

[54] **FLUID PRESSURE OPERATED
DIAPHRAGM SWITCH WITH
IMPROVED ADJUSTMENT MEANS
AND CONTACT STRUCTURE**

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[52] U.S. Cl. **200/83 P, 200/83 N, 200/83 S**

[51] Int. Cl. **H01h 35/40**

[58] Field of Search **200/83, 81.9 R**

[56] **References Cited**

UNITED STATES PATENTS

2,520,894	8/1950	Woods	200/83 C UX
2,764,646	9/1956	Young	200/83 N
2,849,577	8/1958	Pfeiffer	200/83 D X

2,889,432 6/1959 Miller 200/83 D

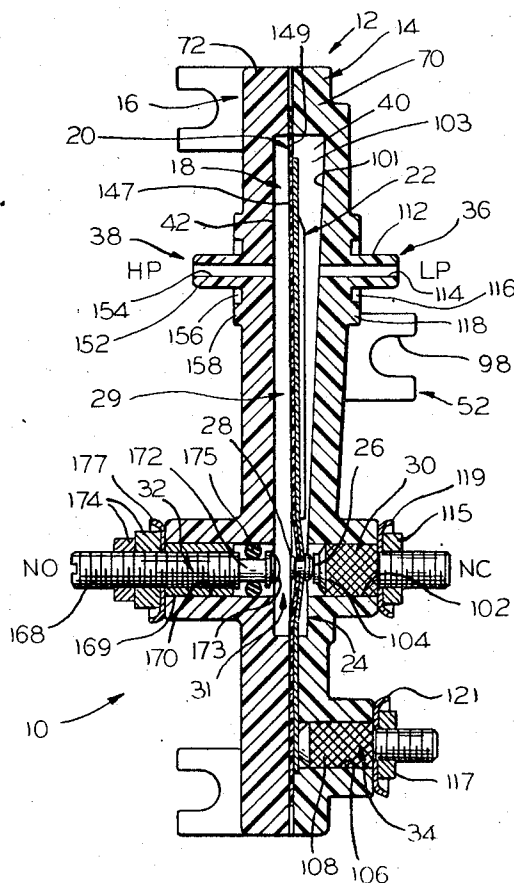
Primary Examiner—J. R. Scott

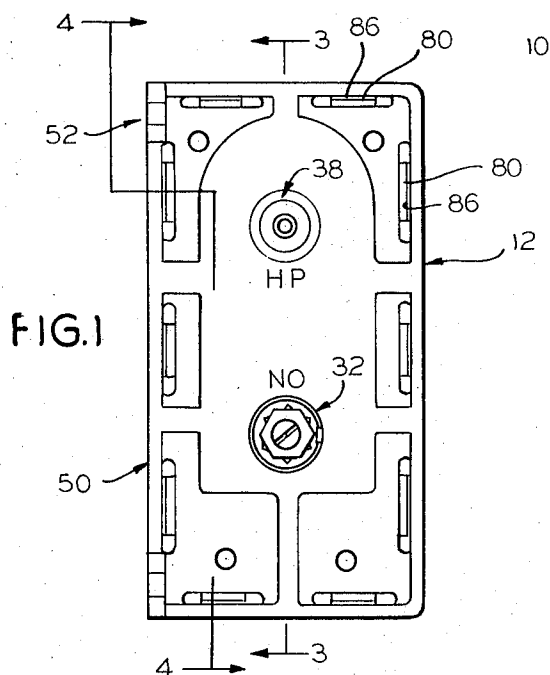
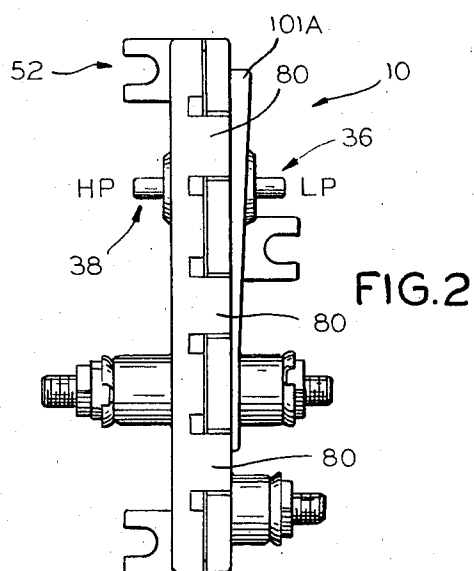
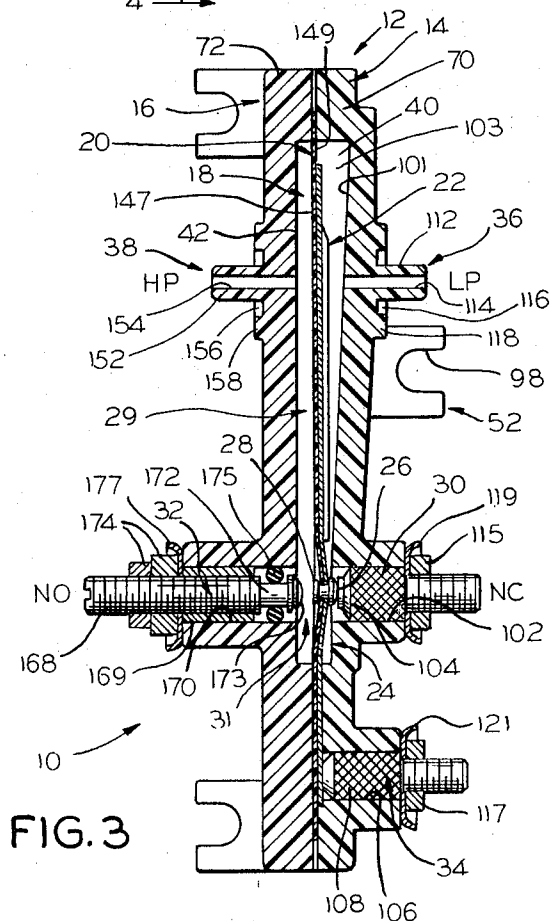
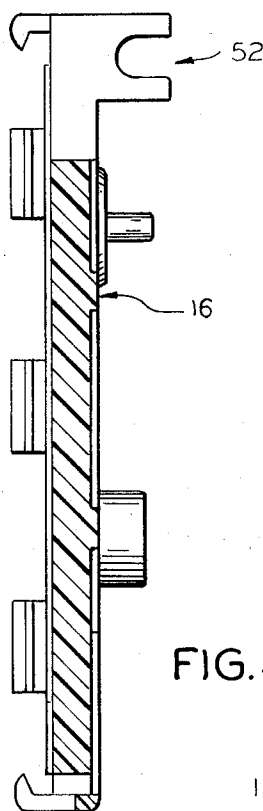
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[57] **ABSTRACT**

