

Oct. 12, 1943.

E. B. DAVENPORT

2,331,826

PRESSURE ACTUATED SWITCH

Filed June 23, 1941

Fig. 1.

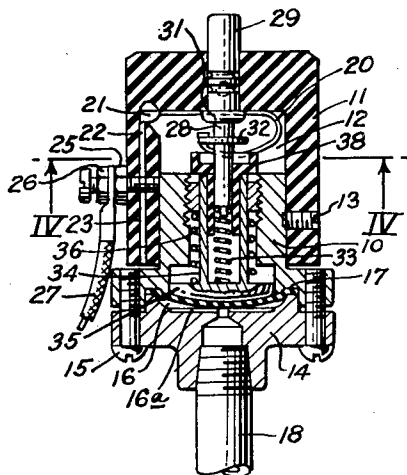


Fig. 2.

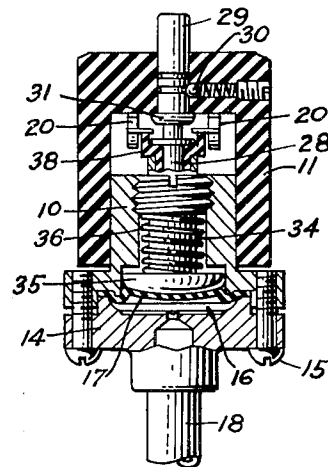


Fig. 3.

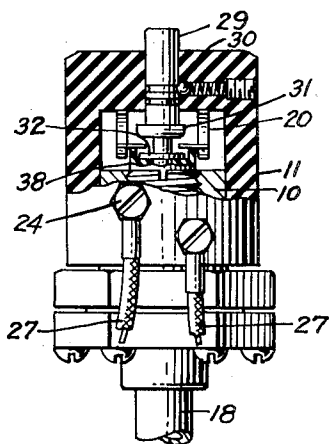


Fig. 5.

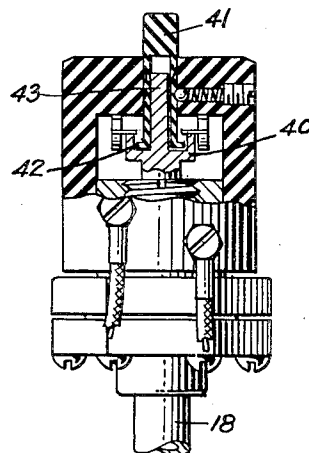
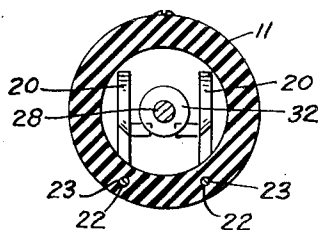


Fig. 4.



INVENTOR.
EDWIN B. DAVENPORT
BY

Eastberg & Roemer
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,331,826

PRESSURE ACTUATED SWITCH

Edwin B. Davenport, San Francisco, Calif.

Application June 23, 1941, Serial No. 399,278

3 Claims. (Cl. 200—83)

The present invention relates to pressure actuated electric switches suitable for automatic control of the ignition circuit of an internal combustion engine.

The proper function of an internal combustion engine sometimes depends upon fluid pressure, such, for example, as the pressure of oil in its lubricating system or the pressure of a fluid at the discharged side of a pump propelled by the engine.

This invention is particularly intended for combination with any engine and a pump propelled thereby, though it may be used in connection with any fluid where it is desired that the pressure of the fluid control the operation of an electric switch for any purpose.

One example of a useful function of the invention is in the case of a pump propelled by an internal combustion engine for pumping water from a well or stream for irrigation purposes or the like. Often the water pumped in this manner serves to lubricate the pump, and a part of the water is by-passed to the cooling system of the engine. In the event of any failure on the suction side of the pump which interrupts the flow of water thereto, the pump and engine may suffer considerable damage unless the engine is stopped. The object of the present invention is, therefore, to provide a simple positive acting switch and pressure actuated control for the switch, by means of which an internal combustion engine may be stopped immediately and automatically by a drop of pressure in a fluid circuit.

