

April 22, 1941.

J. BIERENFELD ET AL

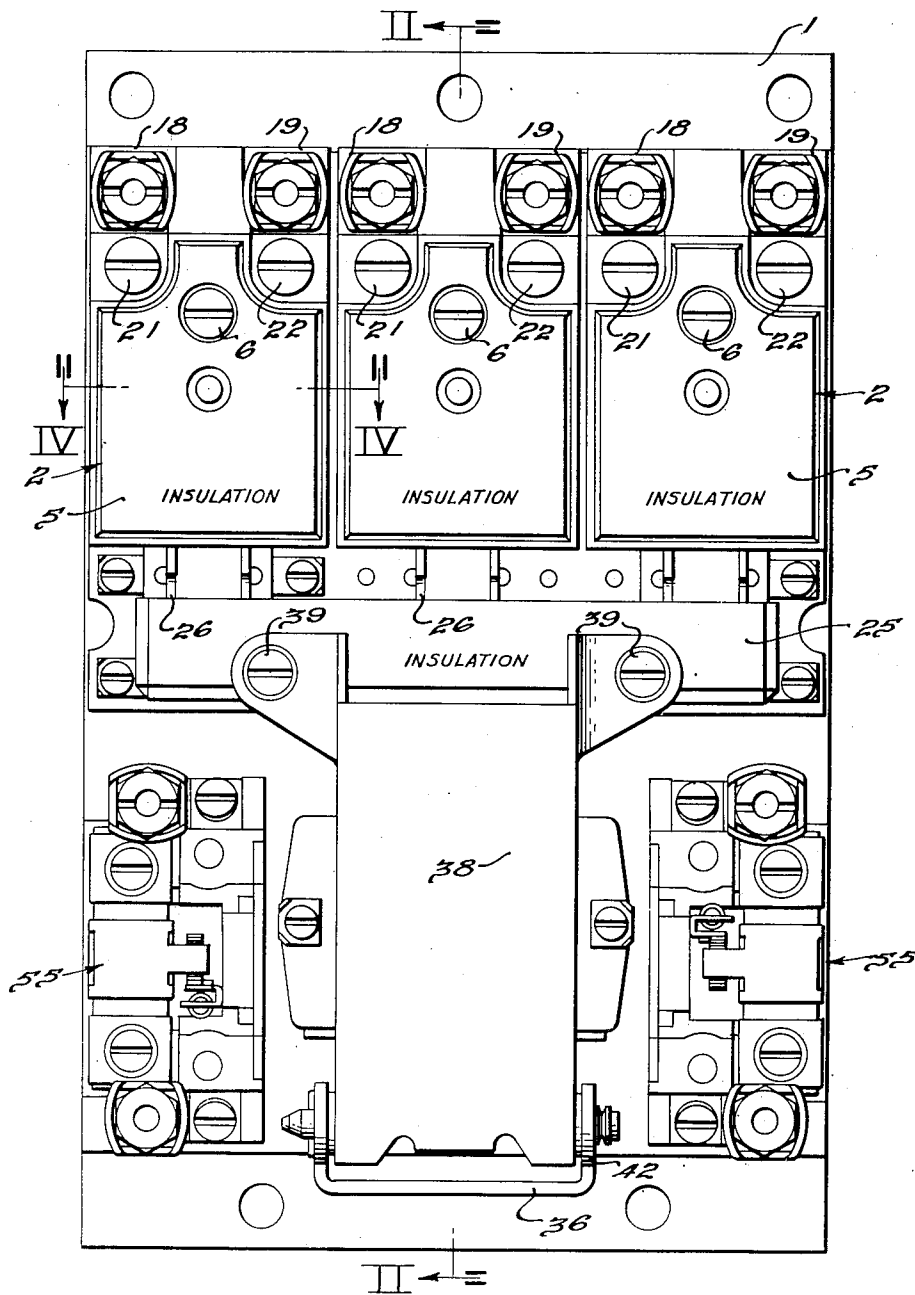
2,239,031

ELECTRIC SWITCH

Filed Aug. 24, 1936

4 Sheets-Sheet 1

FIG. 1.



