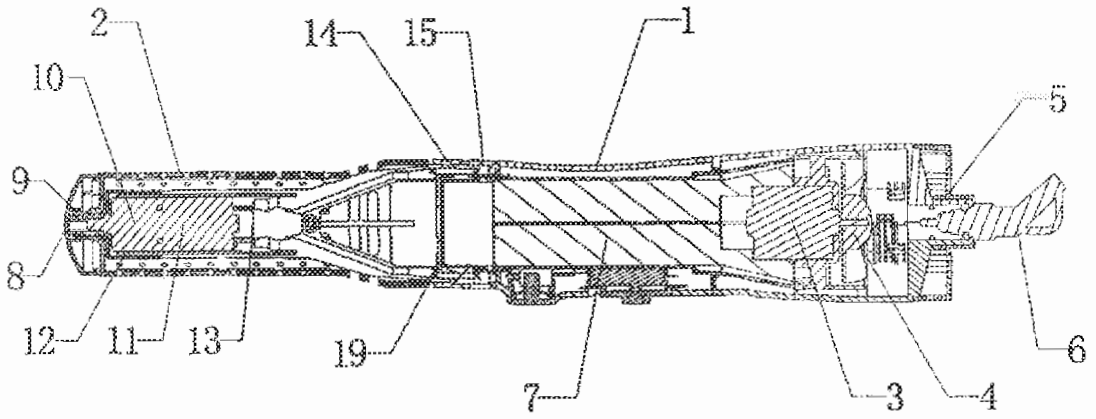


图 1

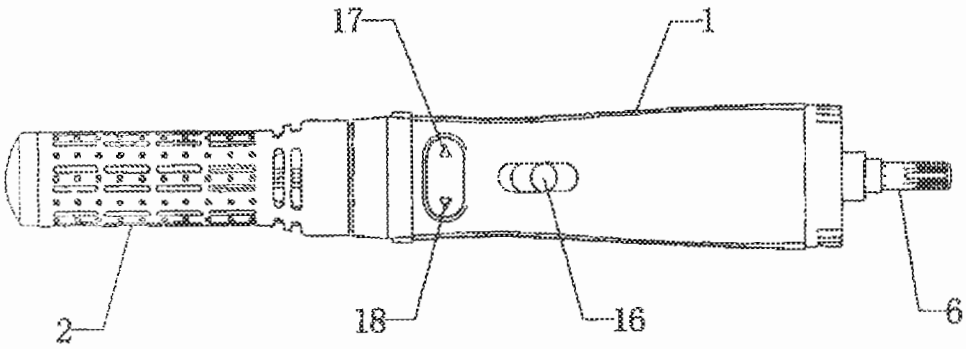


图 2

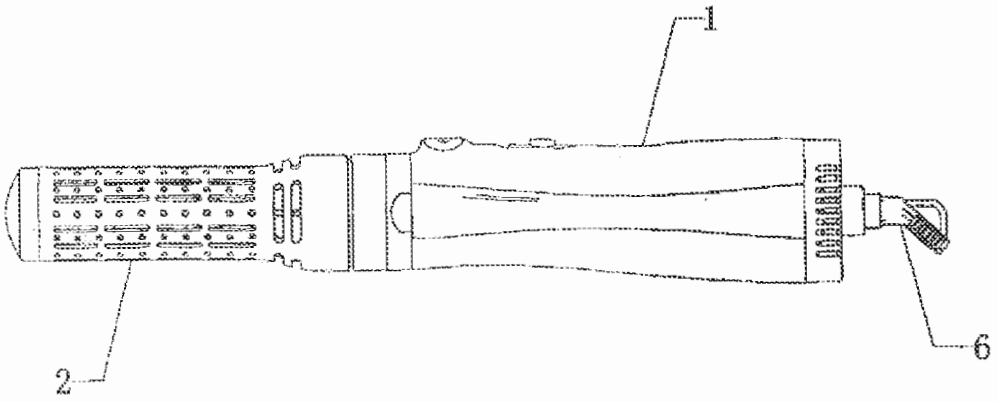


图 3

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(43) Date of A Publication 02.10.2013

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(30) Priority Data:
(31) 1205679 (32) 30.03.2012 (33) GB

(51) INT CL:
A45D 20/10 (2006.01) *F24H 3/04* (2006.01)

(56) Documents Cited:
JP 2004000312 A US 5875562 A
US 5133043 A US 20110203128 A1

(58) Field of Search:
INT CL A45D, F24H
Other: EPODOC, WPI

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(74) Agent and/or Address for Service:
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Intellectual Property Department, Tetbury Hill,
MALMESBURY, Wiltshire, SN16 0RP, United Kingdom

(54) Title of the Invention: **A hand held appliance**
Abstract Title: **A sound and vibration reducing hot air blower**

(57) A hairdryer or hand-held appliance comprises a body 812 having a fluid inlet 820a, 830a for admitting fluid into the appliance, a fluid outlet 820b, a duct 814 lined with a material 140, and a primary fluid flow path 830 extending from the fluid inlet to the fluid outlet and through the duct. The material may be foam or felt, may be a sound absorbing material, a vibration absorbing material, an insulator, and may be tuned to resonant frequencies of the appliance. The primary fluid flow path may be non-linear. The duct may have a non-circular cross-section and may comprise a handle portion, the handle portion being lined with said material. A fan unit 860 may be provided located upstream of the handle portion. The duct may comprise a first handle portion and a second handle portion of the appliance.

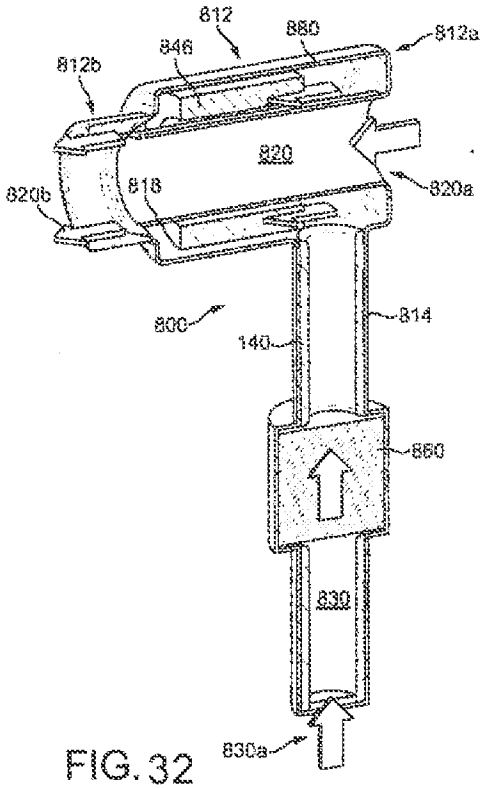


FIG. 32

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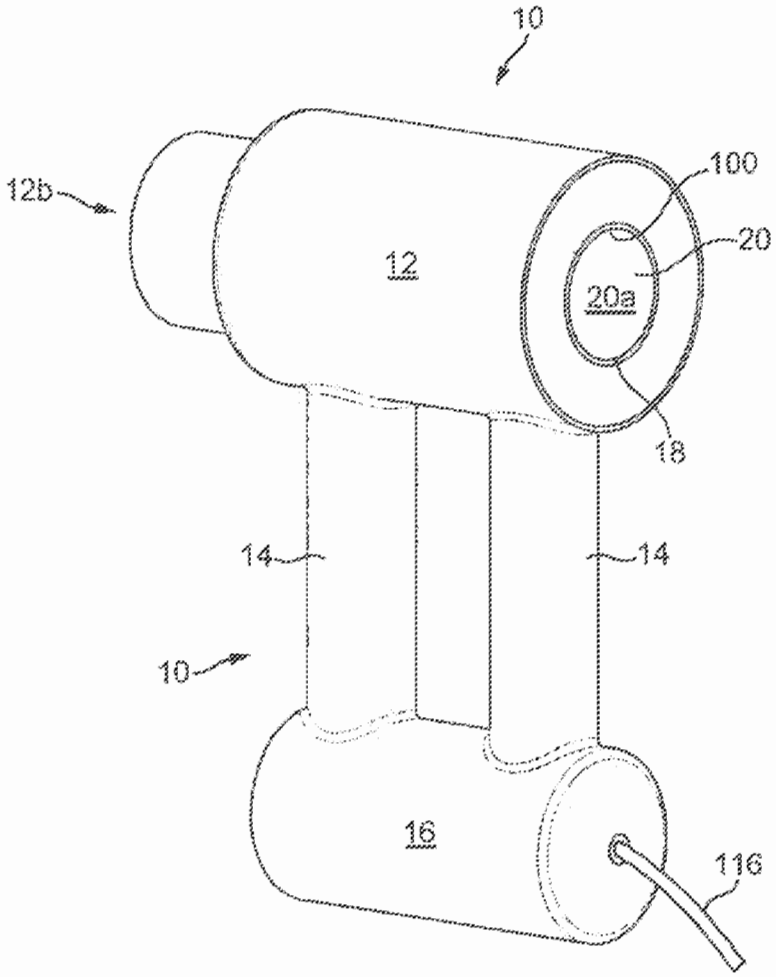

10
12b
100
20
12
20a
18
14
14
10
16
116

FIG. 1

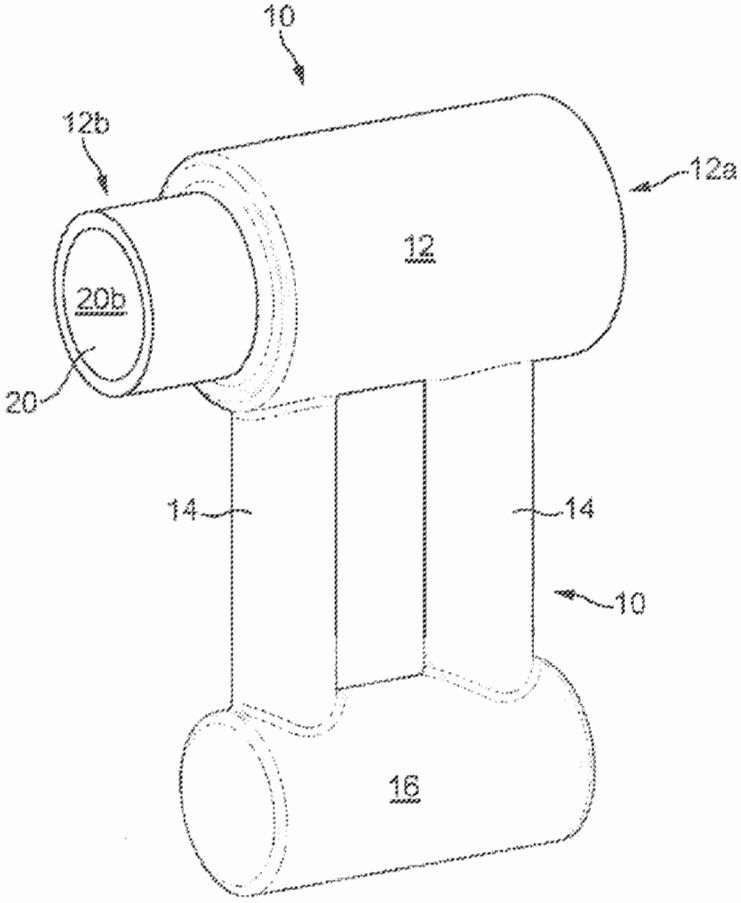

10
12b
12a
12
20b
20
14
14
10
16

FIG. 2

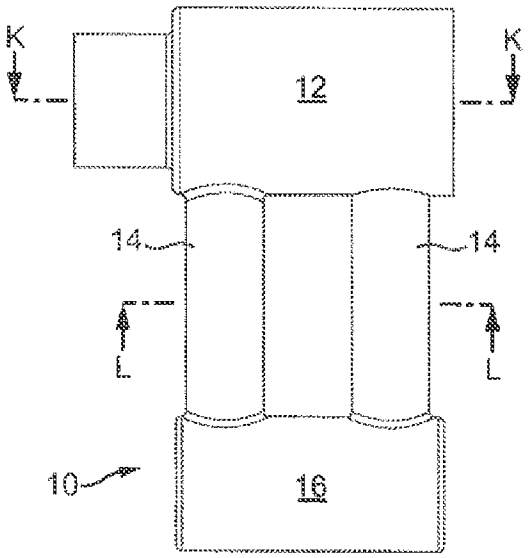


FIG. 3

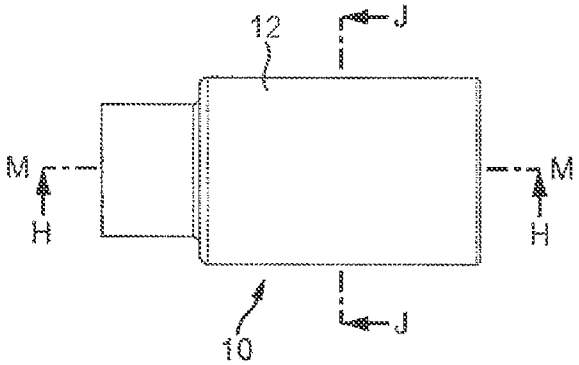


FIG. 4

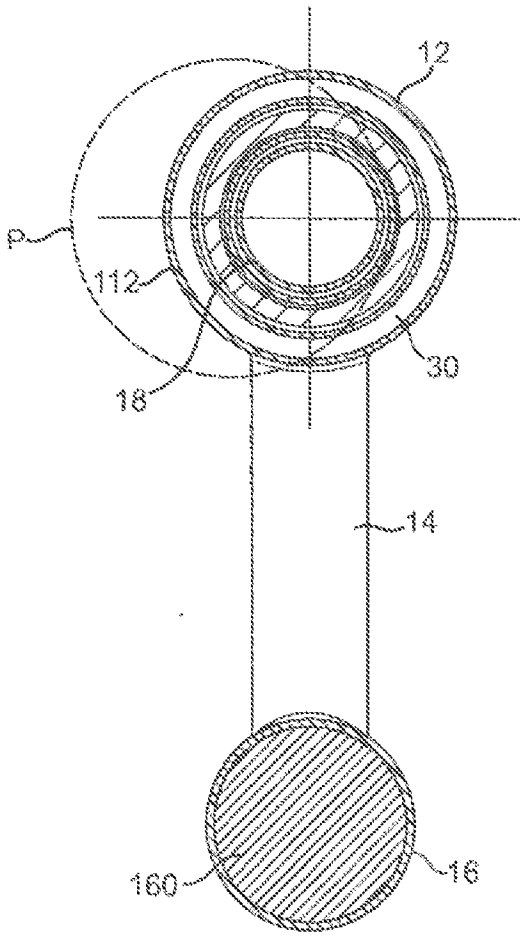


FIG. 5a

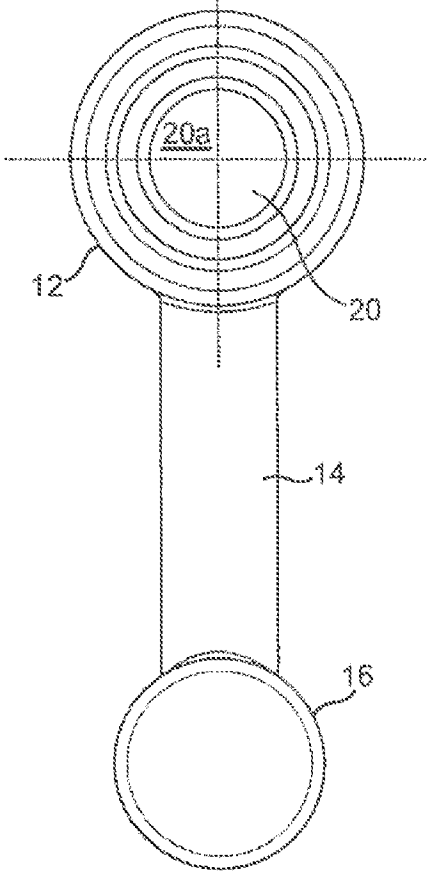


FIG. 5b

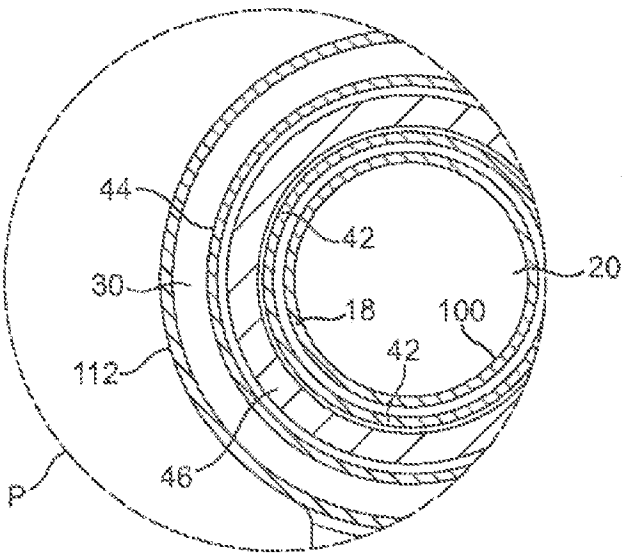


FIG. 5c

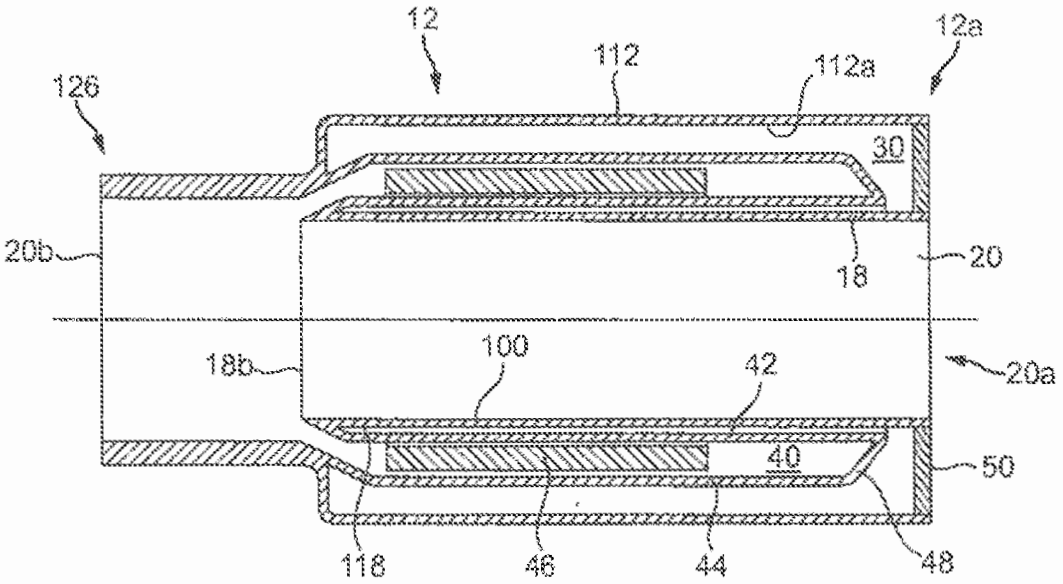

12
12a
112
112a
126
30
20b
18
20
18b
100
42
20a
40
50
116
46
44
48

FIG. 6

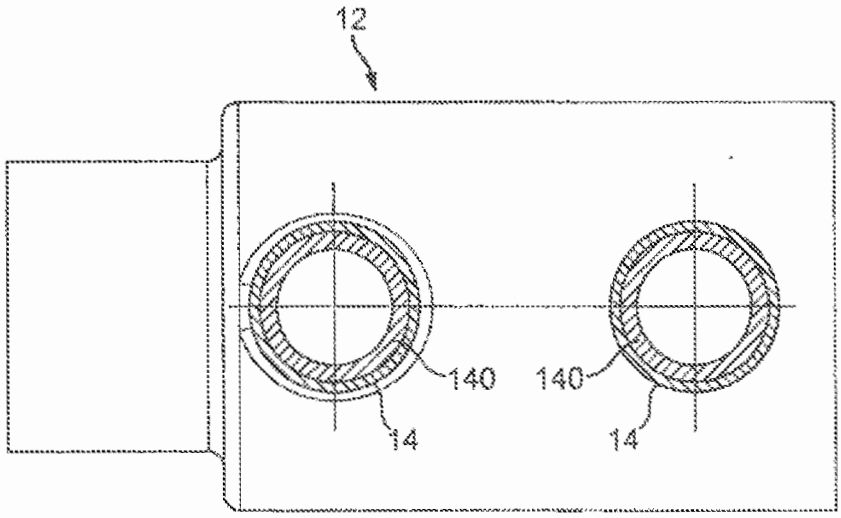

12
140
140
14
14

FIG. 7

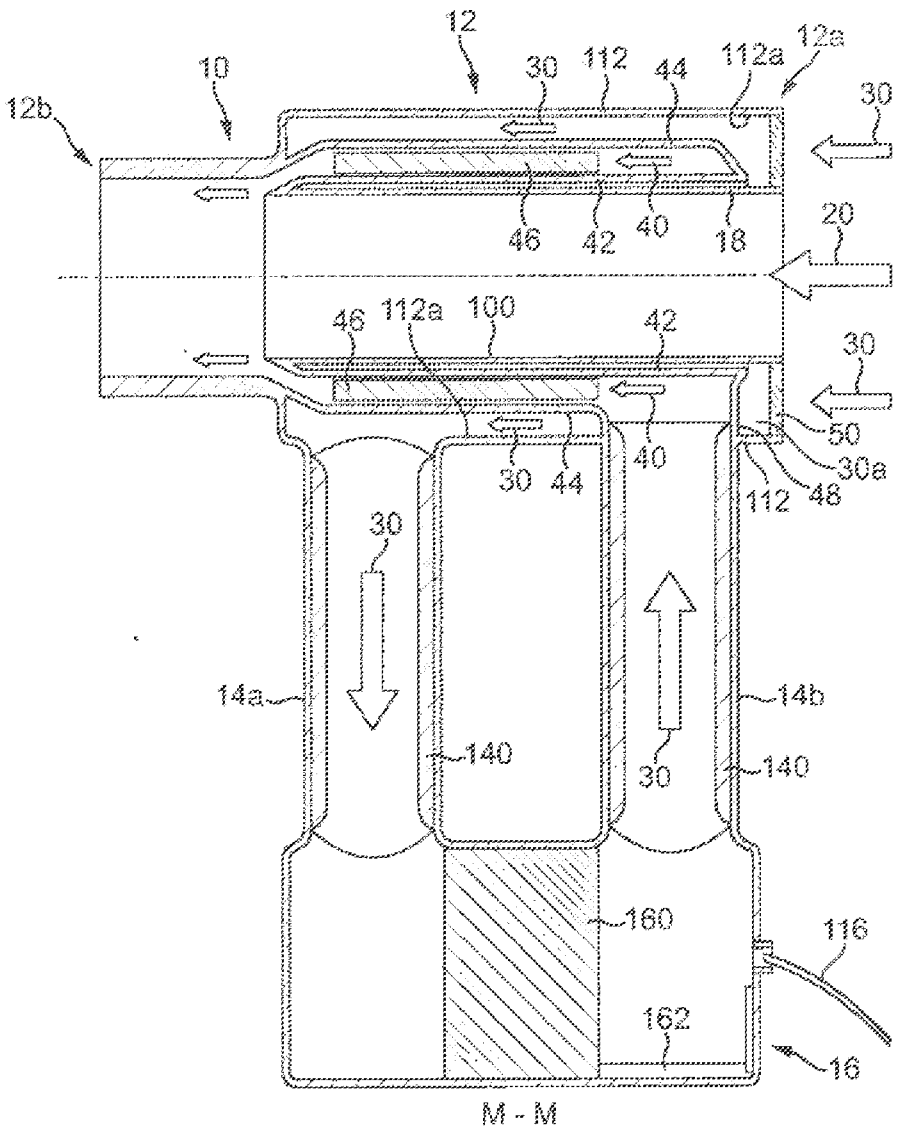


FIG. 8

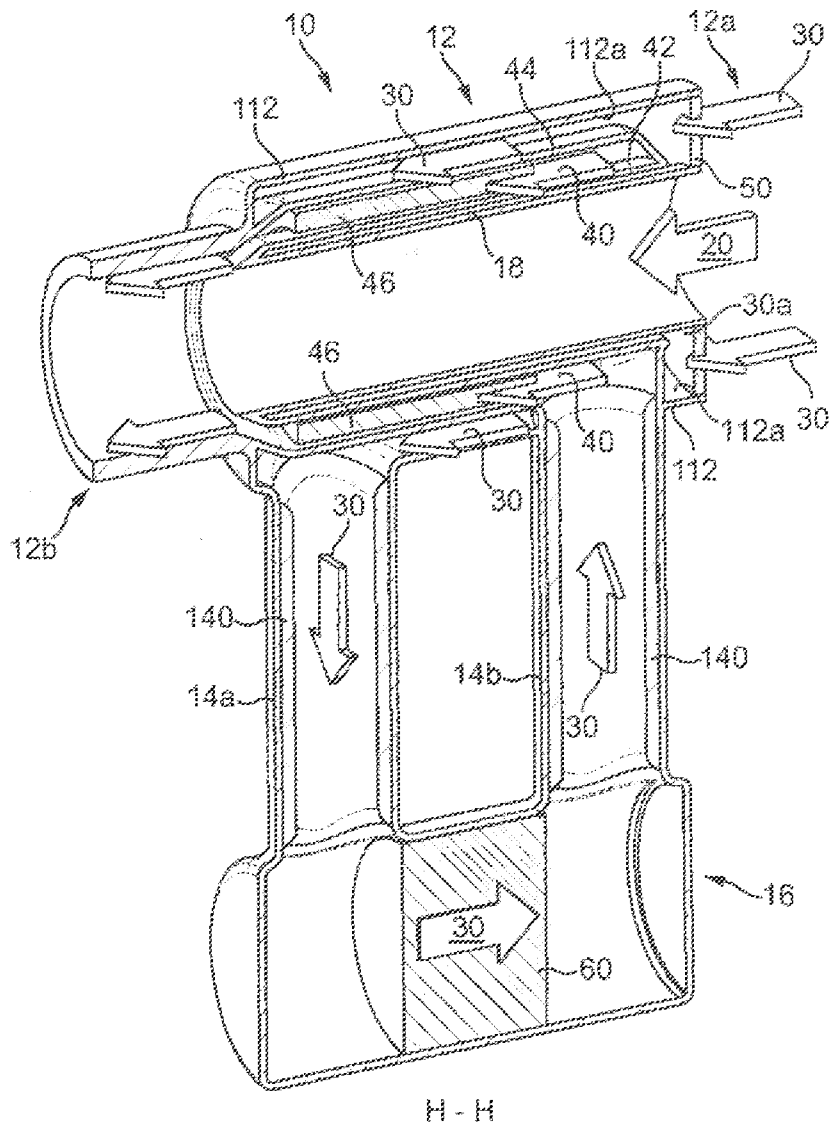


FIG. 9

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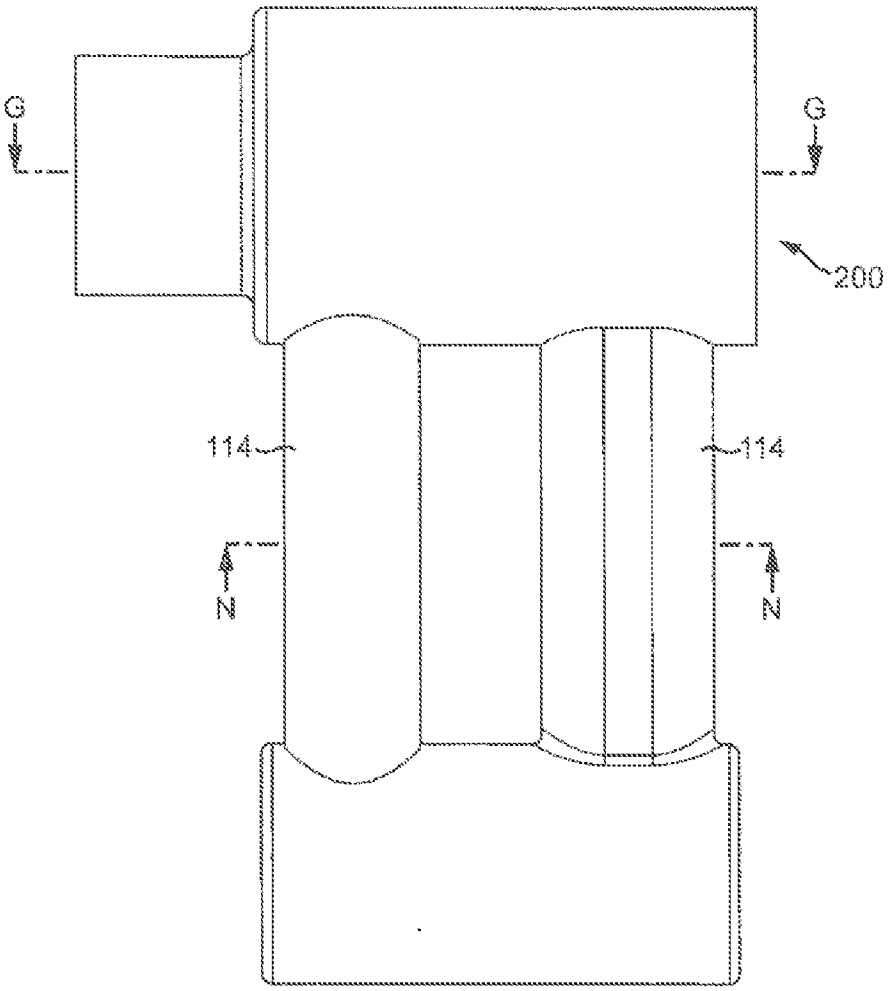


FIG. 10

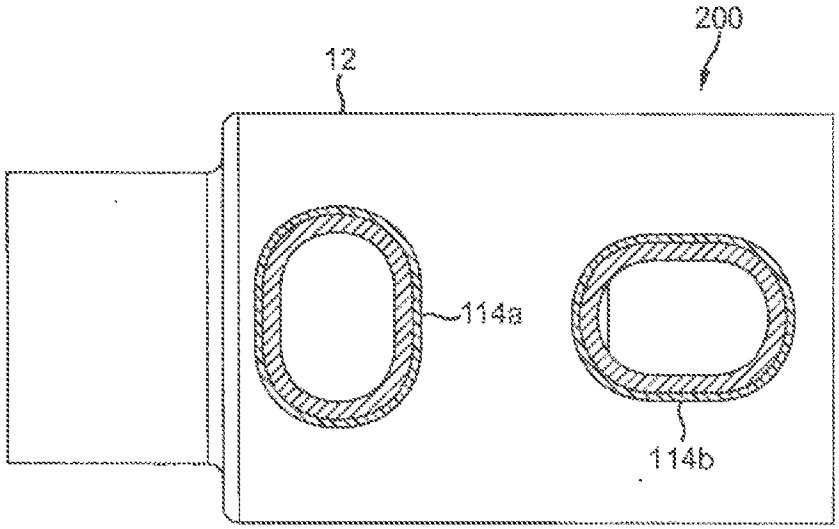


FIG. 11

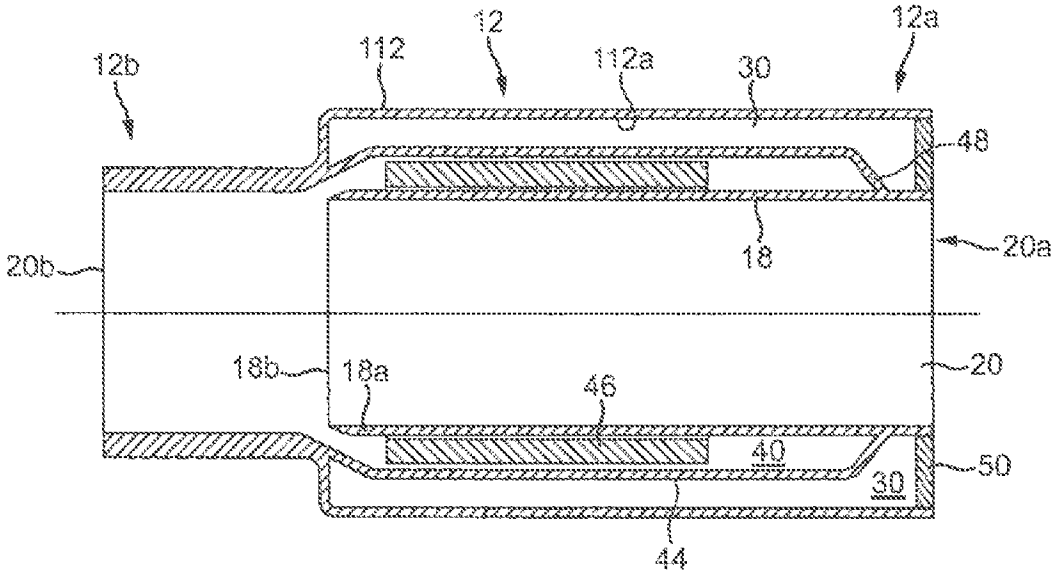

12b
112
12
112a
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12a
48
18
20a
20b
18b
18a
46
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30
44

