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(54) **HAIR DRYER**

(57) A hair dryer comprises a fan (F) for generating an air flow from an air inlet (AI) to an air outlet (AO); an air inlet channel (AIC) from the air inlet (AI) to the fan (F); an air outlet channel (AOC) from the fan (F) to the air outlet (AO); and a first heating unit (FHU) at least partially around the air inlet channel (AIC). The first heating unit (FHU) may be in the air outlet channel (AOC), which may be at least partially around the air inlet channel (AIC). A first support (FS) for the first heating unit (FHU) may be partially around the air inlet channel (AIC), and a second support (SS) may be mounted between ends of the first support (FS). The second support (SS) may be aligned with the air flow in the air outlet channel (AOC) and perpendicular to the first support (FS). A second heating unit (SHU) may be mounted around ends of the first support (FS) and the second support (SS). A shape of the first support (FS) may match a U-form having an elongated bottom part partially around the air inlet channel (AIC), the first heating unit (FHU) being mounted around the elongated bottom part, while a second heating unit (SHU) is mounted around legs (L) of the U-form. The first heating unit (FHU) may guide air from the fan (F) into the air outlet channel (AOC). A second heating unit (SHU) in the air outlet channel (AOC) may guide air leaving the air outlet (AO).

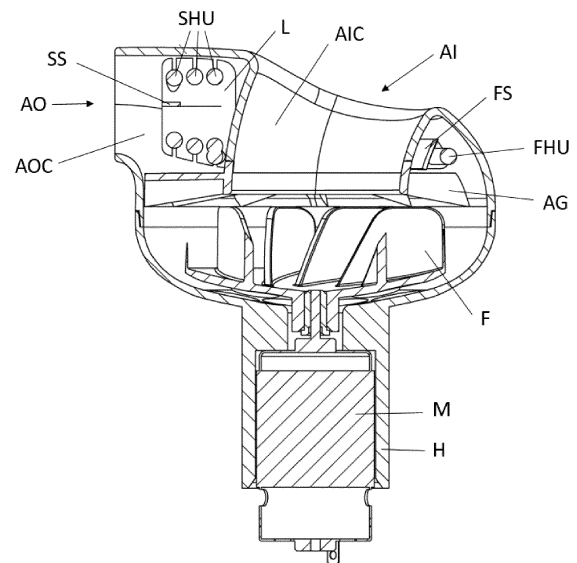


Fig. 1

Description

FIELD OF THE INVENTION

[0001] The invention relates to a hair dryer.

BACKGROUND OF THE INVENTION

[0002] CN206413915 (U) discloses a hair dryer, including a plurality of heating windings around a first axis that is substantially perpendicular to a second axis around which a step-down winding is wound. The second axis and the heating windings are parallel to a direction of an air flow caused by a fan. Air flows from an air inlet of the elongated hair dryer through the fan, then through an opening of the step-down winding, and finally along the heating windings to an air outlet. The step-down winding provides a reduced voltage for the fan motor.

SUMMARY OF THE INVENTION

[0003] It appears that customers are now desiring hair dryers that have a more compact shape, different from the prior art elongated shapes. This poses new challenges for sufficiently heating the air in such a more compact shape.

[0004] It is, inter alia, an object of the invention to provide an improved hair dryer. The invention is defined by the independent claims. Advantageous embodiments are defined in the dependent claims.

[0005] An aspect of the invention provides a hair dryer comprising a fan for generating an air flow from an air inlet to an air outlet; an air inlet channel from the air inlet to the fan; an air outlet channel from the fan to the air outlet; and a first heating unit at least partially around the air inlet channel. This appears to result in a very compact hair dryer in which still sufficient heat can be generated. In an advantageous embodiment, the first heating unit is in the air outlet channel, the air outlet channel being at least partially around the air inlet channel.

[0006] In accordance with various advantageous embodiments, the first heating unit is mounted around a first support at least partially around the air inlet channel. The first support may be partially around the air inlet channel, and a second support may be mounted between ends of the first support, and the second support may be aligned with the air flow in the air outlet channel and perpendicular to the first support. A second heating unit may be mounted around ends of the first support and the second support. A shape of the first support may match a U-form having an elongated bottom part partially around the air inlet channel, the first heating unit being mounted around the elongated bottom part, while a second heating unit is mounted around legs of the U-form. The first heating unit may be shaped to guide air from the fan into the air outlet channel. A second heating unit in the air outlet channel is preferably shaped to guide air leaving the air outlet.

