Aug. 7, 1945. J. O. MOORHEAD 2,381,835

SWITCH

Filed Dec. 18, 1943

FIG. 1.

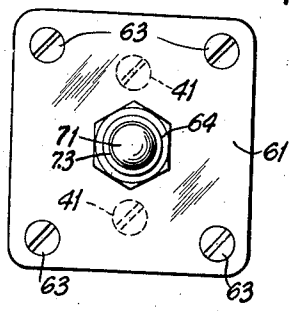



FIG. 2.

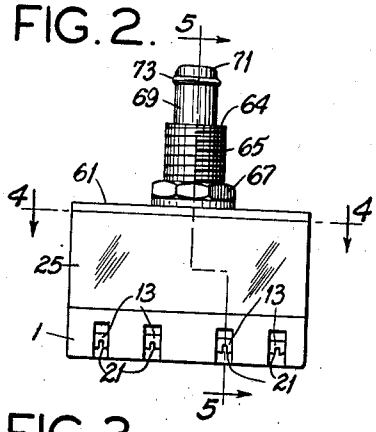



FIG. 3.

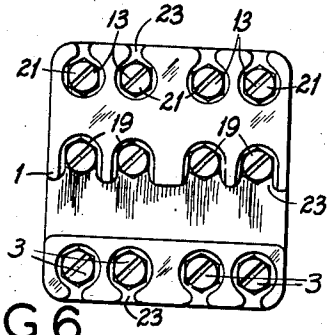



FIG. 4.

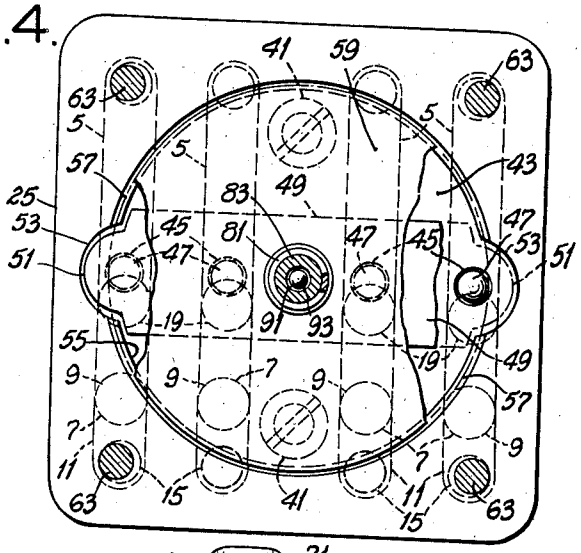



FIG. 5.

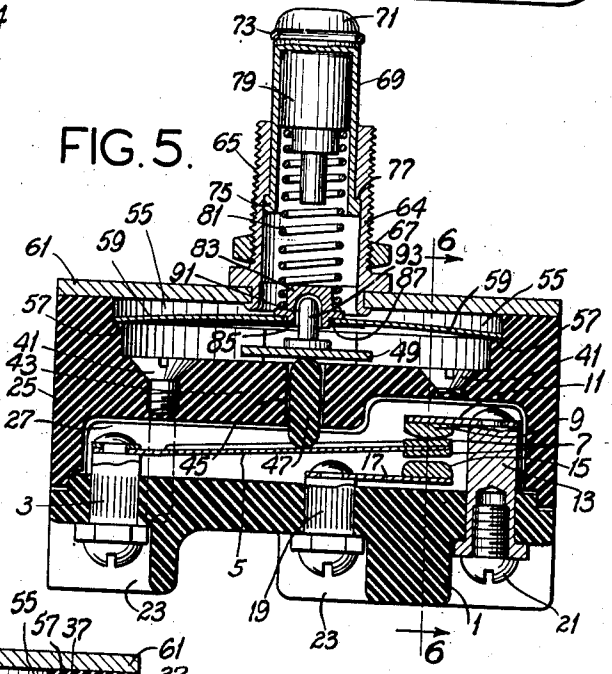
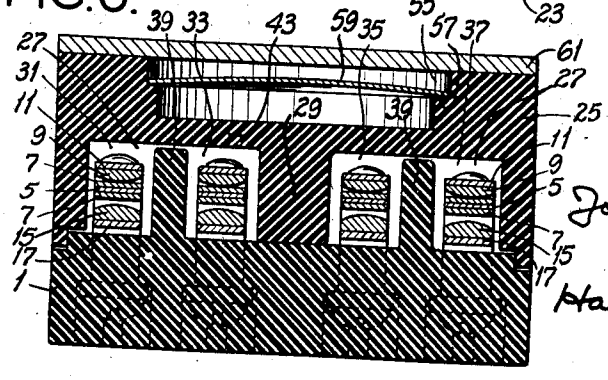



