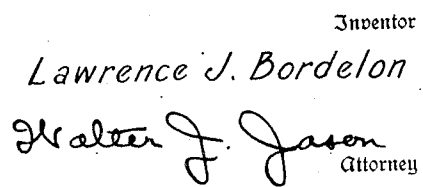


2,492,261

Filed March 5, 1948



UNITED STATES PATENT OFFICE

2,492,261

PRESSURE SWITCH

Lawrence J. Bordelon, San Diego, Calif., assignor
to Consolidated Vultee Aircraft Corporation,
San Diego, Calif., a corporation of Delaware

Application March 5, 1948, Serial No. 13,272

13 Claims. (Cl. 200—82)

1

This invention relates to devices for controlling electrical circuits and more particularly to circuit controlling devices automatically operable in response to variations in external conditions.

An object of the present invention resides in providing a novel pressure operated mechanism for operating an electric switch automatically in response to variations in external pressure conditions to control an electrical circuit.

Another object of this invention is to provide an improved form of pressure operated electric circuit controlling device having a simplicity of construction, efficiency of operation and economy in manufacturing.

Other objects and features of the present invention will be readily apparent to those skilled in the art from the following specification and appended drawings wherein is illustrated a preferred form of the invention, and in which:

Figure 1 is a front elevational view of the switch according to the present invention with a portion thereof shown in section for clarity, and with a cover plate removed;

Figure 2 is a sectional view taken along line II—II of Figure 1;

Figure 3 is a front elevational view of a detail.

Figure 4 is a vertical sectional view of a segment of the engine nose casing of an aircraft engine showing the pressure switch of the present invention mounted on the casing and in position for being operated by hydraulic pressure.

As illustrated in the drawings, the pressure switch A, in accordance with the present invention, comprises a housing 10, which may be cast or otherwise formed out of a light weight metal, such as aluminum. The housing 10 comprises two principal portions, a substantially circular mounting flange 11 and a substantially rectangular box-like portion 12 integral with flange 11 and extending from one side thereof. An annular series of holes 13 are drilled or otherwise provided in the mounting flange 11 which are adapted to receive mounting bolts 14 for securing the pressure switch A at a desired location.

The annular wall 15 of the mounting flange 11 defines an internal passage 16 therein across which passage transversely extends a cylindrical portion 17, which is formed integral with flange 11. Through the cylindrical portion 17 is provided a longitudinally extending bore or passage 18, which passage communicates with a threaded bore 21 formed in the wall 15 of the mounting flange 11 to open to the exterior at a point furthest disposed from rectangular portion 12. Sur-

2

rounding the opening of bore 21 is a cylindrical boss 22 formed integrally with flange wall 15 and extending therefrom. Adapted to be secured in the threaded bore 21 is a cylindrical plug 23 carrying exterior threads and having a hexagonal head 24 which facilitates the removal or insertion of plug 23 from or in the bore 21. Bore 21 is of larger diameter than bore 18 with which it connects and is provided with an annular seat 25 at its inner end, against which seat 25 is rested a sealing gasket 26. The gasket 26 is adapted to be engaged by a shoulder surface of the plug 23 to prevent leakage of fluid therepast.

Slidably fitted within bore 18 of cylindrical portion 17 is a liner or sleeve 27 which serves to prevent excess wear of the walls of this bore. Gasket 26 and plug 23 act to retain the sleeve 27 within its bore 18.

Depending from the base of the plug 23, integrally formed therewith and adapted to project into the interior of transverse bore 18 is a stop or movement limiting cylindrical portion 28. Carried upon the exterior surface of the cylindrical stop 28 and disposed within an annular groove formed therein is a sealing ring 29. The stop 28 is engageable by a piston 31 slidably contained within sleeve 27 and serves to limit the movement of this piston. Integral with piston 31 and extending therefrom is an elongated piston rod 32 having its opposite end projecting through a connecting opening 30 in flange 11 to extend into the confines of rectangular portion 12. Piston 31, as will be more fully described hereinafter, is adapted to be acted upon by fluid pressure and to be responsive to variations of such fluid pressure.

Disposed within the piston sleeve or cylinder 27 and slidably mounted upon piston rod 32 is a tubular sleeve or spring guide 33 the end 34 of which is adapted to be engaged by the piston 31 whereby it limits and defines the amount of movement, under fluid pressure, of piston 31 within cylinder 27. Spring guide 33 at its opposite end carries an out-turned flange 35 which abuts a washer 36 formed of steel or similar material, which in turn rests upon a sealing cup 37 mounted within a constricted portion 38 of bore 18. Formed integrally with sealing cup 37 and depending from the base thereof is a bushing 41 which closely fits within opening 30 and accepts piston rod 32 and serves to maintain the piston rod against lateral deflection and prevents its abrading the surrounding material of flange 11 as it reciprocates within opening 30.