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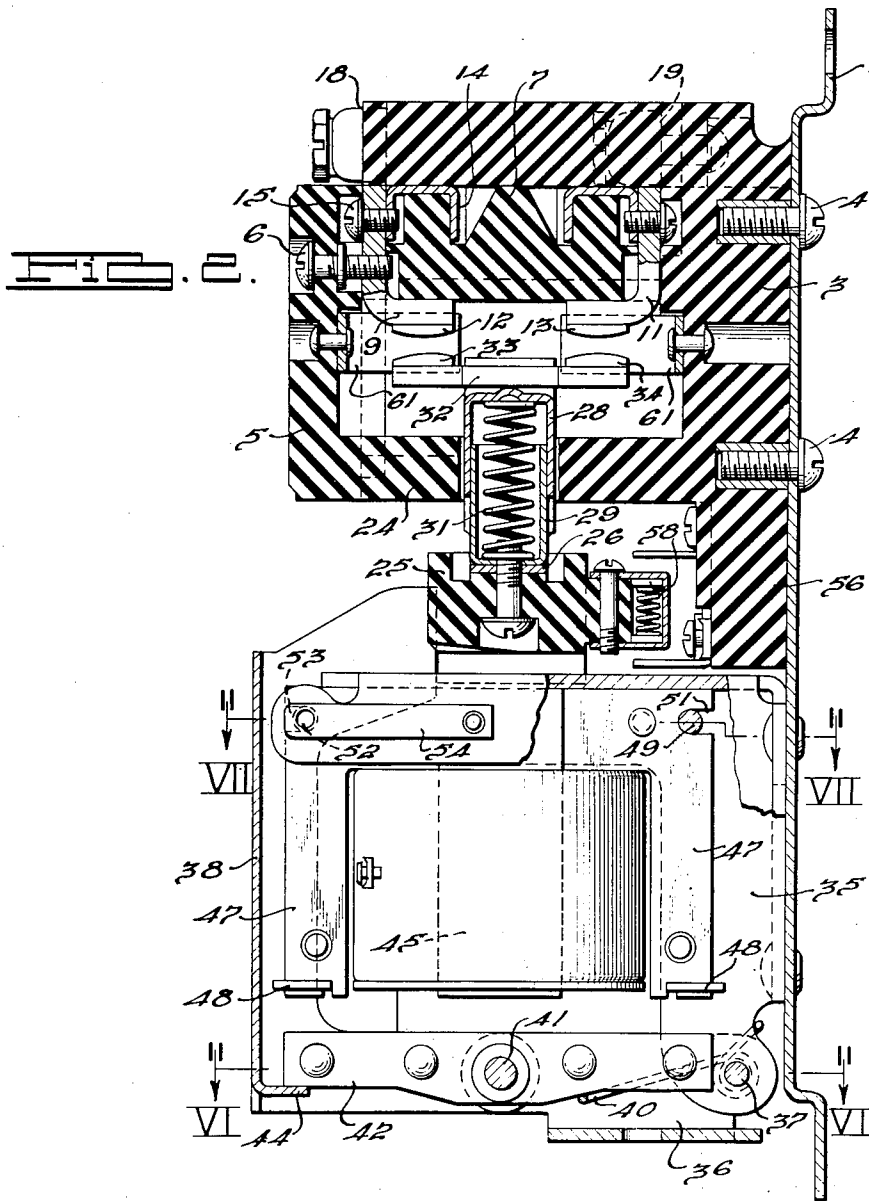
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ELECTRIC SWITCH

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4 Sheets-Sheet 2



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## ELECTRIC SWITCH

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4 Sheets-Sheet 3

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ELECTRIC SWITCH

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4 Sheets-Sheet 4

FIG. 4.

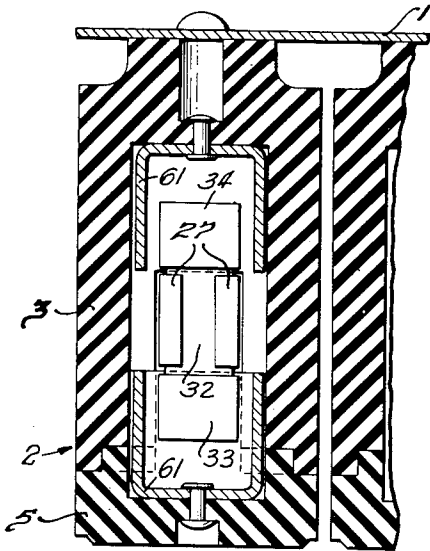


FIG. 5.