FIG. 6.




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# UNITED STATES PATENT OFFICE

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## SWITCH

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8 Claims. (Cl. 200—6)

This invention relates to switches, and with regard to certain more specific features, to multi-pole, snap-acting switches.

Among the several objects of the invention may be noted the provision of a multi-pole, snap-acting switch of simple organization which may be economically fabricated and easily assembled; the provision of a switch of the class described which, by a very simple structure, obtains equalized snap-action; and the provision of a switch of this class in which creep action of the snap-acting element does not translate into creep action in certain switch operations. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structures hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing, in which is illustrated one of various possible embodiments of the invention,

Fig. 1 is a top plan view of the switch about full size;

Fig. 2 is a front elevation of Fig. 1;

Fig. 3 is a bottom plan view of Fig. 2;

Fig. 4 is an enlarged horizontal section taken on line 4—4 of Fig. 2;

Fig. 5 is an enlarged vertical section taken on line 5—5 of Fig. 2; and,

Fig. 6 is a vertical section taken on line 6—6 of Fig. 5.

Referring to the drawing, numeral 1 indicates a molded insulating bottom-forming base. This base 1 forms the foundation for a sub-assembly which comprises a row of line terminals 3, to which are riveted spring contact arms 5. The latter bias upward. At the ends of the spring arms 5 are contacts 7. Upward bias of the arms normally forces the upper faces of the contacts 7 against upper contacts 9 on rigid conducting extensions 11. The extensions 11 are riveted to a second row of line terminals 13. The lower faces of the contacts 7 are adapted to engage with contacts 15, mounted on rigid extensions 17, the latter being riveted to a third row of line terminals 19. From the above it will be seen that the spring arms 5 normally bias up to close parallel circuits between the respective contacts of the rows of line terminals 3 and 13. When the arms 5 are pushed down, they substantially simultaneously close parallel circuits through respective pairs of the line terminals 3 and 19. Each line terminal is made as is the one shown at the right in section in Fig. 5, being tapped and provided with a terminal screw 21. Each screw is in a molded socket 23 having a side outlet for the insertion of lead-in wires (Figs. 3 and 5).

Above the base 1 is a separate sub-base member 25 made up of molded insulating material. This is hollowed as shown at 27 to surround the switch operating parts on the top of the base 1. The sub-base 25 also has an integral median partition wall 29 located between a central pair of switch elements, the latter being indexed in general by numerals 33 and 35 in Fig. 6. The base 1 also has integral separating walls 39 which separate the pairs of switch units which are indexed in general as 31, 33 and 35, 37 in Fig. 6. Thus each switch is in a separate compartment between the bases 1 and 25. Furthermore, the central wall 29 of the sub-base 25 is provided with holes for holding screws 41 which are threaded into the portion of the base 1 just below the wall 29 (Fig. 5). These screws hold together the two bases.

Above the vertical wall 29, the member 25 is formed as a horizontal wall 43 in which are formed four holes 45. These are located along a line at right angles to the separating wall 29 and directly above the spring arms 5. They form vertical guides for short cylindric insulating and operating pins 47, the latter having rounded ends. These pins slide in the guides 45 and rest upon the arm 5. They are light in weight being also molded from insulating material. They protrude slightly above the upper surface of the horizontal wall 43.

