

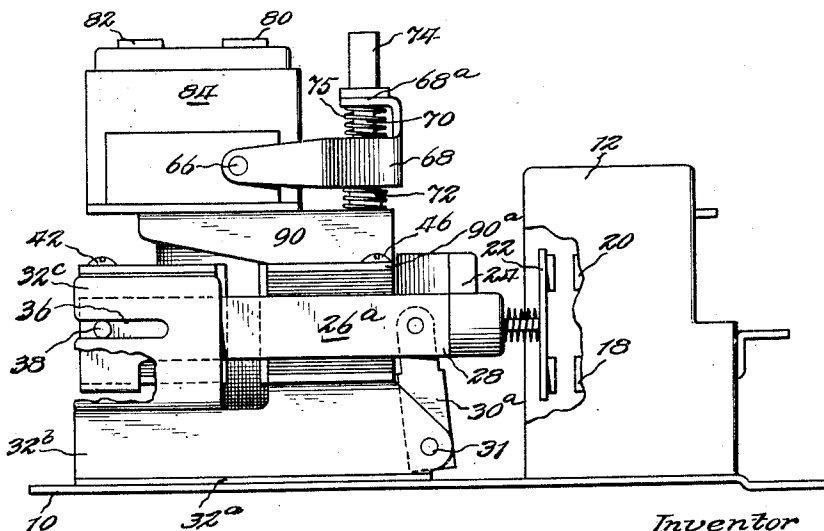
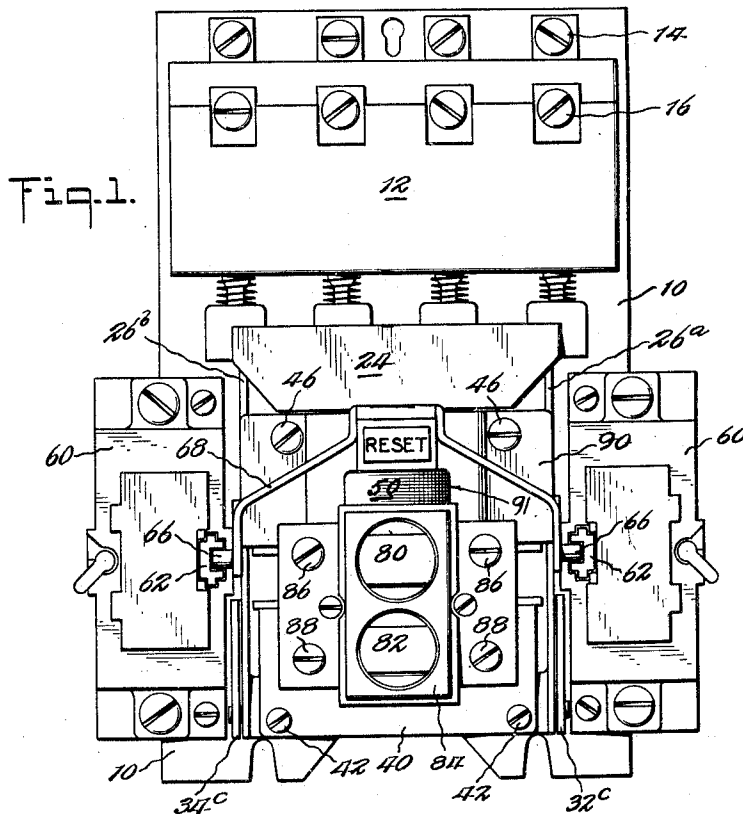
Jan. 31, 1950

