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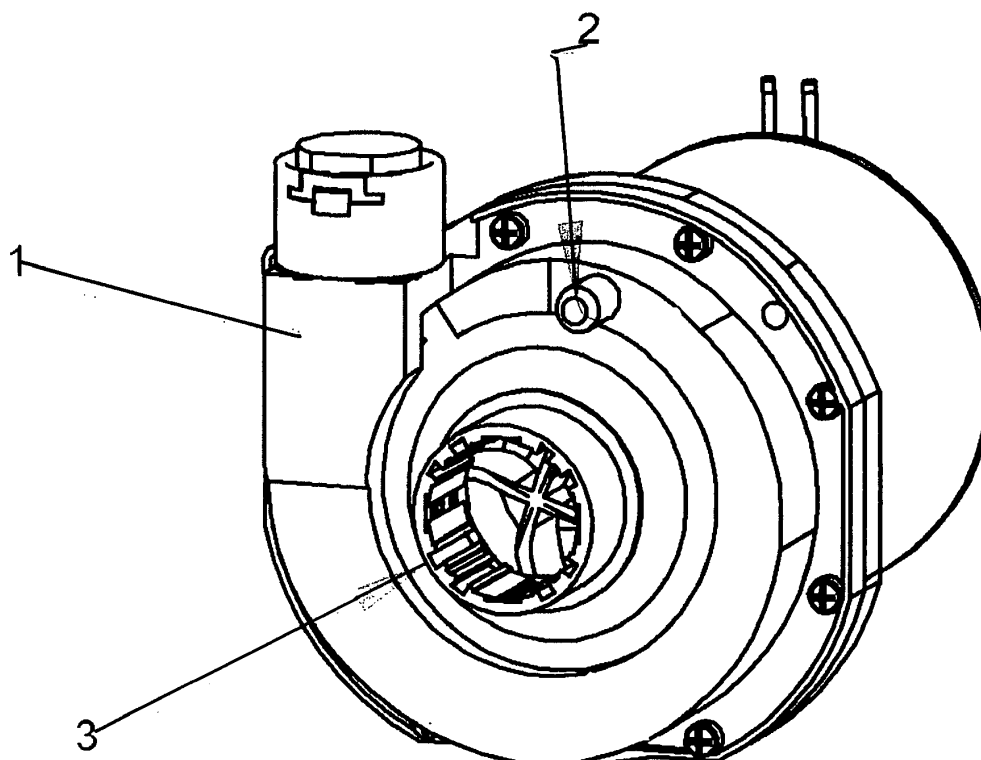
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(54) **Pump body for open impeller centrifugal pumps installed in a longitudinal position and fitted with an air vent pipe**

(57) The invention relates to a pump body for open impeller centrifugal pumps, installed in a longitudinal position, the top of which is fitted - preferably in a vertical

position to the suction pipe - with at least one air vent pipe capable of effecting the evacuation of all the air trapped inside the pump body.

FIG.1



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Description

STATE OF THE ART

[0001] Open impeller centrifugal pumps - i.e. pumps that, thanks to the open impeller design, enable the pumping of liquids that contain suspended solid materials - used in connection with the discharging of grey and black waters and the simultaneous grinding of organic materials, exploit their high rotation speed, and resulting large flow rate, to create a depression in the suction pipe, which rapidly draws into the pump the wastewater discharged by a toilet or a grey/black water collection tank. Generally speaking, with regard to the use of these pumps in connection with toilets or grey/black water collection tanks, when the tank is completely emptied, during the final part of its operation, the pump can draw in a certain amount of air which, if not removed, will cause the failure of the pump to start, or a delay in starting, the next time it is switched on. This is known as cavitation and occurs because open impeller centrifugal pumps are typically non-self-priming pumps, i.e. they are unable to start if no water supply is present, because they are unable to generate enough suction to draw the liquid into the pump while it is running.

[0002] The air trapped inside the pump body, therefore, must be removed before the pump is switched on, so that it can be suitably primed, i.e. filled with liquid before being used.