FIG. 12

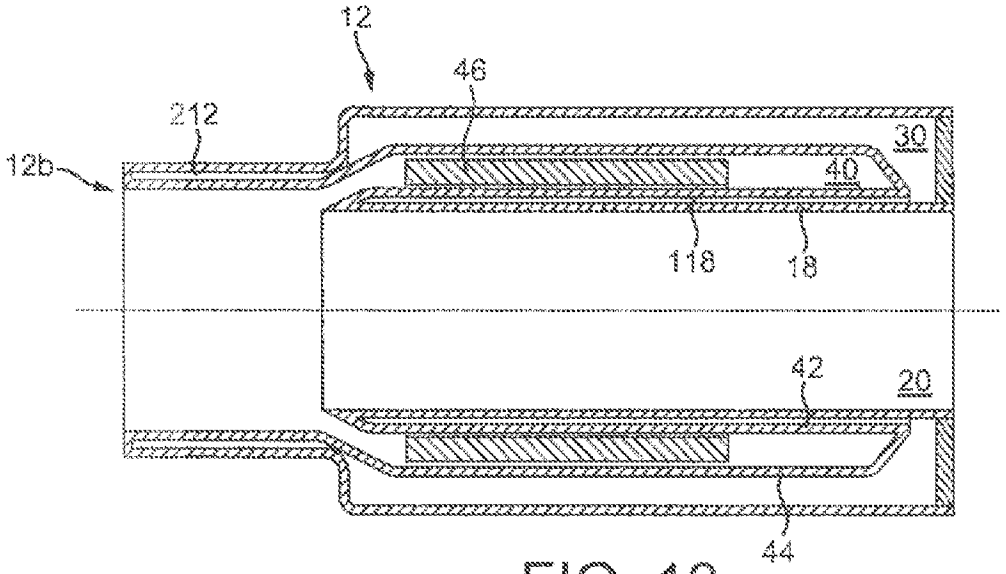

12
46
212
30
12b
40
118
18
42
20
44

FIG. 13

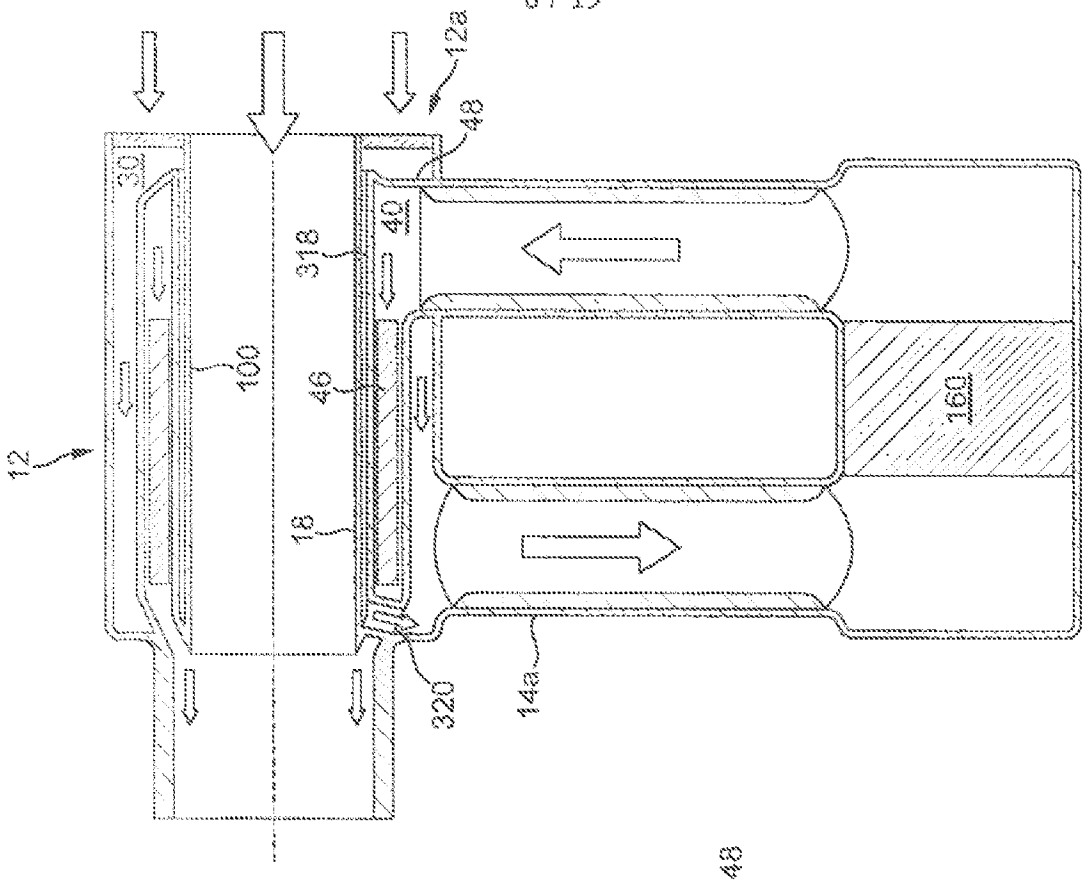

12a
48
30
40
318
100
46
160
12
18
320
14a

FIG. 15

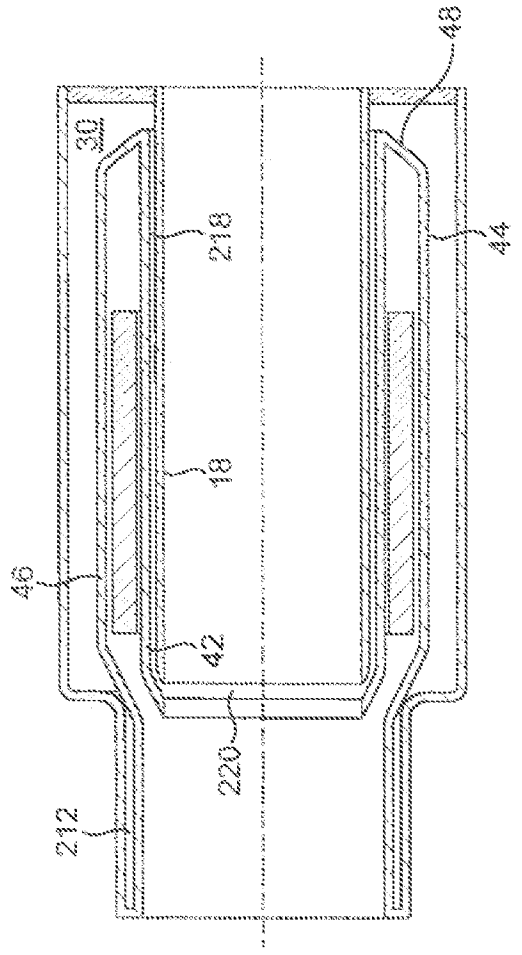

48
30
218
44
18
46
42
220
212

FIG. 14

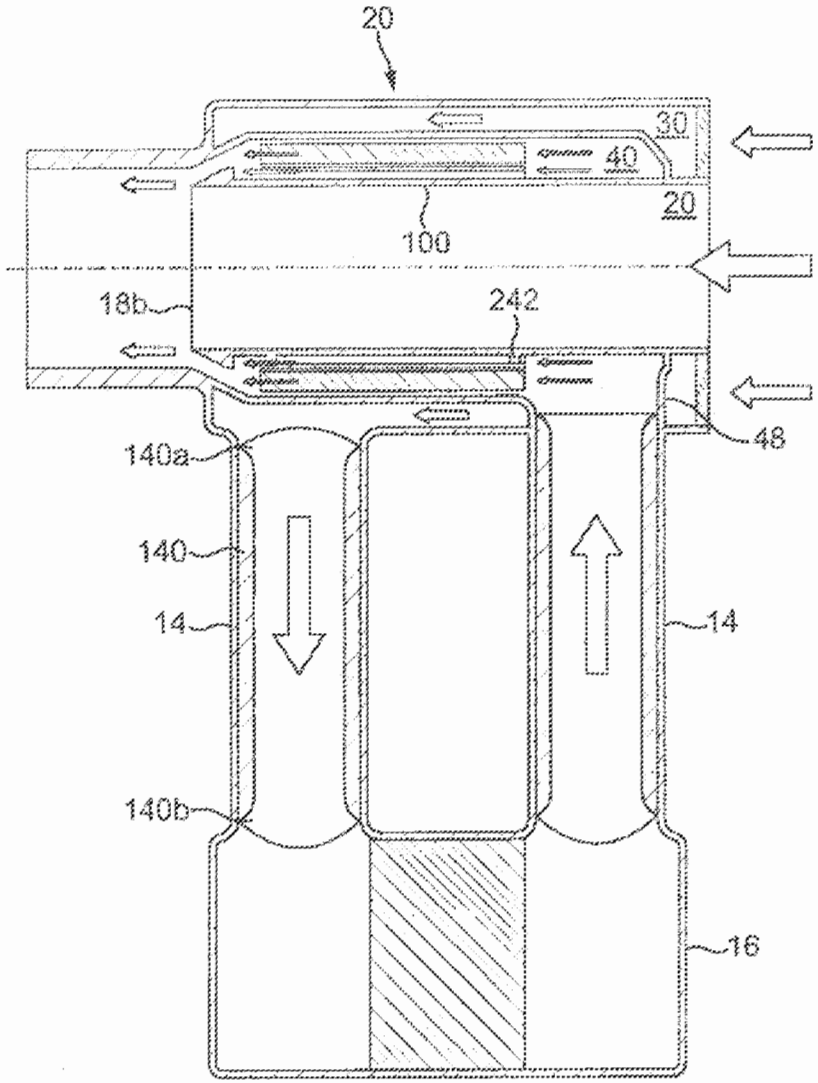


FIG. 16

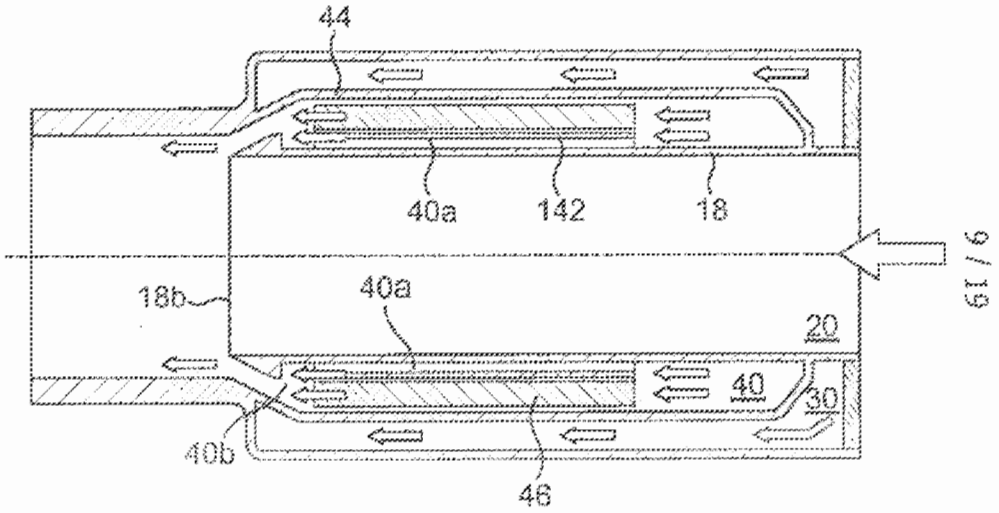


FIG. 17

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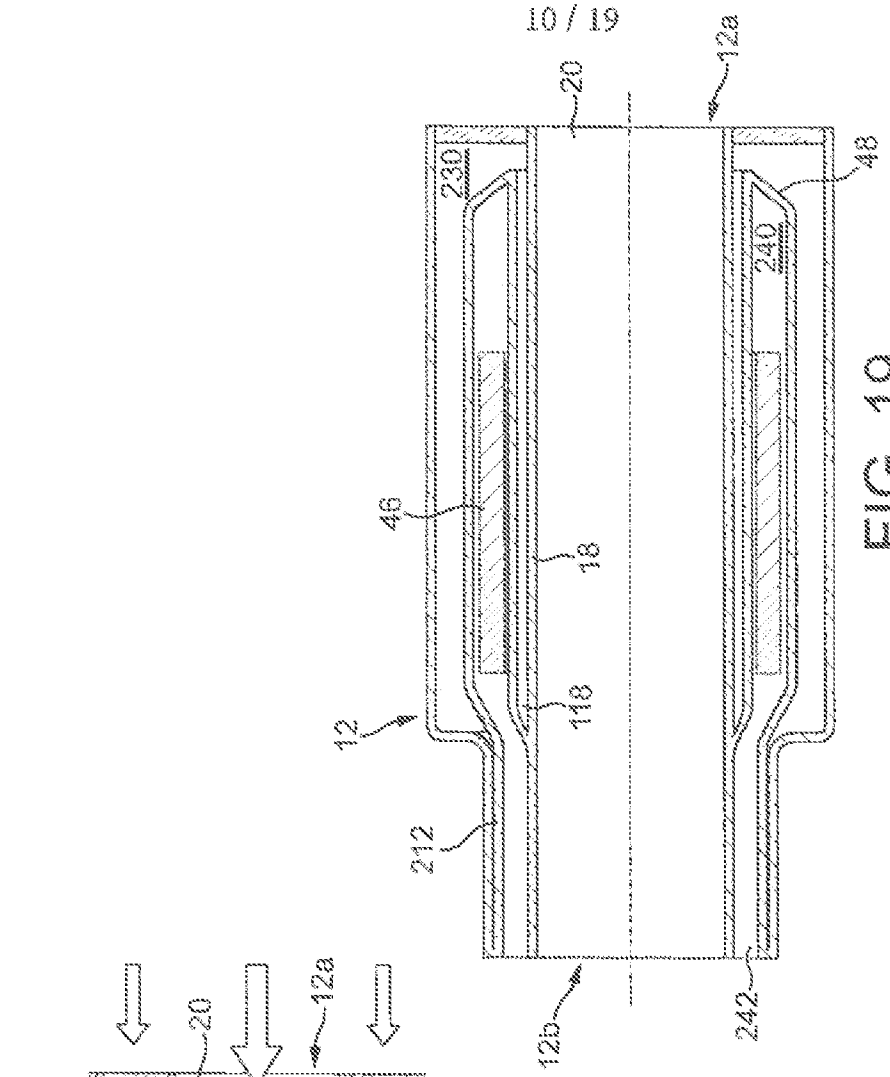


FIG. 19

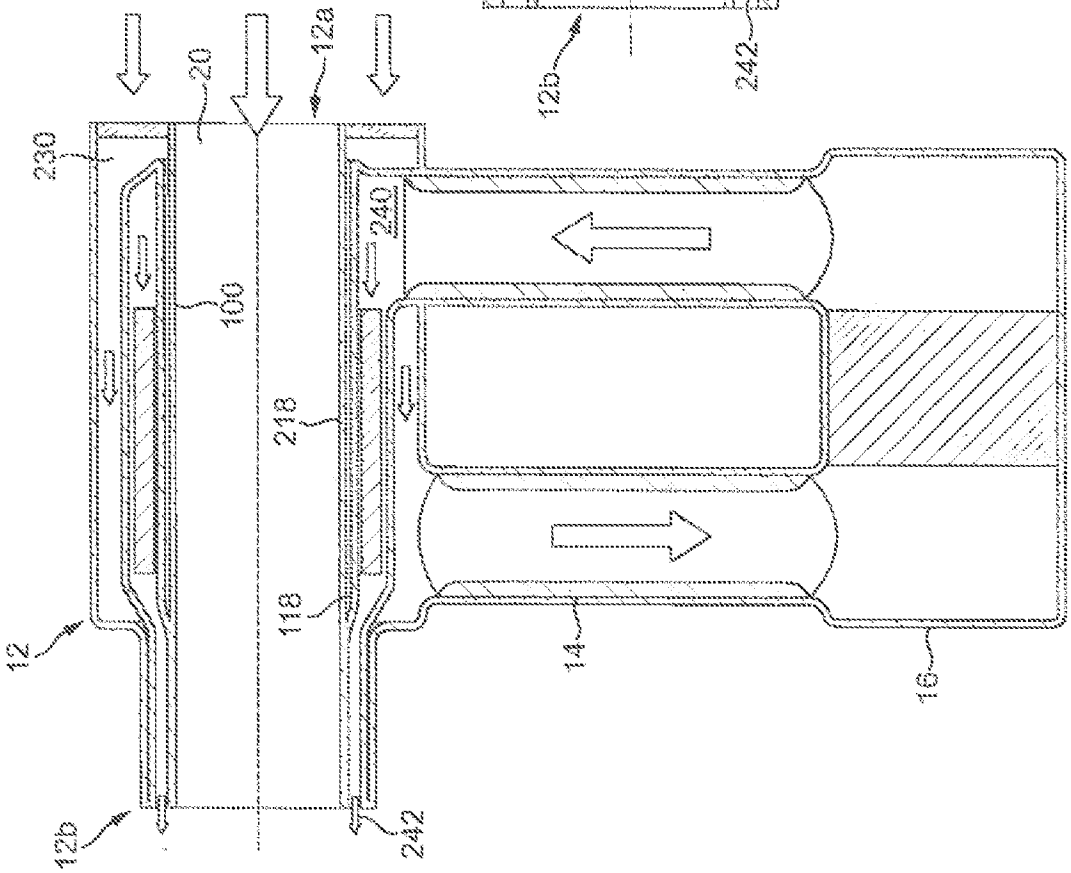


FIG. 18

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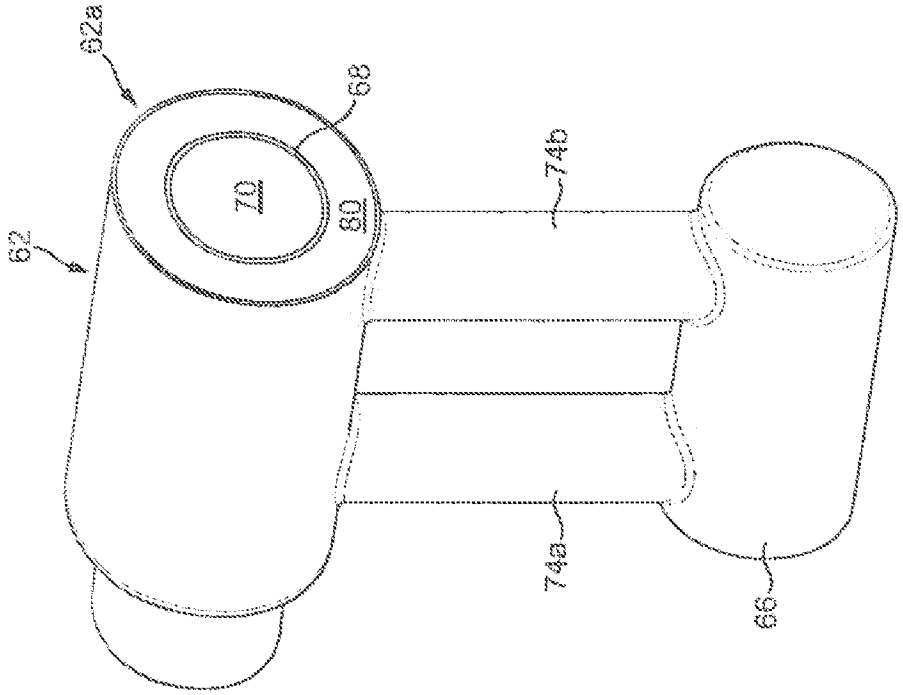


FIG. 21

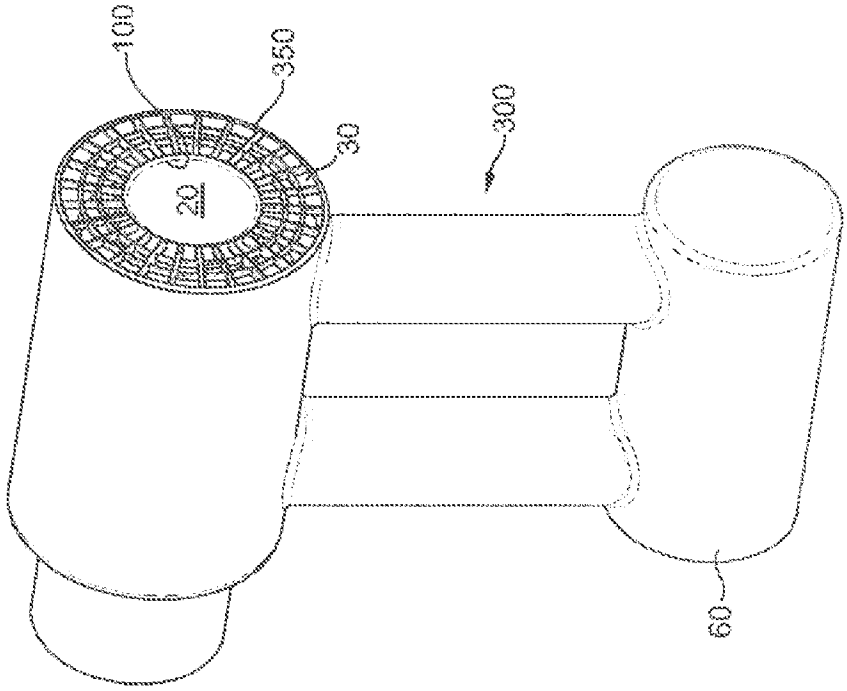


FIG. 20

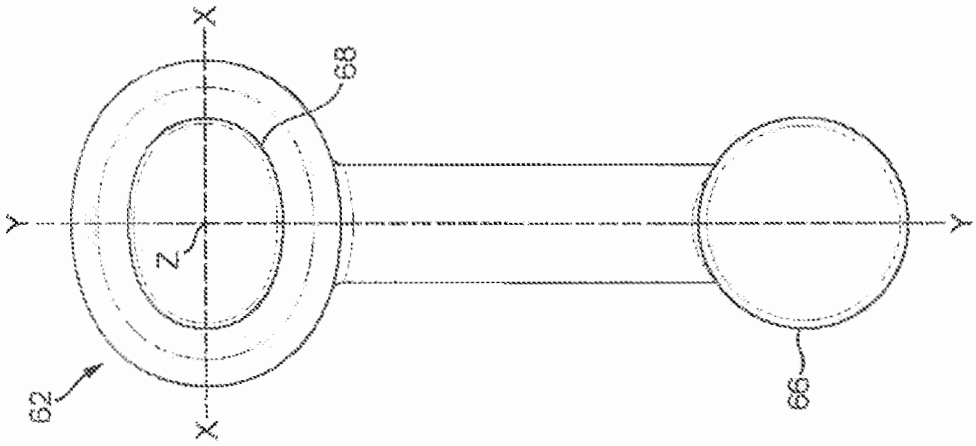


FIG. 22b

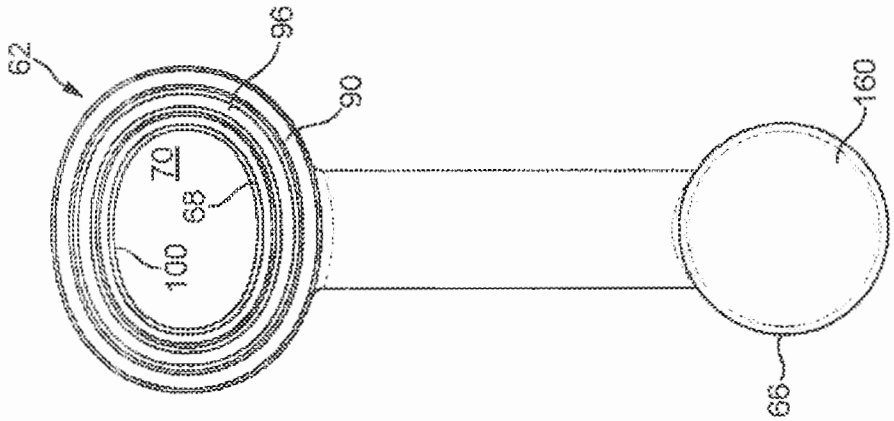


FIG. 22a

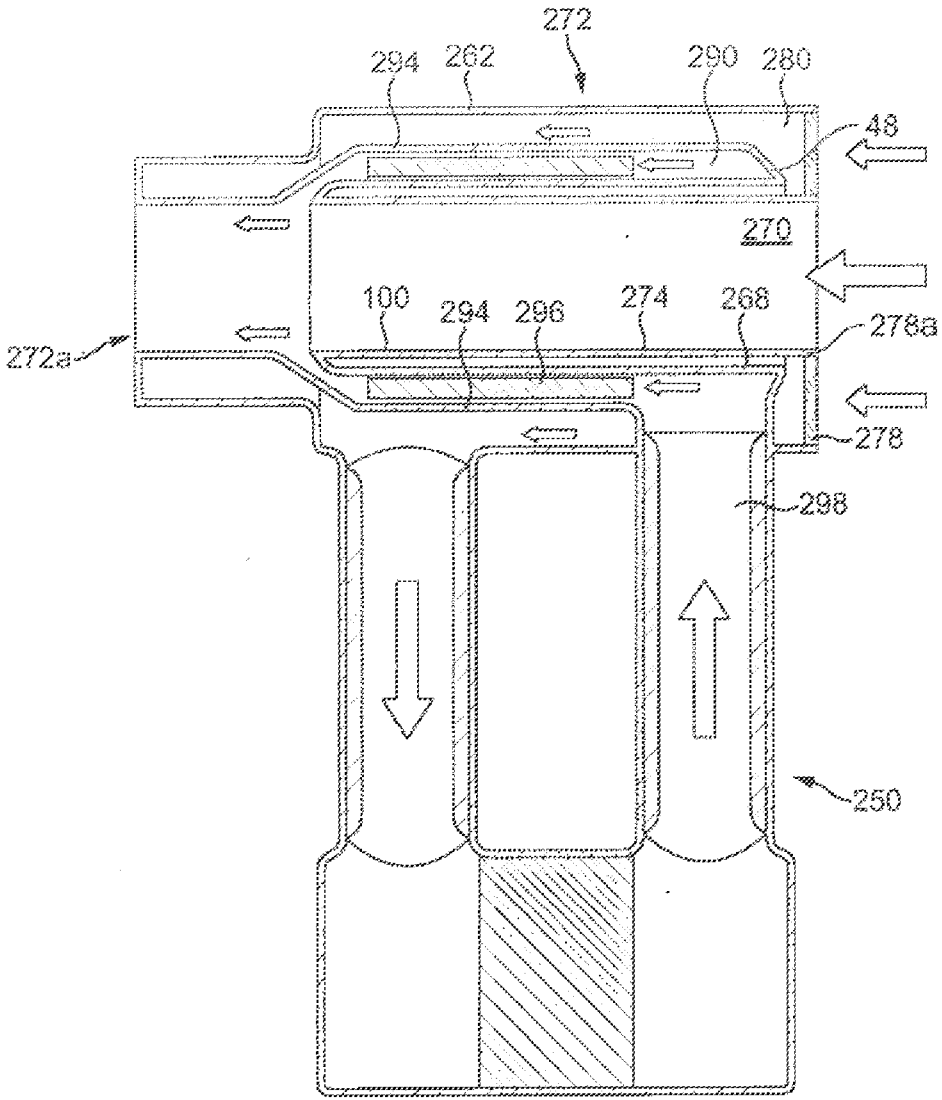


FIG. 23

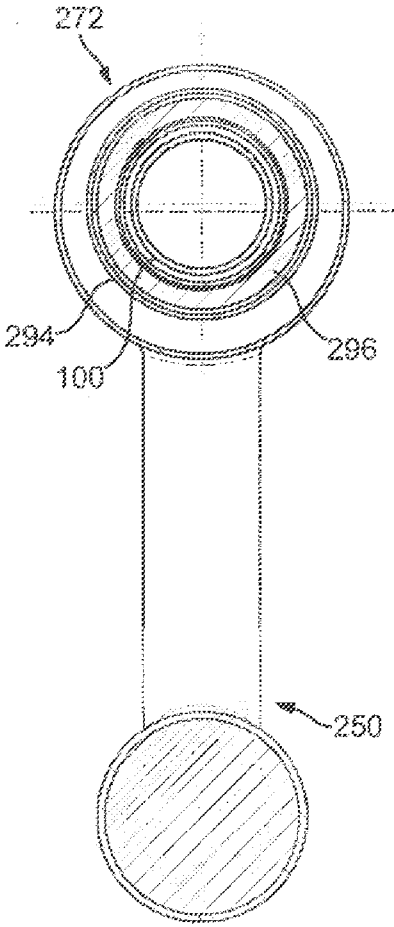


FIG. 24a

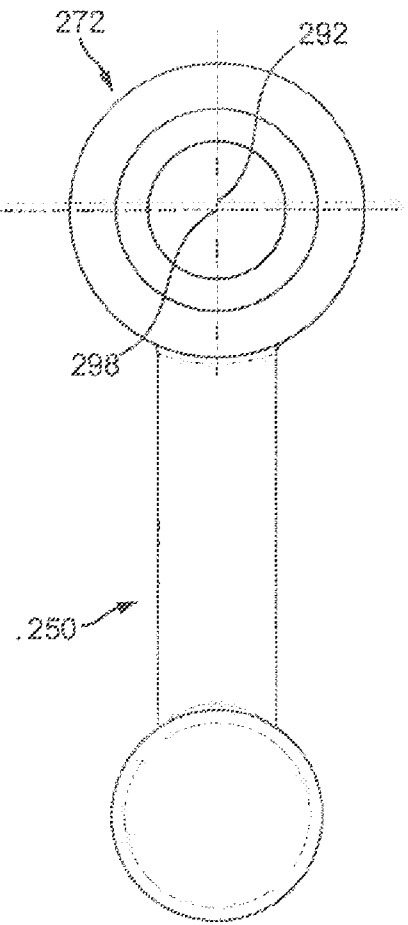


FIG. 24b

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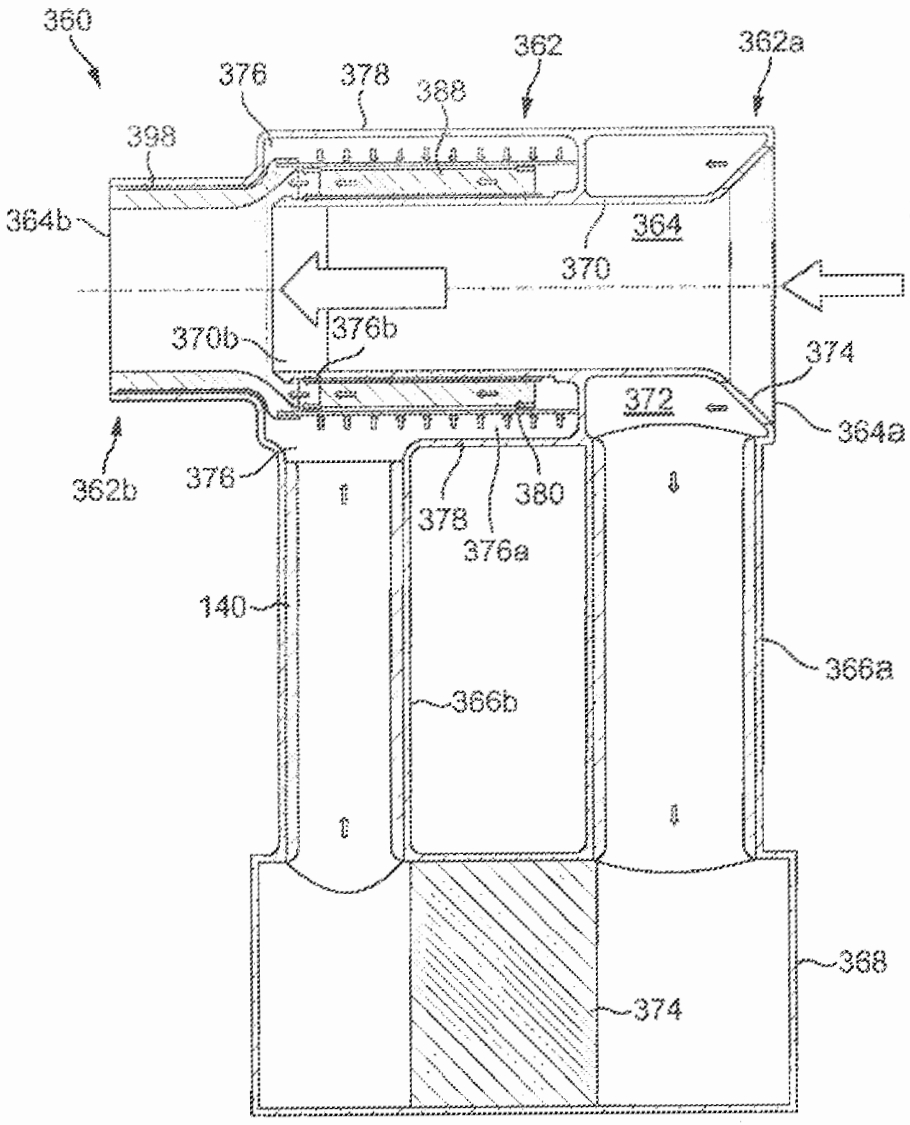


