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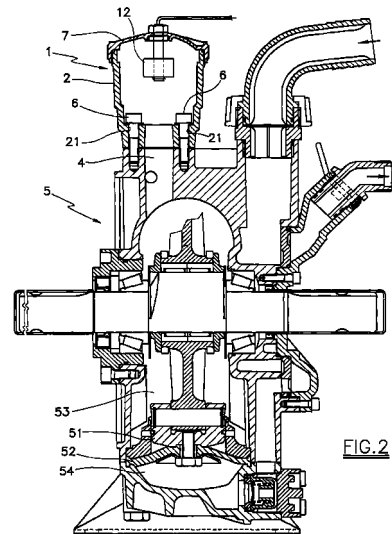
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(54) **Device for indicating diaphragm rupture in high pressure pumps**

(57) A device for indicating diaphragm rupture in high pressure pumps, comprising a small vessel connected to the pump crankcase and located higher than the level of the highest point of the crankcase, in the interior of which there are provided oil level-sensitive means arranged to operate an indicator device when the oil level increases even by a minimum amount beyond the normal crankcase filling level.



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Description

[0001] This invention relates to high pressure pumps, and in particular diaphragm pumps.

[0002] Diaphragm pumps are known comprising a plurality of equidistant pistons distributed radially about a rotary shaft to which they are connected by usual connecting rods.

[0003] The heads of said pistons are connected to the centre of a diaphragm which separates the pump crankcase from the pumping chamber.

[0004] To ensure effective lubrication of the mechanical members present in the pump crankcase, this latter is filled with lubricating oil.

[0005] The diaphragm of such pumps is subjected to considerable stress and wear, it sometimes rupturing with consequent infiltration of water into the pump crankcase. If the operator does not become aware of it in time, this infiltration can result in irreparable pump damage.

[0006] There is therefore a need for an alarm device able to warn the operator that said diaphragm has undergone rupture.

[0007] Alarm devices are known in this sector for indicating diaphragm rupture which are based upon dielectric properties of the lubricating oil. These devices comprise two electrodes positioned in the lubricating oil crankcase, between these there being applied a potential difference. If the lubricating oil is not contaminated by the liquid pumped by the pump, no current circulates between the electrodes, whereas if pumped liquid is present in the lubricating oil this liquid creates within the oil a conductive path through which electric current passes, to activate the alarm device.

[0008] Although known devices well satisfy the purpose for which they are designed, they have the drawback of high cost and of not acting as soon as the merest crack appears in the diaphragm surface, with some consequent liquid infiltration into the oil. In this respect a certain liquid quantity must build up within the lubricating oil to create the conductive path enabling current to pass between the two electrodes and hence activate the alarm device.

[0009] An object of the invention is to overcome the aforesaid drawbacks within the framework of a rational, reliable and low-cost solution.

[0010] The invention attains this and other objects by providing an alarm device which is activated by a variation in the oil volume present in the pump crankcase.

[0011] More specifically, the invention provides a small lubricating oil vessel branching from the highest part of the crankcase, within the vessel there being a float which on varying its level beyond a certain value closes a usual relay switch which is connected across a light and sound emitting alarm circuit.

[0012] The infiltration of even a minimum quantity of liquid into the oil results in a substantial movement of the float, with corresponding alarm activation.

[0013] The particular characteristics of the invention are defined in the claims.

[0014] The constructional and operational characteristics of the invention will be more apparent from the ensuing description of a preferred embodiment thereof given by way of non-limiting example and illustrated on the accompanying drawing.

Figure 1 is a section through a first embodiment of the invention taken on a vertical plane.

Figure 2 is a section through a three-cylinder diaphragm pump to which said first embodiment of the invention is applied.

Figure 3 shows a second embodiment of the invention.

[0015] Said figures show the device 1 of the invention, comprising a cup-shaped body of transparent plastic provided lowerly with a port 20 for communication with the crankcase conduit 4 of the pump 5, and with two holes 21 for the passage of screws 6 for fixing said cup-shaped body to the pump 5, as shown in Figure 2.

[0016] The pump 5 comprises three pistons 51, each of which is fixed to the centre of a diaphragm 52 which separates the crankcase 53 from the pump heads 54.

[0017] Along its upper edge the cup-shaped body 2 has an external thread 22 onto which the cover 7 is screwed.

[0018] Said cover 7 has a central hole 70 through which there is inserted a cylindrical plastic bar 8 which is retained in a fixed position by the nut 9 and locking nut 10.

[0019] Inside the bar 8 there is provided the relay 11, the contacts 110 and 111 of which are connected respectively to the conductors 112 and 113 emerging from the bar 8 for connection to the electrical circuit, not shown, of which an audible alarm and/or a light-emitting alarm form part.

