Aug. 26, 1958 A. R. CELLERINI 2,849,555

OPERATING MECHANISM FOR ENCLOSED CIRCUIT BREAKERS OR SWITCHES

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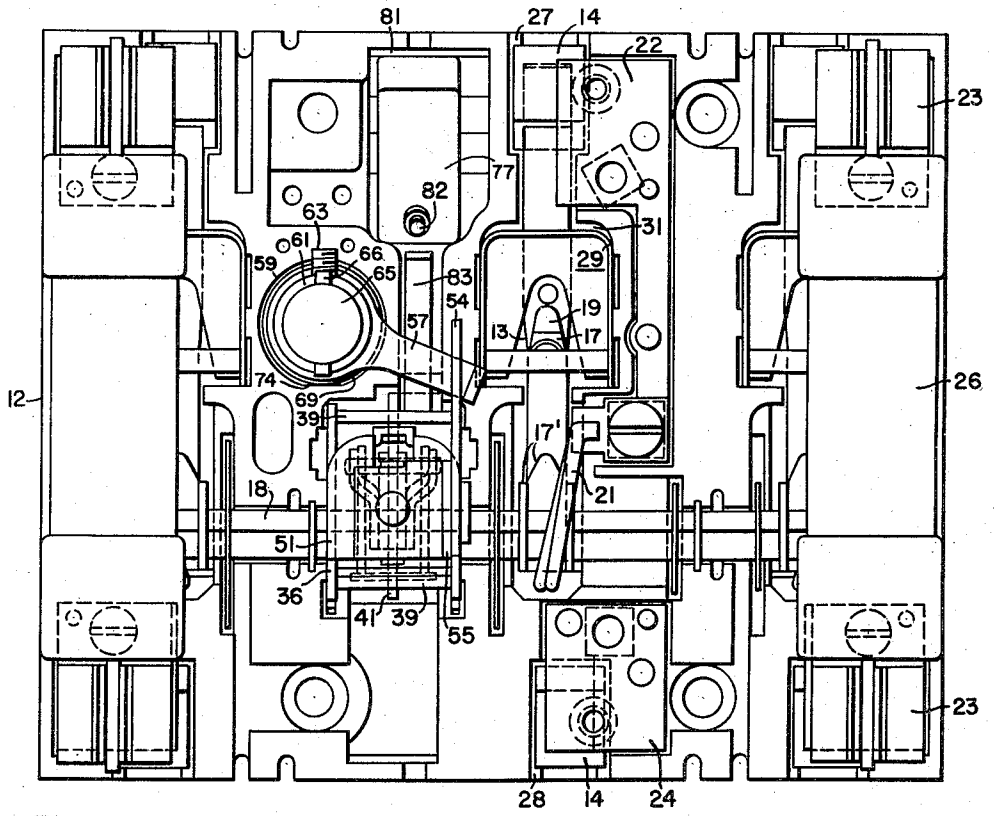


Fig. 1.

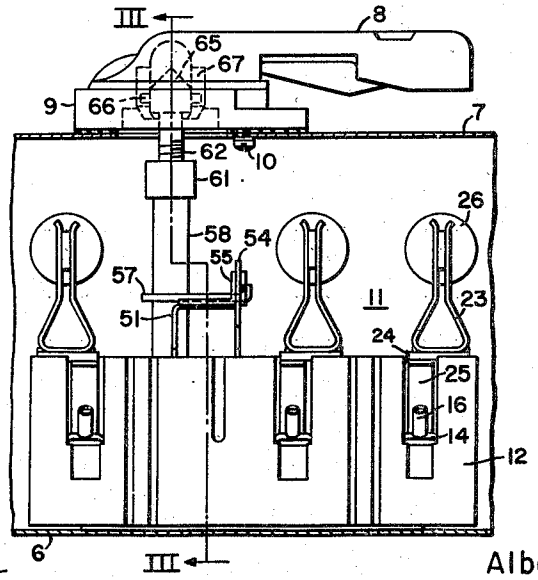


Fig. 2.

WITNESSES

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Fig. 3.

