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CIRCUIT BREAKER

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Fig. 1.

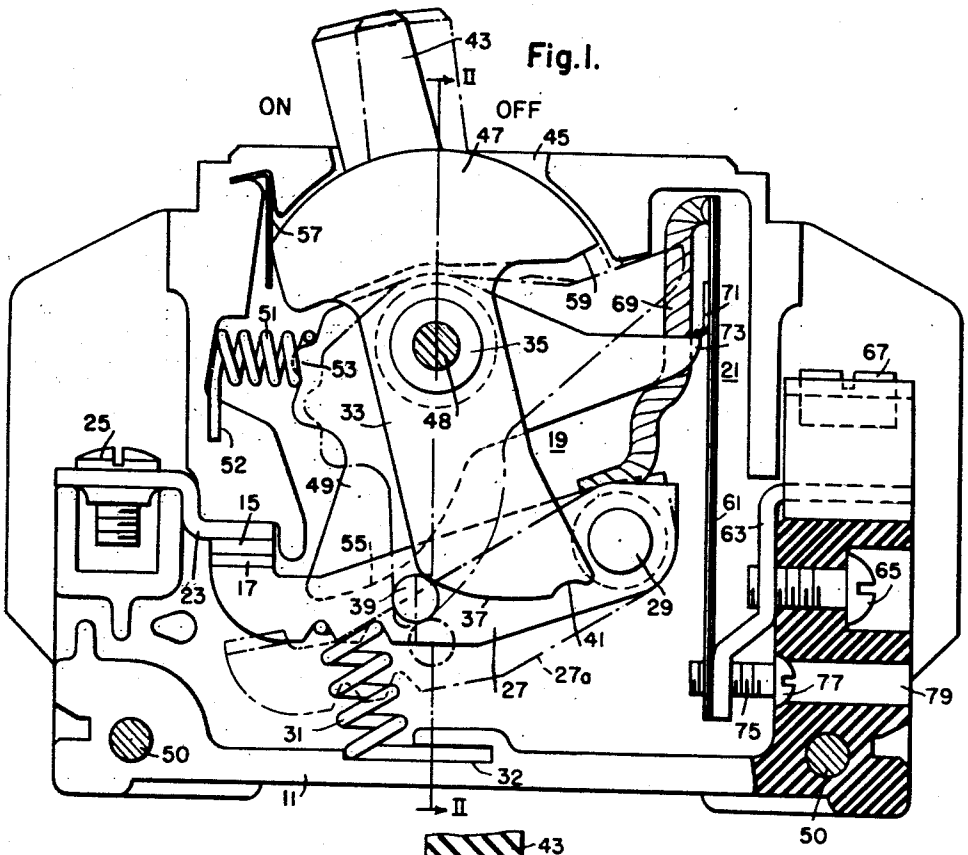
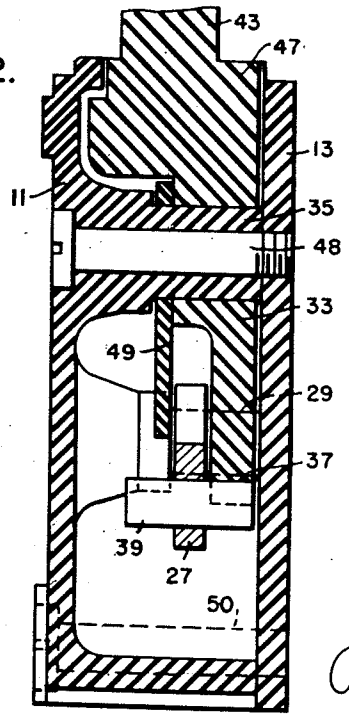


Fig. 2.



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CIRCUIT BREAKER

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This invention relates to circuit breakers and, more particularly, to circuit breakers of the type which are manually operable to open and close the circuit and which are automatically operated to open the circuit in response to predetermined abnormal conditions.

