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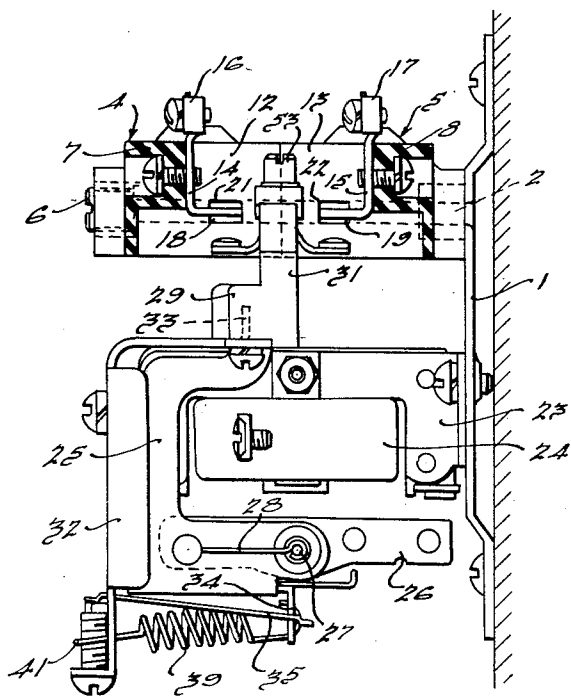
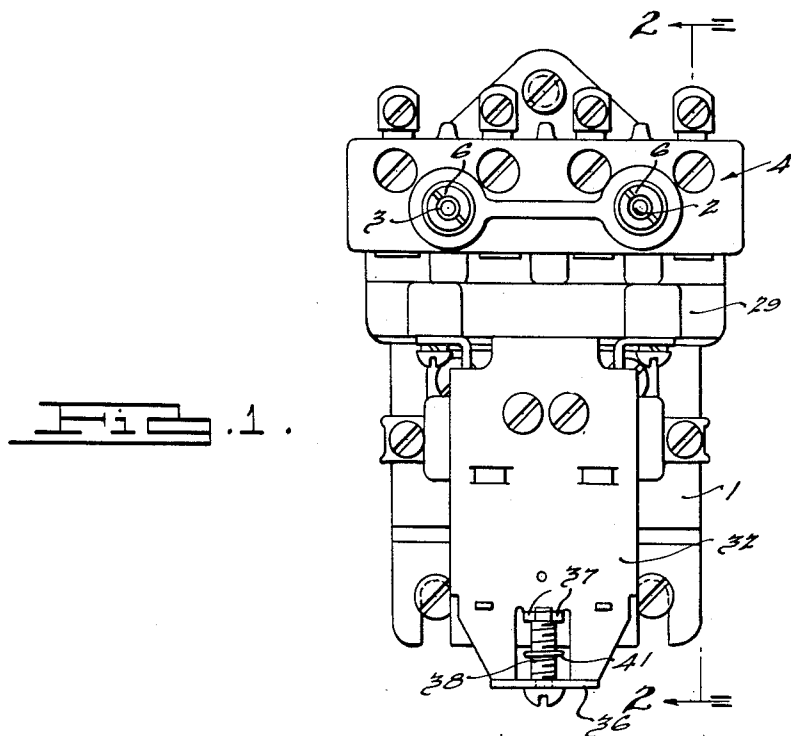
H. L. VAN VALKENBURG ET AL

2,589,167

ELECTRIC SWITCH

Filed March 15, 1946

2 SHEETS--SHEET 1



INVENTORS,  
Herman L. Van Valkenburg,  
Kenneth G. Sedgwick.

BY *Myra T. Fitch*

ATTORNEY.

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H. L. VAN VALKENBURG ET AL

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2 SHEETS—SHEET 2

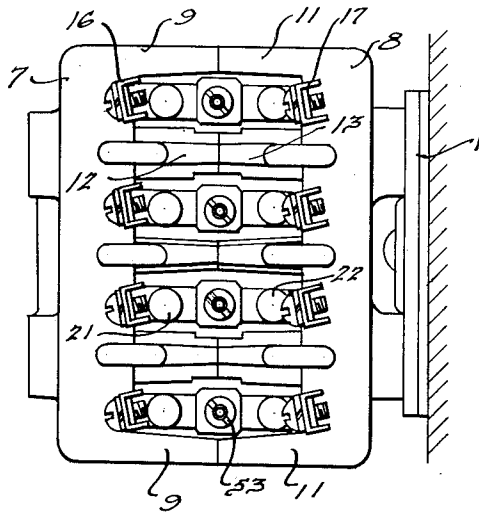


FIG. 1.

