

Oct. 17, 1944.

H. L. VAN VALKENBURG ET AL

2,360,744

ELECTROMAGNETIC OPERATOR

Original Filed Nov. 24, 1939 3 Sheets-Sheet 1

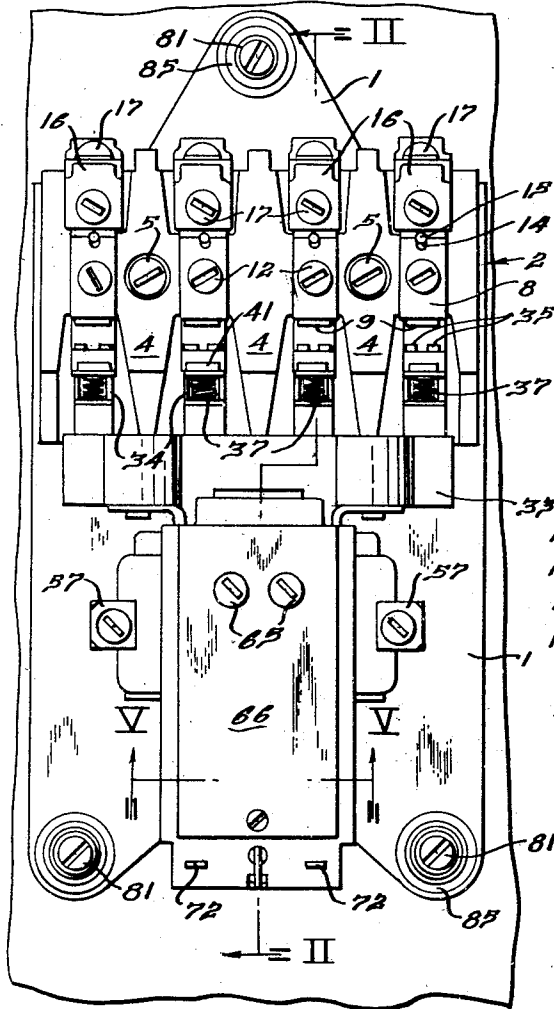
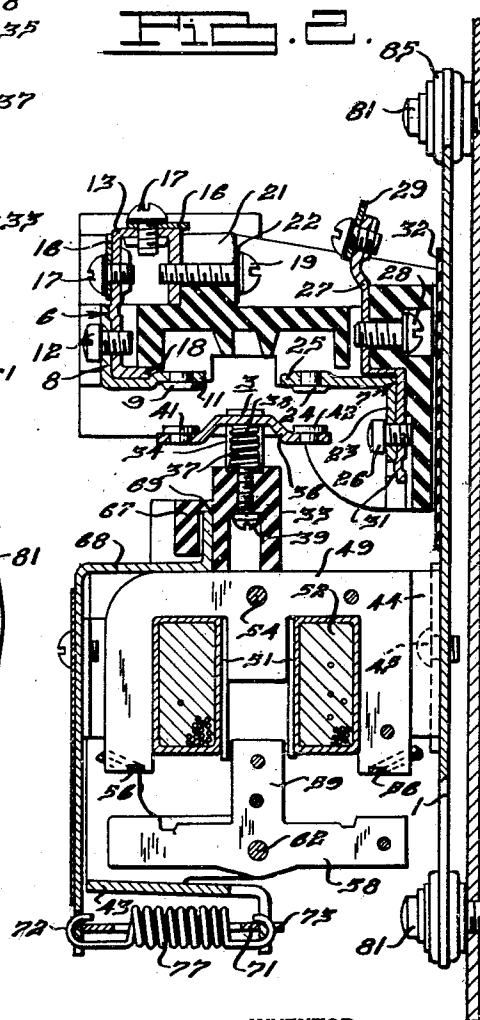


FIG. 1.



INVENTORS
Herman L. Van Valkenburg,
Josef Bierentfeld.
BY *Myron J. Seibold*
ATTORNEY

Oct. 17, 1944.