[0003] With regard to the use of the present invention, namely to grind the organic materials from toilet waste or to pump the grey/black waters collected in tanks, and due to its longitudinal installation of the pump, this problem is further worsened by the necessary presence of a check valve on the discharge line, to prevent backflow and foul odours escaping.

[0004] The presence of a check valve, in fact, heightens the problem of cavitation, preventing the natural evacuation of the air trapped inside the pump along the discharge line.

[0005] It ensues that, generally speaking, open impeller centrifugal pumps used in connection with black and/or grey water discharges, installed in a longitudinal position, can only evacuate the air trapped inside the pump - while the pump is not working - via the suction pipe.

[0006] The pump's longitudinal position, moreover, determines the fact that the air trapped inside the pump body can only be partially removed through the suction pipe, which is normally connected in a barycentric position to the pump, as a result of which the air trapped inside the pump above the inlet point has no way out.

[0007] In such widespread conditions, with respect to the present use, the pump operates in a condition of partial cavitation, due to the presence, inside the pump body, of a certain amount of air that has not been removed from the aforesaid pump body.

[0008] These operating conditions for the pump entail

a significant increase of the pump's noisiness, due also to the bursting of the air bubbles that form inside, a considerable increase of the pump's vibration, and the increased wear and tear of the impeller ball bearings. Moreover, a considerable impairment of the pump's performance also ensues, which is even more serious in respect of the use of the pump described here, for short periods of time but during which it must be highly efficient.

10 SUMMARY OF THE INVENTION

[0009] According to its broadest aspect the invention is an open impeller centrifugal pump body, installed in a longitudinal position, the top of which is fitted with an air vent pipe - vertically to the suction pipe - capable of ensuring the complete removal of the air trapped inside the pump body and the consequent solution of the problems mentioned above.

[0010] In accordance with the preferred embodiment of the present invention, the pump body features one or more air vent pipes, fitted to the top of the pump body and, in any case, above the suction pipe; the air vent pipe is directed to evacuate the air trapped at the top of the pump body and which causes the above mentioned inconveniences.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] By way of example, an embodiment of the invention is described more fully hereinafter with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of the pump body improved by the addition of the air vent, in accordance with the present invention.

Figure 2 is a schematic cross-section view of the pump and the impeller with the air vent pipe.

Figure 3 is a longitudinal cross-section view of the pump body showing the trapped air (dark shading) that needs to be removed.

Figure 4 is a view of the pump body and the pump connected to a grinder unit.

Figure 5 is a longitudinal cross-section of a pump connected to a grinder unit.

Figure 6 is a partial cross-section of a centrifugal pump housed inside a toilet grinder unit and fitted with the air vent pipe described herein.

Figure 7 is a longitudinal cross-section of a centrifugal pump housed inside a toilet grinder unit and fitted with the air vent pipe described herein.

Figure 8 is a detail of a cross-section of a pump connected to a toilet grinder unit.

DETAILED DESCRIPTION OF THE INVENTION

[0012] A preferred embodiment of the present invention is now described with reference to the drawings, wherein like reference numerals are used to refer to like

elements throughout. The pump body (1) features at least one air vent pipe (2) fitted at the top of the pump body itself (1), preferably at the top of the pump body (1) and above the suction pipe (3), which conveys the wastewater into the pump.

[0013] As shown in the attached drawings, the air vent pipe (2) is fitted to the top of the pump body (1) so that, the pump being installed in the longitudinal position, the quantity of air that has not been evacuated via the suction pipe (3) and which is trapped in the top part of the pump (4) (shaded in fig. 3) - thus preventing the proper priming of the pump and the malfunctioning mentioned above - can be effectively removed through the air vent pipe (2), when the pump is not running.

[0014] The position of the air vent pipe (2) at the top of the pump body is fundamental for effecting the removal of the air, because this is the part of the pump in which the trapped air tends to accumulate and from which it can, therefore, be easily evacuated.

[0015] The air vent pipe (2) can be fitted in a number of positions, for example above the suction pipe (3) along the vertical axis passing through the centre of the suction pipe (3).

[0016] Still other positions can obviously be just as effective, provided that the air vent pipe (2) is fitted to the pump body (1) above the suction pipe (3).

