Jan. 9, 1951 A. C. KORTE ET AL 2,537,354

OIL PRESSURE SWITCH

Filed Dec. 11, 1946 2 Sheets-Sheet 1

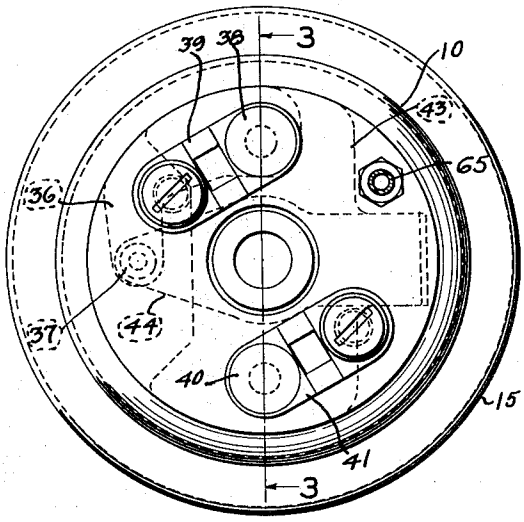


FIG. 1.

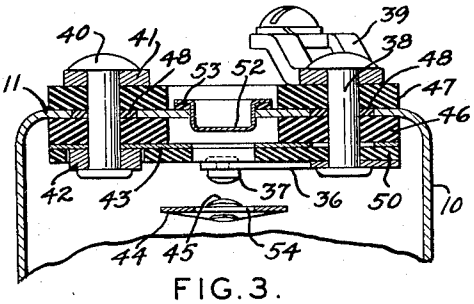


FIG. 3.

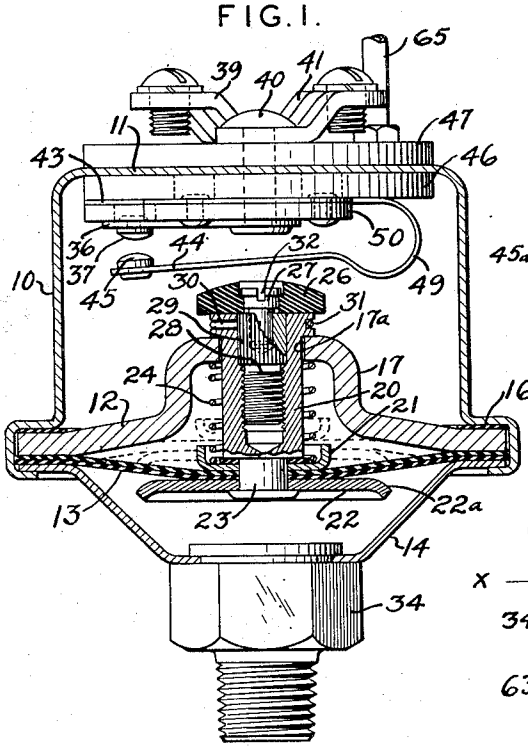


FIG. 2.

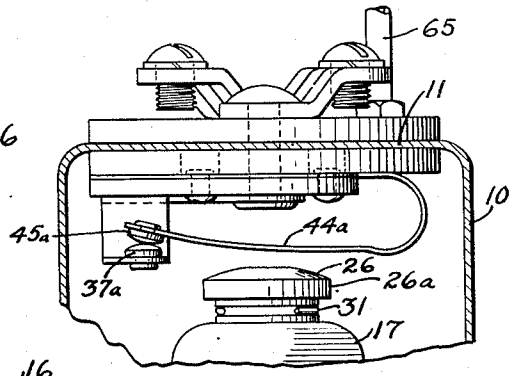


FIG. 4.

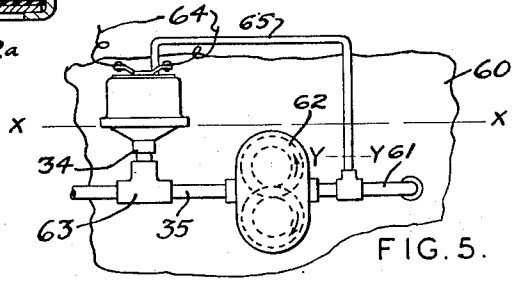


FIG. 5.