[0007] These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

5 BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Fig. 1 shows a cross-section of part of a first embodiment of a hair dryer in accordance with the present invention;

Fig. 2 shows a heating arrangement for use in the embodiment of Fig. 1;

Fig. 3 shows a cross-section of part of a second embodiment of a hair dryer in accordance with the present invention; and

Fig. 4 shows a front view of part of a third embodiment of a hair dryer in accordance with the present invention.

20 DESCRIPTION OF EMBODIMENTS

[0009] Embodiments of the invention have aspects in common with CN UM patent application 201820845226.5 filed on 1 June 2018 (attorneys' reference 2018PF00307), incorporated herein by reference, especially Fig. 4 thereof, but differ as regards the positions of the heaters, which are optimized so as to give a maximum heat output notwithstanding the challenge that the compact hair dryer design only allows for little room to accommodate the heaters.

[0010] Fig. 1 shows a cross-section of part of a first embodiment of a hair dryer in accordance with the present invention. A motor M of a (centrifugal) fan F is mounted in a handle H of the hair dryer. An air inlet channel AIC conducts cold air from an air inlet AI of the hair dryer to the fan F. An air outlet channel AOC conducts air from the fan F to an air outlet AO. In accordance with aspects of the present invention, the hair dryer comprises a first heating unit FHU around the air inlet channel AIC. In accordance with an advantageous embodiment, a second heating unit SHU is present in the air outlet channel AOC. An air guide AG is present between the fan and the air outlet channel AOC. The air guide AG steers the air from the fan F along the first heating unit FHU.

[0011] In accordance with the shown embodiment, the first heating unit FHU is mounted around a first support FS, which may be formed by a first mica sheet. Seen from the top, a shape of the first support FS resembles a horseshoe. A second support SS, which may be formed by a second mica sheet, best shown in Fig. 2, is mounted between ends of the first support FS. The first support FS has a U-shape with a very elongated bottom part, around which the first heating unit FHU is mounted, and relatively short legs L perpendicular to the elongated bottom part. The second heating unit SHU is mounted around these legs L and the second support SS.

[0012] Embodiments of the invention show the follow-

ing features / advantages: The support structure FS, SS supports a first circular winding FHU and a second circular winding SHU perpendicular to the first winding FHU. One of the circular windings can have an air channel AIC internally of the winding FHU - a pass through. The support structure FS, SS may consist of only 2 main elements (or even allow 1 element with folding at tip), whereas conventional support structures usually have 3 or more elements. The support structure FS, SS is shaped in the airflow direction and therefor delivers lowest resistance possible, whilst using plate mica sheet material. It is lightweight and flat, and makes use of the flexibility of mica sheet in bending direction and the rigidity in length direction. The support structure FS, SS may have additional parts that influence the airflow, and which thus can replace diffusor elements. It may have a horseshoe shape. An alternative horseshoe shape may allow a first circular winding FHU and a second circular winding SHU parallel offset (enabling hair stylers). Alternatively, the bended horseshoe mica element can be put under an angle due to different cut out; doing so may improve the airflow.

[0013] Fig. 3 shows a cross-section of part of a second embodiment of a hair dryer in accordance with the present invention. In contrast with the embodiment of Fig. 1, the first heating unit FHU is now formed by the air guide AG, which is made from a ceramic heating material. Also, the second heating unit SHU is now made from a ceramic heating material. The second heating unit SHU may be a honeycomb-shaped heating module. Alternatively, the second heating unit SHU may be formed from horizontal or vertical plates. This second embodiment is based on the recognition that if ceramic heating elements are used, they may be shaped in a manner that influences the airflow, and in that case, they may perform functions that are normally carried out by hair dryer attachments like diffusers. As by doing so, a separate diffuser is redundant, a very compact hair dryer with a built-in diffuser is achieved.

