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(54) **Hydraulic machine with automatic control device attached**

Hydraulische Maschine versehen mit automatischer Steuereinrichtung

Machine hydraulique munie d'un dispositif de commande automatique

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Description

Technical Field

[0001] The invention relates the technical sector of the construction of pumps for fluids and particularly for the distribution of water in external or internal areas.

Background art

[0002] At present experts of this field know pumps of different kind through which fluids are moved.

[0003] It's not the aim of this patent application to describe the types of pumps nowadays on sale, since all technicians of this field already know how they work, as they constitute known art. Especially, what is already known are hydraulic working machine, alternative pumps, as well as centrifugal, axial or others, able to lift or push a liquid.

[0004] Pumps that are known at present are switched on when the user wish to move a fluid, and work till they are switched off without any control on the pressure or the delivery of the fluid. Thus implying not only inconvenience for the user compelled to act on the pump for activate or deactivate it, but also risks relative to the possibility that the machine dry-works.

[0005] In order to eliminate these drawbacks, control and protective devices against dry-working are known, as well as mechanical or electromechanical apparatus which improves the pump's working avoiding damages to the machine.

[0006] Said devices are generally constituted by a casing containing inside it the following elements:

- 1- a system for measuring the pressure of the fluid, specifically a pressure switch;
- 2- a system for measuring the delivery of the fluid, specifically a flow switch either a rotating, axial or weighing one;
- 3- possibly, a protective system for the pump against dry-working;
- 4- a control panel.

[0007] Said devices are applied out of the pump through thread or specific clutches located on the delivery point, therefore out of the casing of the same pump. For these characteristics they are better qualified as separated completing accessories of the pump.

[0008] Specifically, a known patent is the WO 96/23936 "Device for regulating a water supply plant", concerning a device designed in order to be applied out of the pump and equipped with one or two pressure switches and a turbine aiming at controlling the pressure and the flow of water, as well as avoiding the machine dry-works.

[0009] It is known also the patent WO 98/36339 "A self-regulating computerized proportional control device for a water pump", concerning a device comprising of a

body with an inlet section and an outlet section, connectable to the pump delivery line and with pressure sensing means associated with the outlet section and generating digital output information.

[0010] Nevertheless, even such device is an external accessory of the pump and is very unwieldy, it raises the output costs and limits the use of the pump which is not compact and easy to use and transport.

[0011] Furthermore these devices, which are external accessories of the pump, have the drawback of producing a high output cost because of the need of join the components in a distinct body which can work with the pump once applied to it.

[0012] This invention aims at eliminating these and other drawbacks, supplying a compact pump, integrated with electromechanical devices that improve its functioning by controlling the pressure and the flow of the liquid and protecting the pump from dry-working.

Disclosure of invention

[0013] These and other aims are achieved by a hydraulic machine water pump integrated with electromechanical devices, providing for the automatic working of the machine itself, regardless of the variations of delivery, as well as with a pump's protective system from dry-working.

[0014] A water pump according to the present invention is defined in claim 1.

[0015] The water pump has the advantage of being equipped with a cooling system for the electric motor, which operates through the passage of the pumped flow that skims the external surface of the electric tight motor. This allows the machine to be very silent and effective while working.

[0016] Conveniently, the pump has at least a delivery indicator and a pressure switch attached to its internal ducts and connected with a control electronic circuit.

[0017] Conveniently, the delivery indicator (5) is a flow switch attached to the water suction or delivery conduit (3) inside the pump (2).

[0018] Conveniently, the pressure indicator (6) is a pressure switch attached to the water delivery conduit (3) inside the pump (2).

[0019] Conveniently, both the delivery indicator (5) and the pressure indicator (6) are easy to be reached from the outside, for possible inspections and cleaning or maintenance operations.

[0020] Conveniently, the electronic control card analyses the data coming from the pressure switch (6) and/or the flow switch (5) and activate automatically the pump when some water is required, for example when a tap has been turned on, when it measures a certain flow and/or a prefixed pressure, which is then kept constant.

[0021] Conveniently, the electronic control card analyses the data coming from the pressure switch (6) and from the flow switch (5) and deactivate automatically the

pump when it measures a prefixed pressure and/or the absence of flow of the liquid.