A further object of the invention is to provide in such a device means to set the switch manually for starting of the engine during low pressure conditions in the fluid circuit, and automatically to set the switch to its normal running position as the pressure in the circuit goes up after the engine has been started.

Further objects and advantages of the engine are made apparent in the following specification wherein reference is made to the accompanying drawing which illustrates a preferred form of the invention. In the drawing

Fig. 1 is a central vertical section of a switch embodying the present invention, and showing the position of the parts assumed during low pressure conditions;

Fig. 2 is a similar view illustrating the position assumed by the parts of the switch under high pressure conditions;

Fig. 3 is a similar view of the switch with the parts shown in their manually controlled starting position;

Fig. 4 is a section taken on line IV—IV of Fig. 1; and

Fig. 5 is a view similar to Figs. 1 and 2 illustrating a modified form of the invention.

Referring to the drawing in detail the switch of the present invention is shown as comprising a generally cylindrical body member 10, the upper end of which is covered by a cap 11 formed to provide above the body member a switch chamber 12. The cap 11 is formed of any suitable dielectric material, for example "Lucite," which has been found very satisfactory for this purpose. The cap may be retained on the body member 10 by means of a set screw as shown at 13. On the bottom of the body member 10 a plate 14 is secured as by screws 15 to form a pressure chamber 16 and to retain in place in said chamber a diaphragm 17. The plate 14 is bored and threaded to receive a pipe 18 or other fitting by means of which the pressure chamber may be placed in communication with a fluid circuit, such as the discharge side of a pump or the water jacket or other fitting in the cooling system of an engine.

The chamber 12 contains a pair of resilient contact fingers 20, each of which preferably extends across the top of the chamber, and is bent downwardly and back toward its end, which is bent at a right angle to project in a direction generally toward the center of the chamber. Each of these contact fingers 20 is secured as by solder, indicated at 21, to a wire 22 which occupies a bore 23 extending longitudinally of the cylindrical side wall of the cap. For each of the wires 22 a binding post 24 enters the side wall of the cap through a bore, which intercepts the bore 23 and the inner end of the binding post is transversely drilled to receive the wire 22. A nut 25 on the binding post is tightened against the outer wall of the cap to retain it in place, and a nut 26 is employed to clamp the terminus of a wire 27 in place. The binding post is preferably formed of an ordinary machine screw, so that the head thereof prevents removal of the clamping nut 26 when it is loosened to release the wire 27. A post 28 is arranged concentrically of the chamber and extends upwardly through the top of the chamber to provide a push button 29, by means of which it may be manually moved from the extended position illustrated in Fig. 1 to the depressed position illustrated in Fig. 3; and a spring pressed detent 30 acts with a pair of grooves formed in the post to retain it in either of the two positions illustrated. The post 28 carries a stop collar 31 which limits its upward movement, and a contact collar 32 positioned to engage the ends of the contact

fingers 20 and to complete a circuit through each of these fingers to the body of the switch and thus to the ground, which in the case of an internal combustion engine would be the cylinder block or some fitting connected therewith.

The wires 27 will, when the device is installed, be connected with the primary circuit of the ignition system of the engine, so that upon grounding of these wires the engine will be stopped. In the structure shown each of the wires 27 is intended to lead to the primary wire of one of the cylinders of a two cylinder engine, consequently, if the parts are in the position illustrated in Fig. 1 the primary circuit of the engine is grounded through the wires 27, wires 22, contact fingers 20 and collar 32 of the post 28, which post carries a spring 33, which ensures completion of the circuit to the body of the switch and to the ground.