H. L. VAN VALKENBURG ET AL

2,360,744

ELECTROMAGNETIC OPERATOR

Original Filed Nov. 24, 1939 3 Sheets-Sheet 2

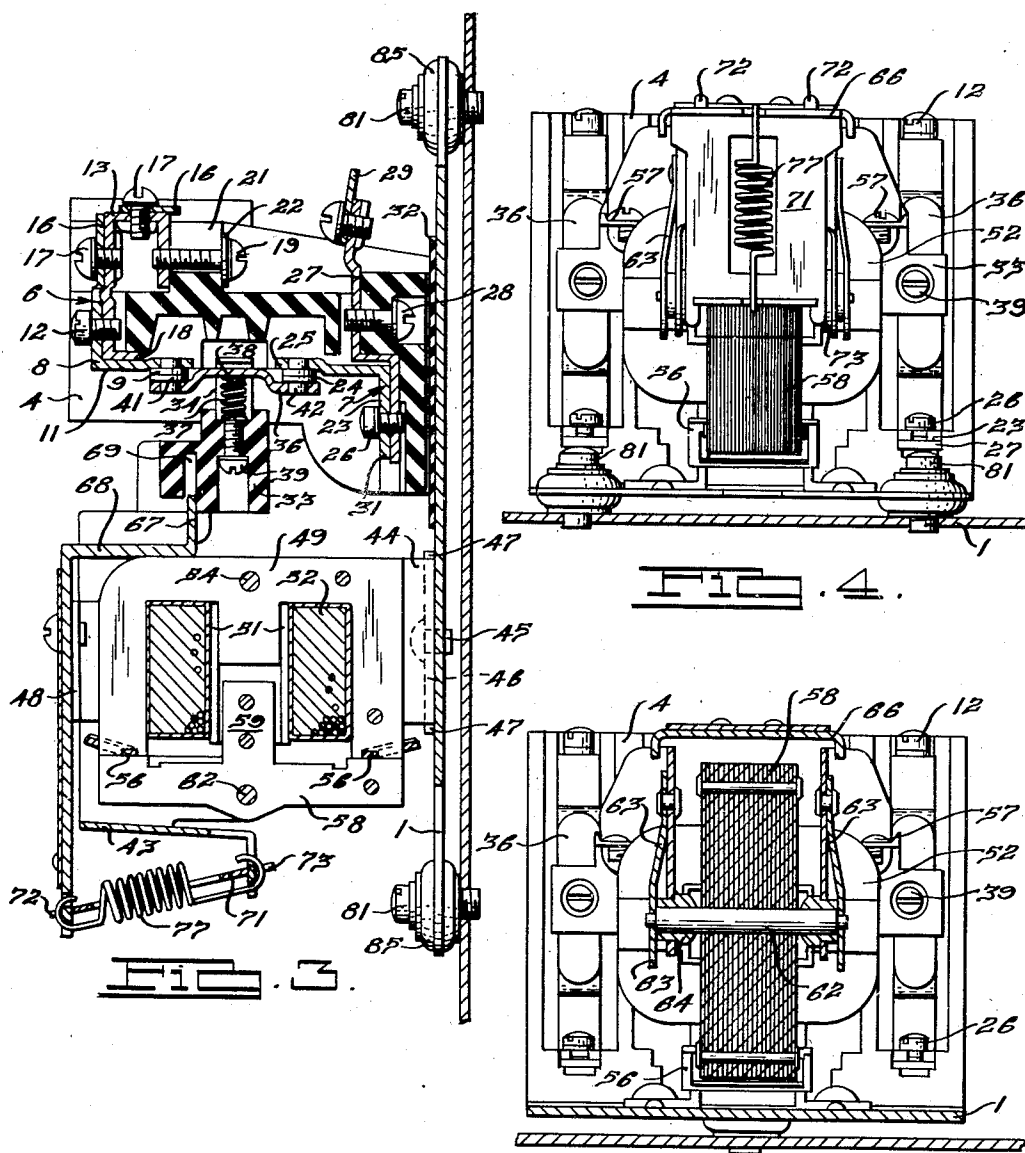


FIG. 5.

INVENTORS
Herman L. Van Valkenburg,
Josef. Bierenfeld.
BY *Myron J. Feibald*
ATTORNEY

UNITED STATES PATENT OFFICE

2,360,744

ELECTROMAGNETIC OPERATOR

Hermon L. Van Valkenburg, Wauwatosa, and
Josef Bierenfeld, Milwaukee, Wis., assignors to
Square D Company, Detroit, Mich., a corpora-
tion of Michigan

Original application November 24, 1939, Serial
No. 305,880. Divided and this application April
13, 1942, Serial No. 438,840

8 Claims. (Cl. 175—341)

This invention relates to electromagnetically operated electric switches, and constitutes a division of application Serial No. 305,880 filed November 24, 1939 for Electric switch, now Patent No. 2,304,972, granted December 15, 1942.