[0022] The electronic card and the control panel have the advantage of being accessible from the outside of the pump, as they can be directly attached to the body of the pump, to its top or to a completely separated support, possibly far from the pump, such as an electric board.

[0023] Another advantage is that the electronic card is programmed so as to allow the pump to work automatically, providing for activating it when the tap is turned on and deactivating it when it's turned off. Furthermore, the card stops automatically the pump in the absence of water to be sucked, thus avoiding possible damages to the machine.

[0024] Conveniently, the card can be programmed in order to carry out further functions according to the producer's or user's needs, always starting from the analysis of the data provided by the pressure switch and the delivery indicator.

[0025] Conveniently, the circuit is programmed so that it deactivates the pump automatically when the pump itself turns on and off more than once in short regular periods of time, because of a loss from the pipes of the hydraulic plant.

[0026] Conveniently, the pumping group, with the pressure-flow switch device attached, is incorporated in a compact block that comprises a control panel.

[0027] This control panel has the advantage of being inserted on the top (12) and is connected to an electronic card for the programmed operation of the device.

[0028] Another advantage of this top is that it works as further acoustic insulator reducing even more the sound emission from the invention, thus permitting it being used also in internal domestic environments.

[0029] Conveniently, the pumping group is fixed to a base and protected by a top at its turn fixed to this base.

[0030] Conveniently, the invention is furnished ready to be installed and it doesn't need any particular procedures, being facilitated by flexible pipes that come out from the suction and the delivery.

Advantageous effects of the invention

[0031] The invention offers a lot of advantages. First of all, it allows the user to have at his disposal a hydraulic machine, specifically a pump, which is activated and deactivated automatically following the opening and closing of the water tap, with no need he acts directly on it. In addition, such pump is equipped with a control system against dry-working, which is integrated in the internal conduits of the pump.

[0032] This allows the user to get a pump that externally is completely similar to traditional pumps, with the same dimensions, but internally it has this further functionality.

[0033] Particularly, rather than attaching control devices out of the machine, this pump is compact and less

unwieldy, since externally is like a traditional pump, even if it contains the integrated control devices. Therefore, it results handy, lighter and easier to use and transport.

[0034] Furthermore, the cooling system of the electric motor permits the pump to be very silent.

[0035] Another advantage is that the user gets a saving in the output costs, since it's not necessary to design and build an independent container with all the relative links for the connection of the pump.

Description of one way of carrying out the invention by reference to the drawing

[0036] In an ideal practical form, the invention is constituted by a pump (2) inside which a delivery indicator (5) and a pressure switch (6) are attached to the water suction conduits (3). These conduits (3) cross the pump so that the fluid skims the external surface of the motor, that is tight. This allows the machine to have a very silent and effective cooling system.

[0037] On the contrary, the control panel is attached to the external body of the pump, and is connected to the electronic card which receives and analyses the information provided by the pressure switch (6) and the flow switch (5), proceeding with the activation or deactivation of the pump according to the needs.

[0038] In a different practical form, the invention is constituted by a pumping group (Fig. 3, n. 1) inside which a delivery indicator (5) and a pressure indicator (6) are attached to the water delivery conduit (3), and above which a top (12) is placed. In this practical solution, the control panel is located on the top of the pump, rather than on its body.

Brief description of drawings

[0039] Further characteristics and advantages will be more evident looking to a favourite but not restrictive form of realization depicted as an example in the attached drawings where:

- Fig. 1 shows a vertical section drawing of the machine (1) constituted by a pump (2) for liquids of any kind, equipped, in this case, with impeller (4), entrance hole (7) for water, water suction conduit (3) and exit hole (8). A delivery indicator, or flow switch, (5) and a pressure indicator, or pressure switch (which is not depicted in this table) are attached to the conduit (3);
- Fig. 2 shows a horizontal section drawing of the machine where the section of the pump (2), the flow switch (5) and the pressure switch (6) are highlighted;
- Fig. 3 shows a schematic possible conformation of the machine constituted by a base (10) equipped with supports (11) where the machine (1) is located, isolated from sounds and vibrations with silent-blocks and/or gaskets (9) which are placed on the

base of the top (12) as well.