To break the circuit to the ground while the engine is running and while pressure is maintained in the pressure chamber 16 the body member 10 is centrally bored and provided with a hollow plunger 34, the lower end of which is closed by an enlarged head 35 which rests against the diaphragm 17. The plunger 34 is urged downwardly by a spring 36 interposed between the head 35 and a nut 37, which serves as a guide for the upper end of the plunger. The upper end of the plunger carries a cup 38 of dielectric material, which is provided with a hollow downwardly extending stem, which serves to support it with relation to the plunger and also serves to guide the lower end of the post 28.

During operation of the engine, which is accompanied by high pressure on the pressure side of the pump with which the chamber 16 communicates, the diaphragm 17 is held in its uppermost position as illustrated in Fig. 2, and holds the plunger 34 in a position where the cup 38, carried by its upper end, surrounds the contact collar 32, and engages the ends of the contact fingers 20 holding them out of contact with the collar thus holding the circuit to the ground open. The parts remain in this position throughout the continued satisfactory operation of the engine and pump, but upon any failure of the pump to deliver fluid, the pressure at its discharge end and consequently in the chamber 16 drops, permitting the grounding switch to assume the closed position illustrated in Fig. 1.

As it is impossible to start the engine with its ignition grounded the button 29 is depressed for starting, causing the parts to assume the position illustrated in Fig. 3 wherein the contact collar 32 has been moved down into the cup 38 leaving the contact fingers 20 supported on the edges of the cup with the circuit broken. With the switch in this position the engine may be started and assuming the pump to be functioning properly, pressure will immediately be built up in the chamber 16 again to raise the plunger to the position illustrated in Fig. 2. As the contact collar 32 rests on the bottom of the cup, the post 28 will be raised by the plunger to return the push button 29 automatically to its normal running position shown in Fig. 2.

It is possible that the diaphragm 17 may at its lowest position contact the bottom of the shallow pressure chamber 16 and close the ori-

fice which forms the communication between the source of pressure and the chamber. This would greatly reduce the area of the diaphragm subjected to pressure and prevent proper operation of the plunger except in the event of very high pressures. To insure admission of pressure to the entire area of the diaphragm the bottom of the chamber 16 is provided with a plurality of radial grooves as shown in Fig. 1 at 16a to admit pressure to the chamber even though its centered orifice may be obstructed by the diaphragm.

In the case of some engines it is desirable to break an ignition circuit rather than to ground the circuit for stopping the engine, and for this purpose the modified form of the invention illustrated in Fig. 5 may be employed. In this modification the plunger 34 is of solid construction and is formed with a cup 40 of conducting material at its upper end. A push button 41 with a collar 42 at its lower end is formed of a dielectric material and preferably bored to receive a guide post 43, which extends upwardly from the plunger. In this case the contact fingers 20 are included as a part of a single circuit and are bridged to close the circuit by the cup 40. The operation of this modification is identical with that described above, though the result in connection with the switch is reversed as the switch is closed when the plunger is raised by pressure as shown in Fig. 5, and opened when the pressure drops and the plunger recedes to permit the contact fingers to be supported in spaced relationship on the dielectric collar 42.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In a pressure actuated switch a resilient contact finger, a reciprocable post having a projection engaging said finger to complete a circuit, and a pressure actuated plunger concentric with said post and carrying a cup shaped dielectric member to embrace said projection and raise said contact finger out of engagement therewith under influence of high pressure.

2. In a pressure actuated switch a resilient contact finger, a reciprocable post having a projection engaging said finger to complete a circuit, and a pressure actuated plunger concentric with said post and carrying a cup shaped dielectric member to embrace said projection and raise said contact finger out of engagement therewith under influence of high pressure, and means to depress said post to cause said projection to enter the cup shaped member when the plunger has receded during low pressure conditions.

3. In a pressure actuated switch, a switch chamber, a pair of resilient contact members therein, a reciprocable post having a conducting collar engageable with said members, a normally retracted pressure actuated plunger entering the chamber from one end and concentric with said post, a dielectric cup carried by said plunger to embrace the collar on the post and separate the contact members therefrom when the plunger is advanced, and means to depress the post manually to cause the collar to enter the cup while the plunger is retracted.

EDWIN B. DAVENPORT.