Aug. 17, 1948. C. W. BROWN 2,447,112

SWITCH CONSTRUCTION

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Fig. 1

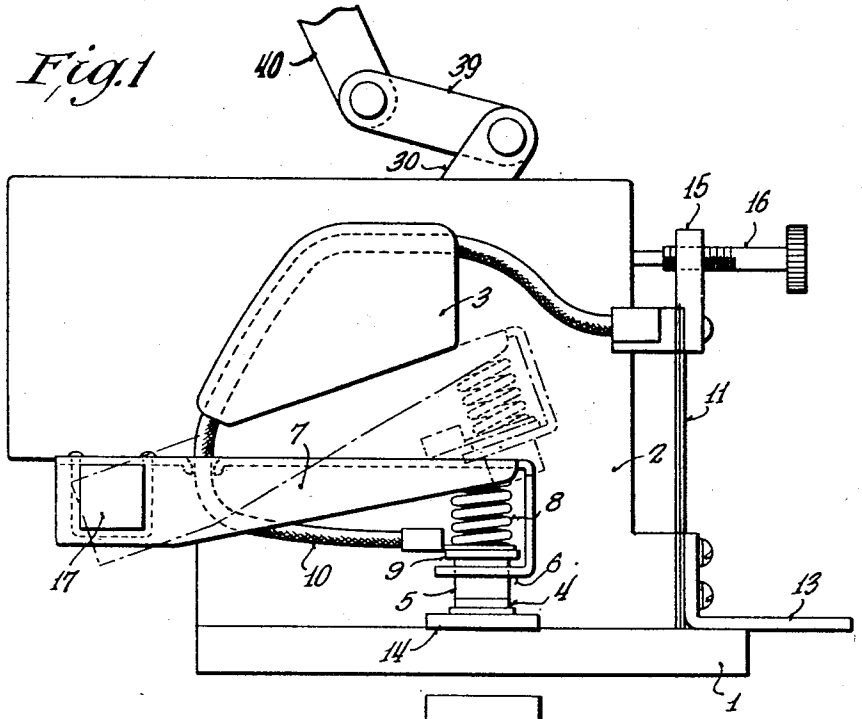
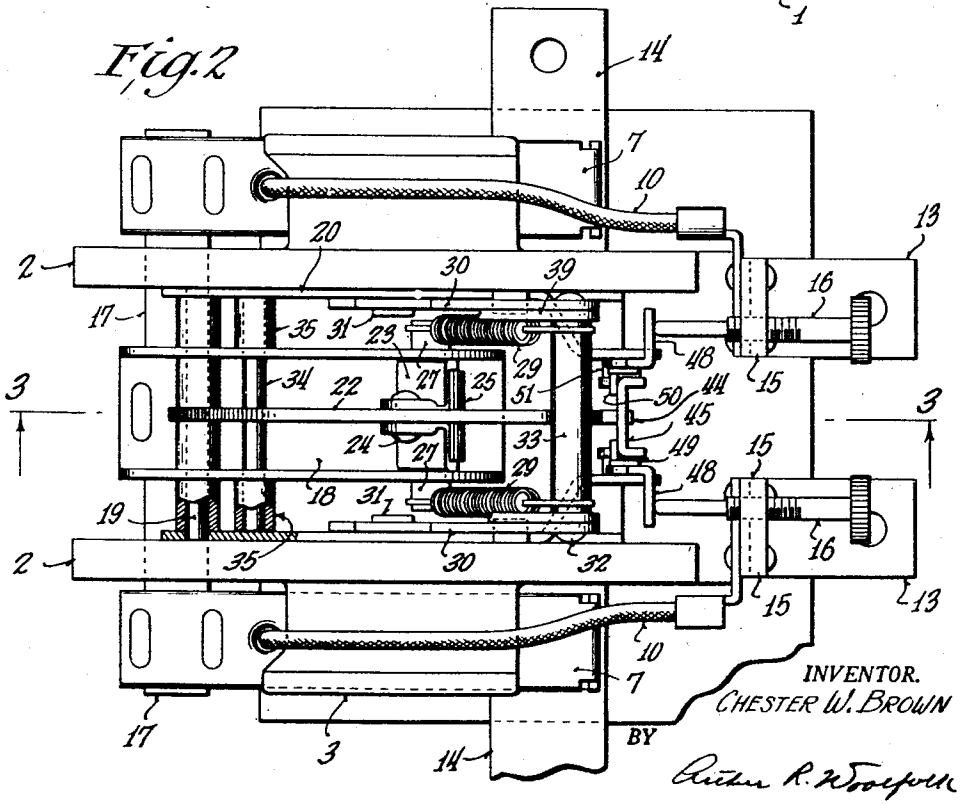



