Nov. 19, 1957 G. A. WILSON 2,813,950

CIRCUIT BREAKER OPERATING MECHANISM

Filed Aug. 18, 1953

3 Sheets-Sheet 1

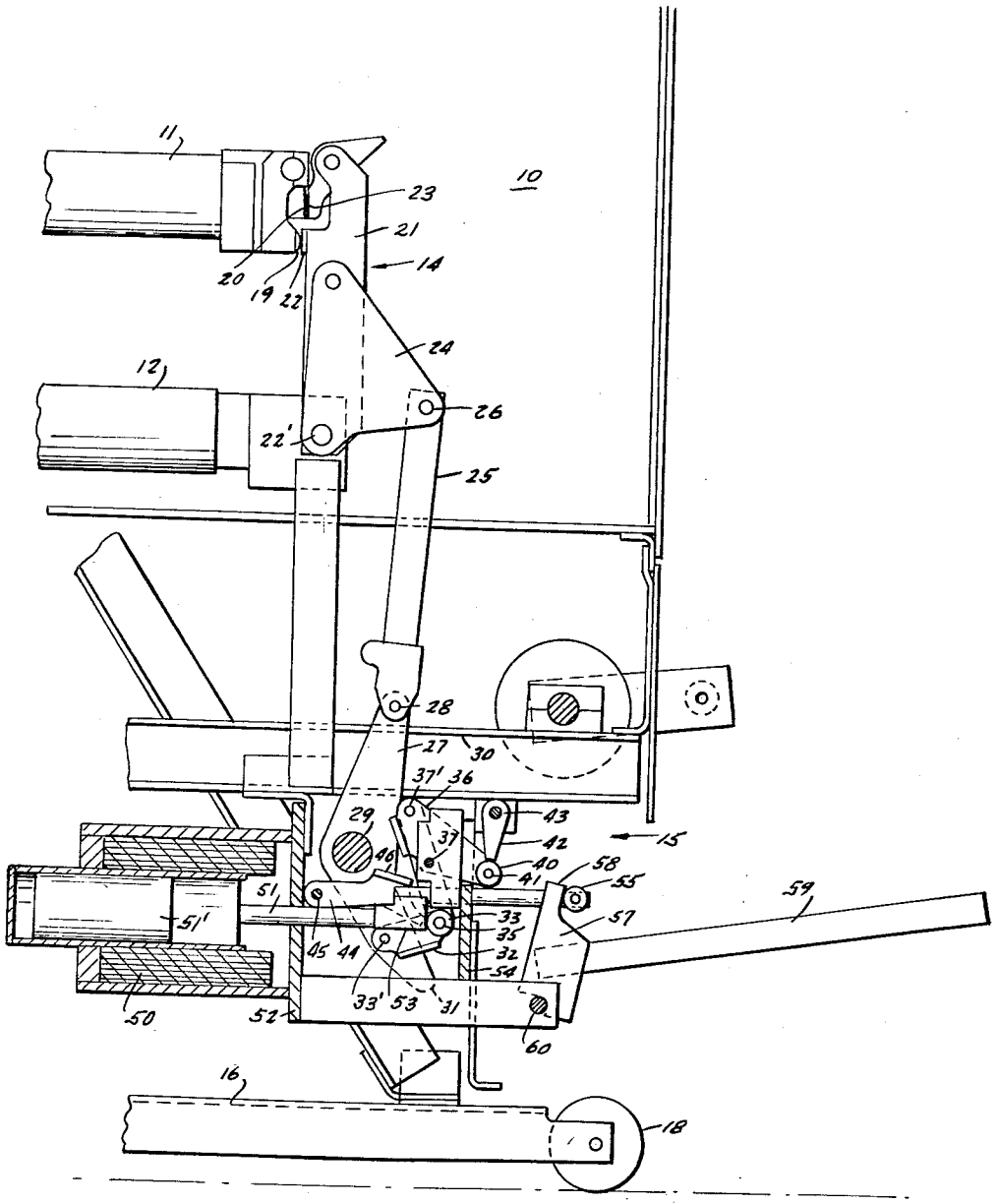


FIG. 1

INVENTOR.
GEORGE A. WILSON

BY

Ostrolenk & Faber

ATTORNEYS

Nov. 19, 1957 G. A. WILSON 2,813,950

CIRCUIT BREAKER OPERATING MECHANISM

Filed Aug. 18, 1953 3 Sheets-Sheet 2

