Sept. 4, 1951 C. J. YARRICK 2,566,866

UNDERVOLTAGE TRIP AND LOCKOUT

Filed April 6, 1948 4 Sheets-Sheet 1

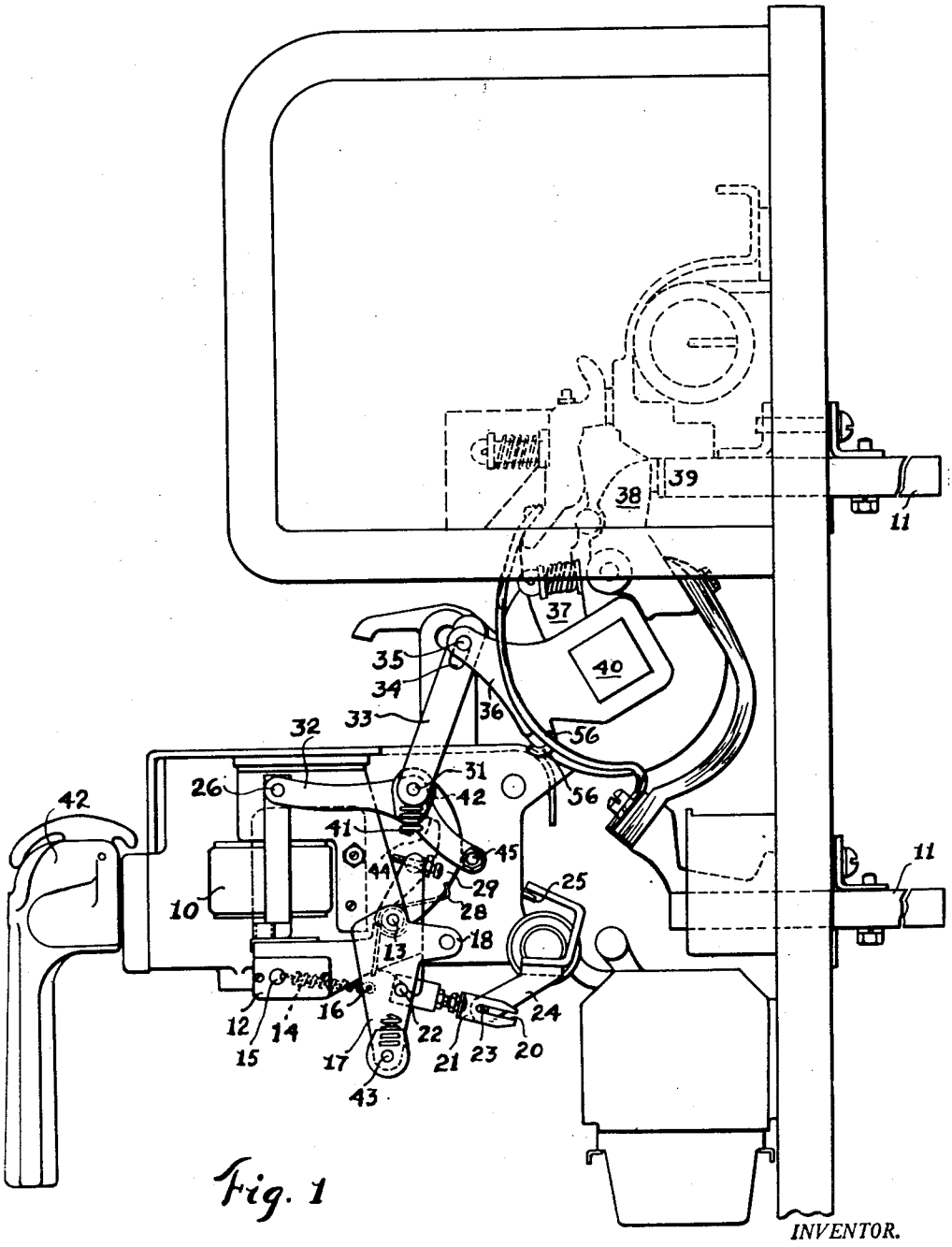


Fig. 1

INVENTOR.

