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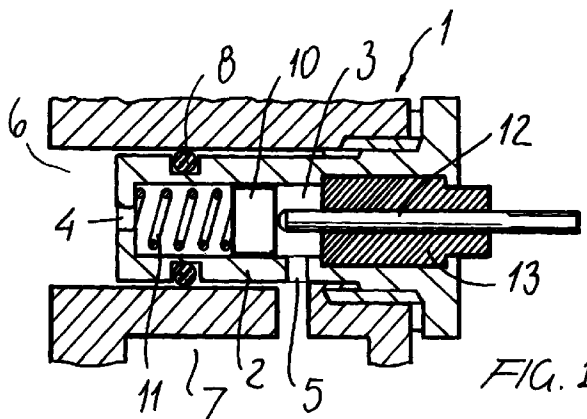
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(54) Hydraulic or pneumatic pressure differential electric switch

(57) The present invention relates to a hydraulic or pneumatic pressure differential electric switch, comprising a switch body defining herein a chamber which can be arranged between two hydraulically or pneumatically pressurized regions.

In the chamber is tightly movable, under the pressure differential between the mentioned two regions, a movable electric contact cooperating with a fixed electric contact supported by the switch body through a dielectric spacer element.

The movable electric contact is moreover acted upon by counter-biasing resilient means.



Description

BACKGROUND OF THE INVENTION

The present invention relates to a hydraulic or pneumatic pressure differential electric switch.

Commercially available prior hydraulic or pneumatic pressure differential electric switches have usually a comparatively large size, hindering a proper installation of the switches and requiring, furthermore, very complex operations for locating said switches.

A further drawback is that the mentioned pressure differential electric switches are very complex construction-wise, and have a very high cost.

SUMMARY OF THE INVENTION

Accordingly, the aim of the present invention is to overcome the above mentioned drawbacks, by providing a hydraulic or pneumatic pressure differential electric switch having a very small size and which, consequently, can be easily installed in a lot of operating systems.

Within the scope of the above mentioned aim, a main object of the present invention is to provide such an electric switch which comprises a small number of component elements, thereby reducing both the assembling complexity and the wearing and damaging possibilities thereof.

A further object of the present invention is to provide such a switch which can electrically operate as a pressure differential, either of a positive, or possibly even of a pulsating type, between two environments, occurs.

A further object of the present invention is to provide such an electric switch which, owing to its specifically designed constructional features, is very reliable and safe in operation.

Yet another object of the present invention is to provide such an electric switch which is very competitive from a mere economic standpoint.

According to one aspect of the present invention, the above mentioned aim and objects, as well as yet other objects, which will become more apparent hereinafter, are achieved by a hydraulic or pneumatic pressure differential electric switch, characterized in that said switch comprises a switch body, defining a chamber herein which can be arranged between two hydraulic or pneumatic pressurized regions, in said chamber being tightly movable, under the pressure differential between said two regions, a movable electric contact, cooperating with a fixed electric contact supported by said switch body through a dielectric spacer element, counter-biasing resilient means operating on said movable electric contact being moreover provided.

BRIEF DESCRIPTION OF THE DRAWINGS

Further characteristics and advantages of the present invention will become more apparent hereinafter from the following disclosure of some preferred, though not exclusive, embodiments of a hydraulic or pneumatic pressure differential electric switch, which is illustrated, by way of an indicative, but not limitative, example, in the accompanying drawings, where:

Figure 1 illustrates a first embodiment of a pressure differential electric switch, in a normally closed position thereof;

Figure 2 illustrates that same switch, the movable contact being shown in an open condition;

Figure 3 is a schematic view illustrating a switch with the switch body defined by the elements thereon it is applied;

Figure 4 illustrates a normally open electric switch;

Figure 5 illustrates the electric switch shown in Figure 1, at a closed contact condition thereof;

Figure 6 illustrates a differential electric switch including a movable contact comprising a proximity sensor;

Figure 7 illustrates a switch having a preloading shim for preloading the resilient means therefor; and

Figure 8 illustrates an electric switch including continuously operating preloading means.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to the number references of the above mentioned figures and, more specifically, to figures 1 and 2, the subject switch, which is generally indicated by the reference number 1, comprises a switch body 2 defining therein a chamber 3 which, through respective inlets 4 and 5, communicates with two hydraulically or pneumatically pressurized regions 6 and 7.

Advantageously, on the outer surface of the switch body 2, a sealing annular or ring-like element 8 for properly tightly separating the regions 6 and 7, is provided.

Inside the chamber 3 is tightly displaceable a movable electric contact 10 which is substantially formed by a small piston affected by resilient means comprising, for example, a spring 11.

More specifically, said movable contact 10 cooperates with a fixed contact 12, the latter being supported by the switch body 2 through a dielectric spacer element

or shim 13.

