

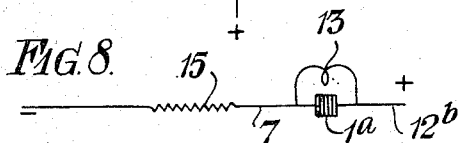
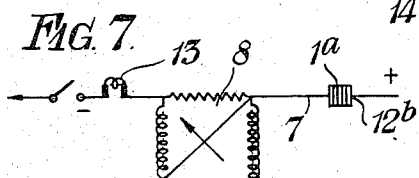
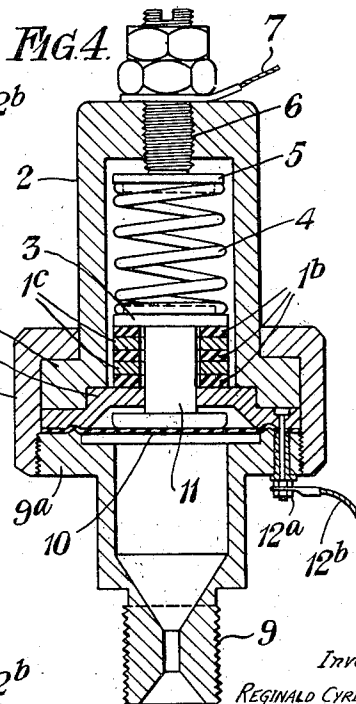
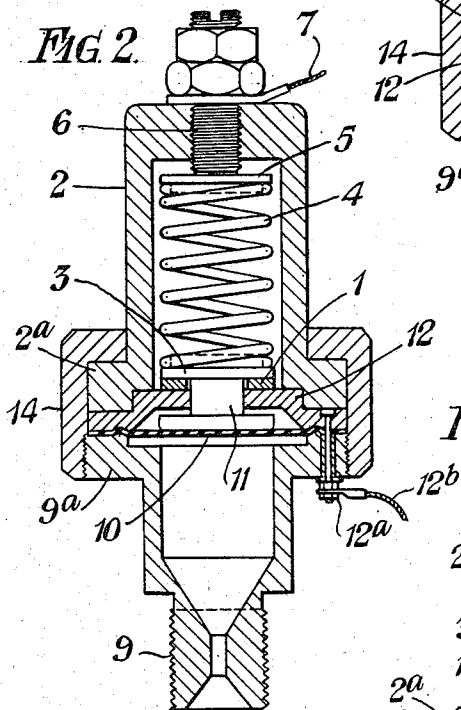
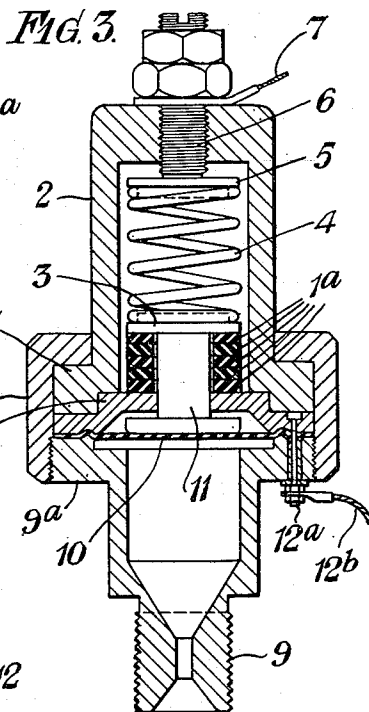
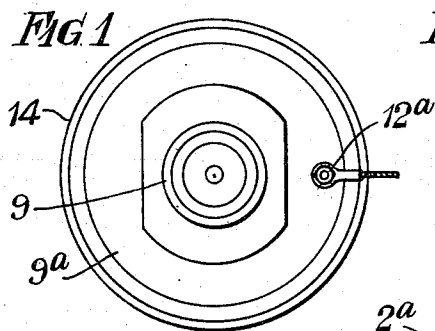
July 18, 1950

