

Aug. 4, 1959

P. M. BYAM

2,898,418

FLUID OPERATED ELECTRIC SWITCH

Filed Dec. 3, 1956

Fig. 1

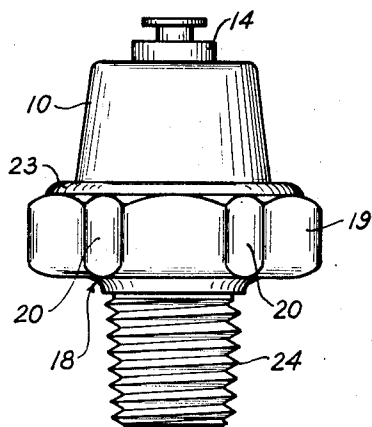


Fig. 2

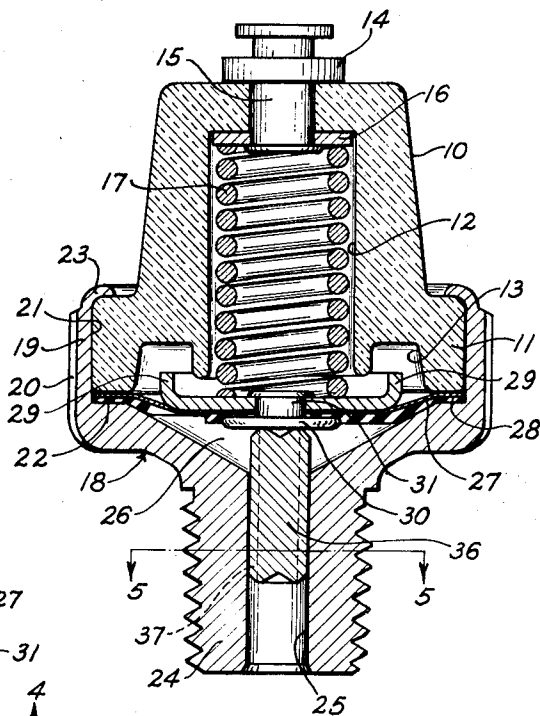


Fig. 3

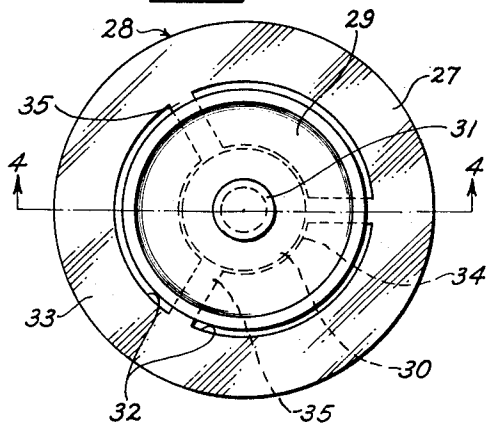


Fig. 5

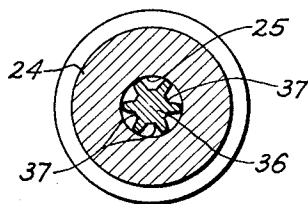
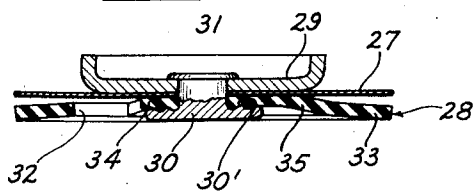


Fig. 4



PETER M. BYAM
INVENTOR.

BY *George A. Gillette, Jr.*

ATTORNEY.

1

2,898,418

FLUID OPERATED ELECTRIC SWITCH

Peter M. Byam, Rochester, N.Y., assignor to Fasco Industries, Inc., Rochester, N.Y., a corporation of New York

Application December 3, 1956, Serial No. 625,748

3 Claims. (Cl. 200—83)

The present invention relates to a fluid operated electric switch and more particularly to a fluid operated switch which is constructed for more precise calibration and also for convenient adjustment of its calibration.

Known fluid operated switches having flexible diaphragms and compressible sealing means not only are often ruptured and leak at or adjacent the areas where sealing pressure is exerted but, because of crimps and/or strains in the diaphragm and/or sealing material, have a relatively large differential between the opening and closing pressures. Also it is customary to assemble such switches by a peening of the switch housing and it is difficult to adjust the calibration of the switch thereafter so that many of such switches must be rejected because it is not feasible to reopen the assembly to correct the calibration.

The primary object of the present invention is to provide a fluid operated switch construction which has a minimum operating pressure differential and which can be readily adjusted or calibrated after assembly.

