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R. N. ROWE

2,551,397

ELECTRIC CIRCUIT BREAKER

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Fig. 1.

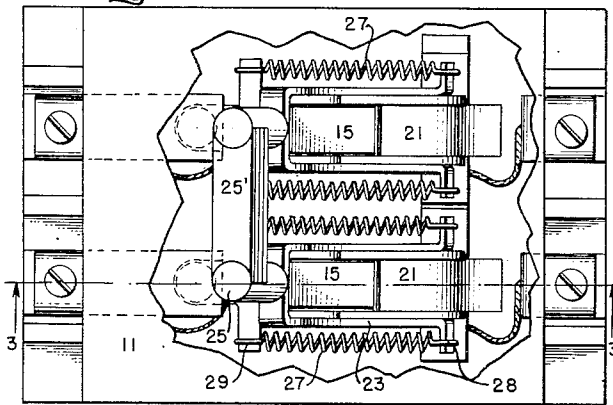


Fig. 2.

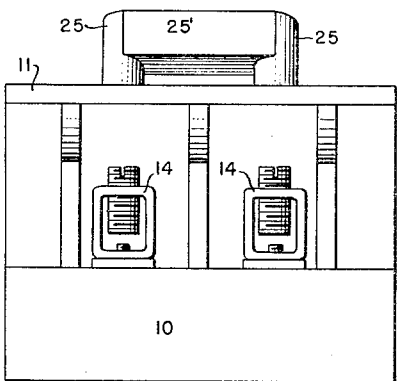


Fig. 3.

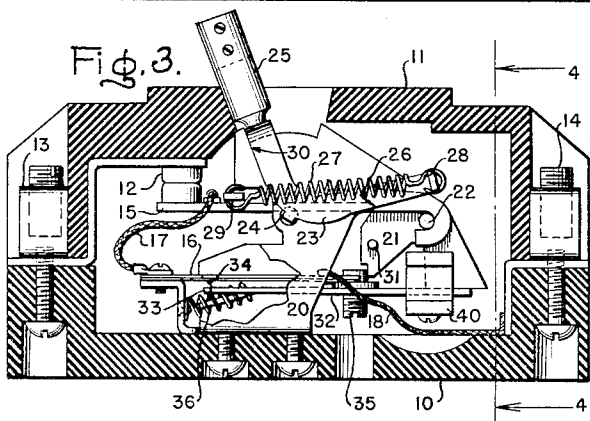


Fig. 4.

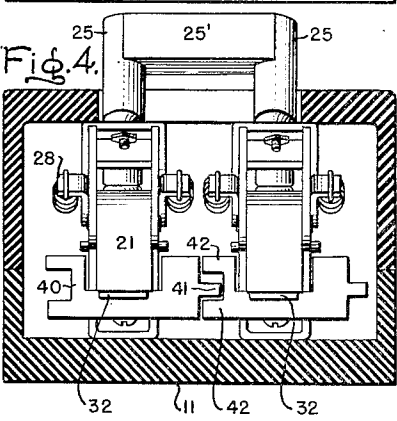


Fig. 5.

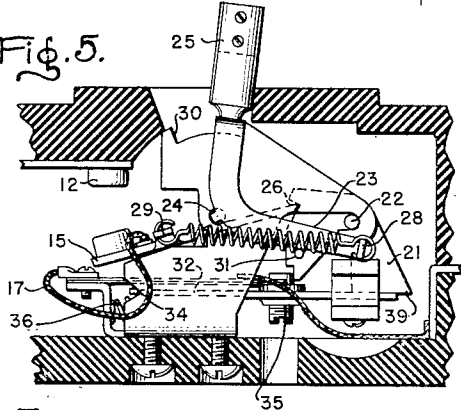


Fig. 6.

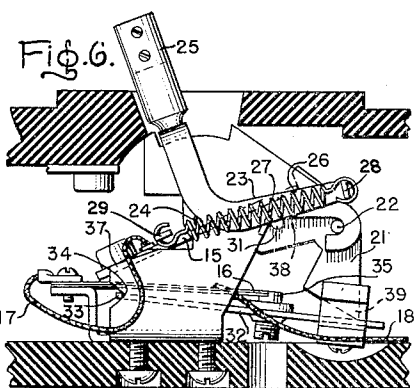


Fig. 7.