R. C. FULLER
ELECTRICAL MEANS FOR OPERATING FLUID PRESSURE
INDICATING GAUGES AND SIGNALING DEVICES

2,515,867

Filed Dec. 14, 1946

2 Sheets-Sheet 1



Inventor
REGINALD CYRIL FULLER
By *Hesselline Lake & Co.*
Attorneys

July 18, 1950

R. C. FULLER
ELECTRICAL MEANS FOR OPERATING FLUID PRESSURE
INDICATING GAUGES AND SIGNALING DEVICES

2,515,867

Filed Dec. 14, 1946

2 Sheets-Sheet 2

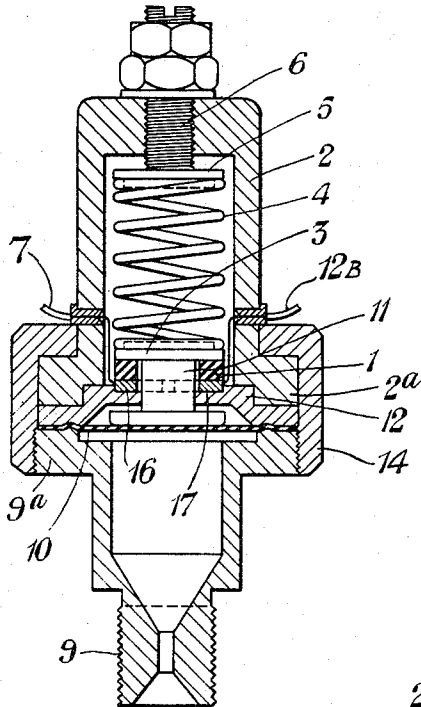


FIG. 5.

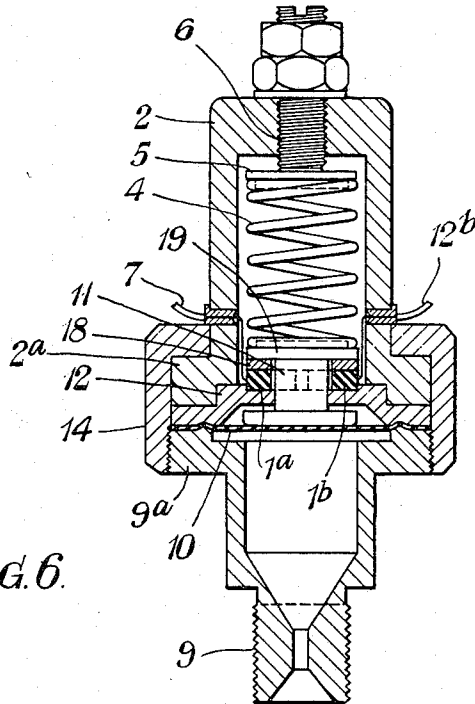


FIG. 6.

Inventor
REGINALD CYRIL FULLER
By Haseltine, Lake & Co.
Attorneys

UNITED STATES PATENT OFFICE

2,515,867

ELECTRICAL MEANS FOR OPERATING FLUID
PRESSURE INDICATING GAUGES AND SIG-
NALING DEVICES

Reginald Cyril Fuller, Brighton, England

Application December 14, 1946, Serial No. 716,208
In Great Britain December 19, 1945

7 Claims. (Cl. 201—48)

1

This invention relates to an electrically operated switch adapted to respond to the influence of hydraulic or gaseous fluid pressure for automatically making and/or breaking a circuit for apparatus actuated electrically and having a certain operative relationship with the hydraulic or gaseous fluid pressure generating means, or means consuming energy from the source of fluid pressure or converting such pressure into kinetic energy. Or the switch may in one form of the invention be adapted as a means for controlling the operation of a fluid pressure indicating gauge, signalling device or automatic controlling device.

