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CIRCUIT MAKER AND INTERRUPTER

Filed March 26, 1926

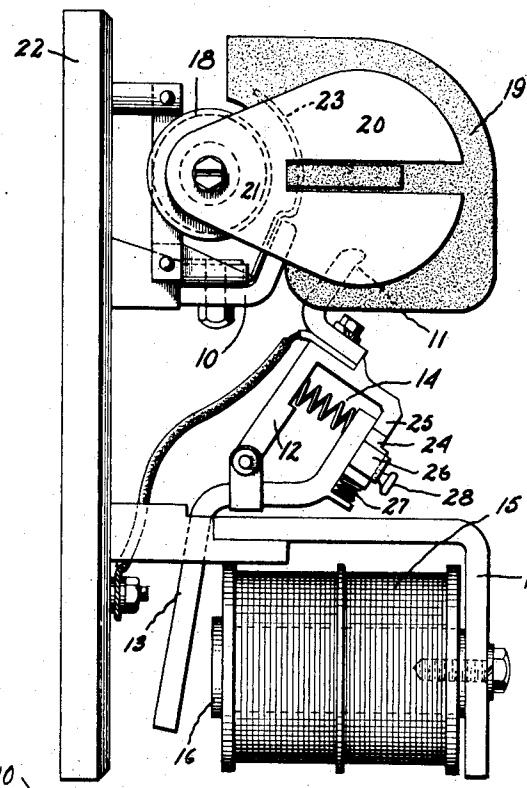
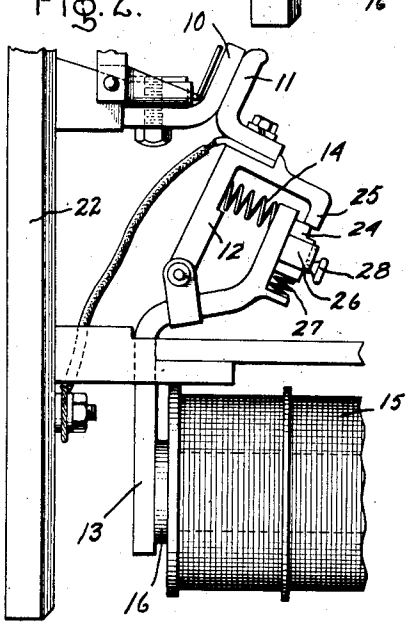


Fig. 1.

Fig. 2.



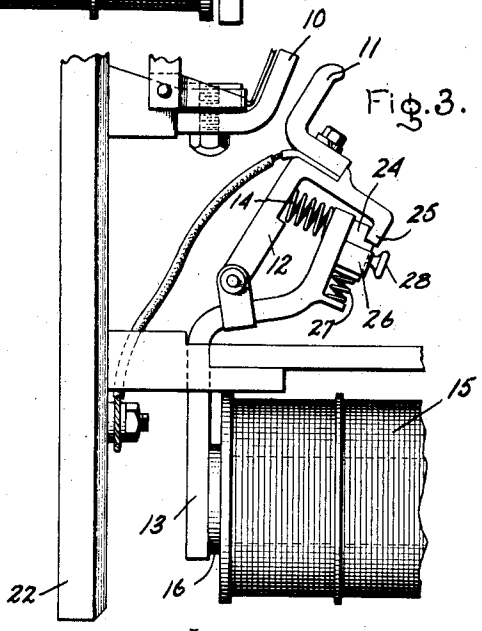


Fig. 3.

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UNITED STATES PATENT OFFICE.

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CIRCUIT MAKER AND INTERRUPTER.

Application filed March 26, 1926. Serial No. 97,734.

Our invention relates to improvements in circuit makers and interrupters, and in particular to circuit closers and interrupters of the well known contactor type.