[0017] In certain heavy duty situations, more than one air vent pipe (2) can be fitted to the pump body (1), to effect the removal of the trapped air from the pump even faster.

[0018] In order to ensure the effective operation of the air vent pipe (2) - even when the pump operates with wastewater containing faeces - the cross-section of the vent should be wide enough to prevent its clogging by any waste materials, to ensure that it remains open even in the heaviest operating conditions.

[0019] The air vent pipe(s) (2) may discharge the trapped air into the grinder unit, the toilet discharge pipe or toilet bowl, or anywhere else; figures 5, 6 and 7 feature examples of how the air can be discharged through the air vent pipe (2).

[0020] Figure 5 shows the cross-section of the pump fitted with the air vent pipe (2) connected to a grinder unit with tank; figure 6 is a view of the pump fitted with the air vent pipe (2) applied to a toilet grinder unit connected by means of a coupling to the toilet drain pipe; figure 7 shows a cross-section of the pump fitted with an air vent pipe (2) connected to the toilet bowl.

the top of the pump body (1).

2. A pump body for open impeller centrifugal pumps, installed in a longitudinal position, as claimed in claim 1 **wherein** the pump body (1) for open impeller centrifugal pumps installed in a longitudinal position is fitted with at least one air vent pipe (2) at the top of the pump body (1) along the vertical axis passing through the centre of the suction pipe (3).
3. A pump body for open impeller centrifugal pumps, installed in a longitudinal position, as claimed in claim 1 **wherein** the air vent pipe (2) features a cross-section that is wide enough to allow the waste materials contained in the water to pass through.
4. A pump body for open impeller centrifugal pumps, installed in a longitudinal position, fitted with the air vent pipe as claimed in claim 1 **wherein** the air vent pipe (2) discharges the air into a tank.
5. A pump body for open impeller centrifugal pumps, installed in a longitudinal position, fitted with the air vent pipe as claimed in claim 1 **wherein** the air vent pipe (2) discharges the air into the toilet drain pipe.
6. A pump body for open impeller centrifugal pumps, installed in a longitudinal position, fitted with the air vent pipe as claimed in claim 1 **wherein** the air vent pipe (2) discharges the air into the toilet bowl suction area.

Claims

1. A pump body for open impeller centrifugal pumps, installed in a longitudinal position, comprising an inlet (3) and an open impeller (3a) at the inlet (3) **characterized by** the fact that the pump body (1) for open impeller centrifugal pumps installed in a longitudinal position is fitted with at least one air vent pipe (2) at