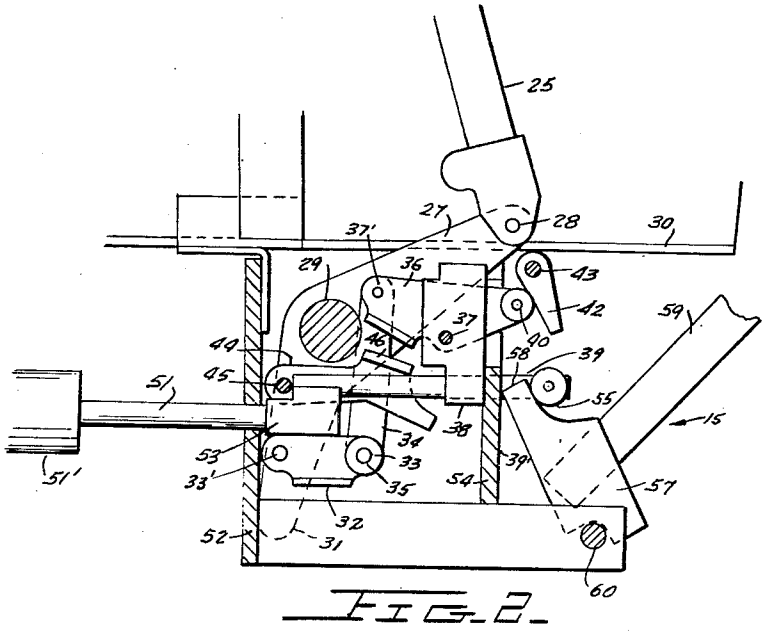


FIG. 2

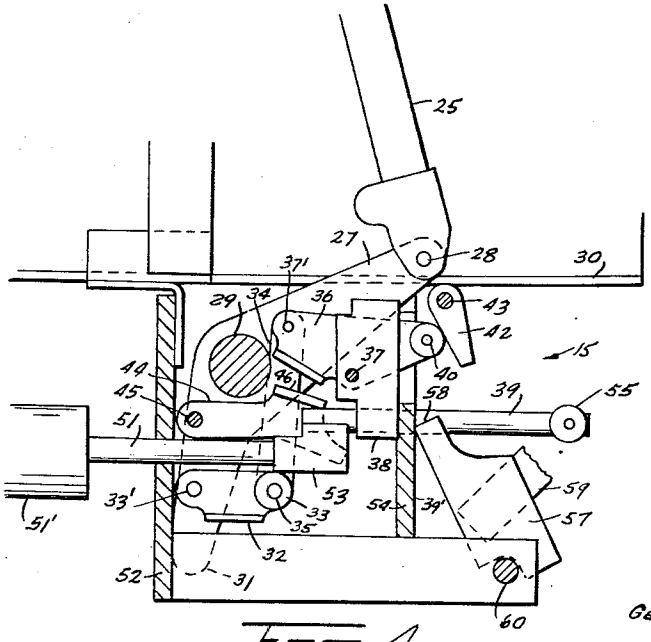


FIG. 4

INVENTOR.
GEORGE A. WILSON

BY Ostrolenk & Faber

ATTORNEYS

Nov. 19, 1957 G. A. WILSON 2,813,950

CIRCUIT BREAKER OPERATING MECHANISM

Filed Aug. 18, 1953 3 Sheets-Sheet 3

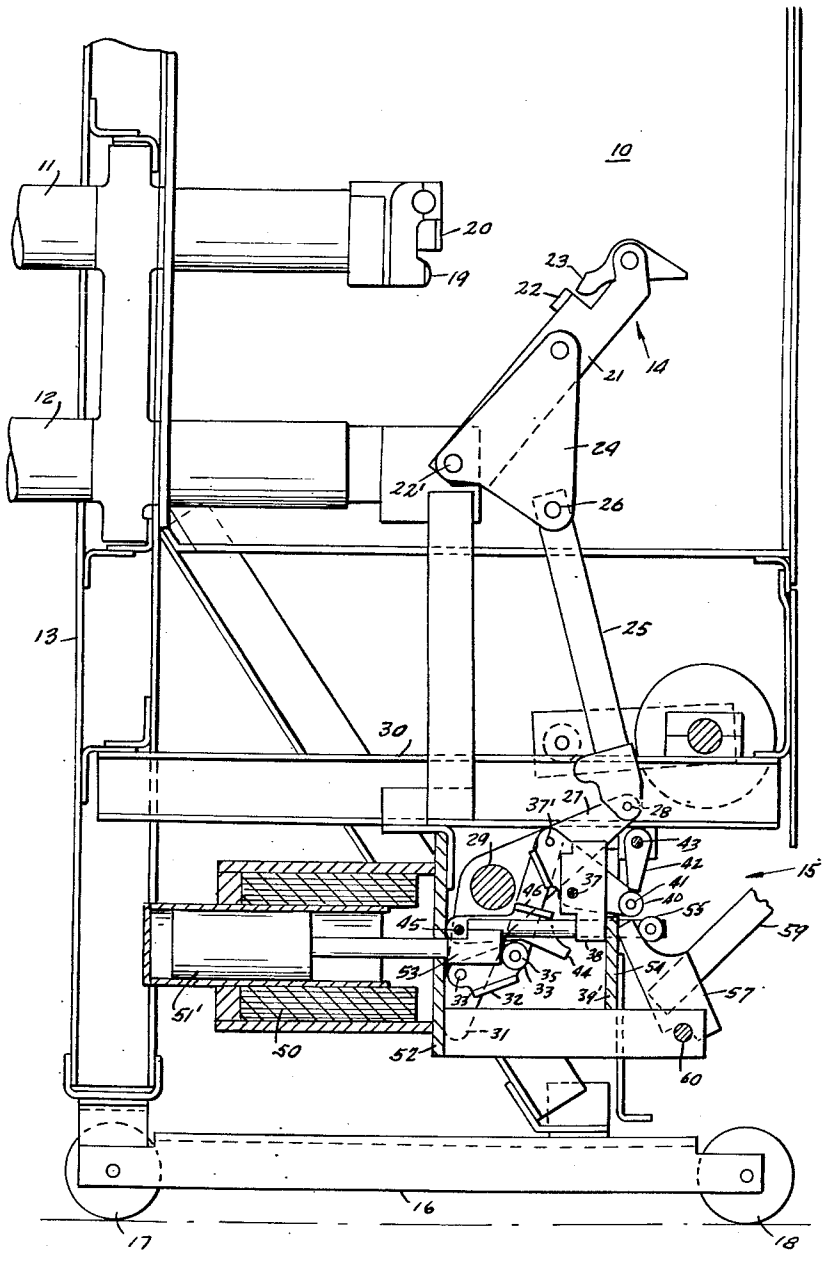


FIG. 3.

