The present invention relates to hydraulic switches. More particularly, the invention relates to diaphragm actuated snap action switches which combine the qualities of low contact resistance, and high vibration and shock resistance.

Prior art hydraulic switches have been found to have complicated switch mechanisms which are and have high resistance at the contact points, and to have complex multi-component diaphragms.

The hydraulic switch of the present invention provides a rugged positive snap-action switch of simple construction and which prevents arcing and pitting of the contact points thereof, thereby greatly reducing the resistance of the switch.

The diaphragm of the switch of the present invention comprises a single piece of molded rubber which includes the flexible disc member and the axial pressure finger for actuating the snap-action mechanism of the switch.

An object of the present invention is to provide a new and improved hydraulic switch wherein a positive snap-action prevents arcing of the contact points thereof.

Another object is to provide a new and improved hydraulic switch having low electrical resistance, high operating efficiency and long life.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Fig. 1 is a sectional view taken substantially along the axis of the hydraulic switch of the present invention;

Fig. 2 is a sectional view taken along the line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 2; and

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 2.

Referring more particularly to the drawings of the present invention wherein like numerals indicate like parts throughout the several views, the casing of the switch is indicated at 10 and has formed therein a switch cavity 11 and a diaphragm cavity 12. Mounted in cavity 11 is the switch mechanism 13, while a rubber diaphragm 14 is mounted in cavity 12. Cavity 12 is closed by a plug member 15 having a threaded nipple 16 for securing the switch to a conduit or other means [not shown] for communicating with a source of hydraulic or, if desired, pneumatic pressure. Nipple 16 is provided with an axial bore 17 communicating with the cavity 12 whereby the pressure medium enters cavity 12 on one side of diaphragm 14.

Diaphragm 14 comprises an axial pressure finger 18 having a shoulder 19 spaced from the end thereof, formed integrally therewith is a flexible circularly folded disc member 21 having an enlarged peripheral portion 22. It is, of course, clear that the foregoing diaphragm member is formed of suitable molded rubber either natural or synthetic.

Cavity 12 is provided with a reduced recess 23 to receive the shouldered portion of finger 18 and a further reduced bore 24 forming shoulder portion 25 and through which the end of finger 18 passes. It will be clear that cavity 12 and shoulder portion 25 act as stops to prevent distension of diaphragm 14 therebeyond.

Switch 13 which as aforesaid is mounted in cavity 11 on insulator disc 26, a metal reinforcing plate 27 being secured to disc 26 by rivet 28 and by connector post 29. Mounted on plate 27 are a pair of supporting posts 31 and 32 on which is mounted the "size wave" spring contact leaf 30, post 31 supporting leaf 30 at end portion 34 thereof and post 32 supporting leaf 30 at the opposite end portion 35 thereof. As clearly shown in Fig. 2, leaf 30 is provided with a straight portion 33 and a portion 36 which is formed substantially in the form of a sine wave, leaf 30 having a lateral bend to the left as at 37 adjacent the median position between the ends 34 and 35, a lateral bend to the right as at 38, and a lateral bend to the left as at 39 adjacent end 35. Adjacent the intersection of bends 38 and 39 and extending parallel to the straight portion 33 of leaf 30 is a contact arm 41 having a contact point 42 fixed thereto. In the initial position thereof, contact arm 41 bends inwardly to engage the plate 27, but when straight portion 33 is pressed inwardly by finger 18 of diaphragm 14, arm 41 snaps outwardly to engage fixed contact arm 43 with contact point 42.

Fixed contact arm 43 is secured to insulator disc 26 by rivet 44 and connector post 45. A cover disc 46 of insulating material and having bores through which connector posts 29 and 45 pass, is mounted in close adjacency to disc 26. Disc 46 covers rivets 28, 44 and bores 47 in disc 26 into which posts 31 and 32 extend.

Discs 26 and 46 are retained against shoulder 48 in recess 11 by a rolled edge 49 of casing 10, while plug 15 is retained by the rolled edge 51 of casing 10.

Peripheral portion 22 is compressed in the circular grooves 52 and 53 formed on the inner face of plug 15 and in the shoulder 54 of casing 10, respectively, thus to form a leakproof joint.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claim the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A hydraulic switch comprising, in combination, a casing having formed therein a switch cavity and a diaphragm cavity spaced from the switch cavity, said diaphragm cavity having circular side and bottom walls, said casing being further formed with a reduced bore extending from the diaphragm cavity centrally of the bottom wall thereof and toward the switch cavity, said reduced bore terminating short of the switch cavity, said casing having a communicating opening formed between the reduced bore and the switch cavity, said opening being smaller than the reduced bore to provide a shoulder portion, between the reduced bore and the switch cavity, a molded rubber diaphragm comprising a flexible fold portion and a pressure finger, said finger having a shoulder formed integrally with said flexible fold portion, said diaphragm being disposed in said diaphragm cavity with said finger extending through said reduced bore and said opening into the switch cavity, said flexible fold portion being integrally formed with a sealing por-
tion having a part in contact with the side wall of the diaphragm cavity and a part formed with a sealing ring, said casing having a groove receiving one side of the sealing ring, a closure member having a groove receiving the other side of the sealing ring, said member being secured to the casing and having a central bore through which pressure fluid is conducted to the diaphragm to flex the same and move said finger, said shoulder portion being adapted to engage the shoulder of said finger to limit movement of the finger, and switch means in said switch cavity engaged and operated by said finger when the same is moved into the switch cavity by flexing of said diaphragm.

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