

(51) Int Cl.:
D06F 58/20 (2006.01) **D06F 73/00** (2006.01)
D06F 39/00 (2006.01) **F22B 1/28** (2006.01)

(22) Date of filing: 18.08.2009

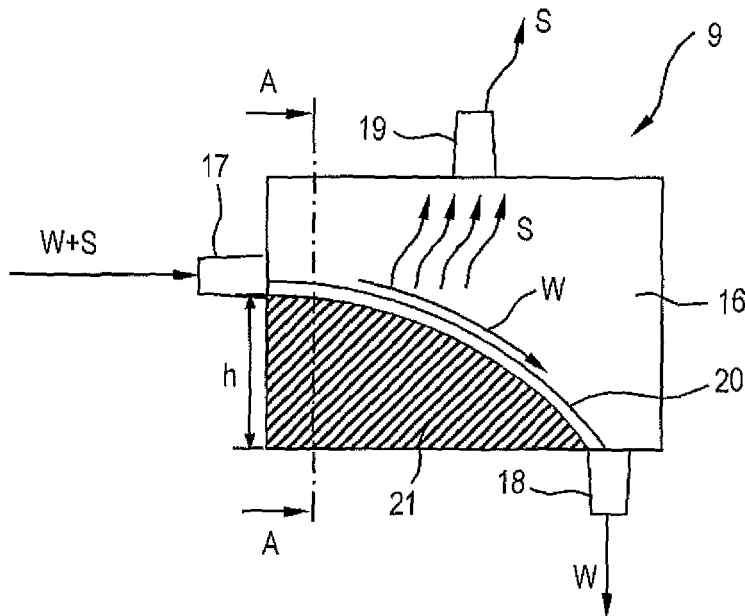
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(54) **Steam injection arrangement for a laundry appliance, and laundry appliance**

nozzle 11 opening into a drum 2 of the laundry appliance 1. The inventive laundry appliance 1 comprises the inventive steam injection arrangement 9, 10, 11, wherein the steam separator 9 is fixed to a bearing shield 22 of the laundry appliance 1.

Fig. 2



Description

[0001] The invention relates to a steam injection arrangement for a laundry appliance. The invention also relates to a laundry appliance comprising the steam injection arrangement.

[0002] WO 1996/032607 A1 relates to a steam generator, in particular to supply steam for housework, and concerns a method and a device for automatically carrying out a replenishment of a tank of the steam generator during normal operation thereof. In particular, it is disclosed that by means of a temperature detector, a temperature is measured inside a cell box which is in communication with the tank. When the level of liquid, e.g. water, inside the cell box reaches a minimum level, the temperature detector is surrounded by steam, the temperature of which is higher with respect to the temperature of the liquid, and enables liquid supply by means for feeding liquid to the cell box, thus replenishing the tank up to an operational level, when the liquid enters the cell box, it cools the temperature detector which disables the liquid feeding means, cutting off inflow of cold liquid to the cell box.

[0003] EP 1 026 306 B1 relates to a automatic refill steam generator for use in conjunction with steam cleaning equipment, clothes irons, fan-assisted ironing boards with refill function, coffee and similar brewing machines. The automatic refill steam generator is provided with at least an electric heating element attached to the outside of the steam generator and equipped with a control thermostat, said steam generator being connected on one side to a water reservoir via a pump and at least a pipe, and being further connected on the other side to the steam using apparatus via a pipe.

[0004] U. S. Patent 4,207,683 relates to a clothes dryer having a touch-up spray for removal of wrinkles from clothing and fabrics and permanent press clothing, in particular without removing possibly present factory set creases. The clothes dryer may include a water heating unit for spraying water of a selected temperature or steam. The steam is applied to remove undesired wrinkles or odours from the laundry being treated and thus provides refreshment to the laundry. Accordingly, this clothes dryer may be designated to be a "refresher dryer". It should be remarked that such nomination is not reserved to an appliance which is designed merely to dry laundry besides the refreshing function; instead, it will also be applied to a washer/dryer with a refreshing function.