BY Charles J. Yarrick

Ostrolenk, Faber
Attorneys

Sept. 4, 1951 C. J. YARRICK 2,566,866

UNDERVOLTAGE TRIP AND LOCKOUT

Filed April 6, 1948 4 Sheets-Sheet 2

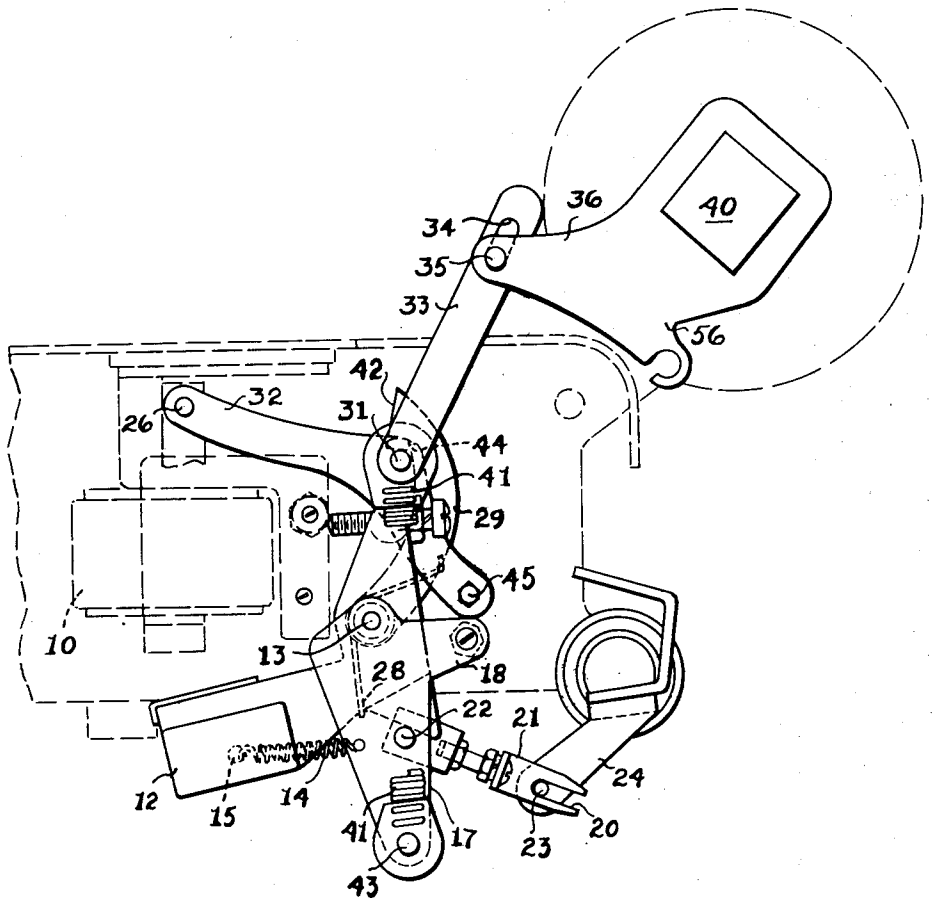


Fig. 2

INVENTOR.