H. E. SCHLEICHER
ELECTROMAGNETIC SWITCH

2,496,178

Original Filed March 24, 1941

2 Sheets-Sheet 1



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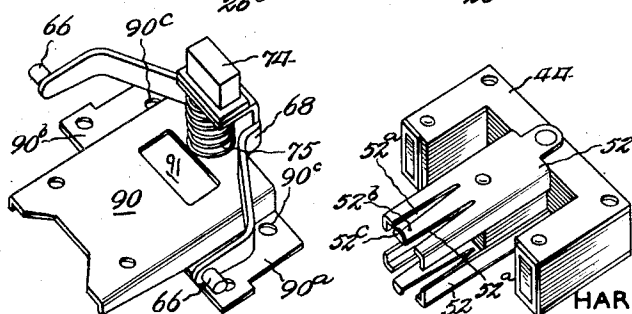
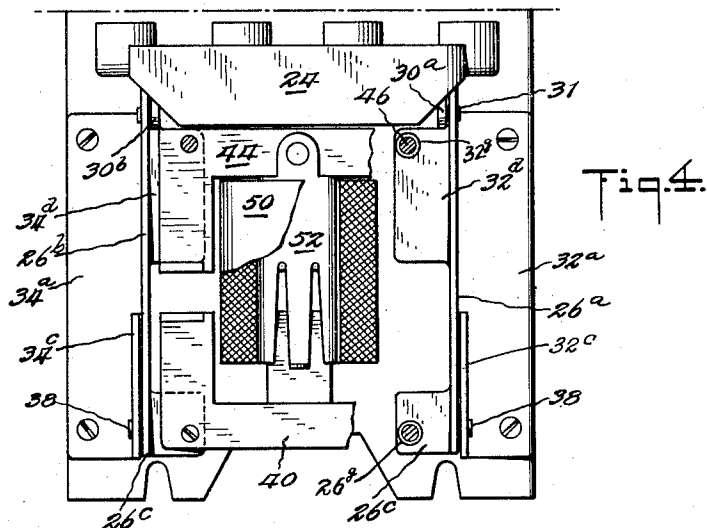
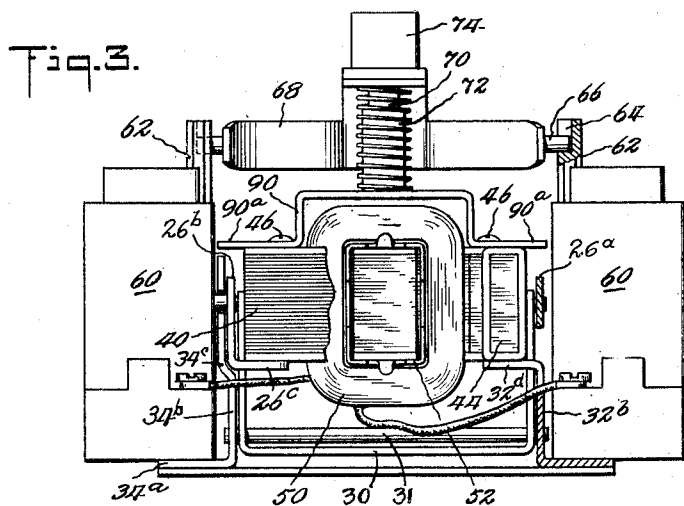


Fig. 5.

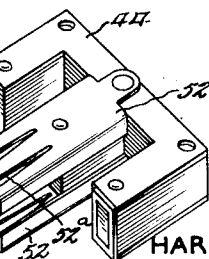


Fig. 6.

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UNITED STATES PATENT OFFICE

2,496,178

ELECTROMAGNETIC SWITCH

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Original application March 24, 1941, Serial No. 385,024. Divided and this application November 30, 1945, Serial No. 632,025

6 Claims. (Cl. 175-335)

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This invention relates to electric switch devices operable by an electromagnet and provided with over-current relay devices for causing de-energization of the electromagnet and opening of the switch, when an overload occurs. More particularly, the invention relates to a novel construction, combination and assembly of certain parts of an electromagnetic switch, with particular reference to the means for mounting the electromagnet coil, and the means for mounting the "stop" and "start" push buttons of the switch and the resetting push button of the over-current relays.

It is an object of the invention to provide a simple and efficient means for mounting the stop, start and reset buttons or devices, which constitute the manual operating assembly whereby they may all be assembled and removed from the switch structure together by the manipulation of only two screws.

Another object of the invention is to provide a simple and inexpensive mounting for the electromagnet coil, whereby the coil may be quickly placed and firmly held in position when the device is assembled, and may be readily removed for repairs or replacement, as occasion arises, without disturbing the manual operating assembly.

A further object is to provide a novel construction, combination and arrangement of parts which may be inexpensively manufactured and assembled, while at the same time attaining jointly the foregoing separate objectives.

Other objects and advantages of the invention will become apparent as it is described in connection with the accompanying drawings.

