Dec. 7, 1937. H. L. VAN VALKENBURG 2,101,288

CONTACTOR CONSTRUCTION

Filed Jan. 26, 1935 4 Sheets-Sheet 1

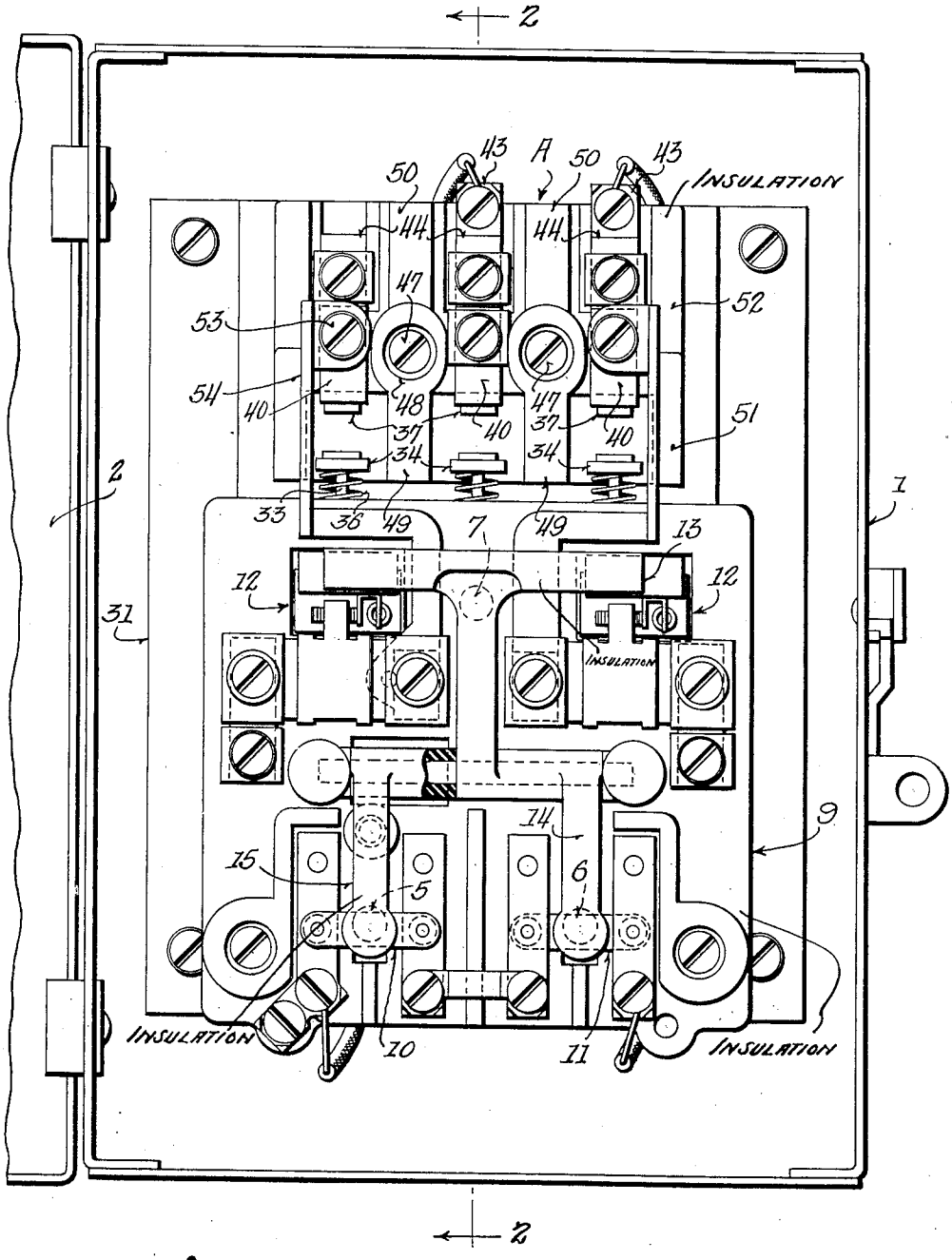


