

Aug. 31, 1937.

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2,091,941

CIRCUIT BREAKER

Original Filed March 6, 1933 2 Sheets-Sheet 1

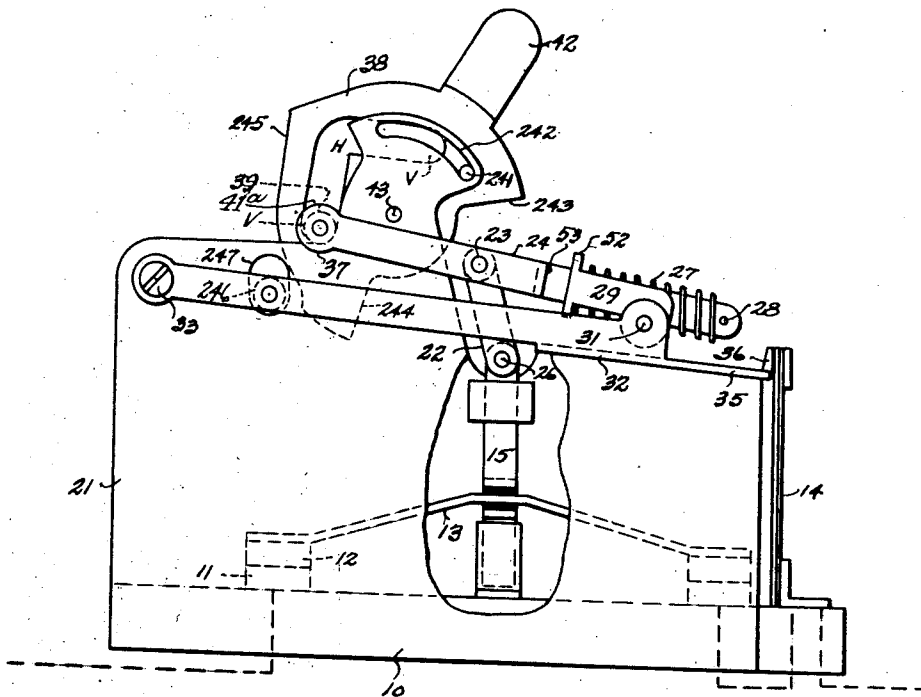


Fig -1

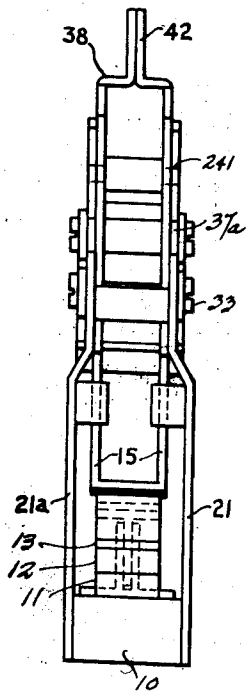


Fig 2

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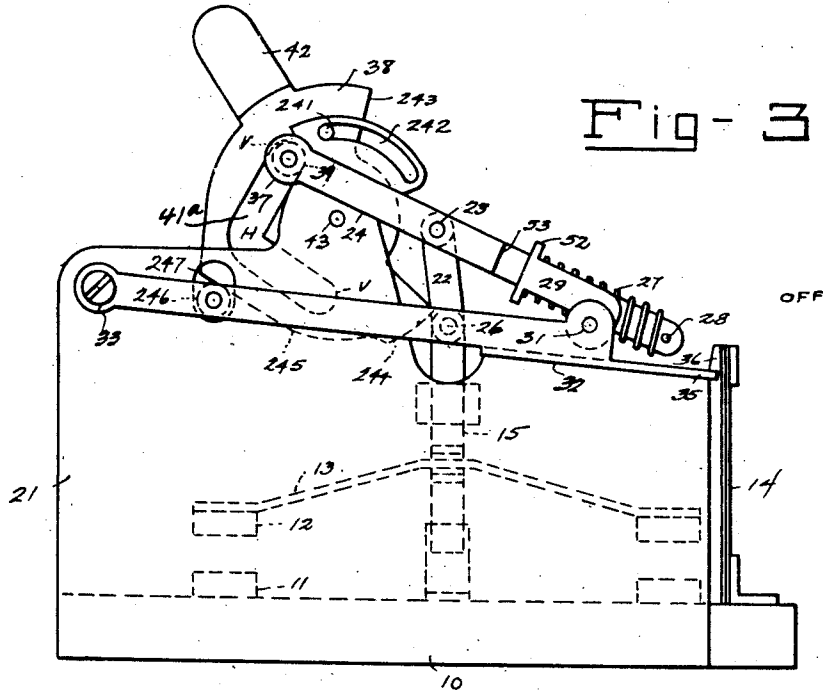
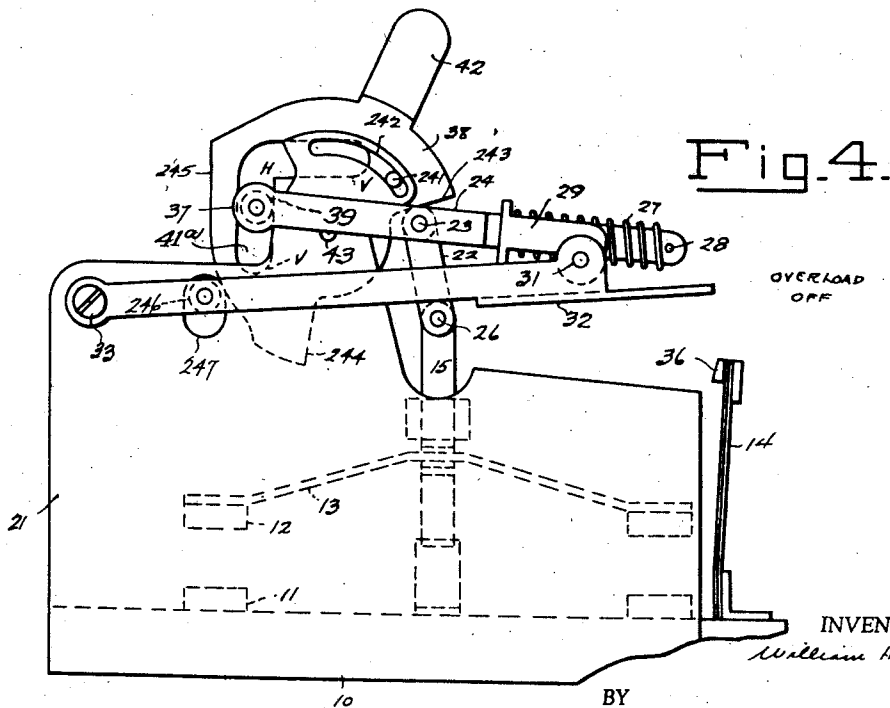
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UNITED STATES PATENT OFFICE

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CIRCUIT BREAKER

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Original application March 6, 1933, Serial No.
659,714. Divided and this application Janu-
ary 9, 1936, Serial No. 58,440

8 Claims. (Cl. 200-116)

This application relates to circuit breakers, and is a division of a prior application, Serial No. 659,714, filed March 6, 1933.

In that application there is disclosed a breaker having a link 24 normally held anchored at one end by a thermal latch 14 and movable by means of a handle 42 over the center of rotation 43 of the handle for make and break action; the mechanism is such that movement of the free end 37 of the link away from a spring abutment 29 thereon determines the degree of flexure of the operating spring 27 of the breaker. In that application, the over-center arrangement of the parts is utilized and the free end 37 of the link 24 is arranged to move circularly only, around the center 43 of the handle 42.

The principal object of the present invention is to provide, in a construction generally similar to that of application Serial No. 659,714, an arrangement of parts providing a separation of link end 37 from spring abutment 29 much greater than that which is possible in the construction of application Serial No. 659,714. This object is attained by replacing the over-center arrangement of the parts as shown in application Serial No. 659,714 with an arrangement disclosed herein, one employing a hill and valley path for the link end 37, the path being such that link end 37 will move radially of the handle center 43 on breaker operation, as well as circularly, with the result that link end 37 will move away from abutment 29 a distance much greater than is the case when link end 37 can move circularly only, about center 43.