In the drawings—

Fig. 1 is a plan view of an electromagnetically-operable switch embodying the principles of the invention,

Fig. 2 is a side elevation view of the device of Fig. 1,

Fig. 3 is an end elevation view, partly broken away, of the device of Figs. 1 and 2.

Fig. 4 is a plan view of the electromagnet assembly, partly broken away, and with the button operating devices removed.

Fig. 5 is a detail view showing in perspective the re-set button assembly.

Fig. 6 is a detail view showing in perspective one section of the core of the electromagnet, with the coil mounting means attached thereto, but with the coil removed.

Referring to the drawings, the operating parts are mounted upon a stamped sheet metal back or base plate 10, which is substantially rectangular in form. At one end thereof, an insulating block 12 has mounted thereon groups of terminals 14 and 16 connected with stationary contacts 18 and 20 that are adapted to be bridged by bridging contact members 22. The bridging contact members are carried in insulated relation by a movable insulating block 24 mounted upon a sheet metal frame in convenient fashion. One satisfactory manner of mounting is illustrated in the patent to Magnus G. Dahl, 2,283,795, dated May 19, 1943. The frame for carrying the movable contact block 24 may comprise a pair of flat parallel side bars 26a and 26b. These side bars are joined on one end by a transverse bar on which the movable contact-carrying insulating block is mounted.

For the purpose of supporting the side bars 26a and 26b and the stationary core or field piece of the electromagnet, there are provided a pair of complementary stamped sheet metal supporting members, designated generally by the numerals 32 and 34 with their component parts being designated by letters added to those numerals. These members have flat flange portions or feet 32a and 34a, resting upon and secured, preferably by welding, to the back plate 10 adjacent its side edges and at the opposite end from the stationary contact block 12. Bent up perpendicularly from the feet of the members 32 and 34 are side plate portions 32b and 34b. The upper portions 32c and 34c of said side plate portions are offset outwardly at one end to provide room for the movement of the side bars 26a and 26b. To guide the movement of the outer ends of the side bars 26a and 26b, slots 36 are provided in the offset portions 32c and 34c running parallel to the back plate, and the slots receive pins 38 that extend laterally from the end portions of the bars 26a and 26b. Alternatively, instead of pins, ribs may be pressed out laterally and parallelly from the end portions of the bars to slide in the slots 36. The opposite ends of the bars 26a and 26b are pivotally supported by the parallel arms 30a and 30b of a U-shaped or yoke member 30. This member is pivotally mounted on an axle rod 31 passing through side plates 32b and 34b and through the arms 30a and 30b adjacent and parallel to the transverse portion of the member 30.

In order to support the E-shaped laminated stationary field piece 44 of the electromagnet, lugs 32d and 34d are bent inwardly from the side plates 32b and 34b parallel to the back plate 10 near the inner end (the upper end in Fig. 4). The field piece 44 is secured to the lugs 32d and 34d by bolts 46 which may also serve to secure the sheet metal stamping or support 90 for the

operating buttons of the device, as will hereinafter be more fully described.

For the purpose of supporting and carrying the armature of the electromagnet, there are provided ears 26c which are bent inwardly from the lower edge of the outer (lower) ends of the side bars 26a and 26b (see Fig. 4). The armature 40 may be of E-shape, and may be secured to the ears 26c by a pair of bolts 42.

For quick and accurate positioning of the armature and field piece, bosses, such as 26g and 32g, may be provided around the holes into which the bolts 42 and 46 thread. These may be formed by pressing up the edges of the holes as the holes are punched. The bosses will be received in enlargements at the ends of the passages in the armature and field pieces through which the bolts 42 and 46 pass.

The electromagnet coil 50 is manufactured as a unit, which may be assembled upon and removed from the central arm of the field piece or core 44 of the electromagnet. For supporting this coil, there are provided a pair of channel-shaped guides 52 facing each other and secured to the top and bottom of the central arm of the field piece 44. These channel-shaped guides are preferably made of non-magnetic material and have cut into their free ends a pair of longitudinal slots 52a forming a central resilient finger 52b whose end is bent perpendicularly thereto, toward the coil. In order that the coil may be readily mounted upon the guides 52 with the guides extending through the coil aperture and held in position when mounted thereon, and may be readily removable therefrom, the guides are preferably made of material which is thin enough and resilient enough to permit flexing inwardly of the resilient fingers 52b to permit passage of the coil over the outwardly-bent ends 52c. It may readily be observed from the foregoing description that when the coil is put in place, the resilient fingers will snap in position so that their outwardly-bent ends 52c will engage the edge of the coil to hold it in assembled position. Conversely, the fingers 52b may be pressed toward each other to permit the coil to be removed.