Fig. 1

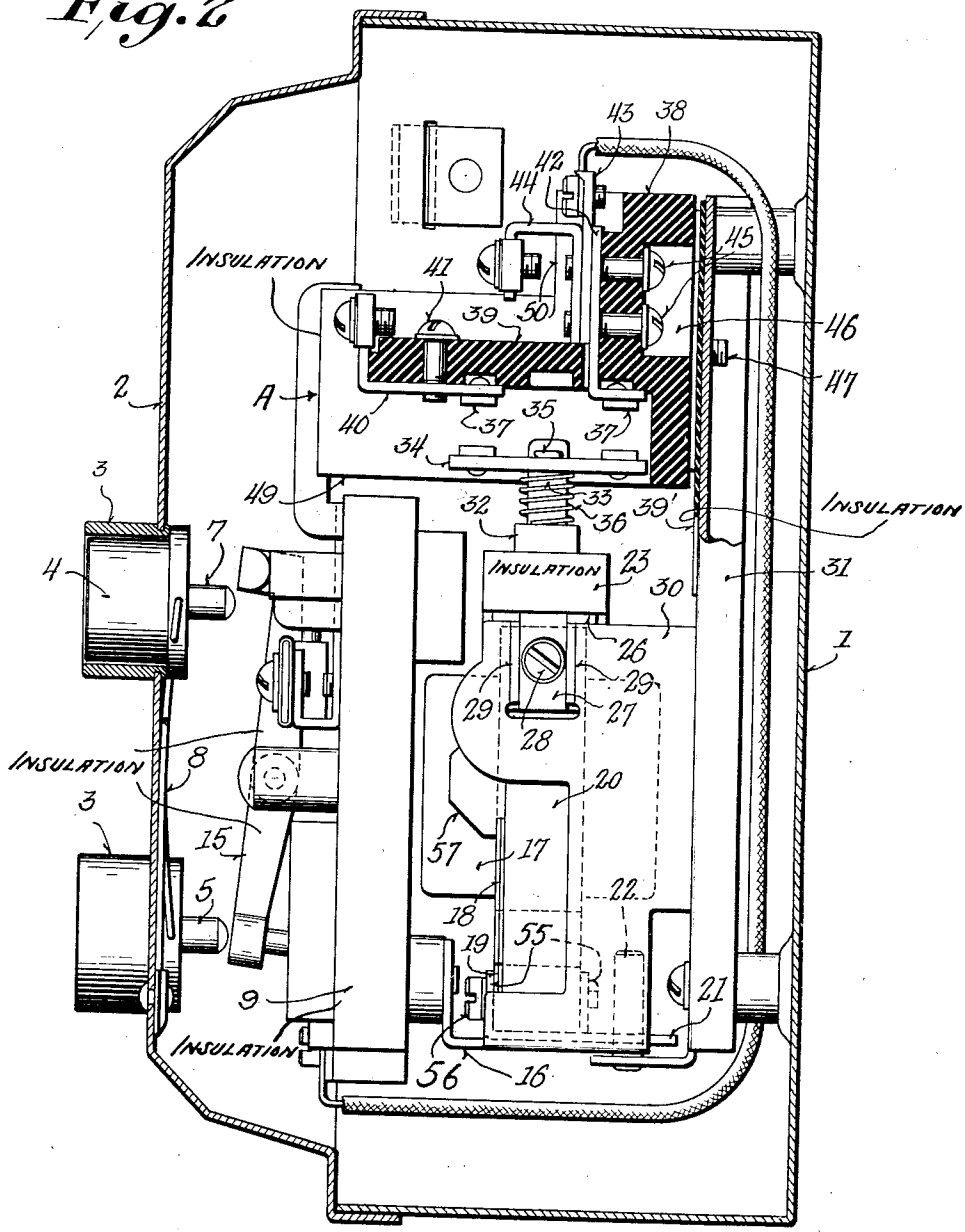
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CONTACTOR CONSTRUCTION