[0005] It is an object of the present invention to provide an improved refreshing and / or de-wrinkling function of a laundry appliance. The object also includes providing a laundry appliance which meets the above requirements.

[0006] The object is achieved according to the features of the independent claims. Preferred embodiments of the invention can be derived, inter alia, from the dependent claims and the subsequent disclosure.

[0007] The object is achieved by a steam injection arrangement for a laundry appliance comprising a steam separator, wherein a steam outlet of the steam separator is connected to a nozzle via a hose, the nozzle opening into a drum of the laundry appliance.

[0008] By virtue of the nozzle, the steam can be selectively directed into the drum. In other words, the nozzle can provide flexibility in directing the steam outlet. The nozzle can be adapted such that it determines a direction of the steam flow injected into the drum. For example, the nozzle can direct the flow of steam into the lower half of the drum, which is mostly analogous to directing the steam directly onto the clothes or laundry. Additionally or alternatively, the nozzle can be adapted such that it determines a shape of the steam flow injected into the drum. The steam injection may comprise an injection of steam and/or a fine mist of water droplets.

[0009] It is a further advantage of the nozzle that it can assist in finely distributing the steam (or mist created from the steam by condensation) by lowering its internal pressure as it passes the nozzle. To this end, a dimension of the nozzle may be adapted accordingly.

[0010] Furthermore, the nozzle may cause a slight overpressure in the separator chamber, thus providing a pressure difference which can assist in driving water (e.g. condensate) accumulated within the separator chamber out of the separator chamber. The water may be guided back to a water reservoir. Also to this end, a dimension of the nozzle may be adapted to adjust the pressure or pressure difference.

[0011] Use of the hose allows a substantially free positioning of the nozzle, e.g. anywhere on a bearing shield. Steam flow rate and pressure or pressure differences may also be adjusted by properly dimensioning the hose.

[0012] The steam separator suppresses an injection of water drops into the drum and thus prevents the drying efficiency of the laundry appliance to deteriorate.

[0013] The above advantages lead, inter alia, to an improved injection of steam into the drum and thus to an improved refreshing and/or de-wrinkling of the clothes.

[0014] It is one preferred embodiment that the nozzle is a removable nozzle. This has the advantage that the nozzle can be taken off for cleaning. It is another advantage that the nozzle can be assembled and disassembled easily.

[0015] It is another preferred embodiment that the nozzle comprises at least one clip element. By virtue of the at least one clip element, the nozzle can be assembled and disassembled particularly easily without the need to use tools. Thus, the nozzle can be assembled and disassembled by a layperson, e.g. a normal user.

[0016] It is still another preferred embodiment that the hose is a flexible hose. This again facilitates assembly of the nozzle.

[0017] It is yet another preferred embodiment that the hose is made from a silicone. This has the advantage that the hose is highly heat resistant, elastic and robust.

[0018] It is yet another preferred embodiment that the

steam separator comprises one fixation point. This has the advantage that the fixation is particularly easy and cost-effective.

[0019] For example, the one fixation point comprises a screw hole. Thus, the fixation can be effected by only one screw connection, e.g. a screw being inserted into the screw hole and screwed to the laundry appliance to fix the steam separator.

[0020] The above said object of the invention is also achieved by a laundry appliance comprising the inventive steam injection arrangement, wherein the steam separator is fixed to a bearing shield of the laundry appliance. The fixation at the bearing shield allows a rugged and compact positioning of the steam separator.

[0021] It is one preferred embodiment that a water outlet of the steam separator is fluidically connected to a water reservoir. Thus the water is not wasted but may be reused.

[0022] It is also a preferred embodiment that the nozzle is removably attached to the bearing shield. This allows a close and mechanically not or only little straining connection to the steam separator.

[0023] It is a further preferred embodiment that the nozzle is clipped to the bearing shield.