The hill and valley path hereof, as contrasted from that of application Serial No. 58,439, filed January 9, 1936 which discloses a breaker resembling that of this case, is formed on the crank or handle of the breaker, rather than on the frame. Consequently, rotation of the handle until the link end 37 climbs over the hill does not cause rotation of link 24 about its pivotal mounting 31 and does not cause movement of the contact linkage connected thereto, and therefore there is no necessity for providing lost motion between the contact and the link 24, all as is necessary in the construction of application Serial No. 58,439. Because of the absence of lost motion between the contact and the link 24, it is desirable to employ "kickers" on the handle or crank for initiating movement of the contact parts out of "on" and "off" positions.

Other characteristics of the breaker herein disclosed will readily occur to those skilled in the

art upon reference to the following description and the accompanying drawings, in which

Figs. 1, 3, and 4 are elevation views of a breaker in "on", "off", and "overload off" positions, respectively;

Fig. 2 shows the breaker in left end view.

The breaker includes a base 10 having a pair of contacts 11 which are to be engaged by the contacts 12 on the ends of a resilient bridging contact arm 13. One of the contacts 11 is connected to the line and the other is connected to one leg of the thermostatic or bimetallic warping element 14, the other leg of the latter being connected to the load. When the contact arm 13 is in "on" position, current flows through contacts 11 and 12, contact arm 13, and warping element 14.

To the vertically moving contact arm 13 is rigidly secured an upwardly projecting sliding link 15. A link 22 is pivotally connected at 23 to a horizontal link 24 and is also pivotally connected to the upper end of the link 15 through a pin 26. A coil compression resisting spring 27 is mounted on the right hand end of link 24 between a pin 28 thereon and the bight of a U-shaped horizontally positioned spring compression link 29, which is pivotally connected at 31 to a pawl 32, the latter being pivotally connected by shouldered screws 33 on its left end to front plate 21. As indicated, the link 24 passes through a slot in the bight of link 29 and these links move as a unit around the pivot 31. In the "on" position the right hand or free end 35 of pawl 32 is held down by a tongue 36 of warping element 14.

The left hand end 37 of link 24 is pivotally connected to an operating bell crank 38 by a pin 39 sliding in a slot 41a of the crank. The bell crank has an extension 42 forming an operating handle for the device, and is pivotally supported on the cross shaft 43 mounted in the front plate 21.

The slot 41a is formed as a hill and valley slot whose valleys are referenced V-V and whose hill is referenced H, the inner edge thereof forming a hill and valley riding path for the pin 39 of link end 37; the hill is radially more remote from pin 31 than are the valleys.

The parts just described may be operated as a simple, quick make and break switch as follows: Assume the parts to be in "on" position, Figure 1.

When the handle 42 is moved to the left, the bell crank 38 rotates counter-clockwise, forcing end 37 of link 24 to slide radially of center 43 towards the left a slight degree and build up an increased compression in coiled spring 27. All

this while, link end 37 does not move circularly about center 43, and the contact linkage 22—15 does not move.

As soon as the end 37 of link 24 has passed over the hill H, the coil spring 27 operates with a snap action to cause link end 37 to ride up in slot 41a from H to V, thus pulling contact arm 13 to its "off" position for quick break.

Reverse movement of handle 42, to the right from the "off" position, Fig. 3, imparts a sliding movement to link 24 away from pin 31 to compress spring 27 until the end 37 of link 24 is past hill H, and during such movement contact linkage 15—22 does not move. When the end 37 of link 24 passes over the hill H, spring 27 expands to snap the parts, and the contact arm 13, to circuit closing position.

Slot 41a permits snap action movement of the links 24 and 29 independent of the handle 42 so that quick make and break are independent and free of the operator. Positive make and break are assured by the positive connection between crank 38 and link 24, namely pin 39 and slot 41a, previously described. Termination of movement is provided by the engagement of crank pin 241 with either end of frame slot 242.

During normal switch operation travel of pawl 32 about its pivot 33 is prevented by its end 35 being held by the anchorage tongue 36 of warping element 14.