[0014] Fig. 4 shows a front view of part of a third embodiment of a hair dryer in accordance with the present invention, in which the second heating unit SHU is formed by a ceramic heater module with vertical heating elements that shape the air flow.

[0015] It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. For example, there may be multiple windings of the first heating unit FHU. A gap may be present in the elongated bottom part of the U-shaped first support FS. Windings of the second heating unit SHU may be oriented aligned with the output air flow, like the heating windings of CN206413915. The first heating unit FHU and/or the second heating unit SHU may have wound heating wires, or may be formed by ceramic heating elements. The first heating unit FHU and the second heating unit SHU may be made from a single continuous heating wire. The first heating unit FHU may be

a step-down winding if the motor needs to work on a lower voltage than the mains voltage; this is not necessary for a BLDC motor, in which case the first heating unit FHU at least partially around the air inlet channel AIC is just present to ensure that notwithstanding the compact overall volume of the hair dryer, sufficient heat is generated. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. The word "comprising" does not exclude the presence of elements or steps other than those listed in a claim. The word "a" or "an" preceding an element does not exclude the presence of a plurality of such elements. The invention may be implemented by means of hardware comprising several distinct elements. In the device claim enumerating several means, several of these means may be embodied by one and the same item of hardware. Measures recited in mutually different dependent claims may advantageously be used in combination.

Claims

1. A hair dryer comprising:

a fan (F) for generating an air flow from an air inlet (AI) to an air outlet (AO);
an air inlet channel (AIC) from the air inlet (AI) to the fan (F);
an air outlet channel (AOC) from the fan (F) to the air outlet (AO); and
a first heating unit (FHU) at least partially around the air inlet channel (AIC).

2. A hair dryer as claimed in claim 1, wherein the first heating unit (FHU) is mounted around a first support (FS) at least partially around the air inlet channel (AIC).

3. A hair dryer as claimed in claim 1, wherein the first support (FS) is partially around the air inlet channel (AIC), and a second support (SS) is mounted between ends of the first support (FS), the second support (SS) being aligned with the air flow in the air outlet channel (AOC) and perpendicular to the first support (FS).

4. A hair dryer as claimed in claim 3, wherein a second heating unit (SHU) is mounted around ends of the first support (FS) and the second support (SS).

5. A hair dryer as claimed in claim 2 or 3, wherein a shape of the first support (FS) matches a U-form having an elongated bottom part partially around the air inlet channel (AIC), the first heating unit (FHU) being mounted around the elongated bottom part, while a second heating unit (SHU) is mounted around legs (L) of the U-form.

6. A hair dryer as claimed in claim 1, wherein the first heating unit (FHU) is shaped to guide air from the fan (F) into the air outlet channel (AOC).
7. A hair dryer as claimed in claim 1 or 6, wherein a second heating unit (SHU) in the air outlet channel (AOC) is shaped to guide air leaving the air outlet (AO).
8. A hair dryer as claimed in any of the preceding claims, wherein the first heating unit (FHU) is in the air outlet channel (AOC), the air outlet channel (AOC) being at least partially around the air inlet channel (AIC).