Fig. 2

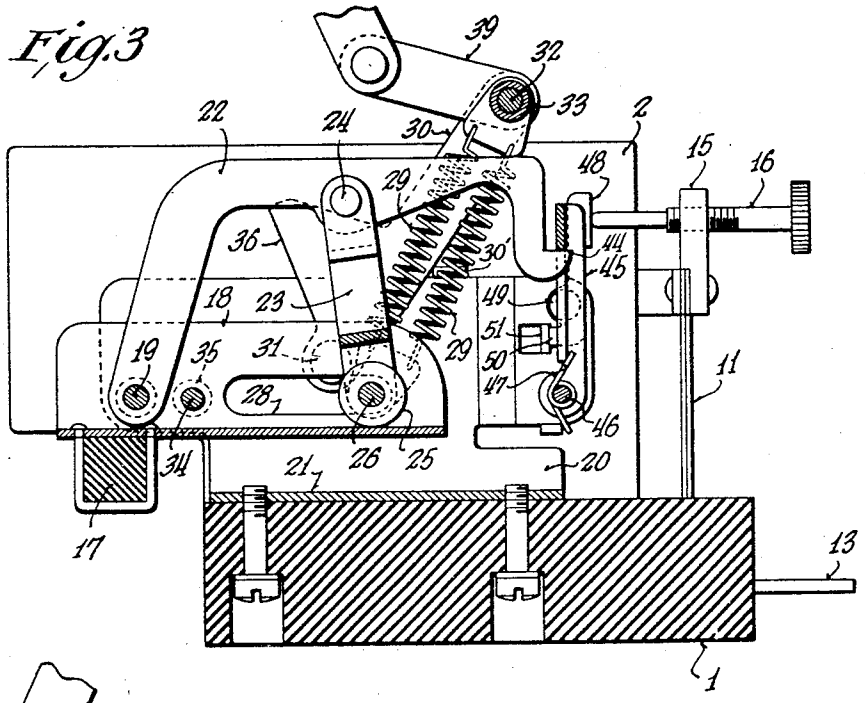


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SWITCH CONSTRUCTION

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Fig. 3



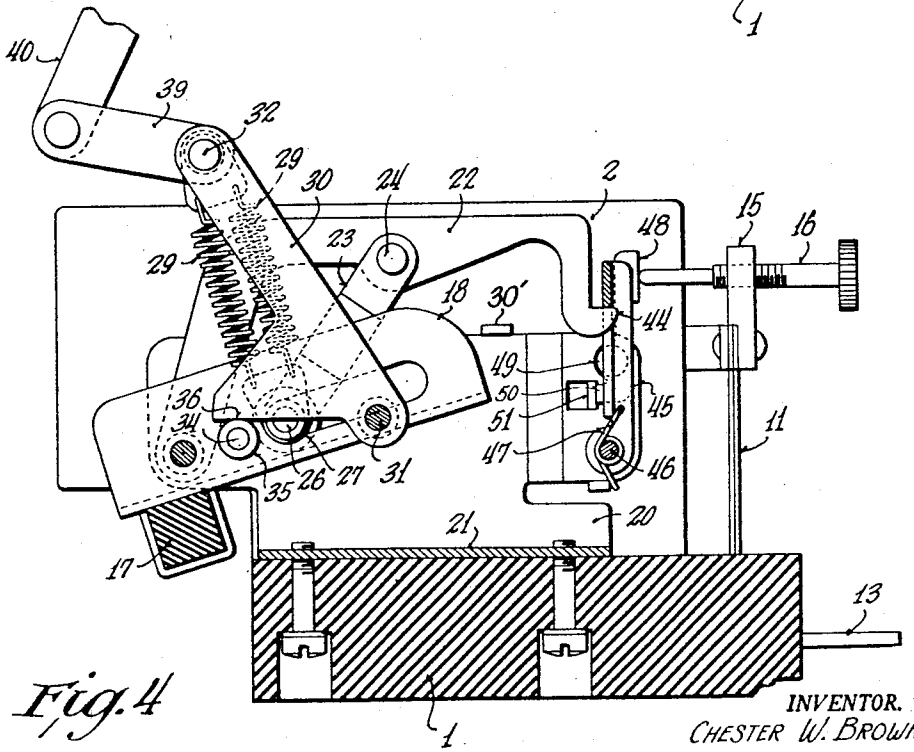




