Feb. 24, 1942. W. H. FRANK ET AL 2,274,135

CIRCUIT BREAKER

Filed Nov. 6, 1939 2 Sheets-Sheet 1

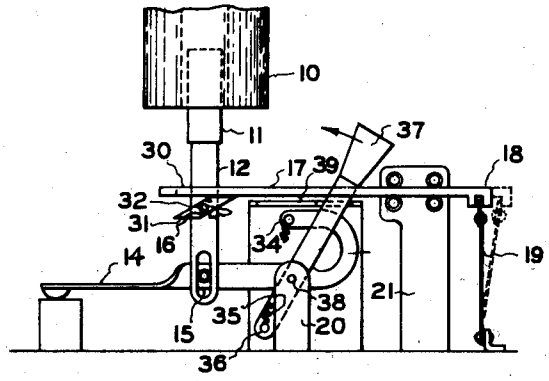

FIG. 1

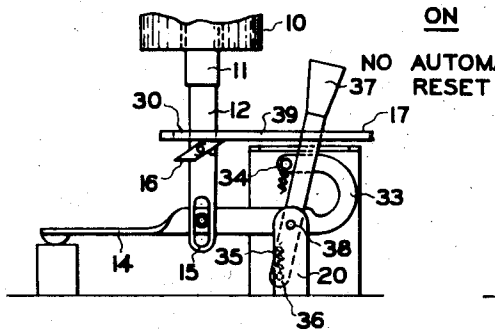

FIG. 2

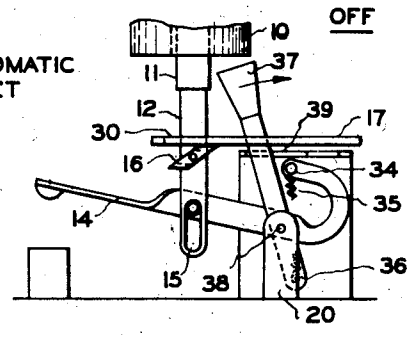

FIG. 3

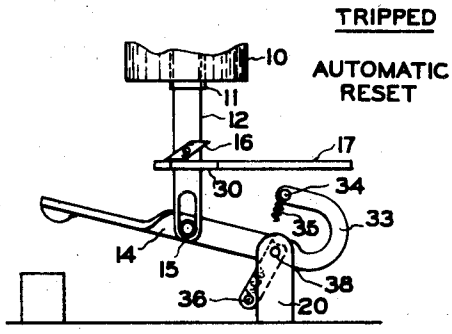

FIG. 4

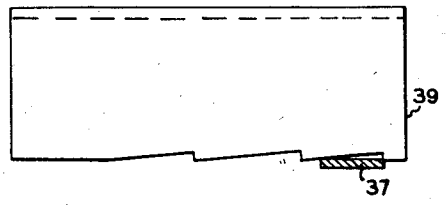

FIG. 4A

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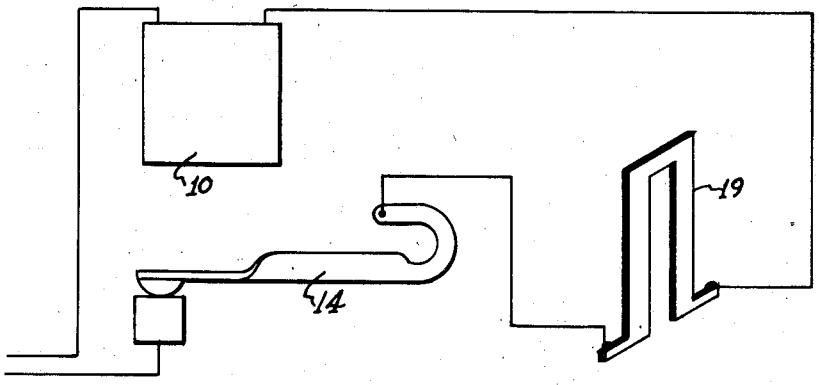