INVENTORS
ALFRED C. KORTE
ALEX N. SZWARGULSKI
George R. Ericson
ATTORNEY

Jan. 9, 1951 A. C. KORTE ET AL 2,537,354

OIL PRESSURE SWITCH

Filed Dec. 11, 1946 2 Sheets-Sheet 2

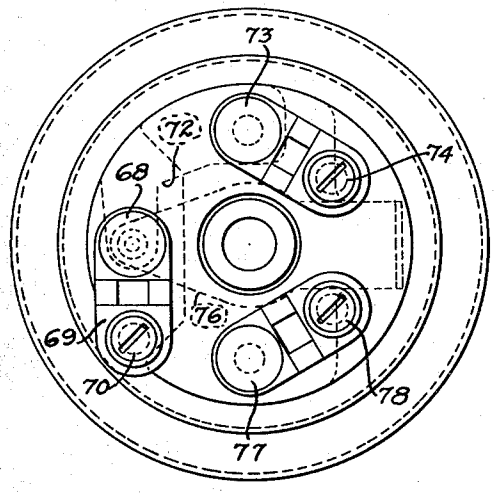


FIG. 6.

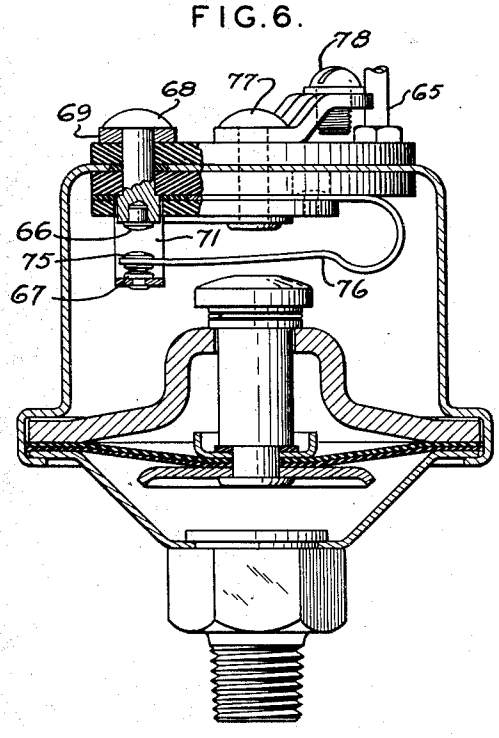


FIG. 7.

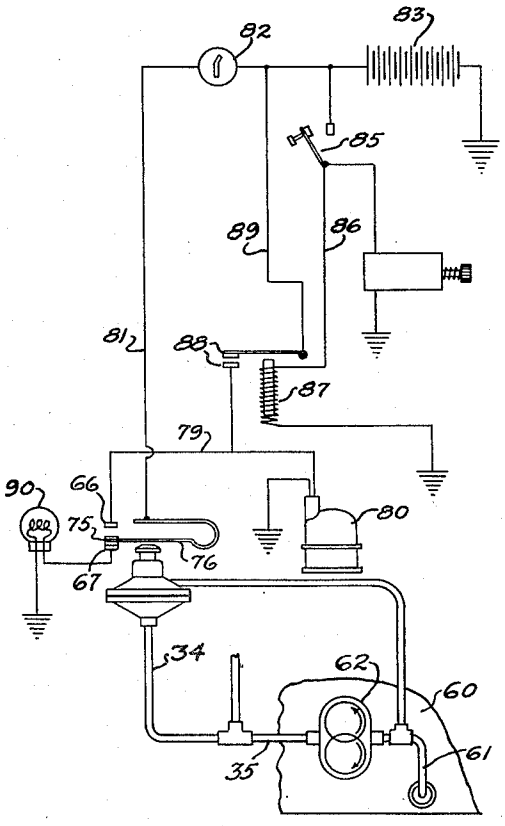


FIG. 8.

INVENTORS
ALFRED C. KORTE
ALEX N. SZWARGULSKI
George R. Ericson
ATTORNEY

Patented Jan. 9, 1951 2,537,354

UNITED STATES PATENT OFFICE

2,537,354

OIL PRESSURE SWITCH

Alfred C. Korte and Alex N. Szwargulski, St. Louis, Mo., assignors to Carter Carburetor Corporation, St. Louis, Mo., a corporation of Delaware

Application December 11, 1946, Serial No. 715,558

7 Claims. (Cl. 200—83)

1

This invention relates to fluid pressure switches for electrical circuits and consists particularly in a novel safety switch which responds to the presence or absence of normal operating pressures in the oil feed line of an engine.

