(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 964 157 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
15.12.1999 Bulletin 1999/50

(51) Int Cl.[6]: **F04B 49/02**

(21) Application number: **99830358.0**

(22) Date of filing: **10.06.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **12.06.1998 IT MC980026 U**

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(54) Well pump with integrated pressure switch

(57) The present invention relates to a canned motor pump internally equipped with a pressure sensor capable of detecting the water pressure at the mouth of the external delivery pipe; it being provided that the pressure sensor is connected to a special electric circuit that enables it to activate or deactivate the motor of the electric pump when the water pressure reaches the set minimum or maximum value, respectively.

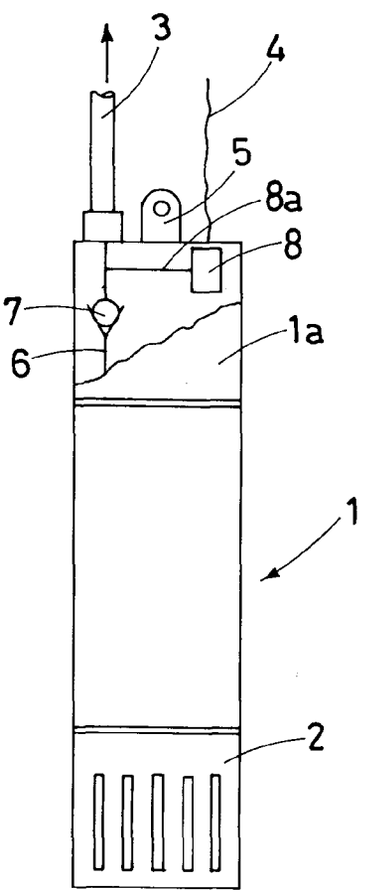

FIG. 2

EP 0 964 157 A1

Description

[0001] The present patent application relates to a canned motor pump used to extract water from wells, capable of switching off automatically and immediately when the water tap is turned off and switching on automatically when the water tap is turned on.

[0002] The canned motor pump according to the present invention has been designed to overcome the serious drawback of the currently available canned motor pumps represented by their manual operation.

[0003] The advantages of the pump according to the present invention will become evident from a brief description of the state of the art.

[0004] Traditional canned motor pumps used to extract water from wells feature a rather elongated cylindrical structure provided with a top cap used to hook the cable that holds the pump inside the well and insert the power electric cable and the water delivery pipe.

[0005] At present, the controls used to switch on the pump and supply water are located on the surface and consist of a switch connected to the electric power supply cable and of a tap connected to the water delivery pipe, respectively.

[0006] In this way, in order to start the water supply, the user needs to activate the pump motor with the switch and then open the tap located at the end of the water delivery pipe. On the other hand, in order to stop the water supply, it is necessary to switch off the pump motor with the switch and then close the tap.

[0007] The big drawback of traditional pumps is represented by the fact that, in order to stop the water supply, the user only turns off the tap. As a matter of fact, since the water supply stops when the tap is turned off, most of the times the user forgets to switch off the pump motor.

[0008] In this unfortunate event, the pump continues to operate without supplying water and this will soon cause permanent damage to the motor.

[0009] It must be said that expedients were designed long time ago in order to avoid the above-mentioned damage of the motor in canned motor pumps. All these expedients are based on the automatic stall of the motor when the pressure of the water supply exceeds the set value. In particular, this value is reached when the pump continues to operate even if the tap is turned off.

[0010] To this purpose a tank with a pressure switch is sometimes installed on the surface, along the delivery pipe just before the tap and outside the well. In particular, apart from stopping the pump, the tank is also capable of accumulating a certain volume of water at the top of the tap.

[0011] At this regard, it is important to note that all the automatic stop devices of canned motor pumps are characterized by the fact that they are located on the surface and physically separated from the pump.

[0012] Generally, the automatic stop devices are mounted after the installation of the pumps and they often require the intervention of skilled installers, as in the case of tanks.

[0013] The purpose of the present invention is to create a canned motor pump capable of switching on and off automatically and immediately when the tap is opened and closed, respectively. It is important to note that the pump according to the present invention is capable of switching on and off automatically without using additional separate devices.

[0014] As a matter of fact, the main peculiarity of the pump according to the present invention is represented by the fact that all the components that are necessary to automatically switch on and off the pump are contained in the pump structure and available for the user from the moment he purchases the pump.