Another object of the invention is the provision in a fluid operated switch of a diaphragm means which has a very small pressure differential between the pressure at which the diaphragm moves in one direction and the pressure at which it returns to its original position.

A further object of the invention is a diaphragm means which is composed of a sheet of high tensile strength plastic and of an apertured sheet of resilient material for sealing purposes and which has a small differential between the pressures at which said diaphragm is moved from one position and returned thereto.

Still another object of the invention is the provision in a fluid operated switch of a contact composed of a longitudinally serrated member which is inserted in the passage leading into the pressure chamber and which may be moved from the outside of the switch to calibrate the same.

Other and further objects of the invention will be suggested to those skilled in the art as the disclosure of the fluid operated switch is described in more detail hereinafter.

The aforementioned and other objects of the invention are accomplished in a fluid operated switch having a diaphragm means whose periphery and central portions are compressed upon assembly of the switch parts and composed of a sheet of high tensile strength plastic and a sheet of compressible material, only the latter of which is provided with openings so that outer and inner sealing portions are left, and in a fluid operated switch having a contact member within the fluid pressure connection and which may be displaced from the exterior of the assembled switch for calibration thereof.

Reference is hereby made to the accompanying drawing wherein like reference characters designate like elements and wherein:

Fig. 1 is an external side elevation of an assembled fluid operated switch;

2

Fig. 2 is a vertical cross-section through the assembled fluid operated switch according to the invention;

Fig. 3 is a top view of the diaphragm means or assembly;

Fig. 4 is a vertical cross-section of the diaphragm means before assembly in the switch and taken on the line 4—4 of Fig. 3; and

Fig. 5 is a horizontal cross-section through the threaded portion of the switch housing and taken on the line 5—5 of Fig. 2.

Although the present invention is applicable to various kinds of fluid operated switches, for purposes of disclosure my invention is shown as embodied in a switch adapted to be connected to an engine lubricating system and for controlling a low oil pressure warning light. In the illustrated embodiment an insulating member 10 is made of suitable insulating material such as Bakelite and is generally conical in shape with a circular shoulder or skirt 11 at one end thereof. Said member 10 is provided with a central bore 12 and at the end adjacent the skirt 11 is provided with a circular recess 13.

A terminal member 14 has a stem 15 extending through the top of the insulating member 10 and the end of stem 15, which is within the bore 12, is riveted or spun over in a known manner against a metallic washer 16 to fasten said terminal member 15 to member 10. A coil spring 17 is placed within bore 12 for purposes to be later described.

The switch housing 18 is composed of metal and includes a hollow generally cylindrical portion 19 which has external recesses 20 for engagement by a socket wrench and which provides a cavity 21 for receiving the skirt 11 of the insulating member 10. A shoulder 22 within cavity 21 is opposite or in juxtaposition to the inner end of the skirt 11 of member 10 and a flange 23 of said housing 18 may be peened or spun over to engage and secure the skirt 11 of the insulating member 10 within the cavity 21 of the switch housing 18. Said switch housing 18 also includes a threaded portion 24 by means of which the switch assembly is mounted upon or connected to the source of fluid pressure and said portion 24 is provided with a central bore 25 which leads into a fluid pressure chamber 26 within the switch assembly.

The diaphragm means or assembly according to the invention comprises two circular sheets or layers, one a circular thin sheet 27 composed of high tensile strength plastic, such as polyethylene terephthalate which is commercially known as Mylar, and the other a sheet 28 composed of a compressible material such as rubber or synthetic rubber which is commercially known as Buna "N." Said circular sheets 27 and 28 are of such diameters as to cover the cavity 21 of the housing 18 and so that the peripheral edges thereof are pressed or compressed between the inner end of skirt 11 and the shoulder 22 within cavity 21 to form a fluid tight seal between insulating member 10 and the switch housing 18.

A contact member includes a cup-shaped member 29 and a headed stud 30 having a stem 31 which extends through apertures in sheets 27 and 28 and is spun over or riveted against the member 29 to form a fluid tight seal between said contact member and said sheets of the diaphragm means. The surface of headed stud 30 which engages the compressible sheet 28 is preferably circularly corrugated as shown at 30' in Fig. 4 to minimize the possibility of leakage around the contact member.