FIG. 25

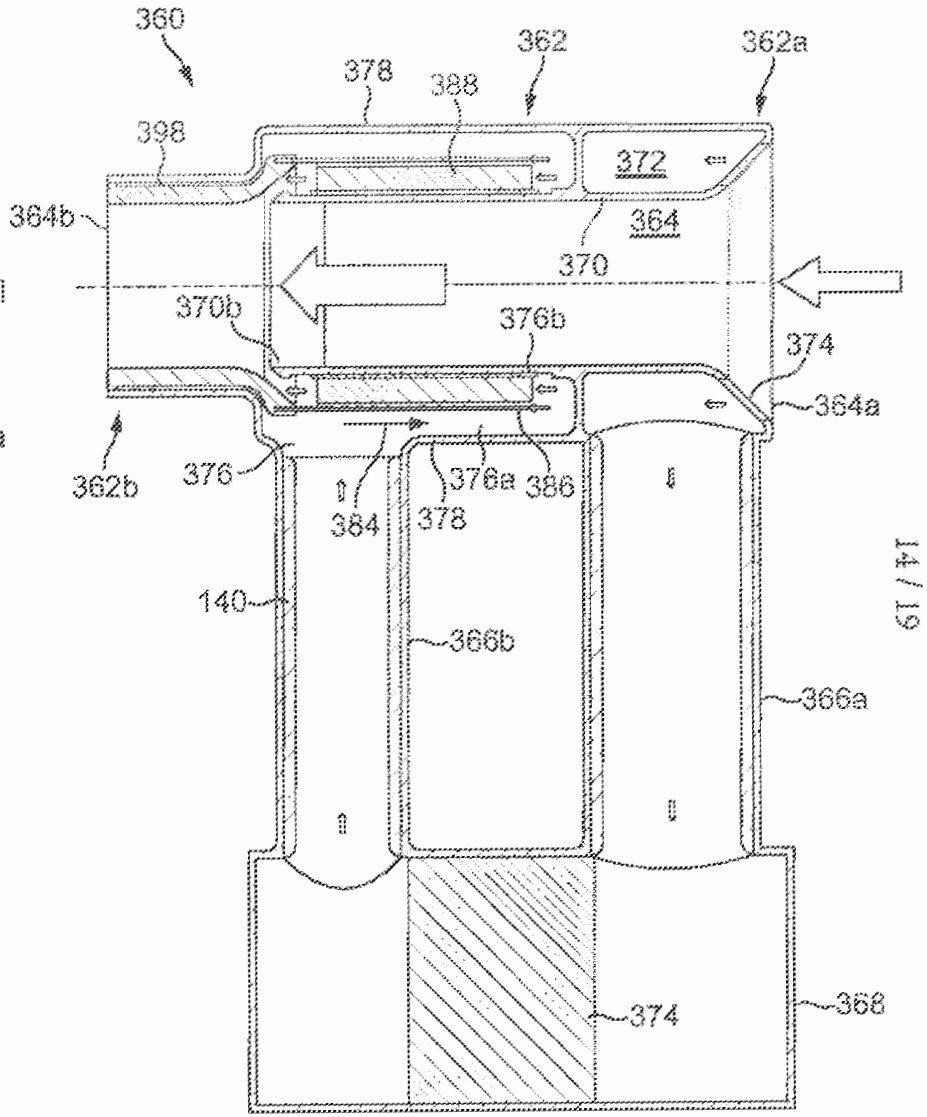


FIG. 26

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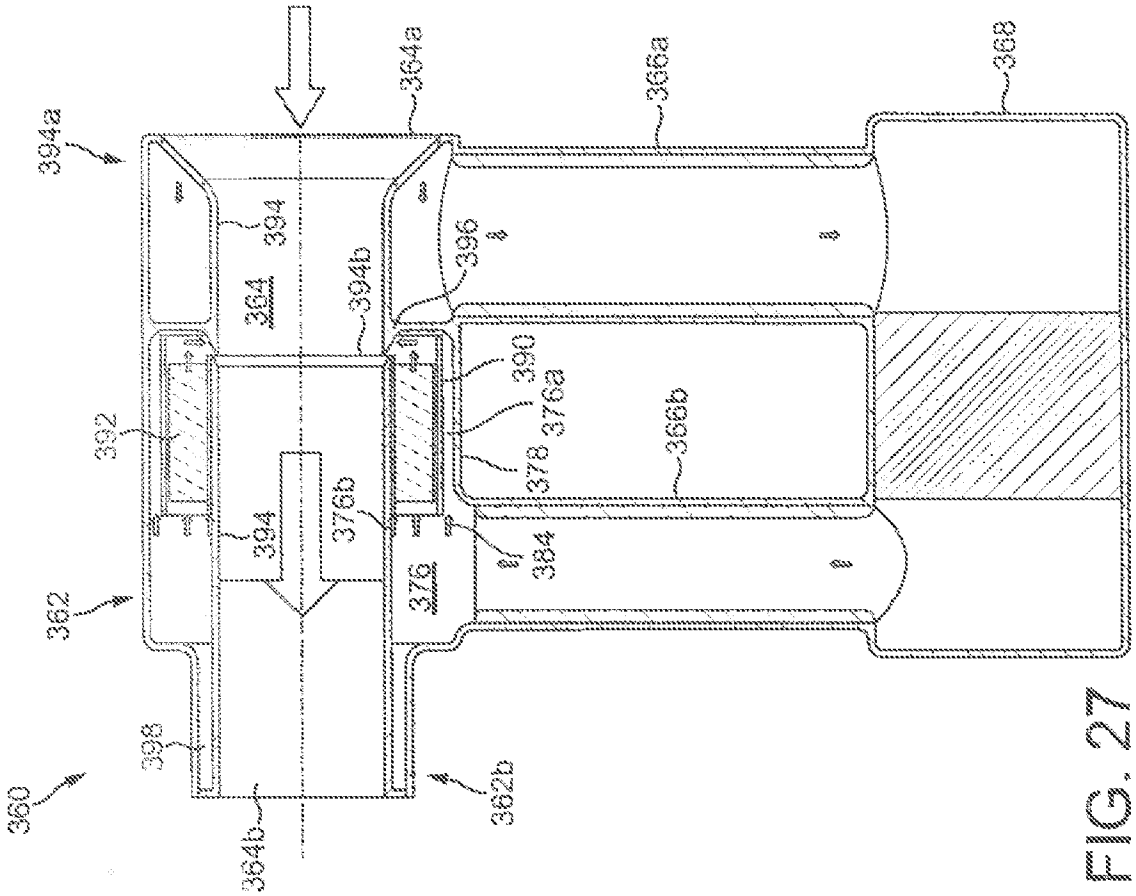

394a
364a
366a
368
394
396
364
394b
390
376a
392
366b
378
376b
394
384
362
376
398
360
362b
364b

FIG. 27

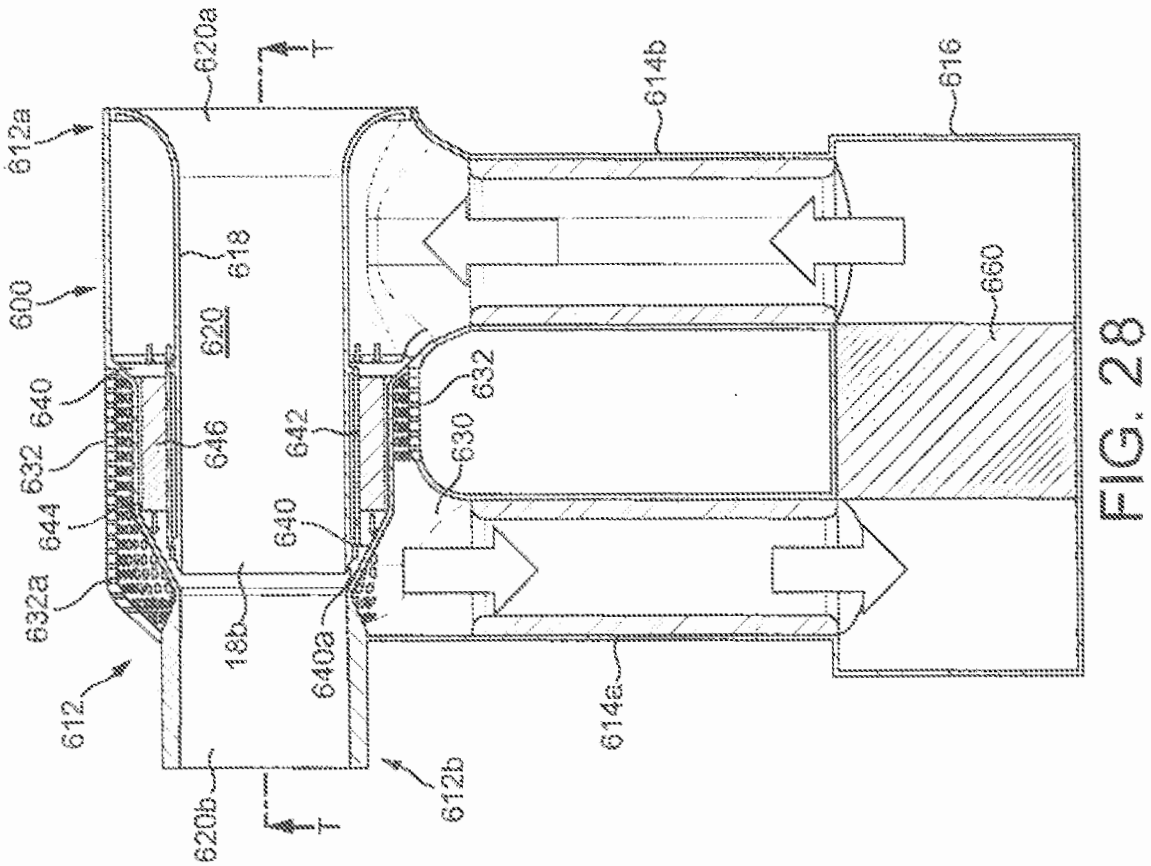

620a
T
612a
614b
616
600
618
620
660
640
632
646
642
632
630
644
640
632a
18b
640a
612
614a
620b
T
612b

FIG. 28

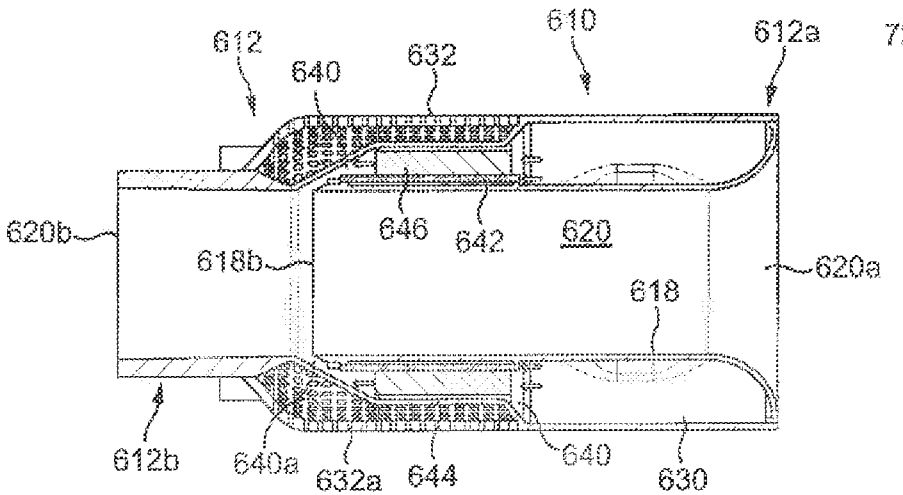


FIG. 29

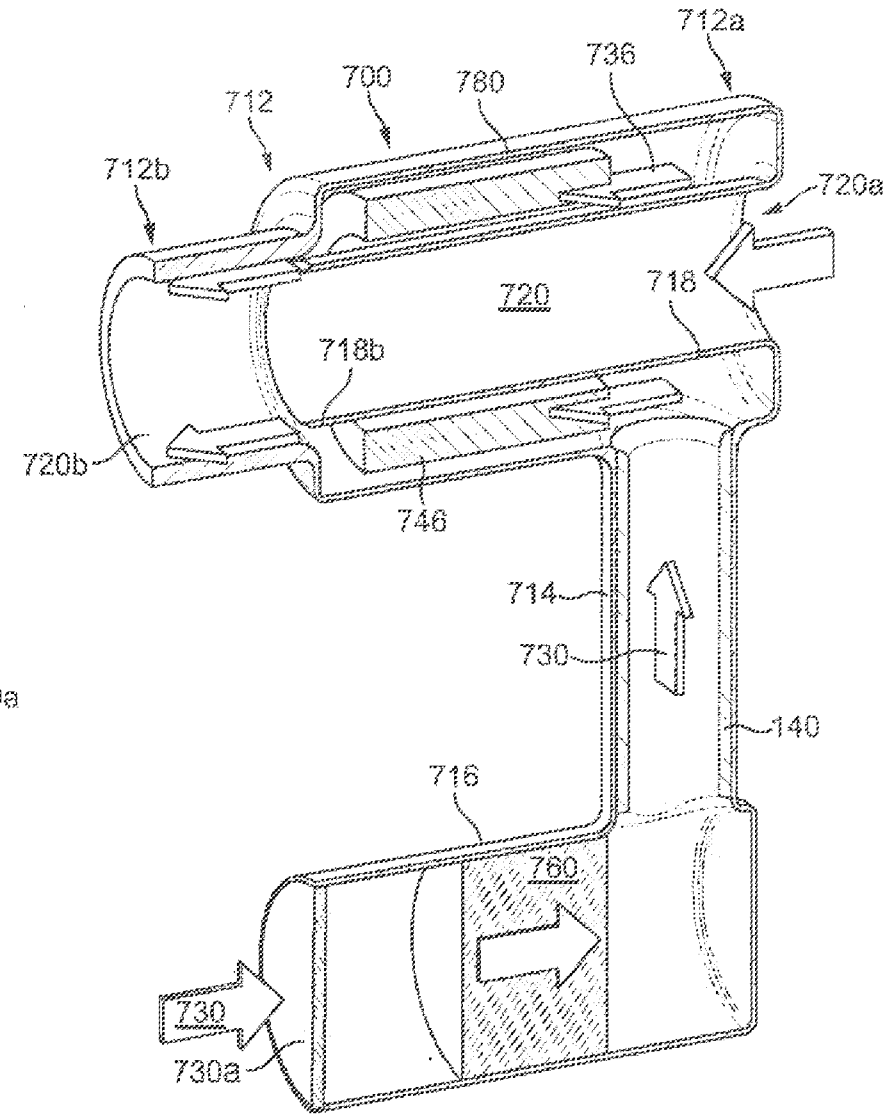


FIG. 30

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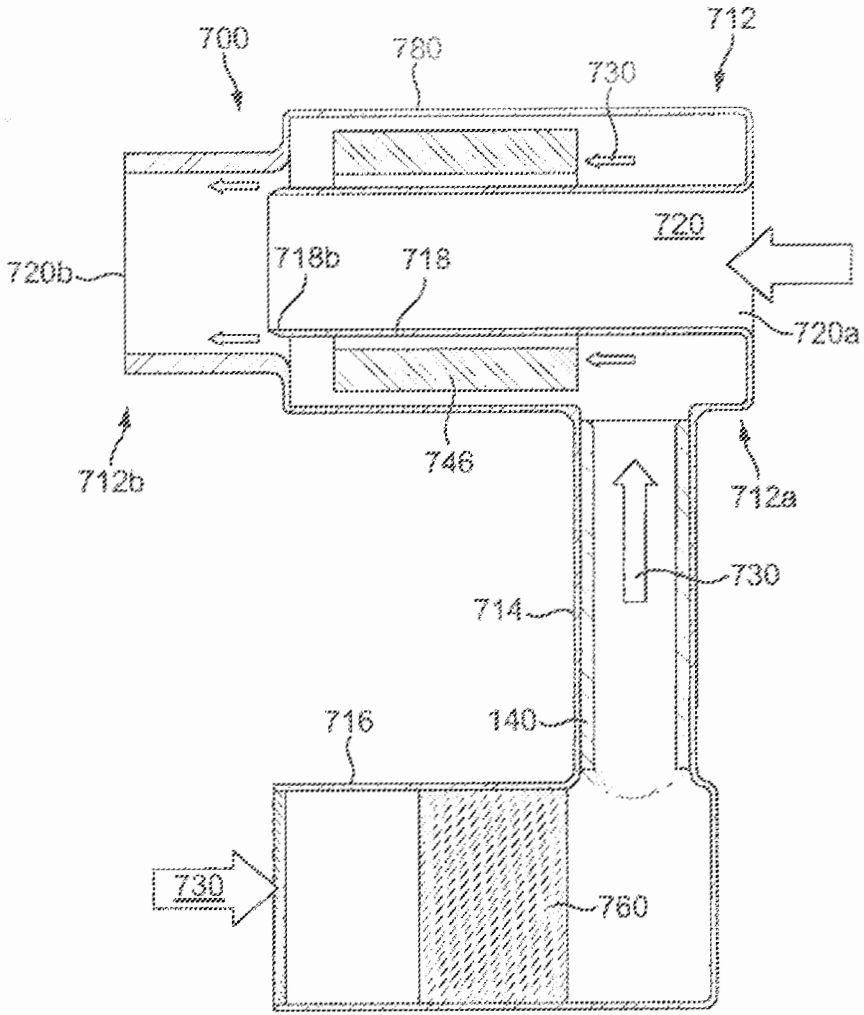


FIG. 31

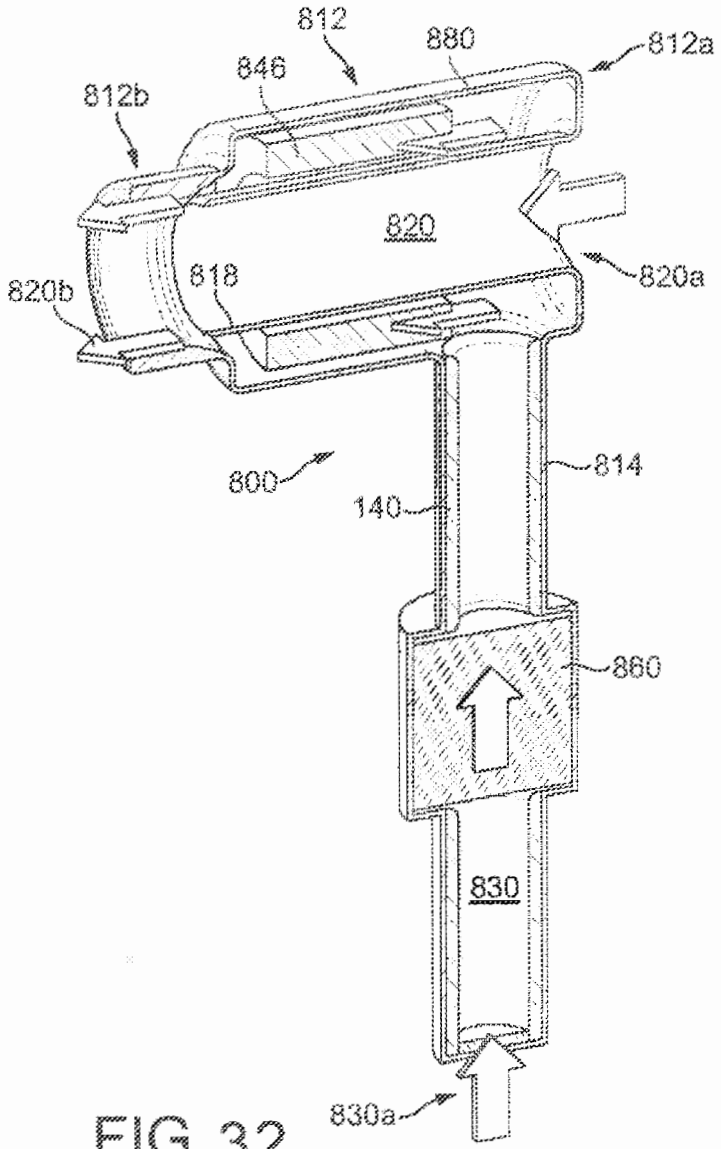


FIG. 32

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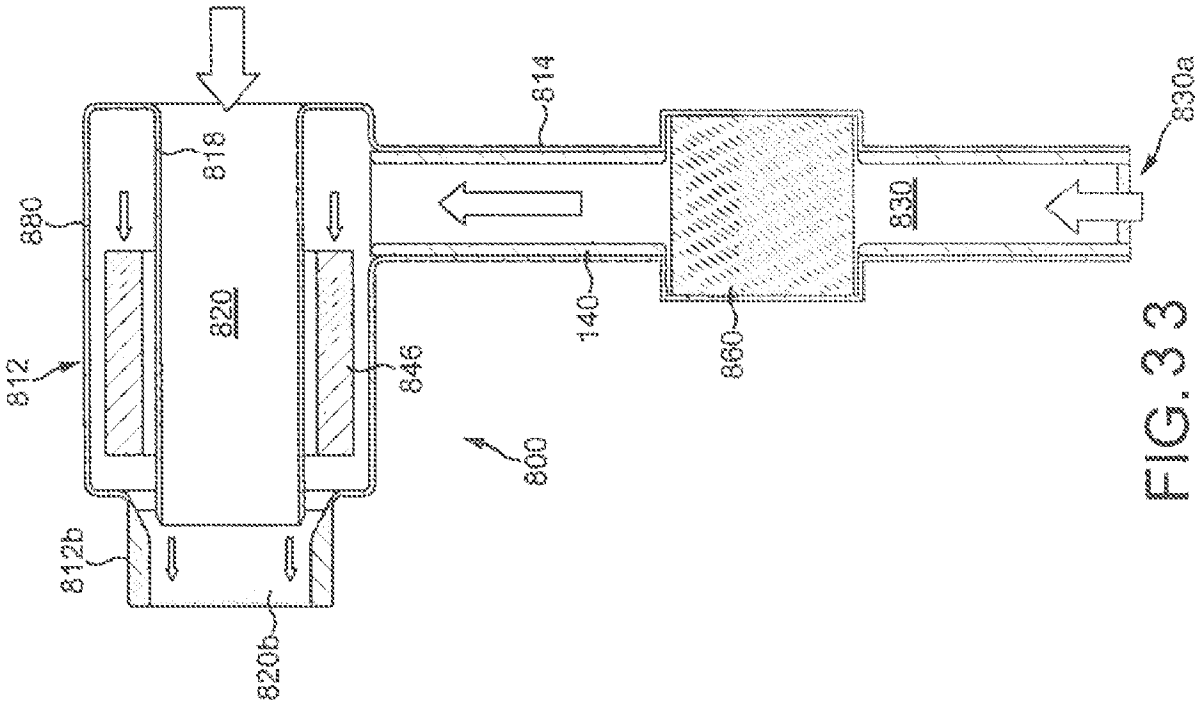


FIG. 33

A Hand Held Appliance

This invention relates to a blower and in particular a hot air blower such as a hairdryer.

Blowers and in particular hot air blowers are used for a variety of applications such as drying substances such as paint or hair and cleaning or stripping surface layers. 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 intake end of the blower.

The present invention provides a hairdryer comprising a body, a fan unit and a duct for conveying fluid to the body, wherein the duct comprises a fluid inlet located at or near an end of the duct which is remote from the body, and the fan unit is disposed in the duct between the inlet and the body, wherein a portion of the duct is lined with a material.

Preferably, the lined portion of the duct is disposed between the fan assembly and the body.

It is preferred that a lined portion of the duct is disposed between the fluid inlet and the fan assembly.

Preferably, the material is a foam or a felt. It is preferred that, the material is a sound absorbing material. Alternatively or additionally, the material is a vibration absorbing material and/or an insulator for example a thermal insulator or a noise insulator. The absorbing properties of the material will at least mitigate the property is question and may be tuned specifically to an appliance either by material density or lining thickness for example. The material can additionally be chosen or tuned based on resonant

frequencies of the appliance. In this way the appliance can be silenced, or manipulated tonally to improve noise characteristics to a user. The material is preferably around 3 mm thick.

The material can alternatively or additionally reflect certain wavelengths and use constructive interference to mitigate them. The absorbing properties of the material will at least mitigate the property is question and may be tuned specifically to a hairdryer either by material density or lining thickness for example. The material can additionally be chosen or tuned based on resonant frequencies of the hairdryer In this way the hairdryer can be silenced, or manipulated tonally to improve noise characteristics to a user.

Preferably, the duct comprises a handle portion of the hairdryer. Preferably, the handle portion of the duct is lined with said material. It is preferred that the lining is continuous around the duct / handle portion.

It is preferred that the fan unit is located upstream of the handle portion.

Preferably, the duct comprises a first handle portion and a portion of the hairdryer, and wherein each handle portion is lined with said material. Preferably, the fan unit is located within a section of the primary fluid flow path located fluidly between the handle portions of the duct. Preferably, the fan unit is disposed approximately mid way between the inlet and the body. Alternatively, the fan unit is nearer to one of the inlet and the body. Thus in this embodiment, there are two silencers, one located each side (upstream and downstream) of the motor. Preferably, the lining of each handle portion is optimised in terms of length, material and thickness, for example, to substantially equalise sound power levels at the outlet of the silencers and at the inlet to the silencers or the handle outlet to the body and inlet to the handle.

The ducts may be circular, however it is preferred that the ducts have non-circular cross-section i.e. elliptical oblate, oval or race track shaped in cross-section. There are

advantages to using non circular ducts, the first is that when the duct is used as a handle it can be easier for a user to grip as the oblate or oval shape mimics the shape made by curled figures more precisely than a circular grip, the second is that the non circular shape can be used to impart directionality to the ducts or handles. This directionality can make the hairdryer easier to use. A third advantage is that for a grippable handle, the non circular shape gives a larger cross-sectional area than the circular handle meaning that a greater flow of fluid can pass through the oval handle. This can reduce one or more of the noise produced by the hairdryer in operation, power consumed by the hairdryer and pressure or duct losses within the hairdryer.

A portion of the duct preferably forms a part of the body i.e. the duct does not open out straight into the body. The body is preferably lined with material around the junction of the duct with the body.

Preferably, hairdryer comprises a primary fluid flow path extending from the fluid inlet through the duct to a fluid outlet. Preferably, the primary fluid flow path is non-linear.

Preferably, the primary fluid flow path extends from the fluid inlet to a fluid outlet. It is preferred that the primary fluid flow path extends at least partially through the body to a fluid outlet

It is preferred that the hairdryer includes means for acting on fluid flow in the primary fluid flow path. Such means includes but is not limited to the fan unit and a heater. The means for acting on fluid flow is also considered to be a processor that processes the fluid that flows, for example by drawing the fluid through the hairdryer, heating the fluid or filtering the fluid flow.

Preferably, the primary fluid flow path comprises an inlet section located in the body, and an outlet section located in the body. It is preferred that each of the inlet section and the outlet section of the primary fluid flow path is annular in shape.

It is preferred that the inlet section and the outlet section are configured to convey fluid through the body in substantially the same direction.

Preferably, the duct extends through a second body, and wherein the fan unit is housed in the second body.

Preferably, the hairdryer comprises a fluid flow path extending through the body. The fluid flow path preferably extends from a first fluid inlet to a first fluid outlet. Preferably, the fluid flow path comprises a fluid inlet, and wherein the fluid inlet of the fluid flow path is located in the body. It is preferred that the fluid flow path passes linearly through the body.

The provision of two flow paths enables fluid that flows through each flow path to be treated differently within the hairdryer.

It is preferred that fluid is drawn through the fluid flow path by fluid emitted from the fluid outlet of the primary fluid flow path. In this embodiment, the fan assembly only processes part, around half, of the fluid flow through the hairdryer so the handle portions of the ducts are able to be of an acceptable diameter for holding comfortably.

It is preferred that the means for acting on fluid flow acts indirectly on fluid in the first flow path i.e. on entrained fluid. Thus the first fluid flow path is in thermal communication with or adjacent to the heater and the primary fluid flow path passes through the heater. Likewise, as the fan and motor (the fan assembly) process or act directly on fluid in the primary fluid flow path, fluid in the fluid flow path is indirectly acted upon as it is entrained into the hairdryer by the action of the fan assembly.