Contained within sleeve 27 and positioned

about the piston rod 32 and a portion of spring guide 33 with one end disposed against the underside of piston 31 is a spring 42 which is of comparatively light construction and which is adapted to exert its bias to maintain piston 31 in contact with stop 28. The opposite end of spring 42 is seated upon one end of a more massive spring 43 which surrounds spring guide 33 and is considerably heavier in construction than spring 42. The other end of spring 43 is seated upon the circular flange 35 provided by spring guide 33. Before heavier spring 43 can be compressed piston 31 must move to compress lighter spring 42 upon its seat on heavy spring 43 in a manner and for a purpose which will be later described when the operation of pressure switch A is outlined below.

Housed within sealing cup 37 and adapted to be retained therein by washer 36 which closes cup 37 is a group of chevron-shaped seals 44 which are designed to prevent fluid from flowing along piston rod 32 into the interior of rectangular portion 12.

Fluid for effecting movement of the piston 31 enters the bore 18, as best shown in Figure 2, through an orifice 45 formed in the underside of cylindrical portion 17, which orifice 45 communicates with an annular groove 46 in sleeve 27. A plurality of openings 47 lead from the annular groove 46 to within the interior of sleeve 27; thus the fluid which enters through orifice 45 will flow around groove 46 and through openings 47 into the sleeve 27. A transverse opening 48 through stop 28 provides a passage for this fluid which then flows through a longitudinal bore 51 in stop 28 to impinge upon the piston 31 to move it.

When fluid under pressure is fed into cylinder bore 18 there is a possibility that a certain amount will leak past the piston 31 to the spring side thereof. To prevent such fluid from collecting in bore 18 there is provided a bleed or draining hole 52 formed in the wall 15 of the mounting flange 11 adjacent sealing cup 37 and leading to the exterior of the housing. Thus the possibility that sufficient fluid could accumulate in cylinder bore 18 to hamper the movement of piston 31, or to be forced past chevron seals 44 into rectangular portion 12 is obviated. Since the by-passed fluid must first reach drain hole 52 before it can be scavenged therethrough, the washer 36 is provided with a number of openings (not shown) which permit the passage of fluid for flow to drain hole 52.

Rectangular portion 12 of housing 10 comprises a base 53, three upstanding walls 54, 55, and 56, with the fourth or closing wall being provided by the mounting flange 11. These several walls cooperate to define a cavity or switch chamber 57 into which the end of piston rod 32 projects. A cover 58 closes switch chamber 57, being secured to rectangular portion 12 by suitable studs 59. Securely mounted as by means of studs 60, or similar fasteners, upon the projecting end of piston rod 32 is a generally L-shaped block or carriage 61 having a slotted leg 62, which carriage 61 is adapted to be longitudinally displaced, relative to rectangular portion 12 by movement of piston rod 32. Pivotaly mounted within the slot of leg 62 and toward the forward end thereof, as by a pin 63, is a trigger 64. Trigger 64 is biased into an upright position by a spring 65 which is housed within a longitudinally extending cylindrical hole 66 formed in leg 62. One end of spring 65 seats against the base of hole 66 and

the other rests against the trigger 64. Trigger 64 comprises an upright, vertical switch actuating arm 67 having a radiused top portion 68 which is adapted to actuate a switch, as will be hereinafter described. Adjacent the arm 67 and spaced from the top 68 thereof is a stop portion 71 which is adapted to engage an end surface 72 on leg 62 of carriage 61 at the forward end thereof to prevent the forward declination of vertical arm 67 of trigger 64 for a reason to be described below. Secured to the wall 56, as by bolt and nut assemblies 73, is a guide block 74 which is slidably engageable by leg 62 of carriage 61 and maintains the carriage and the trigger 64, which it carries, in the desired path of movement and further prevents distortion or misalignment of the carriage 61 upon its support on rod 42 when pressure is applied to trigger 64.