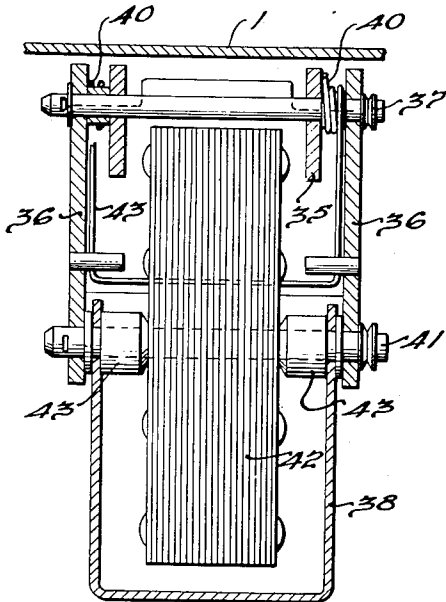
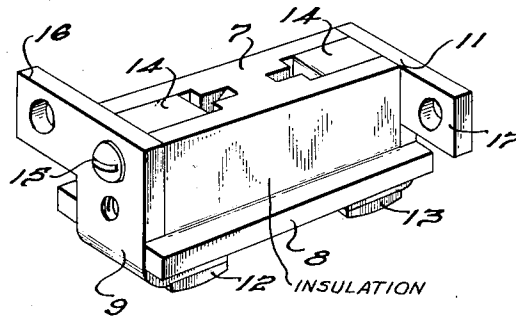


FIG. 6.

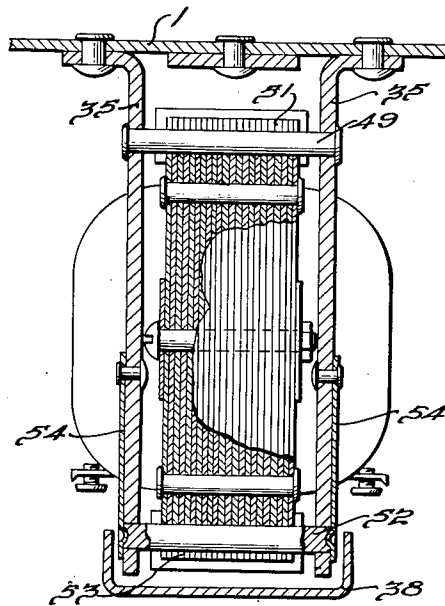


FIG. 7.

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## UNITED STATES PATENT OFFICE

2,239,031

## ELECTRIC SWITCH

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Application August 24, 1936, Serial No. 97,532

27 Claims. (Cl. 200—104)

This invention relates to electric switches, more particularly to electro-magnetically operated switches adapted for the control of electric motors and other translating devices.

One object of the present invention is the provision of an electric switch providing for ease of accessibility and replacement of the parts.

Another object of the present invention is the provision of an electric switch having a reciprocable contact in which the contact may be readily swung to an accessible position for inspection and replacement.

Another object of the invention is to provide an electric switch with an improved resilient mounting for the movable contacts.

Another object of the invention is to provide an electric switch with an improved stationary contact assembly permitting ready removal of the contacts while leaving the terminals in place.

Another object of the invention is to provide an electromagnetically operated switch in which the magnetic structure may be readily disassembled.

Another object of the invention is the provision of an electromagnetically operated switch in which the movable contacts are vertically reciprocable and are hingedly mounted to be readily swung outward for inspection and replacement.

Another object of the invention is to provide an electric switch having a substantially enclosed arcing chamber containing separable contacts with a movable contact vertically reciprocable by connections extending through the bottom of the chamber with the front of the chamber readily removable to permit swinging removability of the movable contacts.

Another object of the invention is to provide an electric switch with an improved form of arcing chamber.

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

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

Figure 2 is a vertical sectional view on the line II—II of Figure 1, with certain of the parts shown in elevation.

Figure 3 is a front elevational view similar to Figure 1 but with certain parts removed and the movable contact assembly swung outward as for inspection and replacement.

Figure 4 is a horizontal sectional view through

the contact chamber on the line IV—IV of Figure 1.

Figure 5 is a perspective view of the stationary contact assembly.

Figure 6 is a horizontal sectional view on the line VI—VI of Figure 2.

Figure 7 is a horizontal sectional view on the line VII—VII of Figure 2.

The electric switch according to the present invention comprises a rear supporting plate 1 upon which are mounted a plurality of contact chambers 2. Each of these chambers includes a body portion 3 secured to the plate 1 by means of studs 4 and a front cover element 5 adapted to close the chamber and maintained in position by a stud 6. Within the body portion 3 is removably mounted a stationary contact assembly shown in perspective in Figure 5 and composed of an insulating portion 7 having side projections 8 cooperating with parts within the body portion 3 to position the assembly. At the front and rear of the insulating portion 7 are mounted contact elements 9 and 11 having contact faces 12 and 13 on their bottom portions. Each of these contact elements is secured to a U-shaped retaining element 14 received within suitable openings at the top of the insulating portion 7 as by means of studs 15 thus serving to mount the stationary contacts on the insulating portion. As shown, the contact element 9 has an integral projection 16 extending to the left while contact element 11 has a similar extension 17 extending to the right for a purpose to be hereinafter described.