Fluid pressure operated switches have been proposed heretofore in which a diaphragm exposed to the direct influence of the fluid pressure is deformed to actuate contacts. Also the use of a stack of carbons in the circuit of pressure gauge indicating apparatus has been proposed heretofore, in which the variations in resistance in the carbon stack influence the electrical circuit to produce changes in the indications of the gauge. The object of the present invention is to provide a switch which is extremely sensitive in its response to very slight changes in fluid pressure whilst being protected against overload by the fluid pressure and the mechanical means which at an appropriate stage overcomes or yields to the fluid pressure to actuate the switch.

According to this invention a fluid pressure actuated switch comprises engaging contacts to receive leads of a signal operating circuit, at least one of which contacts is a carbon body, spring means and a fixed abutment between which at least one carbon contact is subjected to pressure, a stud slidable through said abutment and having a flanged head at one end, an imperforated flexible diaphragm contacted by said head, the other end of the stud being positioned so as to transmit the load due to the predetermined fluid pressure on the diaphragm to said spring so as to reduce the spring pressure on the contacts, a fluid pressure receiving chamber adapted to be connected to a source of fluid pressure and between which and said abutment said imperforated flexible diaphragm is secured by a continuous peripheral marginal part so that the imperforated diaphragm completely isolates the said chamber from the said stud and contacts, a recess in said abutment accommodating said stud head and of such a depth that slight deformation of the diaphragm under the influence of fluid pressure will result in the said head being stopped against the abutment at substantially the stage when the

2

spring pressure on the contacts is freed or reduced to an extent sufficient to cause a signal to be transmitted in the circuit, said abutment acting as a positive stop to prevent the spring pressure from being transmitted to the diaphragm to an extent which will subject the diaphragm to deformation greater than the deformation to which it is subjected by the fluid pressure.

In order that the invention may be clearly understood and readily carried into effect drawings are appended hereto illustrating embodiments thereof, and wherein:

Figure 1 is a plan view, and

Figure 2 is a sectional elevation showing an embodiment of the invention using a single carbon ring.

Figure 3 is a detail broken sectional elevation showing the use of a stack of carbon rings instead of a single carbon ring,

Figure 4 is a detail sectional elevation showing the use of carbon rings alternating with metallic conductor rings and arranged as a stack,

Figures 5 and 6 are detail sectional elevation views showing alternative pairs of the contact elements, and

Figures 7 and 8 are diagrams showing the connection of the device in the electrical circuit of an electrically operated pressure indicator.

Referring to the drawings, the variable electric resistance comprises either a single annular carbon ring 1 as shown in Figure 2 or a stack of carbon rings 1a as shown in Figure 3 or as a further alternative, a number of carbon rings 1b alternating with metallic conducting rings 1c as shown in Figure 4. The ring or rings, is or are, enclosed in an insulating tube 2, pressure against a contact plate 3 on top of the carbon ring or rings being applied by an adjustable device comprising a coiled compression spring 4 interposed between the top contact plate 3 and a plate 5 carried by an adjusting screw 6, such screw conveniently comprising a terminal to which can be connected one end of a lead 7 from the gauge or signalling device indicated diagrammatically at 8 in Figure 7.

The said insulating tube forms part of, or is accommodated within a housing, which is partitioned into one end portion provided with an adaptor or union device 9 for the reception of a pipe, or for attachment to the output of a pump, so that the pressure of the circulating system is transmitted directly to a diaphragm 10. This diaphragm can be metallic or composed of a non-porous fabric and is engaged on the side