Claims

1. Water pump **characterized by the fact that** is a body one with:

- a pressure indicator (6) integrated to the water delivery conduit (3) inside the pump (2), which checks the pressure of the fluid; 10
- a flow indicator (5) integrated to the water suction or delivery conduit (3) inside the pump (2) which registers the presence of flow of water inside the pump; 15
- a programmed electronic circuit connected with the pressure indicator and the flow indicator, specifically programmed to activate the pump when a certain pressure and/or flow is registered, and to deactivate the pump when a certain pressure is registered and/or in the absence of flow of the fluid, reading the data coming from the pressure indicator and the flow indicator; 20

2. Pump according to claim 1 **characterized by** the fact that it's equipped with a cooling system of the electric motor, which operates through the passage of the pumped flow around the external surface of the electric tight motor, which, being skimmed by the fluid, cools. This allows the machine to be very silent and effective while working. 25 30

3. Pump according to claim 1 or 2 **characterized by** the fact that the programmed electronic circuit analyses the data coming from the pressure switch (6) and/or the flow indicator sensor (5) and activate automatically the pump when some water is required, when it measures a certain flow and/or a prefixed pressure, which is then kept constant. 35 40

4. Pump according to claim 1, **characterized by** the fact that comprises a control panel accessible from the outside of the pump, as it is directly attached to the body of the pump, to its top or to a completely separated support, possibly far from the pump. 45

5. Pump according to claim 4 **characterized by** the fact that the control panel is inserted on the top (12), that works as further acoustic insulator, and is connected to the circuit for the programmed operation of the device. 50

6. Pump according to claim 1, 2 or 3 **characterized by** the fact that the electronic circuit is programmed so as to allow the pump to work automatically, providing for activating it when the tap is turned on and deactivating it when it's turned off and/or in the ab-

sence of water to be sucked, thus avoiding possible damages to the machine.

7. Pump according to claim 1 **characterized by** the fact that the circuit can be programmed in order to carry out further functions according to the producer's or user's needs, always starting from the analysis of the data provided by the pressure switch and the flow indicator. 5

8. Pump according to claim 7 **characterized by** the fact that the circuit is programmed so that it deactivates the pump automatically when the pump itself turns on and off more than once in short regular periods of time, because of a loss from the pipes of the hydraulic plant. 10 15

9. Pump according to claim 1 or 2 **characterized by** the fact that the pumping group, with the pressure-flow switch device attached, is incorporated in a compact block that comprises a control panel. 20

Patentansprüche

1. Aus einem einzelnen Körper bestehende hydraulische Maschine mit:

- Vorrichtungen zur Messung des Flüssigkeitsdrucks mittels eines auf den Wasserleitungen im Inneren der Maschine angebrachten Druckwächters (6);
- Vorrichtungen zur Feststellung des Vorhandenseins des Wasserdurchflusses im Inneren der Pumpe mittels eines auf den Wasserleitungen im Inneren der Maschine angebrachten Durchflussschalters (5);
- Vorrichtung, die die Maschine startet, sobald ein bestimmter Druck und/oder Wasserfluss festgestellt wird und die Maschine abschaltet, wenn kein Druck und/oder Wasserfluss vorhanden ist. Dies geschieht durch einen vorprogrammierten elektronischen Kreislauf, der die von Druck- und Durchflussschalters festgestellten Daten einliest und auf deren Grundlage die Betriebsfunktionen der Maschine reguliert;

2. Pumpe wie 1) mit einem Kühlsystem, bei dem die Kühlung durch die gepumpte Flüssigkeit selbst erfolgt, die über die Außenflächen des hermetischen Motors geleitet wird. Dies ermöglicht optimale Leistung bei extrem niedriger Geräuschentwicklung;

3. Pumpe wie 1) und 2), bei der die elektronische Steuerplatine die Daten des Druckwächters (6) und des Durchflussschalters (5) analysiert und die Pumpe automatisch startet, wenn die voreingestellten Durchfluss- und/oder Druckwerte festgestellt wer-

den, die dann konstant gehalten werden;