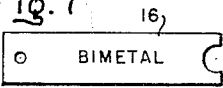


Fig. 8.

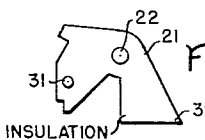
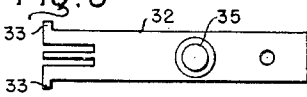


Fig. 9.



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ELECTRIC CIRCUIT BREAKER

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13 Claims. (Cl. 200-116)

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My invention relates to switches or circuit breakers actuated manually to open and close a circuit and automatically to open a circuit on an overload in the circuit and manually resettable after automatic release.

Such switches utilize a toggle action for swinging the movable contact when opening and closing the circuit.

One object is to improve the effectiveness of the make and break action.

Another object is to simplify the construction.

Another object is to slide the movable contact across the face of the stationary contact when the circuit is broken automatically, to prevent sticking.

Another object is to provide a mechanism where two or more breaker units are independently operable and in which the automatic tripping of any one unit may be initiated unhindered by the other units and yet in which all units will trip automatically when any one trips.

The current responsive element in each unit is only called upon to furnish sufficient force for tripping that particular unit. Thereafter the main operating spring of the circuit breaker mechanism comes into play to cause tripping of the adjacent unit or units.

Another object is to provide a multiple unit breaker in which each unit may be independently calibrated and yet the tripping of any one unit upon an overload will cause the other unit or units to be tripped automatically regardless of the condition of the overload devices of the other units.

Fig. 1 is a plan view showing a combination of two units involving my invention, parts being broken away.

Fig. 2 is an end view of the exterior of the switch of Fig. 1.

Fig. 3 is a longitudinal sectional view taken on the plane of the line 3-3 of Fig. 1, the parts being shown in the closed circuit position.

Fig. 4 is a cross-sectional view taken on the plane of the line 4-4 of Fig. 3.

Fig. 5 is a fragmentary sectional view similar to Fig. 3 but showing the parts in the open circuit position.

Fig. 6 is another view similar to Figs. 3 and 5 but with the parts in the open circuit position after automatic tripping.

Fig. 7 is a detail plan of the overload release actuator.

Fig. 8 is a side view of the rocker or trip member.

Fig. 9 is a detail plan of the latch member.

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Each unit of the invention is shown as embodied in an insulating housing having a base 40 and a cover 41. A stationary contact 42 inside the housing has an external terminal 43. The other terminal 44 is connected to the movable switch contact arm member 45 by a thermostatic bimetal overload strip 46 and flexible conductors 47 and 48.

All of the switch parts except the stationary contact 42 are carried by a U-shaped frame 20. The rocker or trip member 21 of insulating material is pivoted at 22 in the frame. The actuating lever 23 is pivoted at 24 and has a handle 25 which may have a cross bar 25' to connect two switch units as shown in Figs. 1, 2 and 4. The movable switch contact carrying arm 45 is hinged at 26 in the trip member 21 and biased to the open and to the closed circuit positions by springs 27 connected to the lever 23 at 28 and to the switch arm 45 at 29.

In the closed circuit position of Fig. 3, the springs bias the actuating lever or its handle toward an abutment or stop 30 and in the open circuit position the lever presses against the stop pin 31 on the trip member.

The latch strip 32 is hinged in the frame by the lugs 33 which rest in the bearings 34. An adjustable stud 35 carried by the strip 32 is positioned by the notched end of the overload actuator strip 46 and is normally positioned in the path of movement of the trip member 21 as shown in Figs. 3 and 5. The spring 36 presses against the end of the latch strip to hold the lugs 33 in the bearing seats 34.

To manually close the circuit, the actuating lever 23 is moved from the position of Fig. 5 toward the position of Fig. 3. As soon as the end 28 of lever 23 passes the plane which includes lugs 29 and pivots 24, the springs 27 throw the switch arm 45 to the closed circuit position. When the lever arm 25 is released, the springs 27 force the arm 25 against the stop shoulder 30.