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Fig. 2



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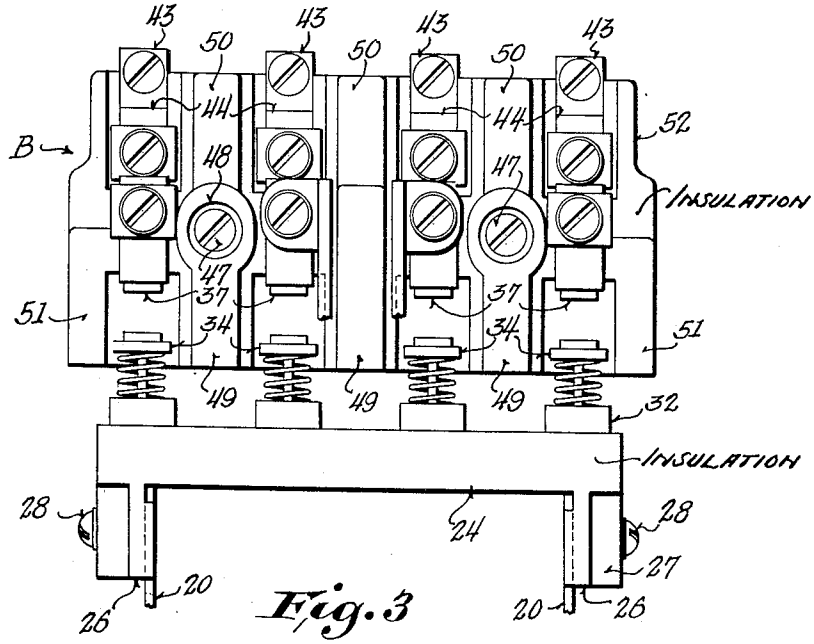


