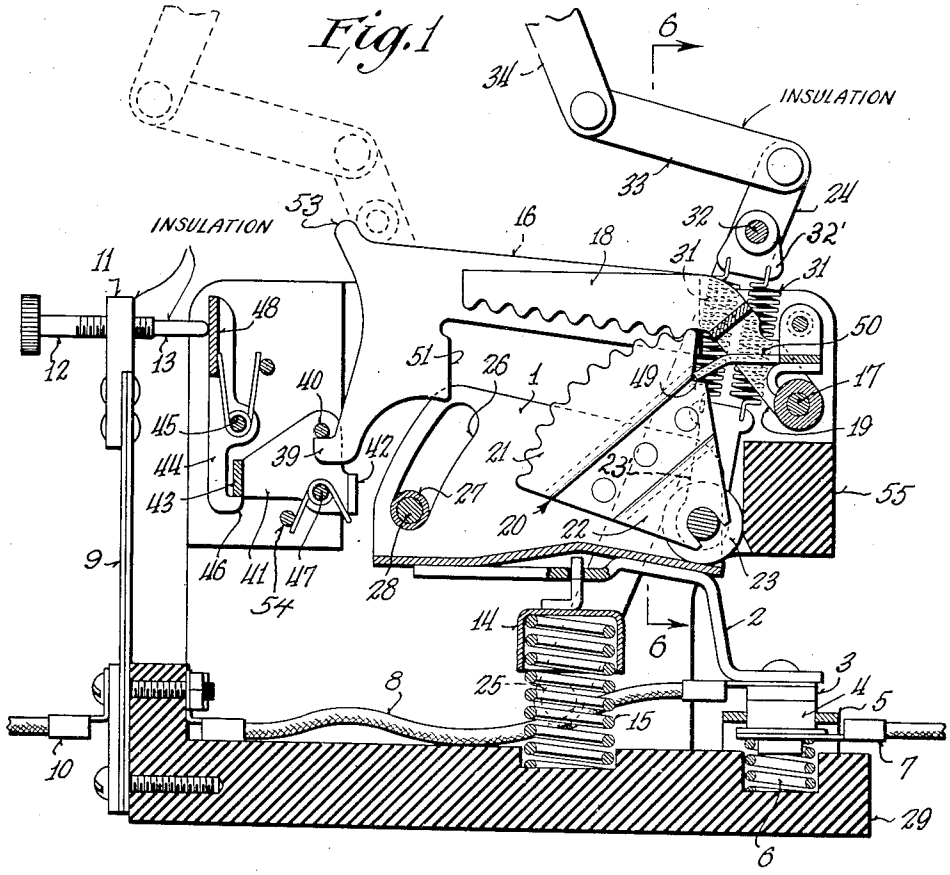
Sept. 5, 1944. G. R. RUNKE 2,357,770

SWITCH CONSTRUCTION

Filed May 21, 1943 4 Sheets-Sheet 1

Fig. 1



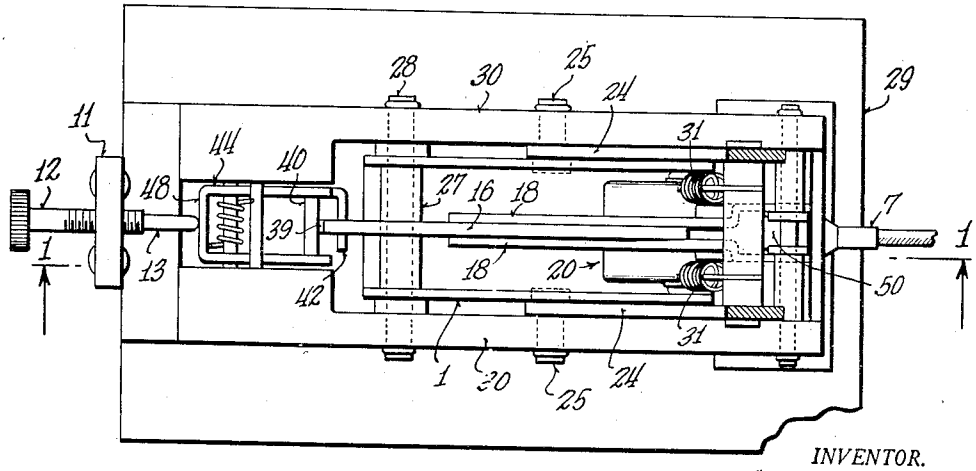


Fig. 2

INVENTOR.
GLENN R. RUNKE

BY

Austin R. Woodford

ATTORNEY.