At the left hand upper front corner of the base 3 is mounted a conducting connector plate 18 adapted to have a circuit terminal connected thereto. The upper right hand portion of the base 3 is recessed to a position slightly beyond the interior position of the extension 17 and at the back of this recessed portion is mounted a similar connector plate 19 adapted to have another circuit terminal connected thereto. When the stationary contact block is inserted in the body portion 3 the extension 16 will contact with the connector plate 18 and the extension 17 will connect with the connector plate 19. These extensions and plates are conductively and mechanically connected by means of studs 21 and 22. The bottom of the body portion 3 at the front thereof is provided with a slot 23 to provide entrance for the movable contact assembly to be hereinafter described and the portion of this slot not occupied by the mounting of the movable contact is closed by portion 24 on the cover 5.

The movable contact assembly comprises an

insulating supporting block 25 having mounted thereon a plurality of generally U-shaped supports 26 which have their free ends bent over as at 27 to maintain a contact plate in place. Within each of the U-shaped supports 26 is mounted a pair of oppositely directed interfitting U-shaped members 28 and 29 and within the chamber formed by the U-shaped members 26, 28 and 29 is disposed a compression spring 31 adapted to bias the movable contact plate against the bent over portions 27. The movable contact comprises a conducting plate 32 having contact surfaces 33 and 34 at the ends thereof. The thickness of the plate 32 is less than the distance between the bent over portions 27 so that the contact plate may be easily inserted edgewise and then upon being turned flat will be pressed against these bent over portions by the biasing spring 31. It is noted by this construction that the biasing spring for the movable contact is mounted within an enclosed chamber and is entirely concealed therein.

A supporting bracket 35 is rigidly secured to the plate 1 as by means of riveting. This bracket is of generally L-shape and is U-shaped in cross section. At the bottom end of the bracket 35 is hingedly mounted a link 36, also generally U-shaped in cross section as by means of a pivot pin 37. To the link 36 is pivoted a generally U-shaped connecting link 38, also U-shaped in cross section and extending at the front of the operating structure and rigidly secured at its upper end to the insulating block 25 as by means of studs 39. The links 38 and 36 are pivoted together by means of pin 41 and upon this pin is also pivotally mounted the armature member 42 properly positioned by means of spacers 43. A spring 40 biases the back end of the armature 42 upwardly and this rotative movement is limited by a stop 44 on the link 38.

To operate the switch there is provided a stationary magnet structure including a central core 45 about which is wrapped a coil 46 and which has connected thereto leg portions 47 at the exterior of the coil 46. A shading coil 48 is placed at the face of each of the legs 47. This stationary magnet and coil assembly is mounted for ready removability. At the rear upper portion of the bracket 35 is rigidly secured a pin 49 and the upper rear corner of the stationary magnet structure is provided with a slot 51 adapted to receive the pin 49 therein. The upper front portion of the bracket 35 is provided with opposite openings adapted to receive a removable pin 52 which registers with a slot 53 at the front upper portion of the stationary magnet structure. A pair of swinging resilient arms 54 are mounted on opposite sides of the bracket 35 and serve to maintain the pin 52 in place.

On either side of the magnet structure are mounted overload relays generally designated by the numeral 55. These may be of standard construction so far as the operation of the switch is concerned and they have here been shown generally and are not to be described in detail as they form no part of the present invention. These relays have elements responsive to the current through the switch and are adapted to interrupt the current through the magnet coil to open the switch upon the occurrence of an overload.

The body portions 3 may be provided with integral bottom extensions 56 upon which may be mounted auxiliary contacts 57 adapted to be contacted by movable switching elements 58 re-

siliently supported upon the insulating block 25. These auxiliary contacts may be used for any purpose and may constitute holding switches for the control circuit of the switch.

To facilitate the interruption of any arc drawn between the contacts, a pair of U-shaped magnetic yokes 61 substantially embracing the space between the contacts when separated, are provided. The rear yoke 61 is rigidly secured as by riveting to the back of the interior of the body portion 3 and the opposite yoke 61 is rigidly secured on the interior face of the cover 5 and is removable therewith.

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

The switch as shown in Figure 2 is in the Off position. Upon the energization of the coil 47 the armature 42 will be attracted to the stationary magnet structure and through the link 38 will move the block 25 vertically so as to move the contact surfaces 33 and 34 into engagement with stationary contact surfaces 12 and 13. This completes the circuit through the switch. Upon the de-energization of the coil 46 the armature 42 will move away from the stationary contact structure by gravity, thus moving the contact block and associated movable contacts downwardly to separate the movable contacts from the stationary contacts. This reciprocatory movement of the movable contact structure is guided by the engagement of the support for the movable contact plate within the opening formed by the back and side surfaces of the slot 23 and the back surface of the portion 24 of the cover 25.