A fluidic switch comprising a housing in the form of a pair of housing sections snapped together in back to back relation and shaped to define a generally planar, small volume, and elongate diaphragm chamber across which is mounted a diaphragm of low spring rate, and a snap spring diaphragm plate anchored cantilever fashion at one end of the chamber and having a snapping portion adjacent its anchored end that snaps between normally closed and normally open contacts on either side of the housing. The housing adjacent the free end of the snap spring is formed for connection to differential gas pressure sources, for snap changing of the switch at a predetermined pressure differential that may be adjusted by adjusting one of the said contacts.

13 Claims, 16 Drawing Figures





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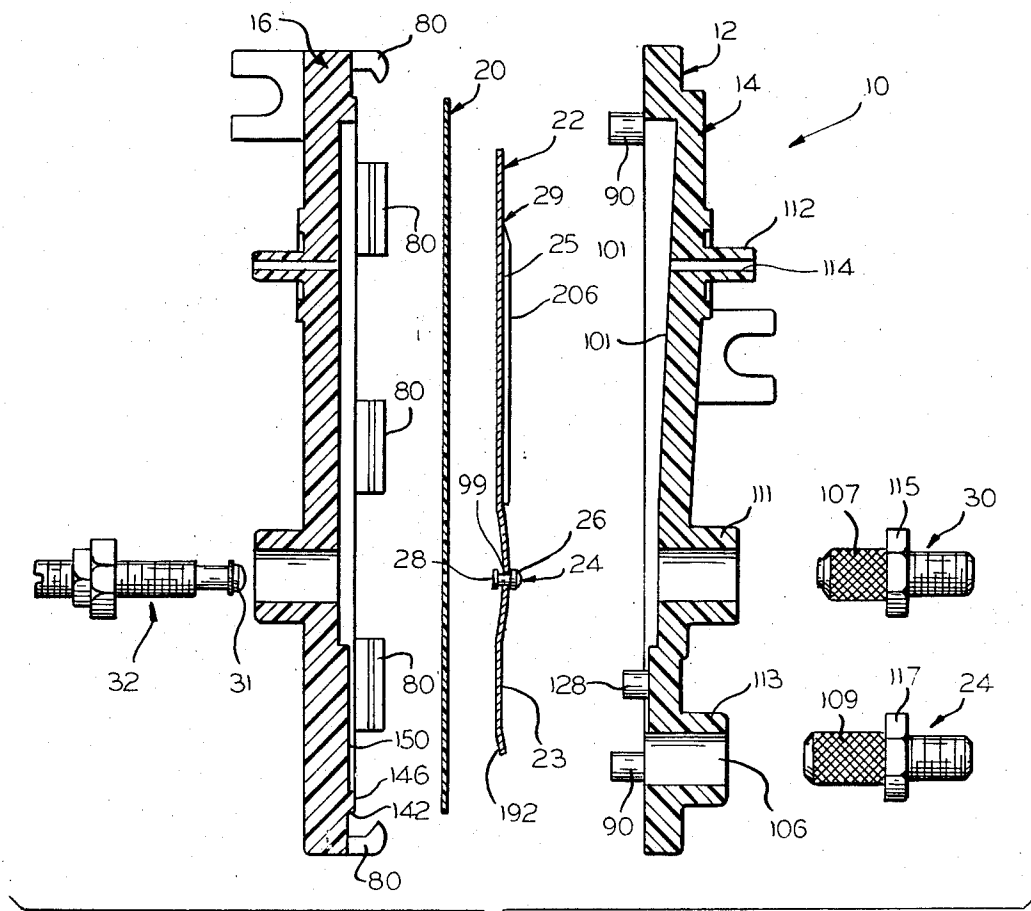