FIG.1

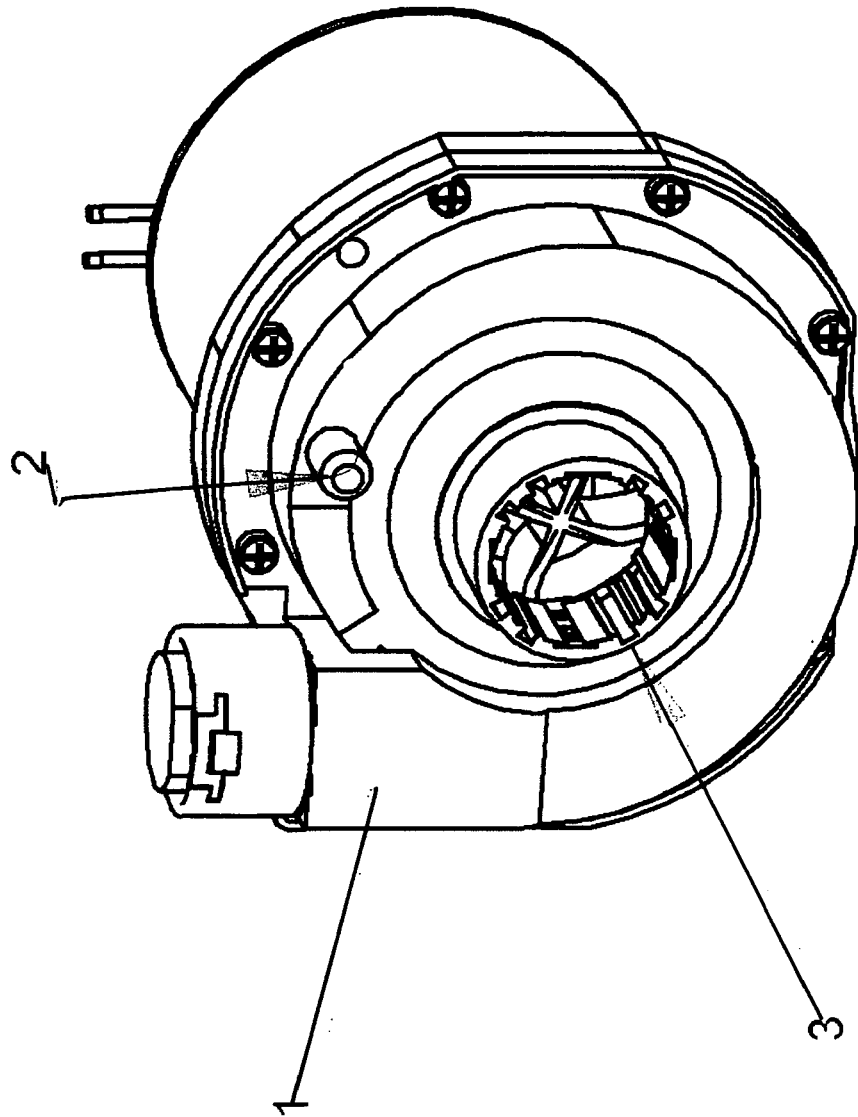
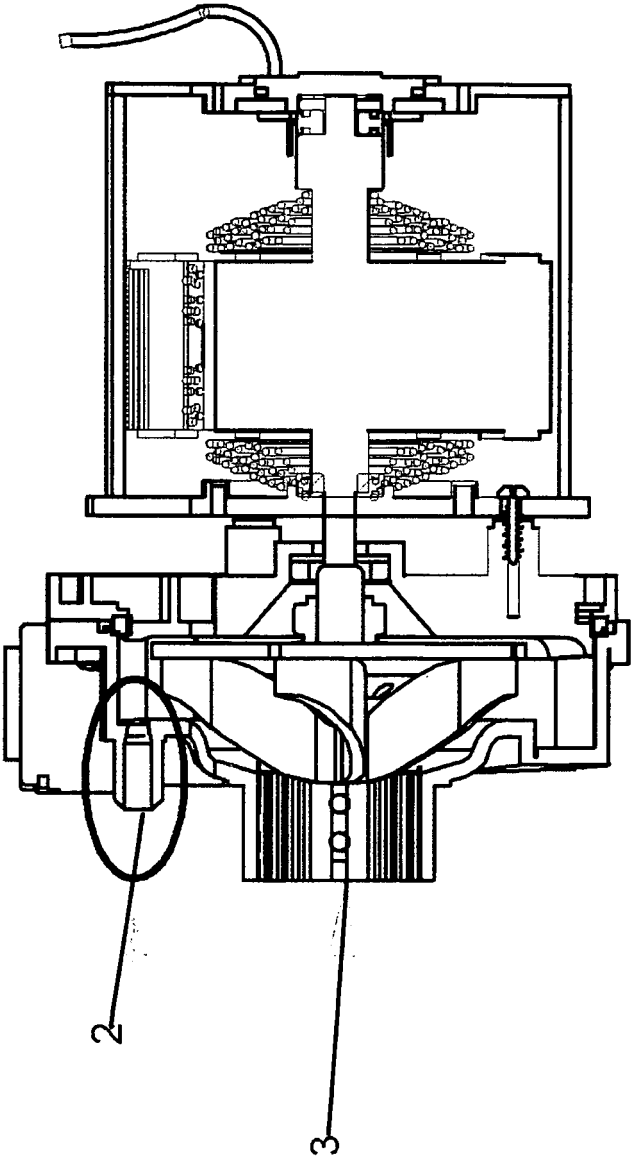