INVENTOR.
GEORGE A. WILSON

BY Ostrolenk & Faber

ATTORNEYS

United States Patent Office 2,813,950 Patented Nov. 19, 1957

2,813,950

CIRCUIT BREAKER OPERATING MECHANISM

George A. Wilson, Springfield, Pa., assignor to I-T-E Circuit Breaker Company, Philadelphia, Pa.

Application August 18, 1953, Serial No. 374,864

12 Claims. (Cl. 200—106)

My invention relates to circuit breakers and is more particularly directed to a novel operating mechanism therefor.

In the operating mechanism of my invention, a bridge member which forms the movable contact arm is connected to and operated by an insulated operating link. The insulated operating link extends below the barrier sheet of the circuit breaker and all of the operating components are located therebelow.

With this arrangement, I am able to eliminate the need of costly and troublesome molded insulated parts and simplify the shielding of the mechanism. That is, since the entire operating mechanism is situated well below the area which may be ionized when an arc is created, the necessity for insulating any parts of the operating mechanism is eliminated.

The only insulating unit which is needed is the insulated operating link which serves as the connection and operating member between the operating mechanism and the bridge of the circuit breaker. This operating insulated link is connected to an operating arm to form the main toggle of the circuit breaker.

The operating mechanism of my invention is very compact since I provide an arrangement wherein the closing means operates directly on a trip free linkage which, in turn, is connected directly to the main toggle comprised of the insulated operating link and the main operating link.

Heretofore, circuit breaker operating mechanisms have been constructed by having the closing mechanism operate directly against the main toggle, one end of which is connected to the trip free linkage. However, this arrangement results in a rather bulky structure and requires that the operating mechanism be mounted in an area adjacent the cooperating contacts.

In some recent designs to overcome these obvious disadvantages, circuit breaker operating mechanisms have been constructed with an arrangement whereby the manual or automatic closing means exerts a force on a closing lever which in turn transmits a force through a thrust transmitting means or toggle to the main operating lever.

In contradistinction, the operating mechanism of my invention provides an arrangement in which the closing means transmits a force directly to the operating lever through a single link thereby eliminating the intermediate toggle means and accordingly, providing for compact arrangement.

As above noted, the closing mechanism transmits a force to the operating link through a trip free linkage. Since the main operating link forms one link of the main toggle, the connection of the trip free linkage at a point on the toggle where the loading is low greatly reduces the latch load. Since the first mentioned prior art arrangement required that the closing mechanism operate directly on the main toggle with the trip free linkage connected to one end thereof, the latch load was relatively high. However, by transmitting the closing force through the trip free linkage to the main toggle at a point where the load is low, it is possible to greatly reduce the latch load.

With my novel arrangement, economy is attained by compactness, requirement of a minimum number of latch load reductions, low pin loading with lighter parts, efficiency in placement of parts, use of a minimum number and simplicity of parts and ease of manufacture.

Accordingly, one object of my invention is to provide a novel operating mechanism for a circuit breaker wherein the closing mechanism operates through a trip free linkage to control the main toggle of the circuit breaker.

Another object of my invention is to provide an arrangement in which an insulated operated arm of the main contact bridge forms one link of the main toggle.

A still further object of my invention is to provide a novel compact latch load reduction operating mechanism wherein the closing means transmits a force to the main toggle, one link of which is the bridge insulated operating arm, without the necessity of operating through a thrust transmitting means or toggle.

Another object of my invention is to provide a novel compact operating mechanism for a circuit breaker wherein the closing means and main operating lever, which forms one link of the main toggle, are independent of each other and have no common pivot or connection.

Another object of my invention is to provide a circuit breaker with a compact operating mechanism which is situated entirely below the barrier sheet.

A still further object of my invention is to provide operating mechanism which is compact and utilizes an efficient toggle system for the operation of the main cooperating contacts.

A still further object of my invention is to provide an economical operating mechanism for circuit breakers which requires minimum number of latch load reductions, has low pin loading and utilizes simple and minimum number of parts and is relatively easy to manufacture.

These and other objects of my invention will be apparent from the following description when taken in connection with the drawings in which:

Figure 1 is a side view of the operating mechanism of my invention illustrating the relative position of the components when the circuit breaker is in the fully closed position.

Figure 2 is a side view of the operating mechanism of my invention similar to Figure 1 showing the relative position of the various parts when the circuit breaker is in the fully open position prior to automatic reset.

Figure 3 is a side view of the operating mechanism of my invention similar to Figure 1 and shows the relative position of the various parts when the circuit breaker is in the fully open automatic reset position.

Figure 4 is a partial side view of the novel operating mechanism of my invention similar to Figure 1 and illustrates the relative position of the various parts when the circuit breaker has opened trip free.