FIG. 5

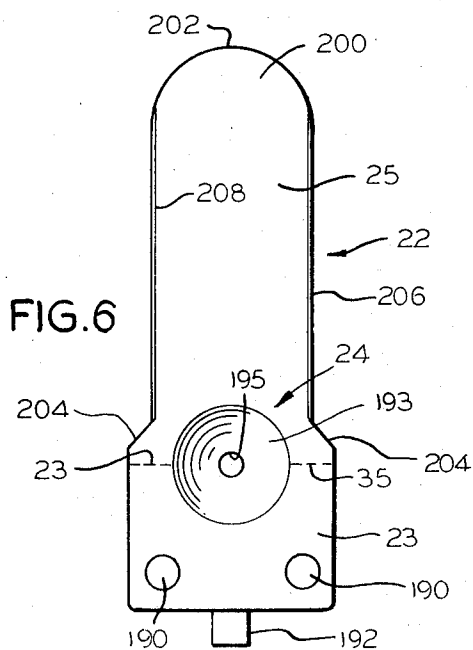


FIG. 6

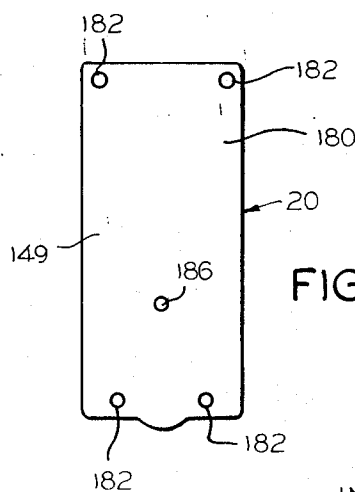


FIG. 7

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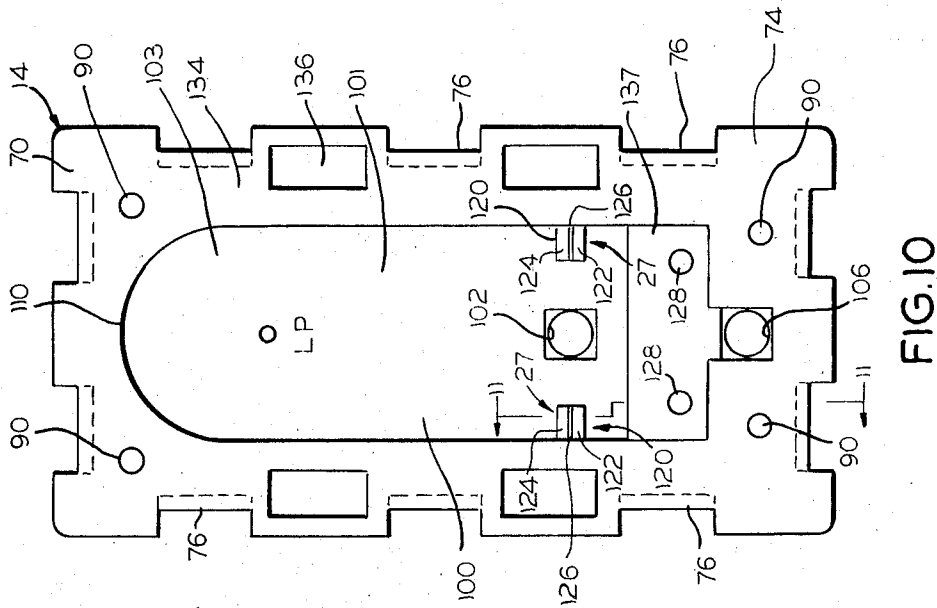


FIG. 10

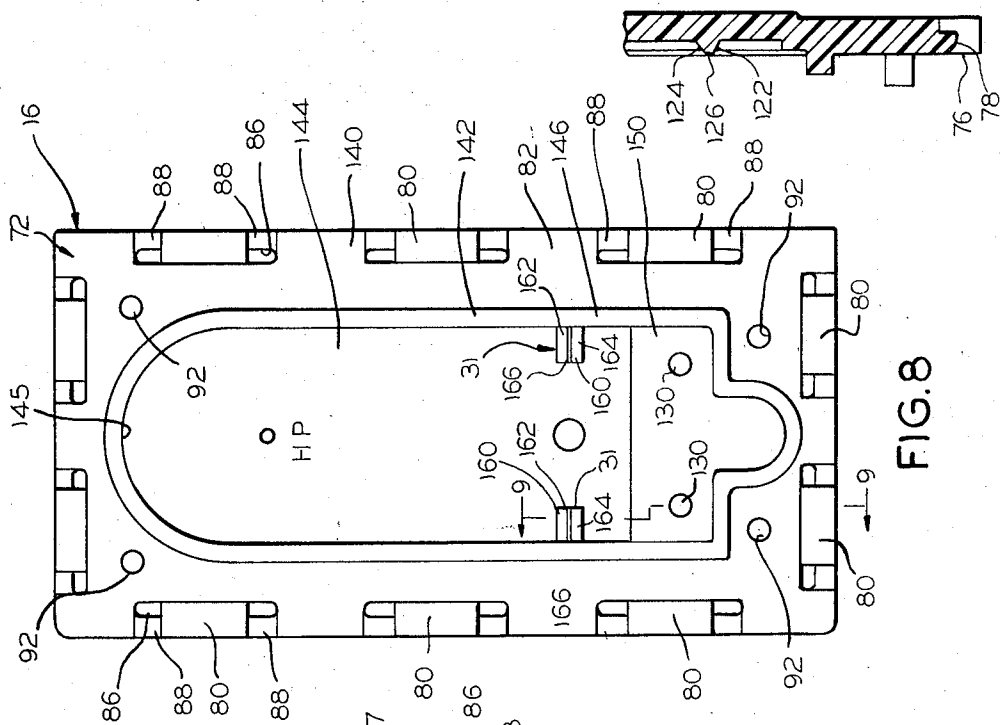


FIG. 8

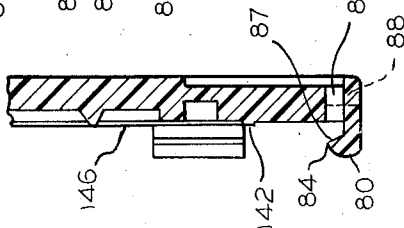


FIG. 9

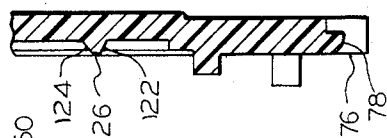


FIG. 11

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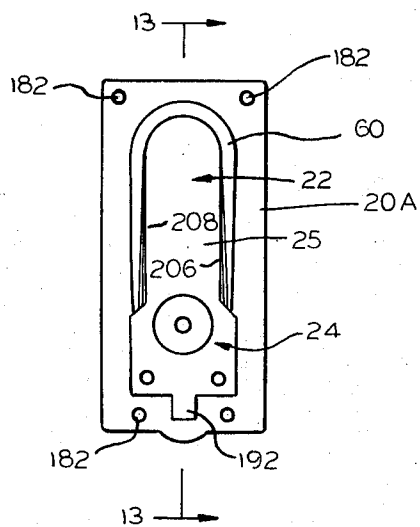