[0015] This means that the pump according to the present invention is not only capable to gLiarantee the integrity of the electric motor, but also to avoid all the difficulties and costs necessary today to install tanks or similar devices on the surface in order to automatically stop the operation of the pump motor, according to the description above.

[0016] In practice, the pump according to the present invention is capable of stopping automatically and immediately when the water pressure in the delivery water pipe exceeds the set value (as it happens when the tap is closed and the pump motor is still operating), and starting up again automatically when the water pressure drops below the second threshold (as it happens when the tap is re-opened).

[0017] For major clarity the description of the invention continues with reference to the enclosed drawings, which are intended for purposes of illustration and not in a limiting sense, whereby:

- Figure 1 is a schematic drawing that shows the canned motor pump according to the present invention in operating condition;
- Figure 2 is an enlarged view of the pump with the top cap partially removed in order to show the internal parts in a schematic view;
- Figure 3 is the diagram of the electric circuit connected to the pump motor according to the present invention.

[0018] With reference to the above mentioned figures, the pump (1) according to the present invention usually features an elongated cylindrical structure which houses the electric motor (2) in its lower end. A cap (1a) is located at the top of the pump, on which the connections for the riser pipe (3) and the electrical cable (4) are located, as well as an eyebolt (5) for the supporting rope.

[0019] Inside the cap (1a) a non-return valve (7) is installed in intermediate position between the connection point of the external vertical riser pipe (3) and the internal delivery water conduit (6). Thanks to the valve action, the water remains inside the riser pipe (3) between the body of the pump (1) and the water tap (3a) even

when the pump motor is not working.

[0020] In the same cap (1a) a pressure sensor (8) that communicates through a small pipe (8a) with the mouth of the external riser pipe (3) is mounted immediately below the non-return valve (7). In this way the pressure sensor (8) is capable of detecting the water pressure in the mouth of the external riser pipe (3).

[0021] As a matter of fact, the sensor (8) is responsible for the activation and deactivation of the motor of the pump (1), since it determines the deactivation of the electric motor when a set (high) water pressure value is detected inside the riser pipe (3). At the same time, it is responsible for the reactivation of the pump motor when a set (low) pressure threshold is detected inside the riser pipe (3).

[0022] The first condition - that is a high pressure value in the riser pipe (3) - is determined when the tap (3a) is closed by the user, but the motor of the pump (1) is still operating. The second condition - that is a low pressure value in the riser pipe (3) - is determined when the tap (3a) is re-opened and the motor of the pump (1) is in stall.

[0023] In other words, when the user opens the tap (3a) on the surface, the motor (2) of the pump (1) is switched on automatically and immediately, while when the tap (3a) is closed, the motor (2) of the pump is switched off automatically and immediately.

[0024] Moreover, it must be said that the pressure sensor (7) features two logical states (on-off) that alternate when the water in the riser pipe (3) reaches the set minimum or maximum pressure value.

[0025] The two logical states are part of an electric circuit (shown in figure 3) capable of switching on the pump when the tap is opened (with the low pressure threshold detected by the sensor) or switching off the pump when the tap is closed (with the high pressure threshold detected by the sensor).

[0026] In practice, the sensor is capable of switching on and off a relay (9) that is an integral part of the electric circuit and is responsible for directly controlling the switching on and off of the motor (2) of the pump (1). The electric circuit is also equipped with a float switch (10) used to permanently cut out the motor (2), regardless of the fact that the tap (3a) is opened or closed.

[0027] The float switch can be very useful when the pump remains unattended for a long time to avoid its accidental switching on, due to the accidental opening of the tap by unauthorized personnel.

[0028] The components of the electric circuit of the motor (2) are housed inside the pump (1) next to the pressure sensor (8).

[0029] The same location can also be used to install electronic boards (possibly with microprocessor) to switch on and off the pump in a more articulated way, according to the specific requirements or needs.

Claims

1. Canned motor pump, of the type provided with an elongated cylindrical structure, equipped with an electric motor (2) in the lower part and a cap (la) in the upper part, which houses the connections for an external riser pipe (3) equipped with a tap (3a) on the surface and for an electric cable (4) equipped with a switch (10) on the surface, characterized by the fact that a non-return valve (7) is located inside the cap (la) in intermediate position between the internal water delivery pipe (6) and the mouth of the external riser pipe (3) which communicates through a small pipe (8a) with a pressure sensor (8) housed inside the cap (1a); it being provided that the sensor (8) is capable of switching on or off the motor (2) of the pump (1) by means of a relay (9) connected in an electric circuit, when the minimum or maximum pressure values are detected at the mouth of the riser pipe (3).