FIG.2



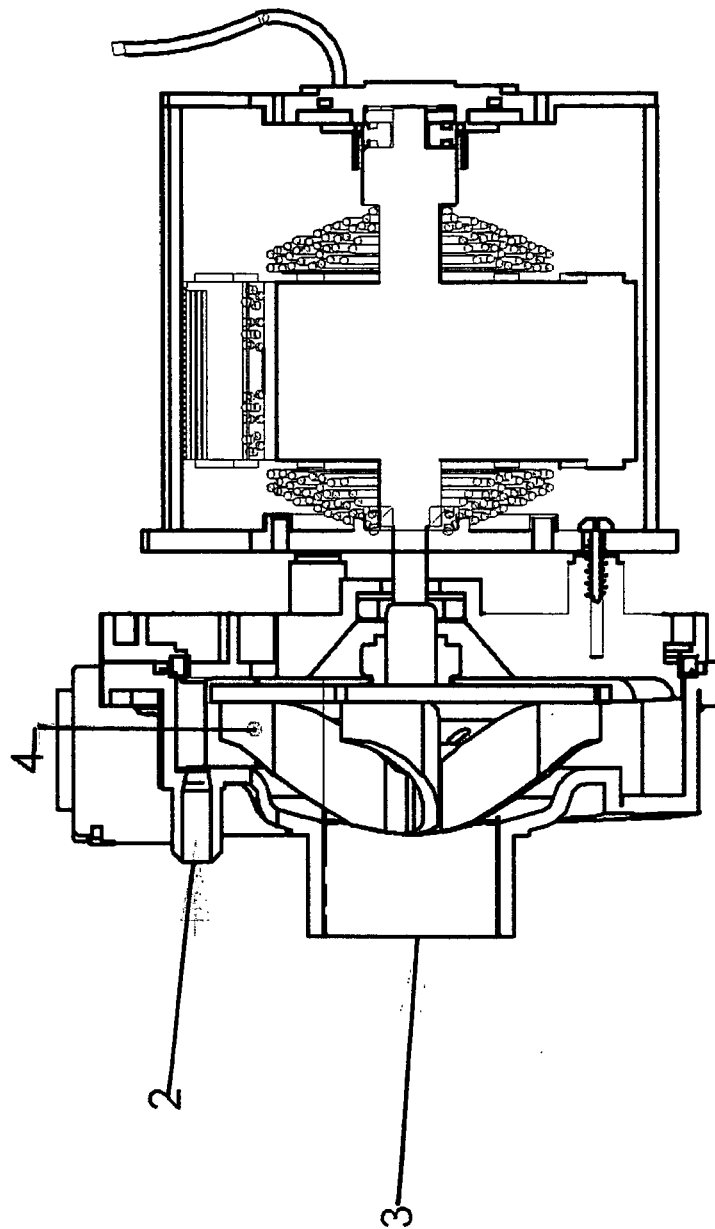


FIG.3