FIG. 12

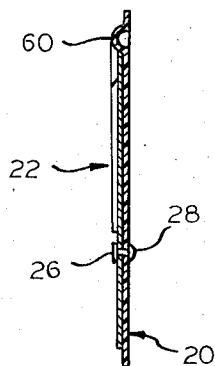


FIG. 13

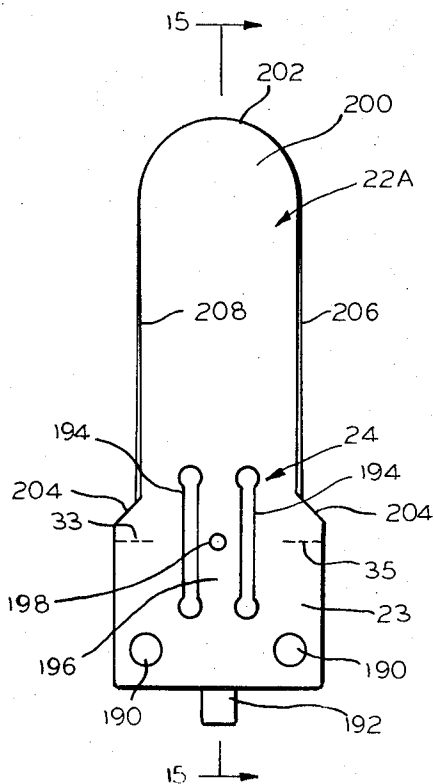


FIG. 14

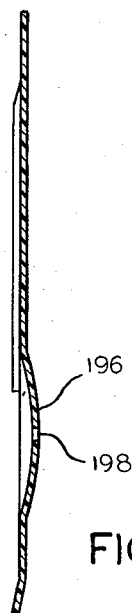


FIG. 15

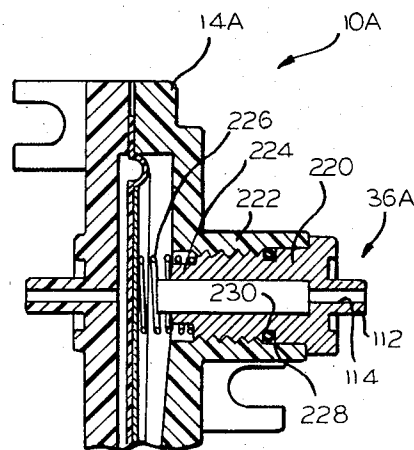


FIG. 16

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FLUID PRESSURE OPERATED DIAPHRAGM SWITCH WITH IMPROVED ADJUSTMENT MEANS AND CONTACT STRUCTURE

This invention relates to fluidic switches, and more particularly, to switches which are fluid pressure differential actuated by connection to two different fluid pressure sources.

Conventional fluidic switches are low volume fluid pressure operated devices that involve separate diaphragm actuated levers, springs, and switch elements, which tend to introduce lost motion and friction into the switching action of the switch that dull response to the fluidic signal relied on and complicate manufacture and assembly. There exists a need for miniature switches of the fluidic type, but the minute motion action required for miniature switches is difficult to insure with the existing fluidic switch arrangements.

A principal object of this invention is to provide a fluidic switch that is especially adapted to be of the miniature switch type.

Another principal object of the invention is to provide a fluidic switch in which the conventional diaphragm actuated lever, spring, and switch element are combined into one member of simplified construction.

Still other objects of the invention are to provide a fluidic switch having an adjustable switch differential, to provide a simplified snap together housing arrangement for fluidic switches, and to provide a fluidic switch that is economical of manufacture, convenient to install, and long lived in operation.

In accordance with this invention, a fluidic switch of the miniature switch type is provided comprising a housing in the form of a pair of generally planar housing sections clamped together back to back and formed to define a low volume, elongate generally planar chamber that is of minute depth as compared to its length and width, across which is mounted a low spring rate diaphragm and a snap spring type diaphragm plate that extends longitudinally of the chamber and is anchored cantilever fashion at one of its ends. Adjacent to its anchored end, the diaphragm plate includes a snapping portion carrying contact heads on either side of same that snap between normally open and normally closed contacts mounted in the respective housing sections. The diaphragm and diaphragm plate are of film proportions in thickness for maximum responsiveness to differentials in pressure on either side of the diaphragm, and the respective housing sections are formed for connection to differential gas pressure sources. The housing mounts a common contact in electrical conducting relation to the diaphragm plate, and the housing sections are arranged for snapping together type assembly and sealed tight relation against the diaphragm.

Still other objects, uses and advantages will be obvious or become apparent from a consideration of the following detailed description and the drawings.

In the drawings:

FIG. 1 is a plan view of one embodiment of the invention, illustrating also one type of mounting arrangement for the switch;

FIG. 2 is a side elevational view of the switch shown in FIG. 1, as viewed from the right hand side of FIG. 1;

FIG. 3 is a cross-sectional view through the switch, as viewed substantially along the line 3—3 of FIG. 1, and also illustrating a modified mounting arrangement for the switch;

FIG. 4 is a cross-sectional view of the high pressure side housing section of the switch, viewed substantially along line 4—4 of FIG. 1, with the mounting bracket of FIG. 1 omitted and illustrating the modified form of switch mounting arrangement contemplated by FIG. 3;

FIG. 5 is a view similar to that of FIG. 3, but showing the parts in exploded relation;

FIG. 6 is a plan view of one form of snap spring diaphragm plate employed in accordance with this invention;

FIG. 7 is a plan view, on a small scale, of the diaphragm employed in accordance with this invention;

FIG. 8 is a plan view of the inside portion of the high pressure side housing section of the device;

FIG. 9 is a fragmental cross-sectional view taken substantially along line 9—9 of FIG. 8;

FIG. 10 is a plan view of the inside portion of the low pressure housing section of the device;

FIG. 11 is a fragmental cross-sectional view taken substantially along line 11—11 of FIG. 10;

FIG. 12 is a plan view of a modified diaphragm and snap spring diaphragm plate assembly in accordance with this invention;

FIG. 13 is a cross-sectional view taken along line 13—13 of FIG. 12;

FIG. 14 is a plan view of a modified snap spring diaphragm plate arranged in accordance with this invention;

FIG. 15 is a cross-sectional view taken substantially along line 15—15 of FIG. 14; and

FIG. 16 is a fragmental cross-sectional view showing modifications whereby an adjustable set point is provided.