Sept. 5, 1944. G. R. RUNKE 2,357,770

SWITCH CONSTRUCTION

Filed May 21, 1943 4 Sheets-Sheet 2

Fig. 3

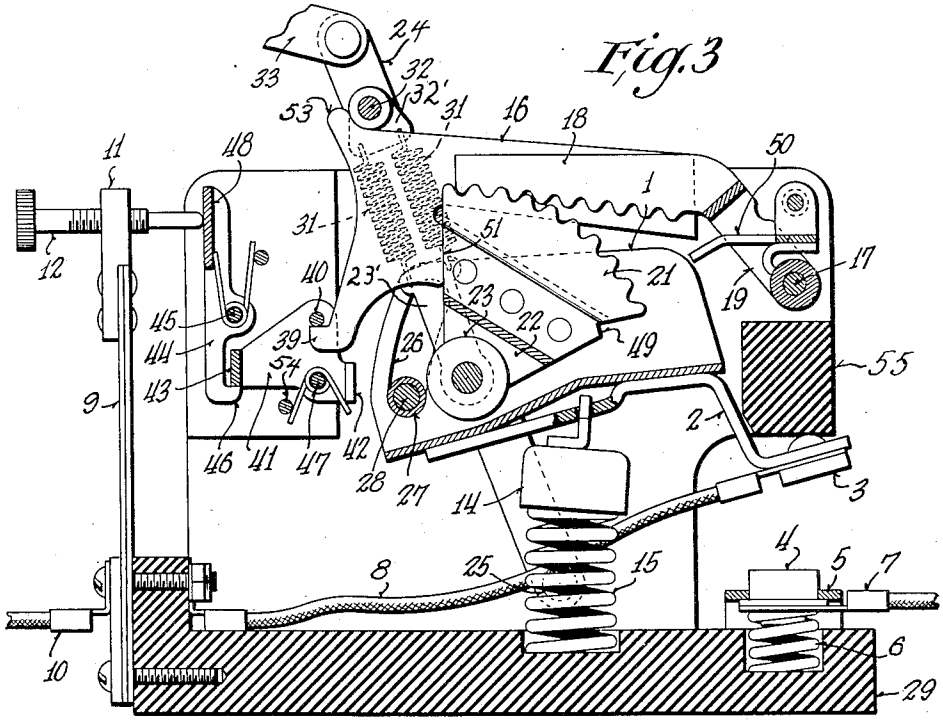
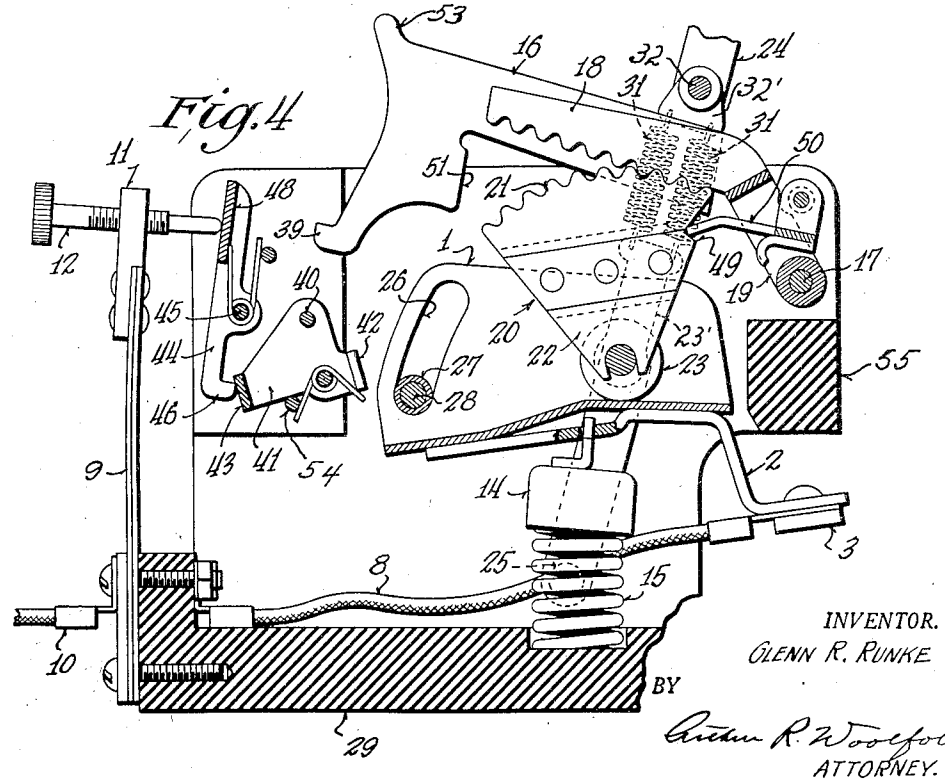


Fig. 4



INVENTOR.
GLENN R. RUNKE

BY

Glenn R. Woolfolk
ATTORNEY.