[0024] In particular, the invention may preferably comprise one or more of the following features:

- The steam injection arrangement comprises at least three elements, i.e. the steam separator, the hose and the nozzle.
- The steam injection arrangement is particularly adapted to prevent dripping of water into the drum.
- The steam injection arrangement is located in a laundry appliance having a refreshing and/or de-wrinkling function. The laundry appliance may be a refresher-dryer, in particular a tumble dryer.
- The steam separator is fixed to the bearing shield (the bearing shield being an internal part of the dryer) by using one or more screws and a respective fixation point for each screw.
- The steam separator is connected to the nozzle through a silicone hose. Due to condensation of the steam and/or ejection of water from the steam generator, the steam separator is used to separate water and steam.
- The steam is generated by the steam generator and delivered with condensate water into the steam separator through a conduit, e.g. a flexible hose. Thus, the steam is not supplied directly from the steam separator to the drum but through the nozzle which is connected with steam separator by the flexible, silicon hose.
- The separated steam is delivered via a conduit to the silicone hose.
- The steam is delivered to the nozzle and then delivered to the drum.
- The condensate water is delivered to a water reservoir (that may be located in a bottom group of the

dryer) via a conduit.

- The nozzle which is assembled to the bearing shield is removable, e.g. clipped to the bearing shield.

[0025] In the following sections, particularly preferred embodiments of the invention are described in greater detail, including references to the Figures of the attached drawing. In particular:

- Fig.1 shows an oblique view onto a laundry appliance comprising a steam generator;
- Fig.2 sketches a cross-sectional side view of the steam separator;
- Fig.3 sketches a cross-sectional front view of the steam separator;
- Fig.4 sketches a transparent top view of the steam separator;
- Fig.5 shows a steam injection arrangement comprising the steam separator in a first view; and
- Fig.6 shows the steam injection arrangement in a second view.

[0026] Fig.1 shows a laundry appliance 1 that is a clothes dryer or refresher dryer that incorporates a clothes or laundry refreshing and de-wrinkling function applying steam to the clothes. The laundry appliance 1 is shown without housing. In particular, the laundry appliance 1 is embodied as a tumble dryer comprising a rotatable drum 2 which holds the clothes to be dried and which may be operated by being rotated in reversing rotational directions. The drum 2 can be loaded and unloaded through an opening 3. The opening 3 is typically closed by a door (further described in Fig.2 and Fig.3). The operation of a tumble dryer as such is well known.

[0027] To implement the refreshing function, the laundry appliance 1 comprises a steam generator 4 which is located at a bottom of the laundry appliance 1 and mounted on top of a cover 5 of a heat exchanger 6 and of which a front side F (see also Fig.2) is visible. The steam generator 4 is used to generate steam from water. Water is supplied to the steam generator 4 via a condensate container shell 7 through a flexible filling hose 8. The water supplied to the steam generator 4 is thus the condensate that is extracted from the damp clothes during the drying process. The condensate container shell 7 may additionally be filled by fresh water, e.g. at the beginning of a drying cycle, if there is not yet enough condensate to supply the steam generator 4.

[0028] The output generated by the steam generator 4 usually contains a mixture of steam and hot water and is led to a steam separator 9. The steam separator separates the steam from the hot water. The steam is fed into the drum 2 via a hose 10 that leads to a nozzle 11. The nozzle 11 opens into the drum 2 and may inject the steam directly onto the clothes or laundry. To this end, the nozzle 11 may have a shape, e.g. angular shape that allows orientation of the steam flow. The hot water is returned to a T-connector 12 located in a dryer pump

reservoir via a flexible hot water return hose. Thus, the steam separator 9 ensures that only steam with a low or very low liquid content is fed into the drum 2. The steam separator 9 and the nozzle 11 are attached to a bearing shield 22 of the laundry appliance 1.

[0029] The steam generator 4 further comprises or is connected to a flexible de-aeration hose 13 that connects to a water tank (see fig.3 for further detail) of the steam generator 4. The steam generator 4 further comprises a siphon fixation 14 for holding or fixing a siphon 15.