One of the difficulties experienced with contactors is that of the welding of the contacts thereof. As a result of investigations which we have made, we have found that one of the common causes of this welding action is the automatic opening and reclosing of the resiliently engaging circuit interrupting contacts due to the repulsive effect of the current through the contacts. For all ordinary values of current which the contactor is called upon to interrupt, the repulsive effect is not of so great a value as to produce a bad effect, but for large currents the repulsive effect is appreciable. When the large value of currents starts through the contacts which are held together by a certain spring pressure, the magnetic force of the current throws the contact tips apart and causes an arc to be established at the contact tips. Magnetic blow out devices are ordinarily provided for effecting the interruption of the arcs established at the circuit interrupting contacts, and these blow out devices are usually provided with an arcing horn or a plurality of arcing horns. The large current through the contacts causes a very heavy magnetic field to be set up by the magnetic blow out device and this field will cause the arc established at the contact tips to be extended toward the arcing horn or horns. This action diverts the current from the contact tips and effects a reduction of the current therethrough. The repulsive force on the contacts is thus reduced and the contact tips reclose so that the current is permitted to take the original path and increase in value. Since the contact tips are hot from the effects of the arc and the current through the tips, when the tips reclose they are likely to be welded and remain closed even though the operating magnet or other operating and holding device is released. The above action is very rapid and may occur several times before the operating and holding device is fully released. Therefore, if the circuit interrupter is provided with a magnetic blow out effective to interrupt a large amount of power, the interrupter may be rendered ineffective by reason of the welding action of the contact tips.

The object of our invention is to prevent the above mentioned welding action of the contact tips. In carrying our invention into effect in a form which we now regard as a preferred form thereof, we cause the contact tips to be latched in their separated positions when the tips are thrown apart by the above mentioned repulsive action so that the tips can not automatically reclose to be welded shut. The latching device is preferably arranged so as to require the manual release thereof and this must be done before the contactor is rendered effective to again close its controlled circuit. The latching device is never effective for the ordinary values of current through the contacts and only becomes effective for the large values of current which would cause the welding action.

For a better understanding of the invention, reference is had to the accompanying drawing, in which Fig. 1 is a side view of an open contactor in accordance with the invention; Fig. 2 is a detail showing the relative position of various parts when the contact tips are closed, and Fig. 3 is another detail similar to Fig. 2 showing the position of the spring pressed movable contact when the latching device has operated by reason of the separation of the contacts due to the above mentioned repulsive action.

Referring to the drawings, the circuit maker and interrupter is indicated as of the well known contactor type having a stationary contact 10 with which the movable contact 11 is arranged to make abutting engagement for completing the circuit through the contacts. The movable contact 11 is mounted on a pivotally mounted support 12 which is resiliently held in position with respect to the pivotally mounted magnetic movable member or armature 13 by means of the spring 14, which is interposed between the member 12 and the upper end of the armature 13. It will be observed by reference to Figs. 1 and 2 that a slight relative movement occurs between the support 12 and the armature 13 when the contacts move into abutting engagement, whereby the contacts move into engagement with a wiping action. The armature 13 forms a part of an operating electro-

magnet having the winding spool 15 mounted on the core 16 of magnetic material, these parts being suitably mounted in the support 17 of magnetic material.

A magnetic blow out device is provided for interrupting the arcs formed between the contact tips 10 and 11. This blow out device comprises a coil 18 which is included in the circuit through the contact tips 10 and 11, and an arc chute 19 of refractory material held between suitable pole pieces 20 secured to the core 21 of the blow out device. The parts of the switch are mounted on a suitable insulating support or base 22. The arrangement thus far described is a well known type of contactor.

The current through the contact tips 10 and 11 sets up a magnetic force which tends to separate its tips. For the ordinary values of current which the contactor is called upon to handle, this magnetic force is insufficient to overcome the holding closed effect applied by the armature 13 through the spring 14. However, in case the current through the switch contacts is very materially larger than the ordinary values encountered, as for instance a value such as would be experienced under short-circuit conditions, the repulsive effect on the contacts is increased to such a value that the strain on the spring 14 is insufficient to hold the contacts in their closed positions. This will effect a separation of the contacts and an arc will be formed at the contacts. By reason of the fact that there is a very powerful magnetic field set up by the blow out device which tends to lengthen the arc thus formed and to extinguish the same, the arc will shift from the contact 10 to the arcing horn 23. This will effect a reduction in the current through the contact tips, particularly through the contact 10 and the repulsive effect is thus very materially reduced. The contacts will then reclose and because of the fact that they are hot from the effect of the arc which had been previously established and the current through the contacts, the reclosing of the contacts will likely effect the welding thereof. The contacts will then remain closed even though the operating electromagnet of the contactor is deenergized.