Fig. 3

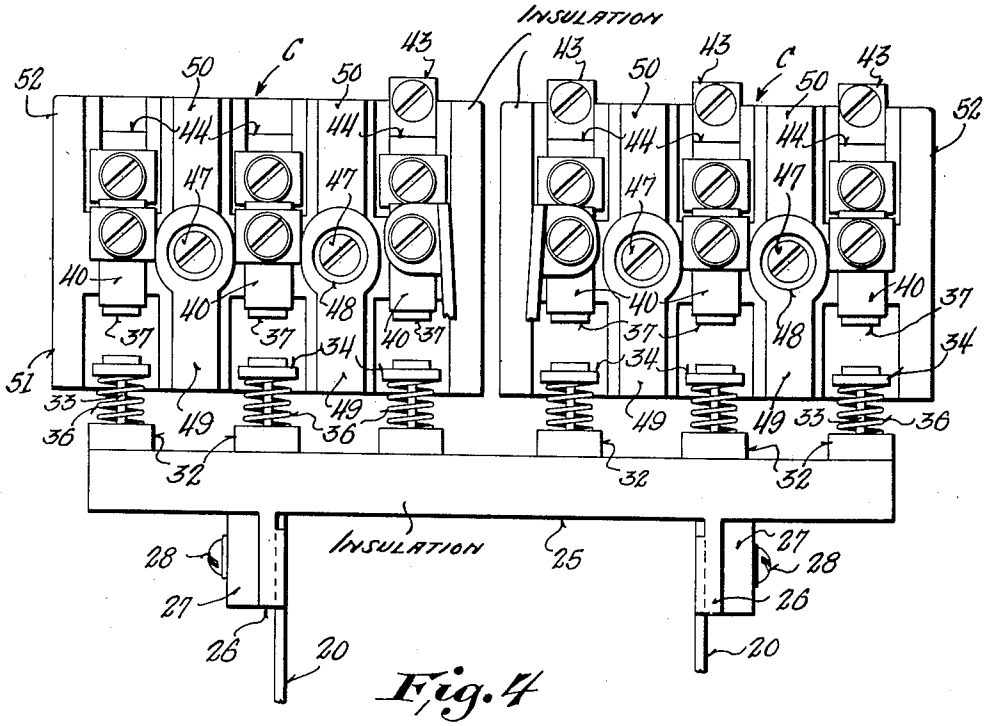


Fig. 4

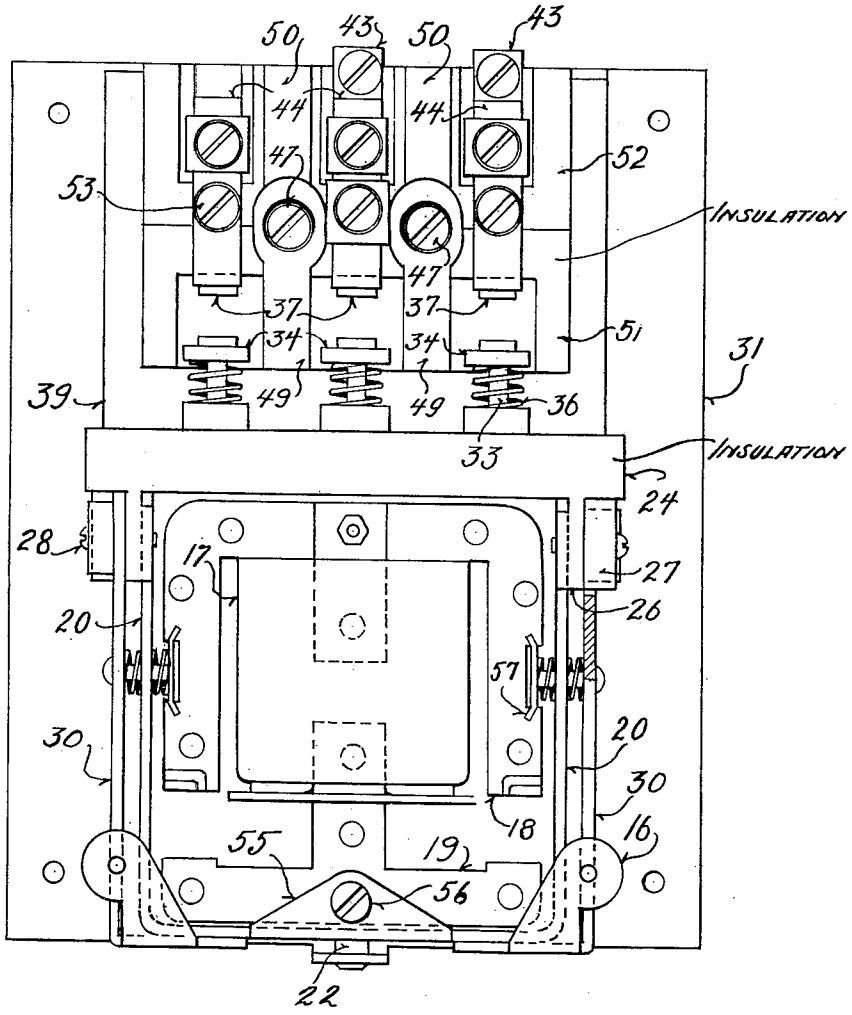
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Fig. 5.



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2,101,288

UNITED STATES PATENT OFFICE

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CONTACTOR CONSTRUCTION

Hermon L. Van Valkenburg, Wauwatosa, Wis., assignor to Square D Company, Detroit, Mich.

Application January 26, 1935, Serial No. 3,571

5 Claims. (Cl. 200—16)

This invention relates to a contactor construction and is particularly directed to a contactor construction for automatic starters.

Though the contactor may be used wherever desired, it is particularly suitable for an automatic starter such as disclosed in my Patent No. 2,013,013 of September 3, 1935, for Automatic starter.

Objects of this invention are to provide an automatic starter which is so constructed that a contactor of multipole construction may be employed, and the same type of starter may be used with a contactor of any number of poles, such as a single pole, two pole, three pole, four pole, or six pole contactor for instance, without the necessity of making any change in the starter construction to accommodate contactors of different number of poles, other than to lengthen the movable yoke to carry the requisite number of movable contacts and to enlarge the housing to accommodate the increase in size of the contactor parts.

In greater detail, objects of this invention are to provide a magnet type of automatic starter in which control switches, such as the start and stop buttons and overload relays, and the major portion of the mechanism asociated therewith are mounted upon a control switch block which is easily removable as a unit, and to mount within the casing, preferably behind this block, a magnet mechanism which operates a contactor, the contactor being mounted transversely of the housing and adjacent the end of the control switch block and magnet, thus providing a very compact though readily accessible construction.

Further objects are to provide a construction of automatic magnet type starter in which the contactor elements are separated from each other by insulating barriers which form channel spaces between successive barriers, which channel spaces are open at the edge of the control switch block so that the contactor elements may be readily inspected without disassembling any portion of the apparatus, and generally to provide a construction which is very compact although in no way detracting from the safety of the device or the accessibility of the parts.