Fig. 4

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SWITCH CONSTRUCTION

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Fig. 5

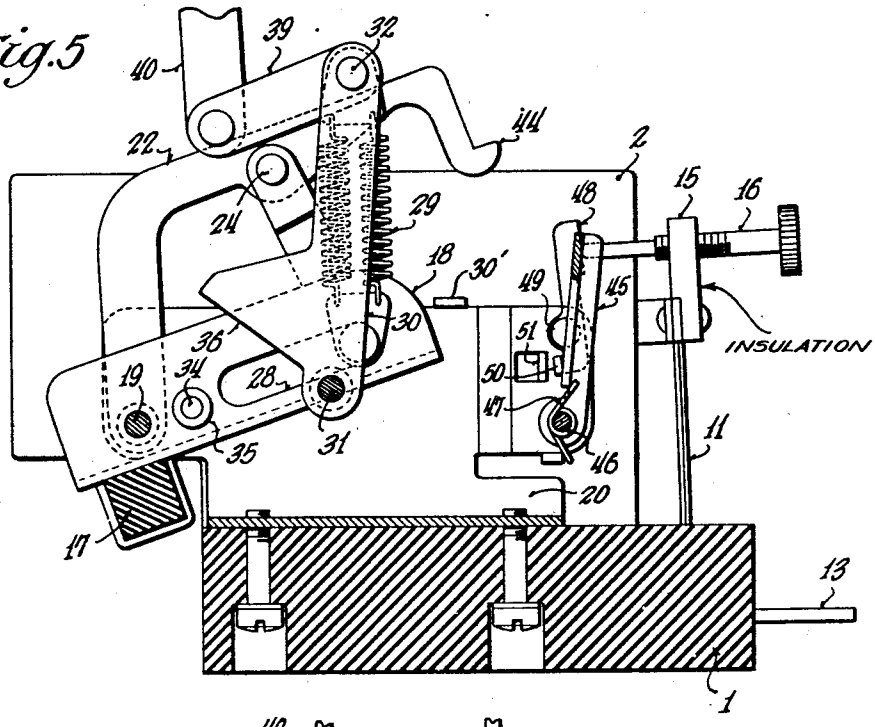
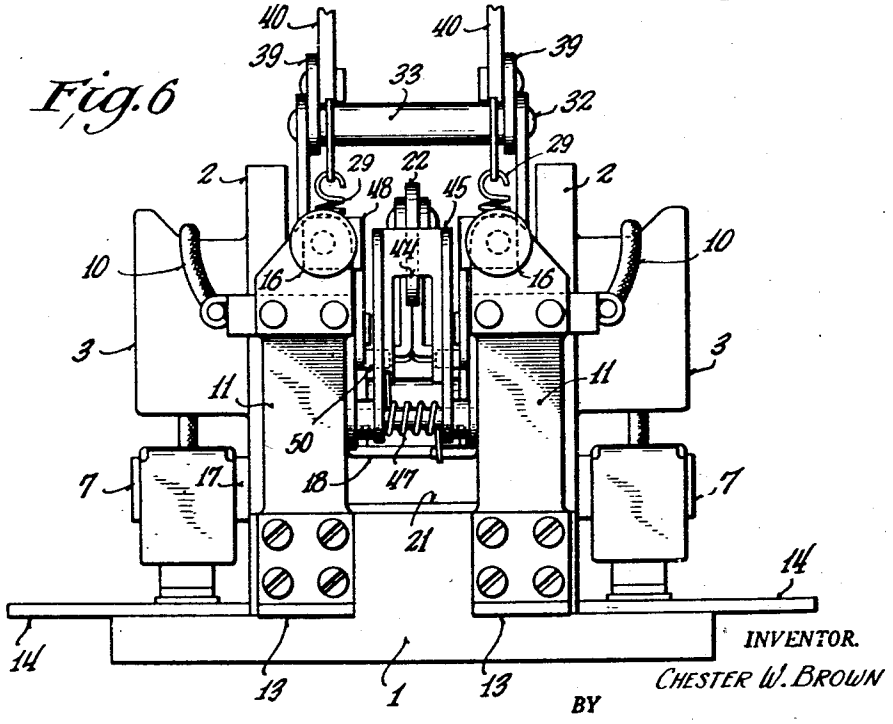