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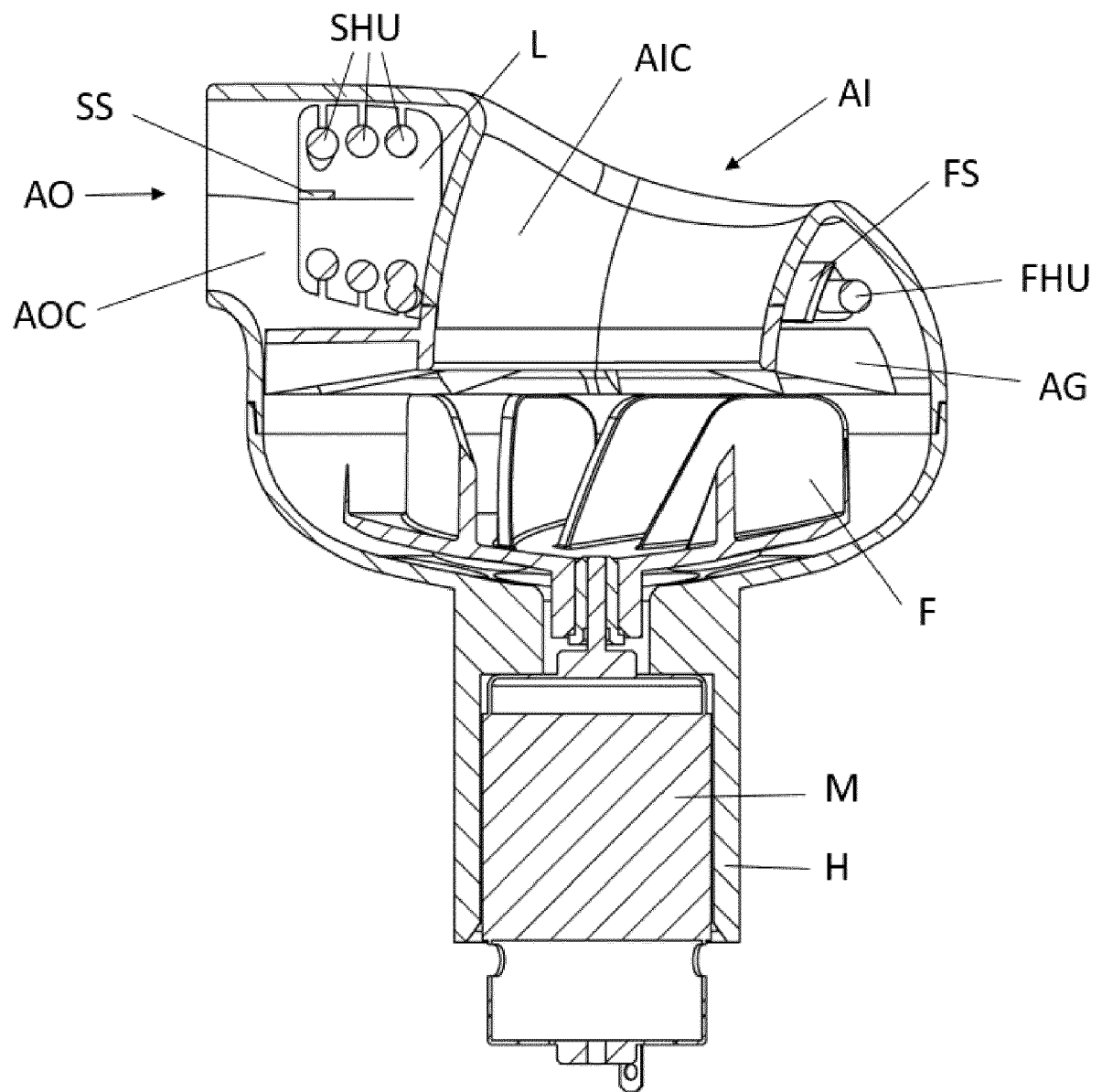