It will be observed that kickers 243—244 engage the pin 23 simultaneously with the alignment of hill H with link end 37 to kick the contact linkage out of its rest position and to kick link end 37 over the hill, in the event such auxiliary action is required. The provision of these kickers also insures positive make and break.

In overload release action, pawl 32, when released (Fig. 4) by the thermal element, moves upwardly with a spring action, screws 33 serving as fixed pivots, and in so moving, pawl 32 causes link 24 to move up so that the later pulls up on links 22—15 for a quick overload break.

Part of the upward travel of pawl 32 is unstrained or free of the crank 38 (for trip free action) and this part is sufficient to cause contacts 12 to leave contacts 11, and effectively rupture the circuit. On the last part of the upward travel of pawl 32, the pin 23 engages kicker 243 and moves crank 38 from "on" position to overload "off" position, this feature providing an overload "off" indicating position to the handle, it being observed that overload "off" position is between the "on" position and the normal "off" position.

During the overload release movement, link end 37 moves upwardly to provide a greater movement of link 24 and a larger break on overload release, than would be the case were the left end of link 24 to remain fixed.

For reset, handle 42 is rotated counter-clockwise to "off" position so that cam edge 245 of crank 38 engages rollers 246 of pawl 32, moving these down in slots 247 of plates 21—21a, and consequently moving the pawl down, resetting the same.

The left end 37 of link 24 in the meantime moves further out of "on" position towards "off" position, the timing of this movement being such that the link 24 assumes its "off" position prior to the time that pawl 32 is reset to its latched position, this insuring against circuit closing during the resetting movement.

Now having described the breaker herein disclosed, reference should be had to the claims

which follow for a determination of the monopoly sought herein.

1. In a circuit breaker, an operating mechanism including a pivotally mounted link, and a link mounted to slide lengthwise through a part of said first mentioned link and to move there-with about the pivot thereof, a coiled spring on the second link reacting between an abutment thereon and the aforementioned part of the first link, a bell crank pivotally mounted on its fixed pivot and having one branch formed to provide a handle and another branch pivotally connected to an end of the second link, and means on the bell crank for causing such end to move radially of the bell crank pivot as well as circularly around the latter when the bell crank is rotated.

2. In a circuit breaker, an operating mechanism including a pivotally mounted link, and a link mounted to slide lengthwise through a part of said first mentioned link and to move there-with about the pivot thereof, a coiled spring on the second link reacting between an abutment thereon and the aforementioned part of the first link, a bell crank pivotally mounted on its fixed pivot and having one branch formed to provide a handle and another branch pivotally connected to an end of the second link, and means causing such end to move radially of the bell crank pivot as well as circularly around the latter when the bell crank is rotated, the pivotal connection between the link end and the bell crank comprising a pin and slot connection whereof the slot permits the pin to move circularly of and radially with respect to the bell crank pivot.

3. In a circuit breaker, an operating mechanism including a pivotally mounted link, and a link mounted to slide lengthwise through a part of said first mentioned link and to move there-with about the pivot thereof, a coiled spring on the second link reacting between an abutment thereon and the aforementioned part of the first link, a bell crank pivotally mounted on its fixed pivot and having one branch formed to provide a handle and another branch pivotally connected to an end of the second link, and means causing such end to move radially of the bell crank pivot as well as circularly around the latter when the bell crank is rotated, the pivotal connection between the link end and the bell crank comprising a pin and slot connection whereof the slot causes the pin to move circularly of and radially with respect to the bell crank pivot.

4. In a circuit breaker, an operating mechanism including a pivotally mounted link, and a link mounted to slide lengthwise through a part of said first mentioned link and to move there-with about the pivot thereof, a coiled spring on the second link reacting between an abutment thereon and the aforementioned part of the first link, a bell crank pivotally mounted on its fixed pivot and having one branch formed to provide a handle and another branch pivotally connected to an end of the second link, and means causing such end to move radially of the bell crank pivot as well as circularly around the latter when the bell crank is rotated, the arrangement of the parts being such that initial movement of the bell crank causes the second link to slide lengthwise and stress the spring, without rotating the link substantially about its pivot, until a critical position of the link and bell crank is reached, whereupon the link is caused to shift about its pivot suddenly by the stressed spring, without requiring further movement of the bell crank,

to cause quick contact movement free of the bell crank.

