

[54] **PRESSURE RESPONSIVE SWITCH
WITH DIFFERENTIAL AND RANGE
ADJUSTING MEANS INCLUDING A
DIFFERENTIAL NUT**

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[58] Field of Search200/83.9, 83 R, 67 B, 67 D;
337/319, 323

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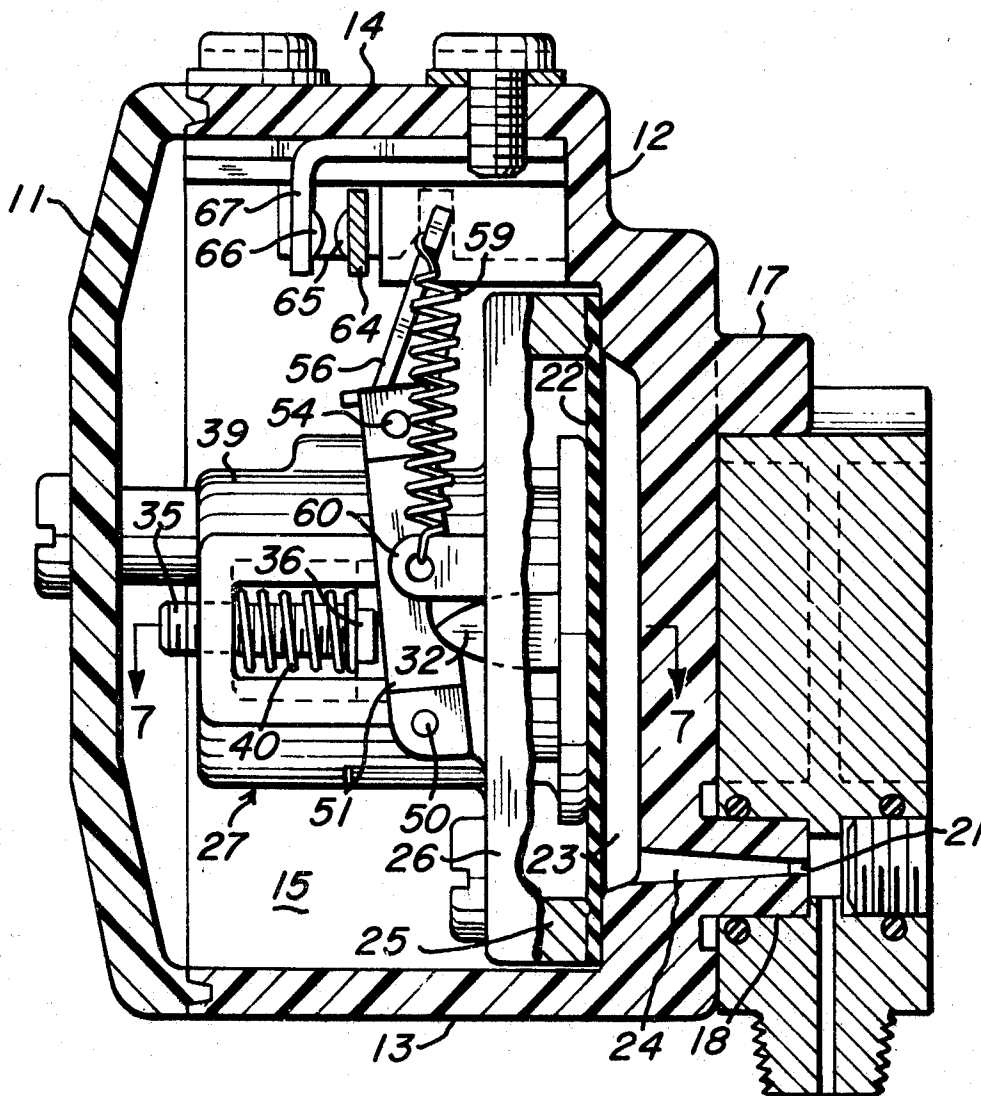
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ABSTRACT

A pressure-sensitive switch is diaphragm controlled to operate through the medium of a spring loaded actuator. The actuator seats a nut which may be differentially positioned to control the interval required for moving the switch between "on" and "off" positions. The nut follows movement of pressure responsive seat means, and is adjustable relative thereto. The switching contacts are caused to function by the actuator through the medium of the aforementioned nut and hingedly related elements. Embodiments of the invention are distinguished by spring controls which insure a positive and flutter-free snap action.

