March 2, 1943. W. H. FRANK 2,312,633

CIRCUIT BREAKER

Original Filed July 5, 1938 2 Sheets-Sheet 1

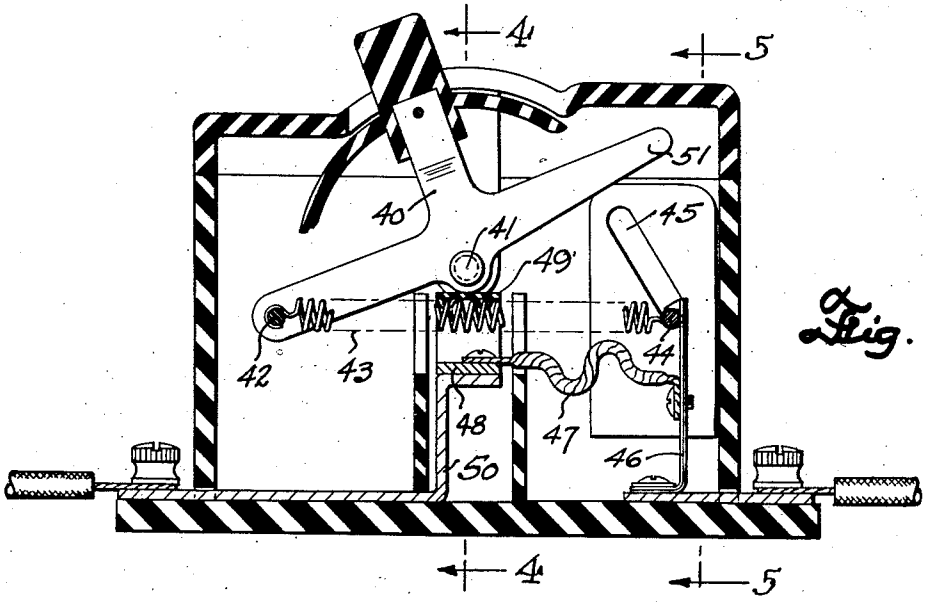


Fig. 1

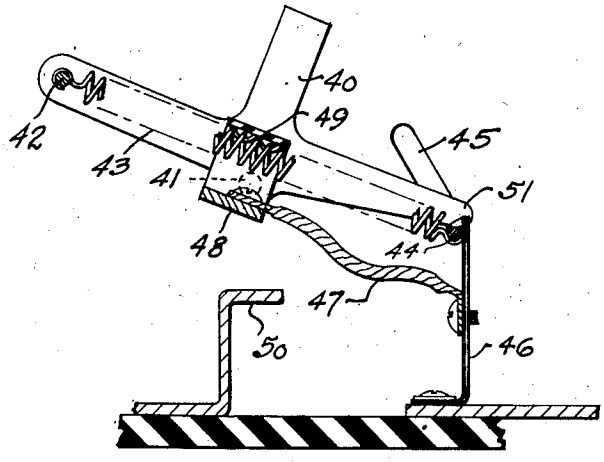


Fig. 2

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CIRCUIT BREAKER

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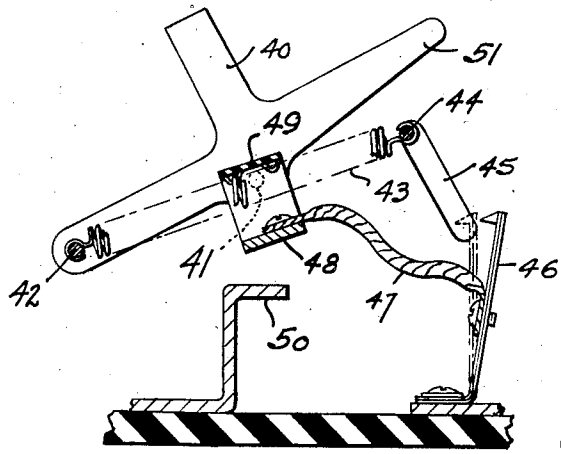