Mounted within the confines of switch chamber 57 and secured to base 53 is a usual self-contained snap switch 75, of the micro-switch type, having the usual stationary contact and resilient contact arm carrying a movable contact, with the latter being biased normally to contact's disengaged position and with an outwardly biased actuating switch button 76 protruding from the interior of the casing 77 of switch 75 and extending into the path of trigger 64 whereby it may be engaged and depressed on movement of the trigger to move into the switch casing 77 to actuate the movable contact therein into contact's engaged position. It is understood that the particular construction of switch 75 has no bearing on the present invention and the invention is not limited to the type illustrated as any circuit controlling instrumentality, of suitable size, adapted to be actuated by movement of the trigger 64 to effect an electrical operation may be used.

Switch 75 is secured to base 53 and a shield member 78 is disposed upon switch 75 by a pair of mounting bolt and nut assemblies 79. Conducting leads 81 run from switch 75 into a usual electric connecting plug 82 which is secured to an annular boss 83 formed on wall 54 of switch box 12.

The pressure switch A of the present invention is adapted for use in any system wherein it is desired that on variation of an external pressure from normal an electric circuit controlling instrumentality is actuated to perform a desired operation. One use of the present pressure switch is disclosed and fully described in a co-pending application, Serial No. 778,933, filed October 9, 1947. In this co-pending application the pressure switch A is applied to a conventional torque nose carrying aircraft engine B, a fragmentary portion of which is illustrated in Figure 4, being mounted upon the nose casing 84 thereof. The vertical sectional view of Figure 4 illustrates the manner of mounting of switch A to the aircraft engine's nose casing 84. As shown switch A is secured to nose casing 84 by a plurality of mounting studs 14 and located over a bore or channel 86 in the casing. A plate 88 fits completely over the top surface of mounting flange 11 of switch A to seal off the passage 16 therein and is held thereon by the studs 14. Fluid such as oil fills the bore 86 in nose casing 84 and passage 16 in mounting flange 11 and completely surrounds the cylindrical portion 17. As the engine B, with which pressure switch A in this example is associated, is started up, oil under pressure is directed through channel 86 in nose casing 84 to pressure switch A. This oil flows through hole 45 in the

wall of cylindrical portion 17, about annular groove 46 in sleeve 27 and through the holes 47 into the interior of sleeve 27 disposed in bore 18. As the engine power output is increased piston 31 moves, under the pressure developed, along bore 18 and against the force of the light spring 42 to compress the latter, and when normal engine power output is attained the oil pressure developed will have additionally compressed heavy spring 43. The movement of the piston 31 under the developed pressure causes simultaneous movement of the piston rod 32 and displaces the carriage 61 and its associated trigger 64, to the right, as viewed in Figure 2, to the dotted line position therein illustrated. It is here noted that trigger 64 as it moves past the switch button 76 does not actuate it into switch casing 77 to cause the operation of switch 75 but rather itself is actuated and pivots, on contact with button 76, in a counter-clockwise direction against the bias of its spring 65 to travel past button 76 without moving it. Immediately after it has cleared button 76, spring 65 returns trigger 64 to its upright position. The position occupied by the trigger 64 at the right of switch button 76 is its armed position and is attained only when the engine B is developing a predetermined number of pounds of torque. Should greater torque be developed by the engine there will be a tendency for the piston 31 to be driven further to the right against the bias of spring 43 but the amount of its travel in this direction is limited by the end 34 of spring guide 33 which will be engaged by the piston 31.

The two springs 42 and 43 are provided to permit the gradual movement of piston 31 and carriage 61 to armed position which position the springs determine will be reached only on attainment by the engine of a predetermined torque pressure. Since it would be extremely difficult to provide a single spring having the compound characteristics of initial light resistance to the movement of piston 31 and subsequent stiff resistance when a predetermined point is reached the two springs 42 and 43 have been provided. The predetermined torque pressure at which the pressure switch A is armed is determined by the minimum effective power output of the engine B.

When the torque pressure developed by engine B falls below the pressure required to compress light spring 42 and to begin the compression of heavy spring 43, the lessened pressure applied to piston 31 permits it to be pushed sharply and quickly to the left under the force of expanding heavy spring 43. The initial impetus to effect movement of carriage 61 and its associated trigger 64 is given by the heavy spring 43 and a quick response to a drop in applied pressure is thus achieved. As trigger 64 strikes switch button 76 it depresses it into its casing 77 to close the normally open contacts of switch 75 and complete a circuit to effect an electrical operation desired. Spring 43 exhausts its travel path at this moment and light spring 42 takes over to continue to move piston 31 to the limit of its travel to the left. Since the power of spring 42 is less than that of spring 43 the movement of piston 31, piston rod 32 and the carriage 61 mounted thereon is slowed and therefore the period of time in which the trigger 64 remains in contact with and holds switch button 76 depressed is prolonged to assure that the normally opened contacts of switch 75 do close. Declination to the right or clockwise movement of the trigger 64 as it engages switch button 76, in this operation, is prevented by the engagement of stop 71 of trigger 64 with

the stop seat 72 provided by leg 62 of carriage 61. Spring 42 will bring piston 31 to rest against stop 28 provided by plug 23 when engine B ceases to deliver power.