It may now be observed that in order to repair or replace the coil 50, it is only necessary to remove the movable armature 40 of the electromagnet core by unscrewing the two bolts 42 and then pressing together the resilient fingers 52b of the guides sufficiently to permit the coil to be pulled off the guides. It is not, however, necessary to remove the operating assembly in order to get at and remove the coil of the magnet, since the coil can be removed as soon as the movable core has been detached from its mounting. The coil can be moved axially underneath the stamping 90 without moving that stamping. The foregoing coil mounting structure forms the subject of my co-pending application Serial No. 385,024, filed March 24, 1941, now Patent 2,399,065, of which the present application is a division.

Mounted upon and extending beyond the opposite side edges of the base are a pair of overload relay units 60 of the type shown in my Patent 2,322,161, dated June 15, 1943. These units each have reciprocable plungers 62 extending from the top thereof at the middle of one side. The extending ends of these plungers have slots 64 cut in the side surfaces to receive the ends of pins 16 which are mounted on, and ex-

tend oppositely from, the arms of a resetting yoke member 68. The yoke member is mounted for reciprocation on a support 90, as will hereinafter more fully appear, to accomplish resetting of the relays.

In electromagnetically-operated devices of the type to which this invention relates, the overload relays are customarily actuated by excess current in the power lines to open the holding circuit of the magnet when an overload occurs, so that the electromagnet will be deenergized and the main contacts will separate to open the power circuit. For normal manual starting and stopping operations, "start" and "stop" push buttons are customarily provided to close the holding circuit or open the holding circuit.

In the present construction, the "start" and "stop" push buttons 80 and 82 are mounted in a block of insulation 84. The contacts that are actuated by the buttons 80 and 82 are connected to terminal screws 86 and 88 and the whole block, with the contacts, terminals and buttons, is mounted as a unit upon a sheet metal stamping or supporting means designated generally by the numeral 90 (see Fig. 5). This stamping may be of channel-shape, with wing portions 90a and 90b bent outwardly from the sides in position to lie upon the top surface of the stationary field piece 44. Apertures 90c are provided in the wing portions to register with similar apertures in the stationary core 44 and to receive the bolts 46 so that the stamping and all parts carried thereby may be held upon the field piece by the two bolts 46.

In addition to the "stop" and "start" push button assembly being mounted upon the stamping 90, the re-setting yoke and its associated parts are also carried by said stamping. The reset yoke 68 is mounted upon the stamping by means of a piston 70 passing through a hollow post 72 which stands upon and extends upwardly from the top surface of the stamping 90. The piston 70 may be screw-threaded at its upper end to pass through an aperture (not visible) in a lip 68a which extends in a central direction between, but in a plane above, the arms of the yoke member 68. The threaded end of the piston 70 may take into and secure an insulating re-set button 74 upon the top surface of said lip. A compression spring 75 is coiled about the post 72 and its bottom coil presses upon the stamping 90, while its top coil presses against the bottom of the lip 68a to hold the yoke in elevated position. From the foregoing, it may be observed that when the re-set button is depressed, the yoke and its pins 66 will move downwardly to depress the plungers 62 to reset the overload relays if one or both have been tripped by overload.

It will now be apparent that the whole re-set assembly, together with the stop and start button assembly, are mounted as a unit on the device, thus simplifying fabrication, and also making it possible to readily disassemble the device in case repairs or adjustments may be necessary.

Since the removal of the bolts 42 makes possible the removal of the armature 40, and since removal of bolts 46 enables removal of the stop-start-reset assembly and the field piece 44, therefore, by removal of the four bolts 46 and 42, the whole magnet assembly may be removed from the device, together with the operating buttons and their associated parts.

It is desirable to be able to know at a glance

the rating of the coil 50 to be known. In order to permit this, I have provided a window 91 in the stamping 90 to view a part of the coil, on which rating indicia may appear.