Referring to the figures, the circuit breaker **10** is supplied from the line terminals **11** and **12**. The line terminals **11** and **12**, in turn, are supported on the back plate structure **13**. The bridge contact structure **14**, the operating mechanism **15** as well as the line terminal studs **11** and **12** and their supporting structure **13** are all mounted on the truck base **16** which in turn is provided with wheels **17** and **18**.

The main stationary contact **19** and arcing stationary contact **20** are electrically connected to the upper line terminal **11** and the bridge member **21** is pivotally mounted and electrically connected to the lower line terminal **12** at the point **22**. The bridge **21** carries the movable main contact **22** and the movable arcing contact **23**.

A triangular member **24** is permanently secured to the bridge member **21** to provide a pivotal connecting means **26** for the insulated operating rod **25**. As will hereinafter be more fully described, the insulated operating rod **25**

forms one link of the main operating toggle which controls the position of the bridge 21.

The lower end of the insulated operating arm 25 is pivotally connected to the main operating member 27 by means of the pivotal connection 28. The main operating member 27 is a bell-crank which is pivotally mounted on the stationary shaft 29. A biasing spring (not shown) is connected to the lower leg 31 of the bell-crank 27 to urge this member in a clockwise direction around the shaft 29 to thereby urge the cooperating contacts 19—22 and 20—23 into disengaged position as illustrated in Figures 2, 3 and 4.

The main operating member 27 forms one link of the main toggle comprised of the links 25—27. It will be noted that the main toggle 25—27 passes through the barrier sheet 30. Thus, the entire operating mechanism 15 which controls the movement of the main toggle 25—27 is situated and positioned below the barrier sheet 30 and is, therefore, out of the area or region surrounding the cooperating contacts 19—22 and 20—23 which may become ionized. Thus, by providing this type of an arrangement, the necessity of providing molded insulated parts is eliminated.

A trip free linkage 32 is pivotally mounted at 33' on the leg 31 of the main operating member 27. The opposite end of the trip free linkage 32 contains prop roller 33 which will hereinafter be more fully described. An inter-connecting link 34 is pivotally connected by the pin 35 to the end of the trip free linkage 32 which contains the prop roller 33. Thus, the prop roller 33 and the interconnecting link 34 are both pivotally mounted on the pin 35 of the trip free linkage 32. The opposite end of the interconnecting link 34 is pivotally mounted to the trip link 36 by means of the pin 37'. The trip link 36 is pivotally mounted on the stationary pin 37. The permanently mounted member 38 which is secured to the support plate 39' houses a spring means (not shown) to bias the trip link in a counterclockwise direction about its stationary pivot 37. The housing member 38 also has an opening which serves as a guide for the closing structure 39 which will hereinafter be more fully described.

The opposite end of the trip link 36 has a pin 41 on which the trip roller 40 is pivotally mounted. A trip latch 42 is pivotally mounted on the stationary pivot 43 and is in latch engagement with the trip roller 40 when the circuit breaker is in the closed position of Figure 1 or the automatic reset position of Figure 3.

The normal position for the trip latch 42 is in the latch position indicated in Figures 1 and 3. This trip latch is operated in a counterclockwise direction by a trip coil in a manner which is well known in the art.

The prop latch 44 is pivotally mounted on the stationary pivot 44. The protruding section 46 of the prop latch 45 rides on top of the closing shaft 39. Biasing means (not shown) are provided to bias the prop latch 44 in a clockwise direction to the position indicated in Figures 1 through 4. The right hand end of the prop latch is in latch 44 engagement with the prop roller 33 of the trip free linkage 32 when the circuit breaker is in the fully closed position of Figure 1. Thus, with the trip latch 42 in engagement with the trip roller 40 and the prop latch 44 in engagement with the prop roller 33, the operating mechanism will maintain the circuit breaker contacts 19—22 and 20—23 in engaged position. That is, even though the opening spring is tending to rotate the main operating member 27 in a clockwise direction around the stationary shaft 29, the latch engagement 40—42 and 44—33 operating through the trip free linkage 32, connecting linkage 34 and trip link 36 will prevent the opening of the circuit breaker contacts by means of the main opening spring. It will be noted that since the linkage 32—34—36 is connected to the lower end of the main operating member 27, which forms one link of the main toggle 25—27, that the latch load is extremely small as compared to the conventional type of operating mechanism for circuit breakers.

The operation of the operating mechanism 15 on the occurrence of a fault current is as follows: The trip coil (not shown) will force the trip latch 42 to rotate in a counterclockwise direction about its stationary pivot 43. Thus, the latch 42—40 which is maintaining the circuit breaker in the closed position against the opening force of the main biasing spring is automatically removed. Hence, the main biasing spring will urge the main operating member 27 in a clockwise direction about its stationary shaft 29 due to the fact that the linkage comprised of the trip free link 32, the connecting link 34 and the trip link 36 are no longer latched in position. Hence, the clockwise force on the main operating member 27 operating through the pin 33' will urge the trip free linkage 32 to the left. The force exerted on the trip free linkage 32 will force the prop roller 33 to roll downwardly and under the prop latch 44. This resulting leftward downward movement of the trip free linkage 32 will operate the connecting link 34 downwardly by means of the force transmitted through the connecting pin 35.