The pressure switch A of the present invention has been described in association with an engine whose power output determines the time of operation of the switch. It is understood and contemplated as within the scope of this invention that the switch A can be utilized in any fluid system wherein variations in pressure will be encountered and desired operations will occur at predetermined pressure conditions.

While certain preferred embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims.

I claim:

1. In a pressure switch, a housing comprising wall portions defining a chamber, an electric circuit controlling instrumentality mounted in said chamber, an actuating member movable to operate said electric circuit controlling instrumentality, and a pressure responsive means for moving said actuating member; said pressure responsive means comprising a rectilinearly movable member, a pivotal member supported thereon, a stop means engageable by said pivotal member, said pivotal member being bodily movable, by and upon movement of said rectilinearly movable member, into engagement with said instrumentality actuating member to be pivoted thereby in one direction until moved therepast, and means to move said pivotal member in the opposite direction to occupy a triggering position, from which position on return movement of said rectilinearly movable member said pivotal member engages and moves said actuating member to operate said electric circuit controlling instrumentality, said stop means, in this latter movement, restraining said pivotal member against pivotal movement.

2. In a pressure switch, a housing comprising wall portions defining a chamber, an electric circuit controlling instrumentality mounted in said chamber, an actuating member movable to operate said electric circuit controlling instrumentality, and a pressure responsive means for moving said actuating member, said pressure responsive means comprising a rectilinearly movable member, a pivotal member supported thereon, a stop means engageable by said pivotal member, spring means exerting its bias upon said pivotal member for engagement of said pivotal member with said stop means, said pivotal member being bodily movable, by and upon movement of said rectilinearly movable member, into engagement with said instrumentality actuating member to be pivoted thereby, against the bias of said spring means, until moved therepast to occupy a triggering position, from which position on return movement of said rectilinearly movable member said pivotal member engages and moves said actuating member to operate said electric circuit controlling instrumentality, said stop means, in this latter movement, restraining said pivotal member against pivotal movement.

3. In a pressure switch, a housing comprising wall portions defining a chamber, an electric circuit controlling instrumentality mounted in said chamber, an actuating member rectilinearly movable to operate said electric circuit controlling

instrumentality, and a pressure responsive means for moving said actuating member, said pressure responsive means comprising a rectilinearly movable member, a support member carried thereby, a pivoted member mounted on said support member, stop means provided by said support member engageable by said pivoted member, spring means contained within a recess in said support member and bearing upon said pivoted member to bias it toward engagement with said stop means, said pivoted member being bodily movable, by and upon movement of said rectilinearly movable member, into engagement with said instrumentality actuating member to be pivoted thereby, against the bias of said spring means, until moved therepast to occupy a triggering position, from which position on return movement of said rectilinearly movable member said pivoted member engages and moves said actuating member rectilinearly to operate said electric circuit controlling instrumentality, said stop means, in this latter movement, restraining said pivoted member against pivotal movement.

4. In a pressure switch, a housing comprising wall portions defining a chamber, an electric circuit controlling instrumentality mounted in said chamber, an actuating member movable to operate said electric circuit controlling instrumentality, and a pressure responsive means for moving said actuating member, said pressure responsive means comprising a member rectilinearly movable in response to fluid pressure acting thereupon, spring means exerting its bias on said movable member to oppose said movement, a pivotal member supported thereon, a stop means engageable by said pivotal member, spring means biased against said pivotal member and urging it into engagement with said stop means, said pivotal member being bodily movable, by and upon movement of said rectilinearly movable member, into engagement with said instrumentality actuating member to be pivoted thereby, against the bias of said second-mentioned spring means, until moved therepast to occupy a triggering position, from which position on return movement of said rectilinearly movable member said pivotal member engages and moves said actuating member to operate said electric circuit controlling instrumentality, said stop means, in this latter movement, restraining said pivotal member against pivotal movement.