Fig. 6




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SWITCH CONSTRUCTION

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Fig. 7

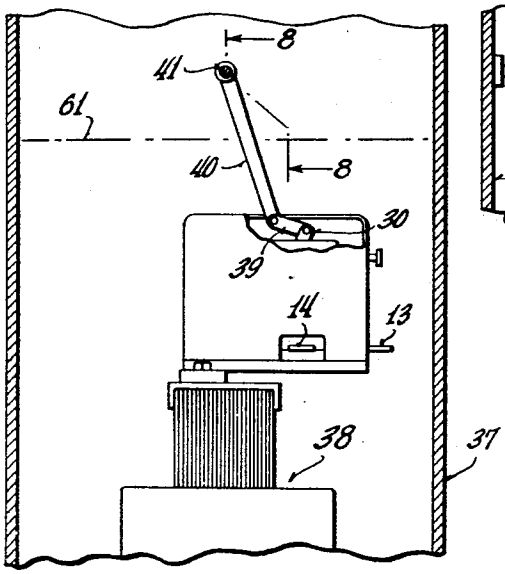



Fig. 8

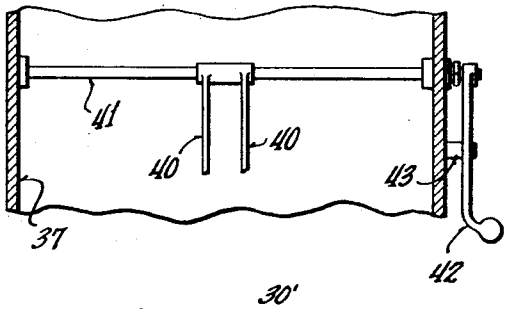



Fig. 9

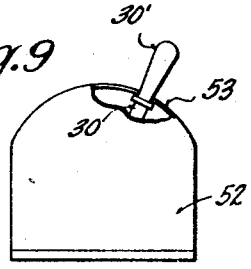



Fig. 10

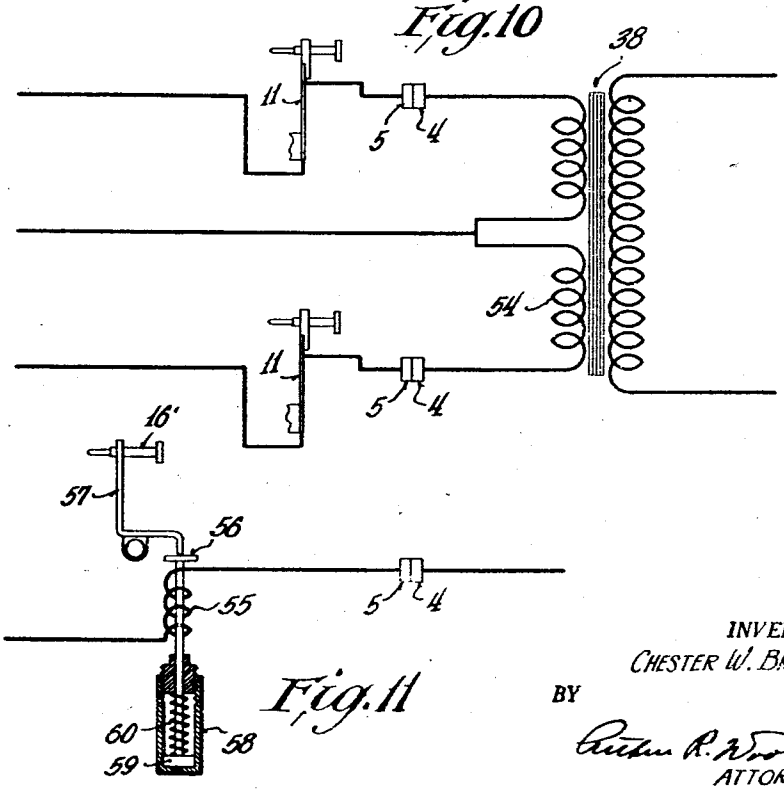



Fig. 11

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Patented Aug. 17, 1948 2,447,112

# UNITED STATES PATENT OFFICE

2,447,112

## SWITCH CONSTRUCTION

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Application May 20, 1943, Serial No. 487,743

15 Claims. (Cl. 200—116)

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This invention relates to a switch construction.

In greater detail, this invention relates primarily to a switch construction of the circuit breaker type.

Objects of this invention are to provide a circuit breaker which has a quick make and a quick break, which has condition responsive means of the trip type, which is so constructed that it releases the circuit breaker so that the circuit breaker will open under predetermined conditions, and which is provided with a handle or other operating means for normally opening and closing the circuit breaker and for resetting the trip means, the trip means and the operating means being so related that the trip means will operate to release the circuit breaker irrespective of the position of the operating means and irrespective of any motion that the operating means may be executing at the time the trip means operates so that the trip means is trip free and will operate no matter whether the operating means is forcibly held in closed position or is being moved from one position to another.

Further objects are to provide a circuit breaker which is so constructed that the circuit breaker cannot be closed until the trip means has moved back to normal position, and in which the resetting of the trip means is accomplished by moving the operating means towards and beyond open position, such motion being followed by movement to closed position after the resetting of the trip means when it is desired to again close the circuit breaker after the occurrence of the predetermined condition.

Further objects are to provide a construction in which the trip means may be either thermostatically or magnetically or otherwise operated and which has either a quick action or a delayed action and which is adjustable so that the condition to which it will respond may be predetermined.

Further objects are to provide a circuit breaker which has a heavy contact pressure when it is closed, in which this heavy contact pressure is maintained during the operation of the circuit breaker until the instant at which the contacts are suddenly separated, thereby avoiding burning of the contacts under overload conditions.

Further objects are to provide a circuit breaker in which the mechanism is so arranged that it is easy to operate in opening and closing the circuit breaker and in resetting the trip means, and which is so made that there is no great wear on the parts during the opening and closing of the circuit breaker or during the resetting of the trip

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means as the mechanism is so arranged that during resetting, for example, relatively small forces or pressures are exerted between the cooperating parts, thereby minimizing wear.

Further objects are to provide a circuit breaker in which the switch operating means is pivoted at a fixed point, in which an actuator coacts with the switch operating means and is itself operatively connected to the main operating means by over center spring means so that a very quick and positive operation of the switch operating means is obtained when the main operating means is moved back and forth, and to so organize the parts that the actuator locks the switch operating means in switch closed position with a high contact pressure.

In greater detail, further objects are to provide a circuit breaker in which the actuator is pivotally mounted on a carrier, and in which the carrier is released on overload to thereby allow the actuator and carrier and switch operating means to quickly move outwardly to switch open position, the arrangement being such that the main operating means is moved to an indicating position showing that automatic operation has taken place.

Further objects are to provide a circuit breaker construction in which resetting of the carrier after automatic tripping is accomplished by moving the main operating means towards switch open position to a greater extent than that required to cause manual switch opening, the forces being transmitted from the main operating means to the switch operating means and from there to the carrier through the agency of the actuator.

Further objects are to provide a circuit breaker construction which is sturdy and is reliable in operation, which may be installed in a transformer case and submerged in the oil in the transformer case if desired, and which if a thermostatic trip means is employed, may be arranged to have the thermostatic means respond solely to the heat generated by current passing through the thermostatic means or to the combined action of the heat in the oil from the transformer or other device as well as from the heat due to the current passing through the thermostatic means, or may be arranged to respond solely to the heat of the oil.

Embodiments of the invention are shown in the accompanying drawings, in which:

Figure 1 is a side elevation showing the circuit breaker in closed position.

Figure 2 is a plan view, partly broken away, of the circuit breaker.

Figure 3 is a sectional view approximately on the line 3—3 of Figure 2 showing the circuit breaker in closed position.

Figure 4 is a view corresponding approximately to Figure 3 showing the circuit breaker in manually opened position.

Figure 5 is a view corresponding approximately to Figure 3 showing the circuit breaker after it has been automatically opened.