However, it is to be distinctly understood that the specific drawing illustrations provided are supplied primarily to comply with the requirements of the Patent Law, and that the invention is susceptible of other embodiments that are intended to be covered by the appended claims.

GENERAL DESCRIPTION

Reference numeral 10 of FIGS. 1—3 and 5 generally indicates one basic embodiment of the invention comprising a housing 12 in the form of a pair of substantially planar housing sections 14 and 16 secured together in back to back relation and formed to define an elongate, generally planar, chamber 18, across which extends a low spring rate diaphragm 20 that is secured between the housing sections 14 and 16 in fluid tight relation thereto. Operably associated with the diaphragm 20 is a snap action diaphragm plate 22 mounted cantilever fashion at one end 23 of same and including a snap acting portion 24 equipped with contact heads 26 and 28 on either side thereof adapted to be snapped between a normally closed contact 30 and a normally open contact 32 mounted in the respective housing sections 14 and 16. The other end 26 of the diaphragm plate serves as the piston portion thereof.

The diaphragm plate 22 is in electrical conducting relation with a common contact 34; and the housing sections 14 and 16 are respectively formed with fitting

structures 36 and 38 for suitably connecting the respective low and high pressure chambers 40 and 42 (see FIG. 3) that are defined by diaphragm 20 with fluid pressure sources that are to be associated with switch 10. The diaphragm 20 and diaphragm plate 22 are connected together at contact heads 26 and 28 to form an assembly 29. The housing sections 14 and 16 are formed with pairs of spaced apart fulcrums 27 and 31, respectively, which, when the housing sections 14 and 16 are assembled against the diaphragm 20, clamp the diaphragm clamp assembly therebetween, and on either side of the diaphragm plate snapping portion 24; the approximate engagement of the respective fulcrums with the diaphragm plate is indicated by dashed lines 33 and 35 in FIG. 6, whereby it will be seen that the diaphragm plate 22 is fulcrumed about an axis passing through the line of action of the contact heads 26 and 28, and that extends transversely of the diaphragm plate.

Switch 10 is provided with open and mounting flanges 52 for suitably mounting the switch 10 in operation.

The normally open contact 32 is preferably made adjustable so that the pressure differential at which switch 10 operates to switch is adjustable.

Switch 10 is connected in the usual control circuiting, with leads being suitably connected to contacts 30, 32 and 34, and the fitting structures 36 and 38 are suitably connected by flexible tubes or the like to the sources of fluid pressure that are involved in the control system of which the switch 10 is a part. If desired, the low pressure chamber 40 may be left open to atmospheric pressure or connected to a specific source of fluid pressure.

Switch 10 in its unswitched normal operating position assumes the relative positioning of parts shown in FIG. 3 wherein the switch snapping portion contact head 26 is in engagement with the normally closed contact 30.

Assuming that the control arrangement of which the switch 10 is made a part contemplates that when the fluid pressure in high pressure chamber 42 reaches a predetermined amount, the switch 10 is to operate to bring normally open contact 32 into the circuiting and switch out contact 30, as pressure in the chamber 42 builds up, the diaphragm 20 and the free end or piston forming portion 25 of diaphragm plate 22 is deflected to the right of FIGS. 3 and 4. The nature of diaphragm plate 22 and its manner of mounting are such that this movement increases the pressure that the contact head 26 bears against contact 30 with, and when the pressure differential between chambers 40 and 42 reaches the switch over point, the snapping portion 24 snaps across the space between contacts 30 and 32 to bring the contact head 28 into contact with normally open contact 32.

When the pressure differentials drop below the said switch over point of diaphragm plate 22, the spring snapping portion 24 reverses position back to engagement with the normally closed contact 30.

While the unconvoluted diaphragm 20 of FIGS. 1-11 is satisfactory for most purposes, the convoluted diaphragm 20A of FIGS. 12 and 13 may be employed for more sensitive applications. As indicated in 12 and 13, the diaphragm 20A is formed with a U-shaped con-

volution 60 that conforms to the general configuration of diaphragm plate piston portion 25.

SPECIFIC DESCRIPTION

The housing sections 14 and 16 are in the form of plate elements 70 and 72 that are, in the form shown, preferably formed from a suitable plastic compound by employing suitable molding procedures. Suitable examples are fiber glass filled polycarbonate, the acetals, and acrylonitrile butadiene styrene.

Plate element 70 about its margin 74 is formed with spaced rounded shoulders 76 (see FIG. 11), each including a rounded camming surface 78, for snap fitting engagement with snap hook portions 80 formed about the margin 82 of plate element 72 and in correspondingly oriented locations, whereby the plate elements 70 and 72 will snap together to hold them in assembled relation. Hook portions 80 of plate element 72 are rounded as at 84 for camming engagement with the respective rounded surfaces 78 of plate element 70. In the specific snap hook shown, a slot 86 extends lengthwise of each hook portion or lug 80 in plate 72 through the plate element 72, with the hook portions 80 being connected to the main body portion of plate element 72 by connecting portions 88 of reduced section to provide for flexing of the hook portions 80.

The snap hooks 80 are each formed with wedging surfaces 87 that tend to cam the housing section 14 into tightly clamped relation against the diaphragm under the resiliency the snap hooks as they are snapped by shoulders 76.