The resulting downward movement of the connecting link 34 will thus cause the trip link 36 to rotate in a counterclockwise direction about its stationary pivot 37 by means of the force transmitted through the connecting pivot pin 37'. It will be noted that this operation of the linkage is permitted due to the fact that the latch engagement 40—42 has been removed thereby permitting counterclockwise rotation of the trip link 36.

The position of the operating parts immediately following the automatic trip of the circuit breaker is shown in Figure 2. As heretofore noted, the trip link 36 is biased in a clockwise direction about its stationary pivot 37. However, since the force of the main opening spring urging the leg 31 of the main operating member 27 is much larger than the relatively small force of the spring urging the trip link 36 in a clockwise direction, the first mentioned force will predominate to cause the trip link 36 to rotate in a counterclockwise direction against its bias.

After the circuit breaker has moved to the automatic tripped open position of Figure 2, the force of the main opening spring will no longer be exerted on the trip link 36. Hence, the biasing spring for the trip link 36 will rotate this member 36 in a clockwise direction about its stationary pivot 37.

Since the trip latch 42 is normally biased in a clockwise direction to the positions indicated in Figures 1 and 3, this latch will now come into latch engagement with the roller 40.

It will be noted that when the trip link 36 rotates in a clockwise direction about its stationary pivot 37, it will also lift the connecting link 34 by force transmitted through the pin 37'. The upward movement of the link 34 will be transmitted to the trip free linkage 32 through the pin 35. Hence, the prop roller 33 will seat itself on the right hand vertical edge of the closing rod connecting member 53. As will hereinafter be more fully explained, this automatic reset of the latch 42—40 and the positioning of the prop roller 33 in front of the closing rod connecting member 53 will subsequently permit either automatic or manual closing of the breaker.

Thus, the circuit breaker will be automatically reset, as clearly illustrated in Figure 3, for a subsequent automatic or manual closing operation.

The closing mechanism will now be described. The closing coil 50 may be energized in any well-known manner, as for example as shown in copending application Serial No. 254,349, filed November 1, 1951, and assigned to the same assignee as the instant application.

The closing coil 50 is provided with a closing plunger 51'. The closing plunger 51' assumes the neutral position indicated in Figure 3 when the closing coil 50 is de-energized. The closing rod 51 is guided in an appropriate opening in wall 52 and rests against the right side

of the closing plunger 51'. The closing rod 51 is connected by means of L-shaped lock 53 to a second closing rod 39. As heretofore noted, the closing rod 39 is guided in an appropriate opening of housing 38 and in a second appropriate opening in the support wall 54.

Spring means (not shown) are provided to bias the closing rod 51—39 to the extreme left to the position seen in Figures 2 and 3. The right hand end of the closing rods 51—39 is provided with a manual closing roller 55. As will hereinafter be more fully explained, movement of the closing rods 51—39 to the right will result in the engagement of the cooperating contacts 19—22 and 20—23. Manual and automatic closing means are provided to move the closing rods 51—39 to the left. The manual closing means is comprised of the pivotally mounted member 57 which has an upwardly extending portion 58 which rides against the manual roller 55.

A closing handle 59 is attached to the closing member 57. When the circuit breaker is in the open automatic reset position of Figure 3, the closing link 57 will be at its extreme counterclockwise position. When it is desired to manually close the breaker, the handle 59 is moved downwardly thereby rotating the member 57 in a clockwise direction around its pivot 60. The engagement between the extension 58 of the closing roller 55 will thereby move the closing rods 51—39 to the right to thereby close the breaker in a manner hereinafter more fully described. In the event it is desired to close the breaker automatically, the closing coil 50 is energized thereby driving the closing plunger 51' to the right. This movement will result in engagement with the left hand end of the closing rod 51 thereby driving the closing means 51—53—39.

The manner in which the closing means operates on the operating mechanism of the circuit breaker is as follows: As is heretofore noted, following the automatic trip of the circuit breaker from the position of Figure 1 to the position of Figure 2, the operating mechanism will automatically reset to the position indicated in Figure 3. That is, the trip latch 42 will come into latch engagement with the trip roller 40 and the prop roller 33 will be urged against the right hand vertical edge of the connecting member 53 for the closing rods 51—39. Hence, if the closing rods 51—39 are moved to the right, either by the manual means 59—57 or by the automatic means 50—51, as fully described above, the connecting member 53 will exert force against the prop roller 33. Since the trip latch 42—40 is in engagement, the trip link 42 will not be able to move. Hence, the pivot pin 37' for the connecting link 34 will now be a fixed pivot and thus, the prop roller 33 can only be moved to the right in an arc swung from the center 37. That is, since the trip link 36 is latched in position, the prop roller 33 will be unable to fall beneath the connecting member 53 since it is limited to arcuate movement about the point 37' by the connecting link 34. Thus, the rightward movement toward the closing position of the closing means 51—53—39 will move the trip free link 32 to the right. Since the trip free linkage 32 is pivotally connected to the leg 31 of the main operating mechanism 27, the closing force will be transmitted through the trip free linkage 32 to rotate the main operating member 27 counterclockwise around its stationary pivot shaft 29. That is, since the closing force will be greater than the force of the biasing spring tending to urge the bell crank 27 in a clockwise direction, the member 27 will be rotated in a counterclockwise direction.

