Dec. 3, 1957 D. F. MOYER 2,815,420

CIRCUIT BREAKER

Original Filed Jan. 19, 1954 2 Sheets-Sheet 1

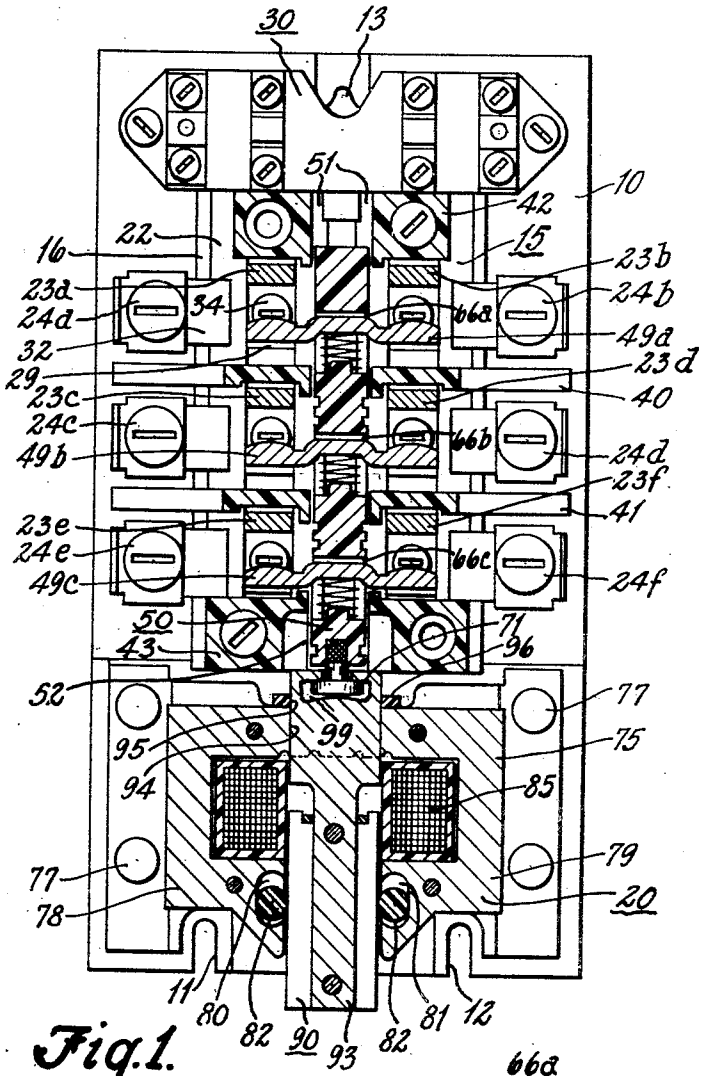

Fig. 1.

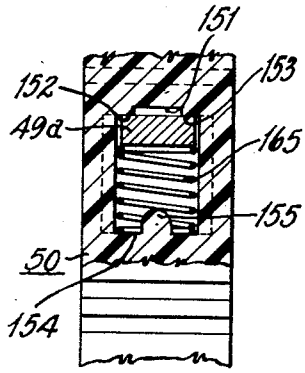

Fig. 3.

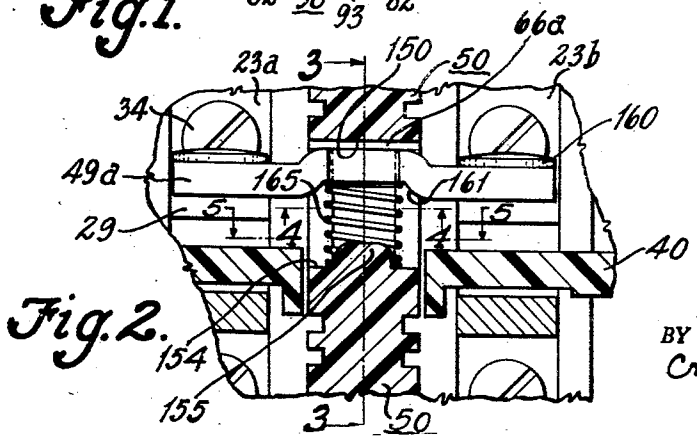

Fig. 2.