The provision of partly drawn in and partly entrained fluid flow through the hairdryer is advantageous for a number of reasons including, as less fluid is drawn in the motor of the fan assembly can be smaller and lighter in weight, the noise produced by the fan assembly can be reduced as there is less flow through the fan, this can result in a smaller

and/or more compact hairdryer and an hairdryer which uses less power as the motor and/or heater are only processing part of the flow through the hairdryer.

Ideally, the means for acting on fluid flow acts indirectly on fluid in the first fluid flow path and directly on fluid in a primary flow path. The provision of two flow paths at the inlet end means that only part of the fluid flow through the hairdryer needs to be processed i.e. directly heated or drawn through the fan. This results in less air flow going through the fan which can result in one or more of a quieter hairdryer, a lighter hairdryer, a smaller and/or more compact hairdryer and a hairdryer which uses less power as the motor and/or heater are only processing part of the flow through the hairdryer. For example, the fan and motor can be smaller.

This means that the fan assembly processes a portion of the fluid that is output from the body and the rest of the fluid that flows through the body through the first fluid flow path passes through the body without being processed by the fan assembly. Thus the drawn or processed flow is augmented or supplemented by the entrained flow. The provision of an hairdryer in which the fan assembly only processes part of the flow is advantageous for a number of reasons including, as less fluid is drawn in the motor of the fan assembly can be smaller and lighter in weight, the noise produced by the fan assembly can be reduced as there is less flow through the fan, this can result in a smaller and/or more compact hairdryer and an hairdryer which uses less power as the motor and/or heater are only processing part of the flow through the hairdryer.

The hairdryer can be considered to comprise a fluid amplifier whereby fluid that is processed by a processor (fan assembly and/or heater) is amplified by an entrained flow.

The noise of the hairdryer is reduced by having a long fluid flow path, a coiled/looped/curved/s-shaped/zigzagged fluid flow path and frequency attenuating lining material. However, the use of these features introduces some drawbacks, for example drag in the fluid flow path which can choke the flow and the appliance size is

increased. To counteract these drawbacks, the use of partially drawn and partially entrained flow, a fan that only processes around half of the flow is used.

Preferably, all the fluid that flows through the ducting is processed by the fan assembly.

Preferably, the fluid flow path is defined by a bore extending through the body.

It is preferred that the bore is an external wall of the body of the hairdryer. Preferably, the bore is within the hairdryer body and it defines an external surface along which fluid is entrained. The bore is inside the body and defines a hole through the body.

Thus, the fluid flow path is nested or embedded in the primary fluid flow path. The primary fluid flow path can be concentric or non-concentric to the fluid flow path.

Preferably, the bore at least partially defines the fluid outlet.

The fluid flow paths are preferably substantially circular in shape; alternatively they are elliptical, oval, rectangular or square. In fact each flow path may be a different shape or configuration.

Preferably, a heater is provided and the heater is located in the body. Preferably, the bore surrounds the heater. More preferably, the bore is an external wall that surrounds the heater. If something is inserted into the hairdryer, it cannot contact the heater directly. There is no direct line of sight to the heater. The perimeter of the hole is defined by the body duct. The bore is a single piece or comprises two or more parts which together define the first fluid flow path.

Preferably, the heater is located in the primary fluid flow path. Preferably, the primary fluid flow path comprises an inlet section and an outlet section, and wherein the heater is located in the outlet section. Preferably, the heater is annular in shape. It is preferred that the heater is tubular in shape.

It is preferred that within the body, the outlet section is isolated from the inlet section by at least one wall.

Preferably, the fluid flow path is accessible to a user.

The invention also provides a hairdryer wherein the heater is inaccessible from the fluid inlet. Preferably, the heater is inaccessible from the first fluid inlet.

Preferably, the heater outlet is at least 20 mm, preferably 30mm, more preferably 40mm, preferably 50mm or most preferably at least 56mm from the inlet and/or outlet end of the body of the hairdryer.

The provision of a heater which is inaccessible from the inlet and/or outlet is useful from a safety aspect. If something is inserted into the appliance, it cannot contact the heater directly. An inaccessible heater is also one without direct line of sight from the inlet and/or outlet.

The flow path and the primary flow path upstream of the fan assembly act as heat.sinks or thermal exchangers for the primary flow path in the vicinity of the heater. It also results in all the fluid flowing through the body being heated whether actively or passively.

Preferably, the handle comprises a first handle portion and a second handle portion, and wherein fluid flows through each of the handle portions. Preferably, the first handle portion is spaced from the second handle portion.

Preferably, the fluid outlet of the primary fluid flow path is configured to emit fluid into the fluid flow path. It is preferred that the fluid outlet of the primary fluid flow path extends about the fluid flow path.

The fluid flow path may be annular to the fluid flow path. Preferably, the fluid outlet of the fluid flow path is annular.

It is preferred that the fluid flow path comprises a first fluid outlet, and the first fluid outlet is arranged to emit fluid from the hairdryer.

Preferably, the fluid flow paths are isolated within the hairdryer.

It is preferred that the first fluid outlet and the fluid outlet are both arranged to emit fluid from the hairdryer. It is preferred that the first fluid outlet and the fluid outlet are co-planar.

Preferably, fluid is emitted from the hairdryer through each of the fluid outlet of the fluid flow path and the fluid outlet of the primary fluid flow path.

Preferably, the fluid flow paths merge within the hairdryer. Preferably, the primary fluid flow path comprises a fluid outlet arranged to emit fluid into the fluid flow path. It is preferred that the first and primary fluid flow paths are combined within the body as this enables even mixing of the hot fluid from the primary fluid flow path with the entrained fluid from the fluid flow path. Preferably, the fluid flow paths merge within the hairdryer.

The invention also provides a hairdryer comprising a fluid chamber at least partially defined by an external wall of the hairdryer, the chamber being configured to provide a thermally insulating barrier between the heater and an external wall.

Preferably, the hairdryer comprises a body and a handle connected to the body, and the chamber is located within the body.

Preferably, the body comprises a bore or tubular wall defining a bore through which fluid flows through the hairdryer, and wherein the fluid chamber is located between the external wall and the tubular wall. Preferably, the fluid chamber extends about the bore.

Due to the fact that around half the flow is processed by the heater i.e. passes through the heater and is heated directly by the heater, the heater can be made more compact with less losses and less flow through it.

Preferably around half of the fluid that flows from the outlet of the hairdryer is drawn through the motor. The rest of the fluid that is admitted out of the outlet of the hairdryer is entrained or induced by the fluid that is processed. The approximately 50% split of drawn to entrained fluid is not essential and can be less or more; the relative fluid flow rates are a function of losses within the duct pathways for each flow path and the configuration e.g. the diameter and cross-sectional areas of the duct pathways.

Traditional hairdryers are essentially and open tube with a fan for drawing fluid into the tube. This makes them noisy unless a big and slow fan is used but then a big motor is required which increases weight. The provision of a long fluid flow path through the body and ducting arrangement reduces the noise produced; the provision of a curved, zigzagged, s-shaped or looped fluid flow path (as provided by the two body portions and ducting therebetween) further reduces the noise produced by the appliance.

A portion of the duct preferably forms a part of the body i.e. the duct does not open out straight into the body. The body is preferably lined with material around the junction of the duct with the body.

A further advantage to having a fan assembly which process some of the fluid flow through the hairdryer and having a fluid flow which is partially drawn and partially entrained is that the ducts through which the processed fluid flows can be of a relatively small diameter. For example for an outflow from the body of around 25l/s, something like 10 to 12l/s passes through the ducts and this flow has a maximum velocity of

around 25m/s. As the ducting has a smaller diameter than would be required for full processing of the fluid, silencing of noise produced by the fluid flow through the primary fluid flow path is effective over a larger range of frequencies than for a larger diameter duct. Thus, airborne noise is attenuated to a higher frequency. This is because a duct diameter of less than around half a wavelength promotes planar wave behaviour.

It is preferred that a filter is provided for filtering one of the two fluid flow paths. Preferably, the filter filters the primary fluid flow path. This has the advantage that less filter material is used than if the whole body inlet were covered. In addition, it provides a line of sight through the central aperture of the hairdryer that is not obscured by filter material. A filter includes one or both of a grill and a mesh material positioned across the primary fluid flow path before fluid flows into the fan assembly.

Preferably, the filter is located upstream of the fan unit. It is preferred that the fan unit comprises a motor, and the filter is located upstream of the motor. Thus, the filter filters fluid before it reaches the motor and preferably before the fluid reaches the fan unit i.e. a fan and a motor, thus the filter is a pre-motor filter. This means the filter protects the motor from the ingress of foreign objects into the fluid flow path which may be detrimental to the motor examples of such objects are hair, dirt and other lightweight objects than may be sucked into the fluid flow path by the action of the fan.

Preferably, the filter is located upstream of the heater.

The fan unit is for drawing fluid through the fluid inlet into the primary fluid flow path.

Preferably, the primary fluid flow path comprises an inlet section and an outlet section, and wherein the heater is located in the outlet section.

Preferably, within the body, the outlet section is isolated from the inlet section by at least one wall.

Preferably, one or more of the inlet and outlet can be used to store the hairdryer. For example the inner opening can be located onto a retainer such as a hook or nail for convenient storage and retrieval as required.

Preferably, each handle portion has a circular cross-section. It is preferred that each handle portion has a non-circular cross-section. Preferably, each handle has, in cross-section, n-fold rotational symmetry, where n is an integer equal to or greater than 2. It is preferred that each handle portion has an elliptical cross-section.

Preferably, the cross-section of each handle portion has a major radius and a minor radius, and wherein the major radius of the first handle portion is angularly offset relative to the major radius of the second handle portion.

It is preferred that the major radius of the first handle portion is angularly offset relative to the major radius of the second handle portion by an angle of 90°.

Preferably, the handle means comprises a first handle portion comprising a first duct for conveying fluid towards the fan unit, and a second handle portion comprising a second duct for conveying fluid away from the fan unit.

The provision of two flow paths enables fluid that flows through each flow path to be treated differently within the hairdryer.

Preferably, the body comprises a first external wall and a second external wall extending about the first external wall, and wherein the first external wall defines a bore extending through the body, and wherein the fluid flow path extends through the bore.

A further aspect of the invention provides a hand held appliance comprising a body having a fluid inlet for admitting fluid into the appliance, a fluid outlet, a duct lined with a material, and a primary fluid flow path extending from the fluid inlet to the fluid outlet and through the duct.

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Also disclosed is a hairdryer comprising a body having a fluid inlet for admitting fluid into the hairdryer, a fluid outlet, a duct lined with a material, and a primary fluid flow path extending from the fluid inlet to the fluid outlet and through the duct.

A further aspect provides a hand held appliance comprising a body, a fan unit and a duct for conveying fluid to the body, wherein the duct comprises a fluid inlet located at or near an end of the duct which is remote from the body, and the fan unit is disposed in the duct between the inlet and the body, and wherein a portion of the duct is lined with a material.

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

Figure 1 shows a rear end perspective view of an appliance according to the invention;

Figure 2 shows a front end perspective view of an appliance according to the invention;

Figure 3 shows a side view of an appliance according to the invention;

Figure 4 shows a top view of an appliance according to the invention;

Figures 5a and 5b show sectional views along line J-J of Figure 4;

Figure 5c is an enlargement of area P of Figure 5a;

Figure 6 shows a sectional view along line K-K of Figure 3;

Figure 7 shows a sectional view along line L-L of Figure 3;

Figure 8 shows a sectional view along line M-M of Figure 4;

Figure 9 shows a 3D sectional view along line H-H of Figure 4;

Figure 10 shows a side view of a second appliance according to the invention;

Figure 11 shows a sectional view along line N-N of Figure 10;

Figure 12 shows a sectional view through the body of an appliance according to the invention;

Figure 13 shows a sectional view through the body of a further appliance according to the invention;

Figure 14 shows a sectional view through the body of another appliance according to the invention;

Figure 15 shows a sectional view through the body of yet another appliance according to the invention;

Figure 16 shows sectional view through the body of an appliance according to the invention;

Figure 17 shows an alternative sectional view through the body of the appliance of Figure 16;

Figure 18 shows sectional view through the body of an appliance according to the invention;

Figure 19 shows an alternative sectional view through the body of the appliance of Figure 18;

Figure 20 shows a rear end perspective of a further appliance according to the invention;

Figure 21 shows a rear end perspective of an alternative appliance according to the invention;

Figures 22a and 22b show rear end views of the appliance shown in Figure 21;

Figure 23 shows a cross section through another appliance;

Figures 24a and 24 b show rear end views of the appliance shown in Figure 23;

Figure 25 shows a cross section through an appliance;

Figure 26 shows a cross section through another appliance;

Figure 27 shows a cross section through another appliance;

Figure 28 shows a cross section through an appliance according to the invention;

Figure 29 shows a sectional view across line T-T of Figure 28;

Figure 30 shows a 3D sectional view of a one handled two bodied appliance according to the invention;

Figure 31 shows a cross section through the appliance shown in Figure 30;

Figure 32 shows a 3D sectional view of a one handled appliance according to the invention; and

Figure 33 shows a cross section through the appliance shown in Figure 32.

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Figures 1 to 4 show various views of an appliance 10 having a first body 12 which defines a fluid flow path 20 through the appliance and a pair of ducts 14 which extend from the first body 12 to a second body 16. The fluid flows through the appliance from an inlet or upstream end to an outlet or downstream end.

With reference to Figures 5a, 5b, 5c and 6, the fluid flow path 20 has a fluid intake 20a at a rear end 12a of the body 12 and a fluid outflow 20b at a front end 12b of the body 12. Thus, fluid can flow along the whole length of the body 12. The fluid flow path 20 is a central flow path for the body 12 and for at least a part of the length of the body 12 the fluid flow path is surrounded and defined by a tubular housing 18. The tubular housing 18 is a bore, pipe or conduit that the generally longer that it is wide and preferably has a substantially circular cross section, however, it may be oval, square, rectangular or another shape. The first body is tubular in shape.

With reference to Figures 6, 8 and 9 in particular, a primary fluid flow path 30 will now be described. The primary fluid flow path 30 is generally annular to the fluid flow path 20 at the fluid intake end 12a of the body 12. In this particular embodiment, the primary fluid flow path 30 passes down the fist tiered section along the inner skin 112a of the outer wall 112 of the body 12 and from there down a duct 14a through the second body 16 and up the other duct 14b back into the body 12 and into a second tiered section or outlet section of the primary flow path 40. The outlet section of the primary flow path 40 is generally annular to the fluid flow path 20 and is nested between the first tier of the primary fluid flow path and the fluid flow path in the body 12. Thus for at least a portion of the length of the body 12, there is a three tiered flow path 20, 30, 40. The primary fluid flow path 30 has an inlet end, a loop and an outlet end.

There is a single opening at the inlet end 12a of the body 12 which is split into a first inlet 20a through which fluid enters the fluid flow path 20, and a second fluid inlet 30a through which fluid enters the primary fluid flow path 30. In this embodiment, the first inlet and the second fluid inlet are co-planar and are divided into two inlets by the bore 18.

The second tiered section located downstream from the first tiered section and the tiered sections are arranged in series. In this example, fluid flows in substantially the same direction through the tiered sections. The first tiered section is isolated from the second tiered section by inner tubular walls 42 and 44 and an annular wall 48 which connects between the inner walls. Both the first and second tiered sections are annular and the first tiered annular section defined by walls 112a and 44 extends about the second annular tiered section defined by walls 44 and 42..

The second body 16 houses a fan unit 160 which includes a fan and motor for driving the fan. Power is supplied to the fan unit 160 via an electric cable 18 and internal electronics 162. The cable 18 is connected to the second body 16 and has a standard household plug (not shown) at its' distal end. Thus, fluid that flows through the primary fluid flow path 30 is drawn in to an inlet section by the action of the fan unit 160. When the primary flow path 30 returns to the body 12, it becomes an outlet section of the primary flow path or second tiered section 40 which flows between two inner tubular walls 42,44 of the body 12 which are located external to tubular housing 18 and internal to the outer wall 112 of the body. Housed within the two inner walls 42,44 of the body in the outlet section of the primary fluid flow path 40 is an at least partially annular heater 46 which can heat the fluid that flows through. Thus the second tier or outlet section of the primary fluid flow path 40 is, in this embodiment the directly heated flow.

The second body 16 is tubular in shape and the longitudinal axes of the first and second bodies are parallel. The fluid flow path 20 extends through the body 12 in an axial direction. An outlet section of the primary fluid flow path 40 extends through the body 12 in an axial direction and surrounds the fluid flow path 20, and a heater 46 located within the section of the primary fluid flow path 40 for heating fluid passing through the primary fluid flow path, and the heater 46 has a length extending in the axial direction.

The tubular housing 18 is also a bore that extends through the body 12; a conduit that extends between the first fluid inlet 20a and the first fluid outlet 20b; a first external surface of the body 12 that is also an inner surface of body.

The heater 46 is preferably annular and can be of the convention type of heater generally used in hairdryers i.e. comprising a former of a heat resistant material such as mica around which a heating element, for example and nichrome wire, is wound. The former provides a scaffold for the element enabling fluid to pass around and between the element for efficient heating.

When the fan unit is operated, fluid is drawn into the primary fluid flow path 30 at the fluid inlet end 12a by the direct action of the fan unit 160. This fluid then flows through an inlet section of the primary fluid flow path along the inside 112a of the outer wall 112 of the body 12 down a first duct14a, through the fan unit 160 and returns to an outlet section of the primary fluid flow path 40 of the body 12 via the second duct 14b. The outlet section of the primary fluid flow 40 passes around a heater 46 and when the heater is switched on fluid in the outlet section of the primary fluid flow path 40 is heated by the heater 46. Once the fluid in the outlet section of the primary fluid flow path 40 has passed the heater 46 it exits from the front end 12b of the body 12 of the appliance.

The fluid flows is a generally circular motion through the primary fluid flow path; the handle means are generally U-shaped i.e. along the body in a first direction down one duct in a second direction along the second body in a third direction and up the second duct in a fourth direction which is the opposite direction to the first duct. The handles are spaced apart

When the fan unit 160 is switched on, air is drawn into the intake 30a of the primary flow path 30, through the outlet section of the primary fluid flow path 40 and out of the fluid outflow 12b of the body 12. The action of this air being drawn in at one end 12a of the body and out of the other end 12b of the body causes fluid to be entrained or

induced to flow along the fluid flow path 20. Thus there is one fluid flow (the primary flow path 30) which is actively drawn in by the fan unit and another fluid flow which is created by the fluidic movement caused by the action of the fan unit 160. This means that the fan unit 160 processes a portion of the fluid that is output from the body 12 and the rest of the fluid that flows through the body through the fluid flow path 20 passes through the body 12 without being processed by the fan unit.

The entrained fluid that passes through the fluid flow path 20 exits from a downstream end 18b of the tubular housing and combines with the fluid that exits the outlet section of the primary fluid flow path 40 near the fluid outlet 12b of the body 12. Thus the drawn flow is augmented or supplemented by the entrained flow. The second fluid outlet is annular and emits into the fluid flow path so the fluid flow paths merge within the hairdryer.

A filter 50 is provided at the fluid inlet 12a of the body 12. This filter 50 is provided to stop foreign objects such as hair and dirt particles from entering at least the primary fluid flow path 20 and travelling along the primary fluid flow path 20 to the fan unit 160 and potentially causing damage to the fan unit and/or reducing the life of the fan unit 160.

The filter 50 is preferably an annular filter that only covers the fluid flow intake of the primary fluid flow path 30, thus only the fluid that flows through the primary fluid flow path 30 is filtered by the filter 50. This has the advantage that the amount of filter material required compared to a conventional appliance is reduced as only approximately half of the cross-sectional area at the fluid intake end 12a is filtered – obviously, the exact proportions of filtered and non-filtered flow depend on the relative cross-sections of the first and primary fluid flow paths 20, 30 as well as any funnelling action due to the design of the fluid intake end of the body 12. Another advantage is that a line of sight is provided through the central or first flow path 20 of the body 12 so a person using the appliance can see through it whilst using the appliance.

In addition, where no filter or an annular filter 50 is provided, the internal surface 100 of the tubular housing is accessible from outside the appliance. In fact, the internal surface 100 of the bore or tubular housing defines a hole (the first flow path 20) through the appliance 10 and the inner surface 100 of the tubular housing is both an inner wall and a first external wall of the appliance 10.

The ducts 14 are used for conveying fluid flow around the appliance. In addition one or both of the ducts 14a, 14b additionally comprises a handle for a user to hold whilst using the appliance. The duct 14a, 14b may comprise a grippable portion on at least a part of the duct that acts as a handle to assist a user holding the appliance. The ducts are spaced apart with one duct 14a being located near the front end 12b of the body 12 and the other duct 14b being located near the rear end 12a of the body12.

The use of two body parts separated by a handle means that the appliance can be balanced, in this case by the heater being provided in one part of the body and the fan unit being provided in the second body part so their weights are offset.

Referring now to Figure 7, in this embodiment the ducts 14 are generally circular in cross section and are preferably lined with a material 140. This material 140 is for example a foam or felt for example that is used for one or more of the following: to mitigate noise from the primary fluid flow; vibrations from the fan unit 160; or as an insulator to retain heat within the fluid flow system of the appliance. The absorbing properties of the material will at least mitigate the property is question and may be tuned specifically to an appliance either by material density or lining thickness for example. The material can additionally be chosen based on resonant frequencies of the appliance. The material can additionally be chosen or tuned based on resonant frequencies of the appliance. In this way the appliance can be silenced, or manipulated tonally to improve noise characteristics to a user.

The lining material 140 is preferably flared, rounded or chamfered at one or both of the upstream 140a and downstream 140b end of the lining. This can reduce pressure losses

in the ducts and assist in reducing the noise generated as a less turbulent flow into/out of the lined portion is provided.

Important features of the invention herein described include the fact that the fan unit 160 only processes a portion, preferably around half of the fluid that flows from the fluid outflow 20b of the appliance 10 for example, the total fluid flow through the appliance is 23 l/s with around 11 l/s being drawn through the motor. The approximately 50% split of drawn to entrained fluid is not essential and can be less or more; the relative fluid flow rates are a function of losses within the duct pathways for each flow path and the configuration e.g. the diameter and cross-sectional areas of the duct pathways.

The use of a tiered flow path through the body 12 the appliance 10 is also advantageous as one or more of the fluid flow paths can be used to insulate one or more of the walls of the body. The inlet section of the primary fluid flow path and the fluid flow path act as heat sinks or thermal exchangers for the outlet section of the primary fluid flow path i.e. fluid in the centre of the body. It also results in all the fluid flowing through the body being heated whether actively or passively.

The fluid that is processed or drawn in by the fan unit 160 flows through the inlet section of the primary fluid flow path 30 and for a least a part of the flow path through the body, this fluid flows through a duct or conduit that is external to the heater 46 i.e. this primary fluid flow path 30 is between the heater 46 and an outer wall 112 of the body 12 and so provides a moving fluid insulator for the outer wall 112 of the body 12. The fluid flow will extract heat from the walls 42, 44, 112 that form the conduit or duct for the primary fluid flow 30 and therefore be heated as it passes near the heater 46. Once this pre-heated or pre-warmed fluid is drawn through the fan it exits the duct 14b into an outlet section of the primary fluid flow path or heated flow path 40. Thus, the fluid insulator is subsequently heated by the heater 46 so less heat energy is lost by the system to ambient. Heat that may have been lost to the outer body 112 is recovered thus

a higher percentage of the heat energy input to the system remains in the primary or second tier 40 of the flow.

A second embodiment is described with respect to Figures 10 and 11. In this embodiment, the appliance 200 has ducts 114 which are oval in cross-section and extend parallel to each other. There are advantages to using oval instead of circular ducts, the first is that when the duct is used as a handle it can be easier for a user to grip as the oval shape mimics the shape made by curled figures more precisely than a circular grip, the second is that the oval shape can be used to impart directionality to the ducts or handles. This feature is shown in Figure 11 where a first duct/handle 114a is oriented at right angles to a second duct/handle 114b. This directionality can make the appliance easier to use.

A third advantage is that for a grippable handle, the oval shape gives a larger cross-sectional area than the circular handle meaning that a greater flow of fluid can pass through the oval handle. This can reduce one or more of the noise produced by the appliance in operation, power consumed by the appliance and pressure or duct losses within the appliance.

Various arrangements of ducting within the body 12 are possible, some of which will now be described. Referring to Figure 12, the heater 46 is supported directly on the outer surface 18a of tubular housing 18 which is a single walled housing. The fluid that flows through the fluid flow path 20 along the inside of the tubular housing 18 provides a cooling action and will be heated slightly as it extracts heat from the housing 18. In addition, fluid that flows along the inlet section of the primary flow path 30 will also extract heat from inner wall 44 that separates the inlet section of the primary fluid flow path 30 from the heated outlet section of the primary fluid flow path 40 and isolates the inlet and outlet sections of the primary fluid flow path. Thus, the fluid that is processed or drawn in by the fan unit is pre-warmed or heated passively prior to being heated directly and provides a cooling flow for the second external or outer wall 112 of the body 12 of the appliance.

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Figure 6 shows an alternative configuration having a ducted inner wall coolant path 118 between the tubular housing 18 and inner wall 42 of the outlet section of the primary fluid flow path 40 producing a third section of the primary fluid flow path which is parallel to the outlet section of the primary fluid flow path and surrounded by the outlet section of the primary fluid flow path which contains heater 46. This ducted inner wall coolant path 118 is a closed path i.e. it does not vent out. Some of the fluid which is drawn into the primary fluid flow path 30 will pass along the ducted inner wall 118 and provide a layer of fluid insulation between the heater 46 and the outer wall of the tubular housing 18. A combination of conduction and convection through the fluid in the ducted inner wall coolant path 118 provides a cooling effect for the tubular housing 18. The third section of the primary fluid flow path is annular and the second annular section extends about the third section and is in parallel with the third section.

Figure 13 shows an arrangement having a ducted outer wall cooling path 212 providing a third section of the primary fluid flow path in parallel with the outlet section of the primary fluid flow path in combination with a closed ducted inner wall coolant path 118. In the embodiments described so far, fluid that is drawn into the body 12 flows down the ducts and back through a outlet section of the primary fluid flow path before joining entrained fluid. As a result, a portion of the body 12 near the outflow end 12b will be in direct contact with the heated fluid and may become hot. To mitigate this heating effect a ducted outer wall cooling path 212 is provided which enables fluid that is drawn into the primary fluid flow path 30 to continue within a double walled body to near the outflow end 12b of the body 12. In this example this outer wall cooling path 212 is closed so provides a cooling effect by a combination of conduction and convection through the fluid in the duct.

Figure 14 shows an alternative arrangement having a ducted outer wall cooling path 212 in combination with an open or vented ducted inner wall coolant path 218 between the tubular housing 18 and inner wall 42 of the outlet section of the primary fluid flow path 40. This ducted inner wall coolant path 218 again is located within the primary fluid

flow path 30 so some of the drawn in fluid will pass along the duct, however at the distal end, the duct vents 220 into the entrained air stream the flows through the fluid flow path 20. This combined vented and entrained fluid then combines with the drawn fluid for exit at the outflow of the body 12. As there is a constant fluid flow through this cooling duct 218 in use, it provides a constant replenishment of fluid for heat exchange with inner wall 42.

Figure 15 shows an alternative arrangement having a ducted inner wall coolant path 318 which enables some of the drawn in fluid to flow along the radially inner side of the heater 46, between the heater 46 and the tubular housing 18, before being ducted 320 into the drawn in flow path 30 at duct 14a. This has the advantage that the ducting and inner wall arrangements not only provide cooling for the outer body of the appliance but also for the inner wall which is accessible from the fluid inlet end 12a. Thus all the fluid that is used to provide cooling for the heater is subsequently drawn through the fan unit 160 and into the outlet section of the primary fluid flow path 40 to be heated by heater 46.

Figures 16 and 17 show an appliance with an alternate internal ducting arrangement. In this embodiment, the heater 46 is spaced apart from the walls 44, 18 that define the outlet section of the primary fluid flow path 40 to provide a fluid flow around as well as through the heater. An inner wall or support 142 is provided spaced from tubular housing 18 by a spacer 242 thus, fluid entering the third or heated flow path 40 can pass through the heater 46, around the outer edges of the heater between the heater and inner wall or support 44 which separates the second 30 and third 40 fluid flow paths and in a flow path 40a created between the heater 46 and the tubular housing 18 by the wall 142. At the downstream end of the heater, wall 142 ends allows the two fluid flow paths 40 and 40a to recombine 40b prior to the first and primary fluid flow paths combining at the downstream end 18b of the tubular housing 18.

By having the air gap between the heater 46 and the tubular housing 18 which is defined by inner wall 142, the tubular housing is not directly heated by the heater thus, the inner

surface of the tubular wall remains relatively cool. In addition, a cooling effect is provided to the tubular housing 18 by entrained fluid that passes through the fluid flow path 20 which is defined by the tubular housing 18 as the fluid extracts heat from the tubular housing. The wall 142 need not be a solid wall, and may include slots or perforations which enables fluid to flow between the two fluid flow paths 40 and 40a.

Figures 18 and 19 show an appliance where the entrained and drawn fluids do not combine prior to exiting the body 12 at the outlet end 12b.

The inner ducting of the outlet section of the primary fluid flow path 240 may be any one of those described with respect to other embodiments of the invention. In this example, the outlet section of the primary fluid flow path 240 is similar to that described with respect to Figure 6 i.e. a configuration having a ducted inner wall coolant path 118 between the tubular housing 18 and inner wall 42 of the outlet section of the primary fluid flow path 240 which contains heater 46. This ducted inner wall coolant path 118 is a closed path i.e. it does not vent out. Some of the fluid which is drawn into the primary fluid flow path 30 will pass along the ducted inner wall 118 and provide a layer of fluid insulation between the heater 46 and the outer wall of the tubular housing 218.

The bore or tubular housing 218 begins as in the other examples herein described at the inlet end 12a of the body 12. However, the tubular housing 218 continues for the whole length of the body 12 to the outlet end 12b of the body. In this manner an annular outflow 242 of the outlet section of the primary fluid flow path or heated fluid flow path 240 is provided at the outlet end 12b of the body. The annular outflow 242 extends about the outlet of the fluid flow path. Thus, the entrained and drawn in fluids do not combine within the body of the appliance they combine at the outflow or downstream exit of the appliance. This provides a high velocity jet or free jet of heated fluid at the outflow which is annular and surrounds the entrained and only partially heated flow which exits from the fluid flow path 20.

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The primary fluid flow path 230 is as described with respect to other examples and has a ducted outer wall cooling path 212 to provide cooling to the outer surface of the body 12 towards the outflow end 12b of the body.

Figure 20 shows an appliance 300 having a filter 350 which is a grill like filter which covers the primary fluid flow path 30, leaving the majority if not all of the central fluid flow path (the fluid flow path) 20 open and unfiltered. The filter 350 may additionally comprise a mesh of material which is disposed between the grills of the filter.

Figures 21, 22a and 22b show an appliance having an oval shaped body 62. The fluid flow path 70 is defined by a tubular housing having an oval cross section 68. An annular and oval shaped primary fluid flow path 80 surrounds the fluid flow path 70 at the inlet end 62a of the body 62. Fluid is drawn into the primary fluid flow path 80, down first duct 74a into a second body 66 by the action of a fan unit 160 located in the second body 66 as has been previously described. The fluid then flows through the second duct 74b to an outlet section of the primary fluid flow path 90. This outlet section of the primary fluid flow path 90 is also oval in cross section and contains an oval heater 96.