Fig. 3

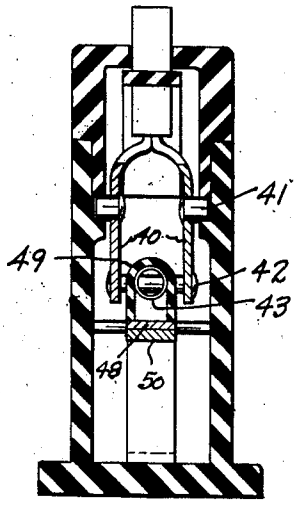


Fig. 4

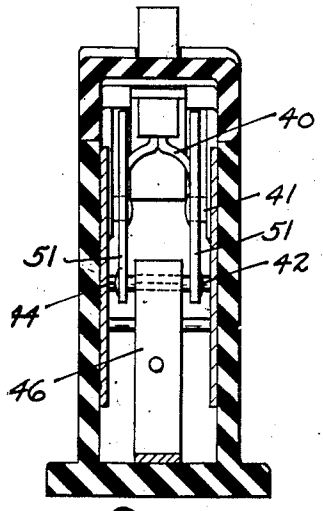


Fig. 5

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Patented Mar. 2, 1943

2,312,633

UNITED STATES PATENT OFFICE

2,312,633

CIRCUIT BREAKER

William H. Frank, Detroit, Mich., assignor to Bulldog Electric Products Company, Detroit, Mich., a corporation of West Virginia

Application July 5, 1938, Serial No. 217,632, which is a division of application Serial No. 119,931, January 11, 1937. Divided and this application February 21, 1940, Serial No. 320,120

21 Claims. (Cl. 200—116)

This application relates to manually operable switches or circuit breakers and is a division of a prior application, Serial No. 217,632, filed July 5, 1938, now Patent No. 2,247,193 of June 24, 1941, in turn a division of Patent No. 2,131,800, of October 4, 1938.

The object of the invention is to produce a breaker operating like that disclosed in Patent No. 2,102,295 of December 14, 1937, but of far simpler construction, as may best be understood on reference to the appended drawings, in which

Figure 1 shows the switch parts in a closed circuit position; Figs. 2–3 show the parts in their open circuit, and overload released positions respectively, and Figures 4 and 5 are sections on corresponding lines of Figure 1.

Referring to the drawings, it will be seen that these show a handle **40** pivoted at **41** to a casing and connected at **42** to one end of a coiled tension spring **43** whose other end is connected to a cross piece **44** arranged to have its ends ride in slots **45** formed in the sides of the casing and adapted to be held by a circuit responsive bimetal latch **46** connected through a flexible connection **47** to a movable contact **48** suitably mounted, as by means of a mounting block **49** loosely surrounding and loosely secured to the spring **43**, with the movable contact mating with a stationary contact **50** for butt contact. The handle is formed with a resetting member **51**, arranged to straddle the spring **43** and engage the ends of cross piece **44**.

When the parts are in the position of Fig. 1, the circuit is closed, and when they are in the position of Fig. 2, the circuit is open; swinging of the handle to and from those positions determines the position of the remaining parts, spring **43** translating handle swing into contact movement.

When the latch releases on overload, it frees the spring to move the contact, but not the handle, to the overload released position of Fig. 3, with a snap action.

For resetting, the handle is moved towards the open circuit position (Fig. 2) so that resetting members **51** of the handle push the cross pieces **44** down under the latch tips of the latch **46** which has cooled and returned and reset the parts in open circuit position of Fig. 2, with the spring **43** again stressed.

It will be observed that during reset, the movable contact does not pass through its circuit closing position, since as the connection latch end of the spring means moves towards its circuit closing position the handle connection end thereof moves away from its circuit closing position.

The switch or circuit breaker hereof may be seen to operate generally similar to that shown in Patent No. 2,102,295 of December 14, 1937. For example, in each of these two breakers the spring provides contact pressure when the circuit is closed, biases the contacts separated when the latch releases or when the handle is moved to the open circuit position, biases the contact into closed circuit position when the handle is moved to closed circuit position, and is arranged for overcenter operation to give snap action to the final part of each movement of the contact when the contact is moved by the handle; the contacts are of the butt contact pressure type and the spring establishes butt contact pressure.