[0020] About the bar 8 there is mounted a plastic float 12 containing internally a magnet 13. The float 12 cannot escape from the bar 8 because of the ring 90.

[0021] When the oil level within the cup-shaped body 2 increases, the float varies its level on the bar 8. If its variation in level is such as to bring the magnet 13 to a position corresponding with the relay 11, the magnetic field generated by the magnet 13 causes the relay 11 to close, with activation of the audible and/or light-emitting alarms.

[0022] It should be noted that in certain applications, closure of the relay 11 can cause the pump to stop or can provide a signal which can be fed to a control card, to be used for various functions all of which have as their purpose the prevention of damage to the pump.

[0023] Figure 3 shows a second embodiment of the

invention, in which components equal to those illustrated in the first embodiment are indicated by the same numbers.

[0024] This second embodiment of the invention differs from the preceding in that inside the bar 8 there are provided two relays 15 and 16, positioned as in the figure. 5

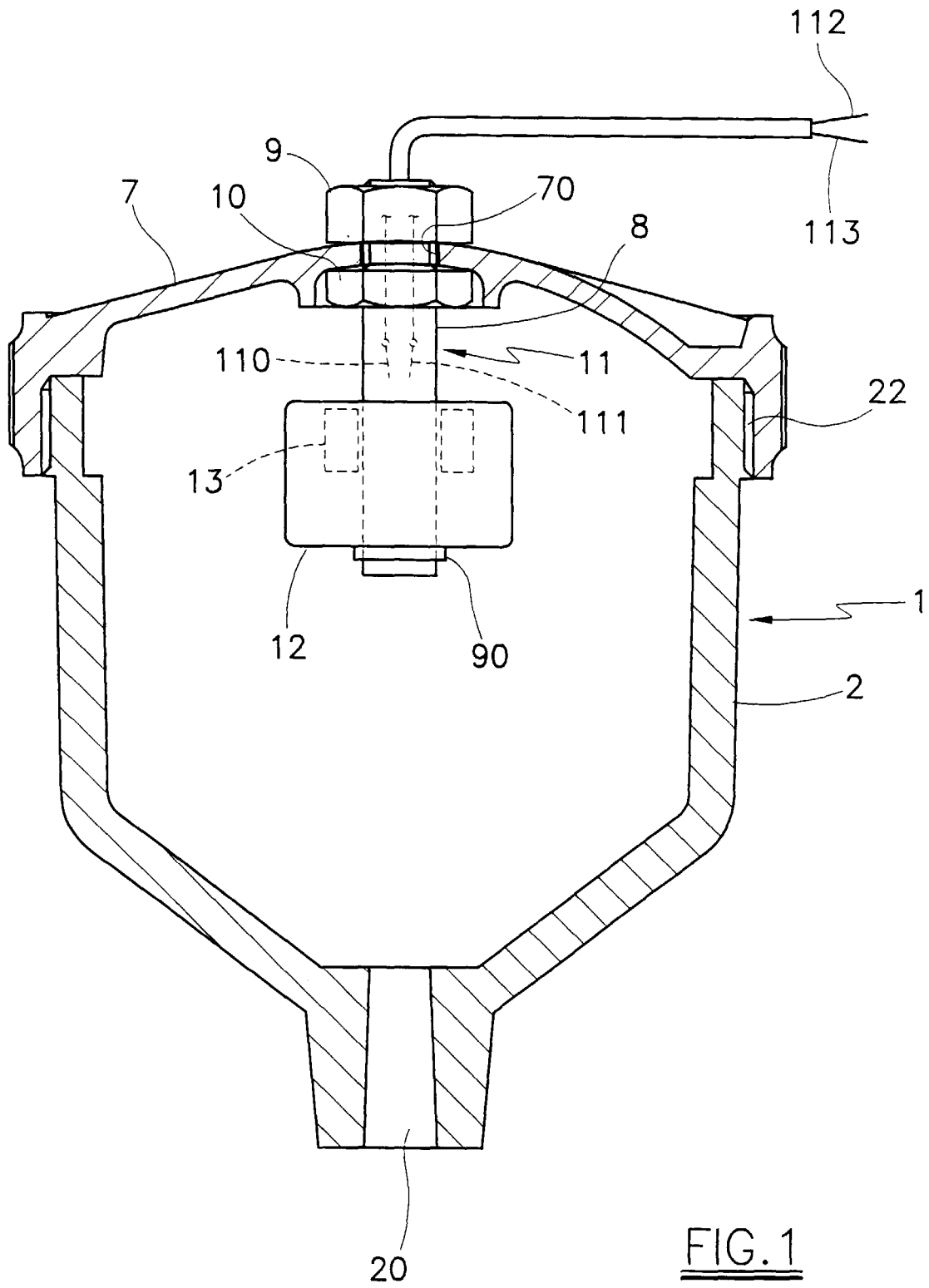
[0025] The relay 15 performs the same function as the relay 11, ie to indicate an oil increase within the pump crankcase. In contrast, the purpose of the relay 16 is to indicate an oil decrease within the pump crankcase, due to possible leakage. 10