Figure 6 is a front end view of the circuit breaker.

Figure 7 is a fragmentary view, partly broken away, showing the circuit breaker mounted within the container for a transformer.

Figure 8 is a sectional view approximately on the line 8—8 of Figure 7.

Figure 9 is a view showing a modified mounting for the circuit breaker.

Figure 10 is a wiring diagram.

Figure 11 is a view, partly in section, of a further form of condition responsive means.

Before proceeding with the detailed description of this invention, it is to be understood that the circuit breaker may have either a single switch means or a plurality of switch means, such as the two switch means chosen for the sake of illustration, or, if desired, three switch elements could be used for a three phase circuit as the invention contemplates either a single or any number of switch elements as desired.

Referring to the drawings, it will be seen that the circuit breaker comprises a base portion 1 of insulating material from which a pair of insulating side walls 2 extend upwardly. These side walls may be provided with overhanging laterally projecting portions 3. The circuit breaker chosen for illustration has a pair of switch elements, though as described hereinabove a single or any number of switch elements could be employed. Each switch element consists of a stationary contact 4 and a movable contact 5. The movable contact 5 is slidably carried by an inturned lip 6 formed integrally with a channel like member 7. The movable contact 5 is urged downwardly by means of the spring 8 and is provided with an upper flange 9 to limit the downward motion of the movable contact 5. The spring 8 is preferably centered at its upper and lower ends by means not shown, such as any of the common means employed for this purpose. Each movable contact 5 is connected by means of a flexible conductor 10 with the free end of a bi-metallic thermostatic element 11. The elements 11 have their lower ends rigidly secured and connected to terminals 13, each stationary contact 4 being connected to a terminal 14. The flexible conductors 10 are loosely guided in channel-shaped portions of the laterally projecting, overhanging members 3 and such members may constitute stops for limiting the opening stroke of the switch means as shown in dotted lines in Figure 1. The upper ends of each of the thermostatic members 11 are provided with insulating pads 15 through which adjusting screws 16 project.

The members 7 of the switch elements are rigidly carried by a rectangular insulating rock shaft 17 which extends transversely across the circuit breaker below the rear portion of the walls 2. This rectangular shaft 17 is rigidly attached to the switch operating means 18, see Figures 2, 3, 4 and 5, which operating means 18 is a channel-shaped metal member pivotally carried by a fixed pivot pin 19 whose ends are carried in the side walls 20 of a metal frame



member whose base portion 21, see Figures 3, 4 and 5, is secured by any suitable means to the insulating base 1 of the circuit breaker.

A carrier 22 is pivotally mounted on the pin 19 and suitable spacer sleeves are positioned on the pin 19, as shown in Figure 2, to properly position the channel-shaped switch operating member 18 and the carrier 22. An actuator indicated generally by the reference character 23 is pivoted by means of the pivot pin 24 to an intermediate portion of the carrier 22.

The actuator 23 is formed of two arms which are secured together intermediate their ends in any suitable manner, as by welding. Their upper ends are spaced apart and positioned on opposite sides of the carrier and pivoted thereto by means of the pivot pin 24. The lower ends of the arms are spaced apart and a roller 25 is positioned therebetween and loosely carried by means of a pin 26 carried by the lower end of the actuator. The pin 26 also carries a pair of smaller rollers 27 located at opposite ends of the roller 25 and adapted to operate within the slots 28 formed in the switch operating member 18. The lower ends of spring means 29 are operatively connected to the outer portions of the pin 26.

Main operating means in the form of a pair of levers 30 are provided and located on opposite sides of the switch operating means 18. The lower ends of the levers 30 are pivotally mounted on short pivot pins 31 which are rigidly carried by the side walls 20 of the main metal frame. The arms 30 of the main operating means are joined adjacent their upper ends by means of the pivot pin 32, a suitable spacing roller 33 being positioned between the arms as shown most clearly in Figure 2. The spring means 29, it will be noted, are operatively connected to the pin 32. Stops 30' are provided for limiting clockwise rotation of the main operating means 30 as viewed in Figure 3.

It is to be noted upon reference to Figures 2, 3, 4 and 5 that the switch operating means 18 carries a pin 34 spaced to the right of the pivot pin 19 as viewed in Figure 2. This pin projects outwardly beyond the side walls of the channel-shaped switch operating means 18 and is provided with a pair of rollers 35. The rollers 35 coact, under certain conditions hereinafter explained, with the lower cam faces 36 of the main operating means 30.

Any suitable means may be provided for rocking the main operating means 30. For example if the circuit breaker is mounted within the transformer casing 37, see Figure 7, it may be mounted directly on the transformer indicated generally at 38. In this case the main operating means 30 may be joined by means of links 39 to a pair of rock arms 40 mounted on a rock shaft 41, one end of which extends through the transformer casing and is provided with an operating handle 42, see Figure 8. If desired, a stop 43 may be provided to limit the opening stroke of the handle 42.