Sept. 5, 1944. G. R. RUNKE 2,357,770

SWITCH CONSTRUCTION

Filed May 21, 1943 4 Sheets-Sheet 3

Fig. 5

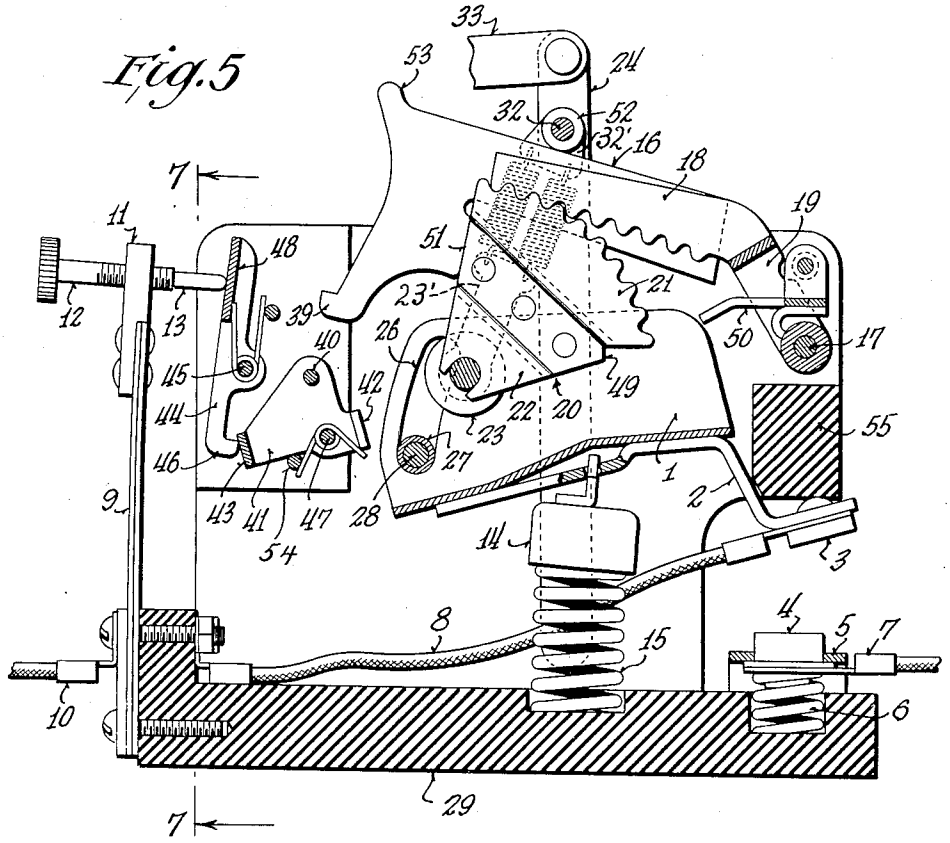


Fig. 6

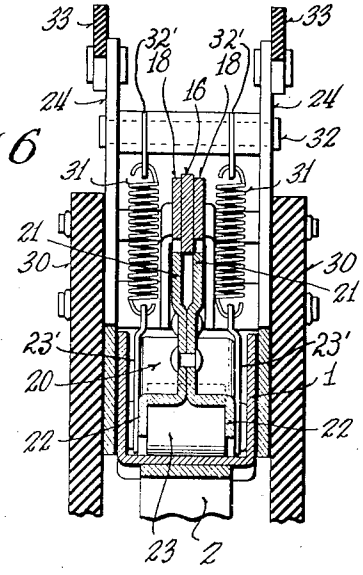
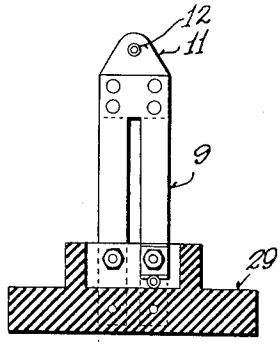


Fig. 7



INVENTOR.
GLENN R. RUNKE

BY

ATTORNEY.