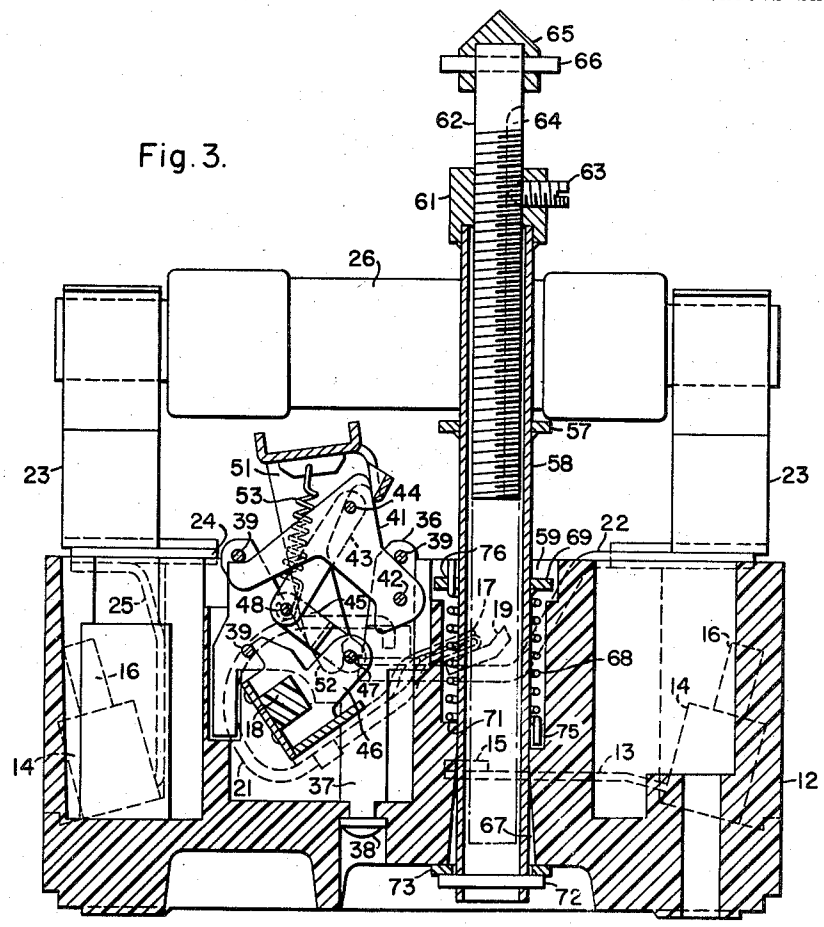
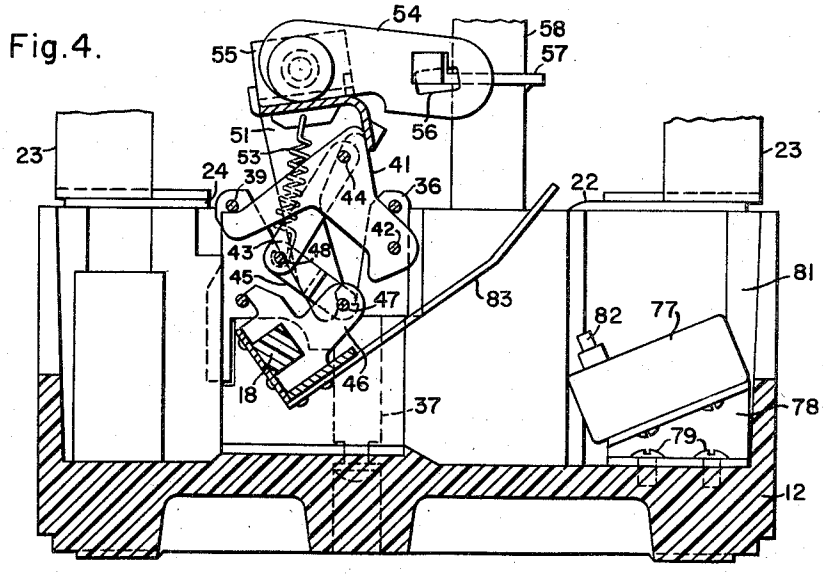


Fig. 4.



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OPERATING MECHANISM FOR ENCLOSED CIRCUIT BREAKERS OR SWITCHES

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10 Claims. (Cl. 200—50)

My invention relates, generally, to operating mechanisms for circuit interrupters, such as automatic circuit breakers and manually operable switches which may be mounted inside enclosing cabinets and having an operating handle mounted on the cover of the cabinet.

An object of my invention is to provide an operating mechanism suitable for utilization with enclosures of different depths.