With reference to figures 1 and 2, the electric switch is herein shown in a normally closed condition.

The pressure differential being absent, the movable contact 10, electrically contacting the switch body 2, closes the circuit, by contacting the fixed contact 12.

As in the region 7 a pressure difference, with respect to the chamber 6, larger than the resilient urging force provided by the spring 11, is generated, then the movable contact 10 will be caused to leftward slide, with reference to the drawing, thereby breaking the power supply circuit.

Figure 3 illustrates a conceptually identical electric switch, the sole difference being that the switch body 1 is directly formed on the equipment thereon the electric switch is assembled.

With reference, in particular, to figures 4 and 5, a normally open electric switch is herein shown.

Under rest conditions, the electric circuit of said electric switch will be in an open condition, and it will be closed as between the regions 6 and 7 a pressure exceeding the counter-biasing force of said spring 11 is generated.

The operating difference between the normally open electric switch and the normally closed switch can be merely obtained by reversing the position of the spring 11 and the plunger or movable contact 10.

With reference to figure 6, the fixed electric contact, herein indicated by 20, can comprise a proximity sensor, of a per se known type, for example a magnetic, inductive or capacitive sensor, adapted to open or close or reverse the inner contacts, as the movable electric contact 10, which can optionally include a magnet 21, is moved away or toward the proximity sensor, under the differential pressure generated between the mentioned two regions 6 and 7.

In his case, the sole electrically conductive element will be constituted by the proximity sensor.

The electric switch according to the invention will allow to preset the opening and closing time of the switch, with respect to the pressure differential, by simply determining the load on the spring, both with a preset spring, and varying the preload thereon by arranging a spacer element or shim 30 in the bearing region of the end of the spring, as is schematically shown in figure 7, and continuously varying the preset value of the preload, by a threaded ring nut 31, affected by the spring 11.

Another important aspect of the present invention is that the dielectric spacer or shim element 13 can be made in different colors, thereby providing a sort of codifying of the spring 11 load.

The electric switch according to the invention is particularly suitable for application in apparatus operating as filtering apparatus, as well as in reciprocating hydraulic pumps, of the pulsating pressure type.

From the above disclosure it should be apparent that the invention fully achieves the intended aim and

objects.

In particular, the fact is to be pointed out that the electric switch according to the invention allows to obtain a very great reduction of space and cost, due to the very reduced number of the component elements thereof and due to their very simple configurations.

Another important feature of the present device is that it would allow to easily control the hydraulic operation of one or more circuits, by simply monitoring the actual pressure differential.

Claims

1. A hydraulic or pneumatic pressure differential electric switch, characterized in that said switch comprises a switch body, defining a chamber herein which can be arranged between two hydraulic or pneumatic pressurized regions, in said chamber being tightly movable, under the pressure differential between said two regions, a movable electric contact, cooperating with a fixed electric contact supported by said switch body through a dielectric spacer element, counter-biasing resilient means operating on said movable electric contact being moreover provided.
2. An electric switch, according to the preceding claim, characterized in that said switch body is tightly coupled to an apparatus thereon said electric switch is applied.
3. An electric switch, according to the preceding claims, characterized in that said switch body is defined by the apparatus the electric switch is applied to.
4. An electric switch, according to one or more of the preceding claims, characterized in that said resilient means and movable electric contact can be positionally interexchanged, in order to provide either a normally closed or a normally open electric switch.
5. An electric switch, according to one or more of the preceding claims, characterized in that said movable electric contact comprises a small piston or plunger which can be tightly driven in said chamber.
6. An electric switch, according to one or more of the preceding claims, characterized in that said resilient means comprise a spring.
7. An electric switch, according to one or more of the preceding claims, characterized in that said fixed electric contact comprises a proximity switch, the proximity switch actuator being provided on said movable electric contact.

8. An electric switch, according to one or more of the preceding claims, characterized in that said electric switch comprises preloading means for preloading said spring. 5
9. An electric switch, according to one or more of the preceding claims, characterized in that said spring preloading means comprise a shim element, arranged in the bearing region for one end portion of said spring. 10
10. An electric switch, according to one or more of the preceding claims, characterized in that said spring preloading means comprise a threaded ring-nut operating on said spring. 15
11. An electric switch, according to one or more of the preceding claims, characterized in that said dielectric spacer or shim element is variably colored in order to codify the preload of said spring. 20
12. An electric switch, according to one or more of the preceding claims, characterized in that said electric switch is applied to a filtering apparatus. 25
13. An electric switch, according to one or more of the preceding claims, characterized in that the apparatus thereon said electric switch is assembled comprises a pulsating pressure reciprocating hydraulic pump. 30

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