Fig. 5

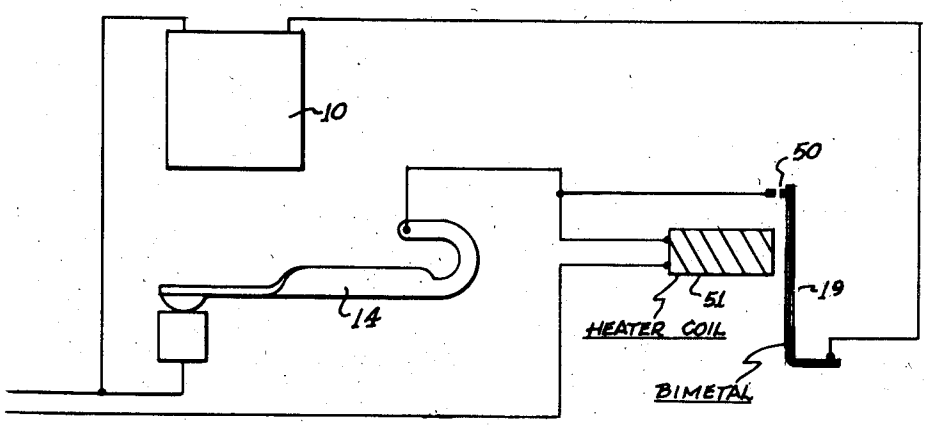

Fig. 6

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CIRCUIT BREAKER

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Application November 6, 1939, Serial No. 302,980

15 Claims. (Cl. 200—89)

This application relates to circuit controlling means or circuit breakers and is a continuation in part of our application Serial No. 99,265 filed September 3, 1936, which in turn discloses an improvement over the breaker shown in Patent No. 2,072,163 of March 2, 1937. Application Serial No. 99,265 filed September 3, 1936, became Patent No. 2,251,703 on August 5, 1941.

In that application there is shown an overload release circuit breaker having an automatic reclosing action and a manually accessible control means for providing manual switching action for the breaker.

The control means of that application is so constructed as to lack a quick make and break spring snap action, whereas the breaker hereof is so constructed that its control means has a quick make and break spring snap action.

Further, in the breaker of the above mentioned application there is provided an arrangement which is manually movable for inhibiting or preventing automatic reclosing, but that arrangement is such that operation of the manual latch, for inhibiting or preventing automatic reclosing, automatically causes release. In the breaker hereof the parts are so constructed that such manual latch may be operated to inhibit or prevent automatic reclosing without at the same time causing release. The means may be operated to set the parts in such a condition that following an overload release opening of the breaker, the parts move to an open circuit position, from which they can be moved manually into the closed circuit position.

The breaker hereof, as well as the breaker shown in the parent application, Serial No. 99,265 above mentioned, has as a feature the use of a magnet operating directly on the contact for biasing it to open circuit position, in opposition to the spring which tends to bias it into the closed circuit position, the magnetic force operating to open the circuit, not through any manual operation means, nor through any overload release latch means, but directly on the contact in an operating path independent of any manual operation means and independent of any overload release latch means.

The control means distinguishing the breaker hereof from that of the prior application, Serial No. 99,265, when operated to prevent automatic reclosing, merely shifts the line of action of the spring which causes closing so that that spring can not operate to cause closing, once the parts have moved to open circuit position on overload, but the control does not operate to cause release of the parts when it is moved to prevent automatic closing of the parts.

For an understanding of the circuit breaker embodiment herein disclosed, reference should be had to the appended drawings showing a circuit breaker of the automatic release and reclosing type having a manual control means for the breaker which is of the spring snap action type and which is operable for preventing automatic closing without such operation causing release. In the drawings, wherein the parts are shown diagrammatically:

Figs. 1 and 4 show the breaker in "on" and "tripped" positions respectively, but with the control means in a position to permit automatic reclosing following release;

Fig. 2 shows the breaker in "on" position, but with the control means in such a position as to prevent automatic reclosing and to require a manual movement for a closing following release;

Fig. 3 shows the breaker in "off" position;

Fig. 4a is a fragmentary plan view of Fig. 1.

Figs. 5 and 6 show alternate wiring diagrams for the breaker.

The drawings show a circuit breaker employing a solenoid **10** whose plunger **11** is connected through a link **12** to a breaker contact arm **14** by a pin and slot connection at **15**. The solenoid **10**, the arm **14**, and the overload release element **19** are electrically connected as shown in Figs. 5–6. The operation of the magnet is under the time delay control of the element **19**, provided by the contacts **50** (Fig. 6) closed on warping of element **19** on overload due to the coil **51**, or provided by the latch **16** on the link **12** which is normally caught under a cross piece **17**, restrained against movement to the right for release of link **12** by the tip **18** of the element **19**. Pedestals **20** and **21** support the contact arm **14** and the cross piece **17**.

The cross piece is formed with a slot **30** formed to cooperate with the latch **16** pivotally mounted on the link **12** and urged by a spring **31** to assume the position shown, with the latch engaging the stop **32** formed on the link **12**, the latch being movable in opposition to the spring **31** from the position shown, in a counterclockwise direction.