[0030] Fig. 2 sketches a cross-sectional side view of the steam separator 9. Fig.3 sketches a cross-sectional front view of the steam separator. Fig.4 sketches a transparent top view of the steam separator.

[0031] Referring now to Figs.2 to 4, the steam separator 9 comprises a separator housing 16. The separator housing 16 may, for example, be box-shaped or cylinder-shaped. A water/steam inlet 17, a water outlet 18, and a steam outlet 19 lead or open into the separator housing 16. The water/steam inlet 17 is provided to feed a mixture of water and steam coming from the steam generator 4 of Fig.1, as indicated by arrow W+S. The mixture of water and steam entering the separator housing 16 is separated in the housing, because the water W flows to the water outlet 18, leaving the separator housing 16 through the water outlet 18, while the steam rises up to the steam outlet 19, leaving the separator housing 16 through the steam outlet 19.

[0032] To provide a substantially disturbance-free flow of the water W through the separator housing 16, the water/steam inlet 17 is connected to the water outlet 18 by an open drain channel 20. The open drain channel 20 is formed on an upper surface of a plate-like insert 22. The open drain channel 20 may, for example, have a cross-sectional shape resembling a half-pipe. Along its flow direction, the drain channel 20 is curved, in particular basically U-shaped, to achieve a high flow velocity. A height h between the water / steam inlet 17 and the water outlet 18 can be designed according to needs.

[0033] The water outlet 18, which in general is located lower than the water/steam inlet 17 is preferably located at a bottom of the steam separator housing 16 at the lowest point of the separator housing 16. Therefore, the water outlet 18 may also act as a drain for condensate formed on the walls of the separator housing 16 by the steam S wherein the condensate trickles or drips down to the water outlet 18.

[0034] The open drain channel 20 allows the water W to flow through the steam separator 9 without major disturbances or turbulences. This, in turn, suppresses an accumulation of water W within the steam separator 9 that could lead to part of this accumulated water leaving via the steam outlet 19. This water going through the steam outlet 19 would then drip into the drum 2 and impair a drying result.

[0035] The steam outlet 19 is positioned directly above the drain channel 20. Thus, the steam S being injected into the separator housing 16 and/or being emitted from

the hot water W can rise up uninhibited to the steam outlet 19.

[0036] For a substantially turbulence-free flow of the water W, the inlet 17 and the water outlet 18 have at least roughly the same cross sectional area. For a high output of the steam S, the steam outlet 19 has a larger cross sectional area than the inlet 17.

[0037] The steam outlet 19 is connected to the nozzle 11 via the flexible hose 10, as shown in Fig.1, the nozzle 11 opening into the drum 2.

[0038] Fig.5 and Fig.6 show the steam injection arrangement 9, 10, 11 for the laundry appliance 1 from different angles. The steam injection arrangement 9, 10, 11 comprises the steam separator 9, wherein its steam outlet 19 is connected to the nozzle 11 via the flexible silicone hose 10. The steam S leaving the steam outlet 19, as indicated by the respective arrow S, flows through the hose 10 and to the nozzle 11. The nozzle 11 opens into the drum 2 of the laundry appliance 1, i.e. comprises a steam injection opening 23 or window through which the steam S is injected into the drum 2, as indicated by the respective arrow. As described in greater detail in Fig.2 to Fig.4, the steam separator 9 is fed with water and steam W + S through the water/steam inlet 17, and water W exits the steam separator 9 through the water outlet 18.

[0039] The water outlet 18 is located at the lowest point of the steam separator and attached to a cone-shaped part 25 of the steam separator 9 to drain as much water as possible from the steam separator 9.

[0040] The steam separator 9, at the outside of its housing 16, comprises only one fixation element or fixation point 26 to screw the steam separator 9 to the bearing shield 22.

