March 11, 1952 H. S. PHELPS ET AL 2,589,025

MULTIPOSITION SWITCH

Filed July 21, 1949 2 SHEETS—SHEET 1

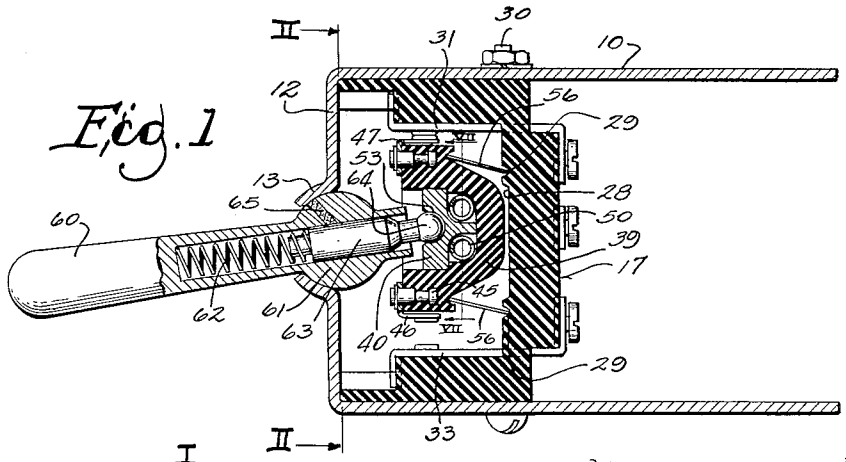



Fig. 1

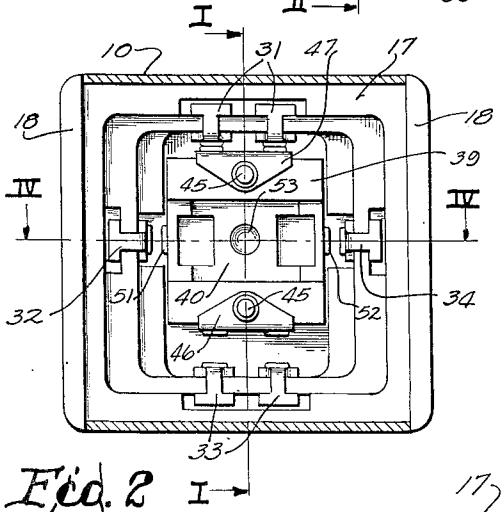



Fig. 2

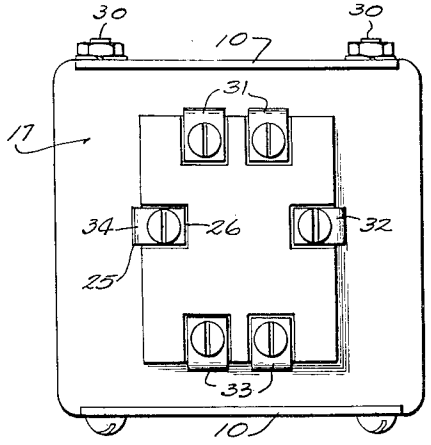



Fig. 3

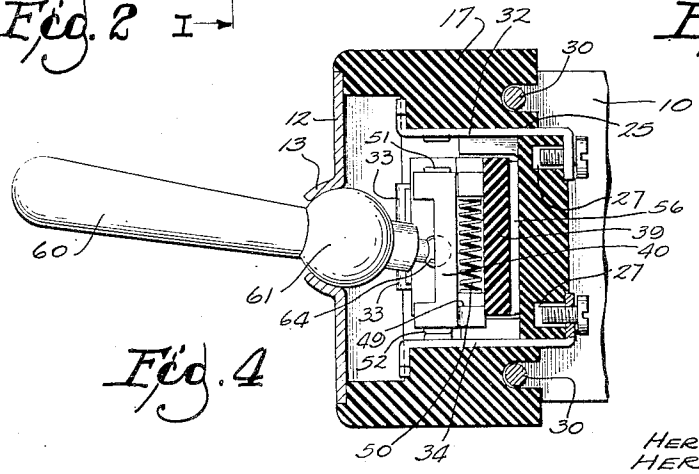



Fig. 4

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MULTIPOSITION SWITCH

Filed July 21, 1949 2 SHEETS--SHEET 2

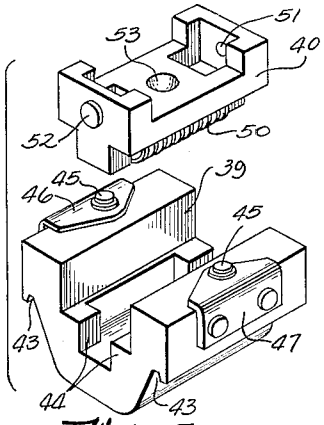



Fig. 5

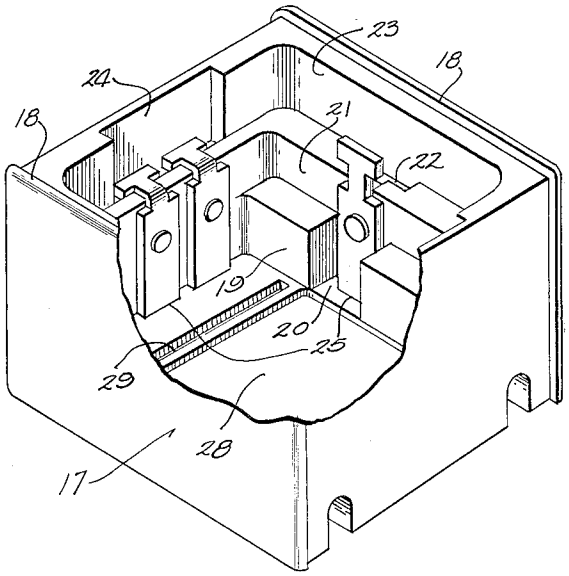



Fig. 6

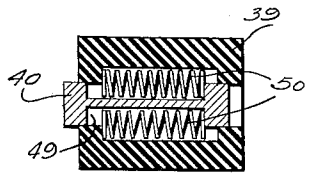



Fig. 7

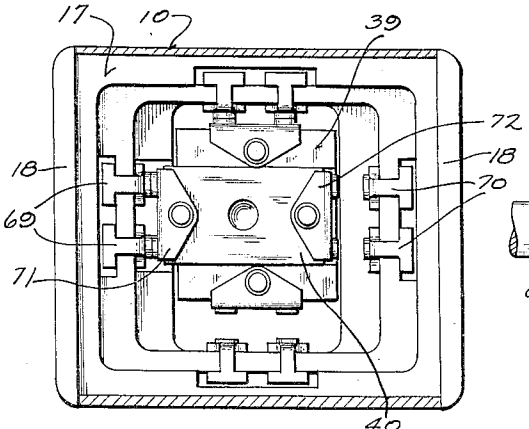



Fig. 8

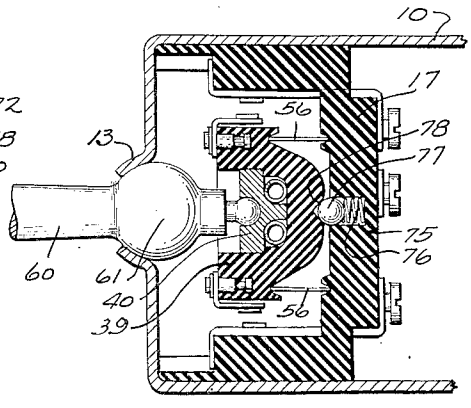



Fig. 9

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## MULTIPOSITION SWITCH

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14 Claims. (Cl. 200—16)

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This invention relates to improvements in electric switches and particularly to switches for controlling a plurality of circuits.

It is one object of the invention to provide a switch which may be used, first, to close either of two electrical circuits and, second, to close either of two other electrical circuits, and while one of the first two circuits remains closed.

Another object of the invention is to provide a switch for closing and keeping closed either one of one pair of electrical circuits until use of the other circuit is desired and for closing and holding closed by voluntary action, either one of another pair of electrical circuits.