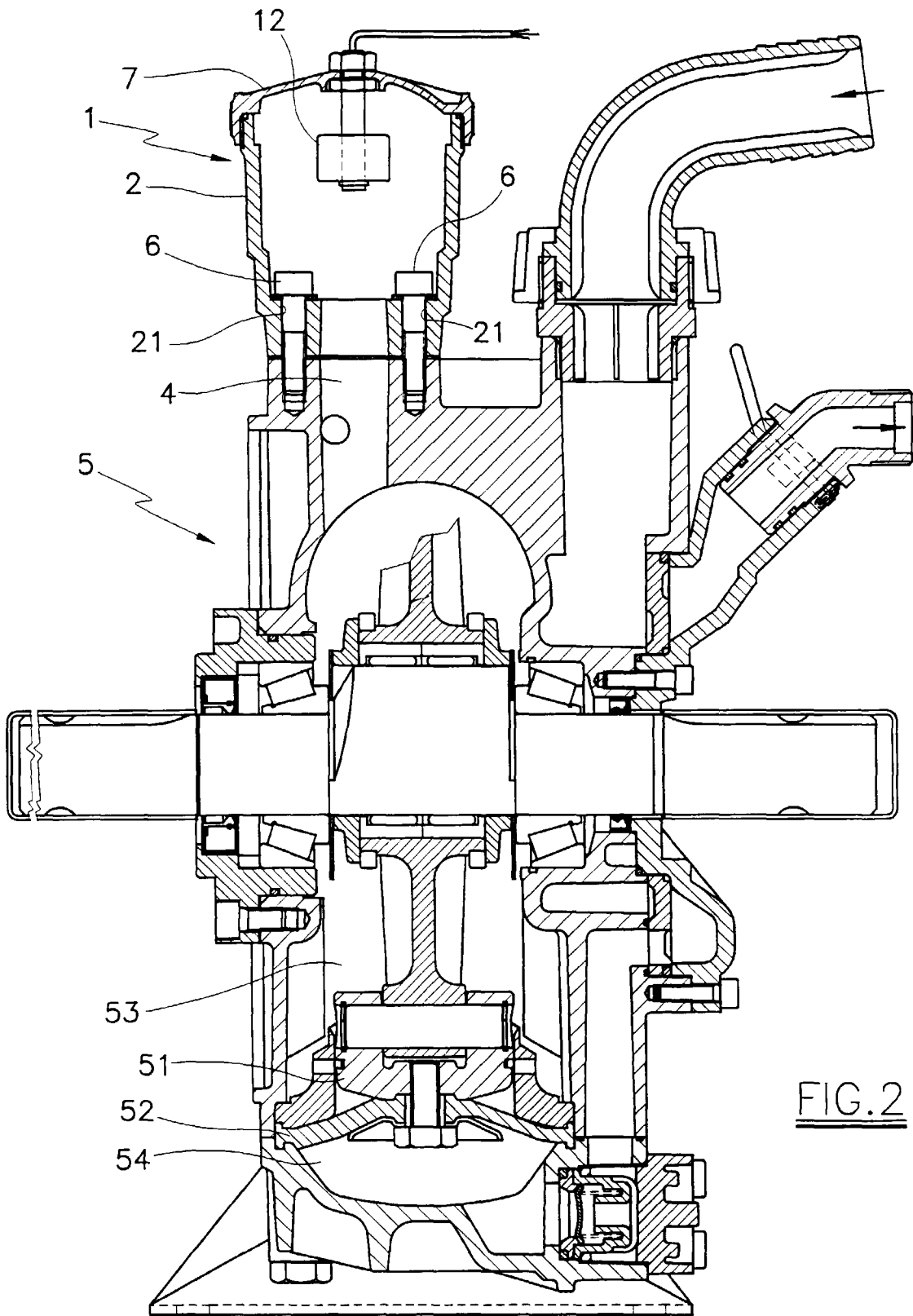
Claims

1. A device for indicating diaphragm rupture in high pressure pumps, characterised by comprising a small vessel connected to the pump crankcase and located higher than the level of the highest point of the crankcase, in the interior of which there are provided oil level-sensitive means arranged to operate an indicator device when the oil level increases even by a minimum amount beyond the normal crankcase filling level. 15
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2. A device as claimed in claim 1, characterised in that said oil level-sensitive means comprise a hollow cylindrical bar within which there is positioned at least one relay forming part of an electrical circuit connected to said indicator device, the state of said at least one relay being controlled by a magnet positioned inside a float which is mounted about the outside of said cylindrical bar and is unable to escape therefrom by virtue of a stop located at the lower end of said bar. 25