From the foregoing, it is apparent that without sacrificing sturdiness of construction and reliability of operation, I have created a simplified automatically-operable, electro-magnetically-operable switch device, which can be fabricated easily and inexpensively, and in which many of the functionally-cooperative parts are removable as units by unscrewing a few bolts.

Many modifications within the scope of the invention will occur to those skilled in the art. Therefore, I do not limit the invention to the exact details of the embodiments as illustrated and described.

I claim:

1. In an electromagnetic switch device, a support comprising back and side members, an electromagnet comprising a field piece, a coil and an armature, said field piece being mounted on said support and said armature being guided in movement by said support, a pair of control relays mounted beside said side members on opposite sides of the device, means connecting the relays and coil whereby the relays act to control the operation of said electromagnet, said relays having resetting members extending therefrom, a mounting plate over said electromagnet, a spring-biased bridge and resetting button mounted on said mounting plate and engaging said relay resetting members for resetting one or both relays jointly, and means jointly securing said field piece to said side members and said mounting plate on said field piece, whereby on removal of said securing means the electromagnet and its relay resetting assembly are thereupon separable from each other and from said support.

2. In an electromagnetic switch device, a support comprising back and side members, an electromagnet comprising a field piece, a coil and an armature located between said side members, a pair of control relays mounted beside said side members on opposite sides of the device, means connecting the relays and coil whereby said relays act to control the operation of said electromagnet, said relays having resetting members extending therefrom, a mounting plate over said electromagnet, a resetting bridge and button assembly mounted on said mounting plate and having its bridge portion engageable with said resetting members for resetting one or both relays jointly, and means jointly securing said field piece to said side members and said mounting plate on said field piece.

3. In an electromagnetic switch device, a support comprising back and side members, an electromagnet comprising a field piece, a coil and an armature located between said side members, a pair of control relays mounted beside said side members on opposite sides of the device, means connecting the relays and coil whereby the relays act to control the operation of said electromagnet, said relays having resetting members extending therefrom, a mounting plate over said electromagnet, a resetting bridge and button assembly mounted on said mounting plate and having its bridge portion engageable with said resetting members for resetting one or both relays jointly, and means comprising a plurality of removable screw bolts each acting jointly to secure said field piece to said support and said mounting plate upon said field piece.

4. In an electromagnetic switch device, a support comprising back and side members, an electromagnet comprising a field piece, a coil and an armature located between said side members, said field piece having armature guide means on which said coil is axially mountable, a portion of said guide means resiliently holding said coil thereon and being flexible to permit axial removal of the coil therefrom, a pair of control relays mounted beside said side members on opposite sides of the device, means connecting the relays and coil whereby said relays act to control the operation of said electromagnet, said relays having resetting members extending therefrom, a mounting plate over said electromagnet, a resetting bridge and button assembly mounted on said mounting plate and having its bridge portion engageable with said resetting members for resetting one or both relays jointly, and means jointly securing said field piece to said side members and said mounting plate on said field piece.

5. In an electromagnetic switch device, a support comprising back and side members, an electromagnet comprising a field piece, a coil and an armature, guide means in said support for the armature and other guide means for the armature affixed to said field piece, the coil being removably mounted axially on said other guide means and normally held thereon by a resiliently flexible portion of said other guide means, a pair of control relays mounted beside said side members on opposite sides of the device, means connecting the relays and coil whereby said relays act to control the operation of said electromagnet, said relays having resetting members extending therefrom, a mounting plate over said electromagnet, a spring-biased bridge and resetting button mounted on said mounting plate and engaging said relay resetting members for resetting one or both relays jointly, and means jointly securing said field piece to said side members and said mounting plate on said field piece.

6. In an electromagnetic switch device, a support comprising back and side members, an electromagnet comprising a field piece, a coil and an armature located between said side members, a pair of control relays mounted beside said side members on opposite sides of the device, means connecting the relays and coil whereby said relays act to control the operation of said electromagnet, said relays having resetting members extending therefrom, a mounting plate over said electromagnet and having an opening for viewing coil-rating indicia on said coil, a resetting bridge and button assembly mounted on said mounting plate in position to give unobstructed view of said opening, said resetting bridge portion being engagable with said resetting members for resetting one or both relays jointly, and means jointly securing said field piece to said side members and said mounting plate on said field piece.

HAROLD E. SCHLEICHER.

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