On the upper ends of the pins 47 rests an equalizing and operating bar 49. The support is a loose rocking one and the ends of the bar are rounded as indicated at 51, loosely to engage notches 53 in the periphery of a disc-shaped recess 55. Recess 55 is formed above the horizontal wall 43 and in the sub-base 25. In this recess 55 is an angular shoulder 57 which supports an over-centering, snap-acting spring disc 59. The normal stable condition of curvature of the disc is convex upward as shown in Fig. 5.

Enclosing the top of the member 25 is a flat metal cap 61, held in place by four screws 63. Centrally this cap 61 has riveted to it a hollow bushing 64 threaded at 65 to receive a nut 67 for attachment purposes to panels and the like. Sliding inside of the bushing 64 is a hollow sleeve 69, the upper end of which forms a push button 71. The sleeve is prevented from being depressed more than a limited extent by means of a snap

ring 73 forming an outer shoulder. At its lower end the sleeve 69 has an outwardly directed shoulder 75 engaging an inwardly directed shoulder 77 of the bushing 63 for limiting outward biased movement of the sleeve 69.

Within the sleeve 69 is an abutment insert 79 for a compression spring 81. The lower end of the spring 81 engages an abutment 83, the latter having a nipple 85 extending loosely into an opening 87 of the disc 59. The abutment 83 is hollow as indicated at 91, the hollow portion providing some lost motion with respect to an operating abutment pin 93 fastened rigidly to the center of the top of the operating bar 49.

For ease of assembly, the nipple 85 is removable from the opening 87 and the abutment 79 is removable from and insertable in the sleeve 69. The spring merely abuts the members 79 and 83.

Operation is as follows, starting with the switch-closed position of parts shown in Fig. 5.

Pressure on the button 71 forces the sleeve 69 down into the bushing 64 which compresses the spring 81. This applies resilient pressure to the top of the disc 59. The latter, under load, after slight creep, snaps or overcenters quickly from the upwardly arched position shown to the downwardly arched position, in which the pin 93 of bar 49 is contacted. This drives the equalizing bar 49 down against the four pins 47 which respectively push down the switch arms 5 out of contact with contacts 9 and into contact with the contacts 15. When pressure is released upon the button 71 the disc 59 again snaps up to the position shown in Fig. 5, thus allowing the arms 5 to reset themselves into their initial upwardly biased positions.

The play or loose connection between the operating pin 93 and the socket 91 in member 83 is doubly important. First, it allows any preliminary slow-acting creep movement of the disc 59 to occur without transmitting creep movement to the arms 5. Then, as the disc snaps downwardly it strikes the pin 93 with more or less of a blow, which suddenly opens all of the contacts practically at once. Second, the play allows complete freedom of the bar 49 to assume an equalizing position on the pins 47. In this connection it will be observed that the spring arms 5 gravitationally support the equalizing bar 49 through pins 47.

The slow-acting creep movement of disc 59 at the start of its return motion is compensated for by making the pins 47 of such length that the spring arms 5 are sprung beyond the position they occupy when the bottom contacts 7 and 15 etc. just make contact. Thus all of the creep of disc 59 is taken up by this spring movement so that the contacts 7 and 15, etc., do not separate until the disc is in its snap movement.

Assembly of the switch is quite easy. A subassembly is made up of the switches 31, 33, 35, 37 and the base 1. Then the member 25 is applied and fastened by means of screws 41. It is then simple to drop the pins 47 into the guide openings 45 and then apply to them the equalizing bar 49 with its lugs 51 in notches 53. The pins and bar all have loose fits. The disc 59 is then dropped into place and the cover 61 is applied, the latter having already had attached to it the bushing and button parts. At the time the cover 61 is applied, the members 69, 79, 83 and spring 81 are inserted. The cover 61 is then fastened down with the screws 63, thus pre-compressing the spring 81, but not to an extent which will snap down the disc 59.

As many changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A multi-pole snap-acting switch comprising a plurality of biased spring switch arms, loosely guided operating pins supported by said arms, a loosely guided equalizer bar supported by said pins, and a snap-acting spring member cooperating with lost motion with said equalizer bar.