It will be observed, however, that the switch or breaker herein disclosed is far simpler of construction than the switch or breaker of the aforesaid patent, principally due to the fact that a simple coiled tension spring **43** is utilized instead of the complex arrangement of parts represented by the contact operating arm **24—32**, spring **27**, and link **29**, all forming the spring means.

Further, whereas in the breaker of the aforesaid patent the connection between the handle and the spring is established through links and the like referenced **24—32—29**, in the instant breaker the connection is a direct connection, as at **42**. This is also true of the connection between the latch and the spring which in the breaker of the aforesaid patent is established through links, whereas here there is a direct connection, as at **44**. The elimination of links and other parts from the spring means of the aforesaid patented breaker results in the breaker hereof which is far simpler of construction than the patented breaker.

Reviewing the operation of the spring to establish butt contact pressure when the parts are in closed circuit position, it is observed that when the parts are in the position of Fig. 1, spring **42** tends to contract. This tendency results in a bias on contact **48** not only to the right from Fig. 1 but also tangentially around the pivot **41** with a component resulting in downward pressure on contact **48**. When the latch releases, the end **42** of the spring does not move solely and rectilinearly to the right, but moves downwardly as well, indicating that the biasing tendency of spring **43** has a downward component.

Similarly, when the handle is moved from the open circuit position of Fig. 2 to the closed circuit position of Fig. 1, spring **43** pulls contact **48**

to the right and downwardly, to bias contact **48** against contact **50** for butt pressure.

Comparing the switch hereof with that of Serial No. 217,632, Figs. 1–5, it will be seen that the instant breaker employs a tension spring as the spring means, whereas the breaker of Serial No. 217,632, Figs. 1–5, employs a link mounted compression spring.

Now having described the devices herein shown, reference will be had to the claims which follow for a determination of the protection sought herein.

I claim:

1. A manually operable switch and circuit breaker including a spring, a contact operatively connected thereto so as to be moved thereby, a handle directly connected to the spring so as to provide for manipulation thereof, a circuit current responsive latch directly connected to said spring, the handle and the latch providing direct connected separate holding means for the spring, the relation between the spring, the latch, and the handle being such that on release of the latch the spring biases the contact to open circuit position by moving around the handle connection thereto as a pivot without requiring movement of the handle, and on movement of the handle the spring moves the contact to open circuit position by moving around the latch connection thereto as a pivot without moving the latch, the points of connection between the handle and spring and between the latch and spring being spaced from each other, the spring normally biasing the contact into closed circuit position.

2. A manually operable switch and circuit breaker including a spring, a contact operatively connected thereto so as to be moved thereby, a handle directly connected to the spring so as to provide for manipulation thereof, a circuit current responsive latch directly connected to said spring, the handle and the latch providing direct connected separated holding means for the spring, the relation between the spring, the latch, and the handle being such that on release of the latch the spring biases the contact to open circuit position by moving around the handle connection thereto as a pivot without requiring movement of the handle, and on movement of the handle the spring moves the contact to open circuit position by moving around the latch connection thereto as a pivot without moving the latch, the points of connection between the handle and spring and between the latch and spring being spaced from each other, the spring normally biasing the contact into closed circuit position, the handle being pivotally mounted and the spring being arranged to cross the pivot of the handle when the handle moves the spring to give snap action to the final parts of the handle actuated movements of the contact.

3. A manually operable switch and circuit breaker including a spring, a contact operatively connected thereto so as to be moved thereby, a handle, and a circuit condition responsive latch, the spring connecting the handle and the latch and for this purpose having its ends connected directly to the handle and the latch, the latch-spring connection being releasable on latch movement due to circuit abnormality so that the spring moves the contact to open circuit position, the handle being actuable to move the spring, and thus the contact, to and from open and closed circuit positions.