One object of the invention is to provide an improved form of electromagnetic operator for an electric switch.

Another object of the invention is to provide an electromagnetic armature and movable contact assembly for an electric switch, providing for rectilinear movement of the switching parts, with the assembly readily removable and replaceable.

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 electromagnetic switch according to the present invention.

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

Figure 3 is a sectional view similar to Figure 2 but showing the parts in the closed circuit position.

Figure 4 is a bottom plan view of the electromagnetic switch of the present invention.

Figure 5 is a sectional view taken on the line V—V of Figure 1.

Figure 6 is an exploded view in perspective of the switch.

The electric switch, according to the present invention, comprises a rear supporting plate 1 upon which is mounted, by means of studs 5, a contact block 2 having a plurality of spaced barrier walls 4. Within each recess 3, at the front and rear thereof, are mounted stationary contact assemblies 6 and 7. The contact assemblies 6, mounted at the front in each chamber 3, are identical to one another, and the contact assemblies 7, mounted at the rear, are also identical. Each stationary contact assembly 6 comprises an L-shaped contact element 8 having a contact face 9 secured to the outside of a leg 11. The contact element 8 in turn is secured as by a stud 12 to a C-shaped conductor 13 supported at the front of block 2 in a manner to be hereinafter described. The contact element 8 is cut away as at 14 to engage with a teat 15 provided upon the conductor 13 for properly positioning the element 8. Carried upon the upper portion of the conductor 13 and at right angles to one another are terminal clamps 16 and their co-

operating terminal screws 17. The conductor element 13 is held in position upon the block 2 by means of a horizontal leg 18 at the bottom which bears against the contact block, and a return bent portion at the top secured by stud 19 to an upstanding ledge 21 on the block.

Disposed at the rear of a recess 3 is the stationary contact assembly 7 comprising an L-shaped contact element 23 having a contact face 24 secured upon the inner face of its leg 25. It is to be noted that the contact face 24 is disposed upon a different face of its supporting leg than is the contact face 9 upon the corresponding leg 11. The contact element 23 is secured as by a stud 26 to a conductor element 27 which extends through an opening in the roof of the block 2 to the exterior thereof and is secured to the block by a stud 28. This conductor element carries at its outer extremity a terminal clamp 29 similar to the terminal clamp 16. A teat 31 is provided upon the lower extremity of the conductor 27 to cooperate with a cutaway portion on contact element 23 to position it. An insulating sheet 32 is disposed between the rear face of block 2 and the supporting plate 1.

The movable contact assembly comprises an insulating supporting block 33 having mounted thereon a plurality of generally U-shaped supports 34 which have their free ends bent inwardly as at 35 to maintain a contact plate 36 within the legs of the U-shaped supports. Within each of the U-shaped supports 34 is disposed a compression spring 37 adapted to bias the movable contact plate 36 against the bent portions 35. The spring 37 is maintained in place by spaced spring seats provided by a pressed out portion 38 on contact plate 36 and the extremity of a stud 39 which secures the U-shaped support 34 to the contact block 33. Upon the movable contact plate 36 and at the ends thereof are disposed contact surfaces 41 and 42 adapted to cooperate with the stationary contact faces 9 and 24. The thickness of contact plate 36 is less than the distance between the bent portions 35 so that the contact plate may be easily inserted edgewise and then upon being turned flat will be pressed against these bent portions by biasing spring 37. The insulating contact block 33 is secured to a movable generally U-shaped supporting member 43 and is movable thereby to carry the movable contacts into engagement with the stationary contacts. The stationary magnet structure 49 is made up of generally E-shaped magnetic laminations and a pair of supporting brackets 44 riveted together into a rigid struc-