12 Claims, 7 Drawing Figures



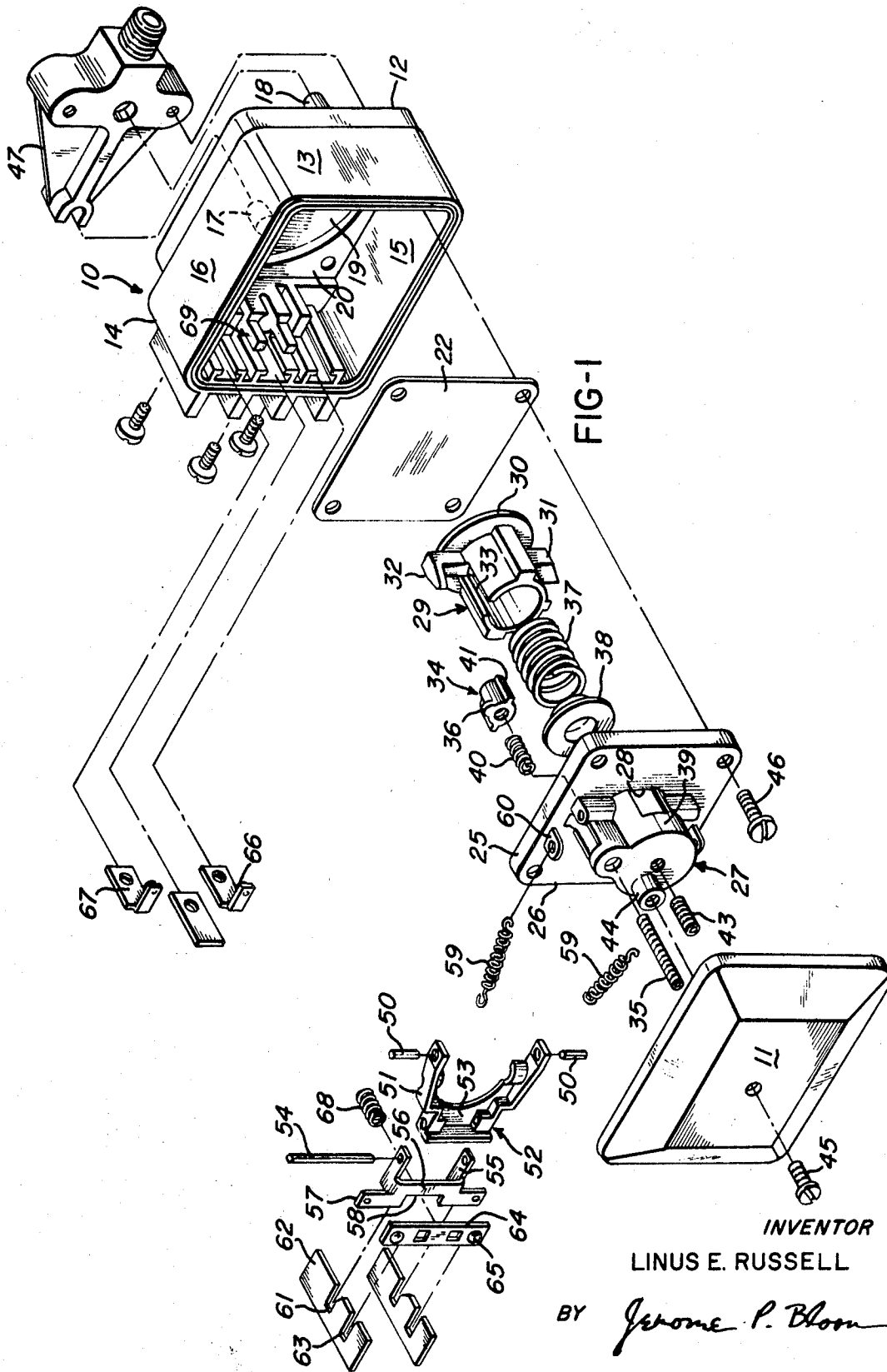


FIG-1

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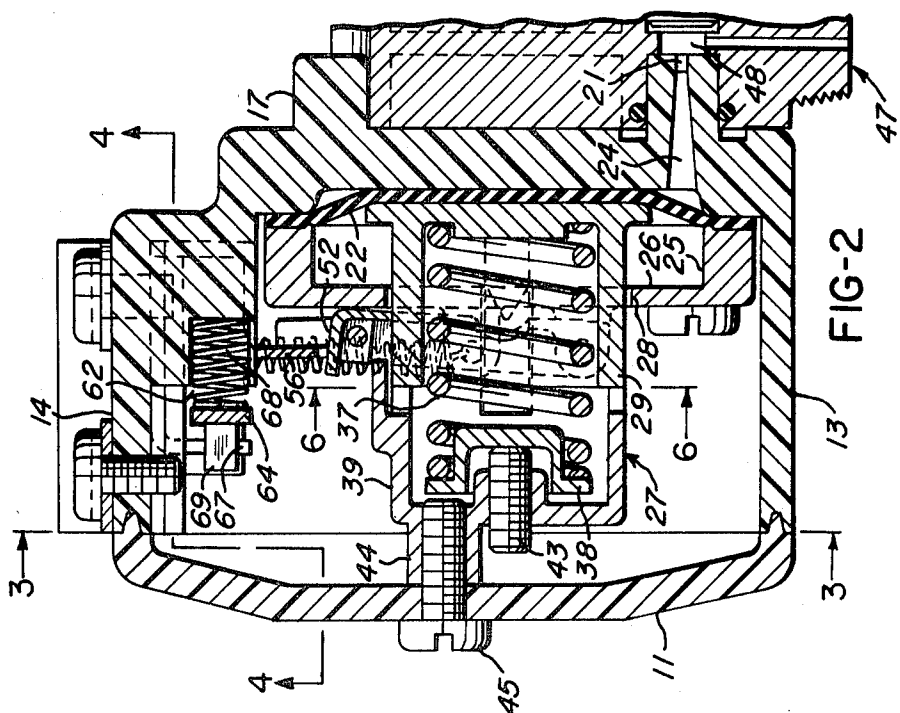