If it is desired to inspect or replace the movable contacts 33 and 34, the covers 5 are removed as shown in Figure 3, whereupon the movable contact assembly may be swung forwardly, entirely out of the body portion 3 of the arcing chamber into the position shown in Figure 3 where the contacts may be readily inspected and replaced. It can be seen that this operation may be performed with great ease as only the studs 6 need be loosened to permit the covers to be removed and the contacts swung outwardly.

If it is also desired to inspect and replace the stationary contacts this requires only the removal of the studs 21 and 22 whereupon the entire stationary contact assembly may be removed from the switch structure. The contact elements 9 and 11 can themselves be readily removed from the insulating portion 7 by the removal of the studs 15. In the arcing chamber shown at the upper right hand corner of Figure 3 the stationary contact block has been removed. To remove any one stationary contact block it is necessary only to remove the associated cover 5 and it is not necessary to remove the other covers or to swing the movable contact assembly outward.

If it is desired to replace the stationary magnet structure or to replace a magnet coil the movable contact assembly is swung outwardly as heretofore described and as shown in Figure 3 and the spring arms 54 are moved out of engagement with the pin 52. Upon removal of this pin 52 the stationary magnet structure and coil may be entirely removed from the switch. To replace a magnet structure after removal the slot 51 is again engaged with the pin 49, the pin 52 is inserted through the openings in bracket 35 into engagement with the grooves 53 and the spring arms 54 are moved into engagement with the pin 52.

In connection with the removal of the sta-

tionary contact assembly it is to be noted that this is effected without detachment of the circuit terminals as these are connected to the terminal plates 18 and 19 which remain in place when the contact block is removed, thus greatly reducing the time and trouble in removing the stationary contacts.

While the body portions of the contact chambers may obviously be joined to form compartments in a single block and/or a single elongated cover may be used, with the chambers divided as herein disclosed greater flexibility is secured in building up any desired number of poles where variations are required.

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 interpretation within the terms of the following claims.

What is claimed is:

1. In an electric switch, an insulating arc enclosing and suppressing chamber having an openable front, a stationary contact assembly within said chamber and comprising an insulating block having a pair of stationary contacts mounted thereon, a bridging movable contact within said chamber having supporting means extending through the bottom of the chamber for reciprocating said movable contact into and out of engagement with said stationary contacts, electromagnetic means for effecting reciprocation of said movable contact, and a removable front cover for said chamber providing for ready forward removability of the stationary contact assembly and for supported swinging removability of said movable contact when the front cover is removed.

2. In an electromagnetically operated electric switch an insulating arc enclosing and suppressing chamber composed of relatively fixed and relatively removable portions, a terminal connector mounted at the exterior on a relatively fixed portion of said chamber and adapted to have a circuit wire connected thereto, a stationary contact within said chamber mounted upon a relatively removable portion and connected to said terminal connector, a movable contact within said chamber and movable by means exterior of the chamber to perform the switching operation, and means for disconnecting the stationary contact from said terminal connector whereby the stationary contact may be removed with a relatively removable portion of said chamber without disturbing the connection of the circuit wire to the terminal connector.

3. In an electromagnetically operated electric switch an insulating arc enclosing and suppressing chamber formed of relatively fixed and relatively removable portions, a terminal connector mounted at the exterior on a relatively fixed portion of said chamber and adapted to have a circuit wire connected thereto, a stationary contact within said chamber mounted on a relatively removable portion thereof, a movable contact within said chamber, means at the exterior of said chamber for moving the movable contact into and out of engagement with the stationary contact to perform the switching operation, and a readily releasable connection between said stationary contact and said terminal connector whereby said stationary contact and the removable portion of the chamber upon which it is mounted may be readily removed for inspection

or replacement without disturbing the circuit wire connection to the terminal connector.

4. In an electromagnetically operated electric switch an insulating arc enclosing and suppressing chamber formed of relatively fixed and removable sections, terminal connectors mounted at the exterior on a relatively fixed portion of said chamber and adapted to have circuit wires connected thereto, spaced stationary contacts within said chamber and mounted on a relatively removable portion thereof, a movable contact within said chamber adapted to bridge said stationary contacts, means at the exterior of said chamber for vertically reciprocating said movable contact into and out of engagement with the stationary contacts to perform the switching operation, and readily releasable connections between said stationary contacts and said terminal connectors whereby the stationary contacts and removable portions of the chamber upon which they are mounted may be readily removed without disturbing the terminal connector and the circuit wires connected thereto.