4. A manually operable switch and circuit breaker including a spring, a contact operatively connected thereto so as to be moved thereby, a handle, and a circuit condition responsive latch, the spring connecting the handle and the latch and for this purpose having its ends connected directly to the handle and the latch, the latch-spring connection being releasable on latch movement due to circuit abnormality so that the spring moves the contact to open circuit position, the handle being actuable to move the spring, and thus the contact, to and from open and closed circuit positions, the spring, in closed circuit position of the parts, biasing the contact to such closed position for establishing contact pressure and also biasing the contact in such a direction that the contact will move to open circuit position in the event of latch release, with movement of the handle from open circuit position to closed circuit position moving the spring to a position wherein it biases the contact to closed circuit position with contact pressure.

5. A manually operable switch and circuit breaker including a spring, a contact operatively connected thereto so as to be moved thereby, a handle, and a circuit condition responsive latch, the spring connecting the handle and the latch and for this purpose having its ends connected directly to the handle and the latch, the latch-spring connection being releasable on latch movement due to circuit abnormality so that the spring moves the contact to open circuit position, the handle being actuable to move the spring, and thus the contact, to and from open and closed circuit positions, the handle being pivotally mounted and the spring being arranged to cross the handle pivot on handle actuated movement of the spring whereby the final part of each handle actuated movement of the spring and contact is snap movement.

6. A manually operable switch and circuit breaker including a spring, a contact operatively connected thereto so as to be moved thereby, a handle, and a circuit condition responsive latch, the spring connecting the handle and the latch and for this purpose having its ends connected directly to the handle and the latch, the latch-spring connection being releasable on latch movement due to circuit abnormality so that the spring moves the contact to open circuit position, the handle being actuable to move the spring, and thus the contact, to and from open and closed circuit positions, the spring, in closed circuit position of the parts, biasing the contact to such closed position for establishing contact pressure and also biasing the contact in such a direction that the contact will move to open circuit position in the event of latch release, with movement of the handle from open circuit position to closed circuit position moving the spring to a position wherein it biases the contact to closed circuit position with contact pressure, the handle being pivotally mounted and the spring being arranged to cross the handle pivot on handle actuated movement of the spring whereby the final part of each handle actuated movement of the spring and contact is a snap movement.

7. A manually operable switch and circuit breaker including a spring, a contact operatively connected thereto so as to be moved thereby, a handle directly connected to the spring so as to provide for manipulation thereof, a circuit current responsive latch directly connected to said spring, the handle and the latch providing direct connected separate holding means for the spring, the relation between the spring, the latch, and the handle being such that on release of the latch

the spring biases the contact to open circuit position by moving around the handle connection thereto as a pivot without requiring movement of the handle, and on movement of the handle the spring moves the contact to open circuit position by moving around the latch connection thereto as a pivot without moving the latch, the points of connection between the handle and spring and between the latch and spring being spaced from each other, the spring normally biasing the contact into closed circuit position, the spring comprising a tension spring stretched between the latch and the handle.

8. A manually operable switch and circuit breaker including a spring, a contact operatively connected thereto so as to be moved thereby, a handle directly connected to the spring so as to provide for manipulation thereof, a circuit current responsive latch directly connected to said spring, the handle and the latch providing direct connected separated holding means for the spring, the relation between the spring, the latch, and the handle being such that on release of the latch the spring biases the contact to open circuit position by moving around the handle connection thereto as a pivot without requiring movement of the handle, and on movement of the handle the spring moves the contact to open circuit position by moving around the latch connection thereto as a pivot without moving the latch, the points of connection between the handle and spring and between the latch and spring being spaced from each other, the spring normally biasing the contact into closed circuit position, the handle being pivotally mounted and the spring being arranged to cross the pivot of the handle when the handle moves the spring to give snap action to the final parts of the handle actuated movements of the contact, the spring comprising a tension spring stretched between the latch and the handle.