BY Charles J. Yarrick

Ostrolenk & Faber

Attorneys

Sept. 4, 1951 C. J. YARRICK 2,566,866

UNDERVOLTAGE TRIP AND LOCKOUT

Filed April 6, 1948 4 Sheets-Sheet 3

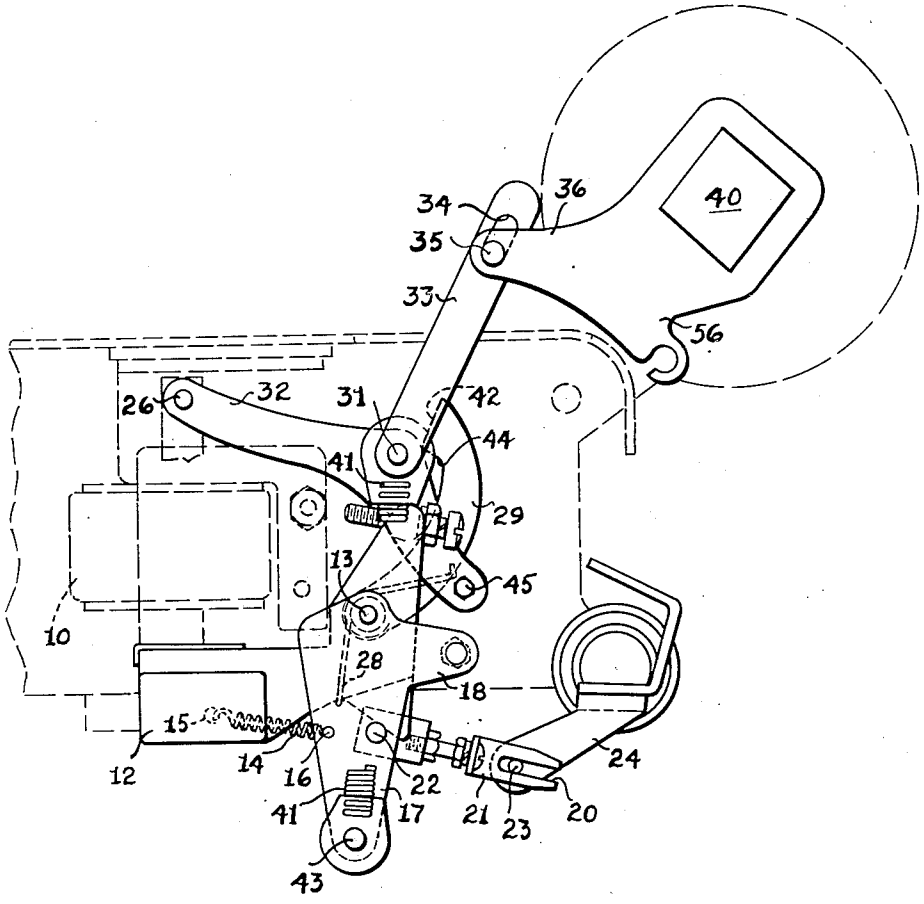


Fig. 3

INVENTOR.