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3. A device as claimed in claim 1, characterised in that said small vessel is constructed integral with the pump crankcase. 40
4. A device as claimed in claim 1, characterised in that said small vessel is separate from the pump crankcase.
5. A device as claimed in claim 2, characterised in that said at least one relay is positioned in the interior of said bar at a level higher than the normal filling level of said small vessel. 45
6. A device as claimed in claim 2, characterised in that said at least one relay is positioned in the interior of said bar at a level lower than the normal filling level of said small vessel. 50
7. A device as claimed in claim 1, characterised in that said indicator device is an audible alarm. 55
8. A device as claimed in claim 1, characterised in that

said indicator device is a light-emitting alarm.

9. A device as claimed in claim 1, characterised in that said indicator device causes stoppage of the pump.





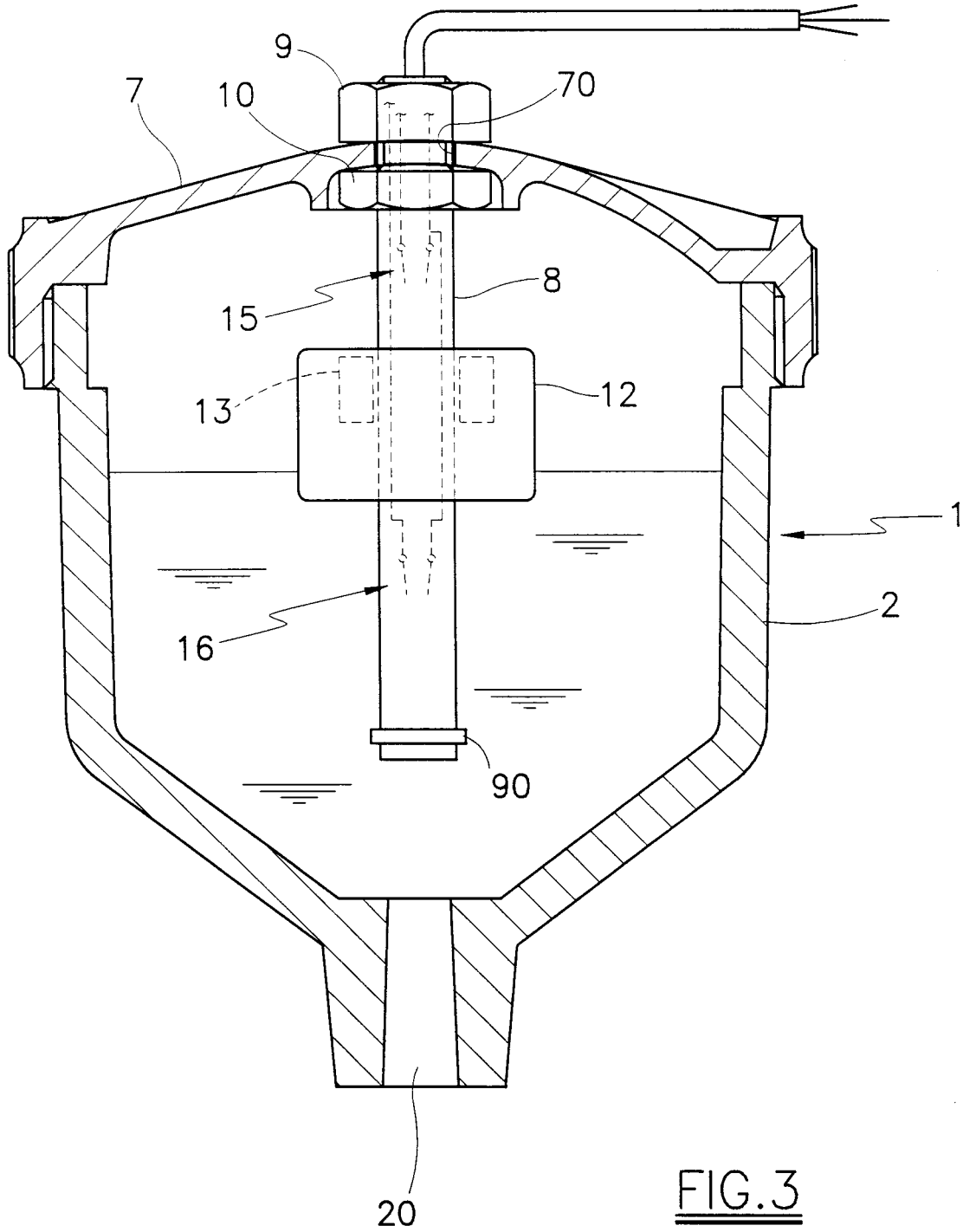


FIG. 3