Referring now to Figures 2 to 5, it is to be noted that normally the carrier 22 is retained in the position shown in Figures 2 and 3 by having its latching end 44 engaged by the transverse portion of a pivoted latch 45. The latch 45 is mounted on a pivot pin 46 and is urged in a counterclockwise direction by means of the spring 47. A pair of small trip arms indicated generally by the reference character 48 are pivotally mounted on the pivot pins 49, as shown in Figures 2, 3, 4 and 5, and

ıre individually operable by means of their respective thermostatic bi-metallic members 11. Each rip arm is provided with an inturned portion 50 vhich normally rests on its rear side against ı stop 51 and bears on its forward side against he latch 45. When either or both of the members 18 are moved due to an overload in either or both of the bi-metallic members 11, such arm or arms ıre moved in a counterclockwise direction and trip he latch 45, thus releasing the carrier 22. The :arrier then springs upwardly from the position hown in Figure 3 to that shown in Figure 5 with ı very quick motion, thereby opening the circuit reaker. During the outward motion of the car- ier 22, such carrier engages the roller 33 of the nain operating means and rocks the main operating means to indicating position as shown in Figıre 5, to thereby indicate from the position of he main operating means that automatic opening ıas occurred. It is to be noted that during autonatic operation the carrier, the actuator and the witch operating means move outwardly as a unit.

In resetting, the main operating means 30 is noved from the position shown in Figure 5 hrough the position shown in Figure 4 to a point vhere the cam faces 36 of the main operating neans 30 engage the rollers 35 on the pin 34 and hus depress the switch operating means 18. Inısmuch as the switch operating means 18 is conıected by means of the actuator 23 with the car- ier 22, the carrier in turn is drawn downwardly nto a position to be relatched by the latch mem- ıer 45, provided the thermostatic element or elenents have cooled sufficiently, and at the same ime the actuator 23 is rocked towards the posiion shown in Figure 4. It is to be noted that alhough the actuator has sliding engagement with he switch operating means, that nevertheless hese means are in reality interlocked so that in esetting force may be transmitted to the carrier o draw the carrier inwardly through the medium of the switch operating means and the actuator.

It is obvious that no damage will occur even if ın attempt is made to relatch the carrier before he thermostatic members have sufficiently cooled ıs there will be no jamming or straining of any of he parts.

In manual operation the main operating means 30 is rocked from the switch open position shown n Figure 4 to the switch closed position shown in Figure 3 and the over center spring means 29 :auses the actuator 23 to suddenly rock to the ight as viewed in Figure 3, thus closing the cir- :uit breaker with a quick motion. It is to be ıoted that the actuator 23 in Figure 3 has rocked slightly past center and thus locks the switch closed with a high contact pressure. When the nain operating means 30 has rocked from the osition shown in Figure 3 to that shown in Figure 4, the over center spring means 29 causes the ıctuator to suddenly rock to the position shown in Figure 4, thus opening the switch means with ı quick motion. This is obvious as the line of ›ull of the springs 29 passes the pivot 24 while the ›perating means 30 is rocked from the position ihown in Figure 3 to the position shown in Figıre 4. When the line of pull of the springs 29 ıas passed the pivot 24, it is apparent that the ıctuator 23 is suddenly rocked from the position ihown in Figure 3 to the position shown in Figure 4 and consequently the switch is opened with a ıuick motion.

It is obvious that the circuit breaker can be nounted in other ways from that described herenabove. For example as shown in Figure 9, the



circuit breaker may be mounted in a housing 52 for wall mounting. The housing may be provided with a slotted and curved outer face 53 through which an insulating handle 30' projects, such handle being directly connected to the main operating means 30 hereinbefore described.

Figure 10 is a wiring diagram and it will be seen that the secondary 54 of the transformer is connected through the contacts of the circuit breaker to the bimetallic members 11 and from thence to the service lines.

It is obvious that other forms of condition responsive means may be employed. For instance, an electromagnetic condition responsive means is shown in Figure 11 which includes a solenoid 55 which is adapted to raise the plunger 56 on overload. The plunger 56 cooperates with a bell crank lever 57 which carries the adjustable screw 16' corresponding to the screw 16 hereinbefore described. In the form of circuit breaker illustrated a pair of these electromagnetic devices would be employed. If desired, a dashpot consisting of a cylinder 58 and a piston 59 may be employed to delay the opening of the circuit breaker for any desired period, a suitable spring 60 being provided for the return of the plunger and associated parts to normal position after operation. This dashpot is provided with an opening above the plunger and below the plunger and may be an air dashpot if desired or may be submerged in the oil in the transformer casing. Obviously the relative sizes of the cylinder and of the openings will determine the amount of delay afforded by the dashpot arrangement. Other time delay means, of course, could be employed and it is to be distinctly understood that the circuit breaker could be made to respond to over or under voltage, overload, phase reversal, or any other desired condition.

The purpose of having time delay is to prevent the breaker from suddenly opening for any sudden and extremely transitory overload for instance, but to allow the breaker to open as promptly as desired for an overload of a period longer than that for which the time delay has been designed.

In addition to the adjustment of the time delay by varying the size of the escape orifices with relation to the size of the cylinder 58, a certain amount of adjustment can be secured by adjusting the screws 16'. Similarly the screws 16 of the first form of the invention can be adjusted to determine the value of the overload that will cause the circuit breaker to open.

It is to be understood that the circuit breaker can be made either with a double switch construction as illustrated or a single switch construction, or, if desired, three switch elements could be used as the invention is not limited to any specific number of switch elements as obviously there could be one or a plurality of switch elements.