ture. The brackets have front flanges 48 for the reception of other parts and rear flanges 44 which are secured to plate 1 by studs 45 to support the magnet structure in place. Pressed out portions 47 are provided on the plate 1 to assist in properly positioning the bracket flanges. Disposed about the central leg of the magnet 49 are two U-shaped guide pieces 51 over which is fitted an operating coil 52 having terminals 57. The coil 52 is maintained in place upon this central leg by means of the L-shaped straps 53 having leg portions engageable with the bottom face of the coil. A stud 54 secures both the U-shaped guide pieces 51 and a pair of L-shaped straps 53 to the magnet 49. A shading coil 56 is placed upon each of the other legs of the E-shaped magnet 49. Cooperating with the magnet 49 is a T-shaped armature 58 having its leg 59 disposed within the opening between the opposed U-shaped guide pieces 51 and movable therein upon energization of the coil 52. The lower leg portions 61 of the U-shaped supporting member 43 are provided with openings therethrough adapted to receive a removable pin 62. A pair of swinging resilient arms 63 are mounted on opposite sides of the supporting member 43 and serve to maintain the pin 62 in place. Pivotaly supported upon pin 62 is the armature 58, the pin passing through an opening in the head portion thereof. Spacers 64 are carried by the supporting member 43 and serve to properly position the armature 58 upon pin 62. Thus, when armature 58 moves vertically upon energization of coil 52, the supporting member 43 will move in the same direction through its connection by pin 62 to said armature 58.

In front of the supporting member 43 and rigidly secured to the brackets 44 by studs 65 threaded into the bent portions 48 of the brackets is a guide member 66. A vertical leg 67 spaced backwardly by the horizontal leg 68 of the guide member is received within a slot 69 extending into the base of the contact block 33 to guide the contact block in its reciprocatory movement. While the guide member 66 is in place, the supporting member 43 though reciprocably movable cannot be removed from the switch. A flat hinge plate 71, having a pair of eared portions 72 and 73 at each end, interconnects the lower ends of guide member 66 and supporting member 43. The ears 72 are received in slots 74 provided in the guide member 66 and the ears 73 are received in slots 75 provided in a flange 76 on the supporting member 43. A spring 77 interconnects the guide member 66 and the flange 76 and exerts its bias upon said members so as to hold the eared portions 72 and 73 of the plate 71 within their respective slots. The provision of the pivotal construction serves to properly position the moving parts of the switch with respect to their cooperating parts and to provide for substantially rectilinear movement of the armature and movable contacts. This arrangement also permits the armature and movable contacts to be readily removed from and assembled on the switch. The spring 77 further provides a biasing force which assists the force of gravity in returning the switch parts to "off" position.

The operation and function of the parts will now be described:

The switch, as shown in Figures 1 and 2, is in the "off" position. Upon energization of coil 52, the armature 58 will be attracted to the E-shaped stationary magnet 49 and through the

pin 62 will move the supporting member 43 vertically, stretching the spring 77 and carrying the insulating supporting block 33 secured to said member 43 in a like direction to move the contact surfaces 41 and 42 into engagement with the stationary contacts 9 and 24 and complete the circuit through the switch. Upon the de-energization of the coil 52, the armature 58 will move away from the stationary contact structure under the force of gravity assisted by the spring 77, thus moving the block 33 and associated movable contacts downwardly to separate the movable contacts from the stationary contacts. The contacts are guided in their reciprocatory movement into and out of engagement by the cooperation of flange 67 of the guide member 66 with slot 69 in the base of the contact carrying block 33.

While certain preferred embodiments of this 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. Operating means for an electric switch comprising a stationary magnet structure, an energizing coil therefor, a bracket disposed in front of said magnet structure, operating means, means at the upper end of said bracket interengaging with a part rigid with said operating means to guide said means for substantially rectilinear movement, a movable armature, means mounting said armature upon said operating means, a hinge link having a tongue and slot pivotal mounting on said bracket and extending rearwardly therefrom into a tongue and slot pivotal engagement with a part rigid with said operating means, a spring means biasing said part toward said bracket to maintain said tongue and slot in engagement.

2. Operating means for an electric switch comprising a stationary magnet structure, an energizing coil therefor, a bracket disposed in front of said magnet structure, operating means, means at the upper end of said bracket interengaging with a part rigid with said operating means to guide said means for substantially rectilinear movement, a movable armature, means mounting said armature upon said operating means, a hinge link having a tongue and slot pivotal mounting on said bracket and extending rearwardly therefrom into a tongue and slot pivotal engagement with a part rigid with said operating means, a spring means biasing said part toward said bracket to maintain said tongue and slot in engagement, the path of movement of said part being substantially tangential to the path of movement of said link whereby the movable parts move substantially rectilinearly and said spring exerts a biasing force tending to move the armature to deenergized position.