The curved end **33** of the contact arm **14** is connected at **34** to a tension spring **35** which in turn is connected at **36** to the handle **37** pivotally mounted at **38** on pedestal **20**. Movement of the handle **37** left and right to and from the positions of Figs. 1 and 3 causes the spring **35** to cross the center or pivot **38** and thus to swing the contact arm **14** open or closed with a spring snap action.

An indexing plate **39** (Fig. 4*a*) having three teeth, the extreme two of which are occupied by the handle **37** in the positions of Figs. 1 and 3 and the intermediate one of which determines the position of the handle in Fig. 2 is provided.

The various operations of the breaker and its functions are as follows:

When the contact arm **14** is in closed position, Figs. 1 and 2, the remaining parts are in the positions of Figs. 1 or 2. Spring **35**, now to the left of pivot **38**, holds the contact arm in closed position with a spring pressure for butt contact.

Movement of handle **37** to the left (Fig. 3) causes the spring to cross pivot **38** and this snaps arm **14** up to open the circuit, the lost motion at **15** acting to permit the contact arm to move without moving link **12**. Reverse movement of the handle (to Fig. 1) causes the arm to move down with a snap action to close the circuit.

If an overload occurs, solenoid **10** is energized and tends to pull arm **14** upwardly to open the circuit. Nothing will happen, however, unless the overload has endured sufficiently long to warp element **19** so that it will move cross piece **17** to the right or close contacts **50** to permit the parts **11—12—14** to move upwardly and open the circuit.

The pin and slot connection **15** insures opening of the circuit in the event of sticking of the contacts by providing sufficient momentum of link **12** before it meets the resistance offered by contact arm **14** on solenoid pull.

Automatic overload release action will take place if the breaker be closed, regardless of the position of the handle **37**, as can readily be seen, inasmuch as such action does not depend upon the position or operation of the spring **35**.

Reclosing will take place automatically (in the event the handle is in the position of Fig. 1 when an overload release occurs), following overload release, and after a delay provided by the cooling of element **19** (long enough to insure opening of contacts **50** or slot **30** of cross piece **17** returning to the position of Fig. 1, wherein it permits latch **16** and link **12** to move down) by virtue of the spring tension of spring **35**, which is still to the left of pivot **38**, not having moved overcenter during overload release.

For preventing an automatic reclosing subsequent to an automatic release, handle **37** may be moved to the position of Fig. 2. This movement does not cause opening of the circuit breaker but merely sets the parts in such a position that in the event the circuit breaker opens on an overload, it will not close automatically but will require manual movement for closing. When the handle **37** is put in the position of Fig. 2, the line of action of spring **33** is placed very close to pivot **38**, and this renders the spring **35** inoperative to pull down the contact arm **14** after it had been moved to open position on an automatic or overload release; with handle **37** in the position of Fig. 2, there is nothing to prevent the arm **14** from being moved upwardly by the solenoid.

During the overload release operation, spring **35** crosses overcenter to move handle **37** to the open circuit position of Fig. 3, where the parts remain, automatically set in such open position by the overload release and by the placing of the handle prior to such release in the position of Fig. 2.

Note here that the breaker is a normally closed spring held breaker which may be opened by the application of a force (magnet) on the arising of an overload. In the "on" position, arm **14** is normally biased into closed position; the handle may move the arm with a snap action to open and closed positions, through the overcenter action of the spring **35**. The breaker automaticaly opens on an overload completely trip free of the handle.

We claim:

1. In an automatic opening and reclosing circuit breaker, a stationary contact, a movable contact, a manually operable overcenter spring means including a handle and a spring for moving the movable contact with a spring snap action to and from the stationary contact in response to movements of the handle and arranged to hold the movable contact against the stationary contact when the handle is in circuit closed position and to tend to move the movable contact towards the stationary contact in the event the movable contact is remote from the stationary contact and the handle is in circuit closed position, and overload responsive means automatically operable on overload for overcoming the spring and moving the movable contact away from the stationary contact, and for thereafter releasing the movable contact so that the spring can return it automatically to the stationary contact.

2. In an automatically opening and reclosing circuit breaker, a stationary contact, a movable contact, a manually operable overcenter spring means including a handle and a spring for moving the movable contact with a spring snap action to and from the stationary contact in response to movements of the handle and arranged to hold the movable contact against the stationary contact when the handle is in circuit closed position and to tend to move the movable contact towards the stationary contact in the event the movable contact is remote from the stationary contact and the handle is in circuit closed position, and overload responsive means separate and independent of the first named means and automatically operable on overload for overcoming the spring and moving the movable contact away from the stationary contact, and for thereafter releasing the movable contact so that the spring can return it automatically to the stationary contact.