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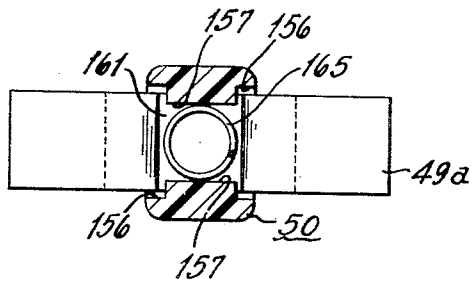

Fig. 4.

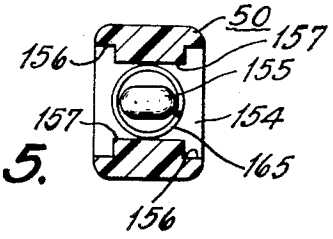

Fig. 5.

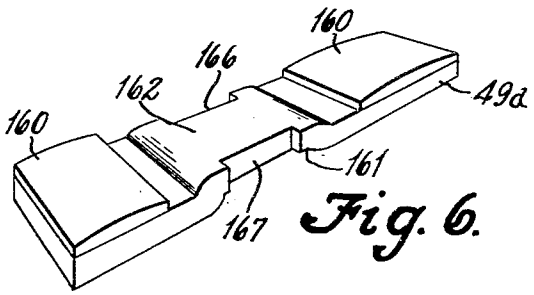

Fig. 6.

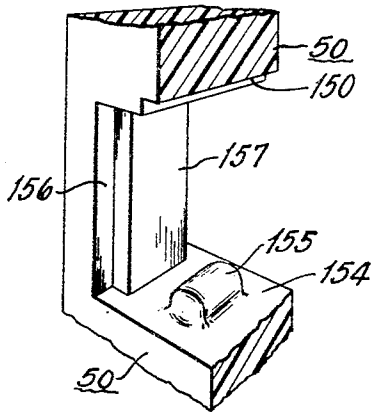

Fig. 7.

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CIRCUIT BREAKER

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Original application January 19, 1954, Serial No. 404,843. Divided and this application May 26, 1954, Serial No. 432,487

3 Claims. (Cl. 200—166)

This invention relates to a motor starting controller.

An object of the invention is to provide an improved structural arrangement of a motor starting controller that is more compact and which provides for quick and easy disassembly of the several parts of the structure for replacement and repair when necessary.

Another object of this invention is to provide a contact carrier having removable contact bars that are resiliently retained in position within the carrier and are normally locked to the carrier by the resilient means which also provides for uniform pressure loading of the contact bar against cooperating stationary contacts.

It is another object of the invention to provide an improved contact carrier in accordance with the foregoing object wherein the contact bars on the carrier are each independently removable for replacement.

It is also an object of the invention to provide a motor starting controller wherein the movable contacts on the contact carrier as well as the stationary contacts and the line terminals are all removable from their supporting structures for easy replacement, the disassembly provided for these elements as well as the disassembly of the armature and magnet coil of the electro-magnet providing for replacement of any part of the contactor in a relatively free and easy manner.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred form of the invention is clearly shown.

In the drawings:

Figure 1 is a transverse cross sectional view of a control switch incorporating features of this invention.

Figure 2 is a cross sectional view of the contact carrier and contact bar supported thereon.

Figure 3 is a cross sectional view taken along line 3—3 of Figure 2.

Figure 4 is a cross sectional view taken along line 4—4 of Figure 2.

Figure 5 is a cross sectional view taken along line 5—5 of Figure 2.

Figure 6 is a perspective elevational view of the contact bar.

Figure 7 is a perspective view partially in cross section of a part of the contact carrier.

In this invention the controller is of the type disclosed in my copending application S. N. 404,843, filed Jan. 19, 1954, of which this application is a division and comprises a mounting plate **10** that supports the main contactor **15**. At the lower end of the contactor **15** there is provided an electro-magnet **20** for operating the contactor.

The contactor may also be provided with an auxiliary control which is the control switch **30** adapted for making and breaking circuit to auxiliary devices that need be electrically synchronized with the operation of the main motor starting control.

The mounting plate **10** has a plurality of screw slots **11**, **12** and **13** provided for receiving screw heads by

which the plate **10** can be mounted on any suitable support.

The terminal base **16** has a platform portion **22** on which the stationary contacts **23***a* to **23***f* inclusive are mounted. Each of the stationary contacts engages one of the line terminals **24***a* to **24***f* respectively.