5. In an electromagnetically operated electric switch, spaced stationary contacts, a movable contact rectilinearly movable in a vertical plane into and out of bridging relation with said stationary contacts to effect the switching operation, a stationary magnet structure below said stationary and movable contacts, an armature member below said stationary magnet structure and adapted to be attracted into engagement therewith, and a power transmitting member connected to said armature and to the movable contact and extending in front of said stationary magnet structure, said last mentioned member being manually swingable forwardly of the switch to expose the movable contact and to provide access to the stationary magnet structure.

6. In an electromagnetically operated electric switch, a stationary contact, a movable contact, means biasing said movable contact to disengaged position, electromagnetic means for moving said movable contact into engaged position, guide means normally limiting movement of said movable contact to a straight line rectilinear movement in response to energization and deenergization of said electromagnetic means, and means providing for manual swinging movement of the movable contact into a readily accessible position for manipulation.

7. In an electromagnetically operated electric switch, a sectional arcing chamber having at least a bottom opening therein, stationary and movable contacts within said chamber, electromagnetic means below said chamber, means connecting said electromagnetic means to said movable contact and extending through said bottom opening, said movable contact being normally guided for rectilinear movement by the walls of said opening in response to energization and deenergization of said electromagnetic means, said chamber including a front portion readily removably mounted to remove the front boundary wall for said bottom opening, and means providing for manual swinging movement of said movable contact out of said chamber and into a readily accessible position when said front chamber portion is removed.

8. In an electromagnetically operated electric switch, spaced stationary contacts, a movable contact plate for bridging said stationary contacts to perform the switching operation, an electromagnetic operator, means connecting said movable contact plate to said electromagnetic

operator and normally guided for rectilinear movement of the movable contact into and out of engagement with the stationary contacts in response to energization and deenergization of said electromagnetic operator, and means providing for manual swinging movement of the contact plate into a readily accessible position for manipulation.

9. In an electromagnetically operated electric switch, an arcing chamber including a rear portion having an open front and an opening in its bottom extending to the front, a cover for the front of said arcing chamber including a surface forming a front wall for the bottom opening, a stationary contact within said chamber, a movable contact within said chamber, an electromagnetic operator beneath said chamber, means connecting said electromagnetic operator to said movable contact and extending through said bottom opening and guided thereby for rectilinear movement in response to energization and deenergization of said electromagnetic operator, and means providing for swinging movement of said movable contact forwardly into a readily accessible position after removal of said front cover.

10. In an electromagnetically operated electric switch, a plurality of side by side arcing chambers having open fronts and openings in their bottoms extending to the front, cover means for said chambers including surfaces providing front walls for said bottom openings, stationary contacts within said chambers, movable contacts within said chambers, means extending through said bottom openings and carrying said movable contacts and normally guided for straight line rectilinear movement, electromagnetic means beneath said chamber and connected to said contact carrying means for effecting movement thereof, and means providing for swinging movement of the movable contacts forwardly into a readily accessible position upon removal of said front cover.

11. In an electromagnetically operated electric switch, a stationary contact, a movable contact normally rectilinearly movable into and out of engagement with said stationary contact, a rigid link pivoted to a fixed part, a force transmitting member pivoted to the free end of said link and having an operative connection with said movable contact, an armature element operatively connected to effect movement of the pivotal connection between said member and link, means for attracting and releasing said armature to effect the switching operation, and means guiding a part movable with the movable contact so as to limit it to normal rectilinear movement in response to movement of the armature, at least a part of said last mentioned means being readily removable to provide for manual swinging movement of the movable contact about the pivots of said member and link into a readily accessible position.

12. In an electromagnetically operated electric switch, a stationary contact, a movable contact normally rectilinearly movable into and out of engagement with said stationary contact, an operating electromagnet, pivotally mounted and connected linkage means having an operative connection with said movable contact, an armature connected to said linkage means to effect movement thereof in response to energization and deenergization of said operating electromagnet, and means guiding a part movable with the movable contact so as to limit it to normal rectilinear

movement in response to movement of said linkage by movement of said armature to effect the switching operation, at least a part of said last mentioned means being removable to provide for manual swinging movement of the movable contact about the pivots of said linkage into a readily accessible position for manipulation.