remote from the fluid pressure receiving side by the flanged end of a stud 11 passing loosely through a bottom contact plate 12 and the carbon ring 1 or stack of carbon rings 1a or stack of carbon rings and metallic rings, this stud being of insulating material and having a flanged end adjacent to the diaphragm, so that displacement of the diaphragm 10 due to the pressure of hydraulic fluid causes the insulated stud 11 to engage with the top contact plate 3 and thus relieves the carbon ring or stack of rings from the pressure due to the action of the said coiled compression ring 4. Relaxation of the spring pressure on the carbon ring 1 or stack of rings produces a change in resistance which can be recorded by a simple type of indicating meter 8, or by varying the luminosity of a lamp 13 (see Figure 7), so that the lamp is only illuminated fully when there is no working pressure upon the fluid, or when such pressure drops below a predetermined minimum. When a gauge is employed for indicating the pressure in the appropriate fluid pressure circuit it can include a segment divided into a number of distinctively coloured sections indicating changes from "maximum pressure" to "no pressure" and so operate from the device as to be brought successively into view.

When the device is intended for use in connection with a lubricating circuit of an internal combustion engine, or for like purposes, the dimensions of the housing 2 can be such that it is merely an inconspicuous fitment to the appropriate part of the apparatus, and for normal requirements the housing 2 can comprise the cylindrical body as shown having an annular flange 2a, the diameter of which need not exceed about one and a half inches, the other body part 9 of the device being likewise flanged as at 9a, the two flanges being coupled together, with the bottom contact plate 12 and diaphragm 10 gripped between them by an annular or gland nut 14 threaded onto the flange 9a. In practice the electrical circuit is completed through the carbon ring 1 or stack of rings, e. g. in the arrangement shown in Figure 3 or 4 one end ring of the stack is connected electrically to the coil spring via the top contact plate 3 and thereby being electrically connected to the aforesaid pressure adjusting screw 8 and the indicator 8 and the other end carbon ring being connected to the bottom contact plate 12 which can be fitted with a terminal 12a for connection by a lead 12b to a battery, or may be directly connected via the union device 9 to earth. The upper and lower faces of the single carbon ring will take the place of the faces of the rings 1a or 1b which contact with the contact plates 3 and 12.

The device is arranged so that the maximum pressure actually breaks the circuit through the carbon or carbons after increasing the resistance.

When it is required to have the lamp 13 illuminated when there is a state of high pressure, e. g. when the blades of an oil pressure operated adjustable pitch airscrew are feathered, the arrangement shown in Figure 8 can be adopted in which the warning device 13 can be connected across both leads 7 and 12b, and a suitable resistance 15 introduced in the negative lead so that the warning device is operated when the pressure on the carbon disc or discs is at its highest.

To obviate excessive pressure damaging the diaphragm 10, the insulated stud 11 abuts against the bottom contact plate 12 thereby restricting

any further movement of the insulated stud and diaphragm after they have performed the function of varying the resistance and finally breaking the circuit at a predetermined pressure.

Instead of connecting the leads 7 and 12b to the members 6 and 12, they can, as shown in Figure 5, be connected to diametrically opposed narrowly spaced part annular brass contact blocks or studs 16 and 17 interposed between a solid carbon disc 1 and the plate 12, the plates 3 and 12 being non-conductive, or being insulated from the carbon member 1 and contact members 16 and 17. Alternatively, as shown in Figure 6, the leads 7 and 12b can be connected to a pair of part annular or other suitably shaped narrowly spaced carbon bodies 1a and 1b interposed between a non-conducting plate 12 and a brass or other suitable conductor disc 18 adapted to act as a bridge across the two carbon bodies, and insulating plate 19 transmitting the pressure of the spring 4 to the carbon bodies 1a and 1b. The disc 18 will receive the direct pressure of the stud 11.