[0041] At the rear side of the nozzle 11 that is facing the bearing shield 22 there are located several engagement means embodied as clips 24 to clip the nozzle 11 at the bearing shield 22. This ensures a secure fastening. On the other hand, the nozzle 11 can be taken off, e.g. for cleaning the nozzle 11. To this end, the bearing shield 22 comprises an opening (not shown) to insert the nozzle 11 and/or the hose 10.

[0042] In particular, the nozzle 11 can be a two-part nozzle 11, with a nozzle head 11a comprising the clips 24 and a nozzle support part 11 b. The nozzle support part 11 b may be attached to an outside of the bearing shield 22, as described in Fig.7 to Fig.9, to provide a fixed and immovable connection for the hose 10. The nozzle support part 11 b is thus adapted to attach the hose 10 thereon. The nozzle head 11a may then be plugged together with the nozzle support part 11 b from the inside of the bearing shield 22 and be clipped to the bearing shield. In this case, cleaning of the nozzle 11 in particular includes cleaning of the nozzle head 11a.

[0043] Thus, the whole steam injection arrangement 9, 10, 11 can be fixed to the laundry appliance 1 by one screwing action to screw the steam separator 9 to the bearing shield 22 and one clipping action to clip the nozzle 11.

zle 11 to the bearing shield 22.

[0044] As indicated in Fig.6, the nozzle 11 is inclined with respect to the bearing shield 22, wherein the orientation of the bearing shield 22 is indicated by the dashed line. The inclination allows the steam S exiting from the nozzle 11 to be directed downwards to a lower region of the drum 2 and thus directly onto the clothes to be refreshed and/or de-wrinkled. This arrangement implies that the nozzle 11 is positioned at an upper half of the bearing shield 22, in particular at a region of the bearing shield 22 surrounding an upper half of the opening 3.

[0045] Of course, the invention is not restricted to the embodiments shown.

List of Reference Numerals

[0046]

1	laundry appliance
2	drum
3	opening
4	steam generator
5	cover
6	heat exchanger
7	condensate container shell
8	filling hose
9	steam separator
10	hose
11	nozzle
11a	nozzle head
11 b	nozzle support part
12	T-connector
13	de-aeration hose
14	siphon fixation
15	siphon
16	separator housing
17	water/steam inlet
18	water outlet
19	steam outlet
20	open drain channel
22	bearing shield
23	steam injection opening
24	clip
25	cone-shaped part
26	fixation point
F	front side
W	water
S	steam
h	height

appliance (1).

2. The steam injection arrangement (9, 10, 11) according to claim 1, wherein the nozzle (11) is a removable nozzle (11).
3. The steam injection arrangement (9, 10, 11) according to claim 1, wherein the nozzle (11) comprises at least one clip element (24).
4. The steam injection arrangement (9, 10, 11) according to any of the preceding claims, wherein the hose (10) is a flexible hose (10).
5. The steam injection arrangement (9, 10, 11) according to claim 4, wherein the hose (10) is made from silicone.
6. The steam injection arrangement (9, 10, 11) according to any of the preceding claims, wherein the steam separator (9) comprises one fixation point (26).
7. The steam injection arrangement (9, 10, 11) according to claim 6, wherein one fixation point (26) comprises a screw hole.
8. A laundry appliance (1) comprising the steam injection arrangement (9, 10, 11) according to any of the preceding claims, wherein the steam separator (9) is fixed to a bearing shield (22) of the laundry appliance (1).
9. The laundry appliance (1) according to claim 8, wherein a water outlet (18) of the steam separator (9) is fluidically connected to a water reservoir.
10. The laundry appliance (1) according to any of the claims 8 or 9 comprising the steam injection arrangement (9, 10, 11) according to any of the claims 2 to 9, wherein the nozzle (11) is removably attached to the bearing shield (22).
11. The laundry appliance (1) according to claim 10, wherein the nozzle (11) is clipped to the bearing shield (22).