In order to prevent the possibility of the contacts being welded shut after the separation thereof due to the repulsive effect of the current through the contacts, we have provided the resiliently mounted catch 24 which is arranged to engage with the projecting end 25 of the support 12 after the contact 11 has separated a certain distance from the contact 11. The detent 24 is mounted for a sliding motion in the support 26, and the spring 27 is provided for biasing the detent into engagement with the projecting end 25. In Fig. 1 we have indicated the relative positions of the various parts when the contactor is in the open position. In Fig. 2 we have indicated the position these parts assume when the electromagnet is energized, the armature 13 attracted and the contacts 10 and 11 brought into a circuit closing engagement. It will be seen that the detent 24 and the projecting end 25 of the support 12 have shifted slightly with reference to each other, but that the projecting end 25 is not engaged by the detent in such a way that the detent will prevent the return of the contact 11 to its position indicated in Fig. 1 when the winding of the electromagnet is deenergized and the switch contacts opened. If the current through the switch contacts is of such a value that the repulsive effect will separate the movable contact 11 from the stationary contact 10 an appreciable distance so that the projecting end 25 will slide over the edge of the detent 24, as indicated in Fig. 3, the contact 11 will thus be prevented from returning into engagement with the contact 10. It will thus be seen that even though the winding of the electromagnet is energized to reclose the contacts, these contacts will not be closed. When the detent 24 thus operates to prevent the reclosure of the contacts, it is necessary to manually release the detent, this being done by pressing down on the button 28 which is secured to the detent 24.

The separation of the contacts due to the repulsive effect mentioned may occur when the winding of the electromagnet is deenergized to effect the opening of the contactor before the armature is fully released. In such a condition, the detent 24 will prevent the reclosing of the contacts and the welding thereof.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. A circuit maker and interrupter having a pair of circuit interrupting engaging contacts, resilient means for holding the contacts in engagement, and a normally inactive device which becomes effective to hold the contacts in their separated position when the contacts are separated a predetermined distance due to the repulsive effect of the current through the contacts.

2. A circuit maker and interrupter having a pair of circuit interrupting engaging contacts, a resilient support for one of said contacts, and means for preventing the reclosure of said contacts when the contacts separate due to the repulsive effect of the current through the contacts.

3. A circuit maker and interrupter having a stationary contact and a movable cooperating contact arranged to engage therewith, and a device rendered operative by a predetermined movement of said movable contact away from said stationary contact due to the

repulsive effect of the current through the contacts for preventing the reclosure of the contacts after such movement.

4. A circuit maker and interrupter having a pair of circuit controlling contacts, a magnetic blow out for the arcs formed at said contacts, and a device rendered operative by a predetermined separation of the contacts due to the repulsive effect of the current through the contacts for preventing the reclosure of the contacts in response to the reduction of the current through the contacts effected by said blowout.

5. A circuit maker and interrupter having a pair of circuit interrupting engaging contacts, a resilient support for one of said contacts, means for holding said contacts in engagement, and means for preventing the automatic reclosure of said contacts after the separation thereof due to the repulsive effect of the current through the contacts when said holding means is released.

6. A circuit maker and interrupter having a pair of circuit interrupting engaging contacts, a resilient support for one of said contacts, an operating member for effecting the closure of the contacts and for holding the same in circuit closing engagement, and means for preventing the reclosure of said contacts, after the separation thereof due to the repulsive effect of the current through the contacts, when the holding effect of said operating member is released.

7. A circuit maker and interrupter having a pair of relatively movable abutting contacts, a resilient support for one of said contacts for providing a resilient wiping abutting circuit completing engagement of the contacts, means for holding said contacts in engagement, and means for preventing the automatic reclosure of said contacts after the separation thereof due to the repulsive effect of the current through the contacts.

8. A contactor having a stationary contact, a movable contact arranged to engage therewith, a resilient support for said movable contact, a magnetic movable member for operating the said support and movable contact, an electromagnet for operating said member, a magnetic blowout for the said contacts, and a resilient latch cooperating with said movable contact for preventing the same from returning to the closed position when separated from the stationary contact by the repulsive effect of the current through the contacts.

9. A contactor having a stationary contact, a movable contact arranged to engage therewith, a resilient support for said movable contact, a magnetic movable member for operating the said support and movable contact, an electromagnet operable when energized to hold said contacts in engagement, and means for preventing the reclosure of said contacts by the operation of said electromagnet after the separation thereof due to the repulsive effect of the current through the contacts.

In witness whereof, we have hereunto set our hands this 24th day of March, 1926.

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