Another object of my invention is to provide an operating mechanism suitable for operating circuit interrupters having toggle mechanisms for actuating the movable contact members of the interrupter.

A further object of my invention is to provide a variable depth operating mechanism for an enclosed circuit interrupter which permits a predetermined amount of misalignment between the operating shaft of the mechanism and the external operating handle on the cover of the enclosure.

Still another object of my invention is to provide a self-aligning mechanism having a torsion spring which also functions to resiliently support the operating shaft of the mechanism.

A still further object of my invention is to provide for operating an auxiliary switch by the same mechanism which operates the main contact members of a switch.

Other objects of my invention will be explained fully hereinafter or will be apparent to those skilled in the art.

In accordance with one embodiment of my invention, the operating shaft of a variable depth mechanism is threaded into the upper end of a sleeve, the lower end of which is rotatably mounted in an opening in the base of a toggle actuated switch. A torsion spring surrounds the sleeve and has one end anchored in the base and the other end anchored to a washer secured to the sleeve. The spring is held under compression between the washer and a shoulder in the opening in the base. A roll pin extends through the sleeve below the opening in the base to retain the sleeve in the base. Thus, the spring cushions the shaft both vertically and horizontally and permits misalignment between the upper end of the shaft and the external operating handle on the cover of the enclosure for the switch. An operating arm, which is secured to the sleeve, is connected to an operating lever of the toggle mechanism by a link, thereby operating the switch by means of the external operating handle. The torsion spring biases the external handle towards the "on" position, thereby counteracting the weight of the handle when the switch is mounted in a vertical position.

For a better understanding of the nature and objects of the invention, reference may be had to the following detailed description, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a view, in plan, of a portion of an electric switch embodying the principal features of my invention;

Fig. 2 is a reduced view, partly in section and partly in end elevation, showing the switch mounted in an enclosure;

Fig. 3 is a view, in section, taken generally along the line III—III in Fig. 2; and

Fig. 4 is a view, partly in section and partly in elevation, showing the actuating mechanism for the switch.

Referring to the drawings, and particularly to Fig. 2, the structure shown therein comprises a sheet metal cabinet 6 having a cover 7 attached thereto by means of hinges (not shown). In the interest of simplicity only a portion of the cabinet 6 is shown in the present drawings. An operating handle 8 is rotatably mounted in a hub 9 which may be attached to the outside of the cover 7 by means of screws 10 inserted into the hub 9. As will be more fully described hereinafter, the external handle 8 is utilized for operating a switch 11 mounted inside the cabinet 6. The handle 8 may be of the type fully described in the copending application of J. O. Rexroad, Serial No. 502,465, filed April 19, 1955, now Patent No. 2,806,099, issued September 10, 1957.

The switch 11 is preferably of the type described in a copending application of A. R. Cellerini and H. D. Dorfman, Serial No. 619,582, filed October 31, 1956. As shown, the switch structure comprises a base 12 in which are disposed the terminal members, the contact members, the arc extinguishers and the actuating mechanism for a three-pole manually operable switch. The base 12 is of a unitary structure, and is, preferably, molded from a suitable insulating material. It is provided with a recess or compartment for the metal parts of each pole of the switch and a separate compartment for the toggle actuating mechanism. It is also provided with numerous recesses for the screws and rivets which are utilized for attaching the metal parts to the base.

As shown more clearly in Fig. 3, each pole of the switch structure comprises a line terminal assembly which includes a conductor 13, a terminal clamp or collar 14 attached to one end of the conductor 13 for connecting a line conductor to the conductor 13, and a contact member 15 secured to the other end of the conductor 13. The collar 14 is provided with a threaded screw 16 for connecting a line conductor to the terminal. A contact arm 17 is secured to an insulating shaft 18 by means of a clamp or bracket 17'. A contact member 19 is attached to one end of the contact arm 17. As will be described more fully hereinafter, the shaft 18, which is rotatably mounted in the base 12 and disposed parallel to the base, is rotated by a toggle mechanism to oscillate the contact arm 17 thereby engaging the contact member 19 with the contact member 15.

A flexible conductor 21, which has one end attached to the contact arm 17 and the contact member 19, has the other end attached to a line side fuse terminal 22. A fuse clip 23 is removably attached to the terminal 22.