To open the circuit, the lever arm 25 is moved from the position of Fig. 3 toward that of Fig. 5. When the end 28 passes a plane which includes the axis of lugs 29 and seat 26, the springs 27 pull down on lugs 29 and throw the switch arm 45 to the open circuit position where the switch member abuts against the frame at 37. When the finger lever 25 is released, the springs pull the lever 23 against the stop pin 31.

In case of an overload in the circuit, the bimetal strip 46 bends downwardly until the upper end of stud 35 frees the tip of member 21 which tilts to the position of Fig. 6 under the pull

of springs 27. These springs connect lugs 29 on switch member 15 to lugs 28 on operating lever arm 23 and cause the thrust of member 15 to turn rocker 21. This causes the right hand end of member 15 to rise above the line of pull about pivot 22 so that the springs 27 pull horizontally and downwardly on the lugs 29 and thus tilt arm 15 and open the circuit.

The switch may then be reset manually by moving the handle 25 from the position of Fig. 6 back to the position of Fig. 5 in which operation the lever 23 presses against the pin 31 and forces the trip member back into position for latching engagement with stud 35 as soon as the bimetal has cooled sufficiently to permit spring 36 to return latch strip 32 to its normal inactive position.

In the automatic breaking of the circuit, the switch member 15 starts to slide across the face of the contact 12 just as the tension of the spring 27 becomes effective so that there is no tendency to stick as is the case where the movement is merely at right angles to the contact surfaces. This sliding action is accomplished by reason of the fact that the trip member 21 which serves as an abutment for the switch member 15 is hinged at a point 22 beyond the pivot 24 of the lever 23 and the hinge 26 of the switch arm in the trip member lies between the pivots 24 and 22. The switch arm therefore moves longitudinally as the trip member turns on its pivot 22, thus causing a more effective action when breaking the circuit on an overload.

When two units are mounted together as shown in Figs. 1, 2 and 4, I provide an insulating block 40 connected to each latch strip 32 so that it moves with the latch. These blocks have spaced projections 41 and 42 which coast to cause one unit to move the next adjacent unit after a short time. This sequential action is made possible by spacing the projections 41 and 42 as shown in Fig. 4, the lost motion permitting the release of the unit which has been overloaded to take place independently.

Each unit has an element which is movable initially to release its circuit breaking mechanism and on continued movement causes tripping of the other units. The initial moving force is supplied by the current responsive device but the force required to trip the other unit is supplied by the conventional operating spring.

A great advantage of this system is that the loading on the latch of any unit is unaffected by the presence or absence of adjacent units and hence the calibration is unaffected.

I claim:

1. In a circuit breaker, a stationary contact, a pivoted trip member, an overload latch normally interposed in the path of movement of the trip member, a switch member hinged to said trip member for coacting with said contact, a pivoted actuating lever and a toggle acting spring connecting said lever and said switch member, the hinge point of said switch member lying between the pivot of the actuating lever and the pivot of the trip member and at one side of a line connecting the pivots of the lever and the trip member so that the switch member slides longitudinally and swings away from the stationary contact when the trip member is released.

2. In a circuit breaker, a stationary contact, a pivoted trip member, a latch normally interposed in the path of movement of the trip member, a thermostatic actuator for said latch, a switch member hinged to said trip member for coacting with said contact, a pivoted actuating lever and

a toggle acting spring connecting said lever and said switch member, the hinge point of said switch member lying between the pivot of the actuating lever and the pivot of the trip member and at one side of a line connecting the pivots of the lever and the trip member.

3. In a circuit breaker, a stationary contact, a pivoted trip member, an overload actuated latch normally interposed in the path of movement of the trip member, a switch member hinged to said trip member for coacting with said contact, a pivoted actuating lever, a toggle acting spring connecting said lever and said switch member, the hinge point of said switch member lying between the pivot of the actuating lever and the pivot of the trip member but at one side of a line connecting the pivots of the lever and the trip member and means of connection between said lever and said trip member for resetting the trip member and switch member.