An object of this invention is to provide an improved circuit breaker having an insulating housing in which the moving parts of the circuit breaker are supported without the use of a metal frame.

Another object of this invention is to provide an improved circuit breaker having a molded insulating housing in which the supports for the moving parts of the circuit breaker are molded integral with the housing.

Another object of the invention is the provision of a circuit breaker as previously described which is simple and inexpensive to manufacture and which has a minimum number of parts.

The novel features that are considered characteristic of the invention are set forth in particular in the appended claims. The invention itself, both as to construction and operation, together with additional objects and advantages thereof, will be best understood from the following detailed description thereof when read in conjunction with the accompanying drawing.

In said drawing:

Figure 1 is a side elevational view, with the cover plate removed and the housing shown partly broken away, of a circuit breaker embodying the principles of the invention.

Fig. 2 is a sectional view taken on line II—II of Fig. 1 and looking in the direction of the arrows.

Referring to the drawing, the circuit breaker comprises a housing **11** and a cover plate **13** (Fig. 2) both of molded insulating material, stationary contact means **15** and cooperating movable contact means **17**, operating mechanism indicated generally at **19** and a trip device **21**. The stationary contact **15** is rigidly mounted on the inner end of a terminal conductor **23** which extends outwardly through an opening in the adjacent end wall of the housing **11** and has a connecting means, such as a terminal screw **25**, on its outer end. The movable contact **17** is rigidly mounted on one end of a switch member or arm **27** pivotally supported at its other end on a pivot member **29** of insulating material which is molded integral with the side wall of the housing **11**.

The switch arm **27** is biased closed by a compression spring **31** having one end seated in a spring seat **32** in the base of the housing **11** and the other end engaging a spring seat on the under side of the switch arm **27**. An operating lever **33**, preferably of a molded insulating material, is pivotally mounted on a pivot **35** molded integral with the side wall of the housing **11**, and has a cam surface **37** on the inner end thereof adapted, upon clockwise movement of the lever **33**, to engage a pin **39** in the switch arm **27** and move the switch arm counter-clockwise to an open position in which a recess **41** in the lever **33** engages the pin **39** to hold the switch arm **27** in the open position.

The operating lever **33** is provided wtih an integral handle member **43** extending outwardly through an opening **45** in the housing and an integral arcuate portion **47** of the handle substantially closes the opening **45** in all positions of the handle.

The contacts are manually opened by clockwise movement of the handle **43** and the operating lever **33** to the "off" position. During this movement, the cam surface **37** acts on the pin **39** to move the switch member **27** to the open position further compressing the spring **31**.

Movement of the handle **43** and the operating lever **33** counter-clockwise from the "off" to the "on" position permits the spring **31** to move the switch member **27** to the closed position to close the contacts.

Pivotally mounted on the pivot member **35** is a releasable member **49** which may be of an insulating material, and is biased in a counter-clockwise direction by means of a spring **51** having one end seated in a spring seat **52** in the adjacent end wall of the housing and the other end engaging a spring guide **53** on the releasable member **49**. The spring **53** biases the releasable member **49** with a small moment arm thereby providing a light latch load.

Referring to Fig. 2 of the drawing, the operating lever **33** and the releasable member **49** are pivotally supported on the pivot member **35** and the portions thereof which cooperate with the pin **39** on the switch arm **27** are disposed on opposite sides of the switch arm. Shoulders on the pivot members **35** and **29**, respectively, serve to locate the releasable member **49** and the switch arm **27** relative to the side wall of the housing **11**, and the cover plate **13** holds the parts in proper positon. The cover plate **13** is held in position by a screw **48** (Figs. 1 and 2) extending through an opening in the pivot member **35** and screws **50** (Fig. 1) extending through the lower corners of the housing and the cover plate. It will be understood that other suitable means, such as rivets, or eyelets, may be used to secure the cover plate **13** to the housing **11**.