5. In a pressure switch, a housing comprising wall portions defining a chamber, an electric circuit controlling instrumentality mounted in said chamber, and a pressure responsive means for effecting the operation of said instrumentality, said pressure responsive means comprising a member rectilinearly movable in response to fluid pressure acting thereupon and having a portion thereof disposed within said chamber, a pair of spring means disposed upon said rectilinearly movable member exteriorly of said chamber and operative to urge said member outwardly of said chamber, one of said spring means being compressible by the other upon movement of the rectilinearly movable member, a member pivotally mounted on said rectilinearly movable member on the portion thereof disposed within said chamber and bodily movable therewith to operate said electric circuit controlling instrumentality, stop means engageable by said pivoted member to restrain movement thereof in one direction, and resilient means exerting its bias normally to maintain said pivoted member in engagement with said stop means.

6. In a pressure switch, a housing comprising wall portions defining a chamber, an electric circuit controlling instrumentality mounted in said chamber, an actuating member rectilinearly movable to operate said electric circuit controlling instrumentality, and a pressure responsive means for moving said actuating member, said pressure responsive means comprising a rectilinearly movable member having a portion thereof disposed within said chamber, a pair of spring means disposed upon said rectilinearly movable member exteriorly of said chamber and operative to urge said member outwardly of said chamber, one of said spring means being compressible by the other upon movement of the rectilinearly movable member in response to fluid pressure acting thereupon, a support member carried by second mentioned rectilinearly movable member on the portion thereof within said chamber, a pivoted member mounted on said support member, stop means provided by said support member engageable by said pivotal member, spring means contained within a recess in said support member and bearing upon said pivoted member to bias it toward engagement with said stop means, said pivoted member being bodily movable, by and upon movement of said rectilinearly movable member, into engagement with said instrumentality actuating member to be pivoted thereby, against the bias of said spring means, until moved therepast to occupy a triggering position, from which position on return movement of said rectilinearly movable member said pivoted member engages and moves said actuating member rectilinearly to operate said electric circuit controlling instrumentality, said stop means, in this latter movement, restraining said pivoted member against pivotal movement.

7. In a pressure switch, a housing comprising a substantially rectangular portion provided with a chamber, and a substantially circular mounting portion, said circular mounting portion providing a support for a rectilinearly movable pressure responsive member a portion of which extends into said chamber, said circular portion having openings therein whereby fluid under pressure may be applied to said rectilinearly movable member for effecting movement thereof into said chamber, spring means disposed upon said rectilinearly movable member exteriorly of said chamber and operative to oppose movement of said member into said chamber, an electric circuit controlling instrumentality mounted in said chamber, and a member movably mounted upon the portion of said rectilinearly movable member disposed within the chamber and being bodily movable with said rectilinearly movable member to operate said electric circuit controlling instrumentality.

8. In a pressure switch, a housing comprising a substantially rectangular portion provided with a chamber, and a substantially circular mounting portion, said circular mounting portion providing a support for a rectilinearly movable pressure responsive member a portion of which extends into said chamber, said circular portion having openings therein whereby fluid under pressure may be applied to said rectilinearly movable member for effecting movement thereof into said chamber, spring means disposed upon said rectilinearly movable member exteriorly of said chamber and operative to oppose movement of said member into said chamber, an electric circuit controlling instrumentality mounted in said chamber, a member pivotally

mounted upon the portion of said rectilinearly movable member disposed within the chamber and being bodily movable with said rectilinearly movable member to operate said electric circuit controlling instrumentality, stop means engageable by said pivoted member to restrain movement thereof in one direction, and resilient means exerting its bias normally to maintain said pivoted member in engagement with said stop means.

9. In a pressure switch, a housing comprising a substantially rectangular portion provided with a chamber, and a substantially circular portion, said circular portion providing a support for a rectilinearly movable pressure responsive member a portion of which extends into said chamber, said circular portion having openings therein whereby fluid under pressure may be applied to said rectilinearly movable member for effecting movement thereof into said chamber, spring means disposed upon said rectilinearly movable member exteriorly of said chamber and operative to oppose movement of said member into said chamber, an electric circuit controlling instrumentality mounted in said chamber, an actuating member operatively associated with said electric circuit controlling instrumentality and movable to operate said instrumentality, a pivotal member mounted upon the portion of said rectilinearly movable member disposed within the chamber, a stop means engageable by said pivotal member, spring means urging said pivotal member into engagement with said stop means, said pivotal member being bodily movable, by and upon movement of said rectilinearly movable member, into engagement with said actuating member to be pivoted thereby, against the bias of said spring means, until moved therepast to occupy a triggering position, from which position on return movement of said rectilinearly movable member said pivotal member engages and moves said actuating member to operate said electric circuit controlling instrumentality, said stop means, in this latter movement, restraining said pivotal member against pivotal movement.