Another object of the invention is to provide a switch in which a single lever actuates a composite movable member for closing and opening either one of two electrical circuits by lever movement to and fro in one direction and for closing or opening either one of two other electrical circuits by lever movement to and fro in another direction.

Objects and advantages other than those above set forth will be apparent from the following description when read in connection with the accompanying drawing in which:

Fig. 1 is a sectional view on the plane of line I—I of Fig. 2, of a switch embodying the present invention, and showing the operating lever or handle in position for closure of one of a first pair of circuits.

Fig. 2 is a sectional view on the plane II—II of Fig. 1, with the handle removed.

Fig. 3 is a bottom plan view of the present construction.

Fig. 4 is a sectional view on the plane of line IV—IV of Fig. 2, and showing the handle in position for closure of one of a second pair of circuits.

Fig. 5 is a perspective view of the composite movable contact block sub-assembly of the switch.

Fig. 6 is a perspective view of the base subassembly of the switch.

Fig. 7 is a sectional view on the plane of line VII—VII of Fig. 1, of the assembled composite movable member of the switch.

Fig. 8 is a view similar to Fig. 2 of a modification in the arrangement of the terminals for the several circuits to be controlled by the switch; and

Fig. 9 is a view similar to Fig. 1 and with means for retaining the switch movable member in an initial position.

Generally, the present multi-position switch includes a base providing a cavity in which are mounted a plurality of terminals for several electrical circuits. A movable member is mounted in the cavity on blades to reduce friction in an over-center toggle action of such member as a whole, upon movement thereof to and fro in one direction for closing and keeping closed one or the other of a first pair of circuits and until the movable member is voluntarily shifted. The movable member comprises a plurality of blocks of which a first block has mounted thereon a second block movable relative to the first block, the second block being biased toward an initial position by springs. A lever presses resiliently on the movable member to coact with the blades in obtaining the over-center toggle action and to permit shifting of the second block relative to the first block for closing either one of a second pair of electrical circuits. Due to the spring bias of the second block, as soon as the handle is released, such block returns to its initial position and the previously closed one of the second pair of electrical circuits is interrupted.

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Referring particularly to the drawings in which like reference numerals are applied to like parts, 10 generally designates a resilient, and preferably metallic, U-shaped plate with the legs of the U extending beyond the other switch parts and serving as a mounting means for the complete switch, a portion 12 of the plate serving as a cover for the contact making and breaking switch parts. The cover portion 12 is formed with a spherical seat 13 about an aperture through the cover portion, the one edge of the aperture being rounded to reduce wear on the part coacting with the seat.

A base (see Fig. 6) of insulating material is generally designated 17 and is formed with flanges 18 at both base ends and about three sides of the base for retaining the base in position in the mounting-cover plate, and for keeping out dust and water. The base is formed with a cavity therein varying in size from the bottom of the cavity, the size adjacent the bottom of the cavity being smallest and being defined by side walls 19 with notches 20. The intermediate and next larger size of the cavity is defined by walls 21 with notches 22 in the upper edge of such wall, and the upper and largest size of the cavity is defined by wall portion 23 with notches 24 therein. Apertures 25 are provided through the base from the bottom of the cavity, and the bottom exterior surface of the base is provided with notches 26 and sockets 27 adjacent to the apertures 25. It will be noted that the interior bottom wall surface of the base is depressed as shown at 28 and that grooves 29 are formed therein ad-

jacent the sides of such depression. The base and cover are joined by bolts 30 passing through the base and the legs of the cover.

Stationary contacts and terminals for the several electrical circuits to be controlled are formed as bars passing through the base apertures 25 and with the upper ends formed to engage in the notches 22 in the intermediate interior wall 21 and in the notches 26 in the exterior bottom surface of the base, such contact-terminals for the several circuits being designated 31, 32, 33 and 34. It will be seen that the stationary contacts are located in the base by bending the contact ends to seat in the notches and that the ends of the contacts outside of the base bottom apertures are bent to fit into the notches adjacent the apertures. The outside ends of the terminals are apertured and threaded to receive terminal screws 35. The above construction avoids the placing of metallic inserts in a mold when the base is formed of one of the known plastics.