An important use of the invention is in connection with the electric fuel pump illustrated in Korte Patent No. 2,394,860 in which the pump motor is energized when the ignition circuit is closed. The switch of the present invention is interposed in the pump motor circuit to open this motor circuit in case the oil pressure should fail or when the engine is not running. During starting, the current is by-passed around the switch to provide for starting fuel as described and claimed in Korte and Lannert Patent No. 2,370,249.

The main object of the present invention is to provide a safety switch of the above type having improved means for preventing corrosion of the switch points.

Another object is to provide such a switch with means permitting access to and adjustment of the switch actuating element while preventing the admission of moisture and other foreign matter to the contact points.

Another object is to provide a self-locking adjustment for the switch actuator.

Another object is to provide such a switch in which the actuator element has adequate movement to compensate for wear and inaccuracies of manufacture.

Another object is to provide such a switch having a switch actuating diaphragm with means for positively limiting the throw of the diaphragm to prevent excessive distortion thereof.

Another object is to provide switch actuating means which causes wiping action between the switch points to insure better contact therebetween.

Another object is to provide a pressure actuated switch that is substantially more sensitive than previous switches of the type so as to operate properly under the wide variation of pressures produced by engine lubricating systems under different operating conditions.

Still another object is to provide a novel pressure switch of the double contact type in which the respective stationary contacts will be closed when there is pressure and absence of pressure in the system.

These objects and other more detailed objects hereafter appearing are attained by the device illustrated in the accompanying drawings in which

2

Fig. 1 is a top view of the switch.

Fig. 2 is a vertical center section therethrough, parts at the top of the switch chamber being shown in elevation.

Fig. 3 is a partial vertical transverse section taken on line 3—3 of Fig. 1.

Fig. 4 is a detail view similar to Fig. 2 but showing a modification.

Fig. 5 diagrammatically illustrates the application of a safety switch to the oil pressure line of an internal combustion engine.

Fig. 6 is a top view of a third modification.

Fig. 7 is a section illustrating the third modification.

Fig. 8 is a wiring diagram illustrating an application of the switch in Figs. 6 and 7.

The switch is enclosed within a casing formed by cylindrical side wall 10, top wall 11, and a bottom web 12. A flexible diaphragm 13 extends across the chamber immediately below the bottom web and is clamped in position by a frusto-conical housing 14 forming a pressure chamber beneath the diaphragm. The edges of web 12, casing 14, and diaphragm 13 are clamped in position, as shown, by the U-sectioned lower edge of casing wall 10, a sealing gasket 16 being provided above web 12. Web 12 has a cup-shaped intermediate portion 17 with a central opening 17a.

An internally-threaded, hollow plunger 20 is centrally secured to the diaphragm by means of force transmitting upper and lower washers 21 and 22 and riveted pin-like projection 23 extending through the diaphragm. Plunger 20 fits rather closely in opening 17a and is guided thereby in its vertical movements with the diaphragm. The diaphragm is constantly urged downwardly by a coiled spring 24 compressed between the under surface of cup 17 and upper washer 21.

An actuator head 26 of insulating material rests on top of plunger 20 and is tightly secured thereto by a shouldered pin 27 pressed into a tightly fitting, axial opening in a shank member 28 having its lower portion threadedly received within plunger 20. Element 28 also has an upper, knurled portion 29 which cooperates with the inwardly projecting extremity 30 of a spring coil 31 received about the plunger to resist unauthorized rotation and adjustment of the shank element and head 26. Pin 27 has a screw driver slot 32 in its upper end.

Lower diaphragm washer 22 is of a diameter approximately the free diameter of the diaphragm and has a downwardly curved outer edge 22a which backs up the diaphragm and cooperates

with upwardly and inwardly tapered outer part of web 12, as shown in broken lines, to limit the throw of the diaphragm when exposed to fluid pressure. A fitting 34 secured in housing 14 provides for connection of an oil pressure line, as at 35 in Fig. 5.