A load side fuse terminal or plate 24 is attached to the base 12. Another fuse clip 23 is removably attached to the plate 24. A load side terminal assembly, which includes a collar 14 and a conductor 25, is connected to the plate 24. One end of the conductor 25 may be brazed or soldered to the bottom of the plate 24. The collar 14 is provided with a screw 16 for connecting a load conductor to the conductor 25. A fuse 26, which may be of the cartridge type, is installed in the fuse clips 23.

As shown in Fig. 1, the line side terminal assembly for each pole is disposed in a recess 27 in the base 12, and the load side terminal assembly for each pole is disposed in a recess 28 in the base 12. An arc extinguisher 29 and the contact members for each pole are disposed in a recess 31 in the base 12. As explained in the aforesaid copending application of Cellerini and Dorfman, the toggle actuating mechanism is disposed in a separate recess located between two poles of the switch, thereby

keeping the actuating mechanism electrically deenergized at all times.

The toggle mechanism for actuating the contact members of the switch may be of a type previously utilized in manually operable switches. As shown most clearly in Figs. 3 and 4, the mechanism is supported between a pair of spaced mounting plates 36, only one of which is shown. Each plate 36 is provided with an extension 37 which projects through an opening in the base 12 and may be riveted to secure the plate to the base, as shown at 38 in Fig. 3. The two supporting plates 36 may be secured together by spacing studs 39.

A cradle member 41 is disposed between the plates 36 in a fixed position. One end of the cradle member 41 is attached to a stud 42 which extends between the plates 36 and is attached to the plates. The other end of the cradle member 41 is anchored under one of the spacing studs 39 as shown in Figs. 3 and 4.

A toggle link 43 is pivotally connected to the cradle member 41 by a pin 44. Another toggle link 45 is pivotally connected to an actuating arm or bracket 46 by means of a pin 47. The toggle links 43 and 45 are pivotally connected together by a toggle pin 48. The actuating arm or bracket 46 is secured to the shaft 18 to which the contact arms 17 are attached, as previously explained.

A generally U-shaped operating lever 51, which is inverted, is pivotally mounted in rounded bottoms 52 of V-shaped notches in the mounting plates 36. Overcenter toggle springs 53 are connected between the toggle pin 48 and the base of the U-shaped lever 51. As shown in Fig. 4, a link 54 is pivotally connected to a bracket 55 which is attached to the base of the operating lever 51. The link 54 has an opening 56 therein through which one end of an operating arm 57 extends. The arm 57 is secured to a sleeve 58 which is rotatably mounted in an opening 59 in the base 12. The sleeve 58 is rotated to operate the switch mechanism in a manner which will be described more fully hereinafter.

As explained hereinbefore, it is desirable to provide for mounting switches of the present type in enclosures which may be of different depths. Also, it is desirable to provide for a certain amount of misalignment between the operating shaft for the switch mechanism and the external operating handle which is mounted on the cover of the enclosure. As shown most clearly in Fig. 3, an internally threaded member 61 is secured to the upper end of the sleeve 58. An operating shaft 62 is adjustably threaded into the member 61. Thus, the vertical height of the upper end of the shaft 62 may be adjusted in accordance with the depth of the enclosure in which the switch is mounted. The shaft 62 may be retained at the desired height by means of a set screw 63 which extends through the member 61 into a groove 64 in the shaft 62.

A generally cone-shaped cap 65 is mounted on the upper end of the shaft 62, and a pin 66 extends through the cap 65 and the shaft 62. As shown in Fig. 2, the cap 65 and the pin 66 are disposed in a recess 67 in the handle 8 when the cover 7 of the enclosure 6 is closed. Thus, the shaft 62 and the sleeve 58 may be rotated by means of the handle 8 to operate the switch mechanism.

The sleeve 58 is normally disposed substantially perpendicularly to the base 12. In order to permit misalignment between the upper end of the shaft 62 and the recess in the handle 8 for receiving the upper end of the shaft, the lower portion of the opening 59 in the base 12 is flared outwardly, as shown at 67 in Fig. 3. The sleeve 58 is resiliently supported in the opening 59 by a spring 68 which is disposed between a washer 69 secured to the sleeve 58 and a shoulder 71 on the base 12. A roll pin 72 extends through the lower end of the sleeve 58 and engages a washer 73 disposed between the pin 72 and the base 12. Thus, the sleeve 58 is rotatably mounted in the base, and the upper end of the shaft 62 is free to move laterally, thereby permitting misalignment between the shaft 62 and the handle 8 on the cover of the enclosure. The spring 68 also cushions the shaft 62 to prevent injury to the mechanism in case the cover is slammed during closing.