In this example the major and minor axes X-X and Y-Y respectively of the first, second and outlet section of the primary fluid flow paths all have the same centre Z i.e. are concentric however, this is not essential. In addition, the second body 66 is shown as being generally circular but it may match the external shape of the first body 62. The ducts 74a and 74b are shown as being generally circular but may be oval and one or both of the ducts 74a, 74b may comprise handles that are capable of being gripped by a user of the appliance.

Figures 23, 24a and 24b show an appliance 250 having substantially circular flow paths which are non-concentric.

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The first 270 and third 290 fluid flow paths are concentric i.e. have a common centre 292 within the body 272 of the appliance. Thus, the heater 296 is also substantially concentric within the outlet section of the primary fluid flow path 290 and this has the advantage that fluid is heated evenly around the cross section of the outlet section of the primary fluid flow path so there are no hot spots in the fluid the exits the body at the outflow end 272a of the body 272. The first 270 fluid flow path is defined by tubular housing 274 and the first 270 and third 290 fluid flow paths are enclosed within inner wall or duct 294. This inner wall 294 is offset with respect to the outer wall 262 of the body 272 so is non-concentric to the outer wall 262 of the body 272.

The outer wall 262 has a centre 298 which is therefore offset from the centre 292 of the inner wall 294 and features of the appliance including 270, 274, 294, 290 and 296. A filter 278 is provided at the fluid inlet of the primary fluid flow path 280 and so is a ring shaped filter with a substantially constant outer diameter defined by outer wall 262 of the body 272. The inner diameter varies around the ring as the inner surface of the filer 278a is defined by the tubular housing 274.

Alternatively, an inner wall 268, 294 is non-concentric to the external wall 262 for only part of the flow path. For example, the middle or third flow path 290 is defined by walls 294, 268 which are non-concentric to the tubular housing 274, heater 296 and external wall 262 in the region where the primary flow path passes 280 into the third flow path 290. In other words, the walls 268, 294 which define the third flow path 290 where duct flow 298 enters the third flow path 290 are non-concentric to improve the aerodynamics of fluid flow where the direction of the fluid flow changes. The skilled person will appreciate that a number of different configurations are possible.

Figure 25 shows an appliance 360 having a having a first body 362 which defines a fluid flow path 364 through the appliance and a pair of ducts 366 which extend from the first body 362 to a second body 368. The fluid flows through the appliance from an inlet or upstream end 362a to an outlet or downstream end 362b.

The fluid flow path 364 has a fluid intake 364a at a rear end 362a of the body 362 and a fluid outlet 364b at a front end 362b if the body 362. The fluid flow path 364 is a central flow path of the body 362 and is surrounded and defined by a generally tubular housing 370.

A primary fluid flow path 372 is provided at the fluid inlet end 362a of the body and is generally annular to the fluid flow path 364. A filter 374 is provided to filter fluid that flows into the primary fluid flow path 372. The primary fluid flow path 372 passes into the first body 362 then through a first duct 366a to the second body 368 and up the other duct 366b back into the body 362. In this embodiment, the first duct 366a of the primary fluid flow path 372 is that nearest the fluid intake end 362a of the body. The flow path through the ducts is thus the reverse of previous examples.

The second body 368 houses a fan unit 74 and fluid is drawn into the primary fluid flow path by the action of the fan unit. This induces or entrains fluid into the fluid flow path 364.

When the primary fluid flow path 372 returns to the first body 362 a fluid chamber 376 is provided. The outer wall 378 of the chamber is a part of an outer wall of the first body 362. Radially inward of the outer wall 378 is a perforated inner wall 380 which provides fluid communication to a heater 382. After flowing through the heater 382, heated fluid combines with the entrained fluid of the fluid flow path 364 at an upstream end 370b of the tubular housing 370.

The flow path from the chamber to mixing of the heated fluid can be considered to be an inlet section of the primary fluid flow path and thus for a portion of the length of the body 362, a three tiered flow path is provided. Fluid in the chamber 376 cools the outer wall 378 and is pre-heated by heat radiating from the inner perforated wall 380. Thus, the chamber provides a thermally insulating barrier between the heater 382 and the external wall 362. The chamber 376 extends about a periphery of the heater 382.

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An alternative arrangement of the primary fluid flow path is shown in Figure 26. In this arrangement, the chamber 376 is provided with a solid inner wall 386 that forces fluid to flow along a part of the first body 362 in the reverse direction or the direction opposite 384 to that of the entrained fluid of the fluid flow path 364. The primary fluid flow path is zigzagged. The reverse direction 384 of the flow path is turned to flow towards the outlet end 362b of the body, flows through the heater 388 and joins entrained fluid at the end 370b of the tubular housing 370. The fluid from the chamber 376 thus encounters the heater somewhere in the middle of the length of the first body 362.

In Figure 27, another arrangement is shown where the combining of the heated and entrained fluid flows occurs in the middle of the first body 362 rather than near or at the downstream end 362b. The chamber is provided with a solid inner wall 390 and fluid flows from the second duct 366b into the chamber 376 and then along a part of the first body 362 in the reverse direction 384 to that of the entrained fluid of the fluid flow path 364. The heater 392 is provided within this reverse flow section. Once fluid has been heated by the heater 392 it is turned by internal ducting 396 to face the downstream end 362b of the body and joins the entrained fluid of the fluid flow path 364 at the downstream end 394b of a inlet section of the tubular housing 394.

In these embodiments, the chamber 376 comprises two parallel sections, and a first one of the parallel sections extends through the fluid chamber 378a and a second one of the parallel sections extends through the heater 378b.

In this embodiment, the tubular housing 394 that defines the fluid flow path is split into two sections 394, 394a. A gap between the two sections 394, 394a enables the heated fluid to mixing with the entrained fluid flow at the downstream end 394b of the inlet section of the tubular housing 394. Thus, mixing of the two fluid flow paths occurs around the downstream end of the heater 392 or the middle of the first body 262. Once the two fluid flow paths have mixed, the second section 394a of the tubular housing guides the fluid flow to the outlet end 362b of the body 362.

The embodiments of Figures 25 to 27 all include a ducted outer wall cooling path 398 which enables some of the fluid that is drawn into the chamber 376 to flow within a double walled body to or near to the outflow end 362b of the body 362. This provides a cooling effect by a combination of conduction and convection through the fluid in the duct 398. Thus, the chamber in effect extends about the first fluid outlet 364b via the ducted outer wall cooling path 398.

Figures 28 and 29 show an alternate appliance 600 according to the invention. In this example, there is a first body 612 which defines a fluid flow path 620 through the appliance and a pair of ducts 614 which extend from the first body 612 to a second body 616.

The fluid flow path 620 has a fluid intake 620a at a rear end 612a of the body 612 and a fluid outflow 620b at a front end 612b of the body 612. Thus, fluid can flow along the whole length of the body 612. The fluid flow path 620 is a central flow path for the body 612 and for at least a part of the length of the body 612 the fluid flow path is surrounded and defined by a tubular housing 618. The tubular housing 618 is a duct, pipe or conduit that the generally longer that it is wide and preferably has a substantially circular cross section, however, it may be oval, square, rectangular or another shape.

A primary fluid flow path 630 is provided having an inlet 632 provided in body 612 spaced apart from the rear end 612a of the body. In this example, the inlet 632 is generally annular and comprises a plurality of apertures 632a. The apertures 632a are spaced and sized so as to act as a filter to dirt and hair ingress. The primary fluid flow path 630 flows from the inlet 632 into the body 612 of the appliance and from there down a duct 614a, through the second body 616 and up the other duct 614b back into the body 612 and into a third or outlet section of the primary fluid flow path 640. The outlet section of the primary fluid flow path 640 is generally annular to the fluid flow path 620 and is nested between the first and primary fluid flow paths for at least a part of the length of body 612. Thus for at least a portion of the length of the body 612, there is a three tiered flow path 620, 630, 640.

The second body 616 houses a fan unit 660 which includes a fan and motor for driving the fan. Thus, fluid that flows through the primary fluid flow path 630 is drawn in by the action of the fan unit 660. When the primary flow path 630 returns to the body 612, it becomes a outlet section of the primary fluid flow path 640 which flows between two inner walls 618,644 of the body 612. Housed within the two inner walls 618, 644 of the body is an at least partially annular heater 646 which can heat the fluid that flows through the outlet section of the primary fluid flow path 640. Thus the third or outlet section of the primary fluid flow path 640 is, in this embodiment the directly heated flow.

The heater 646 is preferably annular and is offset from tubular housing 618 by an inner duct 642. The outlet section of the primary fluid flow path has a first flow path 630 through and around the heater 640 and a flow path 640a created between the heater 646 and tubular wall 618 by inner wall 642.

When the fan unit is operated, fluid is drawn into the primary fluid flow path 630 at the inlet 632 by the direct action of the fan unit 660. This fluid then flows around a space created between the inlet 632 and inner wall 644 i.e. around the inner wall that surrounds the heater 646 down a first duct 614a, through the fan unit 660 and returns to a outlet section of the primary fluid flow path 640 of the body 612 via the second duct 614b. The outlet section of the primary fluid flow 640 passes around a heater 646 and when the heater is switched on fluid in the outlet section of the primary fluid flow path 640 is heated by the heater 646. Once the fluid in the outlet section of the primary fluid flow path 640 has passed the heater 646 it exits from the front end 612b of the body 612 of the appliance.

When the fan unit 660 is switched on, air is drawn into the intake 632 of the primary flow path 630, through the outlet section of the primary fluid flow path 640 and out of the fluid outflow 612b of the body 612. The action of this air being drawn into and out of the body causes fluid to be entrained or induced to flow along the fluid flow path

620. Thus there is one fluid flow (the primary flow path 630) which is actively drawn in by the fan unit and another fluid flow which is created by the fluidic movement caused by the action of the fan unit 660. This means that the fan unit 660 processes a portion of the fluid that is output from the body 612 and the rest of the fluid that flows through the body through the fluid flow path 620 passes through the body 612 without being processed by the fan unit.

The entrained fluid that passes through the fluid flow path 620 exits from a downstream end 618b of the tubular housing and combines with the fluid that exits the outlet section of the primary fluid flow path 640a near the fluid outlet 612b of the body 612. Thus the drawn flow is augmented or supplemented by the entrained flow. In addition, this entrained fluid acts as a moving insulator, or a cooling flow for the tubular housing 618 which is accessible from the rear end 612a of the body.

The ducts 614 are used for conveying fluid flow around the appliance. In addition one or both of the ducts 614a, 614b additionally comprises a handle for a user to hold whilst using the appliance. The duct 614a, 614b may comprise a grippable portion on at least a part of the duct that acts as a handle to assist a user holding the appliance.

The outlet section of the primary fluid flow path 640 is surrounded and defined by a wall 644, 644a. For part of the outlet section of the primary fluid flow path the surrounding wall is the outer wall 644a of the body, however in the region of the heater 646, this surrounding wall is an internal wall 644 and the outer wall of the body is the inlet 632 of the primary fluid flow path 630. Thus fluid that is drawn into the primary fluid flow path 630 provides a cooling flow for the wall 644, 644a which surrounds the heater 646 and outlet section of the primary fluid flow path 640. In addition, this results in fluid that flows along the primary fluid flow path 630 being pre-warmed by the heater before it is processed by the fan unit 660 and directly heated by the heater 646 i.e. it is fluid that is processed or drawn in by the fan unit 660 which is directly heated by the heater. Also, fluid that flows along the primary fluid flow path 630 acts as a moving fluid insulator for the outer wall 644, 632 of the body 612.

For all the embodiments described, the inner opening at one or other end of the appliance can be used to store the appliance for example, by hooking the inner opening onto a retainer such as a hook or nail for convenient storage and retrieval as required.

In all the embodiments described herein, the heater 46, 96, 296, 382, 388, 392, 646, 746, 846 is inaccessible from one or more of the inlet and outlet of the appliance. Referring to Figure 12 for simplicity, at the inlet end 12a of the body 12 the tubular housing 18 surrounds the internal surface of the heater 46, thus any foreign object that enters the inlet will not directly contact the heater. In fact, when the fan unit is switched on, anything loose that enters the inlet will be drawn in and through the body by the entrained fluid.

At the outlet 12b, depending on the configuration of the internal ducting, there may be a small indirect passage to the heater but as the downstream end 18b of the tubular housing 18 is further downstream that the heater 46 anything inserted would not have a direct line of sight to the heater and would have to be thinner and longer than say a child's finger to reach the heater. In addition when the appliance is switched on entrained fluid will be blowing the other way, accidental ingress of objects at this end 12b is unlikely. Obviously, the downstream end 18b of the tubular housing will be hot when the heater is on but not as hot as the heater. This is useful from a safety aspect. If something is inserted into the appliance, it cannot contact the heater directly.

Figures 30 and 31 show a one handled two bodied appliance 700 having a first body 712 which defines a fluid flow path 720 through the appliance and a duct 714 which extends from the first body 712 to a second body 716.

The fluid flow path 720 has a fluid intake 720a at a rear end 712a of the body 712 and a fluid outflow 720b at a front end 712b of the body 712. Thus, fluid can flow along the whole length of the body 712. The fluid flow path 720 is a central flow path for the

body 712 and for at least a part of the length of the body 712 the fluid flow path is surrounded and defined by a tubular housing 718.

A primary fluid flow path 730 is provided. The primary fluid flow path 730 has a filter covered inlet 730a in the second body portion 716. A fan assembly 760 which includes a fan and a motor is also provided in the second body portion 716 and fluid is drawn into the primary fluid flow path 730 by the fan assembly 760. Fluid that enters the inlet 730a is drawn in by the fan assembly 760, through the second body portion 716 into duct 714. The inlet 730a is covered by a filter which filters fluid before it reaches the fan assembly i.e. it is a pre-motor filter. Where duct 714 meets the body 712, the primary fluid flow path 730 is defined by the outer wall 780 of the body 712 and the tubular housing 718. Housed within this primary flow path between the two walls 780, 718 of the body is an at least partially annular heater 746 which can heat the fluid that flows through the primary flow path 730. Thus fluid which is drawn into the appliance is subsequently directly heated by the heater.

The entrained fluid that passes through the fluid flow path 720 exits from a downstream end 718b of the tubular housing and combines with the fluid that exits the primary fluid flow path 730 near the fluid outlet 712b of the body 712. Thus the drawn flow is augmented or supplemented by the entrained flow.

Figures 32 and 33 show a one handled appliance 800 having a body 812 which defines a fluid flow path 820 through the appliance and a duct 814 which extends from the first body 812.

The fluid flow path 820 has a fluid intake 820a at a rear end 812a of the body 712 and a fluid outflow 820b at a front end 812b of the body 812. Thus, fluid can flow along the whole length of the body 812. The fluid flow path 820 is a central flow path for the body 812 and for at least a part of the length of the body 812 the fluid flow path is surrounded and defined by a tubular housing 818.

A primary fluid flow path 830 is provided. The primary fluid flow path 830 has a filtered inlet 830a in the duct 814. A fan assembly 860 which includes a fan and a motor is also provided in the duct 814 and fluid is drawn into the primary fluid flow path 830 by the fan assembly 860. Fluid that enters the inlet 830a is drawn in by the fan assembly 860, through the duct 814 and into the body 812. The inlet 830a is covered by a filter which filters fluid before it reaches the fan assembly i.e. it is a pre-motor filter. In the body 812, the primary fluid flow path 830 is defined by the outer wall 880 of the body 812 and the tubular housing 818. Housed within this primary flow path between the two walls 880, 818 of the body is an at least partially annular heater 846 which can heat the fluid that flows through the primary flow path 830. Thus fluid which is drawn into the appliance is subsequently directly heated by the heater.

The entrained fluid that passes through the fluid flow path 820 exits from a downstream end 818b of the tubular housing and combines with the fluid that exits the primary fluid flow path 830 near the fluid outlet 812b of the body 812. Thus the drawn flow is augmented or supplemented by the entrained flow.

In the embodiments shown in Figures 18,19 and 27 as the tubular housing 218, 394 extends for the whole length of the body 12, there is only a small annular opening for access to the heater.

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.

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CLAIMS

1. A hairdryer comprising a body, a fan unit and a duct for conveying fluid to the body, wherein the duct comprises a fluid inlet located at or near an end of the duct which is remote from the body, and the fan unit is disposed in the duct between the inlet and the body, wherein a portion of the duct is lined with a material and wherein the lined portion of the duct is disposed between the fan assembly and the body.

2. A hairdryer according to claim 1, wherein a lined portion of the duct is disposed between the fluid inlet and the fan assembly.

3. A hairdryer according to claim 1 or claim 2, wherein the material is a foam or a felt.

4. A hairdryer according to any preceding claim, wherein the material is a sound absorbing material.

5. A hairdryer according to any preceding claim, wherein the material is a vibration absorbing material.

6. A hairdryer according to any preceding claim, wherein the material is an insulator.

7. A hairdryer according to any preceding claim, wherein the material is tuned to resonant frequencies of the hairdryer.

8. A hairdryer according to any preceding claim, wherein the fan unit is disposed approximately mid way between the inlet and the body.

9. A hairdryer according to any preceding claim, wherein the duct comprises a handle portion of the hairdryer.

10. A hairdryer according to claim 9, wherein the fan unit is upstream of the handle portion.

11. A hairdryer according to any preceding claim, wherein a primary fluid flow path extends from the fluid inlet to a fluid outlet.

12. A hairdryer according to claim 11, wherein the primary fluid flow path is non-linear.

13. A hairdryer according to claim 11 or 12, wherein the primary fluid flow path extends at least partially through the body to the fluid outlet.

14. A hairdryer according to any preceding claim, wherein the duct has a circular cross-section.

15. A hairdryer according to any preceding claim, wherein the duct comprises a first handle portion and a second handle portion of the hairdryer, and wherein each handle portion is lined with said material.

16. A hairdryer according to claim 15, wherein the fan unit is located within a section of the primary fluid flow path located fluidly between the handle portions of the duct.

17. A hairdryer according to any preceding claim, wherein a heater is provided and the heater is located in the body.

18 A hairdryer according to claim 17, wherein the heater is located in the primary fluid flow path.

19. A hairdryer according to claim 17 or claim 18, wherein the heater is annular in shape.

20. A hairdryer according to any of claims 17 to 19, wherein the heater is tubular in shape.

21. A hairdryer according to any preceding claim, comprising a fluid flow path extending through the body.

22. A hairdryer according to claim 21, wherein fluid is drawn through the fluid flow path by fluid emitted from the fluid outlet of the primary fluid flow path.

23. A hairdryer according to claim 21 or claim 22, wherein that the fluid flow path passes linearly through the body.

24. A hairdryer according to any of claims 21 to 23, wherein the fluid flow path is defined by a bore extending through the body.

25. A hairdryer according to claim 24, wherein that the bore is an external wall of the body of the hairdryer.

26. A hairdryer according to claim 24 or claim 25, wherein the bore at least partially defines the fluid outlet.

27. A hairdryer according to any of claims 24 to 26, wherein the bore surrounds the heater.

28. A hand held appliance comprising a body, a fan unit and a duct for conveying fluid to the body, wherein the duct comprises a fluid inlet located at or near an end of the duct which is remote from the body, and the fan unit is disposed in the duct between the inlet and the body, wherein a portion of the duct is lined with a material wherein the lined portion of the duct is disposed between the fan assembly and the body.

29. An appliance according to claim 28, wherein a lined portion of the duct is disposed between the fluid inlet and the fan assembly.

30. An appliance according to claim 28 or claim 29, wherein the material is a foam or a felt.

31. An appliance according to any of claims 28 to 30, wherein the material is a sound absorbing material.

32. An appliance according to any of claims 28 to 31, wherein the material is a vibration absorbing material.

33. An appliance according to any of claims 28 to 32, wherein the material is an insulator.

34. An appliance according to any of claims 28 to 33, wherein the material is tuned to resonant frequencies of the hairdryer.

35. An appliance according to any of claims 28 to 34, wherein the fan unit is disposed approximately mid way between the inlet and the body.

36. An appliance according to any of claims 28 to 35, wherein the duct comprises a handle portion of the hairdryer.

37. An appliance according to claim 36, wherein the fan unit is upstream of the handle portion.

38. An appliance according to any of claims 28 to 37, wherein a primary fluid flow path extends from the fluid inlet to a fluid outlet.

39. An appliance according to claim 38, wherein the primary fluid flow path is non-linear.

40. An appliance according to claim 38 or 39, wherein the primary fluid flow path extends at least partially through the body to the fluid outlet.

41. An appliance according to any of claims 28 to 40, wherein the duct has a circular cross-section.

42. An appliance according to any of claims 28 to 41, wherein the duct comprises a first handle portion and a second handle portion of the hairdryer, and wherein each handle portion is lined with said material.

43. An appliance according to claim 42, wherein the fan unit is located within a section of the primary fluid flow path located fluidly between the handle portions of the duct.

44. An appliance according to any of claims 28 to 43, wherein a heater is provided and the heater is located in the body.

45 An appliance according to claim 44, wherein the heater is located in the primary fluid flow path.

46. An appliance according to claim 44 or claim 45, wherein the heater is annular in shape.

47. An appliance according to any of claims 44 to 46, wherein the heater is tubular in shape.

48. An appliance according to any of claims 28 to 47, comprising a fluid flow path extending through the body.

49. An appliance according to claim 48, wherein fluid is drawn through the fluid flow path by fluid emitted from the fluid outlet of the primary fluid flow path.

50. An appliance according to claim 48 or claim 49, wherein that the fluid flow path passes linearly through the body.

51. An appliance according to any of claims 48 to 50, wherein the fluid flow path is defined by a bore extending through the body.

52. An appliance according to claim 51, wherein that the bore is an external wall of the body of the hairdryer.

53. An appliance according to claim 51 or claim 52, wherein the bore at least partially defines the fluid outlet.

54. An appliance according to any of claims 51 to 53, wherein the bore surrounds the heater.

55. An appliance as substantially herein described with reference to the Figures.

Application No:	GB1304982.0	**Examiner:**	Mr David McWhirter
Claims searched:	1-55	**Date of search:**	21 July 2013

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1, 6, 9, 11-14, 17-21, 28, 33, 36, 38-41 & 44-48	JP 2004000312 A (HITACHI MAXELL) see English abstract and figure 1
A	None	US 5133043 A (BAUGH)
A	None	US 2011/203128 A1 (RODRIGUES)
A	None	US 5875562 A (FOGARTY)

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC[X] :

Worldwide search of patent documents classified in the following areas of the IPC

A45D; F24H

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI

International Classification:

Subclass	Subgroup	Valid From
A45D	0020/10	01/01/2006
F24H	0003/04	01/01/2006

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(21) Application No: 1304984.6

(22) Date of Filing: 19.03.2013

(30) Priority Data:
(31) 1205687 (32) 30.03.2012 (33) GB

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MALMESBURY, Wiltshire, SN16 0RP, United Kingdom

(51) INT CL:
A45D 20/12 (2006.01) *F24H 3/04* (2006.01)

(56) Documents Cited:
GB 2482548 A CN 202146022 U
US 20070294909 A

(58) Field of Search:
INT CL A45D, F24H
Other: EPODOC, WPI

(54) Title of the Invention: **A hand held appliance**
Abstract Title: **Hand held blower with heater**

(57) A hand held appliance such as a hairdryer comprises a body 12, a fluid flow path 20 extending through the body 12 from a first fluid inlet 12a to a first fluid outlet 12b. A further primary fluid flow path 30 extends from a second fluid inlet 30a through to a second fluid outlet 40. A heater 46 is provided in the primary fluid flow path 30 and has a length extending in an axial direction of the body 12. The heater is preferably annular or tubular in shape. Fluid flowing through the primary flow path 30, drawn by the fan 160, is heated by the heater 46. It then exits the annular outlet 12b and sucks fluid through the tubular housing 18 along the fluid flow path 20 through a process of entrainment.