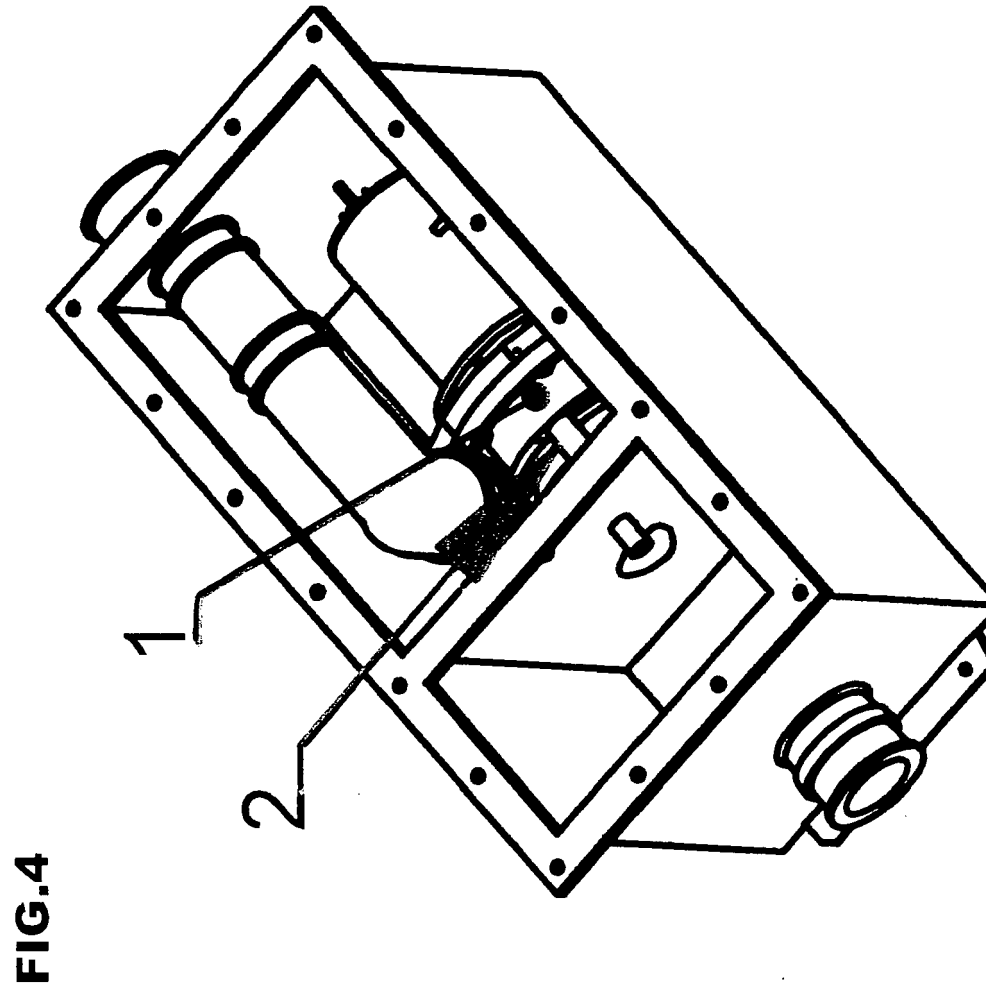
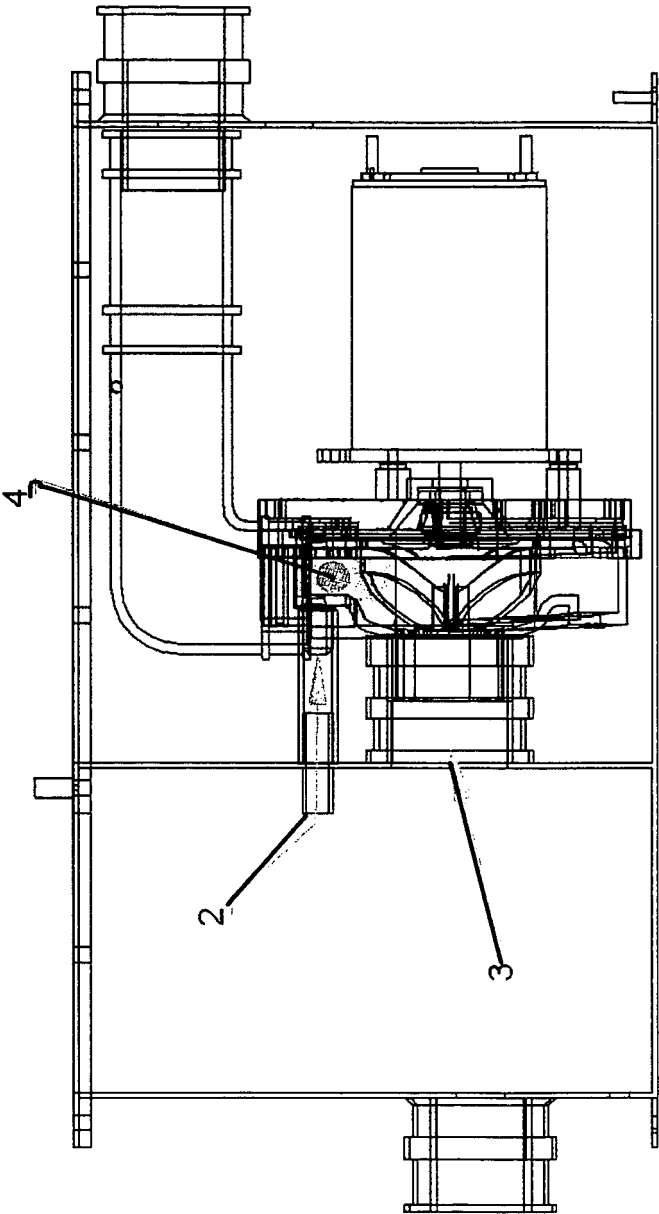