BY Charles J. Yarrick

Ostrolenk & Faber

Attorneys

Sept. 4, 1951 C. J. YARRICK 2,566,866

UNDERVOLTAGE TRIP AND LOCKOUT

Filed April 6, 1948 4 Sheets-Sheet 4

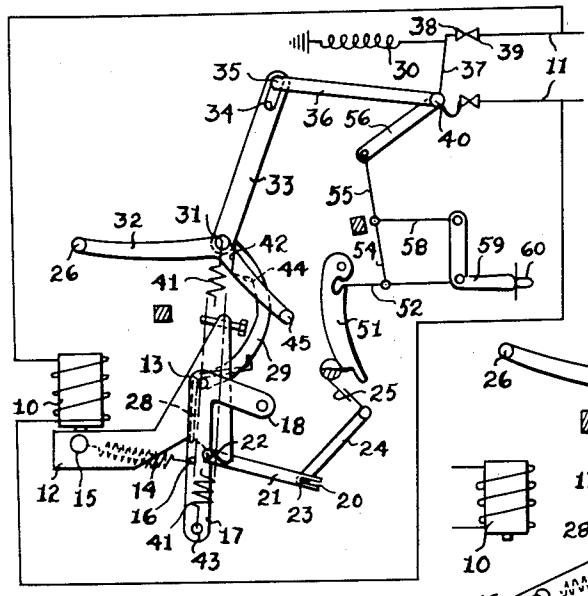


Fig. 4

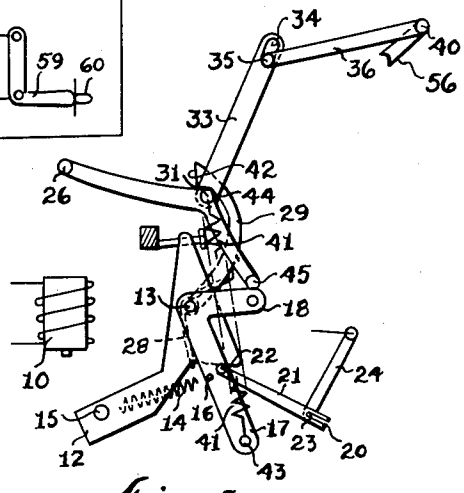


Fig. 5

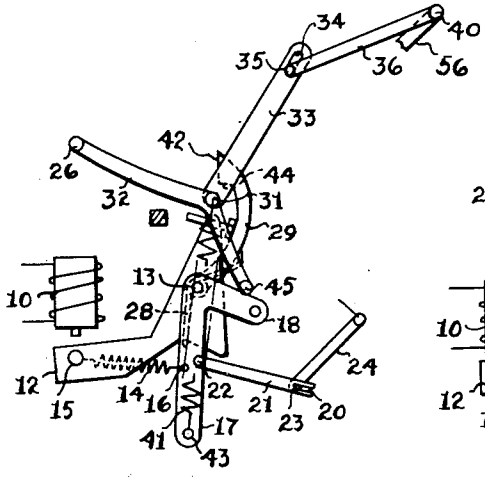


Fig. 6

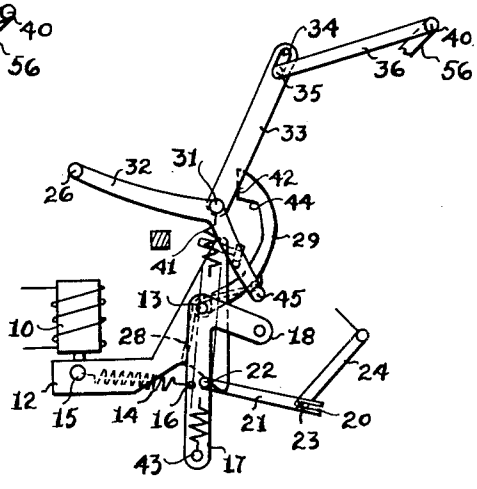


Fig. 7

INVENTOR.
Charles J. Yarrick
BY
Attorneys

Patented Sept. 4, 1951 2,566,866

UNITED STATES PATENT OFFICE

2,566,866

UNDERVOLTAGE TRIP AND LOCKOUT

Charles J. Yarrick, West Collingswood, N. J., assignor to I. T. E. Circuit Breaker Company, Philadelphia, Pa., a corporation of Pennsylvania

Application April 6, 1948, Serial No. 19,307

3 Claims. (Cl. 200—106)

1

My invention relates to an undervoltage lock-out trip and more particularly relates to a novel undervoltage lock-out trip in which a unitary structure, including an operating mechanism, functions to both operate and lock-out the contacts until normal voltage conditions are restored.

In the operation of undervoltage lock-out mechanisms, it is desirable that the circuit breaker be operated in response to a drop in voltage, be tripped to open the circuit and remain locked out until proper voltage conditions are restored in the circuit. Heretofore this has been achieved with separate units, one operating in response to voltage conditions for tripping the circuit breaker and another unit for locking and unlocking the circuit breaker.

I have provided a novel construction in which the circuit breaker is interrupted in response to a drop in voltage, automatically locks itself open while abnormal voltage conditions continue and automatically releases its self lock in response to restoration of normal voltage conditions, all in a unitary structure.

Accordingly an object of my invention is to provide a novel operating magnet arranged in response to a drop in voltage for effecting disengagement of the contacts and locking them out and operating in response to a restoration of the voltage to normal conditions for releasing the locking mechanism in preparation for reclosing.

These and other objects of my invention will become apparent from a detailed description of the apparatus in connection with the drawings in which

Figure 1 is a side elevational view of a circuit breaker embodying my novel undervoltage mechanism.

Figure 2 shows the position of the mechanism with the contacts locked open.

Figure 3 shows the position of the mechanism when the contacts 39—39 are disengaged but the mechanism in a condition to permit the closing of the circuit breaker.

Figures 4 to 7 are schematic illustrations showing just sufficient parts of my mechanism to illustrate the position of the parts for the conditions in which the contacts are opened, locked out, and ready to be reclosed.

Figure 4 schematically shows the conditions of all parts with the circuit breaker closed.

Figure 5 shows the parts, with the circuit breaker tripped open and locked out and with the contacts not yet in full open position.

2

Figure 6 shows the parts in full open position with the armature partially restored toward its pole face in preparation for re-energization when full voltage is restored, and

Figure 7 shows normal voltage restored and the latch removed in preparation for reclosing the circuit breaker.

Referring now to the drawings, an operating magnet 10 connected across the line 11—11 of the circuit to be protected and therefore responsive to its voltage is provided with an armature 12 which is pivoted at 13. A tension spring 14 extends from a lug 15 on the armature 12 to a lug 16 on the member 17 and provides, as will appear more clearly hereinafter, a flexible connection driving between armature 12 and member 17. Member 17, which is also pivotally mounted on the pin 13 and is provided with an extension 18 through which, as will appear hereinafter, movement of armature 12 is transferred to operate the locking mechanism and through which operating power is transferred back to the armature for partially restoring it towards its pole face after the circuit breaker has been tripped in preparation for restoration in response to normal voltage line conditions.