9. A manually operable switch and circuit breaker including a spring, a contact operatively connected thereto so as to be moved thereby, a handle, and a circuit condition responsive latch, the spring connecting the handle and the latch and for this purpose having its ends connected directly to the handle and the latch, the latch-spring connection being releasable on latch movement due to circuit abnormality so that the spring moves the contact to open circuit position, the handle being actuable to move the spring, and thus the contact, to and from open and closed circuit positions, the spring comprising a tension spring stretched between the latch and the handle.

10. A manually operable switch and circuit breaker including a spring, a contact operatively connected thereto so as to be moved thereby, a handle, and a circuit condition responsive latch, the spring connecting the handle and the latch and for this purpose having its ends connected directly to the handle and the latch, the latch-spring connection being releasable on latch movement due to circuit abnormality so that the spring moves the contact to open circuit position, the handle being actuable to move the spring, and thus the contact, to and from open and closed circuit positions, the spring, in closed circuit position of the parts, biasing the contact to such closed position for establishing contact pressure and also biasing the contact in such a direction that the contact will move to open circuit position in the event of latch release, with movement of the handle from open circuit position to closed circuit position moving the spring to a position wherein it biases the contact to closed circuit position with contact pressure, the spring comprising a tension spring stretched between the latch and the handle.

11. A manually operable switch and circuit breaker including a spring, a contact operatively connected thereto so as to be moved thereby, a handle, and a circuit condition responsive latch, the spring connecting the handle and the latch and for this purpose having its ends connected directly to the handle and the latch, the latch-spring connection being releasable on latch movement due to circuit abnormality so that the spring moves the contact to open circuit position, the handle being actuable to move the spring, and thus the contact, to and from open and closed circuit positions, the handle being pivotally mounted and the spring being arranged to cross the handle pivot on handle actuated movement of the spring whereby the final part of each handle actuated movement of the spring and contact is snap movement, the spring comprising a tension spring stretched between the latch and the handle.

12. A manually operable switch and circuit breaker including a spring, a contact operatively connected thereto so as to be moved thereby, a handle, and a circuit condition responsive latch, the spring connecting the handle and the latch and for this purpose having its ends connected directly to the handle and the latch, the latch-spring connection being releasable on latch movement due to circuit abnormality so that the spring moves the contact to open circuit position, the handle being actuable to move the spring, and thus the contact, to and from open and closed circuit positions, the spring, in closed circuit position of the parts, biasing the contact to such closed position for establishing contact pressure and also biasing the contact in such a direction that the contact will move to open circuit position in the event of latch release, with movement of the handle from open circuit position to closed circuit position moving the spring to a position wherein it biases the contact to closed circuit position with contact pressure, the handle being pivotally mounted and the spring being arranged to cross the handle pivot on handle actuated movement of the spring whereby the final part of each handle actuated movement of the spring and contact is a snap movement, the spring comprising a tension spring stretched between the latch and the handle.

13. A butt pressure contact circuit breaker including a movable butt contact, a stationary contact, a handle, and a circuit responsive latch, and a single spring for butt pressing the movable contact against the stationary contact when the parts are in circuit closed position, and for biasing the movable contact away from the stationary contact in the event of a release by the latch, and for producing a snap movement of the movable contact into circuit closing position following movement of the handle out of circuit open position, the spring having an end connected to the handle and an end connected to the latch.

14. A butt pressure contact circuit breaker including a movable butt contact, a stationary contact, a handle, and a circuit responsive latch, and a single spring for butt pressing the movable contact against the stationary contact when the parts are in circuit closed positions, and for biasing the movable contact away from the stationary contact in the event of a release by

the latch, and for producing a snap movement of the movable contact into circuit closing position following movement of the handle out of circuit open position, the spring being a tension spring having an end connected to the handle and an end connected to the latch.