It is apparent that the entire device may be submerged below the oil level which is indicated at 61 in Figure 7. If the thermostatic trip means are employed, these thermostatic trip means may be heated not only by the current passing therethrough but by the general temperature of the oil. The purpose of this is to allow the thermostatic elements to respond not only to a relatively sudden overload but to allow them to respond to the gradual rise of temperature of the oil which would result from a small and prolonged overload due to the heating of the transformer itself. Thus there may be afforded the double protection of opening of the switch upon the occurrence of an overload of reasonable magnitude or the open-

ing of the switch from a prolonged small overload due to the heating of the transformer. It is obvious also that if desired the main current need not pass through the thermal elements and the thermal elements could then respond merely to the heating of the oil if so desired, or the oil level could be so regulated that it was below the thermal elements and then the thermal elements would respond merely to the heat from the current passing therethrough.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

1. A circuit breaker comprising switch means, switch operating means for opening and closing said switch means, a movably mounted carrier, an actuator pivoted to said carrier and having sliding engagement with said switch operating means, movable main operating means, over center spring means operatively connecting said main operating means and said actuator for rocking said actuator back and forth to operate said switch operating means, said carrier being biased for outward motion, condition responsive means normally restraining said carrier against motion and releasing said carrier for outward motion upon the occurrence of a predetermined condition, said carrier when released moving outwardly as a unit with said actuator and said switch operating means without relative motion between said actuator and said switch operating means.

2. A circuit breaker comprising switch means, switch operating means for opening and closing said switch means, a movably mounted carrier, an actuator pivoted to said carrier and having sliding engagement with said switch operating means, movable main operating means, over center spring means operatively connecting said main operating means and said actuator for rocking said actuator back and forth to operate said switch operating means, said carrier being biased for outward motion by said spring means, condition responsive means normally restraining said carrier against motion and releasing said carrier for outward motion upon the occurrence of a predetermined condition, said carrier when released moving outwardly as a unit with said actuator and said switch operating means without relative motion between said actuator and said switch operating means.

3. A circuit breaker comprising switch means, switch operating means pivoted at a fixed point for opening and closing said switch means, a movably mounted carrier, an actuator pivoted to said carrier and having sliding engagement with said switch operating means, movable main operating means, over center spring means operatively connecting said main operating means and said actuator for rocking said actuator back and forth to operate said switch operating means, said carrier being biased for outward motion, condition responsive means normally restraining said carrier against motion and releasing said carrier for outward motion upon the occurrence of a predetermined condition, said carrier when released moving outwardly as a unit with said actuator and said switch operating means without relative motion between said actuator and said switch operating means.

4. A circuit breaker comprising switch means, switch operating means pivoted at a fixed point for opening and closing said switch means, a movably mounted carrier, an actuator pivoted to said carrier and having sliding engagement with said switch operating means, movable main operating means, over center spring means operatively connecting said main operating means and said actuator for rocking said actuator back and forth to operate said switch operating means, said carrier being biased for outward motion by said spring means, condition responsive means normally restraining said carrier against motion and releasing said carrier for outward motion upon the occurrence of a predetermined condition, said carrier when released moving outwardly as a unit with said actuator and said switch operating means without relative motion between said actuator and said switch operating means.

5. A circuit breaker comprising switch means, switch operating means for opening and closing said switch means, a movably mounted carrier, an actuator pivoted to said carrier and having sliding engagement with said switch operating means, movable main operating means, over center spring means operatively connecting said main operating means and said actuator for rocking said actuator back and forth to operate said switch operating means, said carrier being biased for outward motion, condition responsive means normally restraining said carrier against motion and releasing said carrier for outward motion upon the occurrence of a predetermined condition, said carrier when released moving outwardly as a unit with said actuator and said switch operating means without relative motion between said actuator and said switch operating means, said main operating means and said switch operating means having coacting portions for resetting said carrier when said main operating means is moved to a predetermined position.

6. A circuit breaker comprising switch means, pivotally mounted switch operating means for opening and closing said switch means, a pivotally mounted carrier, said carrier and said switch operating means being pivotally movable about the same axis, an actuator pivoted on said carrier for operating said switch operating means, movable main operating means, over center spring means operatively connecting said main operating means and said actuator for moving said actuator back and forth to operate said switch operating means, condition responsive means normally holding said carrier against motion and releasing said carrier for motion upon the occurrence of a predetermined condition, said carrier being biased for outward motion and when released allowing said switch operating means to move to switch open position.

7. A circuit breaker comprising switch means, pivotally mounted switch operating means for opening and closing said switch means, a pivotally mounted carrier, said carrier and said switch operating means being pivotally movable about the same axis, an actuator pivoted on said carrier for operating said switch operating means, movable main operating means, over center spring means operatively connecting said main operating means and said actuator for moving said actuator back and forth to operate said switch operating means, condition responsive means normally holding said carrier against motion and releasing said carrier for motion upon the occurrence of a predetermined condition, said carrier being biased for outward motion by said spring means and when released allowing said switch operating means to move to switch open position.

8. A circuit breaker comprising switch means, pivotally mounted switch operating means for opening and closing said switch means, a pivotally mounted carrier, said carrier and said switch operating means being pivotally movable about the same axis, an actuator pivoted on said carrier for operating said switch operating means, said actuator and said switch operating means having interlocking portions, movable main operating means, over center spring means operatively connecting said main operating means and said actuator for moving said actuator back and forth to operate said switch operating means, condition responsive means normally holding said carrier against motion and releasing said carrier for motion upon the occurrence of a predetermined condition, said carrier being biased for outward motion and when released allowing said switch operating means to move to switch open position, said main operating means and said switch operating means having coacting portions for resetting said carrier when said main operating means is moved to a predetermined position.