FIG.5



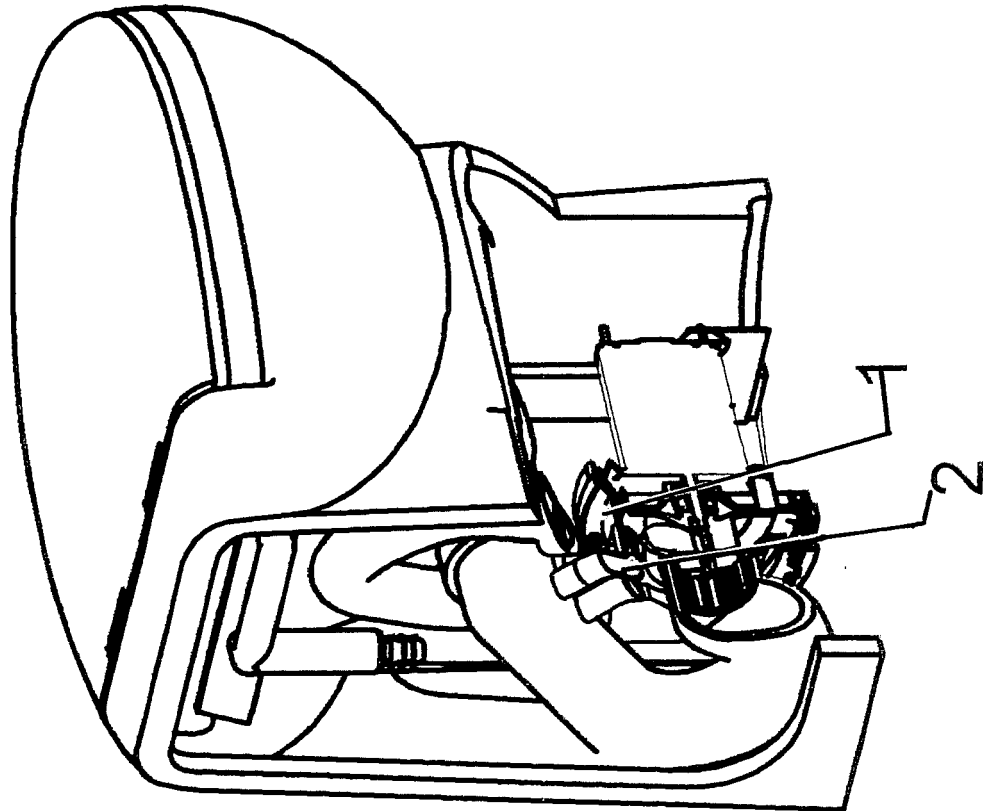
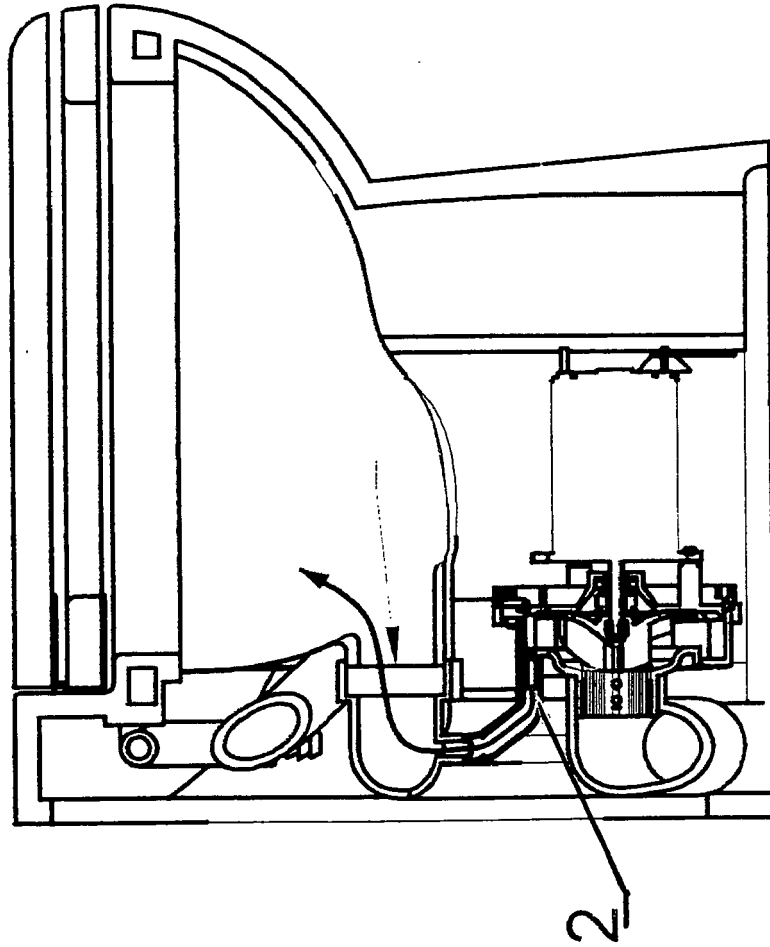