In contactor construction it is the usual practice to make the body portion or block of the contactor of porcelain or other insulating material. Difficulty is experienced in making an elongated block having many barriers and channels for the contacts, due to the warping during manufacture and cracking of the block. This is particularly true where porcelain is used, with the result that the difficulty and cost of these insulating blocks increases out of proportion to their length.

This invention overcomes the above noted difficulty and provides a construction such that, when a large number of barriers and channels are required, a plurality of shorter units or sections may be assembled on the base and thus make a contactor having a block of any desired length, the only other change being an increase in the length of the crosshead which carries the movable contacts.

Embodiments of the invention are shown in the accompanying drawings, in which:—

Figure 1 is a face view of the device with the cover open and with parts broken away, such view showing a three pole contactor.

Figure 2 is a view at right angles to that shown in Figure 1, such view being a sectional view approximately on the line 2—2 of Figure 1, with the control switch block and magnet construction shown in full.

Figure 3 is a fragmentary view showing how the invention may be applied to a four pole contactor.

Figure 4 is a view corresponding to Figure 3 showing how the invention may be applied to a six pole contactor.

Figure 5 is a view of the magnet construction showing it associated with a contactor with the control switch block removed and with the chassis removed from the housing.

Referring to the drawings, it will be seen that the entire mechanism is carried within a housing 1 provided with a hinged cover 2, the cover carrying guiding sleeves 3 for the push buttons 4. Usually three push buttons are provided and constitute start, stop and reset push buttons all as described in my above noted copending application. The stems, or operating portions of the start, stop, and reset push buttons are respectively indicated at 5, 6, and 7. The push buttons are provided with springs as indicated at 8 in Figure 2.

The control switch block is indicated by the reference character 9, and carries the control switches, viz., the start and stop switches 10 and 11, and thermal overload relays indicated generally at 12. These overload relays actuate an extended arm 13 integral with the stop switch lever 14, such lever being actuated by the stop switch whose stem 6 is indicated in Figure 1. The start switch arm is indicated by the reference character 15 in Figure 1. All of these parts are carried by the control switch block 9 and are removable therewith as a unit. This invention is pri-

marily directed to the contactor construction, and the specific form of the parts hereinabove described are developed in greater detail in my copending application, noted above. Their specific construction forms no part of the present invention.

The control switch block 9 is supported from the supports 16 of the magnet whose energizing winding is indicated at 17 and whose body portion and armature are indicated respectively by the reference characters 18 and 19. The armature is carried by a yoke whose arms are indicated at 20 in Figures 2, 3, and 4. If desired, the yoke may be provided with a downwardly projecting lip 21 guided by a pin 22, as shown in Figure 2.

It will be seen particularly from Figures 2 and 5 that the armature of the magnet is carried between the inturned ears 55 of the U-shaped yoke 20 pivoting upon the screw or pin 56. The magnet body may be removably held by means of the spring pressed clips 57, as may be seen from Figures 2 and 5, such specific construction, however, forming no part of the present invention and forming the subject matter of the invention disclosed in the application of Josef Bierenfeld, Serial No. 735,386 filed July 16, 1934, for Magnet construction for contactors.

The ends of the arms of the yoke 20 are attached to a crosshead which may be of any length desired, for instance, for a three pole contactor, a four pole contactor, a six pole contactor, or in fact, for a contactor of any desired number of poles. The yoke for the three pole contactor, as shown in Figure 1, is itself shown in Figure 2 and is indicated by the reference character 23.

The yoke for a four pole contactor is shown in Figure 3 and is indicated by the reference character 24. The yoke for a six pole contactor is shown in Figure 4 and is indicated by the reference character 25.

In each case, the yoke is provided with projecting portions 26 which are preferably integral with the yoke in each instance. These projecting portions are provided with narrower portions 27 on their outer sides, which constitute slides. On their inner sides they are slotted and receive the ends of the arms 20 which are locked to the projecting portions in any suitable manner as by screws 28.

The sides 27 are slidably received between outwardly turned ears 29 integral with the supporting side walls 30 for the magnet and control switch block 9. The supports 30 are in turn supported from the chassis 31 which is in turn supported from the housing 1.

The face of the crosshead presented towards the body portion of the contactor may be provided with a plurality of bosses 32. The crosshead 25 is formed of insulating material and may be formed of a molded phenolic condensation product, if desired. It carries a plurality of rectangular pins 33 which are preferably secured within the crosshead during the molding of the crosshead.