4. Pumpe wie 1), bei der die Steuertafel von außen zugänglich ist, da direkt auf dem Pumpenkörper, auf der Abdeckung oder dem Gestell angebracht ist. Eine elektrische Schalttafel die völlig separat ist und sich auch in einiger Entfernung zur Pumpe befinden kann; 5
5. Pumpe wie 4), bei der die Steuertafel in die Abdeckung (12) eingesetzt ist, die als weitere Schalldämmung fungiert und mit einer Platine für die programmierte Steuerung der Anlage verbunden ist; 10
6. Pumpe wie 1), 2) oder 3), bei der die Steuerplatine so programmiert ist, dass der Pumpenbetrieb automatisch erfolgt. Die Pumpe wird gestartet, sobald der Hahn geöffnet wird bzw. gestoppt, sobald der Hahn geschlossen wird, oder - um das zu Schaden kommen der Pumpe zu verhindern - wenn kein Ansaugwasser vorhanden ist; 15 20
7. Pumpe wie 1) mit Platine, die auf Grundlage der Analyse der von Druckwächter und Durchflusswächter gelieferten Daten den Bedürfnissen des Herstellers oder des Benutzers entsprechend für weitere Funktionen programmiert werden kann; 25
8. Pumpe wie 7), bei der der Kreislauf so programmiert ist, dass die Pumpe sich bei durch Verluste in den Leitungen verursachtes, mehrfach aufeinander folgendes Starten und Stoppen in kurzen Abständen, automatisch abschaltet; 30
9. Pumpe wie 1) oder 2), bei der die Pumpengruppe mit Druck-/Durchflusswächter in einen kompakten Block eingebaut ist, der auch die Steuertafel enthält. 35 40

Revendications

1. Pumpe à eau **caractérisée par** un corps avec : 45
 - un indicateur de pression (6) intégré à la conduite d'arrivée d'eau (3) dans la pompe (2), qui contrôle la pression du fluide;
 - un indicateur de débit (5) intégré à la conduite d'arrivée ou d'aspiration de l'eau (3) dans la pompe (2) qui enregistre la présence d'un débit d'eau dans la pompe; 50
 - un circuit programmé électronique connecté à l'indicateur de pression et l'indicateur de débit, spécifiquement programmé pour activer la pompe quand une certaine pression et/ou débit est enregistré, et pour désactiver la pompe quand une certaine pression est enregistrée et/ou en l'absence de débit du fluide, lisant les 55

données provenant de l'indicateur de pression et de l'indicateur de débit;

2. Pompe en conformité avec la revendication 1 **caractérisée par** un système de refroidissement du moteur électrique, qui opère par le passage du débit pompé autour de la surface extérieure du moteur électrique étanche, qui, étant enveloppé par le fluide, se refroidit. Cela permet à la machine d'être particulièrement silencieuse et efficace durant le travail.
3. Pompe en conformité avec les revendications 1 ou 2 **caractérisée par** un circuit électronique programmé pour analyser les données provenant du commutateur de pression (6) et/o du capteur indicateur de débit (5) et activer automatiquement la pompe quand il y a besoin d'eau, quand il mesure un certain débit et/ou une pression prédéfinie, qui est alors maintenue constante.
4. Pompe en conformité avec la revendication 1 **caractérisée par le fait qu'elle** comprend un tableau de commande accessible par l'extérieur de la pompe, car directement attaché au corps de pompe, par le dessus et ou par un support totalement séparé, si possible loin de la pompe.
5. Pompe en conformité avec la revendication 4 **caractérisée par** un tableau de commande inséré sur le dessus (12), qui fonctionne comme un autre isolant acoustique, et il est connecté au circuit pour l'opération programmée de l'instrument.
6. Pompe en conformité avec les revendications 1, 2 ou 3 **caractérisée par** un circuit électronique programmé pour permettre à la pompe de travailler en automatique, prévu pour activer la pompe quand le robinet est allumé et la désactiver quand il est éteint et/ou en absence d'eau à aspirer, en évitant donc de possibles dégâts à la machine.
7. Pompe en conformité avec la revendication 1 **caractérisée par** un circuit qui peut être programmé pour exécuter d'autres fonctions en conformité avec les besoins du producteur ou de l'utilisateur, toujours en partant de l'analyse des données fournies par le commutateur de pression et l'indicateur de débit.
8. Pompe en conformité avec la revendication 7 **caractérisée par** un circuit programmé pour désactiver la pompe automatiquement quand la pompe s'allume et s'éteint d'elle-même plus d'une fois pendant de courtes et régulières périodes de temps, à cause d'une perte sur des tubes de l'installation hydraulique.