A machine screw **34** extends through the leg **29** of the stationary contact into threaded engagement with the leg **32** of the terminal **24***a* whereby to retain the two elements together.

The line terminals **24***a*, **24***c* and **24***e* are adapted to be connected with the three wires of a three phase wiring system. The line terminals **24***b*, **24***d* and **24***f* are linearly aligned with the line terminals **24***a*, **24***c* and **24***e* whereby the wires of the three phase wiring system may be connected straight through the terminal base for simplification of wiring.

The terminal base **16** has partition wall sections **40** and **41** that separate the line terminal set **24***c*—**24***d* from the line terminal sets **24***a*—**24***b* and **24***e*—**24***f* thereby compartmenting the line terminal sets and their cooperating stationary contacts one from the other. The end walls **42** and **43** provide closure walls for confining the terminal sets **24***a*—**24***b* and **24***e*—**24***f*. The partition walls **40** and **41** extend substantially above the level of the contacts **23***a* to **23***f* to make it more difficult to directly engage the live contacts and terminals by an operator when replacing one of the contacts or dis-assembling the contactor.

The stationary contact sets **23***a*—**23***b*, **23***c*—**23***d* and **23***e*—**23***f* are bridged by the movable contacts **49***a*, **49***b* and **49***c* respectively whereby to conduct current between the respective line terminals on opposite sides of the terminal base **16**.

The movable contact bars **49***a*, **49***b* and **49***c* are supported in a contact carrier **50** that has linear movement only to move the movable contacts into and out of engagement with the cooperating stationary contacts.

The contact carrier **50** is made of an electrical insulating material and extends through the partition walls **40** and **41**. The upper end of the carrier **50** engages the guide surface **51** on the terminal base **16**. The lower end of the carrier **50** engages corresponding guide surfaces **52** at the opposite end of the base **16**.

A cover (not shown) is provided with guide surfaces corresponding to guide surfaces **51** and **52** engaged by opposite ends of the carrier **50** to retain the carrier in position in the contactor.

The contact bars **49***a*, **49***b* and **49***c* are each removably supported in the carrier **50** in openings **66***a*, **66***b* and **66***c* respectively, the openings extending through the contact carrier **50** transversely of the axis of the carrier. The upper wall **150** of the opening **66***a* has a recess **151** extending transversely of the axis of the carrier **50** whereby to provide shoulders **152** and **153** that extend transversely of the axis of the carrier. The bottom wall **154** of the opening **66***a* has a projection **155** extending upwardly therefrom. Between the walls **150** and **154**, the side walls **156** each have a guide ridge **157** extending therefrom.

The contact bar **49***a* has the contacts **160** at each end thereof. The central portion of the contact bar **49** is formed to provide a recess **161** on the lower side thereof. The upper face **162** of the formed portion engages the shoulders **152** and **153** of the carrier **50** to position the contact bar **49***a* substantially normal to the axis of the carrier. The contact bar **49***a* is normally retained against the shoulders **152** and **153** by a compression spring **165** that has one end thereof positioned within the recess **161** of the contact bar and the other end positioned over the projection **155** provided on the carrier **50**.

The contact bar **49***a* has notches **166** and **167** pro-

vided in opposite edges of the heretofore mentioned formed portion that fit over guide ridges **157**, as shown in Figure 4. Thus, when the contact bar is in its normal position, as shown in the drawings, it cannot move transversely of the opening **66***a*, being prevented by the cooperation between the notches **166**, **167** and the guide ridges **157**.

The spring **165** permits the contact bar **49***a* to tilt on the spring as a pivot to secure like contact pressure between the contacts **160** of the bar **49***a* and the stationary contacts **23***a* and **23***b*.

To remove the contact bar **49***a* from the carrier **50**, the upper end of the compression spring **165** is tilted transversely of the opening **66***a* about the projection **155** as a pivot so that the spring can be removed sidewise from the carrier **50**. When the spring **165** is removed, the contact bar **49***a* can then be rotated on its longitudinal axis to disengage the notches **166** and **167** from the guide ridges **157** and thereby permit removal of the contact bar transversely of the carrier **50** through the opening **66***a*. Reinsertion of the contact bar **49***a* is occasioned by reversing the aforementioned operations.

The lower end of the carrier **50** is provided with a T-head fitting **71** for connection to the armature of the electro-magnet in a manner hereinafter described.