Each of these pins loosely carries one of the movable contact bars 34 and is provided with a split pin or other member 35, see Figure 2, to prevent the movable contact bar from slipping off the pin, such contact bar in each instance being urged outwardly by a spring 36 loosely surrounding the pin 33 and yieldingly urges the movable contact bar outwardly.

The movable contact bars 34 bridge the stationary contacts 37 when the crosshead is moved to contactor-closing position, and the springs 36 provide a yielding pressure for the movable contact bars, the construction permitting self-aligning of each movable contact bar.

The stationary contacts 37 of the contactor are supported from the insulating body portion, indicated generally at 38, of the contactor. This body portion is preferably formed of porcelain and is supported from the chassis or metal base or main support 31. If desired, a fiber or other insulating sheet 39', see Figure 2, may be positioned between the contactor block and the metal base or chassis 31.

The fiber or other insulating sheet 39' prevents any chance of a flash or striking from the bottom of the screws 45 direct to the metal chassis or base portion. Also, it will be noted that the fiber sheet together with the body portion 38 of the contactor block forms compartments for the heads of the screws 45 and thus adequately insulates them from the metal body portion.

It is to be noted also that in each case the screws pass through the stationary contactor block, for example the screw 41 extends through the outwardly projecting portion or wall 39 and engages the stationary contact member 40 and the screws 45 extend through the horizontal wall of the base portion and lock the members 42 in place, thus securely holding the stationary contacts in their correct position.

The body portion of the contactor or contactor block 38 is provided with the outwardly projecting portion 39 to which the angularly bent terminal members 40 are attached as by means of screws 41. The terminal members carry the upper or outer stationary contacts 37 and are bent over the outer end of the portion 39. The inner stationary contacts 37 are carried by the terminal members 42 which project rearwardly through openings formed in the wall 39. These inner terminal members may have additional portions as indicated at 43 and 44 secured thereto, as shown in Figure 2. Depending upon the connections desired, one or both of such members 43 and 44 may be employed. At all events, it will be noted that the actual point at which the lines or conductors are attached are located rearwardly of the wall 39, so that such portions are removed from the active faces of the stationary contacts 37 and are separated therefrom by the wall or longitudinal barrier 39 of the contactor body portion. The parts 42, 43, and 44 are locked to the rearwardly projecting portion of the contactor body by screws 45 located rearwardly of the wall 39 with their heads located in separate recesses 46 in the base of the contactor body as shown in Figure 2.

Screws 47 are inset within openings 48 formed in the body portion of the contactor block and are screwed into the base or chassis 31.

The contactor block is provided with laterally arranged, forwardly projecting intermediate barriers 49 and with laterally arranged, rearwardly projecting intermediate barriers 50 and with forwardly and rearwardly projecting end barriers or walls 51 and 52, respectively. The barriers, together with the forwardly and rearwardly projecting portions of the base of the contactor block, form channels closed on three sides and open at their outer or top portions.

It will be noted, that even when the contactor is in fully open position, the movable contact bars 34 are still within the outline of the barriers 49 and end walls 51. In other words, the movable

contacts are never withdrawn from the channels formed in the contactor block.

It will be noted that the construction of contactor block provides separate compartments or channels for each of the sets of stationary and movable contacts, and for each of the sets of terminal members for the several pairs of stationary contacts. In reality, the front and rear barriers are connected, or continued across the top of the wall **39**, as may be seen in Figure 2.

The same numbering of the parts of the contactor has been followed in all of the figures of the drawings as the elements that go to make up each contactor are similar, the contactors, however, being for different numbers of poles.

The contactors for different numbers of poles are differentiated by the letters A, B, and C. For instance, the three pole contactor in Figures 1 and 2 is indicated generally by the reference character A, the four pole contactor in Figure 3 by the reference character B, and the two units of the six pole contactor in Figure 4 by the reference character C.

This construction lends itself readily to the construction of contactors of any number of poles. In changing from a three pole contactor to one or more poles, for instance, it is merely necessary to use a longer crosshead and a longer contactor block, as is apparent from the preceding description and from Figures 1, 3, and 4. Of course, a larger housing or box may be used when required. The main, or active parts of the apparatus are, however, unchanged.