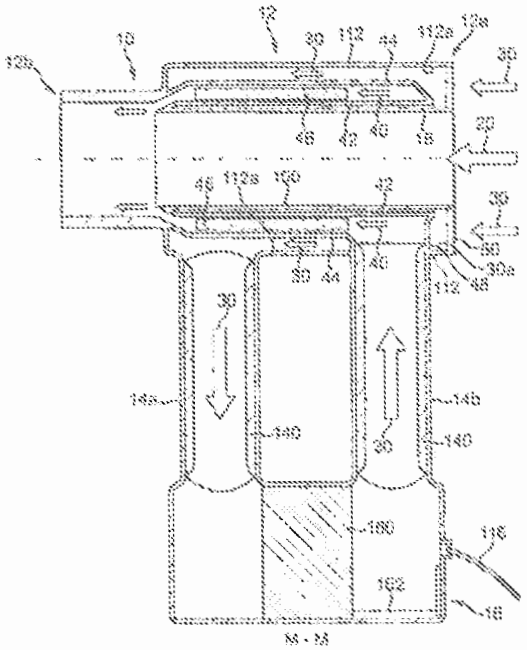


FIG. 8

GB 2500800 A

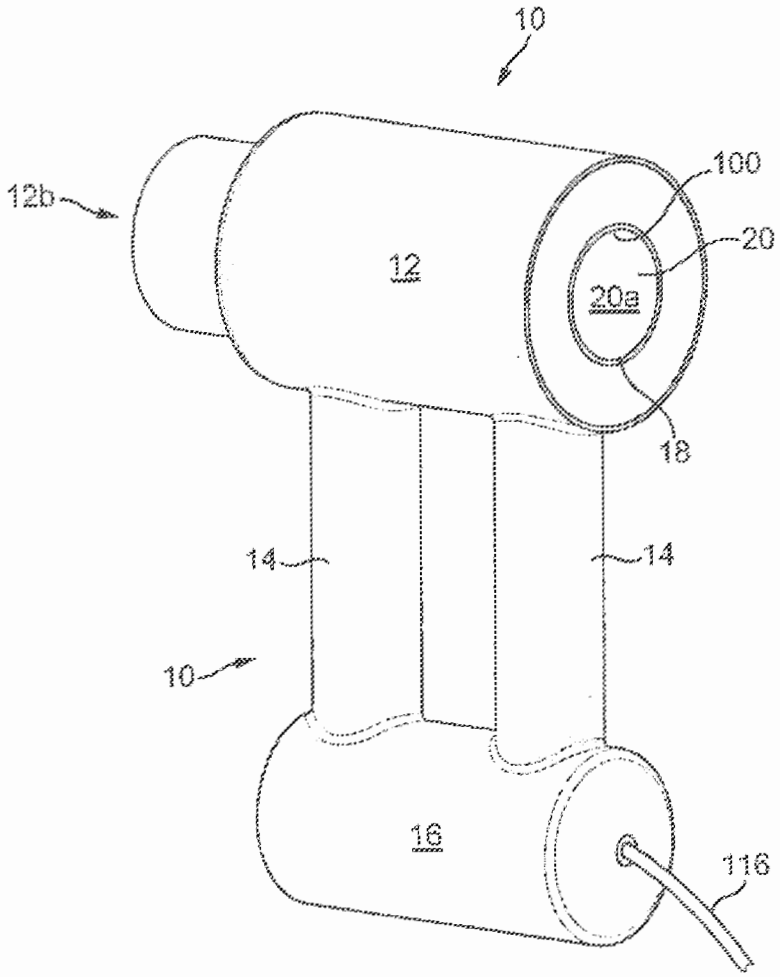

10
12b
100
20
12
20a
18
14
14
10
16
116

FIG. 1

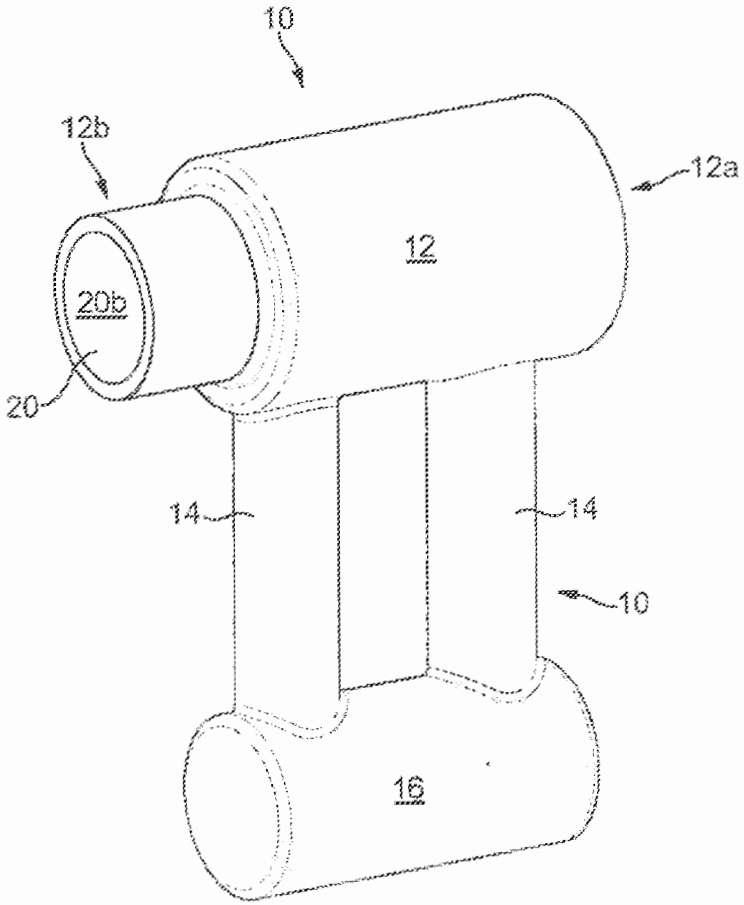

10
12b
12a
12
20b
20
14
14
10
16

FIG. 2

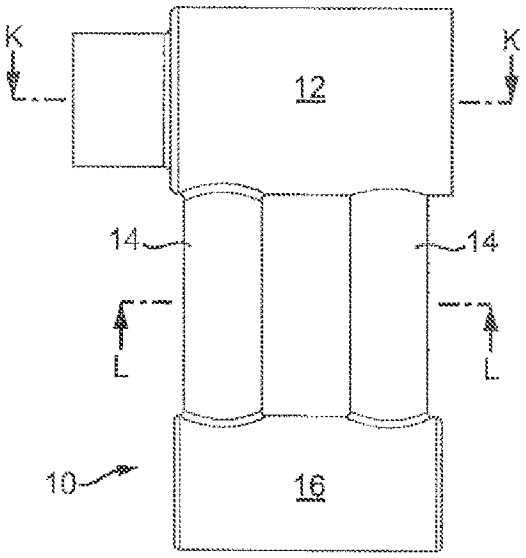


FIG. 3

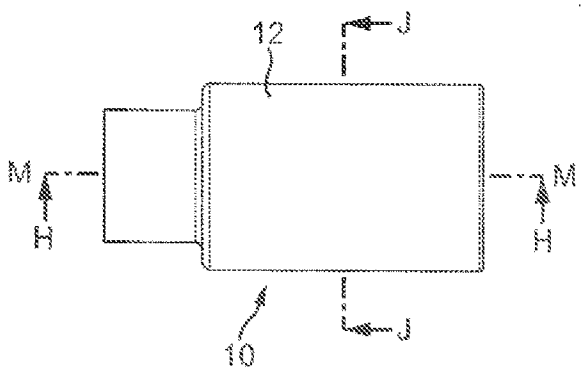


FIG. 4

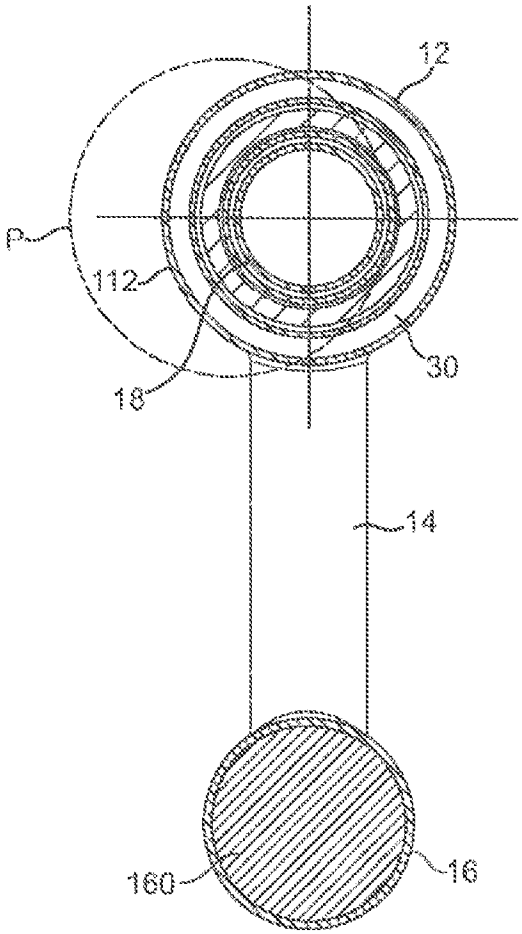


FIG. 5a

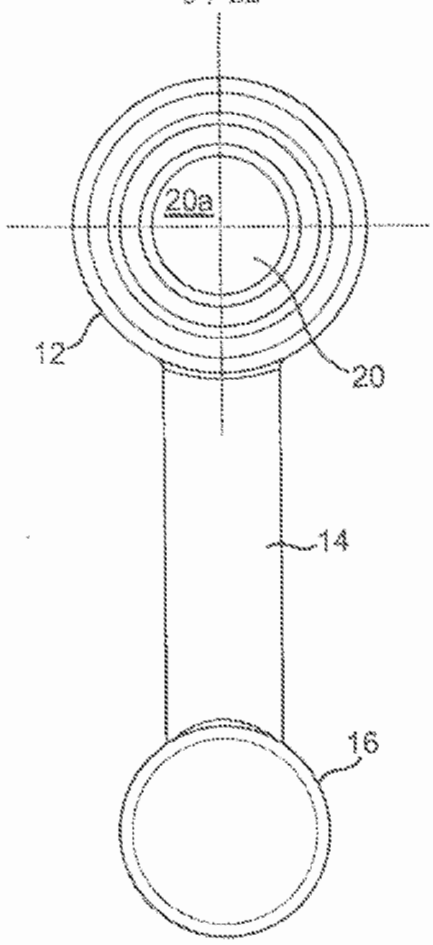


FIG. 5b

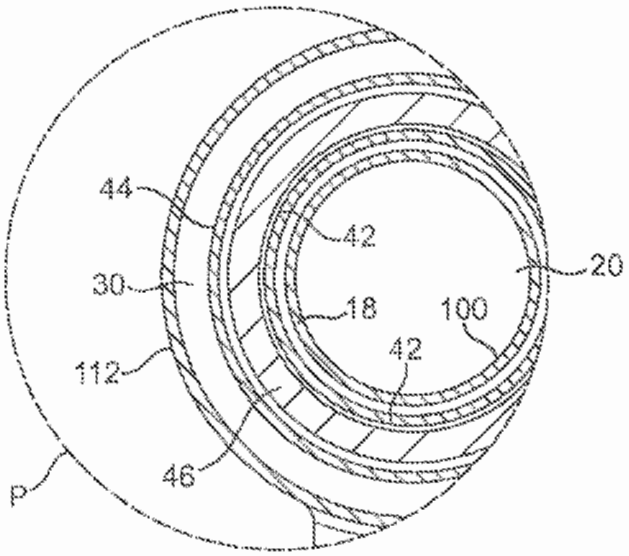


FIG. 5c

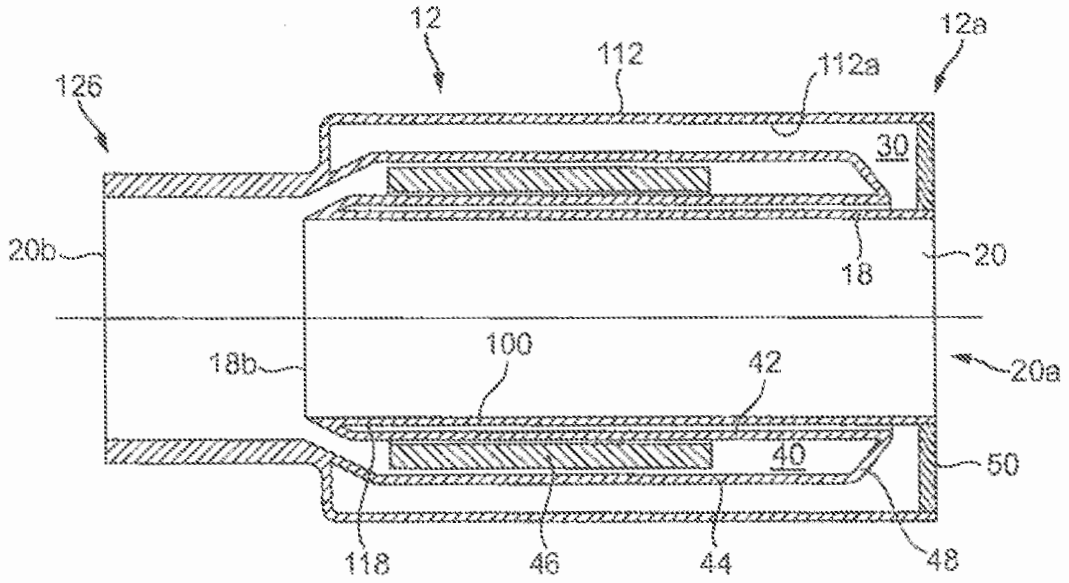

12
112
112a
12a
126
30
20b
18
20
18b
100
42
20a
40
50
118
46
44
48

FIG. 6

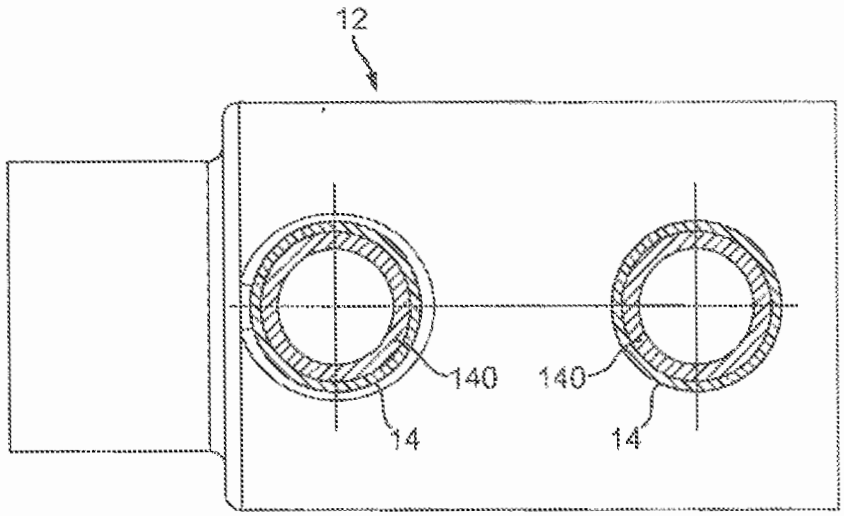

12
140
140
14
14

FIG. 7

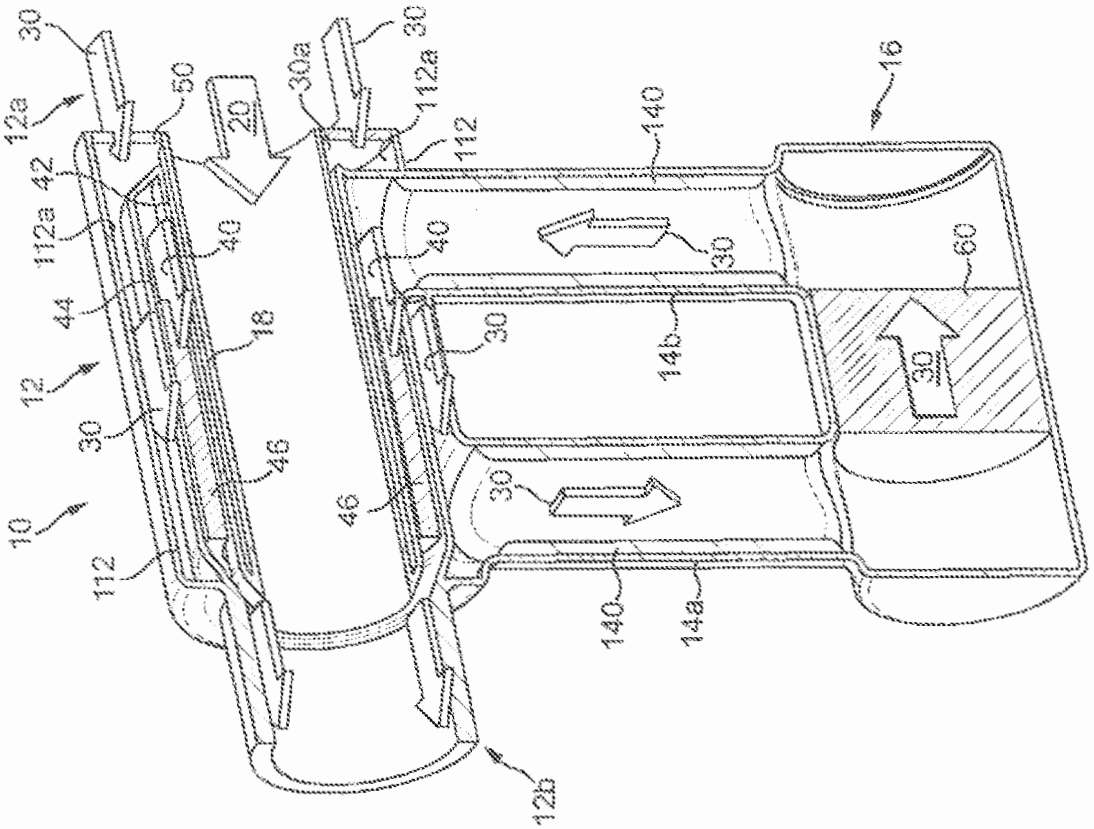


FIG. 9

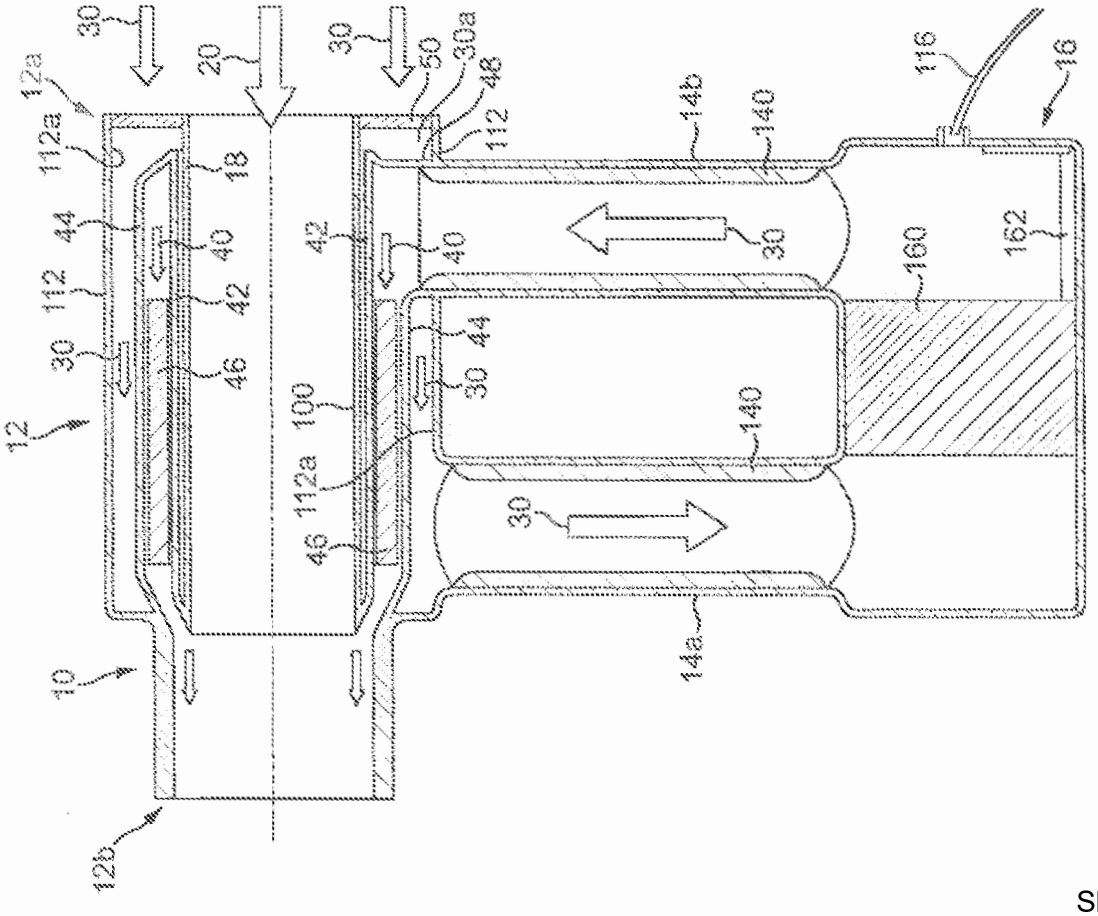


FIG. 8

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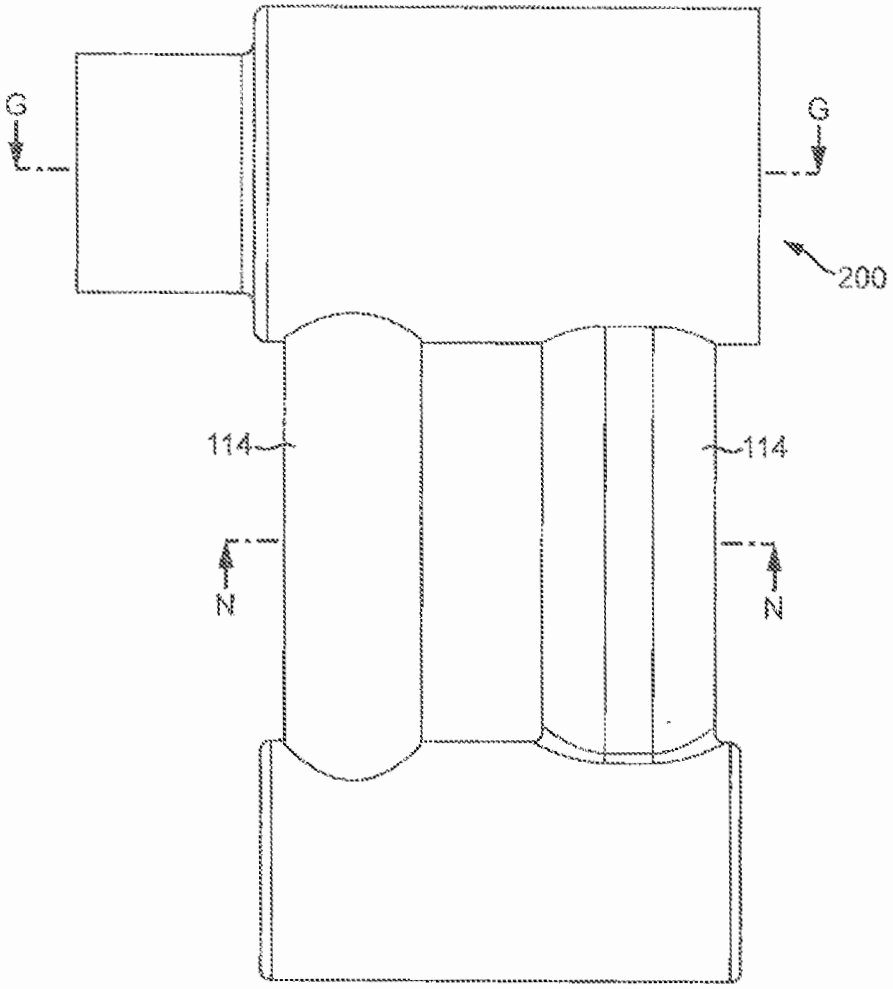


FIG. 10

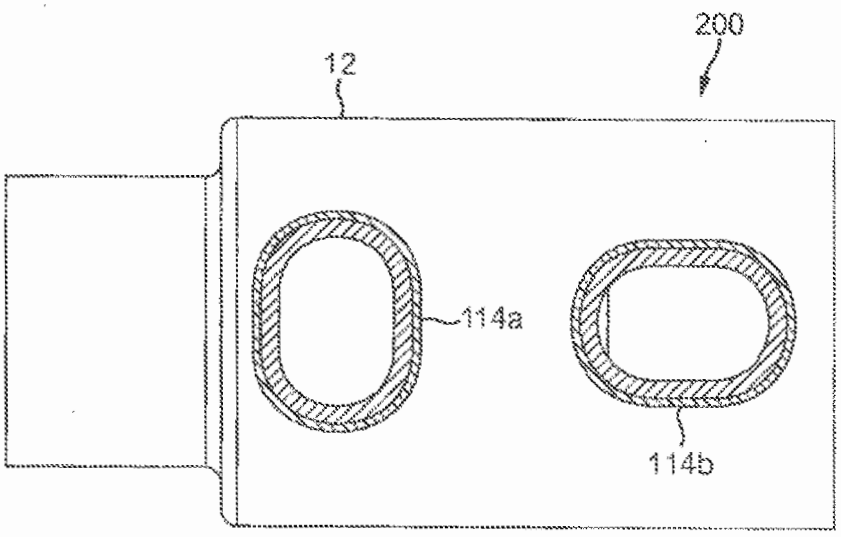


FIG. 11

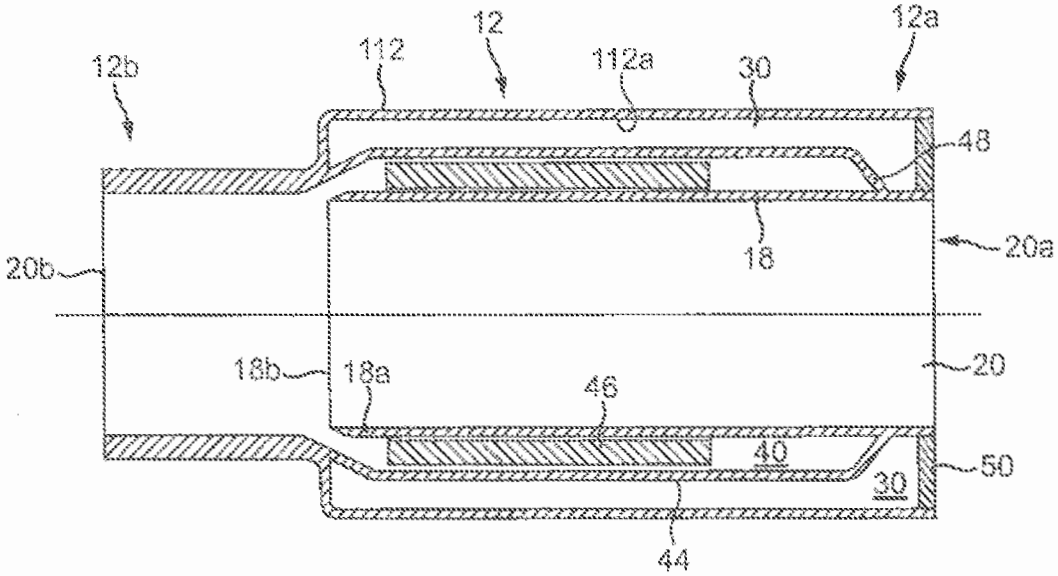

12b
112
12
112a
30
12a
48
18
20a
20b
18b
18a
46
20
40
50
30
44

FIG. 12

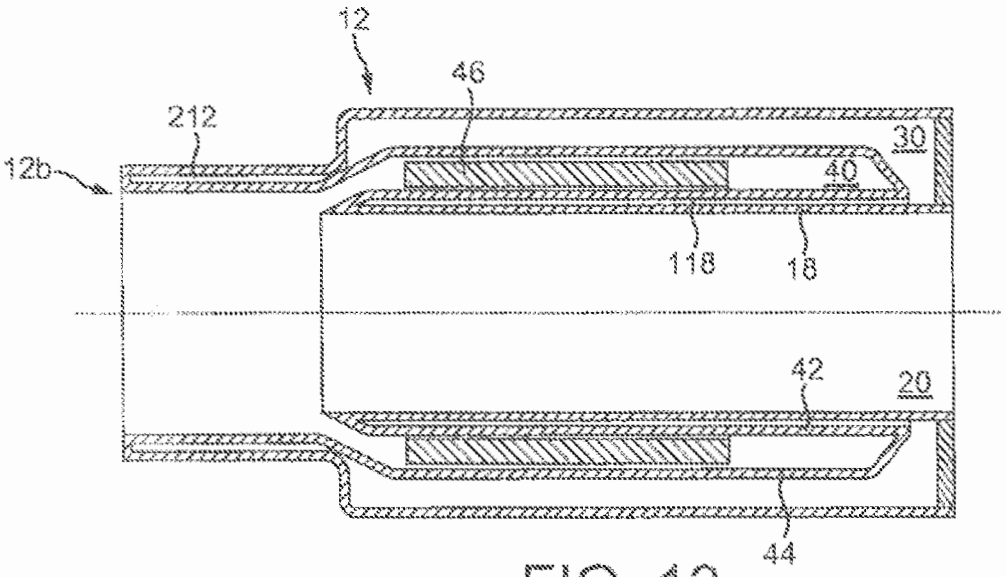

12
46
212
30
12b
40
118
18
42
20
44

FIG. 13

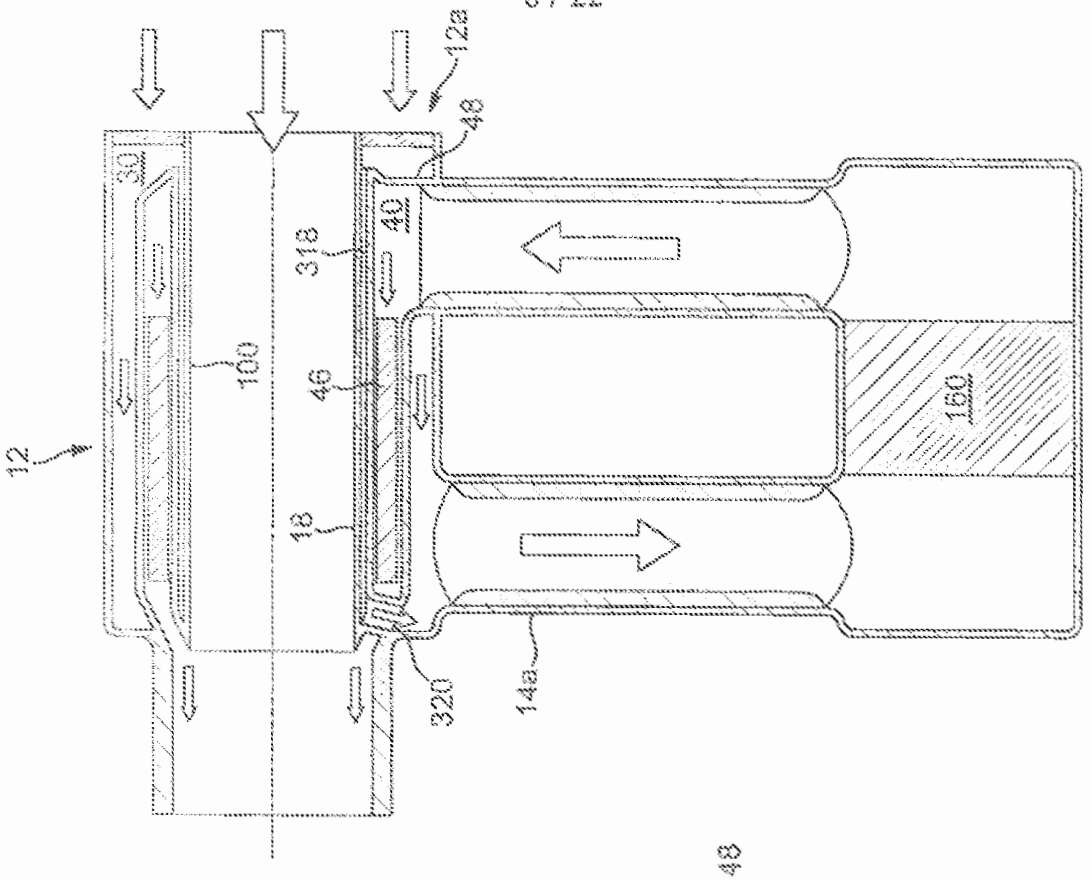


FIG. 15

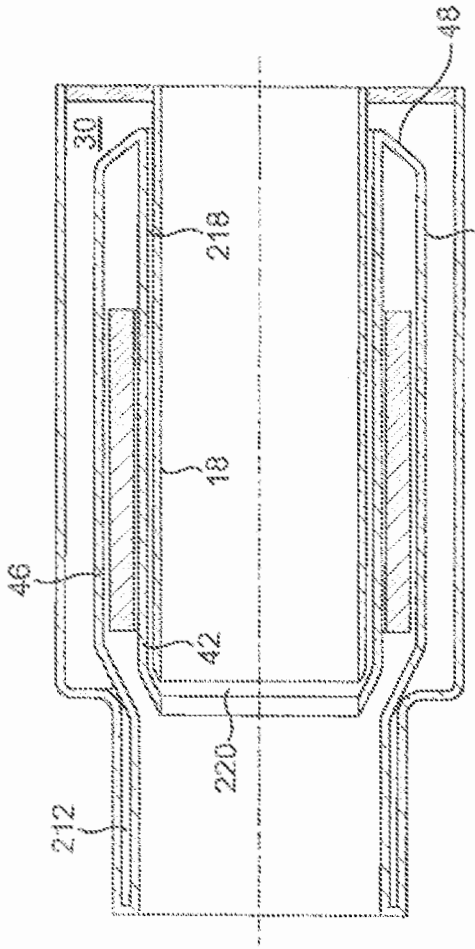


FIG. 14

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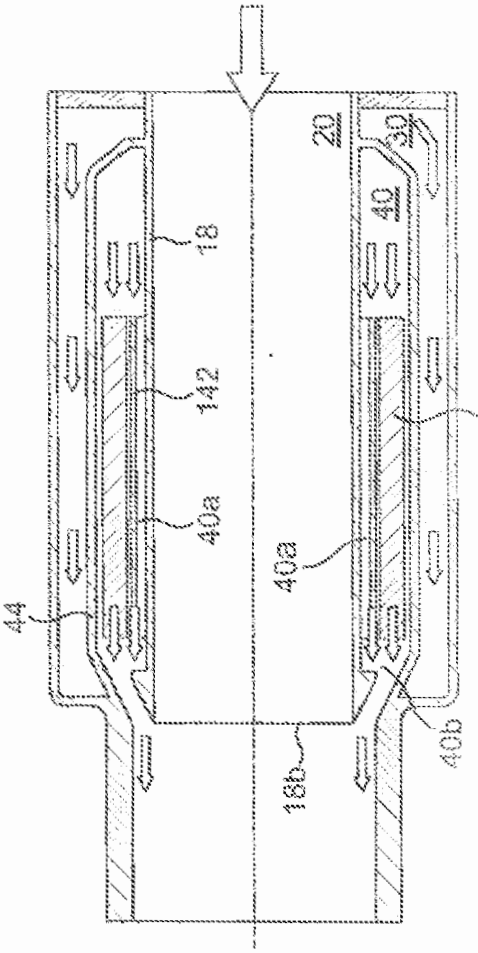

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30
18
40
142
46
40a
40a
44
40b
18b