FIG-2

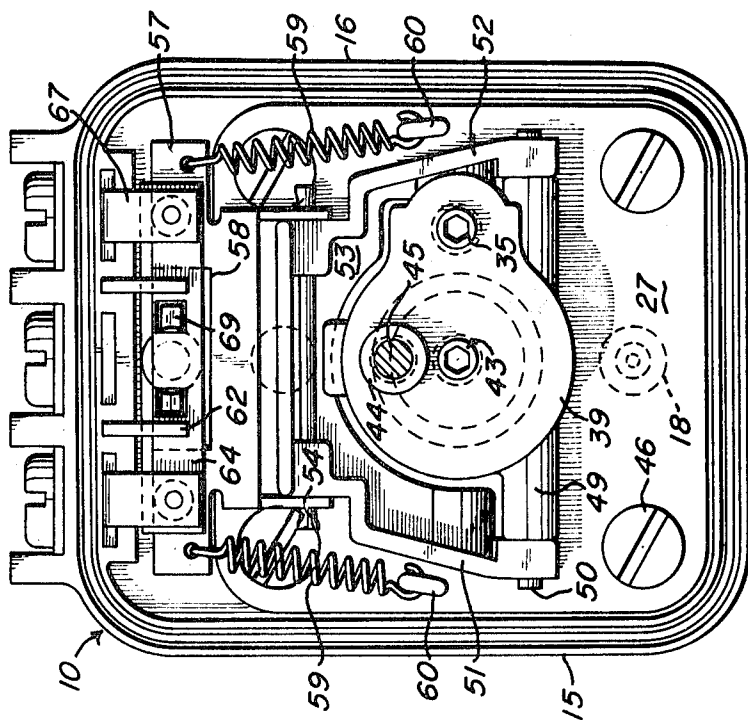
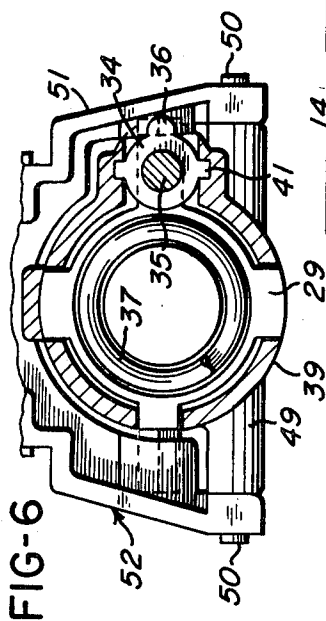
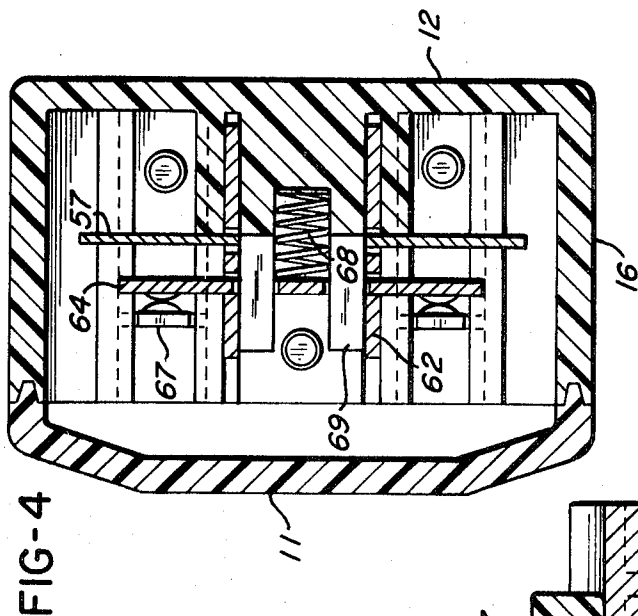
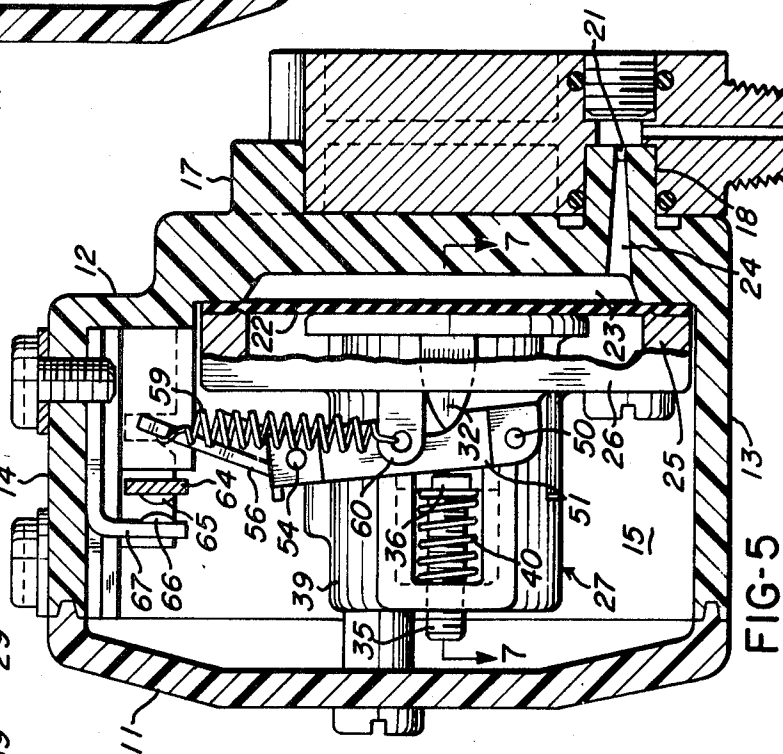
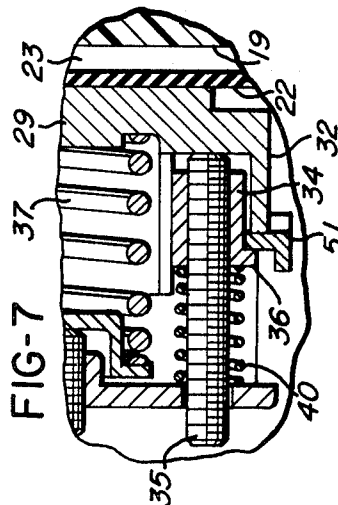


FIG-3

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PRESSURE RESPONSIVE SWITCH WITH DIFFERENTIAL AND RANGE ADJUSTING MEANS INCLUDING A DIFFERENTIAL NUT

BACKGROUND OF THE INVENTION

This invention relates to pressure-sensitive switches characterized by an absence of arcing, chattering and fluttering. Embodiments are economical to fabricate and more efficient and satisfactory in use, particularly as applied in the control of a fluid flow system and will be so described for purposes of illustration. However, it is to be understood that neither the form of the invention embodiment nor its application is necessarily limited to that illustrated.

There have in the prior art been many attempts to produce an effective pressure-sensitive switch unit wherein one would avoid arcing, chattering and fluttering at the critical interval of making and breaking contacts and do so in an economical manner. Various switches have been designed to allegedly accomplish the desired result. Many contemplate a snap action switch control operating through the medium of springs. However, the structural relationship of the switch components has been such to still present frequent conditions of fluttering in making contacts, producing a characteristic of frequent arcing, burning, and generally diminishing the useful life of the switch units. The problem has not been heretofore properly solved.