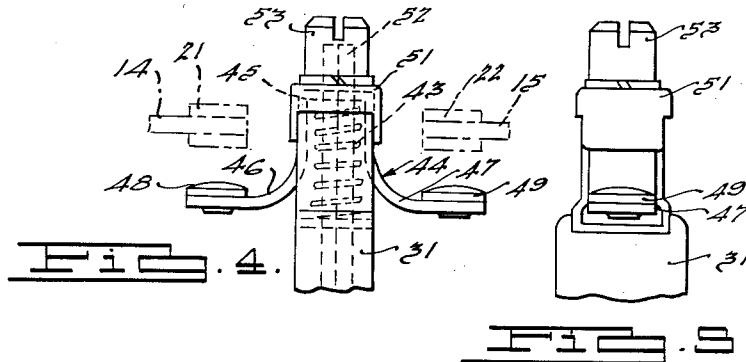


FIG. 2.

FIG. 3.

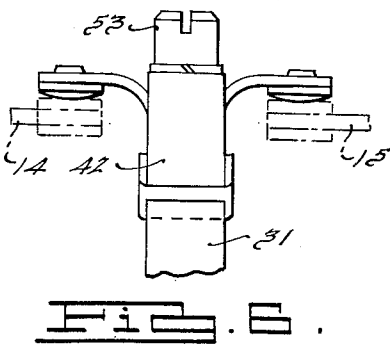


FIG. 4.

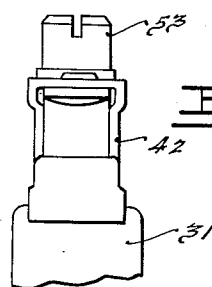


FIG. 5.

INVENTORS,  
Herman L. Van Valkenburg,  
Kenneth G. Sedgwick.

By Myron J. Geibold

ATTORNEY.

## UNITED STATES PATENT OFFICE

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## ELECTRIC SWITCH

Hermon L. Van Valkenburg, Wauwatosa, and  
Kenneth G. Sedgwick, Shorewood, Wis., assign-  
ors to Square D Company, Detroit, Mich., a  
corporation of Michigan

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9 Claims. (Cl. 200—166)

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This invention relates to an electric switch, and more particularly to an electric switch having cooperating contacts engaged and disengaged in response to energization and de-energization of an electromagnetic operator.

One object of the invention is the provision of an electric switch having a sectional insulating block upon which the stationary contacts are mounted, having improved features of removability and accessibility for the contacts.

Another object of the invention is the provision of an electric switch in which the contacts are readily changeable from normally open to normally closed type without manipulation of the stationary contacts.

Another object of the invention is the provision of an electric switch in which the movable contact is in the form of a bridging element with a biasing spring in which the bridging element and biasing spring are formed as a unit assembly readily reversible top for bottom to change the bridging element from a normally closed to a normally open contact.

Another object of the invention is an electric switch with normally closed contacts having their spring bias determined by the operating armature and its associated carrier in which an adjustable spring bias is applied to the armature to assist the gravitational bias thereon with the spring adjustment compensating for the bias exerted on the armature by the contact springs.

Other objects and features of the invention will be readily apparent to those skilled in the art from the specification and appended drawings illustrating certain preferred embodiments in which:

Figure 1 is a front elevational view of the switch according to the present invention.

Figure 2 is a vertical sectional view on the line II—II of Figure 1.

Figure 3 is a top plan view of the switch.

Figure 4 is a side elevational view of the movable contact element in its normally disengaged arrangement.

Figure 5 is a front elevational view of the movable contact arrangement of Figure 4.

Figure 6 is a side elevational view of the movable contact element in its normally engaged position.

Figure 7 is a front elevational view of the movable contact arrangement of Figure 6.