Fig. 1

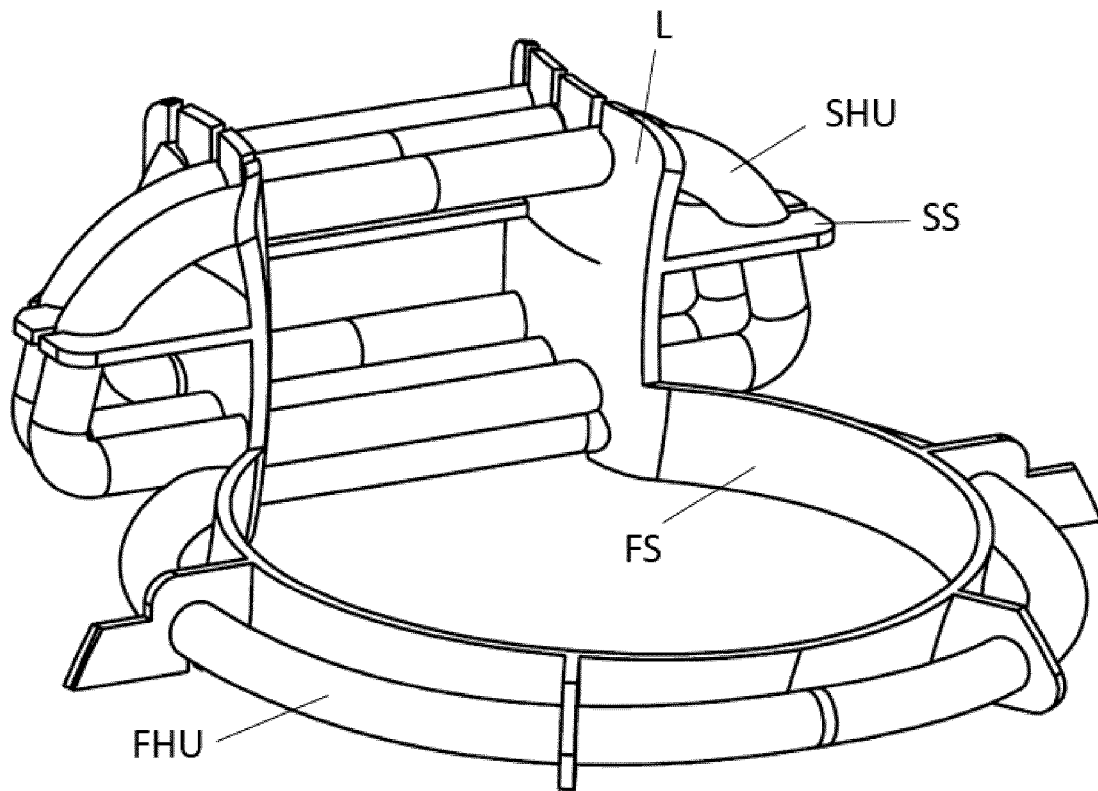


Fig. 2

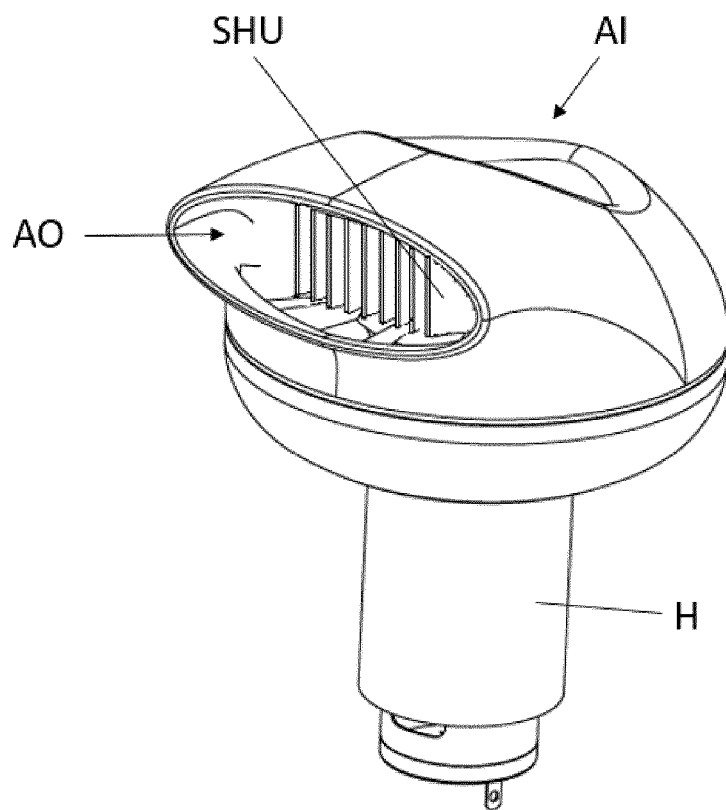


Fig. 4

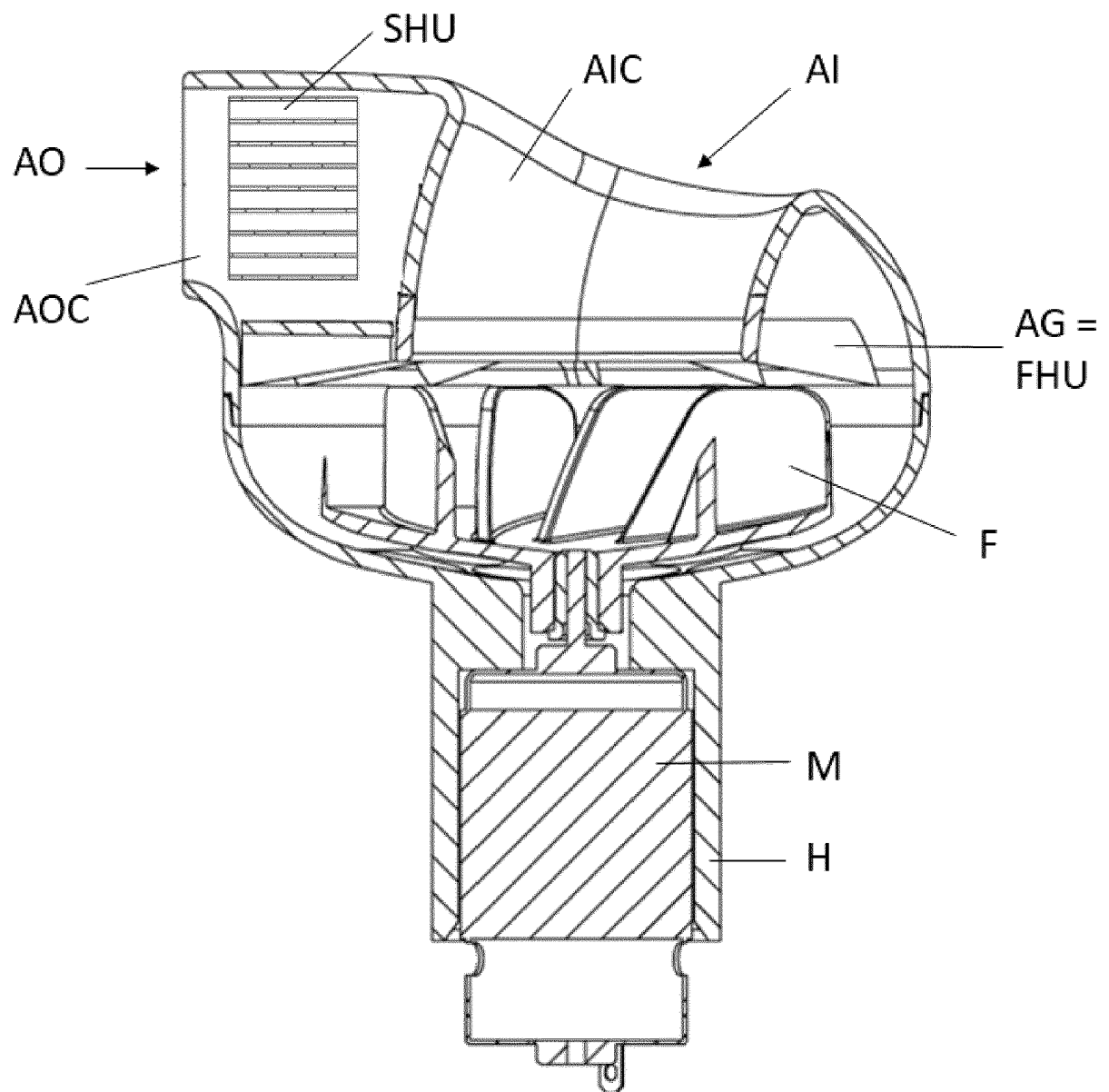


Fig. 3



EUROPEAN SEARCH REPORT

 Application Number
 EP 18 18 7925

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	AU 62609 80 A (BRISTOL MYERS CO) 1 April 1982 (1982-04-01) * page 4, line 1 - line 30; figures 1-3 * -----	1-8	INV. A45D20/12
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A	US 4 232 454 A (SPRINGER WILLIAM E) 11 November 1980 (1980-11-11) * the whole document * -----	1-8	
A	US 2018/031318 A1 (GOLDMAN RYAN [US] ET AL) 1 February 2018 (2018-02-01) * the whole document * -----	1-8	
			TECHNICAL FIELDS SEARCHED (IPC)
			A45D
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		27 February 2019	Fidalgo Marron, B
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 18 18 7925

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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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