A movable switch member (see Fig. 5) is formed from a first or main block generally designated 39 in which is mounted a second and sliding block generally designated 40. The blocks may be formed of electrical insulating material or conductive material dependent on the circuits to be controlled. The main block 39 is generally U-shaped with overhanging portions at the end of the U-legs to define grooves 43, and with interrupted walls 44 at the bottom of the U for substantially defining a rectangular cavity therein. Inserts 45 are severally placed in the legs of the main block for retaining movable contact members 46, 47 thereon for several engagement thereof with the stationary contacts 31 and 33.

The sliding block 40 is substantially T-shaped with the ends of the T-leg of a size to pass between the partial end walls 44 of the main block 39 and with notches 49 in the sides of the T-leg to receive helical compression springs 50. The leg of the sliding block and the springs are adapted to enter the cavity in the main block so that moving of the sliding block therein seats the springs 50 on one or the other of the end walls 44 of the main block as shown in Fig. 7. A notch 49 is formed in each end of the T-bar of the sliding block for mounting contacts 51, 52 on the block and a spherical socket 53 is formed in the top of the sliding block. The composite movable member is supported in the base cavity on blades 56 which are severally mounted edgewise in the grooves 29 in the base bottom and in the grooves 43 of the main block legs to serve as pivots for moving the main block between the fixed contacts 31 and 33 in the base.

A lever which may serve as a handle is mounted in the cover and extends through the cover into the socket 53 of the sliding block for moving both the composite member and the sliding block individually. The lever comprises a main portion 60 with a spherical portion 61 and is partially bored axially to receive a spring 62 and a portion of a pin 63 with a spherical head 64 at one end, the other end of the pin being reduced in size to provide a seat and guide for the spring. The spherical handle portion 61 engages the seat 13 in the cover 12 with the handle portion 60 protruding through the aperture in the cover, and the pin-head 64 seats in the sliding block socket 53 when the switch is assembled. Lubrication is provided for the engaging surfaces of the seat 13 and the lever spherical portion 61, by oil absorbed in a wick 65 placed under compression in a hole in the spherical handle portion. The hole is so placed that the one end thereof is always within the area of the seat 13 in all positions of the switch lever. It has been found that sufficient lubrication is provided for several hundred thousand switch movements merely by soaking the wick in oil before insertion in the hole, the oil spreading by capillary action over all the engaging surfaces of the seat 13 and spherical handle portion 61.

Because of the handle construction and of the blades 56, the switch movable member has an over-center toggle action which produces a snap action engagement of the contacts 31, 33 and retains the movable member in position for closing either of such contacts as desired. In addition to movement of the entire movable member in one direction by movement of the handle to and fro in line between contacts 31, 33, the sliding block 40 may be moved to and fro transversely of such line against the compression of springs 50 to cause engagement of the contacts 51 and 52 thereof with the fixed contacts 32 or 34. However, when the handle is released, the springs 50 return the sliding block to its inital position. The switch may, therefore, be said to close either of two circuits and to remain in either such positions until voluntarily brought back to the initial position. Dependent on the location of the contacts 32, 34 and of interlock notches 20, the switch may also close either one of two other electrical circuits but will automatically return to an initial position if the handle is released. Thus the contacts 32, 34 may be so placed that one of the second pair of electrical circuits will be closed when either one of the first pair of circuits is closed. It will be understood that springs 50 may be omitted if it is desired to have the circuits of contacts 32 or 34 remain closed rather than opened upon release of the handle. If desired a blade mounting may also be provided for the sliding block to coact with the handle in providing an over-center toggle action of such block.

In the structure shown in Figs. 1 to 7, the mounting and cover 10 forms one side of the circuits coacting with contacts 32, 34 while in the modification shown in Fig. 8, double terminals are shown at 69, 70 in place of the single terminals 32, 34 to provide a dead front switch. It is then necessary to provide double contacts on the sliding block as shown at 71, 72.