Contactors of several different numbers of poles have been shown, though obviously they may be of any number of poles required.

A particularly important feature of this invention is that where a contactor with a large number of poles is required, the contactor block may be formed of several distinct and separate units as shown at C in Figure 4.

These contactor blocks are usually formed of porcelain and if it is attempted to make a long contactor block, cracking or warping usually occurs. The result is that the long contactor blocks are usually defective and are much more expensive than two or more shorter blocks which may be used to obtain the requisite length for the required number of poles.

This invention, therefore, provides a construction whereby the contactor may be made of several short sections, with a reduction of expense and with a better alignment of the parts. The sections of the contactor block may be slightly spaced, as shown in Figure 4, or may be arranged in butt to butt relation.

A further feature of this construction is that the channels in the contactor block are open at their outer or upper ends and are also located beyond the outline of the control switch block. The stationary and movable contacts may be readily inspected and their condition instantly ascertained without dismantling any portion of the apparatus.

Further, the contactor block can be readily removed if desired by merely loosening the terminal screws which receive the conductors, unscrewing the screws **47** which hold the contactor to the base, and unscrewing the screws **53** which hold the supporting arms **54** from the control block, see Figure 1.

The crosshead is supported independently of the contactor block and is freely slidable into contactor-closing position or to open position, the contactor being biased towards open position by any suitable means as by a spring or by gravity. In the forms shown in the drawings, the latter mode of biasing the contactor towards open position is employed.

It will be seen that a novel form of contactor has been provided which allows ready inspection of the contacts without dismantling the device, which although compact nevertheless has the contacts well separated and insulated from each other, and which is so made that a contactor of any desired number of poles can be constructed without requiring an expensive construction for the contactor, as small, easily produced blocks may be used.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

1. In a contactor, a metal chassis, metal side walls extending outwardly therefrom and having guiding slots, an insulating elongated crosshead mounted transversely of said walls and having extensions projecting from one of the longer sides of said crosshead and forming slides located within said guiding slots, said extensions projecting at right angles to said crosshead, movable contact members carried by said crosshead, a stationary contactor block formed of insulating material and having a base portion supported from said chassis and having an outwardly projecting wall, and a plurality of stationary contacts carried by said outwardly projecting wall and positioned for engagement by said movable contacts.

2. A contactor comprising a metal chassis, a pair of metal side walls carried by said chassis and guide members projecting laterally of said walls, a crosshead having projecting slide portions located between said guide members and guided thereby, a U-shaped yoke secured to said crosshead and supported therefrom, means for moving said yoke, means for slidably supporting said yoke at a point spaced from said crosshead, stationary contacts mounted opposite said crosshead, and movable contacts carried by said crosshead for cooperation with said stationary contacts.

3. A contactor comprising a metal chassis, metal side walls supported thereby and having integral outwardly turned guide members, a crosshead formed of insulating material and having integral projecting slides positioned between and guided by said guide members, a U-shaped yoke having its arm secured to said slide members, and supported thereby, means for moving said yoke, guiding means for slidably supporting the transverse portion of said yoke, whereby said yoke has a three-point suspension, a contactor block arranged opposite said yoke and formed of insulating material and supported from said metal chassis, stationary contacts carried by said contactor block, and movable contacts carried by said yoke for cooperation with said stationary contacts.

4. A contactor comprising a chassis, a crosshead, guiding means supported from said chassis for guiding said crosshead, a U-shaped yoke having its arms secured to said crosshead and having a transverse portion, means for slidably supporting the transverse portion of said yoke and located in spaced relation to said crosshead, stationary contacts mounted opposite said crosshead, and movable contacts carried by said cross-

head and located on one side thereof for cooperation with said stationary contacts, said crosshead having slides projecting from that side thereof opposite said movable contacts and guided by said guiding means.

5. In a contactor, a metal chassis, metal side walls extending outwardly therefrom and having guiding slots, an insulating crosshead mounted transversely of said walls and having extensions at right angles to said crosshead and located within said slots, said extensions projecting wholly from one side of said crosshead, contact members carried by said crosshead, stationary contact members positioned for engagement by said first mentioned contact members, and operating members for said crosshead projecting substantially at right angles to said crosshead and secured to said extensions.

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