13. In an electromagnetically operated electric switch, a stationary contact, a movable contact, electromagnetic means normally operating to effect rectilinear reciprocatory movement of the movable contact into and out of engagement with the stationary contact in response to energization and deenergization of the electromagnetic means to perform the switching operation, and means providing for manual swinging movement of said movable contact into a readily accessible position remote from its normal path of movement and from said stationary contact, whereby the movable contact may be readily inspected and manipulation thereof facilitated.

14. In an electromagnetically operated electric switch, an arcing chamber, stationary and movable contacts, within said chamber, electromagnetic means exterior of said chamber normally operating to effect rectilinear reciprocatory movement of the movable contact within the chamber into and out of engagement with the stationary contact in response to energization and deenergization of the electromagnetic means to perform the switching operation, and means providing for manual swinging movement of said movable contact out of said chamber and into a readily accessible position at the exterior thereof, and remote from its normal path of movement and from said stationary contact, whereby the movable contact may be readily inspected and manipulation thereof facilitated.

15. In an electromagnetically operated electric switch, spaced stationary contacts, a movable contact plate normally rectilinearly movable into and out of bridging relation with said stationary contacts, electromagnetic means normally operating to effect rectilinear reciprocatory movement of said movable contact plate in response to energization and deenergization of the electromagnetic means to perform the switching operation, and means provided for manual swinging movement of said movable contact plate into a readily accessible position remote from its normal path of movement and from said stationary contacts, whereby the contact plate may be readily inspected and manipulation thereof facilitated.

16. In an electromagnetically operated electric switch an arc chamber having an open front and an opening in its bottom extending to the front, a stationary contact within said chamber, a movable contact within said chamber adapted to be normally reciprocated therein into and out of engagement with the stationary contact, a front cover for said chamber closing said front opening but maintaining the bottom opening into said chamber, operating means extending through said bottom opening into said chamber and carrying said movable contact, electromagnetic means at the exterior of and beneath said chamber and connected to said operating means to effect rectilinear reciprocatory movement thereof in response to energization and deenergization of the electromagnetic means to perform the switching operation, and means providing for manual swinging movement of said movable contact out of said chamber when said front cover is removed, and into a readily accessible position remote from its normal path of movement and from

said stationary contact, whereby the movable contact may be readily inspected and manipulation thereof facilitated.

17. In an electromagnetically operated electric switch, stationary and movable contacts, pivotally mounted supporting means for said movable contact, means normally guiding said movable contact for substantially rectilinear movement only, an armature connected to said supporting means, electromagnetic means for attracting and releasing said armature in response to energization and deenergization of the electromagnetic means to effect rectilinear movement of the movable contact into and out of engagement with the stationary contact to perform the switching operation, at least a portion of said guiding means being removable at will, and said movable contact being manually swingable upon removal of said at least a portion of said guiding means into a readily accessible position remote from its normal path of movement and from said stationary contact, whereby the movable contact may be readily inspected and manipulation thereof facilitated.

18. In an electromagnetically operated electric switch for industrial control service, stationary and movable contacts, a link connected to said movable contact, a second link pivoted into said first link into a fixed part, an armature pivotally mounted on said links, a stationary magnet structure for attracting and releasing said armature in response to energization and deenergization thereof and operated to effect movement of said armature and of the pivotal connection between said links in a direction substantially parallel to the direction of normal movement of the movable contacts, and means guiding said movable contact for substantially rectilinear movement only in response to movement of said armature toward and away from the said magnet structure.

19. In an electromagnetically operated electric switch for industrial control service, stationary and movable contacts, a pivotally mounted link connected to said movable contact, an armature connected to said link, a stationary magnet structure operating to attract and release said armature in response to energization and deenergization of the magnet structure to perform the switching operation whereby the movable contact is moved into and out of engagement with the stationary contact, means for guiding said movable contact for normal substantially vertical rectilinear movement in response to such movement of said armature, at least a portion of said guiding means being removable to provide for manual swinging movement of the movable contact into a readily accessible position remote from its normal path of movement and from said stationary contact, whereby the movable contact may be readily inspected and manipulation thereof facilitated.

20. In an electromagnetically operated electric switch for industrial control service, a stationary contact, a reciprocable member, a movable contact connected to said member to be moved thereby into and out of engagement with the stationary contact, a link pivoted to said member and to a fixed part, an armature pivotally mounted on said link and member, and a stationary magnet structure for attracting and releasing said armature in response to energization and deenergization thereof, and operating to effect movement of the pivotal connection between said link and member in a direction substantially parallel to the direction of move-

ment of said movable contact, and guiding means for normally limiting movement of said reciprocable member to a substantially straight line of rectilinear movement only.