3. In an automatic opening and reclosing circuit breaker, a stationary contact, a movable contact, a manually operable overcenter spring means including a handle and a spring for moving the movable contact with a spring snap action to and from the stationary contact in response to movements of the handle and arranged to hold the movable contact against the stationary contact when the handle is in circuit closed position and to tend to move the movable contact towards the stationary contact in the event the movable contact is remote from the stationary contact and the handle is in circuit closed position, and overload responsive means automatically operable on overload for overcoming the spring and moving the movable contact away from the stationary contact, and for thereafter, following a time delay, releasing the movable contact so that the spring can return it automatically to the stationary contact.

4. In an automatic opening circuit breaker, a stationary contact, a movable contact, a manually operable overcenter spring means including a handle and a spring for moving the movable contact with a spring snap action to and from the stationary contact in response to movements

of the handle and arranged to hold the movable contact against the stationary contact when the handle is in circuit closed position and to tend to move the movable contact towards the stationary contact in the event the movable contact is remote from the stationary contact and the handle is in circuit closed position, and overload responsive means automatically operable on overload for overcoming the spring and moving the movable contact away from the stationary contact without moving the handle from closed circuit position, and for thereafter releasing the movable contact so that the spring can return it automatically to the stationary contact, the handle and spring being movable manually to a position wherein the spring is rendered incapable of exerting any stress on the movable contact after automatic opening operation, whereby there will not be an automatic reclosing after an overload opening.

5. In an automatic opening circuit breaker, a stationary contact, a movable contact, a manually operable overcenter spring means including a handle and a spring for moving the movable contact with a spring snap action to and from the stationary contact in response to movements of the handle and arranged to hold the movable contact against the stationary contact when the handle is in circuit closed position and to tend to move the movable contact towards the stationary contact in the event the movable contact is remote from the stationary contact and the handle is in circuit closed position, and overload responsive means automatically operable on overload for overcoming the spring and moving the movable contact away from the stationary contact without moving the handle from closed circuit position, and for thereafter releasing the movable contact so that the spring can return it automatically to the stationary contact, the handle and spring being movable manually to a position wherein the spring is rendered incapable of exerting any stress on the movable contact after automatic opening operation, whereby there will not be an automatic reclosing after an overload opening, with the parts so arranged that such movement of the handle and spring means does not cause the movable contact to move away from the stationary contact but merely prevents the movable contact from returning to the stationary contact in the event the movable contact is caused to leave the stationary contact, as on overload, by the action of the overload opening means.

6. In a circuit breaker, a stationary contact, a movable contact, a manually operable overcenter spring means including a handle and a spring for moving the movable contact with a spring snap action to and from the stationary contact in response to movements of the handle and arranged to hold the movable contact against the stationary contact when the handle is in closed circuit position, electrically operating overload actuating means separate and independent of the first named means and automatically operable when released on an overload by a holding means for overcoming the spring and moving the movable contact away from the stationary contact and holding means for said actuating means, arranged to release the latter on overload.

7. In a circuit breaker, a stationary contact, a movable contact, a manually operable overcenter spring means including a handle and a spring for moving the movable contact with a spring snap action to and from the stationary contact in response to movements of the handle and arranged to hold the movable contact against the stationary contact when the handle is in closed circuit position, electrically operating overload actuating means separate and independent of the first named means and automatically operable when released on an overload by a holding means for overcoming the spring and moving the movable contact away from the stationary contact even though the handle be held in closed circuit position and holding means for said actuating means, arranged to release the latter on overload.

8. In a circuit breaker, a stationary contact, a movable contact, a manually operable overcenter spring means including a handle and a spring for moving the movable contact with a spring snap action to and from the stationary contact in response to movements of the handle and arranged to hold the movable contact against the stationary contact when the handle is in closed circuit position, electrically operating overload actuating means separate and independent of the first named means and automatically operable when released on an overload by a holding means for overcoming the spring and moving the movable contact away from the stationary contact and thereafter releasing the contact to the influence of the spring, whereby the spring will automatically reclose the circuit and holding means for said actuating means, arranged to release the latter on overload.

9. In a circuit breaker, a stationary contact, a movable contact, a manually operable overcenter spring means including a handle and a spring for moving the movable contact with a spring snap action to and from the stationary contact in response to movements of the handle and arranged to hold the movable contact against the stationary contact when the handle is in closed circuit position, electrically operating overload actuating means separate and independent of the first named means and automatically operable when released on an overload by a holding means for overcoming the spring and moving the movable contact away from the stationary contact and thereafter releasing the contact to the influence of the spring, whereby the spring will automatically reclose the circuit, and holding means for said actuating means, arranged to release the latter on overload, the handle being movable manually to a position wherein the spring can not move the movable contact back to closed circuit position after it is moved to the open circuit position by the actuating means following its release by the holding means.