9. A circuit breaker comprising switch means, pivotally mounted switch operating means for opening and closing said switch means, a pivotally mounted carrier, said carrier and said switch operating means being pivotally movable about the same axis, an actuator for operating said switch operating means, said actuator and said switch operating means having interlocking portions and said actuator being movably supported by said carrier, movable main operating means, over center spring means operatively connecting said main operating means and said actuator for moving said actuator back and forth to operate said switch operating means, condition responsive means normally holding said carrier against motion and releasing said carrier for motion upon the occurrence of a predetermined condition, said carrier being biased for outward motion by said spring means and when released allowing said switch operating means to move to switch open position, said main operating means and said switch operating means having coacting portions for resetting said carrier when said main operating means is moved to a predetermined position.

10. A switch construction comprising switch means, pivotally mounted switch operating means for opening and closing said switch means, a pivotally mounted carrier, said carrier and said switch operating means being pivotally movable about the same axis, an actuator for operating said switch operating means, said actuator being pivotally mounted on said carrier, movable main operating means, over center spring means operatively connecting said main operating means and said actuator for rocking said actuator back and forth to operate said switch operating means, latch means normally holding said carrier against motion and adapted to be tripped to release said carrier for outward motion, said carrier being biased towards outward motion and when released from said latch means allowing said switch operating means to move to switch open position, and coacting means carried by said main operating means and said switch operating means for drawing said carrier inwardly to relatch said carrier when said main operating means is moved to a predetermined position.

11. A circuit breaker comprising switch means, pivotally mounted switch operating means for opening and closing said switch means, a pivotally



mounted carrier, said carrier and said switch operating means being pivotally movable about the same axis, an actuator carried by said carrier for operating said switch operating means, movable main operating means, over center spring means operatively connecting said main operating means and said actuator for moving said actuator back and forth to operate said switch operating means, condition responsive means normally holding said carrier against motion and releasing said carrier for motion upon the occurrence of a predetermined condition, said carrier being biased for outward motion and when released allowing said switch operating means to move to switch open position, said main operating means moving to an indicating position when said carrier is released.

12. A circuit breaker comprising switch means, pivotally mounted switch operating means for opening and closing said switch means, a pivotally mounted carrier, said carrier and said switch operating means being pivotally movable about the same axis, an actuator pivoted on said carrier for operating said switch operating means, movable main operating means, over center spring means operatively connecting said main operating means and said actuator for moving said actuator back and forth to operate said switch operating means, condition responsive means normally holding said carrier against motion and releasing said carrier for motion upon the occurrence of a predetermined condition, said carrier being biased for outward motion by said spring means and when released allowing said switch operating means to move to switch open position, said main operating means moving to an indicating position when said carrier is released.

13. A circuit breaker comprising switch means, pivotally mounted switch operating means for opening and closing said switch means, a pivotally mounted carrier, said carrier and said switch operating means being pivotally movable about the same axis, an actuator pivoted on said carrier for operating said switch operating means, said actuator and said switch operating means having interlocking portions, movable main operating means, over center spring means operatively connecting said main operating means and said actuator for moving said actuator back and forth to operate said switch operating means, condition responsive means normally holding said carrier against motion and releasing said carrier for motion upon the occurrence of a predetermined condition, said carrier being biased for outward motion and when released allowing said switch operating means to move to switch open position, said main operating means and said switch operating means having coacting portions for resetting said carrier when said main operating means is moved towards and beyond switch open position.

14. A circuit breaker comprising switch means, pivotally mounted switch operating means for opening and closing said switch means, a pivotally mounted carrier, said carrier and said switch operating means being pivotally movable about the same axis, an actuator pivoted on said carrier for operating said switch operating means, said actuator and said switch operating means having interlocking portions, movable main operating means, over center spring means operatively connecting said main operating means and said actuator for moving said actuator back and forth to operate said switch operating

means, condition responsive means normally holding said carrier against motion and releasing said carrier for motion upon the occurrence of a predetermined condition, said carrier being biased for outward motion by said spring means and when released allowing said switch operating means to move to switch open position, said main operating means and said switch operating means having coacting portions for resetting said carrier when said main operating means is moved towards and beyond switch open position.

15. A circuit breaker comprising switch means, switch operating means for opening and closing said switch means, a carrier, an actuator pivoted to said carrier at one end and having a slot and pin connection with said switch operating means at the other end, said carrier and said switch operating means being pivoted about a common axis, a main operating means movable to switch open and switch closed position, tension spring means operatively connecting said actuator and said main operating means for rocking said actuator when said main operating means is moved to switch open and switch closed positions, said spring means acting through said actuator and biasing said carrier towards outward rocking



motion, condition responsive means normally holding said carrier against motion and releasing said carrier for outward rocking motion upon the occurrence of a predetermined condition, and coacting means carried by said switch operating means and said main operating means for rocking said switch operating means directly from said main operating means when said main operating means is moved to a position beyond switch open position, said switch operating means when rocked by said coacting means drawing said carrier inwardly for resetting said carrier.

CHESTER W. BROWN.

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