Since the main operating member 27 comprises one link of the main toggle 25—27, this main toggle will be driven to center position, as indicated in Figure 1, thereby directly closing the cooperating contacts 19—22 and 20—23.

It will be noted that the closing means 51—53—39 operates directly on the toggle means 25—27 through the trip free linkage 32 without operating through any other toggle or thrust transmitting means.

As heretofore noted, the prop latch 44 is biased in a counterclockwise direction about its stationary pivot 45 to the position indicated in the various figures.

As noted, the closing means (to the right) of the closing means 51—53—39 will drive the prop latch in an arcuate path around the center point 37 to the right. Near the end of the closing stroke of the closing rods 31—39, the prop roller 33 will be brought into latch engagement with the prop latch 44. Hence, when the force upon the closing means 51—53—39 is removed so that its biasing means drives it to the extreme left position, the trip free linkage 32 will be maintained in a position indicated in Figure 1 due to the prop latch engagement 44 and 33. Thus, the circuit breaker will be in the fully closed position with prop latch engagement 44—33 and trip latch engagement 42—40.

In the event the circuit breaker is either manually or automatically closed on a normal line, it will remain latch closed, as above described. If the circuit breaker is manually or automatically closed on a fault line, the operating mechanism is trip free to allow opening of the cooperating contacts 19—22 and 20—23 even though a continued closing force urges the closing means 51—53—39 to the closing (right) position. The trip free operation of the circuit breaker is illustrated in Figure 3.

In the illustration of Figure 4, it is assumed that the closing means 51—53—39 have been forced to the right or to the closing position by the automatic closing means 50—51. However, as soon as the circuit breaker contacts engage, the trip coil will be energized thereby rotating the trip latch 42 in a counterclockwise direction around its stationary pivot 43. This will automatically unlatch the trip latch 42 from the trip roller 40 thereby removing the restraining means which prevented the main operating spring from rotating the main operating member 27 in a clockwise direction.

Thus, if the circuit breaker is automatically or manually closed on a fault, the trip latch 42 will unlatch with the trip roller 40 thereby permitting the prop roller 33 to roll downwardly and off the prop latch 44 due to the force exerted by the main opening spring to the trip free linkage 32 from the main operating member 27 through the pin 33. That is, since the trip link 36 is no longer restrained from having counterclockwise rotation about its stationary pivot 37, the leftward force exerted on the trip free linkage 32 will permit unlatching of this member from the upper latch 44 since the connecting link 34 can now be moved downwardly and rotate the trip link 36 counterclockwise about its stationary pivot 37. Thus, when the circuit breaker is either automatically or manually closed against fault circuit the operating mechanism will trip free and immediately assume the position indicated in Figure 4.

When the closing force on the closing rods 51—39 is removed, these members will move to the extreme left, as indicated in Figure 2, and the various components will momentarily assume the position indicated in Figure 2. Instantly thereafter, the various components will automatically reset to the position indicated in Figure 3, as herein before described.

Thus, it will be noted, I have provided a novel operating mechanism for a circuit breaker in which the closing means can operate through a trip free linkage directly on a main toggle of the circuit breaker, one link of which is the insulated operating rod of the bridge member. All the various components of the operating mechanism can be mounted below the barrier sheet and since the closing means operates through a trip free linkage, the latch load of the various components is extremely low since the load at the free end of the toggle is extremely small. For this reason, the operating mechanism of my invention is compact, has very low latch and

pin loading and uses a minimum number of parts and is relatively easy to manufacture.

In the foregoing, I have described my invention only in connection with preferred embodiments thereof. Many variations and modifications of the principles of my invention within the scope of the description herein are obvious. Accordingly, I prefer to be bound not by the specific disclosure herein but only by the appending claims.

I claim:

1. A circuit breaker having a pair of cooperating contacts, a bridge, and an operating mechanism comprising an operating rod, a main operating member, a trip free link and a connecting member; said main operating member operatively connected to said cooperating contacts to move said cooperating contacts between an engaged and a disengaged position; said main operating member pivotally mounted on a stationary shaft; said connecting rod having one end pivotally mounted to said main operating member and the other end pivotally mounted to the bridge of said circuit breaker; said main operating member and said operating rod comprising the main toggle of said circuit breaker; one end of said trip free link being pivotally connected to said main operating member at a first pivot and the other end being pivotally connected to one end of said connecting member at a second pivot; the other end of said connecting member being connected to a third pivot; a closing rod for said circuit breaker; said closing rod manually and automatically operative; said closing rod acting on said second pivot to exert a force on said main toggle through said trip free link; said first pivot approaching said third pivot when said main operating member is moving said cooperating contacts from said disengaged position to said engaged position.

2. A circuit breaker having a pair of cooperating contacts, a bridge, and an operating mechanism comprising an operating rod, a main operating member, a trip free link, a connecting member, and a trip link; said main operating member operatively connected to said cooperating contacts to move said cooperating contacts between an engaged and a disengaged position; said main operating member pivotally mounted on a stationary shaft; said operating rod having one end pivotally mounted to said main operating member and the other end pivotally mounted to the bridge of said circuit breaker; said main operating member and said operating rod comprising the main toggle of said circuit breaker; said trip free link having one end pivotally mounted on said main operating member at a first pivot and the other end pivotally mounted on a first end of said connecting member at a second pivot; a second end of said connecting member pivotally mounted on said trip link at a third pivot; said trip link pivotally mounted on a stationary pivot; a closing rod acting on said second pivot to exert a force on said main toggle through said trip free link; said first pivot approaching said third pivot when said main operating member is moving said cooperating contacts from said disengaged position to said engaged position.