Top wall 11 of the switch chamber casing opposite diaphragm 13 mounts a stationary contact strip 36 (Fig. 3) and contact 37 by means of a rivet 38 carrying a terminal clip 39 on the outside of the casing. A second rivet 40 in wall 11 mounts a terminal clip 41 and carries a metallic washer 42 inside the casing which bears against a metal plate 43 formed of spring steel and constituting one leg of the U-sectioned spring. The other leg 44 of this spring carries movable contact 45 in juxtaposition with stationary contact 37. Gaskets 46 and 47 are clamped by the rivets, respectively, below and above chamber top wall 11, the holes through this wall for the rivets being sealed and insulated by non-conducting gaskets 48. Upper leg 44 of the movable contact spring extends across the switch chamber and is clamped by both rivets 38 and 40. A looped intermediate portion 49 of free spring leg 44 serves to better accommodate flexing of the movable leg. A gasket 50 is clamped beneath leg 43 and insulates the same stationary contact strip 36.

A central orifice is provided in each of gaskets 47, 46 and 50, in switch chamber top wall 11, and in spring leg 43. A cup-like plug 52 and gasket 53 normally seal the opening in the top wall. There is also an opening 54 of substantially less diameter than head 26, through spring leg 44 carrying the movable contact. All of these openings are aligned with the actuator plunger to permit access therethrough for application of a screw driver to slotted pin 32 which rigidly connects insulator head 26 and threaded shank 28. Turning of the slotted pin raises or lowers head 26 relative to the plunger and diaphragm for adjusting the switch operation. Spring projection or detent 30 cooperating with knurled part 29 of the shank member provides a yieldable lock for the adjustable shank.

The form in Fig. 4 is the same as the first form except that the switch is normally closed and actuating plunger head 26*a* engages spring leg 44*a* to separate movable contact 45*a* from stationary contact 37*a*.

In both forms there is a wiping action between the switch contact during making and breaking thereof. In the first form, the throw of the diaphragm is slightly greater than is necessary to make contact so that spring leg 45 is flexed to produce the wiping action between the points.

Fig. 5 illustrates somewhat diagrammatically a method of installing the safety switch in an oil pressure system of an internal combustion engine having an oil pan 60. An oil supply line 61 leads from the lower part of the pan to gear type oil pump 62 and thence by a lead 35 to a part to be lubricated. The switch pressure chamber is connected by means of fitting 34, and T-fitting 63 to oil feed line 35. Pump motor wires 64 are connected to the terminal clips at the top of the switch. A vent tube 65 connects the switch chamber to oil line 61 on the inlet of suction side of pump 62. This vent insures the maintenance of substantially atmospheric pressure within the switch chamber irrespective of movements of the diaphragm and temperature changes. Its manner of functioning is as follows:

When the engine is not in operation, oil stands in pan 60 and in vent tube 65 at the level *x*—*x*. When the engine is running, pump 62 reduces the pressure in line 61 and lowers the level of oil in tube 65, say to level *y*—*y*, to accommodate the air displaced by the diaphragm movement, caused by the application of oil pressure from the pump to the underside of the diaphragm. In case of reduction of the oil pressure, or when the engine stops, spring 24 lowers the diaphragm, increasing the air space within the switch chamber. This draws air from the vent tube into the chamber, but oil rises in the vent tube proportionately so that the air pressure in the vent and chamber is not reduced. Similarly, the oil level in tube 63 rises to compensate for any contraction in the air in chamber 10 caused by reduced atmospheric temperature.

As a consequence of the sealed construction, if the device is assembled under favorable atmospheric conditions, that is, in the absence of moisture and other foreign matter, the air in the casing will remain free of such matter and the switch points will be relatively free of corrosion. A small amount of oil fumes will enter the chamber from the vent tube, but this will not be harmful.

The switch in Figs. 6 and 7 is generally the same as the previous forms but has two stationary contacts 66 and 67 corresponding, respectively, with contacts 37 and 37*a* in Figs. 2 and 4. Contact 66 is connected by rivet 68 and strap 69 to terminal 70 while contact 67 is connected by depending angle 71 and strap 72 to rivet 73 and terminal 74. Movable point 75 is connected by spring strip 76 and rivet 77 to terminal 78.