BRIEF SUMMARY OF THE INVENTION

In contrast, by means of the present invention, there has been achieved simple and positive-acting structure-advancing concepts of the prior art and providing improvements thereon whereby the making and breaking of contacts is clean and sharp. In addition, the structure provided to this end is simple, critically responsive, and has differential control features to lend it versatility and preciseness in application. The invention embodiments are distinguished by a diaphragm operation through the medium of an actuator which may be differentially controlled to produce a selected interval in the movement of switch components to achieve a switching function. Embodiments are further distinguished by means which maintains, in all cases, contacts in firm and positive engagement until when and if the preset control pressure at which the contacts are to be broken does in fact occur.

It is therefore a primary object of the invention to provide a pressure-sensitive switch which is more economical to fabricate, more efficient and satisfactory in use, adaptable to a wide variety of applications and unlikely to malfunction.

A further object of the invention is to provide a switch which is automatically responsive to pressure conditions and distinguished by a lack of fluttering, arcing and chattering.

Another object of the invention is to provide an improved pressure-sensitive switch which is diaphragm operated and utilizes springs in a most effective manner to insure that contacts will make or break in a precise and certain fashion.

An additional object of the invention is to provide an improved pressure-sensitive switch which utilizes an improved spring-controlled system for making and breaking of contacts.

Another object of the invention is to provide a switch possessing the advantageous structural features, the inherent meritorious characteristics and the means and mode of operation herein described.

With the above and other incidental objects in view as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof, and the mode of operation as hereinafter described or illustrated in the accompanying drawings, or their equivalents.

Referring to the accompanying drawing wherein are shown some but obviously not necessarily the only forms of embodiment of the invention,

FIG. 1 is an exploded perspective view of a switch in accordance with the present invention;

FIG. 2 is a sectional view of the switch showing the parts so disposed to have the contacts closed;

FIG. 3 is a view taken on line 3—3 of FIG. 2;

FIG. 4 is a view taken on line 4—4 of FIG. 2;

FIG. 5 is a view like FIG. 2 with the switch components shown as the contacts are disposed in an open position; and

FIGS. 6 and 7 are fragmentary sectional views illustrating details of the differential control nut and its relation to the operating components of the switch.

Like parts are indicated by similar characters of reference throughout the several views.

DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

The switch of the present invention is housed in a case 10 having a rectangular cuplike form. Its projected lip is capped by a cover 11 which is outwardly dished. Rimming the periphery of the cover is a thin male projection which nests in a complementary channel formed in the lip of the cup and a seal is provided therebetween.

For purpose of description with reference to the drawings and not by way of limitation as to their orientation, the cup 10 provides a case with a backwall 12, a bottom wall 13, a top wall 14 and sidewalls 15 and 16. Centered between the sidewalls, adjacent the top wall 14, the backwall 12 has on its outer surface a cylindrically formed projected mounting lug 17. Positioned in vertical alignment with lug 17, adjacent the bottom wall 13, is a tubular projection 18. As will be further described, the latter has a dual function. It may serve as a second mounting lug and it defines an inlet to the case 10 in the area of a central recessed portion 19 of the inner surface of the backwall 12. By the creation of the recessed portion 19, there is formed in rimming relation thereto a continuous, relatively projected shoulder 20 of rectangular form. The recessed portion 19 is bridged by a resilient flexible diaphragm 22 the periphery of which is suitably fixed in a sealing coextensive engagement with the shoulder 20.

The diaphragm defines thereby, with the backwall 12, a chamber 23. The only access to the chamber 23 is provided by a passage 24 defined by the tubular inlet 18. The cross-sectional dimension of passage 24 varies, there being a short portion 21 of small bore configuration adjacent its outermost end, from which portion the passage conically expands to open its largest cross section to the chamber 23. As will be further described, the passage 24 provides a medium for fluid to move to and from the chamber 23 in a quiet nonpulsating fashion, in the process of which to control the operation of the illustrated switch.

Fixed in coextensive overlying and sealing relation to the portion of the diaphragm which overlies the shoulder 20 is the projected extremity of a wall portion 25 forming an integral part of and defining a circular aperture 28 in the base 26 of a switch frame 27 in the case 10. Under "open contact" conditions (FIG. 5), the diaphragm is normally positioned squarely across the wall portion 25 of the frame 27 to lie in a substantially parallel-spaced relation to the recessed portion 19 of the backwall 12. It will be noted that the base 26 has formed therein four notches (FIG. 6) which open to the aperture 28 at positions spaced 90° apart.

Projected through the aperture 28 is a tubular actuating element 29. The latter has at one end thereof a bridging plate portion which forms its base and radially projects to form thereon an external flange 30. The latter resiliently seats to the center of the diaphragm 22. Viewing the drawings, it may be there seen that projected from respectively diametrically opposite portions of the tubular actuating element 29, at its base, and extending axially thereof from the flange 30, is a solid generally tapered lug portion 31 in the one case and a right-angled lug portion 32 in the other case. The outer arm of lug 32 positions in line with a slot 33 in and longitudinally of the adjacent in-line wall portion of the element 29 to form therewith a pocket. It will be noted that one of the aforementioned notched openings in the base 26 of the switch frame 27 is a rectangular cutout in a line perpendicular to the case sidewalls 15 and 16. This cutout accommodates the lug 31,

enabling it to move with the actuating element 29, in a bearing relation to the switch frame 27. A second of the aforementioned notched openings in base 26 provides a suitable cutout at a diametrically opposite position rimming the aperture 28 to accommodate the movement therein and with respect thereto of the right angles actuating lug portion 32. The pocket defined by the lug portion 32 opens in a sense inwardly of the case 10 and away from the diaphragm 22 to accommodate the base of the cylindrically formed, axially elongated, internally threaded, differential nut 34. A peripheral portion of the nut 34 is accommodated in the adjacent slot 33 in the wall of the actuating element 29. At the end thereof remote from the diaphragm 22 and at a point diametrically opposite the slot 33, the nut 34 has formed integrally therewith a peripherally projected tab 36. This tab overlies the projected extremity of the right angled portion of the lug 32 which is spaced outwardly of the tubular body of the actuating element and projects perpendicularly to its flange 30.