2. A multi-pole snap-acting switch comprising a plurality of spring switch arms biased in one direction, operating pins supported by said arms, an equalizer bar supported by said pins, a snap-acting spring disc member cooperating with lost motion with said equalizer bar and manually operated resilient means for applying a load through said spring member to the disc to snap it in a direction to take up said lost motion toward said equalizer bar and to drive it against said pins to operate said switch arms.

3. A multi-pole snap-acting switch comprising a plurality of parallel spring switch bars biased in a certain direction and located side-by-side, a row of operating pins supported by said arms, said row extending perpendicular to the bar lengths, an equalizer bar supported by said pins and extending parallel to said row, an operating abutment on said bar, a snap-acting spring disc member cooperating centrally with lost motion with said abutment of the equalizer bar, and manually operated resilient means for applying a resilient load, said disc to snap it in a direction to take up said lost motion and to drive said equalizer bar through said abutment and against said pins to operate said switch arms.

4. In a multi-pole snap-acting switch, a switch-arm assembly comprising a base, rows of paired line terminals thereon, a plurality of switch arms supported by certain of said terminals, an insulating covering member attached to said base and covering said switch-arm assembly, said cover member having a shouldered recess, a snap-acting spring disc supported in said recess, guide openings through the cover member extending from said recess, sliding pins respectively in said guide openings and respectively engaging the switch arms, and an equalizing bar located in said recess under the disc and engaging said pins and operated by said spring disc.

5. In a multi-pole snap-acting switch, a switch-arm assembly comprising a base, rows of paired line terminals thereon, a plurality of switch arms supported by certain of said terminals, contacts carried by certain of the line terminals and in position to cooperate with said switch arms, an insulating covering member attached to said base and covering said switch arm assembly, said cover member having a shouldered recess, a snap-acting spring disc supported in said recess, guide openings through the cover member extending from said recess, sliding pins respectively in said guide openings and respectively engaging the switch arms, an equalizing bar located in said recess under the disc and engaging said pins and operated by said spring disc, said recess carrying guiding notches loosely engaged by the ends of said bar, a cover over said recess on the outside of said disc, a push-button guide on the cover, a push button sliding in the guide

and resilient pressure means connecting the push button and the disc.

6. A multi-pole snap-acting switch comprising a main insulating base, a plurality of switch assemblies carried on said base, parallel separating walls forming part of the base and separating some of said switch assemblies, an auxiliary base formed with outside and inside recesses and having therebetween a horizontal wall and a wall separating other of said switch assemblies on the main base, the inside one of said recesses accommodating all of the switch assemblies, means for fastening the auxiliary base to the main base through its separating wall, a row of openings joining said recesses and extending perpendicularly to said separating wall, sliding pins in said openings respectively, a snap-acting spring disc carried in the outside recess and normally concave toward said pins and an equalizer bar in said outside recess resting upon said pins, said outside recess being peripherally notched to guide the ends of the bar.

7. A multi-pole snap-acting switch comprising a main insulating base, a plurality of switch assemblies carried on said base, parallel separating walls forming part of the base and separating some of said switch assemblies, an auxiliary base formed with outside and inside recesses and having there between a horizontal wall and a wall separating other of said switch assemblies on the main base, the inside one of said recesses accommodating all of the switch assemblies, means for fastening the auxiliary base to the main base through said separating wall, a row of openings joining said recesses and extending perpendicularly to said separating wall, sliding pins in said openings respectively, a snap-acting spring disc carried in the outside recess and normally concave toward said pins and an equalizer bar in said outside recess resting upon said pins, said outside recess being peripherally notched to guide the ends of the bar, lost motion engagement means between the disc and said equalizing bar, and a cover on said auxiliary base enclosing said outside recess, a bushing attached to said cover, sliding operating means in said bushing and a spring between said sliding operating means and connected to apply force resiliently to said disc.

8. A multi-pole snap-acting switch comprising a plurality of biased spring switch arms, operating pins supported by said arms, a loosely guided equalizer bar supported by said pins, and a snap-acting spring member cooperating with lost motion with said equalizer bar.

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