4. A circuit breaker comprising a stationary contact, a movable switch member for coacting therewith, a pivoted trip member having a hinge bearing for the switch member located to move in a direction away from said contact and cause the switch member to slide on said contact when the trip member turns, a pivoted actuating lever, a spring connecting said switch member and said lever at points which, when in closed circuit position, lie at one side of the pivot axis of said actuating lever and when in open circuit position lie on the opposite side of said pivot axis biasing said switch member to turn the trip member, and an overload latch coacting with said trip member to oppose its turning on its pivot.

5. A circuit breaker comprising a stationary contact, a movable switch member for coacting therewith, a pivoted trip member having a hinge bearing for the switch member located to move in a direction away from said contact and cause the switch member to slide on said contact when the trip member turns, a pivoted actuating lever, a spring connecting said switch member and said lever at points which, when in closed circuit position, lie at one side of the pivot axis of said actuating lever and when in open circuit position lie on the opposite side of said pivot axis biasing said switch member to turn the trip member, an overload latch coacting with said trip member to oppose its turning on its pivot and means of connection between the lever and trip member to permit resetting of said trip member.

6. A circuit breaker comprising a stationary contact, a movable switch member coacting with said contact, a pivoted trip member pivotally supporting said switch member in a plane offset from the plane including the pivots of said trip member and a manually actuated lever, a latch member spring-pressed against said trip member, a manually actuated lever pivoted between said trip member and said contact, a toggle acting spring connecting said lever and said switch member and a thermostatic overload member coacting with said latch member to release the trip member in case of an overload.

7. In a circuit breaker, a pivoted trip member, a switch member pivoted thereto, a pivoted actuating lever, a main spring connecting said lever with said switch member at points which, when in closed circuit position, lie at one side of the pivot axis of said actuating lever and when in open circuit position lie on the opposite side of said pivot axis and biasing the trip member to turn in one direction, a pivoted latch member co-

acting with the trip member, a spring pressing said latch member against said trip member in opposition to the bias of the main spring and an overload member for retracting the latch member from the trip member.

8. In a circuit breaker, a pivoted trip member, a switch member hinged to said trip member at one side of the pivot of the trip member, an overload latch interposed in the path of movement of the trip member at the opposite side of the pivot of the trip member, a pivoted actuating lever, and a toggle acting spring connecting the switch member and the actuating lever at points movable from one side of the pivot of the actuating lever to the other.

9. A circuit breaker comprising a stationary contact, a hinged switch member coacting therewith, a pivoted actuating lever, a main spring connecting said lever and said switch member at points which, when in closed circuit position, lie at one side of the pivot axis of said actuating lever and when in open circuit position lie on the opposite side of said pivot axis, an overload latch, a pivoted trip member having a hinge bearing for said switch member and normally held against said latch member by said spring, an auxiliary spring biasing said latch against said trip member, said trip member having a heel engaging said latch when released.

10. In a circuit breaker, a hinged tripping member, a switch member pivoted to the tripping member, an actuating lever, a main spring connecting said lever and said switch member at points which, when in closed circuit position, lie at one side of the pivot axis of said actuating

lever and when in open circuit position lie on the opposite side of said pivot axis, a spring pressed arm having a latch stud normally holding the tripping member from turning, an overload response device for retracting said arm and its stud and permitting said main spring to rotate said tripping member by the thrust of said switch member, said tripping member having a shoulder engaging said spring pressed arm to hold it depressed independently of the overload response device.

11. A multiple unit circuit breaker in which each unit is formed as set forth in claim 10 and each spring pressed arm has a lost motion interlocking element connected to an element of an adjacent unit.

12. A breaker unit as defined in claim 2 combined with another unit of similar construction and lost motion means of connection between the latch member of the two units.

13. The combination of two breaker units as set forth in claim 1 and lost motion means of connection between the latch members.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,726,233	Krantz -----	Aug. 27, 1929
2,329,362	Swingle -----	Sept. 14, 1943
2,367,382	Taylor -----	Jan. 16, 1945
2,447,652	Jennings -----	Aug. 24, 1948