In the modification shown in Fig. 9, a socket 75 is formed in the base 17 to receive a spring 76 on which is placed a ball 77 for engaging in a socket 78 in the main block 39 thereby positively locating the movable member in the initial position.

It will thus be seen that the present structure provides a switch which may be placed in and retained in either of two positions for closing either one of a first pair of separate electrical circuits. A second pair of electrical circuits may also be closed and held closed as long as desired. Movement for opening and closing the first pair of circuits is by an over-center toggle action which opens or closes one of the first pair of circuits. Movement for closing and opening the second pair of circuits, however, is under spring action. Thus one of each pair of circuits may be closed simultaneously or one of each pair of circuits may be closed singly dependent on the position of the interlock notch in the switch.

Although but two embodiments of the present invention have been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

We claim:

1. In a switch for controlling a plurality of electric circuits, a base having a cavity therein, a plurality of contact-terminals mounted in the base, a movable member mounted in the base cavity and comprising a plurality of blocks movable in directions at an angle relative to each other, a plurality of contacts mounted on each of the blocks for severally engaging the contact-terminals, and means for shifting the movable member as a whole and for shifting one of the blocks individually, the block contacts severally closing two of the circuits at the same time.

2. In a switch for controlling a plurality of electric circuits, a base, a plurality of contact-terminals mounted on the base, a movable member comprising a plurality of blocks movable relative to each other, blades pivotally mounting the movable member on the base, one of the blocks being mounted on the other block, a plurality of contacts mounted on each of the blocks for severally engaging the contact-terminals, and a lever for shifting the movable member as a whole in one direction and for individually shifting the said one block in another direction for thereby severally closing one of the circuits in each direction of movement of each of the blocks.

3. In a switch for controlling a plurality of electrical circuits, a base, a cover for the base, a plurality of contact-terminals mounted on the base, a movable member mounted on the base and comprising a plurality of blocks movable relative to each other, a plurality of contacts mounted on each of the blocks for severally engaging the contact terminals, and a lever engaging the cover and the movable member for shifting the movable member as a whole in one direction and for individually shifting one of the blocks relative to the other block and in another direction, movement of the member as a whole closing and opening one pair of circuits and movement of the said one block individually closing and opening another pair of circuits.

4. In a switch for controlling a plurality of electrical circuits, a base, a plurality of contact-terminals mounted on the base, a movable member mounted on the base and comprising a first block and a second block mounted on the first block, springs between the blocks for returning the second block to an initial position, a plurality of contacts on the blocks for severally engaging the contact-terminals, and a lever for shifting the movable member as a whole and for individually shifting the second block.

5. In a switch for controlling a plurality of electrical circuits, a base, a cover for the base and having an apertured spherical seat therein, a plurality of contact-terminals mounted on the base, a movable member mounted on the base and comprising a first block and a second block mounted on the first block, a plurality of contacts on the blocks for severally engaging the contact-terminals, and a lever for shifting the movable member as a whole and for individually shifting the second block, the lever extending through the cover aperture and having a spherical portion engaging in the cover seat.



6. In a switch for controlling a plurality of electrical circuits, a base, a cover for the base, the cover having a spherical seat therein, a plurality of contact-terminals mounted on the base, a movable member movable as a whole and comprising a plurality of blocks individually movable relative to each other, a plurality of contacts on the blocks for severally engaging the contact terminals, a lever having a spherical portion engaging the seat in the cover and engaging the movable member for shifting the same for closing a desired one of the circuits, and means for lubricating the engaging surfaces of the cover seat and the lever.

7. In a switch for controlling a plurality of electrical circuits, a base, a cover for the base and having a seat therein, a plurality of contact-terminals mounted on the base, a movable member movable as a whole and comprising a plurality of blocks movable individually relative to each other, a plurality of contacts on the blocks for severally engaging the contact terminals, an axially socketed lever engaging the seat in the cover, a pin slidable in the lever, and a spring acting between the lever and the pin for providing resilience in the action of the lever on the movable member.