The housing section 14 is formed to define a plurality of locating dowels or studs 90 that are oriented to fit into correspondingly located openings 92 formed in housing section 16. Mounting flanges 52 are an integral part of the respective housing sections and their slots 98 receive attaching screws or bolts or the like that are employed to press clamping washers thereagainst for the purpose of mounting the switch 10 as desired.

The housing section 14 is recessed as at 100 to define (with diaphragm 20) the low pressure chamber 40, and the contact 30 is suitably applied to opening 102 in section 14, so as to have its inner end portion 104 disposed to be engaged by the diaphragm plate contact head 26 when the switch is in its unswitched operating position. Similarly, common contact 34 is suitably applied to opening 106 formed in housing section 14 and has its inner end portion 108 disposed for engagement by the diaphragm plate in the manner indicated in FIG. 3.

Contacts 30 and 34 may be of any suitable type and are preferably applied to housing section 14 employing a suitable ultrasonic welding procedure, whereby contacts 30 and 34 are permanently mounted in place in housing section 14. For this purpose contacts 30 and 34 are suitably knurled, as indicated at 107 and 109, respectively. Housing section is preferably bossed as at 111 and 113, respectively, about the respective openings 102 and 106. Contacts 30 and 34 threadedly carry securing nuts 115 and 117 that respectively act against cupped washers 119 and 121.

The recess 100 of housing section 14 is formed to define an angled wall 101 that is slanted at an angle of about three degrees with respect to surface 134 to provide a substantially wedge shaped recess portion 103 extending from the opening 102 to the end 110 of the

recess to accommodate the desired swinging action of the diaphragm plate for switching purposes. Wall 101 projects out of the plane of section 14 for this purpose, as indicated at 101A (see FIG. 2).

The fitting structure 36 of the housing section 14 is in the form of a stud 112 in concentric relation with a passage 114 that extends through the housing section 14. Stud 114 is proportioned to receive the usual type of hose connector, the end of which will ordinarily be seated in recess 116 defined by an annular ridge 118 that is in concentric relation with the stud 112.

The fulcrums 27 are integral parts of the housing section 14 and each comprise a protuberance 120 defining inclined surfaces 122 and 124 merging at apex 126 that is slightly flattened as indicated in FIG. 11. Section 14 also includes a pair of locating studs 128 proportioned to fit into correspondingly located openings 130 of housing section 16 for locating purposes intermediate the contacts 30 and 34.

The inner face or back 134 of housing section 14 is planar in configuration, except for studs 90 and recesses 136, the latter being provided to facilitate molding of the housing section 14, and specifically to aid in its removal from the mold. The recess 100 includes a shelf 137 against which the end 23 of the diaphragm spring 22 abuts when the assembly 29 is applied to the housing.

Turning now more specifically to the housing section 16, its inner face or back 140 is planar in configuration, except for an upstanding ridge 142 that is in circumambient relation about the recess 144 that (together with diaphragm 20) defines high pressure chamber 42. Ridge 142 is formed to define a planar sealing surface 146 that is adapted to bear against one side 147 of the diaphragm 20 for sealing purposes, as indicated in FIG. 3; the diaphragm other side 149 is engaged by surface 134 of housing section 14.

The recess 144 of section 16 is formed with a shelf 150 that abuts the diaphragm 20 in the assembled relation of the housing to firmly clamp the diaphragm plate end 23 against the shelf 137 of housing section 14 to restrict the spacing between same and the diaphragm 20 intermediate the contacts 30 and 34. Thus, the diaphragm and anchored portion 23 of the diaphragm plate are substantially clamped in place between the shelf portions of sections 14 and 16.

The housing section 16 at fitting structure 38 defines stud 152 that is in concentric relation with passage 154 extending through section 16 to chamber 42. Stud 152 is proportioned to receive the usual connection hose, which should be inserted to abut in recess 156 defined by annular ridge 158 that is in circumambient relation about the stud 152.

The fulcrums 31 of housing section 16 are similar in nature to the fulcrums 27 of housing section 14, they each being in the form of an integral lug or protuberance 160 defining angled surfaces 162 and 164 that merge into apex 166 that is slightly flattened for engagement with the diaphragm assembly 29.

Contact 32 comprises a threaded element 168 threadedly received in internally threaded sleeve 169 that is press fitted into opening 170 formed in housing section 16; element 168 defines inner end portion 172 of reduced diameter that terminates in a head 173 that is positioned for engagement with contact head 28 of

the diaphragm plate 22. Threaded member 168 is equipped with suitable clamping nuts 174 to lock same in a desired position of adjustment, and an O-ring seal 175 is applied between end portion 172 and the surface of opening 170 for fluid sealing purposes. Nuts 174 seat against cupped washer 177. By adjusting the end portion 172 of the threaded member inwardly or outwardly of the chamber 18 (after loosening nuts 174), the pressure differential at which the switch changes position (to close contact 30 and open contact 32) may be adjusted, after which nuts 174 are tightened to hold member 168 in its adjusted position.

Diaphragm 20 generally comprises a sheet of a suitable wear resisting elastomeric material (such as polyurethane) given the general rectangular shape indicated in FIG. 7, and being of film proportions in thickness. The sheet 180 is formed with openings 182 to receive the respective studs 90 of housing section 14, sheet 180 being uninterrupted over studs 128 to insure good sealing.

Sheet 180 is also formed with a suitable opening 186 for application of the contact heads 26 and 28 to the diaphragm plate 22 in the manner about to be described.

The diaphragm plate 22 is preferably formed from a suitable spring action material such as a suitable beryllium copper alloy and is of generally planar elongate construction including lever portion 25 which serves as the piston for operating the snapping portion 24, and the end portion 23 at which the diaphragm plate is anchored. End portion 23 is formed with openings 190 to receive the respective studs 128 of housing section 14, and a tab portion 192 that is angled somewhat out of the plane of the diaphragm plate for making spring biased engagement with common contact 34 in electrical conducting relation therewith on assembly of the switch 10.