Claims

1. A steam injection arrangement (9, 10, 11) for a laundry appliance (1) comprising a steam separator (9), wherein a steam outlet (19) of the steam separator (9) is connected to a nozzle (11) via a hose (10), the nozzle (11) opening into a drum (2) of the laundry

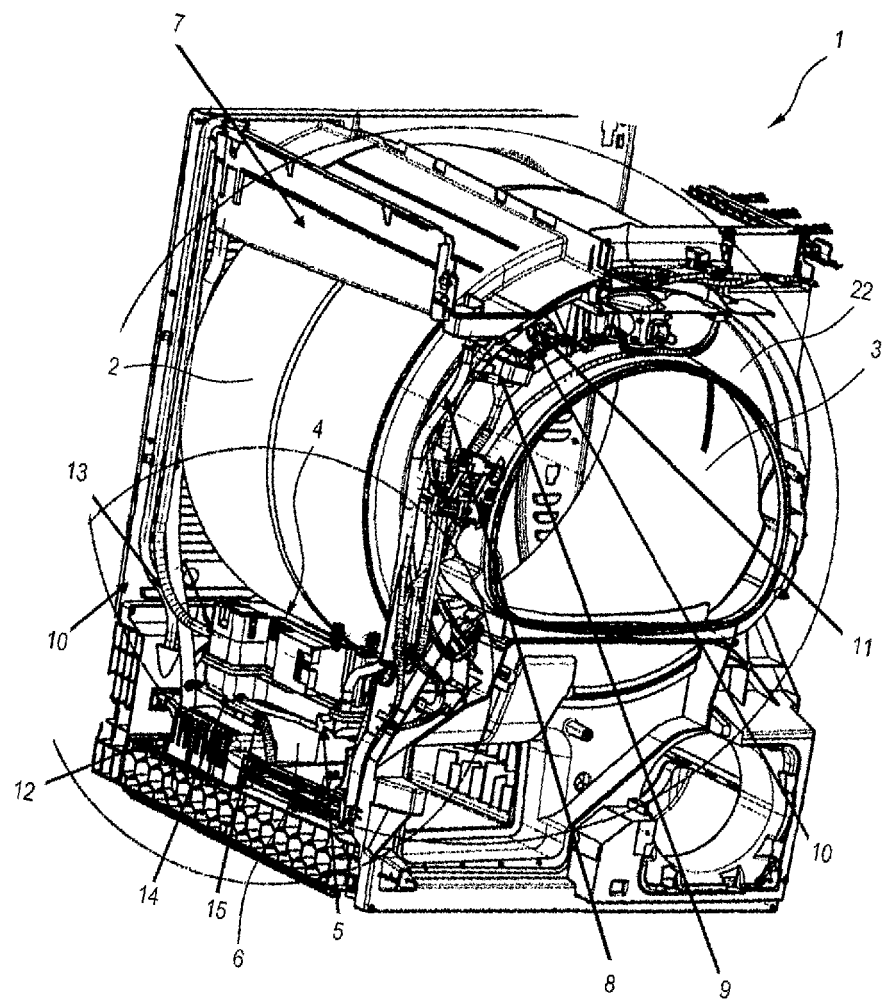


Fig. 1

Fig. 2

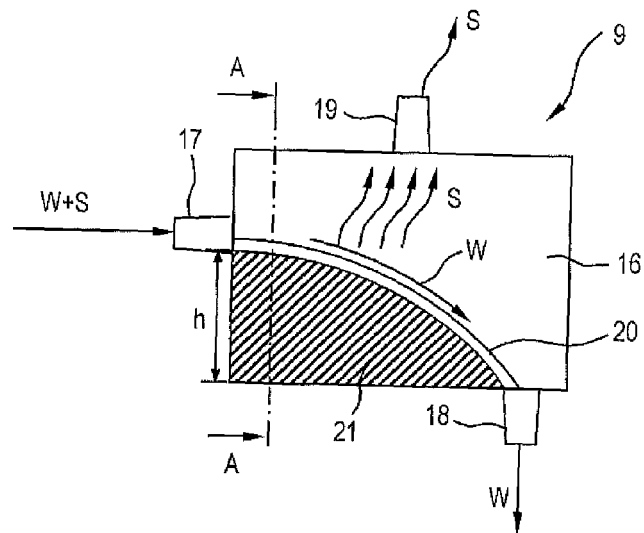


Fig. 3

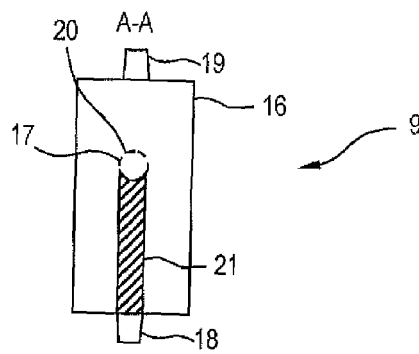


Fig. 4