10. In a circuit breaker, a stationary contact, a movable contact, a manually operable overcenter spring means including a handle and a spring for moving the movable contact with a spring snap action to and from the stationary contact in response to movements of the handle and arranged to hold the movable contact against the stationary contact when the handle is in closed circuit position, electrically operating overload actuating means separate and independent of the first named means and automatically operable when released on an overload by a holding means for overcoming the spring and moving the movable contact away from the stationary contact, and holding means for said actuating means, arranged to release the latter on overload there being a time delay provision for the operation of the actuating means.

11. In a circuit breaker, a movable contact, means for automatically causing opening and reclosing movements thereof cyclically, a quick make and break, snap action, manually operable means for manually moving the contact to open and clase the circuit, and constructed to be operable for inhibiting automatic reclosing operation of the first means without causing circuit opening movement of the contact.

12. In a circuit breaker, a movable contact, means for automatically causing opening and reclosing movements thereof cyclically, a quick make and break, snap action, overcenter spring, manually operable means for manually moving the contact to open and close the circuit, and constructed to be operable for inhibiting automatic reclosing operation of the first means without causing circuit opening movement of the contact.

13. In an automatic opening circuit breaker, a stationary contact, a movable contact, a manually operable overcenter spring means including a handle and a spring for moving the movable contact with a spring snap action to and from the stationary contact in response to movements of the handle and arranged to hold the movable contact against the stationary contact when the handle is in circuit closed position and to tend to move the movable contact towards the stationary contact in the event the movable contact is remote from the stationary contact and the handle is in circuit closed position, and overload responsive means automatically operable on overload for overcoming the spring and moving the movable contact away from the stationary contact without moving the handle from closed circuit position, and for thereafter releasing the movable contact so that the spring can return it automatically to the stationary contact, the handle and spring being movable manually to a position wherein the spring is rendered incapable of exerting any stress on the movable contact after automatic opening operation, whereby there will not be an automatic reclosing after an overload opening, the parts being so arranged that when the handle is in a position to prevent automatic reclosing, and an overload arises, the handle is moved to the open circuit position into which it is ordinarily moved on manual operation, and all parts come to rest in an open circuit position.

14. In an automatic opening circuit breaker, a stationary contact, a movable contact, a manually operable overcenter spring means including a handle and a spring for moving the movable contact with a spring snap action to and from the stationary contact in response to movements of the handle and arranged to hold the movable contact against the stationary contact when the handle is in circuit closed position and to tend to move the movable contact towards the stationary contact in the event the movable contact is remote from the stationary contact and the handle is in circuit closed position, and overload responsive means automatically operable on overload for overcoming the spring and moving the movable contact away from the stationary contact without moving the handle from closed circuit position, and for thereafter releasing the movable contact so that the spring can return it automatically to the stationary contact, the handle and spring being movable manually to a position wherein the spring is rendered incapable of exerting any stress on the movable contact after automatic opening operation, whereby there will not be an automatic reclosing after an overload opening, with the parts so arranged that such movement of the handle and spring means does not cause the movable contact to move away from the stationary contact but merely prevents the movable contact from returning to the stationary contact in the event the movable contact is caused to leave the stationary contact, as on overload, by the action of the overload opening means, the parts being so arranged that when the handle is in a position to prevent automatic reclosing, and an overload arises, the handle is moved to the open circuit position into which it is ordinarily moved on manual operation, and all parts come to rest in an open circuit position.

15. In a circuit breaker, a stationary contact, a movable contact, a manually operable overcenter spring means including a handle and a spring for moving the movable contact with a spring snap action to and from the stationary contact in response to movements of the handle and arranged to hold the movable contact against the stationary contact when the handle is in closed circuit position, electrically operating overload actuating means separate and independent of the first named means and automatically operable when released on an overload by a holding means for overcoming the spring and moving the movable contact away from the stationary contact and thereafter releasing the contact to the influence of the spring, whereby the spring will automatically reclose the circuit, and holding means for said actuating means, arranged to release the latter on overload, the handle being movable manually to a position wherein the spring can not move the movable contact back to closed circuit position after it is moved to the open circuit position by the actuating means following its release by the holding means, the parts being so arranged that when the handle is in a position to prevent automatic reclosing, and an overload arises, the handle is moved to the open circuit position into which it is ordinarly moved on manual operation, and all parts come to rest in an open circuit position.

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