FIG. 17

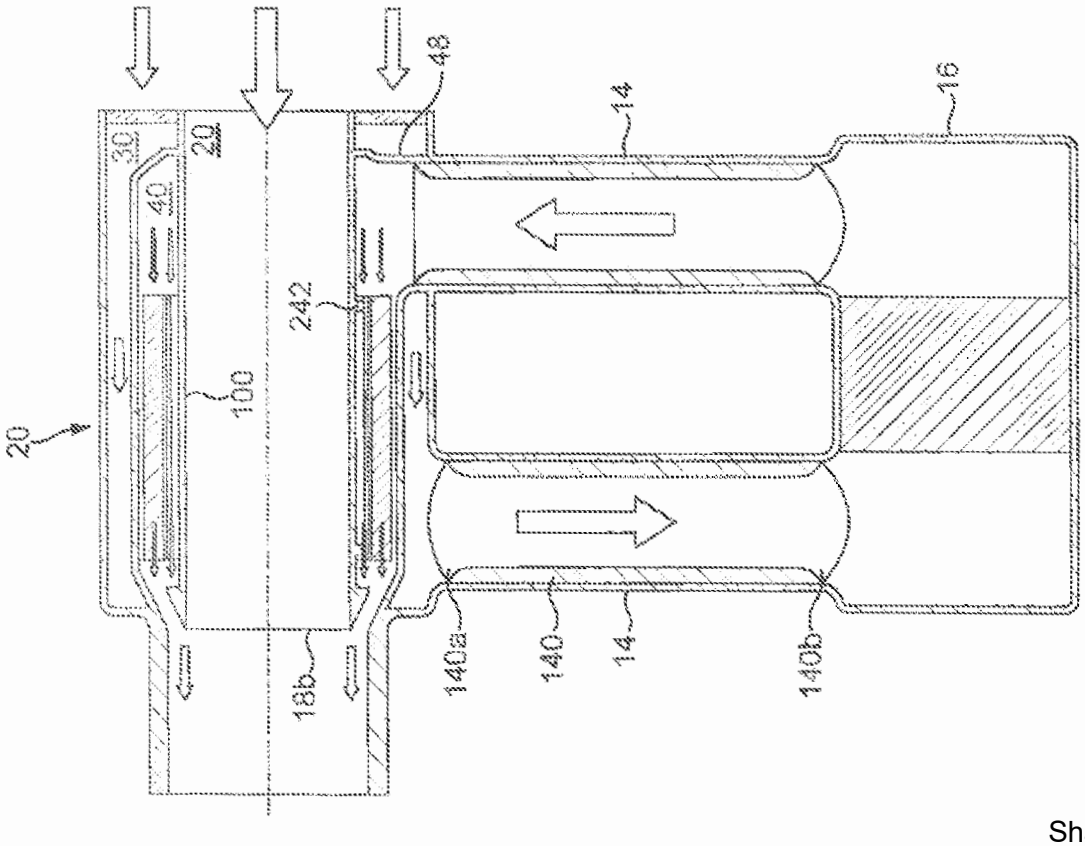

48
14
16
30
20
40
242
100
20
18b
140a
140
14
140b

FIG. 16

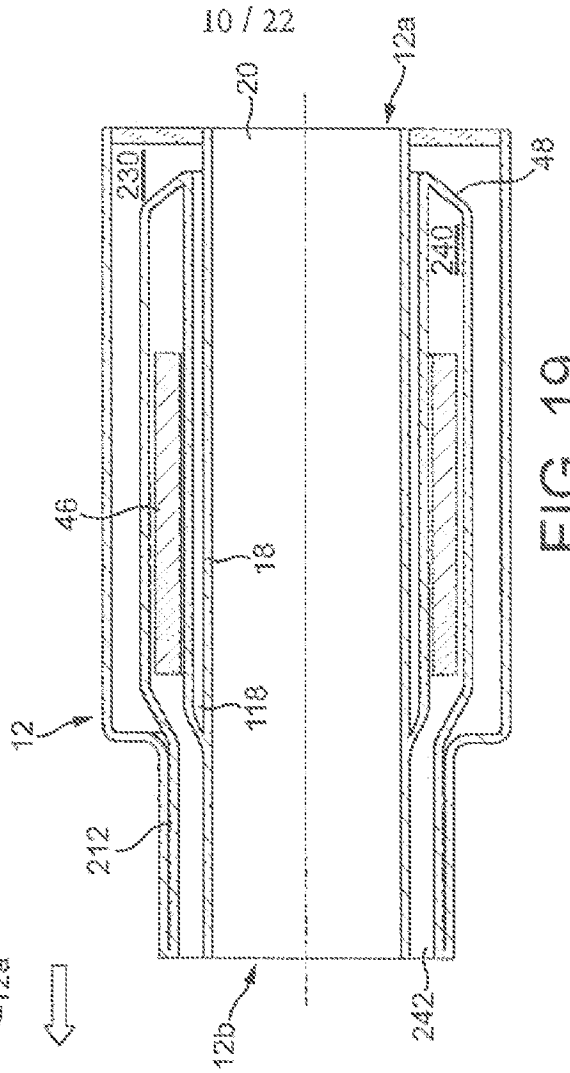

12a
20
230
48
240
46
18
118
12
212
120
242

FIG. 19

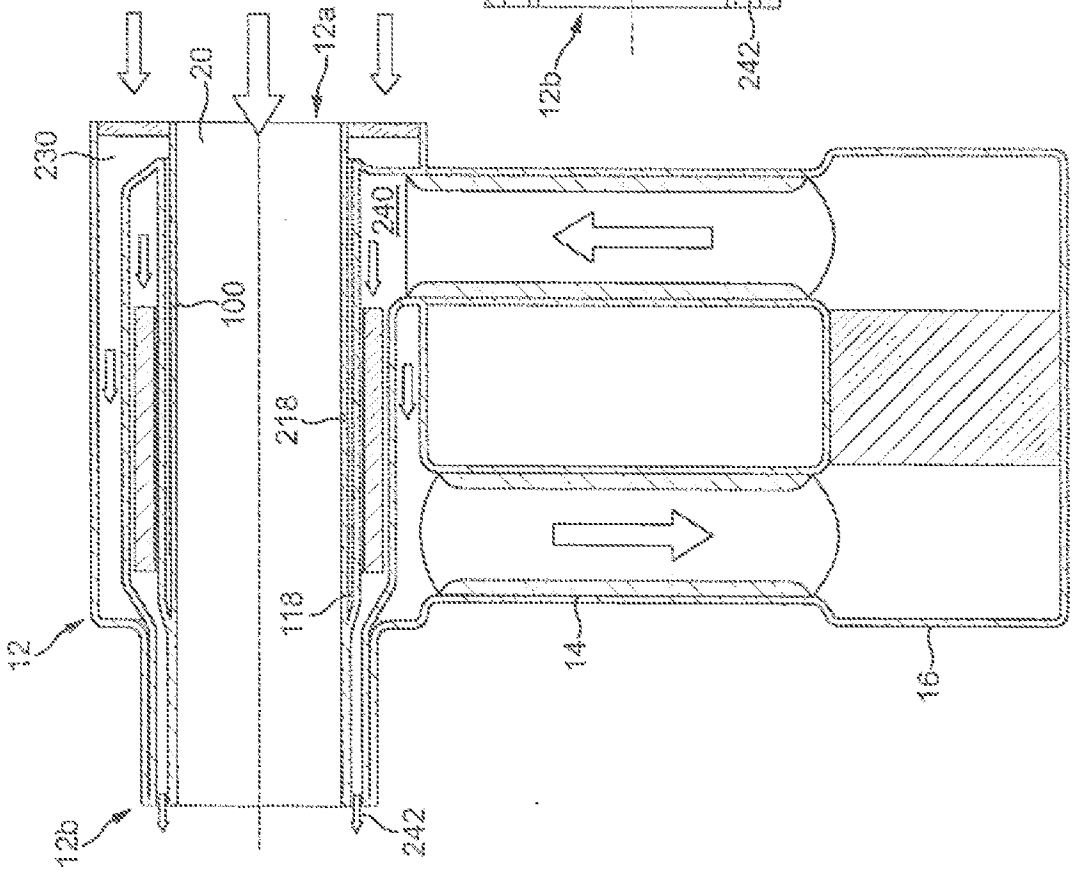

12a
20
230
240
100
218
118
12
120
242
14
16

FIG. 18

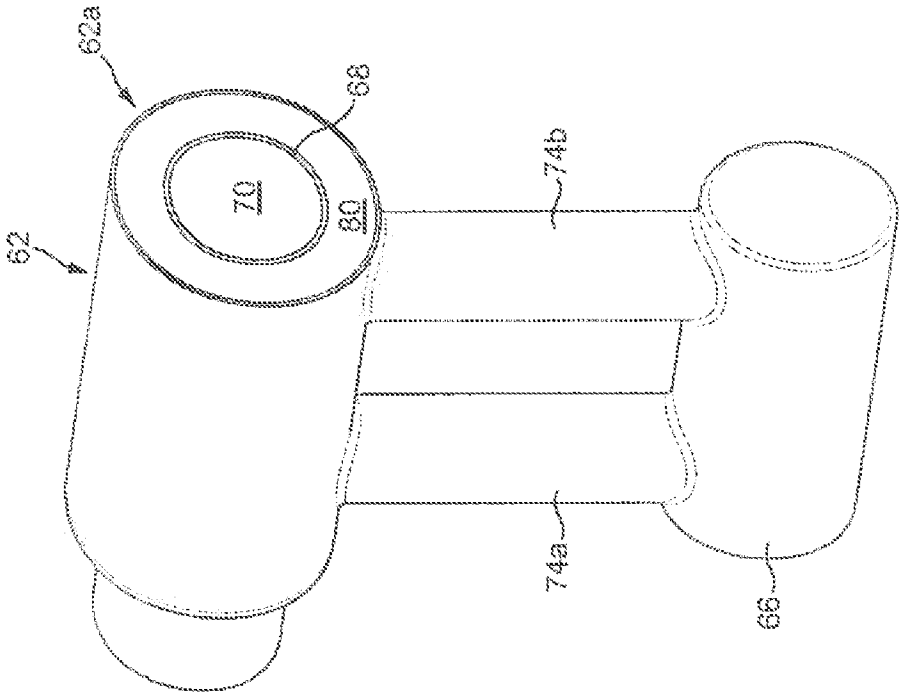


FIG. 21

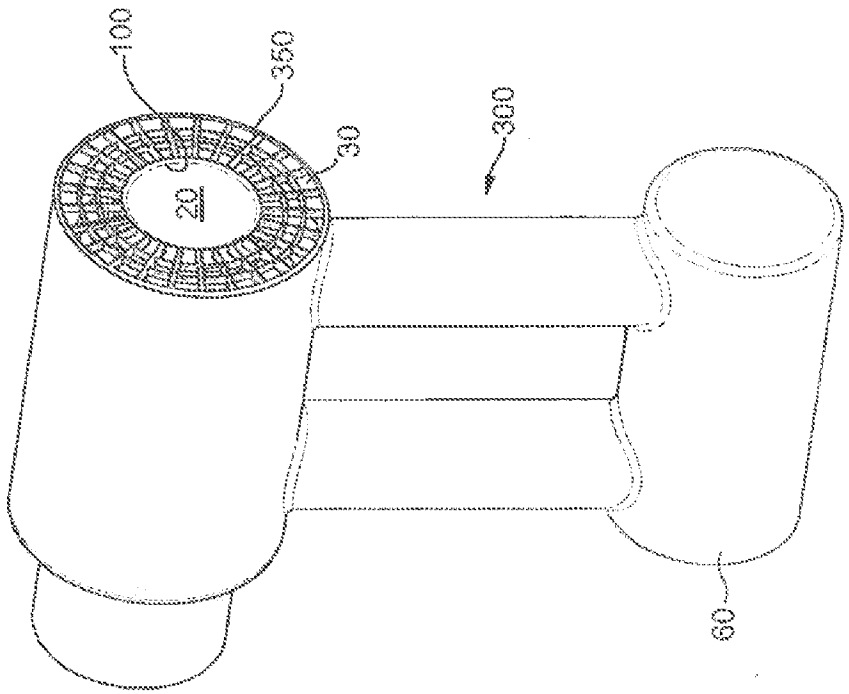


FIG. 20

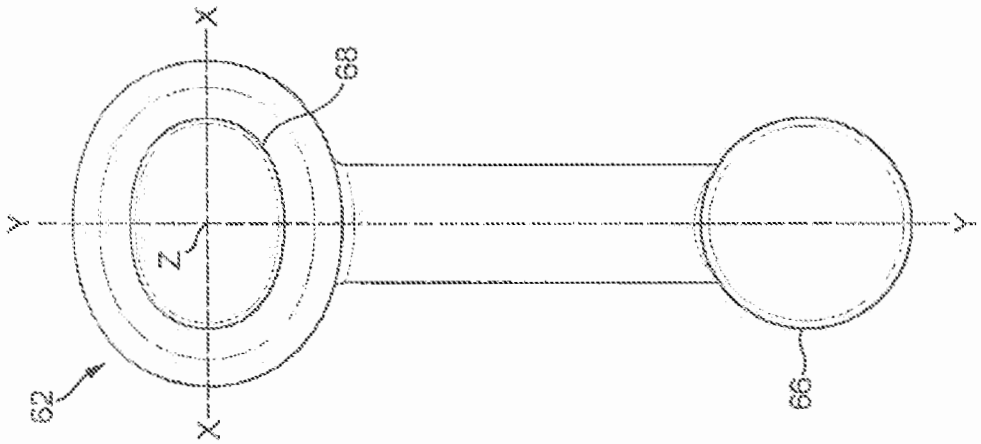


FIG. 22b

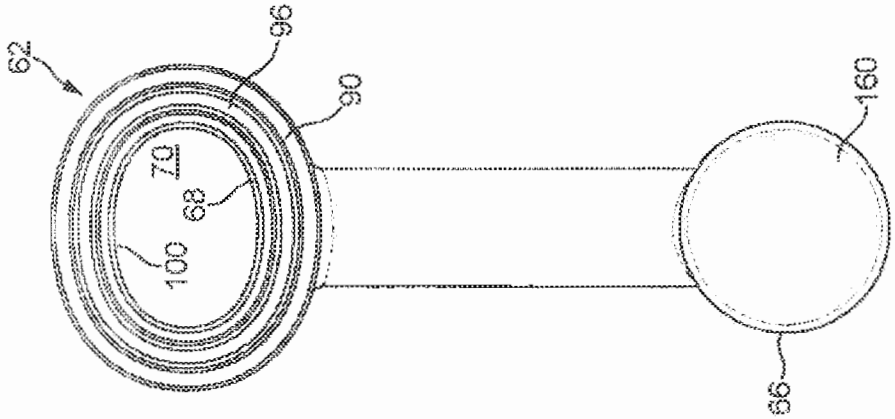


FIG. 22a

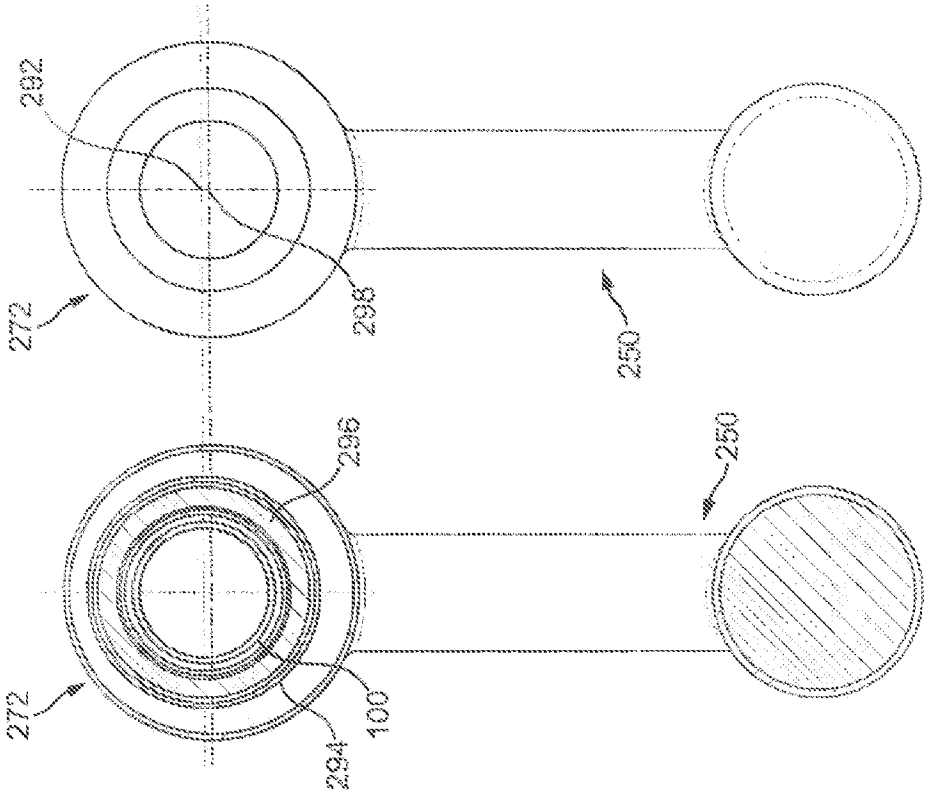


FIG. 24b

FIG. 24a

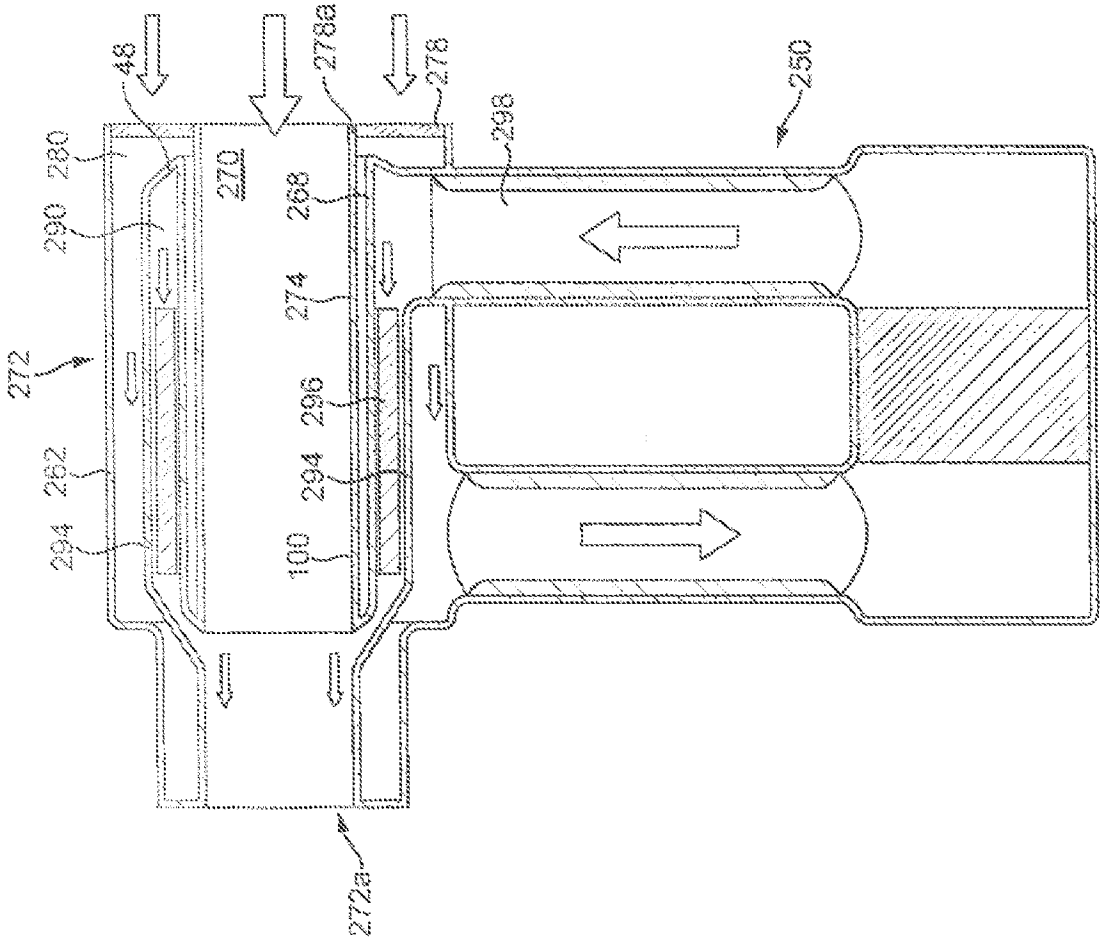


FIG. 23

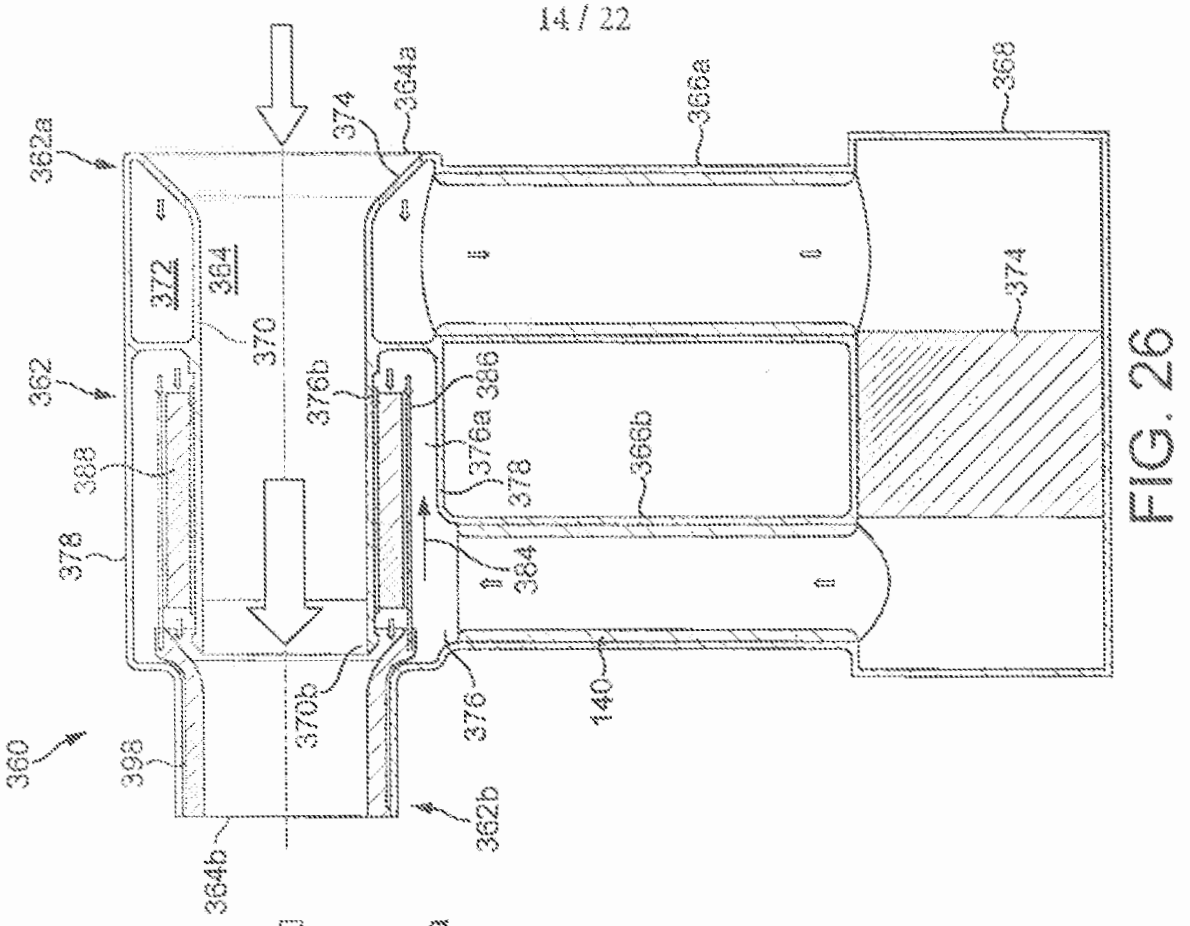

362a
364a
374
366a
368
372
364
370
362
376b
386
376a
382
366b
378
384
360
393
370b
376
362b
140
364b

FIG. 26

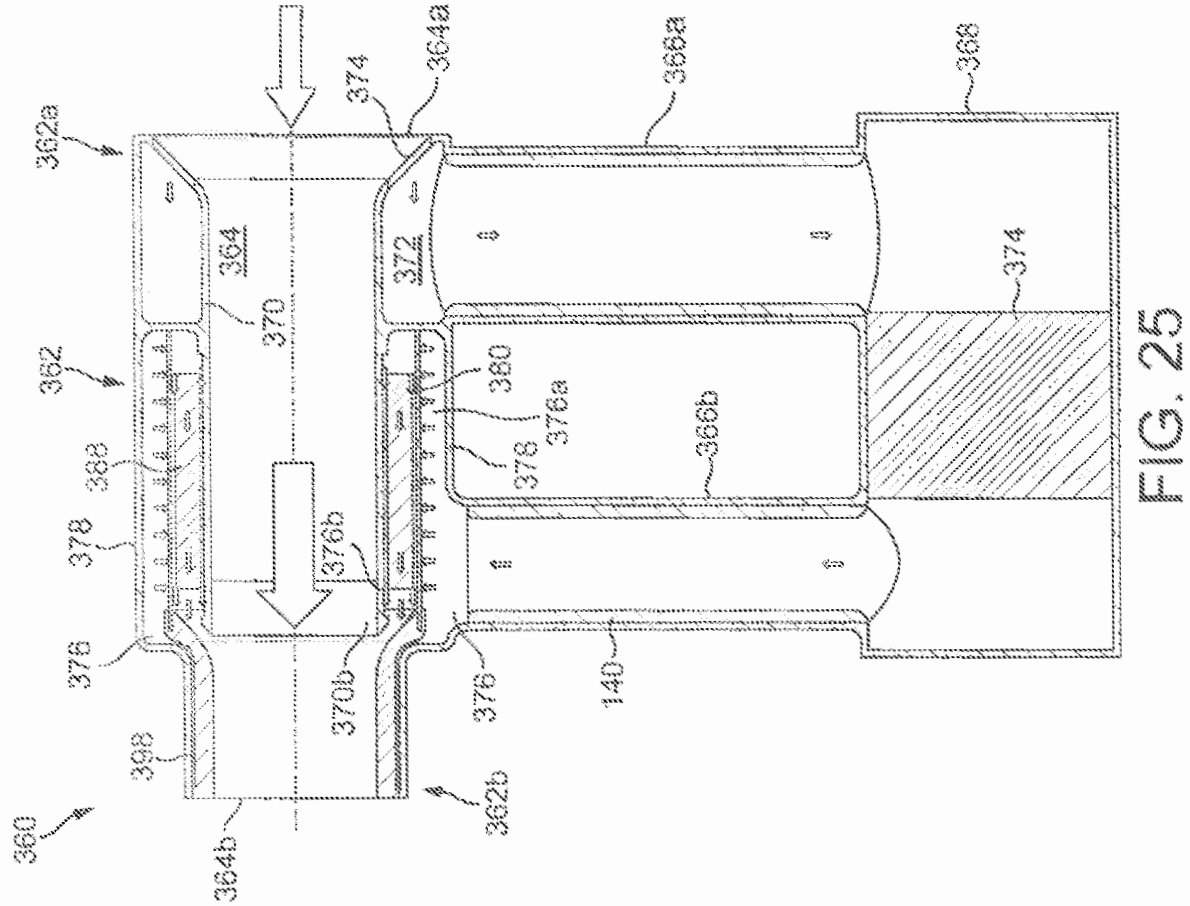

362a
364a
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366a
368
364
372
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362
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376a
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366b
378
376b
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370b
376
362b
140
393
364b

FIG. 25

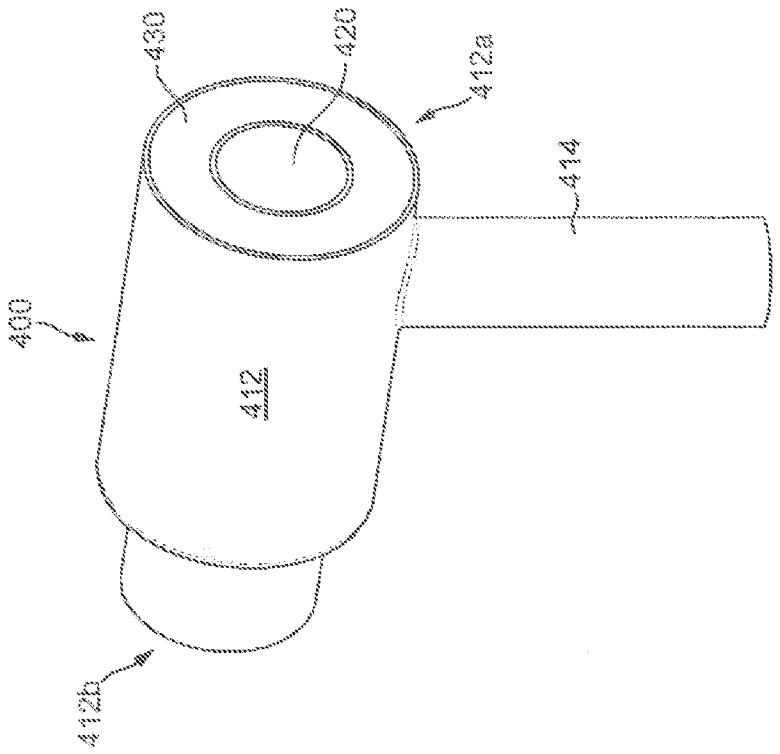


FIG. 28

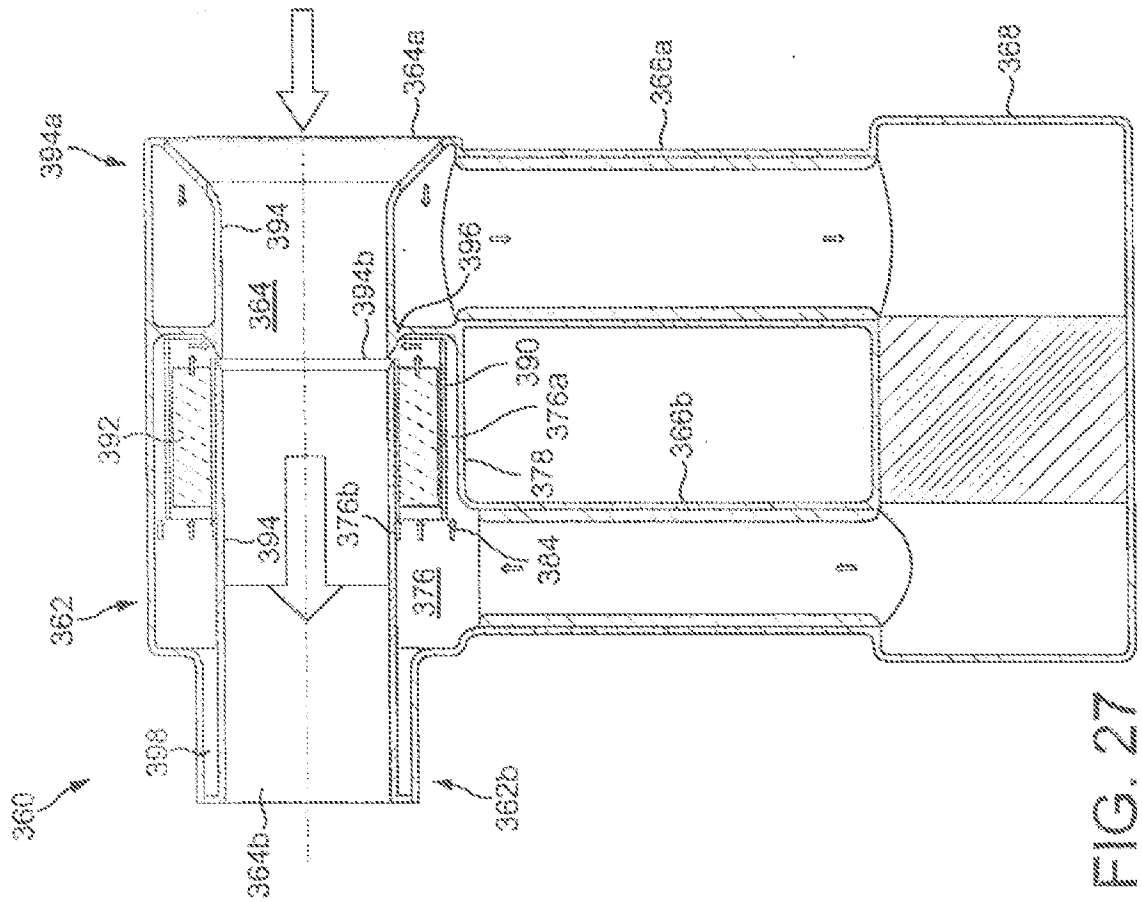


FIG. 27

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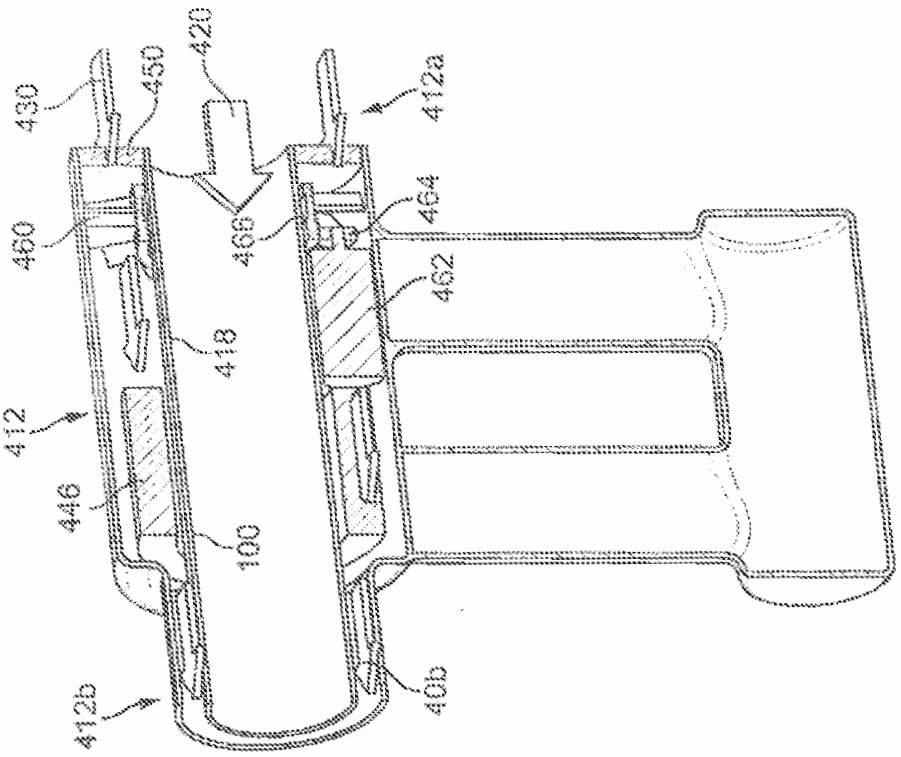