As shown most clearly in Fig. 1, the upper portion of the opening 59 in the base 12 has a straight side 74. This straight side is engaged by the washer 69 on the sleeve 58 to prevent sagging of the sleeve and the shaft 62 when the switch is mounted vertically with the shaft 62 then disposed horizontally and the straight side 74 being at the lower side of the washer 69.

As shown in Fig. 3, one end of the spring 68 is anchored to the base 12 in a recess 75 in the base. The other end of the spring 68 extends through an opening 76 in the washer 69. Thus, the spring 68 applies a torsion force to the sleeve 58, thereby counteracting the weight of the handle 8 when the switch is mounted vertically with the shaft 62 disposed horizontally. Therefore, the spring 68 performs a dual function of resiliently supporting the sleeve 58 in the base and also applying a torsion force to the sleeve.

It is frequently desirable to provide an auxiliary switch or auxiliary contact members which are operated in conjunction with the main contact members of a switch of the present type. The auxiliary contact members may be utilized in control or indicating circuits for the main switch. As shown in Figs. 1 and 4 an auxiliary switch 77 is mounted on a bracket 78 which is attached to the base 12 by screws 79. The switch 77 is disposed in a recess 81 in the base 12. The switch 77 may be of a snap-acting type available on the open market, and the contact members of the switch are actuated by a plunger 82.

As shown most clearly in Fig. 4, an arm 83 is attached to the actuating bracket 46 which, as explained hereinbefore, is attached to the shaft 18. When the shaft 18 is rotated by means of the toggle mechanism to oscillate the contact arms of the main switch, the arm 83 is oscillated to engage the plunger 82, thereby operating the contact members of the auxiliary switch 77. Thus, the auxiliary switch is operated in conjunction with the main contact members of the switch.

As previously explained, the auxiliary switch may be connected in any desired circuit by means of conductors (not shown) which may be readily connected to the auxiliary switch. In this manner the auxiliary switch may be mounted in space available in the base 12 and operated by an arm connected to the main shaft 18 which is rotatably mounted in the base and disposed parallel to the base.

From the foregoing description, it is apparent that I have provided a mechanism for operating a switch or circuit breaker which is mounted in an enclosure. I have provided a simple and efficient means for adjusting the height of the operating shaft of the mechanism in accordance with the depth of the enclosure in which the switch is mounted. I have also provided for resiliently supporting the operating shaft to prevent injury to the mechanism when the cover of the enclosure is slammed and to take care of misalignment between the operating shaft and the external operating handle on the cover of the enclosure. I have also provided for mounting and operating an auxiliary switch in conjunction with the main contact members of the switch.

Since numerous changes may be made in the above-described construction, and different embodiments of the invention may be made without departing from the spirit and scope thereof, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. In a multi-pole electric switch, in combination, a unitary insulating base having a plurality of recesses

therein, main contact members for each pole disposed in separate recesses in the base, a shaft rotatably mounted parallel to said base for actuating said main contact members, an actuating mechanism disposed in another recess in the base for rotating said shaft, an auxiliary switch disposed in a recess in the base, and actuating means operated by said shaft in a plane perpendicular to the base for actuating said auxiliary switch.

2. In a multi-pole electric switch, in combination, a unitary insulating base having a plurality of recesses therein, main contact members for each pole disposed in separate recesses in the base, a shaft rotatably mounted parallel to said base for actuating said main contact members, an actuating mechanism disposed in another recess in the base for rotating said shaft, an auxiliary switch disposed in a recess in the base, and an arm attached to said shaft and movable in a plane perpendicular to the base for actuating the auxiliary switch.

3. In a multi-pole electric switch, in combination, a unitary insulating base having a plurality of recesses therein, main contact members for each pole disposed in separate recesses in the base, a shaft rotatably mounted parallel to said base for actuating said main contact members, an actuating mechanism disposed in a recess between the contact members for two of the poles of the switch for rotating said shaft, an auxiliary switch disposed between said two poles of the switch, and an arm attached to said shaft and movable in a plane perpendicular to the base for actuating the auxiliary switch.