The snapping portion 24 of the diaphragm plate 22 may take any one of a number of known configurations of this type, one of which is shown in FIG. 6, wherein snapping portion 24 is in the form of a rounded upset indentation 193 of concavo-convex configuration, having an opening 195 at its midportion for application thereto of contact heads 26 and 28. Alternately, the form of FIGS. 14 and 15 may be employed, wherein the snapping portion 24A is shown as comprising a pair of slots 194 formed in the diaphragm plate to extend longitudinally thereof and in spaced apart relation to define therebetween a strip portion 196 of reduced width that is upset or indented out of the plane of the diaphragm plate to define an arcuate configuration of the type illustrated in FIG. 5. Strip portion 196 is formed with opening 198 to mount the contact heads 26 and 28. Heads 26 and 28 are preferably in rivet form whereby one contact head 26 includes a stem 199 (see FIG. 5) extending through the openings 195 or 198, as well as through opening 186 of the diaphragm 20, for securing the diaphragm and diaphragm plate in riveted relation.

The spacing between the diaphragm plate contact head 28 and the end 172 of contact 32 for a diaphragm plate 22 of a given resiliency determines the switch differential set point (the pressure differential required to return the diaphragm plate snapping portion once it has snapped to close the normally open contact 32). The

switch set point (the point at which the snapping portion 24 will snap from the position of FIG. 3 to its opposite position to close contact 32 and open contact 30) can be adjusted by using diaphragm plates 22 of selected resiliencies, in the embodiments of FIGS. 1 - 15.

The terminal portion 200 of the diaphragm plate lever portion 25 is rounded as at 202 in general conformity to the end portions 110 and 145 of the housing section recesses 100 and 144, respectively. Lever portion 25 is of reduced width as compared to end portion 23 and extends from angled side edge portions 204 of the diaphragm plate away from the snapping portion thereof, and is formed with flanges 206 and 208 along either edge thereof for reinforcing purposes.

Both the diaphragm 20 and the diaphragm plate are preferably of film dimensions in thickness such that they admit of the minute movement required for snap switch operation under low lever pressure changes (the thickness of these parts is out of proportion for illustrative purposes, their thicknesses preferably lying in the range of from about 0.002 inch to about 0.010 inch). The diaphragm plate is secured to the diaphragm with the flanges of the diaphragm plate facing away from the diaphragm, as indicated in FIGS. 3 and 5, and the configuration and proportioning of the diaphragm plate 22 is such that on assembly of the switch in the manner indicated in FIG. 3, the diaphragm plate and diaphragm lie in substantially coplanar relation within the general plane of chamber 20, and snapping portion 24 disposes contact head 26 in engagement with normally closed contact 30, and tab 192 engages and is biased against common contact 34.

In this connection, it is to be noted that the diaphragm and diaphragm plate are not secured together at any other point than at the contact heads 26 and 28. The resiliency built into the diaphragm plate insures its return to the position of FIG. 3 after switching has occurred and the pressure differentials involved have dropped to the point where the contact head 26 should return to engagement with contact 30.

In assembling the device 10, assuming that the diaphragm plate assembly 29 has been assembled in the manner indicated, it is applied to the housing section 14 by laying same across housing section recess 100 to align the snapping portion 24 with contact 30, and openings 190 of the diaphragm plate respectively with studs 128, which then may be passed through such openings to fit the diaphragm assembly into recess 100 and across the fulcrums 27. Stud 90 is located in diaphragm openings 182.

The housing section 16 is then applied to housing section 14 with the snap hook elements 80 of section 16 directed against the respective shoulders 76 of section 14, whereby the studs 90 and 128 of section 14 are automatically aligned with the corresponding openings 92 and 130 of section 16. The housing sections are then suitably pressed together to snap the snap hooks 80 behind shoulders 76 whereby studs 90 and 128 pass into and lodge in openings 92 and 130 (stud 128 pressing the diaphragm into openings 130), respectively to secure the housing sections together and apply the fulcrums 27 and 31 against the diaphragm assembly 29 in the manner that has been indicated.

After the switch 10 has been suitably mounted in position and a connection hose applied to at least the high pressure fitting structure 38 for connecting same to the high pressure gas source, and the contacts 30, 32 and 34 are suitably connected into the control circuiting involved, when the pressure in the high pressure chamber 42 starts to exceed the pressure in the low pressure chamber 40, diaphragm 20 deflects against the lever portion 25 of the diaphragm plate 22 which in turn deflects towards the angled wall 101 of recess 100 of housing section 14. When the pressure differentials involved reach a predetermined amount, as determined by the set point selected for the diaphragm plate 22, snapping portion 24 reverses position to bring its contact head 28 into engagement with the end portion 172 of contact 32, thus providing the switching action desired. This relationship of parts remains until the pressure differentials change in favor of more equalization of pressure, and when the pressure differentials reach a predetermined minimum as determined by the setting of contact 32, the snapping portion 24 reverses position back to contact with normally closed contact 30.

It is to be noted that as pressure differentials increase up to the set point of the diaphragm plate 22, contact head 26 bears with increasing pressure on contact 30, thus insuring that the circuit connected by head 26 and contact 30 remains closed until the set point of the diaphragm plate is reached.

FIGS. 12 and 13 illustrate a modified form of diaphragm 20A having the indicated convolution 60 which is of U-shaped configuration in conformity with the portion of diaphragm plate 22. The convolution 60 insures a more stable set point and increases the flexibility of the diaphragm and thus the sensitivity of the switch, but is not required for many applications.

The switch device 10A of FIG. 16 includes a housing section 14A in which fitting structure 36A forms a part of threaded tubular body 220 threadedly received in cylindrical wall 222 of housing section 14A and having a reduced end portion 224 over which compression spring 226 is received that bears against diaphragm plate 22. O-ring seal 228 received in groove 230 of body 220 is in fluid tight sealing relation with wall 222. By turning body 220 inwardly or outwardly of housing section 14A, the set point of device 10 may be adjusted.