3. Operating means for an electric switch comprising a stationary magnet structure, an energizing coil therefor, a stationary bracket supported in front of said magnet structure, operating means having an insulating block readily secured to the upper portion thereof, interengaging portions upon said block and bracket for guiding said block for substantially rectilinear movement, an armature mounted adjacent the lower portion of said operating means, a hinge plate having a tongue and slot pivotal connection with said bracket and extending rearwardly thereof into tongue and slot pivotal engagement with a

part rigid with said operating means, and spring means biasing said part toward said bracket to maintain said parts in assembly.

4. Operating means for an electric switch comprising a stationary magnet structure, an energizing coil therefor, means for mounting said stationary magnet structure and provided at one end thereof, a guide element spaced from and supported by the opposite end of said stationary magnet structure, an actuating member having a portion thereof disposed between said guide element and said end of the stationary magnet structure spaced therefrom, an insulating block secured to an end of said actuating member, an end portion of said guide element having a telescoping engagement with said insulating block for guiding said block for substantially rectilinear movement, said end portion of said guide element being effective to prevent separate removal of said operating member, a movable armature pivotally mounted on said actuating member, a link member having one end pivoted on said actuating member and the other on said guide element, and spring means interconnecting said actuating member and said guide element for retraction of the armature on deenergization of the coil.

5. Operating means for an electric switch comprising a stationary magnet structure, means whereby said stationary magnet structure may be mounted at one end, a guide element supported at the opposite end of said stationary magnet structure, a movable operating member, an insulating block carried thereby and having a slot therein for receiving an end portion of said guide element whereby said operating member may be guided in a substantially rectilinear movement, an energizing coil for said stationary magnet structure, a movable armature pivotally supported by said operating member, a hinge link having a pivotal engagement with the operating member and with the guide element, and a spring means for maintaining said hinge link in said pivotal engagements and for retracting said armature on deenergization of said energizing coil.

6. Operating means for an electric switch comprising a stationary magnet structure supported at the rear thereof, an energizing coil therefor, a guide element disposed in front of and supported by said stationary magnet structure, an operating member, means carried by the upper end of said guide element and cooperating with a part rigid with said operating member to guide said operating member for substantially rectilinear movement, a movable armature mounted on said operating means and movable toward said stationary magnet structure, and a hinge link pivotally sup-

ported by said guide element and extending rearwardly into pivotal engagement with said operating member, said guide element, operating element, hinge link, and movable armature forming a unit readily removable and replaceable with respect to the stationary magnet structure without disarrangement of the various parts.

7. Operating means for an electric switch comprising a stationary magnet structure supported at the rear thereof, an energizing coil therefor, a guide element disposed in front of and supported by said stationary magnet structure, an operating member, means carried by said guide element and interengageable by a part rigid with said operating member to guide said operating member for substantially rectilinear movement, a movable armature, means mounting said armature upon said operating member, a hinge link having a tongue and slot pivotal engagement with said guide element and extending rearwardly therefrom into a tongue and slot pivotal engagement with a part rigid with said operating member, spring means exerting its bias to maintain the tongue and slot engagements of said hinge link with both said guide element and said part, said guide element, operating member, hinge link, and movable armature forming a unit assembly readily removable and replaceable relative to said stationary magnet structure without disarrangement of the assembly parts.

8. Operating means for an electric switch comprising a stationary magnet structure supported at the rear thereof, an energizing coil therefor, a stationary guide element supported in front of and by said stationary magnet structure, an operating member having an insulating block secured to the upper end thereof, a portion of said guide element having a telescoping engagement with said block for guiding said block for substantially rectilinear movement, an armature mounted adjacent the lower portion of said operating member, a hinge plate having a tongue and slot pivotal connection with said guide element and extending rearwardly therefrom into tongue and slot pivotal engagement with said operating member, and spring means for biasing said operating member toward said guide element to maintain said parts in assembly, said guide element, operating member, hinge plate, and movable armature constituting a unit assembly readily removable and replaceable with respect to said stationary magnet structure without disarrangement of the parts in assembly.

HERMON L. VAN VALKENBURG.
JOSEF BIERENFELD.