I claim:

1. A fluid pressure actuated switch comprising engaging contacts to receive leads of a signal operating circuit, at least one of which contacts is a carbon body, spring means and a fixed abutment between which the carbon portion of the contacts is subjected to pressure, a stud slidable through said abutment and having a flanged head at one end, an imperforated flexible diaphragm contacted by said head, the other end of the stud being positioned so as to transmit the load due to the predetermined fluid pressure on the diaphragm to said spring so as to reduce the spring pressure on the contacts, a fluid pressure receiving chamber adapted to be connected to a source of fluid pressure and between which and said abutment said imperforated flexible diaphragm is secured by a continuous peripheral marginal part so that the imperforated diaphragm completely isolates the said chamber from the said stud and contacts, a recess in said abutment accommodating said stud head and of such a depth that slight deformation of the diaphragm under the influence of fluid pressure will result in the said head being stopped against the abutment at substantially the stage when the spring pressure on the contacts is freed or reduced to an extent sufficient to cause a signal to be transmitted in the circuit, said abutment acting as a positive stop to prevent the spring pressure from being transmitted to the diaphragm to an extent which will subject the diaphragm to deformation greater than the deformation to which it is subjected by the fluid pressure.

2. In a switch according to claim 1, the combination with said fixed abutment of another abutment interposed between the spring means and the carbon portion of the contacts, the said stud being slidable through and relative to said fixed abutment and engaging the other abutment so that the spring means yieldingly opposes the hydraulic pressure transmitted to it via said stud.

3. A fluid pressure actuated switch comprising engaging contacts to receive leads of a signal operating circuit, at least one of which contacts is a carbon body, spring means and a fixed abutment between which the carbon portion of the contacts is subjected to pressure, a stud slidable through said abutment and having a flanged head at one end, an imperforated flexible diaphragm contacted by said head, the other end of the stud being positioned so as to transmit the

5

load due to the predetermined fluid pressure on the diaphragm to said spring so as to reduce the spring pressure on the contacts, a fluid pressure receiving chamber adapted to be connected to a source of fluid pressure and between which and said abutment said imperforated flexible diaphragm is secured by a continuous peripheral marginal part so that the imperforated diaphragm completely isolates the said chamber from the said stud and contacts, a recess in said abutment accommodating said stud head and of such a depth that slight deformation of the diaphragm under the influence of fluid pressure will result in the said head being stopped against the abutment at substantially the stage when the spring pressure on the contacts is freed or reduced to an extent sufficient to cause a signal to be transmitted in the circuit, said abutment acting as a positive stop to prevent the spring pressure from being transmitted to the diaphragm to an extent which will subject the diaphragm to deformation greater than the deformation to which it is subjected by the fluid pressure, a second abutment interposed between a spring means and a carbon portion of the contacts, the said stud being slidable through and relative to said fixed abutment and engaging the second abutment so that the spring means yieldingly oppose the hydraulic pressure transmitted thereto through said stud, the stem or shank of the headed stud passing freely through a carbon contact body of annular form.

4. A switch according to claim 3, wherein the carbon body is divided into a plurality of carbon elements arranged as a stack.

5. A switch according to claim 3, wherein the

6

said carbon body is sub-divided into a plurality of carbon elements, metallic conductor elements alternating with the carbon elements.

6. A switch according to claim 3 wherein the carbon body comprises two opposed co-planar spaced parts, a contact member subjected to the spring pressure bridging the said co-planar spaced parts.

7. A switch according to claim 3 including a pair of contacts adapted to be connected to the leads, and a carbon body receiving the spring pressure bridging said pair of contacts.

REGINALD CYRIL FULLER.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
805,505	Waddell	Nov. 28, 1905
1,528,627	Peters	Mar. 3, 1925
1,581,957	Keller	Apr. 20, 1926
1,681,314	Vawter	Aug. 21, 1928
1,695,295	Rollins	Dec. 18, 1928
1,788,678	Knaak	Jan. 13, 1931
1,796,919	Brogger	Mar. 17, 1931
2,030,523	Keller	Feb. 11, 1936
2,163,518	Postelwaite	June 20, 1939
2,347,695	Leathers	May 2, 1944

FOREIGN PATENTS

Number	Country	Date
471,422	Great Britain	Sept. 3, 1937
705,669	France	June 11, 1931