15. A circuit breaker including a stationary contact, a spring means, a movable contact operatively connected thereto so as to be moved thereby, a handle directly connected thereto so as to provide for manipulation thereof, a circuit responsive latch directly connected to said spring means, the handle and the latch providing separate direct acting holding means for the spring means, the relation between the spring means, the latch, and the handle being such that on release of the latch the spring means moves around the handle connection thereto as a pivot without requiring movement of the handle so as to bias the contact to open circuit position, and on movement of the handle the spring means moves around the latch connection thereto as a pivot without moving the latch, so as to bias the contact to open circuit position, the points of connection between the handle and spring means and between the latch and spring means being spaced from each other, the movable contact connected to the spring means being formed to butt against the stationary contact, with the spring means biasing the movable contact against the stationary contact when the circuit is closed and the handle and latch hold the spring means.

16. A circuit breaker including a stationary contact, a spring means, a movable contact operatively connected thereto so as to be moved thereby, a handle directly connected thereto so as to provide for manipulation thereof, a circuit responsive latch directly connected to said spring means, the handle and the latch providing separate direct acting holding means for the spring means, the relation between the spring means, the latch, and the handle being such that on release of the latch the spring means moves around the handle connection thereto as a pivot without requiring movement of the handle so as to bias the contact to open circuit position, and on movement of the handle the spring means moves around the latch connection thereto as a pivot without moving the latch, so as to bias the contact to open circuit position, the points of connection between the handle and spring means and between the latch and spring means being spaced from each other, the movable contact connected to the spring means being formed to butt against the stationary contact, with the spring means biasing the movable contact against the stationary contact when the circuit is closed and the handle and latch hold the spring means, the spring being a tension spring having its ends connected to the handle and latch respectively.

17. In a circuit breaker controlling mechanism, a stationary contact, a movable contact arranged to butt against the stationary contact, a spring means operatively connected to the movable contact and arranged to bias it against the stationary contact when the spring means is in normal stressed position, a circuit responsive latch directly connected to the spring means for holding it under stress in normal contact biasing position, a rotatably mounted handle directly connected to the spring means and manipulable by rotary movement out of its normal position to stress the spring means and move it bodily out of its normal position and towards the center of rotation of the handle so that when the handle is released after such movement the spring means will tend to relieve itself of its stress with a snap action, the relative arrangement of the parts being such that on such stress relieving movement of the spring means following such handle movement and subsequent release, the spring means will move bodily beyond the center of rotation of the handle and about the connection between the spring means and latch as a pivot, to move the movable contact away from the stationary contact, and also being such that on release of the latch, when the handle and spring means are in normal position, the spring means will tend to relieve itself of its stress with a snap action and in so doing will move bodily about its connection to the handle as a pivot, and move the movable contact away from the stationary contact.

18. In a circuit breaker controlling mechanism, a stationary contact, a movable contact arranged to butt against the stationary contact, a spring means operatively connected to the movable contacts and arranged to bias it against the stationary contact when the spring means is in normal stressed position, a circuit responsive latch directly connected to the spring means for holding it under stress in normal contact biasing position, a rotatably mounted handle directly connected to the spring means and manipulable by rotary movement out of its normal position to stress the spring means and move it bodily out of its normal position and towards the center of rotation of the handle so that when the handle is released after such movement the spring means will tend to relieve itself of its stress with a snap action, the relative arrangement of the parts being such that on such stress relieving movement of the spring means following such handle movement and subsequent release, the spring means will move bodily beyond the center of rotation of the handle and about the connection between the spring means and latch as a pivot, to move the movable contact away from the stationary contact, and also being such that on release of the latch, when the handle and spring means are in normal position, the spring means will tend to relieve itself of its stress with a snap action and in so doing will move bodily about its connection to the handle as a pivot, and move the movable contact away from the stationary contact, the spring being a tension spring having its ends connected to the handle and latch respectively.

19. A construction of the character described in claim 1 wherein the parts are so related that the handle may be moved to cause relatching of the spring without causing the contact to move into circuit closing position.

20. A construction of the character described in claim 3 wherein the parts are so related that the handle may be moved to cause relatching of the spring without causing the contact to move into circuit closing position.

21. A construction of the character described in claim 13 wherein the parts are so related that the handle may be moved to cause relatching of the spring without causing the contact to move into circuit closing position.

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