In the electric switch, according to the present invention, there is provided a back mounting plate 1 in which are rigidly secured a pair of forwardly extending elongated mounting studs 2 and 3. Upon the studs 2 and 3 are slidably

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mounted a pair of mating insulating blocks 4 and 5 rigidly secured upon the studs 2 and 3 by nuts 6 threaded thereon. The insulating blocks have front and back walls 7 and 8, side walls 9 and 11 and a plurality of intermediate barrier walls 12 and 13, with the side and barrier walls of the blocks meeting to form individual chambers. Within these chambers and upon the back face of the wall 7 and the front face of the wall 8 are supported conducting connectors 14 and 15 carrying terminal connectors 16 and 17 at their upper ends for the reception of circuit wiring. The conducting connectors 14 and 15 are L-shaped as shown in Figure 2, and at their interior ends carry stationary contacts 18 and 19 on their lower faces and additional stationary contacts 21 and 22 on their upper faces.

Rigidly secured to the back plate 1 is a generally E-shaped stationary field magnet 23 about the middle leg of which is disposed an operating coil 24. Slidably disposed at the sides of the front leg of the field magnet 23 is a carrier 25 of general U shape having pivotally mounted to its lower leg a bridging armature 25 by means of a pin 27 maintained in position by spring element 28. To the upper leg of the carrier 25 is mounted an insulating contact bar 29 having a plurality of integral posts 31 extending upwardly therefrom and upon which the movable contact units are mounted.

On the front face of the field magnet 23 is mounted a stationary support 32 having an upwardly extending flange 33 disposed in a slot in the contact bar 29 to serve as a guide therefor in its reciprocatory movement. The lower leg of the carrier 25 has a downwardly extending flange 34 and pivotally disposed between the flange 34 and the support 32 is a lever 35 pivotally connected thereto by tongue and slot engagement.

In the lower portion of the support 32 there are provided a supporting flange 36 and guide flanges 37 which serve to retain a freely rotatable screw element 38, this element having a reduced throat portion at flange 36 so that it may be rotated without effecting longitudinal movement. Between the screw element 38 and the flange 34 is disposed a biasing spring 39 having the end loop 41 thereof disposed in the spiral thread on the screw element so that rotation of the screw is accompanied by vertical movement of the loop 41 with consequent change in the angle of the spring bias and, hence, of the vertical biasing force on the armature 26.

The movable contact unit is shown more particularly in Figures 4 through 7. This unit is embodied by a U-shaped element 42 within which

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are disposed the contact biasing spring 43 and the bridging contact element 44. This bridging element has a central cup-shaped portion 45 and a pair of horizontal extending arms 46 and 47 carrying the movable contacts 48 and 49. The U-shaped element 42 is provided with a cap 51 enclosing the spring 43 and the bridging element 44 so that the element 42, spring 43, bridging element 44 and cap 51 form a unit assembly which may be removed as a unit without disassembly of the parts.

Extending from the posts 31 of the contact bar 29 are mounting studs 52 for the movable contact assembly, the horizontal faces of the element 42 and cap 51 having holes therein through which the stud 52 extends with the spring 43 being of a size to receive the stud 52 therein. A nut 53 holds the element 42 and its cap 51 rigidly upon the post 31 with the bridging element 44 free to reciprocate therein, but biased to its extreme position by the contact pressure spring 43.

The parts as shown in Figures 4 and 5 are in the normally disengaged position where the contacts are disengaged when the operating coil 24 is deenergized. To change the contacts to the normally closed type, as illustrated in Figures 6 and 7, the only operation is a reversal top for bottom of the movable contact unit assembly formed by the element 42, cap 51, bridging element 44 and spring 43. This is done by removing the nut 53 and moving the contact assembly top for bottom with replacement of the nut to secure it in position. It is to be noted that the connectors 14 and 15 have stationary contacts on both their top and bottom faces and that no change is necessary in the stationary contacts or their supporting connectors to modify the contact operation from normally engaged to normally disengaged. In the normally disengaged position, movable contacts 48 and 49 cooperate with the stationary contacts 18 and 19 to make and break the circuit and in the normally engaged position of Figures 6 and 7 the movable contacts 48 and 49 cooperate with the stationary contacts 21 and 22.