Threaded through the nut 34 to connect integral therewith is a screw 35, one end of which bottoms in the base of the pocket formed by the lug 32 and the other end of which projects to and through the switch frame 27 the details of which will be further described.

The base closure plate at the end of the actuator 29 which seats to the diaphragm 22, has formed thereon a cylindrical projection serving to center on said base, within the body of the actuator, a large coil spring 37. This is a main control spring which projects from and coaxially of the element 29. Its projected extremity is capped by a cup-shaped washer 38. The cup portion of the washer nests within the spring while a peripherally projected external flange at the lip of the cup seats in an overlying relation to the spring.

Attention is directed to the fact that there were previously mentioned four notched openings about the aperture 28 in the base of the switch frame 27. The other two notched openings not previously described in detail provide cutouts to accommodate rectangular lugs formed longitudinally of the outer surface of the actuating element 29 which lugs are spaced 90° from the lug portions 31 and 32. This arrangement insures that any movement of the actuating element 29 within the switch frame will be axial and controlled.

The shape of frame 27 is such that it includes an irregularly formed dome-shaped shell-like housing 39 formed integral with its base within which are contained the elements 29, 34 and related switching components.

The shell 39 has an aperture in line with and accommodating the projection therethrough of screw 35. It is also formed to define thereabout a concentric peripheral wall segment containing a coil spring 40 which encircles the screw 35. The one end of the spring 40 abuts the dome of the shell 39 about the aperture through which the screw 35 projects while the opposite end of the spring seats to the most adjacent end of the differential nut 34. It is noted that the nut 34 has diametrically opposite projections forming elongate rectangular guides 41. The guides are displaced 90° from the tab 36, run the length of the nut, and bear in complementarily formed channels in the wall of the shell 39. Accordingly, it will be seen that on turning the screw 35, which bottoms in the base of the pocket formed by the right-angled lug 32, the differential nut is caused to move axially of the screw. By such means one varies the position of the nut and the load on the spring 40 for interval control purposes.

Reverting to the washer 38, in line with the central axis of the spring 37 which it caps, the washer is centrally abutted, in the cup thereof, by one end of a screw 43. The screw 43 is inserted through an opening in the dome of the shell 39 to threadedly engage in a tubular projection on its inner surface in coaxial relation with the actuator element 29 and spring 37. The screw 43 is a headless screw of a conventional nature. It may be turned by insertion of an appropriate wrench in a socket formed in its outermost end, which end is exterior to the shell 39.

Immediately adjacent and offset from the screw 43, the dome of the shell 39 includes an aperture defined by an exterior projection 44. The latter is internally threaded and aligns with an aperture in the cover 11. On insertion of a screw 45 through the cover and into engagement with the projection 44, the cover is secured to the switch frame. The frame, in turn, is clamped to cup 10 by screws 46 which extend through the base 26, diaphragm 22 and the backwall 12 of the switch case. Referring to the drawings, these screws 46 may serve to mount the case 10 to an adapter 47 having a passage 48 therein an opening from which aligns with the inlet passage 24. The adapter may thus function to directly communicate the chamber 23 with a fluid pressure line by way of the passage 48. The details of the mount are not further described since in and of themselves they form no part of the present invention. Suffice it to say that the lug 17 and the projection 18 are appropriately accommodated in the adapter, the lug 17 in a saddle formed portion of the adapter and the projection 18 in a recess therein which opens passage 24 to passage 48, as the case is fastened to the support by the screws 46.

Referring further to the drawings, it will be there seen that the shell 39 has formed integral therewith to project oppositely therefrom, below the nut 34 and in line with the lowermost portion of the actuating element 29, oppositely projected sections 39 in which are defined passages providing cylindrical bearing surfaces for pivot pins 50. The pins 50 are in line and project oppositely to respectively and pivotally mount the downwardly divergent arms 51 of an actuating lever 52. The upper ends of arms 51 are bridged by a bar segment 53 the under edge of which is formed as an arc of uniform radius to position in concentric-spaced relation to the upper arcuate surface of the shell 39. Intermediate their ends, the arms 51 have an arcuate offset in a direction away from the base 26 of the switch frame 27. The arcuate offset of one arm 51 positions between the projected extremity of lug 32 and the rear of the tab 36, for purposes to be further described.

The bar segment 53, the width of which is reduced relative to that defined at the projected extremities of its divergent arm portions, has parallel end surfaces and coaxial passages therein which open therefrom to receive pivot pins 54. The pins 54 project through platelike ears 55 on the lateral extremities and to the lower end of a trigger plate 56, and at right angles thereto. Above the ears 55, the plate 56 includes rectangular plate portions 57 which are laterally projected and spaced by a rectangular notch 58. The plate portions 57 provide laterally spaced ears outwardly projected to either side of the trigger plate 56. Each ear has in the projected end an aperture which receives therethrough one end of a spring 59, the other end of which is projected through and anchored to pivot on a lug 60 formed integral with the base 26 of the switch frame 27. The lugs 60 are positioned above and outwardly of the pivot pins for the actuating lever 52. Looking to the drawings, it may be there seen that the portions of the ears on the trigger plate 56 to which the springs 59 connect are directly above the divergent lower ends of arms 51 on the lever 52, the arms being divergent to the hinge connection of the lever 52 to the trigger plate and the springs 59 being divergent in the same sense as the arms.