4. In a circuit interrupter, in combination, an insulating base having a plurality of recesses therein, main contact members disposed in some of said recesses, terminal members disposed in other recesses, an actuating mechanism disposed in another recess for actuating said main contact members to and from a closed position, an auxiliary switch disposed in a recess in said base between said terminal members, and actuating means operated by said actuating mechanism for actuating said auxiliary switch, said actuating means engaging the auxiliary switch when the main contact members are in the closed position.

5. In a circuit interrupter, in combination, an insulating base having a plurality of recesses therein, main contact members disposed in some of said recesses, terminal members disposed in other recesses, an actuating mechanism disposed in another recess for actuating said main contact members to and from a closed position, an auxiliary switch disposed in a recess in said base between said terminal members, and an arm oscillated by said actuating mechanism to engage the auxiliary switch to operate the switch, said arm engaging the auxiliary switch when the main contact members are in the closed position.

6. In a multi-pole electric switch, in combination, an insulating base having a plurality of recesses therein, a shaft rotatably mounted parallel to said base, a contact arm for each pole disposed in a separate recess in the base, said contact arms being attached to said shaft, an actuating mechanism disposed in another recess in the base for rotating said shaft to oscillate said contact arms, an operating shaft rotatably mounted in an opening in the base substantially perpendicularly to the base, an operating arm driven by the operating shaft to operate the actuating mechanism, and operating means for rotating said operating shaft.

7. In a multi-pole electric switch, in combination, an insulating base having a plurality of recesses therein, a shaft rotatably mounted parallel to said base, a contact arm for each pole disposed in a separate recess in the base, said contact arms being attached to said shaft, an actuating mechanism disposed in another recess in the base for rotating said shaft to oscillate said contact arms, an operating shaft rotatably mounted in an opening in

the base substantially perpendicularly to the base, spring means disposed in said opening for resiliently supporting the operating shaft, an operating arm driven by the operating shaft and connected to the actuating mechanism to operate the mechanism, and operating means for rotating said operating shaft.

8. In a multi-pole electric switch, in combination, an insulating base having a plurality of recesses therein, a shaft rotatably mounted parallel to said base, a contact arm for each pole disposed in a separate recess in the base, said contact arms being attached to said shaft, an actuating mechanism disposed in another recess in the base for rotating said shaft to oscillate said contact arms, an operating shaft rotatably mounted in an opening in the base substantially perpendicularly to the base, a spring disposed in said opening to resiliently support the operating shaft and to apply a torsion force to the shaft, an operating arm driven by the operating shaft and connected to the actuating mechanism to operate the mechanism, and an operating handle for rotating the operating shaft, the torsion force of said spring counteracting the weight of said handle.

9. In a multi-pole electric switch, in combination, an insulating base having a plurality of recesses therein, a shaft rotatably mounted parallel to said base, a contact arm for each pole disposed in a separate recess in the base, said contact arms being attached to said shaft, an actuating mechanism disposed in another recess in the base for rotating said shaft to oscillate said contact arms, a sleeve disposed substantially perpendicularly to the base and having one end rotatably mounted in an opening in the base, a threaded member secured to the other end of the sleeve, an operating shaft threaded into said threaded member and adjustably fastened in the sleeve to rotate the sleeve, an operating arm secured to the sleeve and connected to the actuating mechanism to operate the mechanism, a spring surrounding the sleeve in said opening to resiliently support the sleeve and to apply a torsion force to the sleeve, and an operating handle for rotating the shaft, the torsion force of said spring counteracting the weight of said handle.

10. In a multi-pole electric switch, in combination, an enclosure having an openable cover, an external operating handle rotatably mounted on the cover, an insulating base mounted inside the enclosure and having a plurality of recesses therein, a shaft rotatably mounted parallel to the base, a contact arm for each pole disposed in a separate recess in the base, said contact arms being attached to said shaft, an actuating mechanism disposed in another recess in the base for rotating said shaft to oscillate said contact arms, an operating shaft rotatably mounted in an opening in the base substantially perpendicularly to the base and engaged by said operating handle when the cover is closed, a spring disposed in said opening to resiliently support the operating shaft and to apply a torsion force to the shaft, an operating arm driven by the operating shaft to operate the actuating mechanism, said operating shaft being adjustable in length for utilization in enclosures of different depths, said opening being of a larger diameter than said operating shaft to permit misalignment between the end of the operating shaft and the external operating handle, and the torsion force of said spring counteracting the weight of the external operating handle when it engages the operating shaft.

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