5. In a circuit breaker, an operating mechanism including a pivotally mounted link, and a link mounted to slide lengthwise through a part of said first mentioned link and to move therewith about the pivot thereof, a coiled spring on the second link reacting between an abutment thereon and the aforementioned part of the first link, a bell crank pivotally mounted on its fixed pivot and having one branch formed to provide a handle and another branch pivotally connected to an end of the second link, and means causing such end to move radially of the bell crank pivot as well as circularly around the latter when the bell crank is rotated, the pivotal connection between the link end and the bell crank comprising a pin and slot connection whereof the slot causes the pin to move circularly of and radially with respect to the bell crank pivot, the arrangement of the parts being such that initial movement of the bell crank causes the second link to slide lengthwise and stress the spring, without rotating the link substantially about its pivot, until a critical position of the link and bell crank is reached, whereupon the link is caused to shift about its pivot suddenly by the stressed spring, without requiring further movement of the bell crank, to cause quick contact movement free of the bell crank.

6. In a circuit breaker, a frame, a pivotally mounted link, a pivotally mounted handle pivotally connected thereto and operable to slide the link circularly about the pivotal mounting of the handle, a contact controller connected to the link, a spring for opposing movement of the link out of one position and positioned to be stressed by and on movement of the link out of that position and to move the link with a snap action into another position when so stressed and when the link has been moved partially out of the first position and towards such other portion by the handle, and means on the handle for guiding the link, in its movement, so that it slides radially of the handle pivot when it is moved circularly about the handle pivot by the handle, the spring being so positioned that it is stressed more by radial and circular movement of the link than by circular movement thereof alone.

7. In a circuit breaker, a frame, a pivotally mounted link, a pivotally mounted handle pivotally connected thereto and operable to slide the link circularly about the pivotal mounting of the handle, a contact controller connected to the link, a spring for opposing movement of the link out of one position and positioned to be stressed by and on movement of the link out of that position and to move the link with a snap action into another position when so stressed and when the link has been moved par-

tially out of the first position and towards such other portion by the handle, and means on the handle for guiding the link, in its movement, so that it slides radially of the handle pivot when it is moved circularly about the handle pivot by the handle, the spring being so positioned that it is stressed more by radial and circular movement of the link than by circular movement thereof alone, the pivotal mounting for the link being automatically releasable on a circuit abnormality to release the link and permit the spring to move it about its pivotal connection to the handle for circuit interruption.

8. In a circuit breaker controlling mechanism, a resilient mechanism, a movable current responsive latch so constructed and arranged that it normally engages the mechanism for holding it, the parts being so arranged relatively that the mechanism, when held by the latch, is under longitudinal stress, the latch being movable on a circuit abnormality for releasing the mechanism, a rotatably mounted handle, means operatively connecting it to the mechanism, the handle being so constructed and arranged that on rotary movement thereof out of its normal position it will stress the mechanism longitudinally 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 mechanism will tend to relieve itself of the longitudinal stress created therein by such movement of the handle with a snap action, the parts being so arranged relatively that on such stress relieving movement of the mechanism following such handle movement and subsequent release, the mechanism will move bodily beyond the center of rotation of the handle and about the connection between the mechanism and latch as a pivot, and also being so arranged relatively that on release of the latch, when the handle and mechanism are in normal position, the mechanism will tend to relieve itself of the stress that it possesses when it is held by the latch with a snap action and in so doing will move bodily about its connection to the handle as a pivot, the resilient mechanism, the handle, and the latch being so arranged and constructed and relatively connected that the handle connection end of the resilient mechanism moves radially of the handle center of rotation a considerable extent as well as circularly thereof when the handle is rotated to rotate the resilient mechanism about its latch connection end, there being at the handle connection end of the resilient mechanism a hill and valley means providing a hill and valley path for the handle connection end of the spring means, the path itself being in the nature of a slot formed in the handle of the device.

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