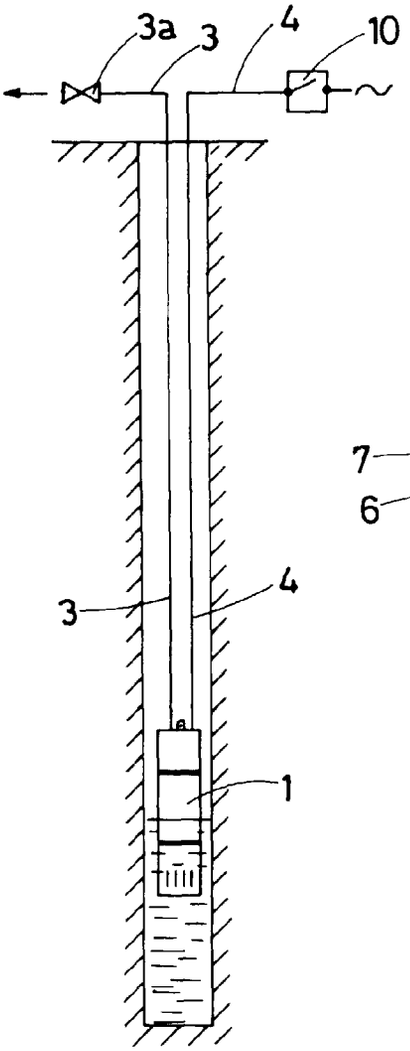

FIG. 1

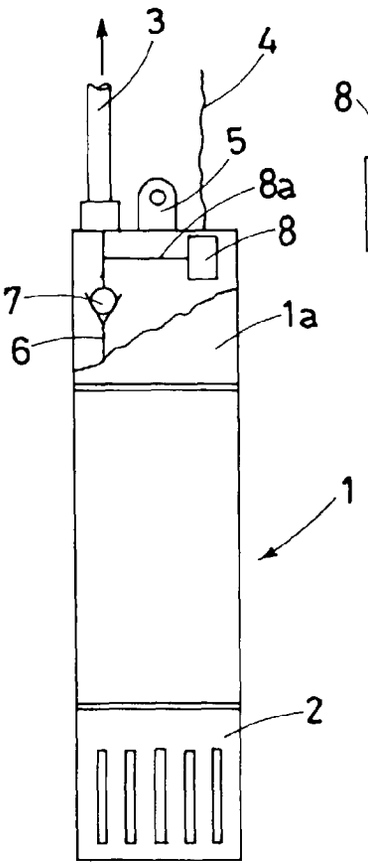

FIG. 2

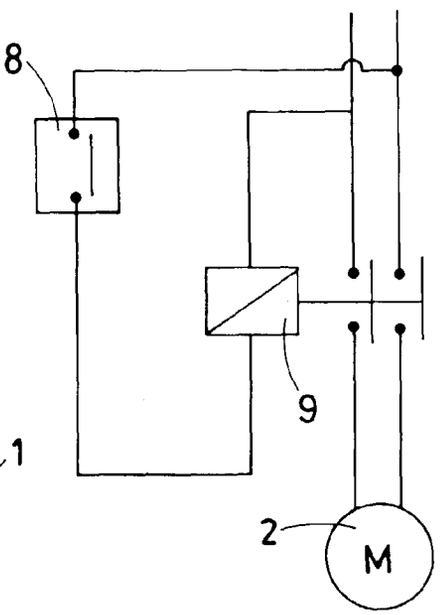

FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 99 83 0358

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION
X	US 5 281 101 A (BEVINGTON JACK T) 25 January 1994 (1994-01-25) * column 3, line 4 - column 5, line 55; figures 1-6 *	1	F04B49/02
A	US 3 865 512 A (DETERS ELMER M) 11 February 1975 (1975-02-11) * abstract; figure 1 *	1	
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TECHNICAL FIELDS SEARCHED

F04B
E03B
F04D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21 September 1999	Ingelbrecht, P

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 99 83 0358

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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21-09-1999

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