3. A circuit breaker having an operating mechanism comprising an insulated connecting rod, a main operating member, a trip free link, a connecting member, and a trip link; said main operating member pivotally mounted on a stationary shaft; said insulated operating rod having one end pivotally mounted to said main operating member and the other end pivotally mounted to a bridge of said circuit breaker; said trip free link having one end pivotally mounted on said main operating member and the other end pivotally mounted on a first end of said connecting member; a second end of said connecting member pivotally mounted on said trip link; said link pivotally mounted on a stationary pivot; said main operating member and said insulated connecting rod forming the main toggle of said circuit breaker; a prop latch for said trip free link and a trip latch for said trip link; said bridge having an engaged and disengaged position; said trip latch and said prop latch maintaining said bridge in said engaged position through said main toggle.

4. A circuit breaker having an operating mechanism comprising an insulated connecting rod, a main operating member, a trip free link, a connecting member, and a trip link; said main operating member pivotally mounted on a stationary shaft; said insulated operating rod having one end pivotally mounted to said main operating member and the other end pivotally mounted to a bridge of said circuit breaker; said trip free link having one end pivotally mounted on said main operating member and the other end pivotally mounted on a first end of said connecting member; a second end of said connecting member pivotally mounted on said trip link; said trip link pivotally mounted on a stationary pivot; said main operating member and said insulated connecting rod forming the main toggle of said circuit breaker; a prop latch for said trip free link and a trip latch for said trip link; said bridge having an engaged and disengaged position; said trip latch and said prop latch maintaining said bridge in said engaged position through said main toggle; closing means automatically and manually operative to move said bridge member from said disengaged position to said engaged position; said closing means operative directly on said trip free link to move said bridge to said engaged position through said main toggle.

5. A circuit breaker having an operating mechanism comprising an insulated connecting rod, a main operating member, a trip free link, a connecting member, and a trip link; said main operating member pivotally mounted on a stationary shaft; said insulated operating rod having one end pivotally mounted to said main operating member and the other end pivotally mounted to a bridge of said circuit breaker; said trip free link having one end pivotally mounted on said main operating member and the other end pivotally mounted on a first end of said connecting member; a second end of said connecting member pivotally mounted on said trip link; said trip link pivotally mounted on a stationary pivot; said main operating member and said insulated connected rod forming the main toggle of said circuit breaker; a prop latch for said trip free link and a trip latch for said trip link; said bridge having an engaged and disengaged position; said trip latch and said prop latch maintaining said bridge in said engaged position through said main toggle; closing means automatically and manually operative to move said bridge member from said disengaged position to said engaged position; said closing means operative directly on said trip free link to move said bridge to said engaged position through said main toggle; said closing means ineffective to exert a closing force on said trip free linkage when said bridge is moved to engaged position on a fault current.

6. A circuit breaker having an operating mechanism comprising an insulated connecting rod, a main operating member, a trip free link, a connecting member, and a trip link; said main operating member pivotally mounted on a stationary shaft; said insulated operating rod having one end pivotally mounted to said main operating member and the other end pivotally mounted to a bridge of said circuit breaker; said trip free link having one end pivotally mounted on said main operating member and the other end pivotally mounted on a first end of said connecting member; a second end of said connecting member pivotally mounted on said trip link; said trip link pivotally mounted on a stationary pivot; said main operating member and said insulated connecting rod forming the main toggle of said circuit breaker; a prop latch for said trip free link and a trip latch for said trip link; said bridge having an engaged and disengaged position; said trip latch and said prop latch maintaining said bridge in said engaged position through said main toggle; closing means automatically and manually operative to move said bridge member from said disengaged position to said engaged position; said closing means operative directly

on said trip free link to move said bridge to said engaged position through said main toggle; automatic operation of said trip latch rendering said prop latch ineffective to maintain said bridge in engaged position; means to reset said trip latch following automatic trip.

7. A circuit breaker having an operating mechanism comprising an insulated connecting rod, a main operating member, a trip free link, a connecting member, and a trip link; said main operating member pivotally mounted on a stationary shaft; said insulated operating rod having one end pivotally mounted to said main operating member and the other end pivotally mounted to a bridge of said circuit breaker; said trip free link having one end pivotally mounted on said main operating member and the other end pivotally mounted on a first end of said connecting member; a second end of said connecting member pivotally mounted on said trip link; said trip link pivotally mounted on a stationary pivot; said main operating member and said insulated connecting rod forming the main toggle of said circuit breaker; a prop latch for said trip free link and a trip latch for said trip link; said bridge having an engaged and disengaged position; said trip latch and said prop latch maintaining said bridge in said engaged position through said main toggle; closing means automatically and manually operative to move said bridge member from said disengaged position to said engaged position; said closing means operative directly on said trip free link to move said bridge to said engaged position through said main toggle; automatic operation of said trip latch rendering said prop latch ineffective to maintain said bridge in engaged position; means to reset said trip latch following automatic trip; said closing means operative through said trip free link to operate said main toggle and said bridge to engaged position; one end of said trip free link restricted in movement by said connecting member; the opposite end of said trip free link restricted in movement by said main operating member.