The releasable member **49** is normally biased by the spring **51** in a counter-clockwise direction, but it is normally releasably restrained in operative position by the trip device **21**. Operation of the trip device releases the releasable member **49** whereupon the spring **51**, which is of considerably greater strength than the contact spring **31**, rotates the releasable member **49** sharply counter-clockwise. During counter-clockwise movement of releasable member **49**, the moment arm of spring **51** increases, and this movement causes a cam surface **55** on the releasable member **49** to engage the pin **39** and move the switch member **27** to the open position.

When the switch member **27** is automatically moved to the open position by the releasable member **49**, the handle **43** is moved to an intermediate indicating position by means of a spring **57** having one end seated in a spring seat in the housing **11** and bearing against one end of the arcuate portion **47** of the handle.

The releasable member **49** is reset and relatched and the contacts closed following an automatic opening operation by first moving the handle clockwise to the full "off" position and then counter-clockwise to the "on" position. When the handle **43** is moved to the "off" position, a surface **59** on the arcuate portion **47** thereof engages and moves the releasable member **49** to its normally restrained position. Counter-clockwise movement of the handle **43** then permits the spring **31** to close the contacts.

The trip device **21** comprises a bimetal element **61** having its lower end rigidly secured to the inner end of a terminal conductor **63** supported by means of a screw **65** on the end wall of the housing **11**, and having a portion extending out through an opening in the end wall of the housing. A terminal conductor **67** is secured to the outer end of the conductor **63**. The upper or free end of the bimetal element **61** is connected by means of a flexible conductor **69** to the pivoted end of the switch arm **27**. A latch member **71** secured to the bimetal element engages a latching portion **73** of the releasable member **49** and releasably restrains the releasable member in operative position. When an overload current occurs, the bimetal element **61** becomes heated and bends toward the right causing the latch **71** to release the releasable member whereupon this member functions in the previously described manner to effect opening movement of the switch member.

Means is provided for calibrating the trip device. This means comprises a screw **75** threaded into the terminal conductor **63** at the point where the bimetal element **61** is mounted thereon. The screw **75** has a rounded head **77** seated in a recess in the end wall of the housing **11**. An opening **79** is provided in the end wall for the insertion of a screw driver to turn the screw **75**. Turning the screw **75** will cause bending of the conductor **63** and

corresponding variation of the position of the bimetal element **61** according to the direction in which the screw **75** is turned to thereby vary the tripping point of the circuit breaker.

It will be seen that the invention provides a circuit breaker in which the molded housing forms the sole supporting frame and supports all of the parts of the circuit breaker without the use of a separate metal frame, the parts being supported in their proper positions in the housing by recesses and surfaces molded in the housing. The pivots for the moving parts of the circuit breaker are molded integral with the housing. None of the parts of the breaker are supported or partially supported by the cover plate which facilitates assembly of the circuit breaker and permits removal of the cover plate for purposes of inspection and replacement of parts without disturbing the calibration of the circuit breaker.

Having described the invention in accordance with the provisions of the patent statutes, it is to be understood that various changes and modifications may be made in the structural details and combinations of elements disclosed without departing from some of the essential features of the invention.

We claim as our invention:

1. A circuit breaker comprising a housing of one-piece molded insulating material, stationary and movable contact means, a pivoted switch member biased closed and movable to open and close said contact means, manually operable means for engaging and moving said pivoted switch member to open position against its normal bias, a releasable member operable when released to engage and automatically move said pivoted switch member to open position against its normal bias, and a single pivot pivotally supporting said manually operable means and said releasable member comprising a pivot member supported on said molded housing.

2. A circuit breaker comprising a housing of molded insulating material, relatively movable contact means, a pivoted switch member biased closed and movable to open and close said contact means, a pivoted operating lever movable to engage and move said switch member to open position against its normal bias, a pivoted releasable means operable when released to engage and move said pivoted switch member to the open position against its normal bias, pivot means for pivotally supporting said pivoted parts comprising a pivot member molded integral with said housing supporting both said operating lever and said releasable means, and a separate pivot member supported on said housing supporting said switch member.