The electro-magnet **20** for operating the contact carrier **50** comprises a substantially C-shaped core **75**. The core **75** is secured to the plate **10** by means of rivets **77**. The C-shaped core **75** has the opposing legs **78** and **79** provided with recesses **80** and **81** that receive the nylon rollers **82**.

A magnet coil **85** is placed within the core **75**. The armature **90** extending through the coil **85** has an extension member **93** projecting from the upper end thereof. The member **93** extends through a slot **94** in the core **75** and through a slot **95** in the nylon guide plate **96** mounted on the core **75**.

The free end of the extension **93** on the armature **90** has a T-slot **99** that engages the T-head **71** on the contact carrier **50** whereby the armature **90** is suspended from the carrier **50** when the controller is in its normal vertical position.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted as may come within the scope of the claims which follow.

What is claimed is as follows:

1. A contact carrier for an electric switch comprising, a carrier bar having an opening through the same transversely of the axis of the bar, a contact bar disposed in said opening and projecting from opposite sides of said carrier bar, and a compression spring in said opening between said contact bar and a first wall of said opening retaining said contact bar against a second wall opposite to the first wall, said second wall having a recess therein extending through said bar and between opposite sides thereof transversely of the axis of the carrier bar forming shoulders along each longitudinal side of the recess extending transversely of the carrier bar and longitudinally of the contact bar along each of opposite edges of the contact bar engaged by the contact bar to position the same normal to the axis of the carrier bar, said contact bar having a portion intermediate opposite ends thereof deformed transversely to effect a flat bottomed recess on one side of the contact bar forming shoulders transverse of the contact bar and a flat faced raised portion on the opposite side of the bar extending transversely of the contact bar, said contact bar recess receiving one end of said spring with the shoulders engaging the spring to retain it against movement longitudinally of the contact bar and to urge said raised portion into engagement with said shoulders, said first wall having a projection encircled by the opposite end of said spring normally to retain said spring within said opening, said spring being removable from the opening upon axial tilting of the spring relative to the contact bar and about the projection as a pivot, said contact bar having a notch in at least one edge of the deformed portion of the contact bar engaging a ridge on a third wall of said opening that extends between the first and second walls, said ridge extending longitudinally of the axis of the said carrier bar to a length greater than the movement of the contact bar in said opening upon opening and closing movement of the said contacts to prevent movement of the contact bar transversely of the axis of the carrier bar during operation of the switch.

2. A contact carrier for an electric switch, comprising, a carrier bar having an opening through the same transversely of the axis of the bar, a contact bar disposed in said opening and projecting from opposite sides of said carrier bar, and a compression spring in said opening between said contact bar and a first wall of said opening retaining said contact bar against a second wall opposite to the first wall, said second wall having a recess therein extending through said bar and between opposite sides thereof transversely of the axis of the carrier bar forming shoulders along each longitudinal side of the recess extending transversely of the carrier bar and longitudinally of the contact bar along each of opposite edges of the contact bar engaged by the contact bar to position the same normal to the axis of the carrier bar, said contact bar having a portion intermediate opposite ends thereof deformed transversely to effect a flat bottomed recess on one side of the contact bar forming shoulders transverse of the contact bar and a flat faced raised portion on the opposite side of the bar extending transversely of the contact bar, said contact bar recess receiving one end of said spring with the shoulders engaging the spring to retain it against movement longitudinally of the contact bar and to urge said raised portion into engagement with said shoulders, said first wall having a projection encircled by the opposite end of said spring normally to retain said spring within said opening, said spring being removable from the opening upon axial tilting of the spring relative to the contact bar and about the projection as a pivot, said contact bar having a notch in at least one edge of the deformed portion of the contact bar engaging a ridge on a third wall of said opening that extends between the first and second walls, said ridge extending longitudinally of the axis of the said carrier bar to a length greater than the movement of the contact bar in said opening upon opening and closing movement of the said contacts to prevent movement of the contact bar transversely of the axis of the carrier bar during operation of the switch, said contact bar being rotatable on its longitudinal axis after removal of said spring from said opening to disengage the notch in the contact bar from engagement with said ridge to provide for movement of the contact bar transversely of the axis of the carrier for removal of the contact bar from the carrier.

3. A contact carrier constructed in accordance with claim 2 in which the said contact bar has notches in each of opposite edges of the said deformed portion of the contact bar that engage ridges in each of opposite walls of the said opening that extend between the first and second walls of the opening.

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