8. In a switch for controlling a plurality of electrical circuits, a base having a cavity therein, a plurality of contact-terminals mounted in the base cavity, a movable member comprising a plurality of blocks movable within the base cavity, blades pivotally mounted in the base cavity for mounting of the movable member therein, a plurality of contacts mounted on the blocks for severally engaging the contact-terminals, and means for shifting the movable member for closing a desired one of the circuits and comprising an axially socketed lever, a spherical headed pin slidable in the lever and engageable with the movable member, and a spring acting between the lever and the pin.

9. In a switch for controlling a plurality of electrical circuits, a base having a cavity therein, a plurality of contact-terminals mounted in the base cavity, a movable member comprising a plurality of blocks movable as a whole and individually within the base cavity, blades pivotally mounted in the base cavity for pivotally mounting the movable member, a plurality of contacts mounted on the blocks for severally engaging the contact-terminals, and means for shifting the movable member for closing a desired one of the circuits, the means comprising a socketed lever, a pin slidable in the lever and engageable with the movable member and a spring acting between the lever and the pin, and a detent in the base for engagement with and for retention of the movable member in an initial position.

10. In a switch for simultaneously controlling a plurality of electric circuits, an insulation base having a cavity therein with apertures through the cavity bottom and notches in the exterior base surfaces adjacent the apertures, the base having grooves from the interior surfaces and aligned with the apertures, a plurality of contact-terminals severally extending through the base apertures and seated in the interior grooves and exterior notches in the base, a member movable as a whole in the base cavity and comprising a plurality of individually movable blocks, a plurality of contacts mounted on each of the blocks for several engagement thereby with pairs of the

contact-terminals, and means for shifting the movable member as a whole and for shifting one of the blocks individually for closing a plurality of circuits at the same time.

11. In a switch for controlling a plurality of electric circuits, a base having a rectangular cavity therein and having a pair of spaced parallel grooves in the bottom of the cavity, a plurality of contact-terminals mounted in the base cavity, a pair of blades engaged edgewise and severally in the base grooves, a movable member engaged edgewise by the blades and pivotally supported thereon, the movable member comprising a plurality of blocks, a plurality of contacts mounted on each of the blocks for severally engaging pairs of the contact-terminals, and means for shifting the movable member as a whole and for shifting one of the blocks individually for closing a plurality of circuits at the same time.

12. In a switch for controlling a plurality of electric circuits, a base having a rectangular cavity therein and having a pair of spaced parallel grooves in the bottom of the cavity, a cover for the base cavity, a plurality of contact-terminals mounted in the base cavity, a pair of blades engaged edgewise and severally in the base grooves, a movable member engaged edge by the blades and pivotally supported thereon, the movable member comprising a plurality of blocks, a plurality of contacts mounted on each of the blocks for severally engaging pairs of the contact-terminals, and a spring pressed lever acting on the movable member and reacting on the cover for pressing the movable member on the blades, the lever movements shifting the movable member as a whole and shifting one of the blocks individually for closing a plurality of circuits at the same time.

13. In a switch for controlling a plurality of electric circuits, a base having a cavity therein, a plurality of circuit contact-terminals mounted within the base cavity, a cover for the base cavity,



the cover having an aperture therethrough and a spherical seat formed about and including the aperture, a movable member mounted in the base cavity and comprising a plurality of blocks, a plurality of contacts mounted on each of the blocks for severally engaging pairs of contact-terminals, a lever having a spherical portion for shifting the movable member as a whole and for shifting one of the blocks individually, the lever extending through the cover aperture and having the spherical portion thereof movably seated in the cover seat, and a lubricant-absorbent wick carried by the lever for lubricating the engaging surfaces of the cover seat and the lever.

14. In a switch for controlling two of a plurality of electric circuits at the same time, a base having a cavity therein, a plurality of pairs of circuit contact-terminals mounted in the walls defining the base cavity and within the cavity, a movable member mounted in the base cavity and comprising a plurality of blocks, a plurality of contacts mounted on each of the blocks for severally engaging pairs of the contact-terminals, a lever for shifting the movable member as a whole and for shifting one of the blocks individually for closing two of the electric circuits at the same time, and a spring-pressed ball mounted in the base and engaging with the movable member for holding the movable member in circuit-open position.

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