Fig. 8 illustrates an application of the double contact switch. Upper contact 66 is connected by wire 79 to electric fuel pump 80. Movable contact 75 connects by wire 81 to ignition switch 82 and battery 83. Starter switch 85 also connects battery by means of lead 86 to a relay primary 87. The points 88 ofthe relay are interposed in a lead 89 connecting battery and the fuel pump motor. The circuit arrangement is such that when either the starter switch is closed or the ignition switch is closed and oil pressure in line 34 moves contact 75 against upper contact 66, the pump motor is energized. When subnormal oil pressure exists in tube 34, movable point 75 contacts lower point 67 to close a circuit from battery to oil pressure warning light 90. This circuit arrangement is claimed in a copending application Serial No. 719,184, filed December 30, 1946, now Patent No. 2,497,029 granted February 7, 1950, in the names of the present inventors.

The switch has adequate mechanical movement, yet is sensitive to pressure changes as is necessary in some automobiles, for instance, in which oil is supplied from the oil pump at pressure as low as 1½ pounds per square inch. Systems normally operating at higher pressures may produce subnormal pressures under high temperature conditions. Although the switch chamber is sealed, variations in the volume and pressure of the air therein due to diaphragm movement and variations of temperature of the air because of atmospheric conditions or oil temperature do not affect the operation of the switch. Moreover, the switch is durably constructed, easy of application and adjustment, and reliable.

The invention may be modified in various respects as will occur to those skilled in the art and the exclusive use of all modifications as

come within the scope of the appended claims is contemplated.

We claim:

1. In a fluid pressure operated switch, a switch chamber having a movable, pressure responsive wall and an opposite, stationary wall, a stationary switch point and a leaf spring carried by said latter wall, a movable switch point on said spring, and a central, switch actuator projecting from said movable wall, said actuator having an adjusting head with a thread attached to the body of said actuator and a knurled portion, the body of said actuator telescopingly receiving said knurled portion and carrying a yielding detent for engaging said portion to resist unauthorized rotation of said head and disposed to bear against an intermediate portion of said spring to operate said movable point, there being openings in said spring and stationary wall in line with said actuator to permit access thereto for adjustment.

2. In a fluid pressure operated switch, a switch chamber having opposing stationary and movable walls, stationary and movable switch points carried by said stationary wall, and a switch actuator comprising an internally threaded plunger projecting from said movable wall, an adjusting head member having a shank with threaded and knurled portions received in said plunger, and a spring coil received on said plunger with a detent forming extremity projecting therethrough into engagement with said knurled portion to resist unauthorized rotation and adjustment of said head member relative to said plunger.

3. In a fluid pressure operated switch, a sealed chamber having a stationary wall, stationary and movable switch points mounted on said wall, a diaphragm forming the opposite wall of said chamber, a web extending across said chamber immediately inside said diaphragm and having a central opening and an inwardly tapered outer part, a switch actuating plunger projecting centrally from said diaphragm through said opening and guided thereby, and a washer on the outer side of said diaphragm and rigidly secured to said plunger, said washer being of a diameter substantially one-half the diameter of said diaphragm so as the cooperate with said web to limit the axial movement of said diaphragm and thereby prevent excessive distortion thereof.

4. In a fluid pressure operated switch, a switch housing having a wall provided with a fitting for connection to a source of fluid under pressure, an opposite wall, and an intervening, pressure responsive wall, a stationary switch point and a leaf spring carried by said opposite wall, a movable switch point on said leaf spring, and a central, switch actuator projecting from said pressure responsive wall, said actuator being longitudinally adjustable and disposed to bear against said leaf spring to operate said movable point, there being openings in said leaf spring and said opposite wall in line with said actuator to permit access thereto for adjustment through said stationary wall and leaf spring.

5. A fluid pressure operated switch as described in claim 4 in which said fitting, said actuator, and said adjustment holes are all in alignment.

6. Switch structure as described in claim 4 in which said actuator has an adjusting head for bearing against said spring and threadedly attached to the body of said actuator, said head being aligned with and of greater diameter than the hole in said spring for access thereto.

7. Switch structure as described in claim 4 in which said leaf spring is U-shaped with a first leg secured to said stationary wall and a flexing leg carrying said movable point, there being openings in both of said legs aligned with said actuator and the opening in said stationary wall permitting access to said plunger for adjustment thereof.

ALFRED C. KORTE.
ALEX N. SZWARGULSKI.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,461,268	DeLaney et al.	July 10, 1923
2,078,441	Carlson	Apr. 27, 1937
2,412,377	Williams	Dec. 10, 1946
2,422,342	Dillman	June 17, 1947