10. In a pressure switch, a housing comprising a substantially rectangular portion provided with a chamber, and a substantially circular mounting portion, said circular mounting portion providing a support for a rectilinearly movable pressure responsive member a portion of which extends into said chamber, said circular portion having openings therein whereby fluid under pressure may be applied to said rectilinearly movable member for effecting movement thereof into said chamber, a pair of spring means disposed upon said rectilinearly movable member exteriorly of said chamber and operative to oppose movement of said member into said chamber, one of said spring means being compressible by the other upon movement of the rectilinearly movable member, an electric circuit controlling instrumentality mounted in said chamber, an actuating member operatively associated with said electric circuit controlling instrumentality and rectilinearly movable to operate said instrumentality, a pivotal member mounted upon the portion of said rectilinearly movable member disposed within the chamber, a stop means engageable by said pivotal member, spring means urging said pivotal member into engagement with said stop means, said pivotal member being bodily movable, by and upon movement of said rectilinearly movable member into engagement with said actuating member to be pivoted thereby,

against the bias of said spring means, until moved therepast to occupy a triggering position, from which position on return movement of said rectilinearly movable member said pivotal member engages and moves said actuating member to operate said electric circuit controlling instrumentality, said stop means, in this latter movement, restraining said pivotal member against pivotal movement.

11. In a pressure switch, a housing comprising a substantially circular mounting portion and a substantially rectangular portion integral with said circular mounting portion and extending from one side thereof, said rectangular portion having a chamber formed therein, said circular mounting portion comprising an annular wall defining a central passage and a cylindrical portion integral with said annular wall and extending transversely across said passage, said cylindrical portion provided with a longitudinally extending bore which opens into the chamber in said rectangular portion, an electric circuit controlling instrumentality mounted in said chamber in said rectangular portion, and an actuating means for effecting the operation of said instrumentality, said actuating means comprising a pressure responsive member slidably disposed in said longitudinally extending bore and having an end extending into said chamber, and means carried by said end and bodily movable therewith to operate said electric circuit controlling instrumentality.

12. In a pressure switch, a housing comprising a substantially circular mounting portion and a substantially rectangular portion integral with said circular mounting portion and extending from one side thereof, said rectangular portion having a chamber formed therein, said circular mounting portion comprising an annular wall defining a central passage and a cylindrical portion integral with said annular wall and extending transversely across said passage, said cylindrical portion provided with a longitudinally extending bore which opens into the chamber in said rectangular portion, an electric circuit controlling instrumentality mounted in said chamber, and a pressure responsive means for effecting the operation of said instrumentality, said pressure responsive means comprising an elongated member slidably disposed within said longitudinally extending bore for rectilinear movement in response to fluid pressure acting thereupon, and having an end thereof extending into said chamber in said rectangular portion, spring means disposed in said longitudinally extending bore exerting its bias to oppose movement of said elongated member, and means provided on said extending end of said elongated member and bodily movable therewith to operate said electric circuit controlling instrumentality.

13. In a pressure switch, a housing comprising a substantially circular mounting portion and a substantially rectangular portion integral with said circular mounting portion and extending from one side thereof, said rectangular portion having a chamber formed therein, said circular mounting portion comprising an annular wall defining a central passage and a cylindrical portion integral with said annular wall and extending transversely across said passage, said cylindrical portion provided with a longitudinally extending bore which opens into the chamber in said rectangular portion, an electric circuit controlling instrumentality mounted in said chamber, and a pressure responsive means for effecting the op-

11

eration of said instrumentality, said pressure responsive means comprising an elongated member slidably disposed within said longitudinally extending bore for rectilinear movement in response to fluid pressure acting thereupon and having an end thereof extending into said chamber in said rectangular portion, a pair of spring means disposed in said longitudinally extending bore and operative upon said elongated member to resist movement thereof into said chamber, one of said spring means being compressible by the other upon movement of the elongated member, and means supported on said extending end of said elongated member for movement there-

12

with to operate said electric circuit controlling instrumentality.

LAWRENCE J. BORDELON.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
775,665	Scott -----	Nov. 22, 1904
1,257,694	Gadke -----	Feb. 26, 1918
2,261,714	Canfield -----	Nov. 4, 1941