At its upper edge, between ears 57, the plate 56 nests in a slot 61 in each of two vertically oriented transversely spaced slide plates 62. Forwardly of the slots 61, the plates 62 have transversely aligned slots 63 to nest therein a transversely disposed contact bar 64 which is mounted for conjoint movement with the slides 62. The contact bar 64 includes at each of its respective extremities a forwardly projected electrical contact 65. With movement of the slide plates 62 and the bar 64, the contacts 65 will move therewith to and from a pair of respectively aligned contacts 66 mounted on lug elements 67 fixed to depend from the top wall 14 of the case 10, in the path of the contacts 65. The contact bar 64 is centrally backed and biased by a spring 68 the remote end of which has a seat in a cavity formed by material molded in connection with the top wall 14 of the case 10. It is noted that the material forming this

cavity incorporates two transversely spaced rodlike projections 69 the adjacent surfaces of which are arcuately contoured to encompass portions of the spring 68. Moreover, these projections are adapted to project through aligned openings in the contact bar 64 for insuring a control of the movement thereof so that the contacts 65 are maintained at all times in continuously parallel planes.

Engaged in the top wall 14 of case 10 are three terminal screws, one engaged in each of the lugs mounting the fixed contacts and the third in a grounding plate anchored on the wall 14. These terminal screws are disposed in an electrical circuit appropriately connecting the contacts to power and to related equipment to serve their intended function. Such detail will depend on the related apparatus and since the connections are well within the capabilities of a mechanic versed in the art, such will not be further described.

Let us consider the use of the above-described switch in a fluid demand system, for example. The switch may be inserted in a circuit for energizing and deenergizing a pump in correspondence with a predetermined low or high pressure in a supply line. In the example illustrated, the switch contacts 65, 66 automatically open on the occurrence in the supply line of a flow under a predetermined high pressure such as 40 p.s.i.g. The setting for the high side of the pump is provided by a selected adjustment of the screw 43. As will be noted, by adjusting the screw 43 inwardly against the cap 38 covering the end of the spring 37, there is produced an increasing compression of the spring 37, which compression resists the displacement of the diaphragm 22 from the recessed surface 19 in the back of the case 10. As will be obvious, the greater the compression of the spring 37, the higher the pressure at which the contacts will break. On the other hand, as will be further described, the adjustment of the screw 35 will change the position of the nut 34 thereon and the compression of the spring 40 to provide a predetermined low-pressure point at which the illustrated switch will have the contacts thereof close. In this latter case, the closing of the contacts will signal a lack of fluid pressure in the supply line and energize the related pump to start a pressured flow of fluid through the supply line to the degree required for the demand that exists in accordance with the setting of the switch.

Under the conditions where the pressure in the related supply line, as reflected by the fluid pressure developed in the passage 24, will indicate in the chamber 23 a preset low pressure where the diaphragm 22 approaches a seat to recessed surface 19 and the back 12, the switch contacts 65, 66 will be closed together to energize the related pump to start a flow which will build up the pressure in the supply line and the passage 24, and correspondingly in the chamber 23. At the point of the energizing of the pump and the contacts being closed, the related components of the switch are as shown in FIG. 2 of the drawings. As may be seen, under the influence of the spring 37, the diaphragm has been bottomed against the backwall 12 through the medium of the resiliently seated actuator 29. The hinge assembly comprising the actuating lever 52 and the trigger plate 56 is disposed to have their hinge portion defined by the pivot pins 54 biased inwardly to the base 26 of the switch frame 27. In such case, the tensioning springs 59 which extend between the trigger plate ears 57 and the lugs 60 on the baseplate will be disposed, as seen in FIG. 2 of the drawings, to the left of the hinge pins 54. The angle of the springs 59 is such, in this case, to tend to maintain the slide plates 62 and correspondingly the contact bar 64 in a forwardly projected position where the contacts 65 and 66 will abut. A further instrument in maintaining a firm relation of the abutted contacts is the spring 68 which backs and biases against the contact bar 64.

As noted previously, in conjunction with the diaphragm 22 seeking a seat to the backwall 12 of the case 10, a predetermined low pressure such as 8 p.s.i.g. has been reached, at which point the contacts of the switch have been placed in their abutted position. Of course, when the flow in the supply line indicates an absence of pressure therein, the diaphragm

will be fully bottomed as illustrated in FIG. 2. As the pump starts to send fluid under pressure through the supply line, a portion of the flow therein will enter the reduced portion 21 of the passage 24 in the inlet 18, passing the reduced portion therein to the conically expanded portion and entering the chamber 23 to commence to move the diaphragm 22 outwardly from the back of the switch case 10 and against the influence of both the springs 37 and 40. As the pressure increases on the diaphragm, it will move outwardly, resiliently biasing therewith, the actuator 29, which is initially positioned so the projected extremity of the lug 32 is slightly spaced from the adjacent cup surface of an offset of an arm 51 of the actuating lever 52. Attention is directed to the fact that the nut 34 and the connected screw 35 will move with the actuator and relative to the switch frame, within the limits of the slot 33 in the wall of the shell 39 of the switch frame. As the actuator is moved outwardly from the backwall of case 10, the lug 32 will then engage the lever 52 by way of the aforementioned offset in the related arm 51 to urge it forwardly about its pivots 50 forming an interconnection thereof to the switch frame. Depending on the setting of the screw 43 and correspondingly of the spring 37 which resists the movement of the actuator, there will be a point at which the assembly of the lever 52 and the trigger plate 56 will have the hinged joint thereof defined by the pivot pins 54 pass through a dead center in reference to the springs 59 and then move to the other side thereof. At this point, the trigger plate 56 will be overthrown in reference to the hinged pins 54 under the influence of the springs 59. As this occurs, there will be a sharp movement of the slides 62 reversely of the contacts 66 to carry therewith the bar 64 and the contacts 65 from the contacts 66, against the bias of the spring 68. It is significant to note that in the course of the procedure whereby there is a reversed hinging of the lever and trigger plate assembly the spring 68 maintains till the precise moment at which a pressure of 40 p.s.i.g. is reached a firm connection and contact between the contacts 65 and 66. The system inhibits any fluttering, chattering and consequent arcing or burning since the spring 68 effectively functions until there is a firm and positive snap action as dictated by the invention arrangement which will signal a positive overthrow of the springs 59 and a sharp withdrawal of the slides 62. The result of this is to produce a position of the switch components as seen in FIG. 5 of the drawings.