As the contacts are changed from normally disengaged to normally engaged positions, it is seen that an additional spring bias is placed upon the armature 26 and the carrier and contact bar moved thereby by the springs 43 which are stressed after engagement of the cooperating contacts. To compensate for this upwardly directed spring bias on the armature and its associated elements, the spring 39 is adjustable by the screw element 38 so that the downward bias on the armature 26 exerted by the spring 39 may be increased or decreased as more or less of the contacts are placed in the normally engaged arrangement.

With the contact mounting blocks herein used, maximum accessibility is provided for the stationary and movable contacts as a simple removal of the nuts 6 permits front block 4 and the stationary contact connectors 14 mounted thereon to be readily slid forward and off of the studs 2 and 3. To remove the back contact block 5, the movable contacts may be removed either individually or as a unit by removal of the bar 29 whereby the back contact block 5 and the stationary contact connectors 15 mounted thereon are slid forwardly from the studs 2 and 3. This ready accessibility and removal of the insulating blocks facilitates the repair and replacement of the stationary and movable contacts.

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While certain preferred embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto, as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims.

What is claimed is:

1. In an electric switch, a support, a back insulating block, a front insulating block, means for mounting said blocks upon the support, barrier walls on said blocks mating in the block supported position to form a plurality of individual chambers between the blocks, sets of spaced stationary contacts mounted in said chambers, one contact of each set being mounted on the back insulating block and one contact of each set being mounted on the front insulating block, movable bridging contacts cooperating with said sets of stationary contacts, an insulating carrier upon which said movable contacts are mounted, said movable contacts including a unit assembly of a bridging element, a contact pressure spring and an enclosure therefor, and means for readily reversing said unit assembly bodily top for bottom on the carrier to vary the contact arrangement from normally engaged to normally disengaged.

2. In an electric switch, a support, a back insulating block, a front insulating block, means for mounting said blocks upon the support, barrier walls on said blocks mating in the block supported position to form a plurality of individual chambers between the blocks, sets of spaced stationary contacts mounted in said chambers, one contact of each set being mounted on the back insulating block and one contact of each set being mounted on the front insulating block, movable bridging contacts cooperating with said sets of stationary contacts, an insulating carrier upon which said movable contacts are mounted, said movable contacts including a unit assembly of a bridging element, a contact pressure spring, and an enclosure therefor, means for readily reversing said unit assembly bodily top for bottom on the carrier to vary the contact arrangement from normally engaged to normally disengaged, said front insulating block and the stationary contacts mounted thereon being readily removable from the support to facilitate manipulation of the movable contacts.

3. In an electric switch, a support, a back insulating block, a front insulating block, means for mounting said blocks upon the support, barrier walls on said blocks mating in the block supported position to form a plurality of individual chambers between the blocks, sets of stationary contacts mounted in said chambers, one contact of each set being mounted on the back insulating block and one contact of each set being mounted on the front insulating block, said stationary contacts each having two contact surfaces facing in opposite directions, movable bridging contacts cooperating with said stationary contacts, and means for reversing the movable contacts to change the contact arrangement from normally engaged to normally disengaged, said change in contact arrangement being effected without modifying the position of the stationary contacts, each of said movable contacts including a unit assembly of a bridging contact element, contact pressure spring and means maintaining them in their cooperating relation, the unit assembly being bodily reversible as a unit top for bottom to facilitate the reversal of the movable contact.

4. In an electric switch, a support, a back in-

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insulating block, a front insulating block, means for mounting said blocks upon the support, barrier walls on said blocks mating in the block supported position to form a plurality of individual chambers between the blocks, sets of stationary contacts mounted in said chambers, one contact of each set being mounted on the back insulating block and one contact of each set being mounted on the front insulating block, said stationary contacts each having two contact surfaces facing in opposite directions, movable bridging contacts cooperating with said stationary contacts, and means for reversing the movable contacts to change the contact arrangement from normally engaged to normally disengaged, the movable contacts in the normally engaged position cooperating with the stationary contact surfaces facing in one direction and in the normally disengaged position cooperating with the stationary contact surfaces facing in the opposite direction, the change in contact arrangement being effected without modification of the stationary contact position, each of said movable contacts including a unit assembly of bridging contact element, contact pressure spring and means maintaining them in their cooperating relation, the unit assembly being bodily reversible as a unit top for bottom to facilitate the reversal of the movable contact.