For the purposes of tripping the circuit breaker in response to a drop in voltage, a link 21 secured at one end through a pin 22 to the member 17 is provided with a slotted end as shown at 20 in which rides a pin 23 carrying the link member 24. The opposite end of the member 24 engages and operates a trip bar 25 of the circuit breaker, as for example shown in Patent No. 2,390,735.

Rotation of the trip bar 25 in a clockwise direction, causes the circuit breaker trip latch 51 to rotate clockwise and release the locking arm 52. Release of the locking arm 52 permits the contact opening spring 30 to collapse the over center toggle 54—55. Collapse of the toggle 54—55 and the bias of the contact opening spring 30 will rotate the arm 56, which is rigidly attached to the fixed pivot 40 in a counter clockwise direction. Arm 56 being rigidly attached to the same shaft 40 that supports the movable contact arm 37, will cause the movable contact arm 37 to rotate counter clockwise and open the circuit breaker (Figure 5).

The collapse of the locking arm 52 and the toggle 54—55 causes the dog leg closing arm 59, through the link 58 to rotate clockwise and place the handle 60 in a position to reclose the circuit breaker.

Member 17 engages one end of a torsion spring 28 carried on the pin 13, the other end of which

spring 28 engages the undersurface of a latching member 29, also pivotally mounted about the pin 13. Torsion spring 28 thus biases latch member 29 in a counterclockwise direction into engagement at its front edge 42 with the pin 31 on which is pivotally mounted an inverted V-shaped member 32. Member 32 is movable about pin 26 as a center. Extending from the pin 31 is the link 33 having a slot at its upper end at 34 in which rides a pin 35 in turn carrying the connecting link 36 connected to the movable contact arm 37 through the fixed pivot 40. Movable contact arm 37 carries the movable contact 38, which is biased open in a counterclockwise direction by the contact opening spring 30, and which engages and disengages the fixed contact 39 of the circuit breaker. When contact 38 moves to disengaged position, it operates through link 36 to move pin 35 downwardly, in turn permitting link 33 to drop and carry pin 31 and member 32 in a clockwise rotation about pivot 26.

In normal conditions with the voltage of the line correct and the circuit breaker contacts closed, link 36 has been rotated to its maximum clockwise position and through pin 35 raised link 33 to its elevated position as shown in Figures 1 and 4. With such normal conditions the winding of the magnet 10 is energized and the armature 12 is held against its pole face against the biasing action of the spring 14 and the overcenter tension spring 41 extending from the pin 43 to pin 31 which provide a bias in a counterclockwise direction for the member 17, which counterbias tends to in turn through the tension spring 14 bias the armature 12 away from the magnet. However, the energization of the magnet at this time overcomes this spring biasing action.

When the voltage on the line drops below a predetermined value, the current through the magnet 10 drops sufficiently to partially de-energize magnet 10. Armature 12 in response to the de-energization of the magnet 10 is now operated by action of spring 41 and through spring 14 to its de-energized position shown in Figures 2 and 5. As a result of the operation of the armature 12 to its de-energized position about its pivot in a counterclockwise direction under the biasing action of spring 41, the member 17 is also rotated counterclockwise about its pivot 13 and the link 21 is moved to the right, rotating the link 24 in a counterclockwise direction to trip the circuit breakers to the open position as schematically shown in Figure 5.

The movement of the movable contact arm 37 to its trip position has in turn rotated the link 36 counterclockwise until pin 35 engages the lower end of the slot 34 in link 33 causing link 33 to be moved until it passes beneath the front edge 42 of the latching member 29. In this position the underedge 44 of the latch member 29 moves over the upper edge of the pin 31 under biasing action of spring 28 and the contacts are locked out of engagement.

It will be noted at this point that the projection 18 of member 17 is limited in its travel by its engagement with the lower end 45 of the member 32 as shown in Figures 2 and 5. The circuit breaker is now in disengaged position.