FIG. 6

FIG.7



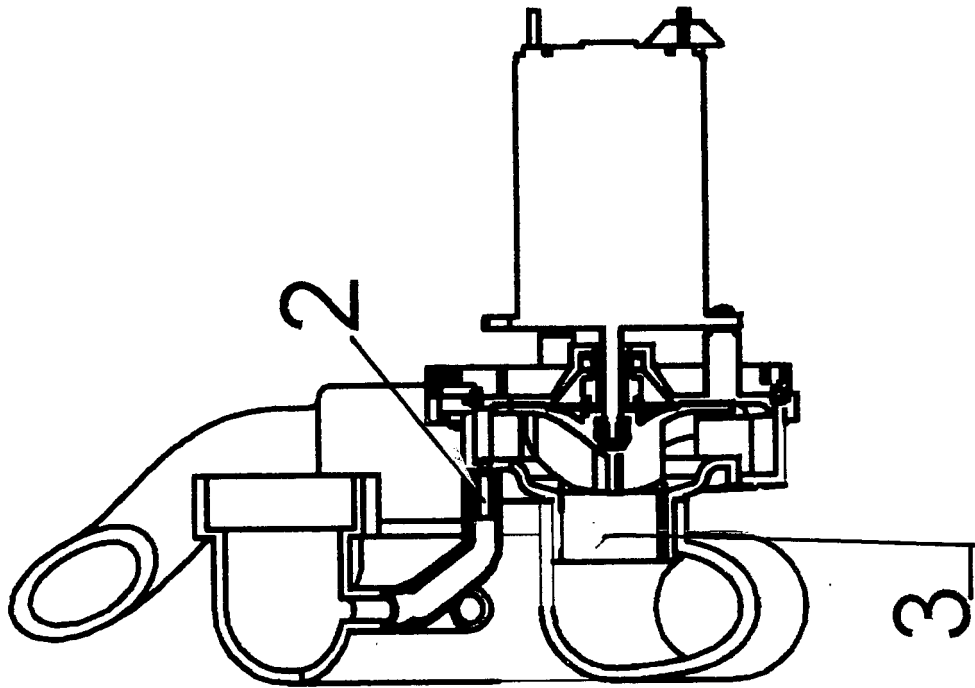


FIG.8



EUROPEAN SEARCH REPORT

Application Number
EP 10 42 5344

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 10 March 2011	Examiner Brouillet, Bernard
CATEGORY OF CITED DOCUMENTS		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	
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 10 42 5344

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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