3. A circuit breaker comprising a housing of molded insulating material, stationary and movable contact means, a pivoted switch member biased closed and movable to open and close said contact means, a projection on said switch member extending on both sides of said switch member, a manually operable lever having cam means thereon disposed on one side of said switch member fo engaging said projection and moving said switch membe to open position, a releasable member having cam means thereon disposed on the other side of said switch member operable when released to engage said projection and automatically move said switch member to open positio and common pivot means for said manually operable leve and said releasable member comprising a pivot membe molded integral with said housing.

4. A circuit breaker comprising stationary and movable contact means, a pivoted switch member biased closed and movable to open and close said contact means, a pin mounted in said switch member and extending transversely on both sides thereof, manually operable means having a portion disposed on one side of said switch member for engaging said pin and moving said switch member to open position, a releasable lever having a portion disposed on the other side of said switch member operable when released to engage said pin and automatically move said switch member to open position.

5. A circuit breaker comprising relatively movable contact means, a pivote switch member movable to open and closed positions to open and close said contact means, biasing means biasing said switch member to closed position, a pin on said switch member extending on both sides thereof, manually operable means having a cam portion disposed on one side of said switch member movable to one position to engage said pin and move said switch member to open position, said manually operable means being movable to another position to permit said biasing means to move said switch member to closed position, and releasable means having a cam portion disposed on the other side of said switch member operable when released to engage said pin and move said switch member to open position irrespective of the position of said manually operable means.

6. A circuit breaker having stationary and movable contact means, a pivoted switch member having a projection on each side thereof, said switch member being biased closed and movable to open and close said contact means, manually operable means movable to open and closed positions and having cam means disposed on one side of said switch member cooperating with said projection to effect opening and closing movements of said switch member, a releasable member having cam means thereon disposed on the other side of said switch member cooperating with said projection to effect automatic opening movement of said switch member upon release of said releasable member, and spring means operable upon automatic opening movement of said switch member to move said manually operable means to an indicating position.

7. A circuit breaker having a pivoted switch arm movable to open and close the circuit, manually operable means movable to an open and to a closed position and having a cam surface thereon disposed on one side of said switch member, said cam surface being engageable with said switch member to move said switch member to open position, a releasable member having a cam surface thereon disposed on the other side of said switch member, a first spring biasing said releasable member to engage said switch member and automatically move said switch member to open position, and a second spring normally biasing said manually operable means toward open position and operable when said switch member is automatically moved to open position by said releasable member to move said manually operable means to an intermediate indicating position.

8. A circuit breaker comprising relatively movable contact means, a pivoted switch arm movable to open and close said contact means, manually operable means for engaging and moving said switch arm to open said contact means, a pivoted releasable member operable when released to engage and automatically move said switch arm to open said contact means, a trip device normally releasably restraining said releasable member in operative position, biasing means engaging said releasable member in a direction to engage and automatically move said switch arm to open said contact means, said biasing means engaging said releasable member at a point to provide a moment arm which is small at the latched position to provide a light latch load, but which is increased by pivotal movement of said releasable member when released.

9. A circuit breaker comprising relatively movable contact means, a pivoted switch member movable to open and close said contact means, a manually operable lever having cam means thereon for engaging and moving said switch member to open position, a releasable member having cam means thereon for engaging and moving said switch member to open position, spring means biasing said releasable member in a direction to engage and move said switch member, a trip device normally releasably restraining said releasable member in operative position and operable in response to overload currents to release said releasable member, a single pivot pivotally supporting said manually operable lever and said releasable means, and the line of action of said spring means extending adjacent said pivot in the closed position of said breaker to provide a light latch load.

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