As a result of the compression at its periphery and at its central portion, the compressible sheet 28 is extruded toward the intermediate portions, even to the extent of causing crimps or wrinkles in the sheet 28, and such cause the diaphragm means to have a certain stiffness and/or irregularity of operation which may be evidenced by the fact that the pressure at which the diaphragm re-

turns to its original position is quite different from that at which the diaphragm was initially operated. Accordingly, such intermediate portions are removed preferably as by providing sector-shaped apertures 32 in the sheet 28 to leave an outer ring 33, an inner portion 34 and interconnecting strips 35. At this point it should be observed that such intermediate portions of sheet 28 may be removed altogether and that the division of functions between the sheets 27 and 28, the former to withstand pressure and the latter for fluid tight sealing purposes, is an important advantage of the invention. Also forming said outer ring 33, inner portion 34 and interconnecting strips 35 integrally facilitates the production and handling during assembly of the fluid sealing portions of sheet 28.

A second contact member 36 extends into the fluid pressure chamber 26 for engagement with the headed stud 30 which is biased by coil spring 17 within bore 12 to be pressed against said second contact member 36. Since the calibration of the switch to operate at a given pressure is controlled by the force exerted by said spring 17, it is of great value to be able to vary that force or pressure after the switch has been assembled. A simple and effective manner of doing that according to the invention is to insert said second contact member 36 into the central bore 25 of threaded portion 24 and providing the same with longitudinal serrations 37 for passage of fluid under pressure. Actually said contact member 36 can be readily formed of gear rod stock. Before or after assembly of the switch said second contact member 36 is inserted into bore 25 so that the teeth of member 36 have high frictional or "driving" fit with the wall of bore 25 and said contact member 36 extends into fluid pressure chamber 26 to engage the headed stud 30 of the first mentioned contact member. If the switch operates at a fluid pressure which is too low, and insertion of member 36 should be such as to tend to create that condition, a suitable member may be inserted through the outer end of bore 25 to drive member 36 inwardly until the desired operating fluid pressure results.

Since many variations of the invention are possible, the foregoing disclosure is to be constructed in an illustrative and not in a limiting sense.

Having now particularly described my invention, what I desire to secure by Letters Patent of the United States and what I claim is:

1. A fluid operated switch comprising a housing providing a fluid chamber and provided with a bore leading into said chamber, a contact member within said bore and extending into said chamber, and a diaphragm means having its periphery compressed within said housing to form a fluid tight seal for said chamber and carrying a second contact member which is biased to engage the first mentioned contact member, characterized by the first mentioned contact member being provided with longitudinal serrations to form teeth having a driving fit with the surface of said bore, and said diaphragm means being com-

posed of a thin, pressure-responsive plastic sheet of high tensile strength extending over said chamber, and a sheet of compressible material provided with openings to form an outer sealing portion providing said fluid tight seal for said chamber and to form an inner central portion providing a fluid tight seal between said second contact member and said thin plastic sheet of high tensile strength.

2. A fluid operated switch comprising a hollow housing having a deformable flange surrounding a fluid chamber and provided with a bore extending into said chamber, an insulating member having a portion within the chamber of said housing, a diaphragm assembly consisting of a thin, flexible and pressure-responsive plastic sheet of high tensile strength extending over said fluid chamber and a sheet of rubber material provided with openings to form a central portion and an outer sealing portion which is compressed to form a fluid tight seal between said housing and said insulating member when said housing flange is deformed, a contact member on said diaphragm assembly and in fluid tight relation to the central portion of said rubber material, resilient means acting on said contact member to urge the same in a direction opposed to movement by increasing pressure in said fluid chamber, and a longitudinally serrated member within the bore of said housing, having a driving fit therewith and extending into said chamber to engage said contact member and limit its movement by said resilient means, and displaceable from outside of the assembled switch to vary its position within said bore and change the pressure at which said switch is operated.

3. A fluid operated switch comprising a housing providing a fluid chamber and provided with a bore leading into said chamber, a diaphragm means enclosing said fluid chamber and carrying a contact biased toward said chamber, and a second contact member provided with longitudinal passages to permit movement of fluid to and from said chamber, and placed within said bore in frictional engagement therewith, and adjustable from outside the assembled switch to vary its position and change the pressure at which said switch is operated.

References Cited in the file of this patent

UNITED STATES PATENTS

795,726	Nightingale	July 25, 1905
1,118,188	Desmond	Nov. 24, 1914
1,225,850	Peterson	May 15, 1917
2,040,891	Wright et al.	May 19, 1936
2,069,222	Cremer	Feb. 2, 1937
2,093,200	Libke	Sept. 14, 1937

FOREIGN PATENTS

674,021	Germany	Apr. 3, 1939
530,940	Great Britain	Dec. 24, 1940
886,446	France	July 5, 1943
1,013,551	France	Apr. 30, 1952
156,384	Australia	May 7, 1954