9. Pompe en conformité avec les revendications 1 ou 2 **caractérisée par** un groupe de pompage, avec l'instrument commutateur de pression-débit fixé, incorporé dans un boîtier compact qui comprend un tableau de commande.

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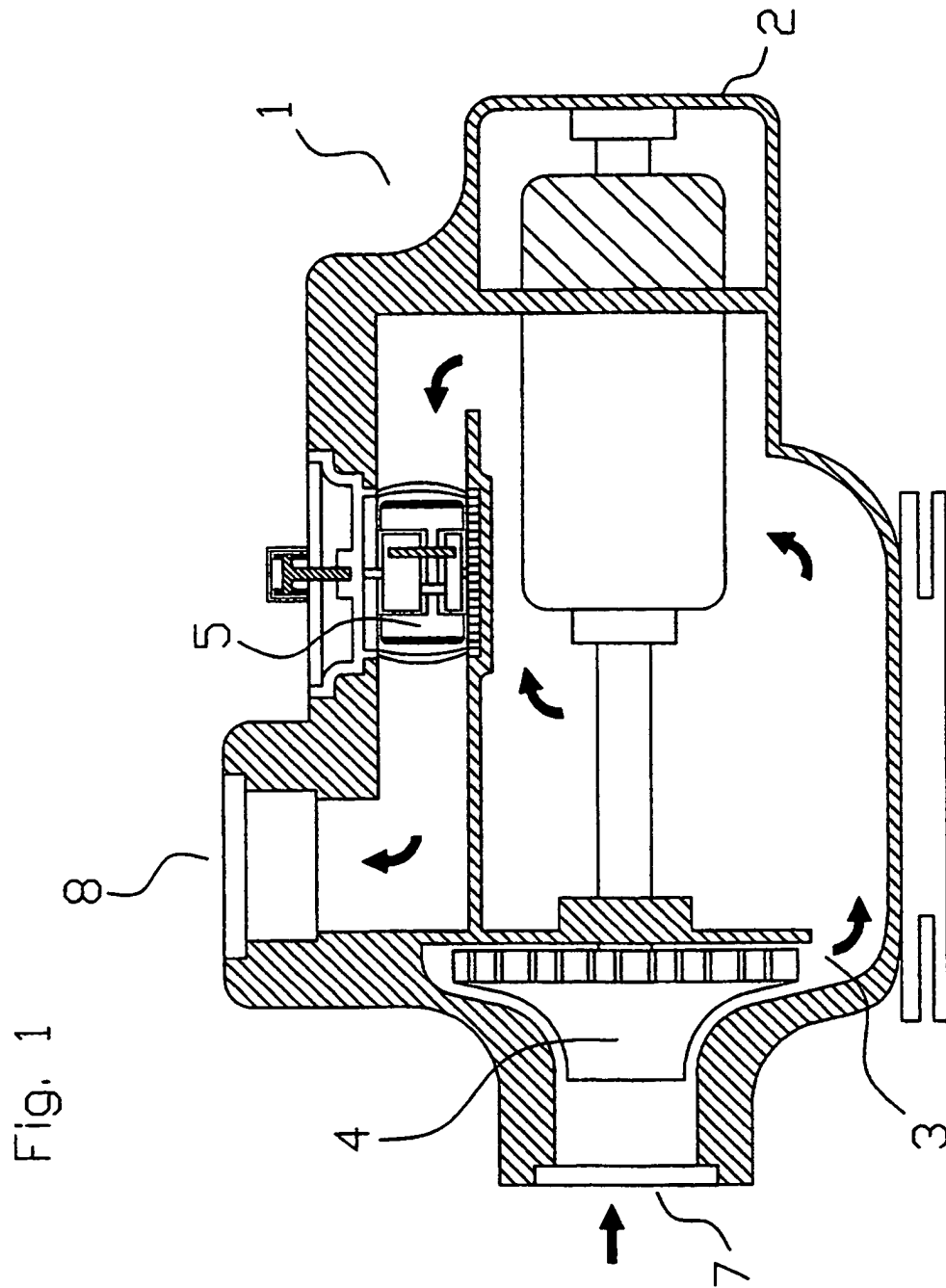
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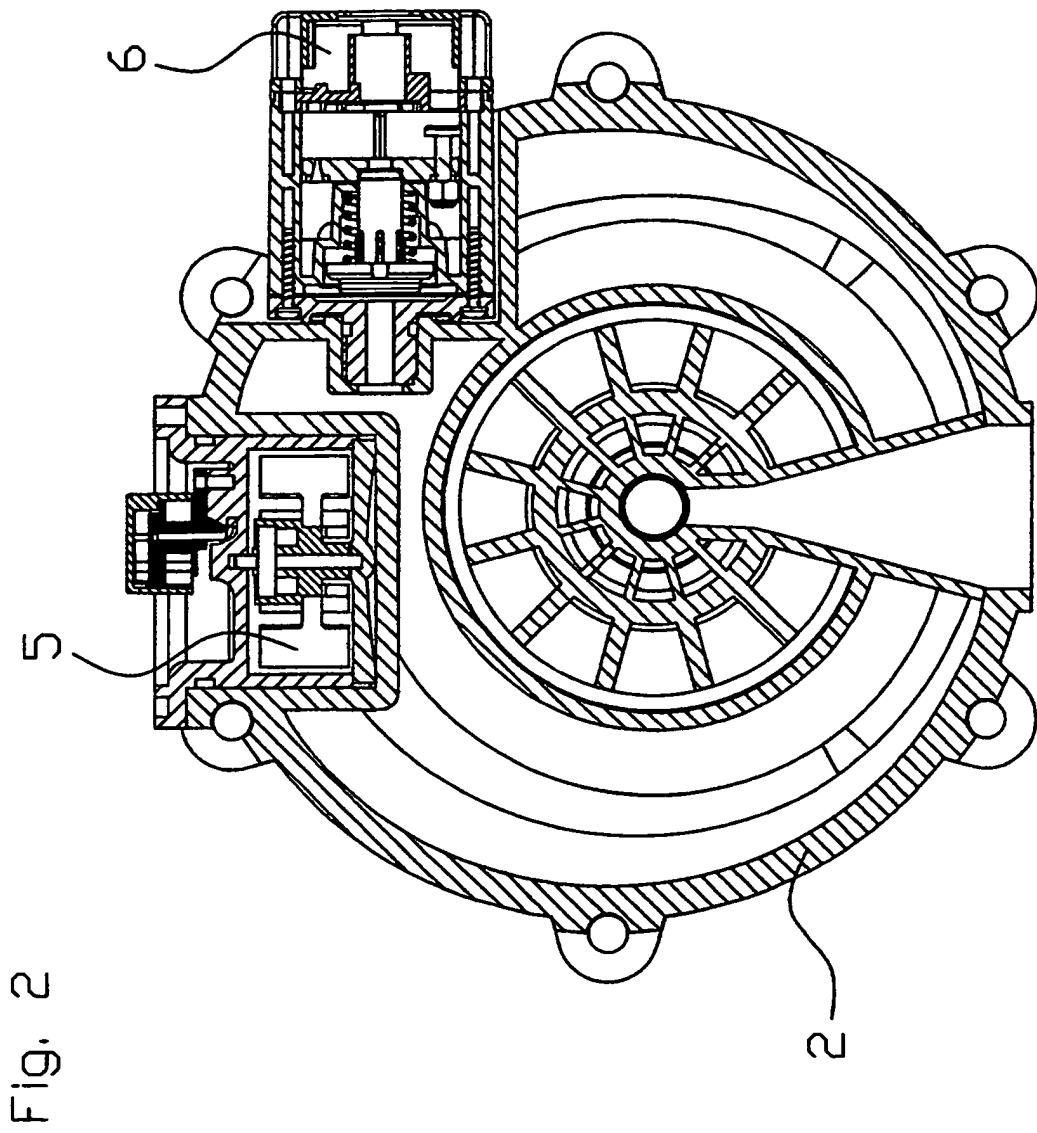


Fig. 3