5. In an electric switch, a support, a back insulating block, a front insulating block, means for mounting said blocks upon the support, barrier walls on said blocks mating in the block supported position to form a plurality of individual chambers between the blocks, sets of stationary contacts mounted in said chambers, one contact of each set being mounted on the back insulating block and one contact of each set being mounted on the front insulating block, said stationary contacts each having two contact surfaces facing in opposite directions, movable bridging contacts cooperating with said stationary contacts, and means for reversing the movable contacts to change the contact arrangement from normally engaged to normally disengaged, said change in contact arrangement being effected without modifying the position of the stationary contacts, said front insulating block and the stationary contacts mounted thereon being readily removable as a unit from the support to facilitate access to and manipulation of the movable contacts for the reversal operation, each of said movable contacts including a unit assembly of bridging contact element, contact pressure spring and means maintaining them in their cooperating relation, the unit assembly being bodily reversible as a unit top for bottom to facilitate the reversal of the movable contact.

6. In an electric switch, a support, a back insulating block, a front insulating block, means for mounting said blocks upon the support, barrier walls on said blocks mating in the block supported position to form a plurality of individual chambers between the blocks, sets of stationary contacts mounted in said chambers, one contact of each set being mounted on the back insulating block and one contact of each set being mounted on the front insulating block, said stationary contacts each having two contact surfaces facing in opposite directions, movable bridging contacts cooperating with said stationary contacts, and means for reversing the movable contacts to change the contact arrangement from normally engaged to normally disengaged, the movable contacts in the normally engaged position co-

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operating with the stationary contact surfaces facing in one direction and in the normally disengaged position cooperating with the stationary contact surfaces facing in the opposite direction, the change in contact arrangement being effected without modification of the stationary contact position, said front insulating block and the stationary contacts mounted thereon being readily removable as a unit from the support to facilitate access to the manipulation of the movable contacts for the reversal operation, each of said movable contacts including a unit assembly of bridging contact element, contact pressure spring and means maintaining them in their cooperating relation, the unit assembly being bodily reversible as a unit top for bottom to facilitate the reversal of the movable contact.

7. In an electric switch, a pair of spaced stationary contacts, each of said contacts having two contact surfaces facing in opposite directions, a bridging movable contact cooperating with said stationary contacts to perform the switching operation, a support for said movable contact, and means for moving said support to move the bridging contact into and out of engagement with the stationary contacts, said movable contacts when in one position on said support cooperating with the stationary contact surfaces facing in one direction, the position of the movable contact on said support being readily reversible so that the movable contact cooperates with the stationary contact surfaces facing in the opposite direction so as to modify the contact operation from normally engaged to normally disengaged, said movable contact including as a unit assembly a bridging contact element, a contact pressure spring and means maintaining said bridging element and contact pressure spring in cooperating relation whether or not mounted upon the support, the reversal of the movable contact being effected by reversing the unit assembly bodily top for bottom as a unit.

8. In an electric switch, a pair of spaced stationary contacts, a bridging movable contact cooperating with said stationary contacts to perform the switching operation, a support for said movable contact, means for moving said support to move the bridging contact into and out of engagement with the stationary contacts, said movable contact being reversible to cooperate with the stationary contacts in the two positions to provide for normally engaged and normally disengaged operations, the movable contact including as a unit assembly a bridging contact element, a contact pressure spring, and means maintaining the bridging element and contact pressure spring in cooperating relation, whether or not mounted upon the support, the support mounting providing for reversal of the movable contact by reversing the unit assembly bodily top for bottom as a unit.

9. In an electric switch, a pair of spaced stationary contacts, a bridging movable contact cooperating with said stationary contacts to perform the switching operation, a support for said movable contact, means for moving said support to move the bridging contact into and out of engagement with the stationary contacts, said movable contact being reversible to cooperate with the stationary contacts in the two positions to provide for normally engaged and normally disengaged operations, the movable contact including as a unit assembly a U-shaped member, a bridging contact element, a contact pressure spring and a cap enclosing said spring and bridg-

ing contact element within said U-shaped member, and means for removably mounting said unit assembly upon said support whereby said unit assembly may be bodily inverted to change the normal operation of said switch.

HERMON L. VAN VALKENBURG.  
KENNETH G. SEDGWICK.

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