8. A circuit breaker having an operating mechanism comprising a main operating member, an insulated operating rod a trip free link, a connecting member, and a trip link; said circuit breaker having a bridge member with an engaged and disengaged position; said insulated operating rod having one end pivotally connected to said bridge member and the other end pivotally connected to said main operating member; said main operating member pivotally mounted on a fixed shaft; said main operating member and said insulated operating rod forming the main toggle for said circuit breaker; said trip free link pivotally mounted on said main operating member; said trip link pivotally mounted on a stationary pivot; said connecting member pivotally connecting said trip free link to said trip link; a trip latch to maintain said trip link in a predetermined position; a prop latch to maintain said trip free link in a predetermined position; said trip latch and said prop latch maintaining said main toggle in a position to hold said bridge in engaged position.

9. A circuit breaker having an operating mechanism comprising a main operating member, an insulated operating rod, a trip free link, a connecting member, and a trip link; said circuit breaker having a bridge member with an engaged and disengaged position; said insulated operating rod having one end pivotally connected to said bridge member and the other end pivotally connected to said main operating member; said main operating member pivotally mounted on a fixed shaft; said main operating member and said insulated operating rod forming the main toggle for said circuit breaker; said trip free link pivotally mounted on said main operating member; said trip link pivotally mounted on a stationary pivot; said connecting member pivotally connecting said trip free link to said trip link; a trip latch to maintain said trip link in a predetermined position; a prop latch to maintain said trip free link in a predetermined position; said trip latch and said prop latch maintaining said main toggle in a position to hold said bridge in engaged position; closing means automatically and manually operative for moving said bridge member from disengaged position to engaged position; said closing means operatively connected to said trip free link.

10. A circuit breaker having an operating mechanism comprising a main operating member, an insulated operating rod, a trip free link, a connecting member, and a trip link; said circuit breaker having a bridge member with an engaged and disengaged position; said insulated operating rod having one end pivotally connected to said bridge member and the other end pivotally connected to said main operating member; said main operating member pivotally mounted on a fixed shaft; said main operating member and said insulated operating rod forming the main toggle for said circuit breaker; said trip free link pivotally mounted on said main operating member; said trip link pivotally mounted on a stationary pivot; said connecting member pivotally connecting said trip free link to said trip link; a trip latch to maintain said trip link in a predetermined position; a prop latch to maintain said trip free link in a predetermined position; said trip latch and said prop latch maintaining said main toggle in a position to hold said bridge in engaged position; closing means automatically and manually operative for moving said bridge member from disengaged position to engaged position; said closing means operatively connected to said trip free link; unlatching of said trip latch when said circuit breaker is automatically or manually closed by said closing means on a fault effective to release said prop latch to render said circuit breaker trip free.

11. A circuit breaker having an operating mechanism comprising a main operating member, an insulated operating rod, a trip free link, a connecting member, and a trip link; said circuit breaker having a bridge member with an engaged and disengaged position; said insulated operating rod having one end pivotally connected to said bridge member and the other end pivotally connected to said main operating member; said main operating member pivotally mounted on a fixed shaft; said main operating member and said insulated operating rod forming the main toggle for said circuit breaker; said trip free link pivotally mounted on said main operating member; said trip link pivotally mounted on a stationary pivot; said connecting member pivotally connecting said trip free link to said trip link; a trip latch to maintain said trip link in a predetermined position; a prop latch to maintain said trip free link in a predetermined position; said trip latch and said prop latch maintaining said main toggle in a position to hold said bridge in engaged position; closing means automatically and manually operative for moving said bridge member from disengaged position to engaged position; said closing means operatively connected to said trip free link; said trip latch automatically reset following an automatic tripping operation.

12. A circuit breaker having an operating mechanism comprising a main operating member, an insulated operating rod, a trip free link, a connecting member, and a trip link; said circuit breaker having a bridge member with an engaged and disengaged position; said insulated operating rod having one end pivotally connected to said bridge member and the other end pivotally connected to said main operating member; said main operating member pivotally mounted on a fixed shaft; said main operating member and said insulated operating rod forming the main toggle for said circuit breaker; said trip free link pivotally mounted on said main operating member; said trip link pivotally mounted on a stationary pivot; said connecting member pivotally connecting said trip free link to said trip link; a trip latch to maintain said trip link in a predetermined position; a prop latch to maintain said trip free link in a predetermined position; said trip latch and said prop latch maintaining said main toggle in a position to hold said bridge in engaged po-

sition; closing means automatically and manually operative for moving said bridge member from disengaged position to engaged position; said closing means operatively connected to said trip free link; said trip latch automatically reset following an automatic tripping operation; said trip free link automatically positioned with respect to said closing means following an automatic tripping operation.

References Cited in the file of this patent

UNITED STATES PATENTS

1,190,060	Wolff	July 4, 1916
1,827,626	Thumim	Oct. 13, 1931
1,953,789	Thumim	Apr. 3, 1934
2,041,903	Cole	May 26, 1936
2,355,075	Jensen	Aug. 8, 1944
2,515,994	Findley et al.	July 18, 1950
2,542,736	Viti et al.	Feb. 20, 1951