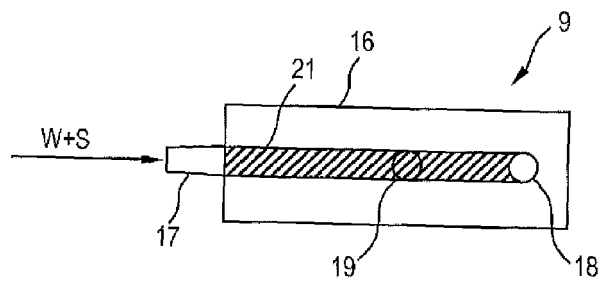


Fig. 5

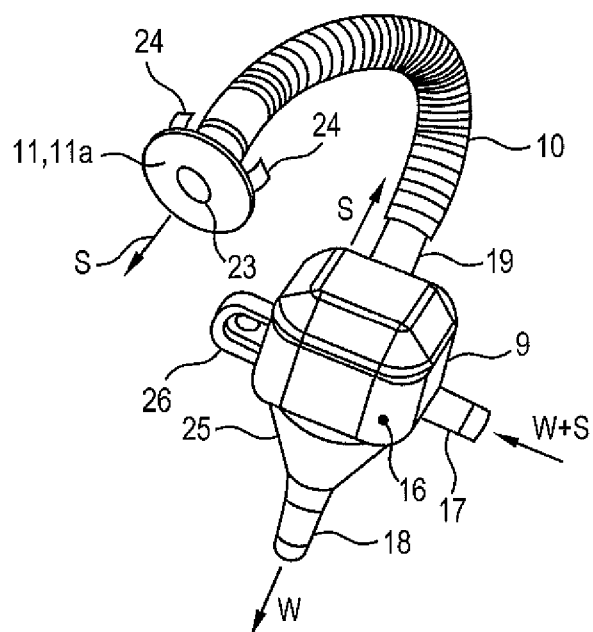
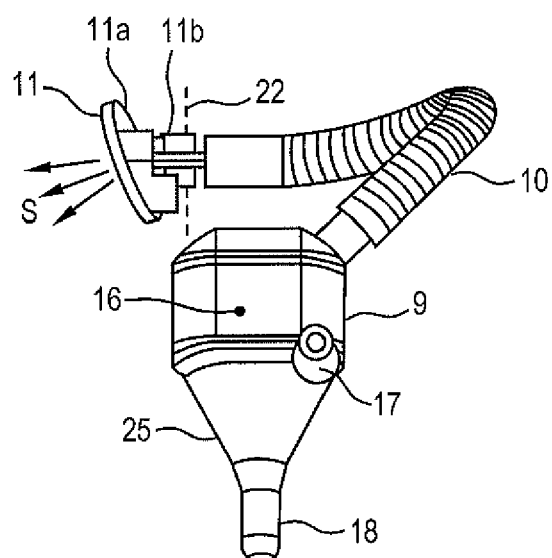


Fig. 6





EUROPEAN SEARCH REPORT

Application Number
EP 09 16 8028

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Place of search Munich		Date of completion of the search 8 February 2010	Examiner Spitzer, Bettina
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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