During the continued movement of the movable contact to open position from the position shown in Figure 5 to the complete open position shown in Figure 6, the member 32 in the course of its counterclockwise rotation has rotated link 33 in a small clockwise direction which in turn through pin 31 turns inverted V member 32 and link 33 clockwise around the fixed pivot 26. The end 45 in engagement with the member 18 therefore has rocked the member 17 in a clockwise direction about its pivot 13. This in turn through the spring 14 permits the armature 12 to be rotated in a clockwise direction about its pivot to the position shown in Figure 6 where the armature air gap is reduced in preparation for re-energization in response to restoration of normal line voltage. The condition with the circuit breaker open and locked open now continues until normal voltage on the line is restored.

When normal line voltage conditions again obtain, the electromagnet 10 is energized sufficiently to operate its armature 12 in a clockwise direction about its pivot 13 until the armature engages the pole piece of the magnet. Movement of armature 12 acts through its spring 14 to rotate member 17 in a clockwise direction. Member 17 in turn, through torsion spring 28 rotates latch member 29 out of latching engagement with pin 31. It will be noted that the movement of the armature to its pole face at this time is not restrained by spring 41 since the pin 31 has dropped to the position in Figure 6 in which it has no biasing action.

The unlatched condition of link 33 now enables it to be again operated to rotate link 36 in a clockwise direction until the movable contact arm 37 has moved contact 38 in the engaged position shown in Figure 1, and the circuit breaker is restored to closed position.

It will now be clear that the present invention provides an arrangement in which, in response to a failure of voltage on the line, the circuit breaker is tripped open and locked open. The opening of the circuit breaker partially restores the armature 12 to reduce its air gap sufficiently so that it may, against the biasing action of its opening spring 14 and 41 be restored to full engagement with the pole face of its electromagnet 10 when normal line voltage is restored, the latter action resulting in automatic unlatching of the circuit breaker.

These functions are achieved by providing a bias spring 41 for the armature 12 which extends from the pin 31 in turn a part of the movable contact mechanism, links 33, 36 and 37 to contact 38. Thus this armature bias is provided only when the circuit breaker is closed. When the circuit breaker contacts open, the armature bias is withdrawn, as pin 31 drops to the position shown in Figure 6 so that the armature is free to be operated against the pole face of magnet 10 without the biasing action of the spring 41.

In the above I have illustrated a preferred form of my invention and I desire to be limited only by the appended claims.

I claim:

1. In an undervoltage circuit breaker having a pair of cooperable contacts, an electromagnet responsive to voltage conditions of the circuit protected by the circuit breaker, an armature for said electromagnet, a trip mechanism for effecting disengagement of said contacts and operable by said armature in response to de-energization of said magnet to effect disengagement of said contacts, a latch mechanism operable in response to disengagement of said contacts for latching said contacts into disengaged position, a member controlled by the complete movement of said movable contact to open position for operating said armature to re-set it close to the pole face

of said magnet preparatory for energization of said magnet, and an operating member controlled by said armature in response to the re-energization of said electromagnet for operating said latching mechanism out of engagement with said latch to permit re-operation of said contacts to engaged position.

2. In an undervoltage circuit breaker having a fixed and a movable contact, an electromagnet responsive to the voltage of the line protected by said circuit breaker, an armature controlled by said electromagnet, a latch for said movable contact operated in response to the operation of said armature to its de-energized position for permitting disengagement of said contacts, a latching mechanism controlled by said armature and operable on movement of said movable contact to its open position for locking said movable contact in its open position, and a member controlled by the opening of said contacts for resetting said armature close to its pole face in preparation for the re-energization of said electromagnet.

3. In an undervoltage circuit breaker having a fixed and a movable contact, an electromagnet responsive to the voltage of the line protected by said circuit breaker, an armature controlled by said electromagnet, a latch for said movable

contact operated in response to the operation of said armature to its de-energized position for permitting disengagement of said contacts, a latching mechanism controlled by said armature and operable on movement of said movable contact to its open position for locking said movable contact in its open position; and a member controlled by the opening of said contacts for resetting said armature close to its pole face in preparation for the re-energization of said electromagnet and for simultaneously disengaging said last mentioned latch mechanism.

CHARLES J. YARRICK.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,492,138	Meyer	Apr. 29, 1924
1,512,064	Sundhaussen	Oct. 21, 1924
2,295,309	Thumim	Sept. 8, 1942

FOREIGN PATENTS

Number	Country	Date
13,590	Great Britain	Nov. 23, 1905
447,748	Germany	July 30, 1927
448,271	France	Nov. 21, 1912