FIG. 30

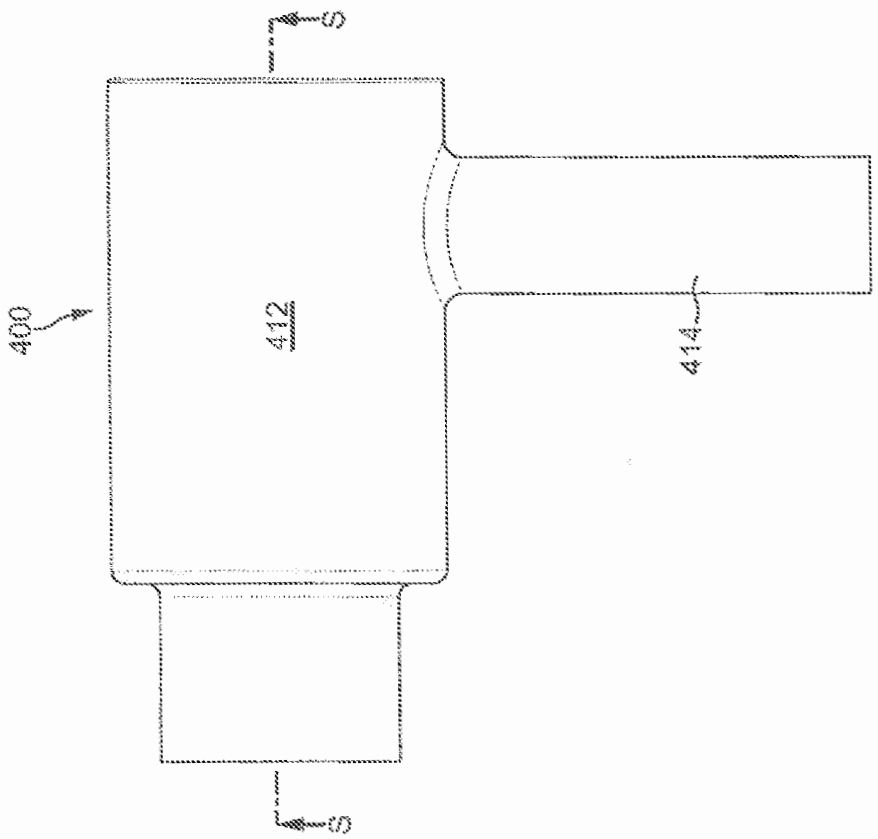


FIG. 29

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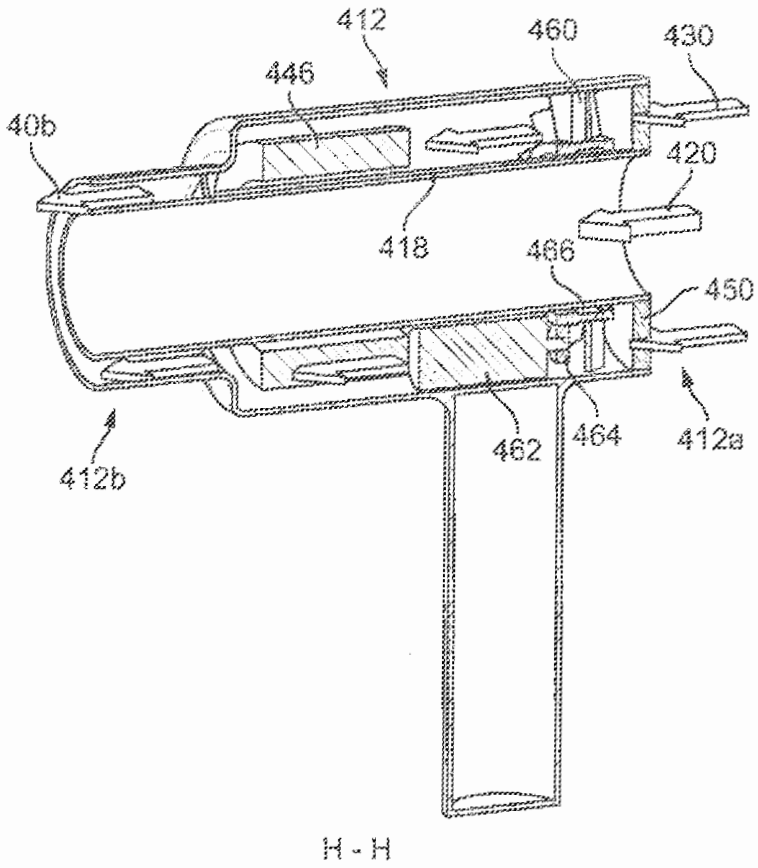

412
460
430
446
40b
420
418
466
450
462
464
412a
412b
H - H

FIG. 31

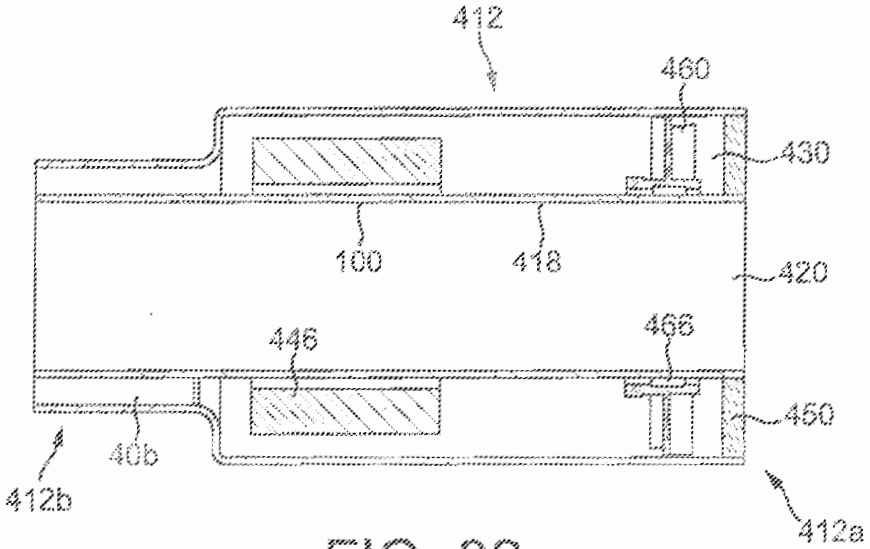

412
460
430
100
418
420
446
466
460
40b
412b
412a

FIG. 32

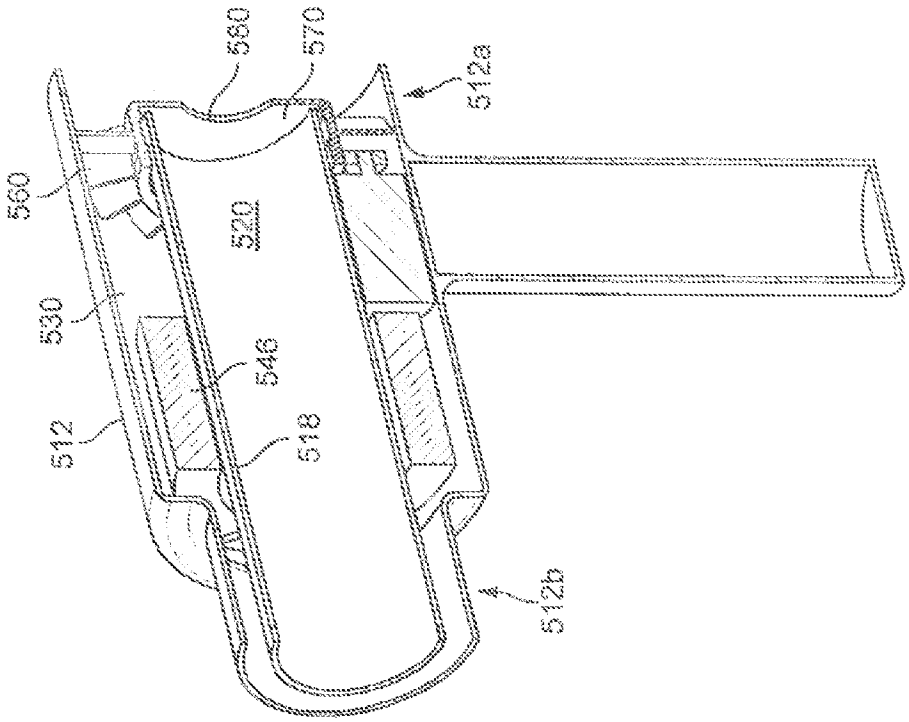

580
570
512a
560
520
530
546
512
518
512b

FIG. 34

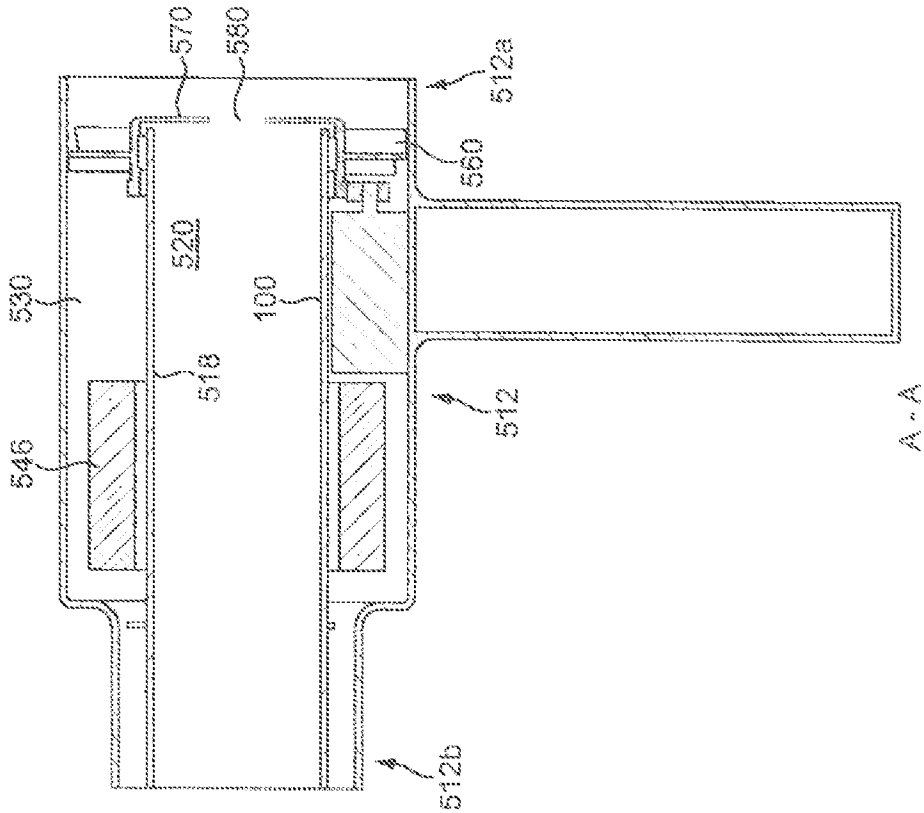

570
580
512a
560
520
530
100
518
546
512
A - A
512b

FIG. 33

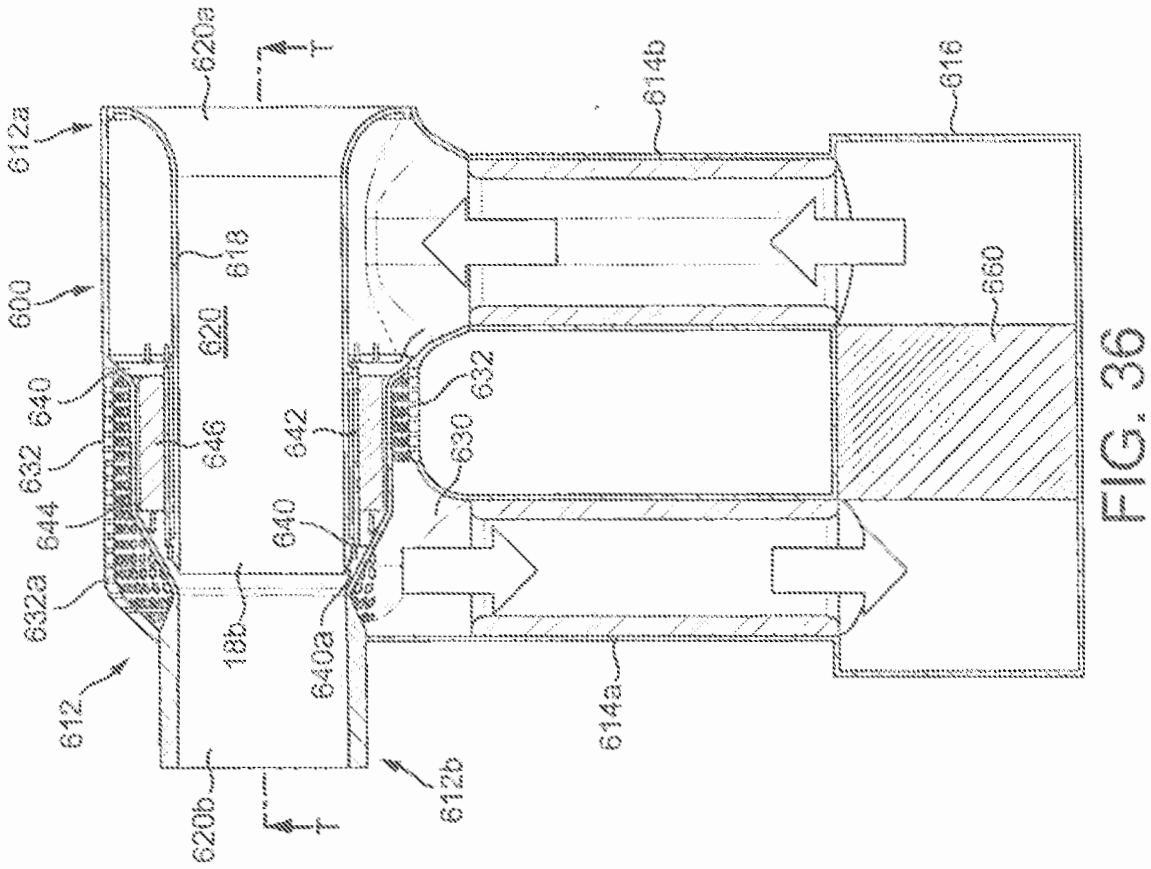

620a
612a
600
618
620
640
632
644
632a
612
618b
620b
612b
646
642
640
640a
630
632
614b
616
660
614a

FIG. 36

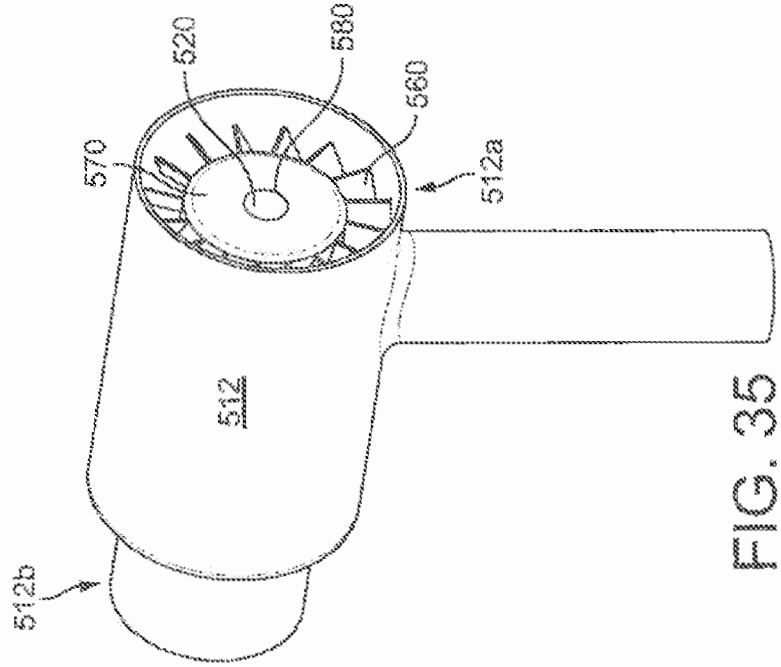

520
580
560
570
512a
512
512b

FIG. 35

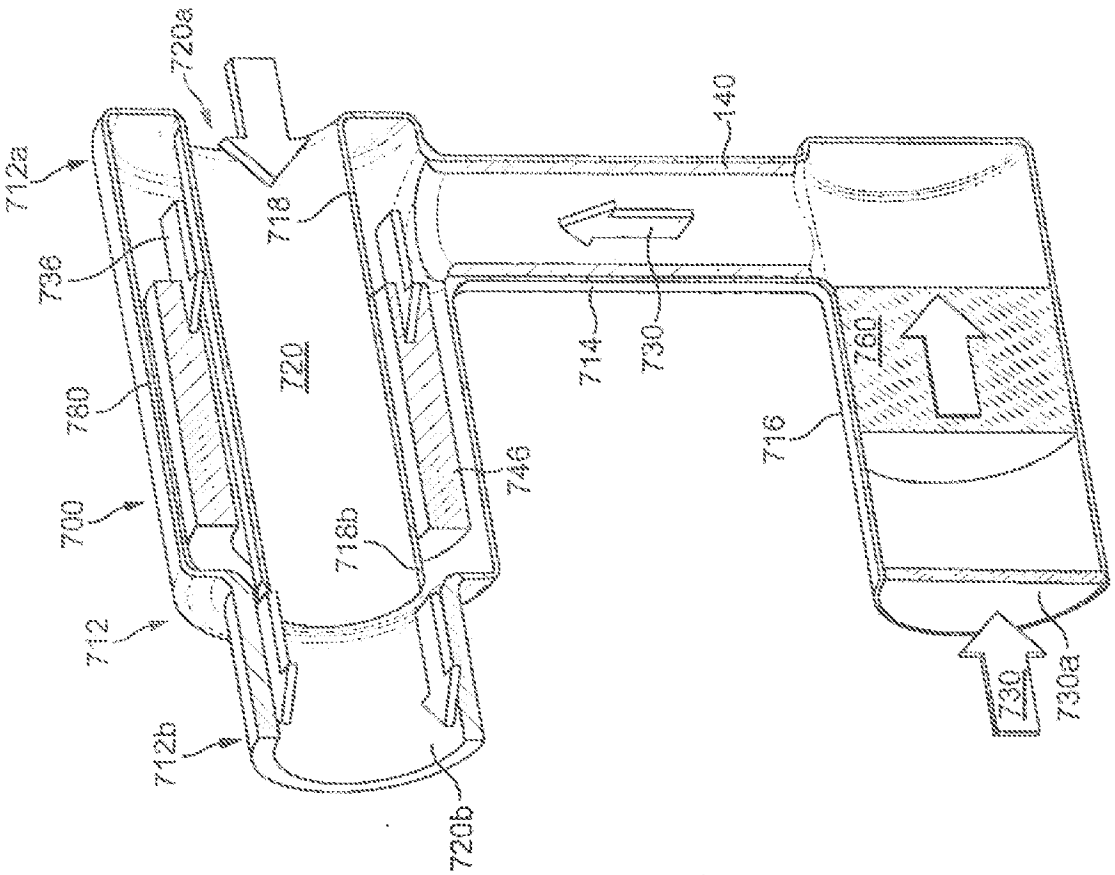


FIG. 38

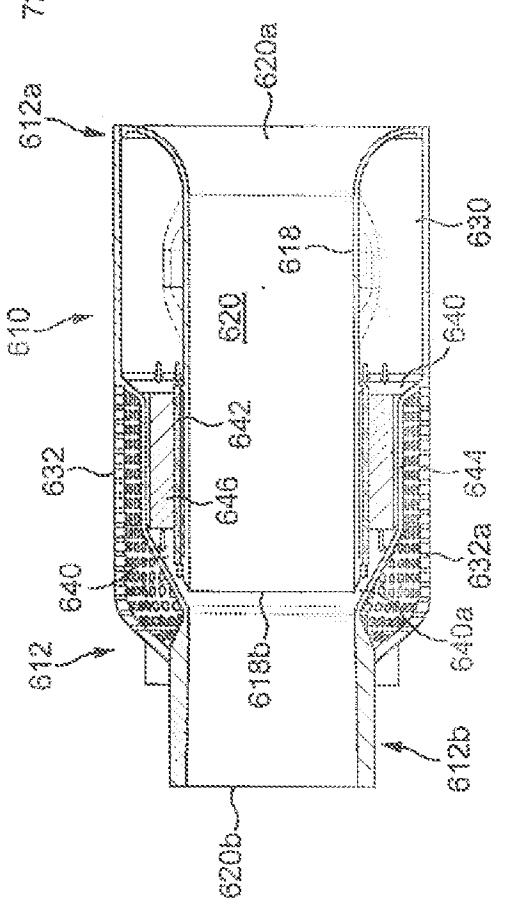


FIG. 37

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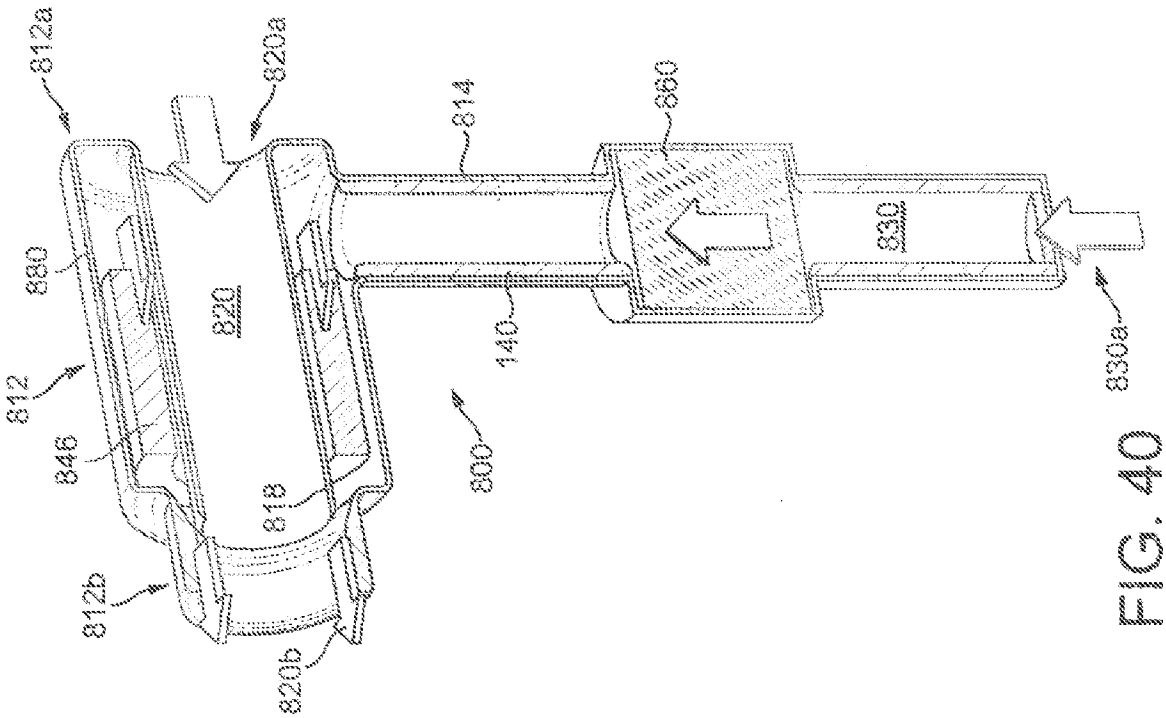

812a
820a
814
860
880
820
830
812
140
830a
846
800
818
812b
820b

FIG. 40

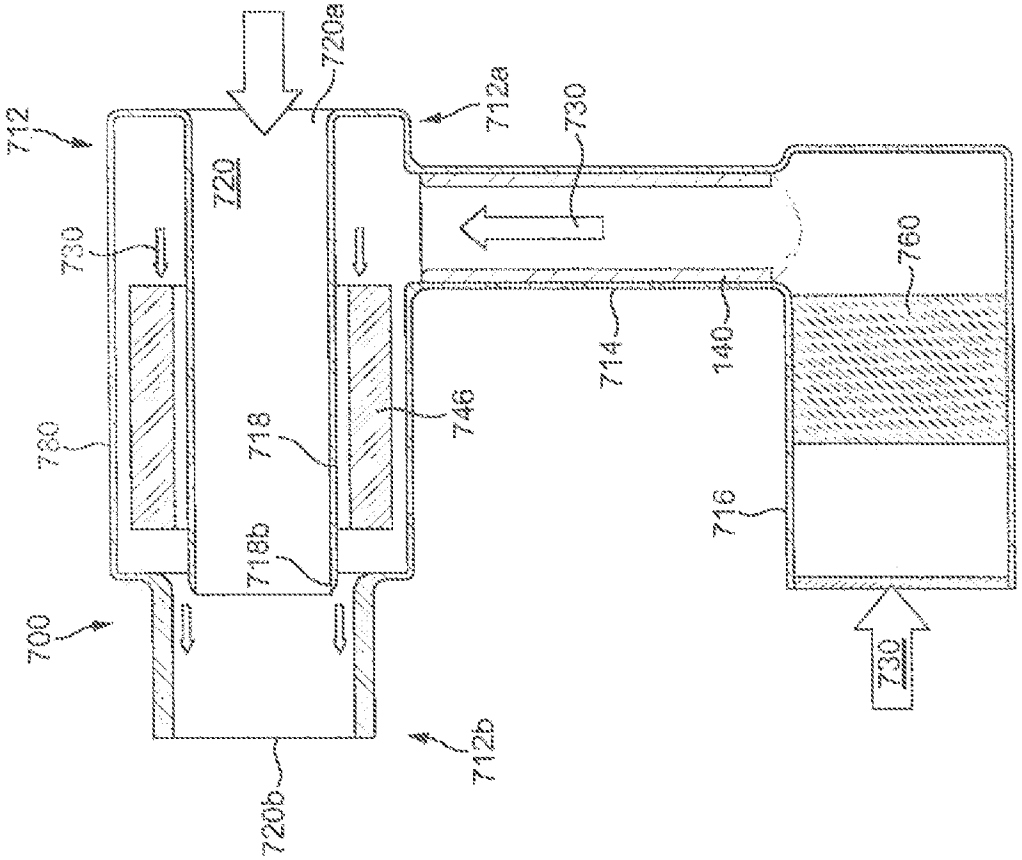

720a
712a
712
730
720
760
730
714
140
746
718
716
718b
700
730
712b
720b

FIG. 39

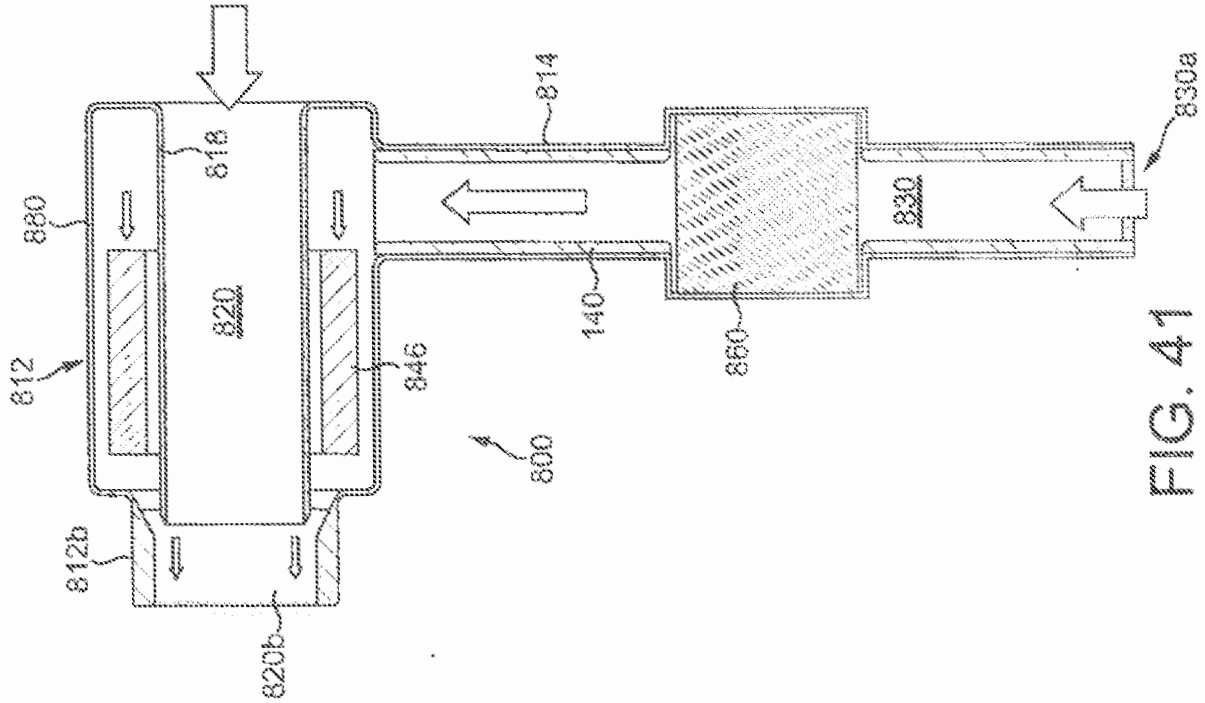


FIG. 41

A Hand Held Appliance

This invention relates to a blower and in particular a hot air blower such as a hairdryer.

Blowers and in particular hot air blowers are used for a variety of applications such as drying substances such as paint or hair and cleaning or stripping surface layers. 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 intake end of the blower.

The present invention provides a hairdryer comprising a body, a fluid flow path extending through the body in an axial direction from a first fluid inlet through which a first fluid flow enters the hairdryer to a first fluid outlet for emitting the first fluid flow from the hairdryer, a primary fluid flow path extending from a second fluid inlet through which a primary fluid flow enters the hairdryer to a second fluid outlet, a section of the primary fluid flow path extending through the body in the axial direction and surrounding the fluid flow path, and a heater located within the section of the primary fluid flow path for heating fluid passing through the primary fluid flow path, and wherein the heater has a length extending in the axial direction.

Preferably, the heater is annular in shape. It is preferred that the heater is tubular in shape.

Preferably, the body comprises the second fluid inlet. It is preferred that the body comprises a duct extending between the first fluid inlet and the first fluid outlet, and wherein the heater extends about the duct.

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Preferably, the duct partially defines at least one of the second fluid inlet and the second fluid outlet.

Preferably, the primary fluid flow path comprises an inlet section and an outlet section, and wherein the heater is located in the outlet section.

Preferably, within the body, the outlet section is isolated from the inlet section by at least one wall. It is preferred that said at least one wall is located adjacent to the second fluid inlet. Preferably, said at least one wall comprises at least two tubular walls located in the body, and an annular wall extending between the tubular walls, and wherein the heater is located between the tubular walls.

It is preferred that each of the inlet section and the outlet section is annular in shape. Preferably, at least part of the inlet section is located behind the outlet section.

It is preferred that at least part of the inlet section is located between the outlet section and the fluid flow path.

Preferably, the hairdryer comprises a duct for conveying fluid from the inlet section to the outlet section.

It is preferred that the duct for conveying fluid from the inlet section to the outlet section comprises a handle of the hairdryer.

Preferably, the duct for conveying fluid from the inlet section to the outlet section comprises a fan unit.

It is preferred that fluid is drawn through the fluid flow path by the emission of fluid from the primary fluid flow path. Preferably, the second fluid outlet extends about the fluid flow path. It is preferred that the second fluid outlet is annular. The primary fluid flow path may be annular to the fluid flow path.

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