Thus, there has been illustrated the manner in which one may have a precise and certain point at which a predetermined pressure in the related supply line will dictate a separation of the continuously biased together contacts 65 and 66 and a shutoff of the related pump which has been inducing the pressured flow of fluid.

Reversely, in the event the pressure in the supply line should for some reason start to diminish, the actuator 29 under the influence of the energy stored in the spring 37 will resiliently bias the diaphragm in the direction of the recessed surface 19 in the backwall 12 of case 10. In the course of this movement, the screw 35 and the nut 34 will move with the actuator under the influence of the precompressed spring 40, the compression of which is determined by the setting of the nut. Depending at what position along the screw 35 the nut has been positioned, this will dictate the interval of time it will take the tab 36 on the nut 34 to reach the adjacent surface of an arm 51 of the actuating lever 52. The latter of course is between the lug 32 of the actuator and the tab 36. Depending on the setting of the nut, the invention dictates that point at which the tab 36 will be carried back against the lever arm 51 to thereby commence a reverse pivoting of the lever. The setting of the spring 40 thus dictates the point at which the actuating lever and trigger plate assembly will be caused to reversely move. At a predetermined low pressure and approach of the diaphragm 22 to the base surface 19, the lever 52 will be pivoted sufficiently to move the hinge pivots 54 to the right of the control springs 59, whereupon the springs 59 will overthrow and snap the slides 62, assisted by the spring 68, to influence the contact bar and the contacts 65 to make an immediate and firm contact with the opposed contacts 66.

Accordingly, it may be readily seen that one may by the initial adjustment of the screw 35 to move the nut 34 thereon create a lesser or a greater pressure at which point the tab 36 will act upon the actuating lever and trigger assembly and induce a quick, firm and positive snap action of the unit to close the contacts and initiate a flow of fluid as previously described.

It should of course be obvious that the contacts may be reversely positioned or variously positioned so that the making and breaking thereof may be achieved in response to opposite signals and at different points of time and under influence of different signals. Such may be contrived by anyone versed in the art with the preceding before them and without the departure from the spirit and concept of the present invention.

In the example illustrated, it is repeated that the screw 43 will dictate that point at which the switch will open a circuit and the screw 35 and the related nut 34 dictate that point at which the switch contacts will close. As noted, the screw 35 will determine also by the positioning of the nut 34 thereon the interval of time that it will take to initiate a snap action closing of contacts.

A characteristic of the structure described is that there is a certain amount of lost motion between the trigger assembly and the slide bar so that springs 59 overthrow and are pulled into tension before the contacts will be broken and separated in the functional operation here described.

Note further that the mounting and the bias as applied to the contact bar 64 insures the contacts are parallel and aligned at all times.

Thus, there is a firm and controlled pressured contact between the mating contacts and this is maintained until there is a quick and positive separation thereof by the function of the switch components. The snap action is extremely forceful with the movable contacts continuously loaded.

It will therefore be apparent that any possibility of floating, chattering, fluttering and consequent arcing and burning is inhibited.

Attention is directed to the fact that the invention switch is extremely useful in a most efficient function thereof irrespective of how slowly pressure builds up or diminishes in the associated structure. It is insured that when the invention switch is inserted in a circuit that you get the power when you need it and you cut the power precisely when you don't need it.

A further feature of the invention must be pointed out in that the usual pressure-sensitive switches are subject to fluctuations that occur in the related systems. In this case, by means of the passage 24 as formed herein with the opening thereto being defined by a short small bore section, there is eliminated any need for orifice plates to insure the proper operation of this switch. As designed, the inlet has proven to smooth pulsations and inhibit the occurrence thereof within the chamber 23, which occurrence would obviously create a fluttering of parts and fluctuations that it is essential to avoid. In some prior art switches, such fluctuations have even operated to open contacts and cause them to chatter.

Accordingly, it may be seen that the invention lends itself to multi and varied usage and the form of the embodiment illustrated may be variously adapted to suit the particular application intended.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise but one of several modes of putting the invention into effect.

Having thus described my invention, I claim:

1. A pressure-sensitive switch comprising a diaphragm, means defining a pressure chamber to one side of said diaphragm, a spring biased movable member seating to the other side of said diaphragm, the diaphragm assuming a position which is a function of the opposing forces represented by pressure in said chamber and the opposing bias of said movable member, switch elements including stationary and relatively movable contact means, snap-acting switch-actuating means having opposite extremes of movement in a first of which it closes said movable contact means upon said stationary contact means and forcibly holds the contact means so engaged and in a second of which it separates said movable contact means from said stationary contact means and forcibly holds said contact means so separated, means on said movable member utilizing deflection of said diaphragm under rising pressure in said chamber to shift said switch-actuating means toward one of its said extremes, and other means spring biased to a following relation to said movable member and adjustable relative thereto to shift said switch-actuating means toward the other of its said extremes in response to a lowering pressure in said chamber.

2. A pressure-sensitive switch according to claim 1, wherein said switch-actuating means is moved by said movable member toward its said second extreme and is moved by said other means toward its said first extreme.

3. A pressure-sensitive switch according to claim 1, wherein said switch-actuating means includes a spring device completing shift thereof to said extremes and resiliently applying to said movable contact means a resilient holding force in either of its set positions.

4. A pressure-sensitive switch according to claim 3, wherein said switch-actuating means further includes an oscillatory lever a portion of which freely disposed between the said means on said movable member and said other means to be engaged and moved in one sense by said movable member and to be engaged and moved in the opposite sense by said other means.