It will therefore be seen that there has been provided a simplified fluidic switch of the miniature switch type involving a housing secured together with a snap fit action against a diaphragm and diaphragm plate of film proportions in which the diaphragm plate not only utilizes the movement of the diaphragm to effect switching action provided, but provides the switching portion of the switch and also provides the spring action that is required to return the diaphragm plate to initial position.

The foregoing description and the drawings are given merely to explain and illustrate the invention and the invention is not to be limited thereto, except insofar as the appended claims are so limited, since those skilled in the art who have the disclosure before them will be able to make modifications and variations therein without departing from the scope of the invention.

We claim:

1. A fluidic switch comprising:

- a housing including a pair of housing sections clamped together and formed to define between them a generally planar elongate diaphragm chamber of restricted depth,
- a low spring rate diaphragm clamped between said housing sections in fluid tight seal relation about said chamber,
- a snap spring diaphragm plate extending longitudinally of said chamber on one side of said diaphragm and in juxtaposition thereto, said snap spring plate being anchored cantilever fashion at one end thereof adjacent one end of said chamber,
- said snap spring plate being formed with a bowed snap acting portion adjacent said one end thereof, with said snap acting portion including a contact head on either side thereof,
- said housing sections each including an electrical contact disposed adjacent the respective sides of said spring snap acting portion and respectively opposing the respective contact heads of said spring plate,
- said housing sections each including a pair of fulcrum abutments disposed on either side of said plate portion, transversely of said chamber, with said respective pairs of abutments opposing each other and clamping said diaphragm and spring plate therebetween,
- and means for connecting the portions of said chamber in either side of said diaphragm adjacent the other end of said chamber to differential gas pressure sources,
- said spring portion being proportioned to normally hold one of said contact heads in engagement with one of said contacts in one position of said spring portion,
- with the other housing section being adapted for connection to the higher gas pressure source,
- said spring portion arcing convexly toward said one contact in said one position thereof,
- said spring portion having a set point to snap into reverse configuration to bring the other contact head thereof into engagement with the other of said contacts in a second position thereof when pressure differentials on either side of said diaphragm deflect the other end of said spring in the direction of said one side of said chamber a predetermined amount,
- said housing including a common contact in electrical conducting relation to said spring plate at said one end thereof,
- whereby, as pressure differentials on either side of said diaphragm increase, the spring plate portion contact head engages said one contact with increasing pressure until said spring set point is reached.
2. The fluidic switch set forth in claim 1 wherein said spring plate is secured to said diaphragm only at said contact heads.
3. The fluidic switch set forth in claim 1 wherein said spring plate and diaphragm are of film dimensions in thickness.
4. The fluidic switch set forth in claim 1 wherein: said other ends of said chamber and said spring plate are rounded transversely thereof in a substantially concentric manner.
5. The fluidic switch set forth in claim 4 wherein:

- said diaphragm is substantially planar in unstressed configuration.
6. The fluidic switch set forth in claim 4 wherein: said diaphragm is formed with a convolution in concentric relation about said other end of said spring plate.
7. The fluidic switch set forth in claim 1 wherein: said housing sections are formed with planar uninterrupted surfaces about said chamber that abut said diaphragm about the margin thereof.
8. The fluidic switch set forth in claim 1 wherein: said housing sections are formed with mating stud and recess means for assembling same together in predetermined orientation relative to each other.
9. The fluidic switch set forth in claim 1 wherein: the other of said housing contacts is adjustable toward and away from the spring plate contact head opposing same, whereby the pressure differential of the switch is adjustable.
10. The fluidic switch set forth in claim 1 wherein: said fulcrum abutments are rectilinear in nature and extend crosswise of said spring plate in alignment with said spring plate contact heads.
11. A fluidic switch comprising:
- a housing of generally planar configuration including a pair of generally planar housing sections clamped together back to back and formed to define between them a generally planar elongate diaphragm chamber that is minute in depth as compared to its length,
- a low spring rate diaphragm clamped between said housing sections in a fluid tight seal relation about said chamber,
- a snap spring diaphragm plate extending longitudinally of said chamber on one side of said diaphragm and in juxtaposition thereto, said diaphragm and spring plate being of film proportions in thickness,
- said snap spring plate being anchored cantilever fashion at one end thereof adjacent one end of said chamber,
- said snap spring plate being formed with a bowed snap acting portion adjacent said one end thereof, with said snap acting portion including a contact head on either side thereof,
- said housing sections each including an electrical contact disposed adjacent the respective sides of said spring snap action portion and respectively opposing the respective contact heads of said spring plate,
- said housing sections each including a pair of fulcrum abutments of rectilinear configuration disposed on either side of said plate portion and extending transversely of said chamber, with said respective pairs of abutments opposing each other and clamping said diaphragm and spring plate therebetween,
- said abutments being aligned with said contact heads,
- and means for connecting the portions of said chamber on either side of said diaphragm adjacent the other end of said chamber to differential gas pressure sources,
- said spring portion being proportioned to normally hold one of said contact heads in engagement with one of said contacts of one of said sections in one position of said spring portion,

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with the other housing section being adapted for connection to the higher gas pressure source, said spring portion arcing convexly toward said one contact in said one position thereof, said spring portion having a set point to snap into reverse configuration to bring the other contact head thereof into engagement with the other of said contacts in a second position thereof when pressure differentials on either side of said diaphragm deflect the other end of said spring in the direction of said one housing section a predetermined amount, said housing including a common contact in electri-

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cal conducting relation to said spring plate at said one end thereof, whereby, as pressure differentials on either side of said diaphragm increase, the spring plate portion contact head engages said one contact with increasing pressure until said spring set point is reached.
12. The fluidic switch set forth in claim 1 wherein the set point of said switch is non-adjustable.
13. The fluidic switch set forth in claim 1 including means for adjusting the switch set point.

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