21. In an electromagnetically operated electric switch, an arcing chamber having an openable front cover and an opening in the bottom thereof extending to said cover, stationary and movable contacts within said chamber, a support for said movable contact projecting through said bottom opening, electromagnetic means at the exterior of and beneath said chamber normally operating to effect rectilinear reciprocatory movement of the movable contact within the chamber into and out of engagement with the stationary contact in response to energization and deenergization of the electromagnetic means to perform the switching operation, and means providing for manual swinging movement of said movable contact out of said chamber when said front cover is open and into a readily accessible position at the exterior of the chamber remote from its normal path of movement and from said stationary contact, whereby the movable contact may be readily inspected and manipulation thereof facilitated.

22. In an electromagnetically operated electric switch, spaced stationary contacts, a movable contact plate adapted to be moved into and out of bridging relation with said stationary contacts, an insulating body portion having an openable front cover and substantially enclosing said contacts and contact plate except for an entrance opening through which extends the supporting and manipulating means for the movable contact, electromagnetic means at the exterior of and beneath said body portion normally operating to effect rectilinear reciprocatory movement of the movable contact into and out of engagement with the stationary contacts in response to energization and deenergization of the electromagnetic means to perform the switching operation, the front cover of the insulating body portion being readily manually operable to provide for readily manual removal of said stationary contacts and for supporting swinging removal of said movable contact plate out of said body portion and into a readily accessible position at the exterior thereof remote from its normal path of movement and said stationary contact, whereby the contact plate may be readily inspected and manipulation thereof facilitated.

23. In an electromagnetically operated electric switch, spaced stationary contacts, a movable contact plate adapted to be movable into and out of bridging relation with said stationary contacts, a chamber substantially enclosing said contacts, electromagnetic means at the exterior of said chamber normally operating to effect rectilinear reciprocatory movement of the movable contact plate within the chamber into and out of engagement with stationary contacts in response to energization and deenergization of the electromagnetic means to perform the switching operation, a pair of oppositely directed U-shaped magnetic yokes within said chamber, each of said yokes being disposed with its legs on opposite sides of one of said stationary contacts and with its bight outside of the path of movement of the movable contact plate with the plane of the U disposed substantially at right angles to the path of movement of the movable contact plate.

24. In an electromagnetically operated electric switch, spaced stationary contacts, a movable contact plate adapted to be moved into and out

of bridging relation with said stationary contacts, a chamber substantially enclosing said contacts, electromagnetic means at the exterior of said chamber normally operating to effect rectilinear reciprocatory movement of the movable contact plate within the chamber into and out of engagement with stationary contacts in response to energization and deenergization of the electromagnetic means to perform the switching operation, and a pair of U-shaped magnetic yokes disposed in said chamber with their legs spaced from, but embracing at least a portion of, the path of the movable contact adjacent to the stationary contacts and with the plane of the U disposed at substantially right angles to the direction of said path.

25. In an electric switch, a contact chamber having an openable front cover, stationary contacts within said chamber and spaced longitudinally thereof, a movable contact within said chamber adapted to bridge said stationary contacts, means for moving said movable contact within said chamber into and out of engagement with said stationary contacts, a U-shaped magnetic yoke mounted on the back interior wall of said chamber and embracing the path of contact movement adjacent to the back stationary contact and a second U-shaped magnetic yoke mounted on the interior wall of the cover and embracing the path of contact movement adjacent to the front stationary contact when said cover is in place.

26. In an electric switch, a contact chamber, a stationary contact assembly in said chamber comprising a removable insulating block and a pair of spaced contacts associated with said block, terminal members mounted on a stationary portion of said chamber and having means

thereon for the reception of circuit wires, means for connecting said stationary contacts to said terminal members so as to be rigidly supported therefrom independent of their association with the removable insulating block, said connecting means being readily disconnected and providing for removal of the insulating block and the stationary contacts as a unit assembly while said terminal members remain mounted on the stationary portion of the contact chamber, whereby removal of the stationary contacts as a unit may be readily effected without disturbing the circuit wiring connections.

27. In an electric switch, a contact chamber formed of front and back insulating elements, means mounting said back insulating element on a support, means removably mounting said front insulating element in cooperating relation with the back insulating elements, terminal members rigidly mounted on the back insulating element and having means for the attachment of circuit wires, a stationary contact assembly in said chamber comprising a removable insulating block and a pair of spaced contacts associated therewith, means connecting said contacts to said terminals so as to be rigidly supported therefrom independent of their association with the removable insulating block, said connecting means being readily disconnected and providing for removal of the insulating block and contacts as a unit assembly while said terminal members remain mounted on the back insulating element, whereby removal of the contacts as a unit may be readily effected without disturbing the circuit wiring connections.

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