5. A pressure-sensitive switch according to claim 4, wherein said other means includes a differentiator nut adjustable relatively to said movable member while maintaining a following relation thereto whereby to impose a variable time delay in the shifting of said switch-actuating means to its said first extreme.

6. A pressure-sensitive switch including means defining a chamber having an inlet thereto one wall portion of which chamber is resilient and moves in correspondence with applied pressure, seating means moving with said one wall portion in correspondence with the pressure applied thereon, lever means operatively related to said seating means having an anchored pivot means to one end, an intermediate hinge and a free operating end, means mounting contact means movable under the influence of said free operating end of said lever means to and from relatively fixed contact means, means operatively related to said seating means the setting of which predetermines the instant at which the free operating end of said lever means will cause said movable contact means to either make or break contact with said fixed contact means, and spring means applying a continuous bias of said movable contact means toward said fixed contact means whereby to maintain said contact means firmly in a made position until there is a positive forceful displacement to a break position by a force sufficient to avoid floating or flutter of the movable contact means, said seating means having in connection therewith means to engage and pivot the anchored end of said lever means on movement thereof in one sense and further means moving with said seating means and adjustable relative thereto to oppositely engage and pivot the anchored end of said lever means in an opposite sense.

7. A switch as in claim 6 characterized by said means to oppositely engage said lever means including a spring-biased element which adjustably mounts thereon a control medium the setting of which determines the point of time at which said lever means will be oppositely engaged.

8. A pressure-sensitive switch comprising a diaphragm, means defining a pressure chamber to one side of said diaphragm, a spring-biased movable member seating to the other side of said diaphragm, the diaphragm assuming a position which is a function of the opposing forces represented by pressure in said chamber and the opposing bias of said movable member, switch elements including stationary and relatively movable contact means, snap-acting switch-actuating means having opposite extremes of movement in a first of which it closes said movable contact means upon said stationary contact means and forcibly holds the contact means so engaged and in a second of which it separates said movable contact means from said stationary contact means and forcibly holds said contact means so separated, means on said movable member utilizing deflection of said diaphragm under rising pressure in said chamber to shift said switch-actuating means toward one of its said extremes, and other means spring biased to a following relation to said movable member to shift said switch-actuating means toward the other of its said extremes in response to a lowering pressure in said chamber, said switch-actuating means including a spring device completing shift thereof to said extremes and resiliently applying to said movable contact means a resilient holding force in either of its set positions, said switch-actuating means further including an oscillatory lever a portion of which freely disposes between the said means on said movable member and the said other means to be engaged and moved in one sense by said movable member and to be engaged and moved in the opposite sense by said other means, said other means including a differentiator nut adjustable relatively to said movable member while maintaining a following relation thereto whereby to impose a variable time delay in the shifting of said switch-actuating means to its said first extreme, the switch further comprising a relatively stationary frame, said differentiator nut being mounted in said frame for nonrotating but relative longitudinal sliding motion, said other means further including a screw member in threaded engagement with said nut intermediate its ends, one end of said screw member abutting said movable member and the other end being presented for manual rotary turning, said other means still further including a spring based on said frame urging the assembly comprising said nut and said screw member in a direction to maintain said one end of the screw in end abutting relation to said movable member.

9. A pressure-sensitive switch according to claim 8, wherein said movable member and the said assembly comprising said nut and said screw member orient in a common direction with the spring bias applied by said frame based spring supplementing the spring bias applied to said movable member.

10. A pressure-sensitive switch according to claim 9, wherein said movable member is a pressure-applying device orienting perpendicularly of the diaphragm, said movable member having a lateral projecting portion defining the said means thereon, said nut having a portion in opposed spaced relation to said laterally projecting portion, said lever disposing in generally transverse relation to said movable member

with said portion of said lever intermediately disposed between the said portions on said movable member and said nut.

11. A pressure-sensitive switch comprising a diaphragm, a housing defining a pressure chamber in the bottom thereof to one side of said diaphragm, frame means peripherally seating said diaphragm in the bottom of said housing in closing relation to said chamber, said frame means having an outwardly projected central portion, a spring-biased movable member seating to the other side of said diaphragm, said outwardly projected central portion of said frame means providing a bearing for said movable member and a retainer for a compression spring providing the spring bias on said movable member urging it to a seat on said diaphragm, the diaphragm assuming a position which is a function of the opposing forces represented by pressure in said chamber and the opposing bias of said movable member, switch elements including stationary and relatively movable contact means, snap-acting switch-actuating means having opposite extremes of movement in a first of which it closes said movable contact means upon said stationary contact means and forcibly holds the contact means so engaged and in a second of which it separates said movable contact means from said stationary contact means and forcibly holds said contact means so separated, means on said movable member utilizing deflection of said diaphragm under rising pressure in said chamber to shift said switch-actuating means toward one of its said extremes, and other means spring biased to a following relation to said movable member to shift said switch-actuating means toward the other of its said extremes in response to a lowering pressure in said chamber, the said other means including a differential member mounted in said frame for nonrotary and relative sliding motion and biased toward said movable member by a spring based on said frame, the said switch-actuating means including a lever pivotally mounted on said frame and extending within said housing generally transversely of said movable member and interposing a portion thereof between said differential member and said movable member, said switch-actuating means further including a hinged extension of said lever operable upon said movable contacts and a spring device anchored to said frame and connected to said hinged extension, the said movable contacts including a common contact bar, and the said switch-actuating means further including slide means for operating said bar slidably mounted in an interior wall of said housing and having a lost motion connection with said hinged extension.

12. A pressure-sensitive switch according to claim 11, characterized by screw means extending through a base end of said frame for individual adjustment of the tension of the spring biasing said movable member and for longitudinally adjusting said differential member relative to said movable member, and a top closure plate for said housing seating thereto in an opposing spaced relation to the bottom of the housing and removable to expose said screw means for adjustment, said frame providing a means detachably to mount said plate.

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