Sept. 5, 1944. G. R. RUNKE 2,357,770

SWITCH CONSTRUCTION

Filed May 21, 1943 4 Sheets-Sheet 4

Fig. 8

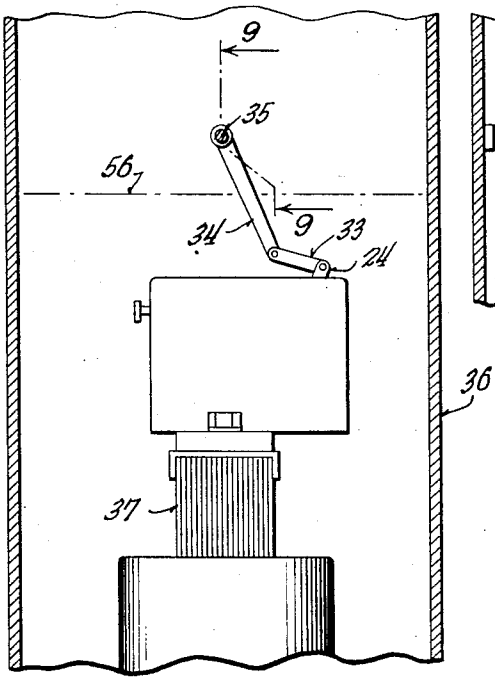


Fig. 9

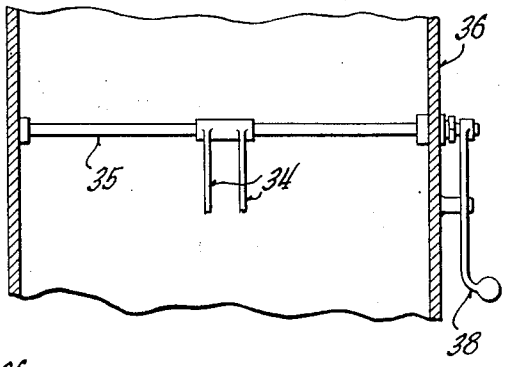


Fig. 10

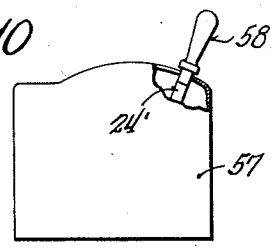


Fig. 11

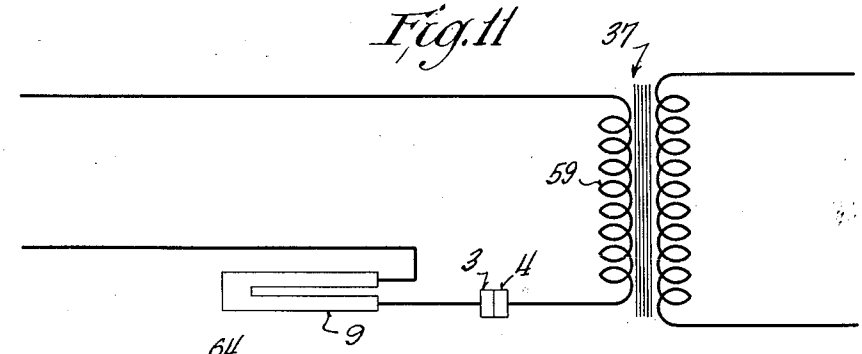
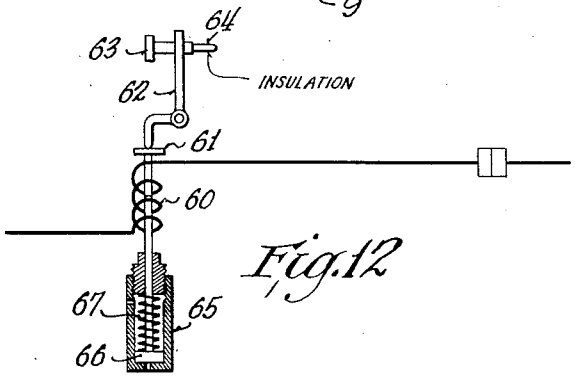


Fig. 12



INVENTOR.
GLENN R. RUNKE
BY
ATTORNEY.

Patented Sept. 5, 1944

2,357,770

UNITED STATES PATENT OFFICE

2,357,770

SWITCH CONSTRUCTION

Glenn R. Runke, Racine, Wis., assignor to Line Material Company, South Milwaukee, Wis., a corporation of Delaware

Application May 21, 1943, Serial No. 487,882

15 Claims. (Cl. 200—116)

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 is moved back to normal position, and in which the resetting of the trip means is accomplished by moving the operating means towards one extreme limit of its motion, 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 operation of the trip means.

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 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 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 main operating means is connected by spring means to an actuator which has a sliding engagement with the switch operating portion of the switch unit for operating the switch unit and which has a continuous rolling engagement with a carrier spaced from the switch unit so that the tension on the spring means will not be unduly increased at any point during the operation of the actuator thus producing an easier operation of the main operating means.

Further objects are to provide a circuit breaker in which the trip means is required to exert only a very small force in order to cause automatic operation, the relation of the parts being such that there is no chance of wedging or jamming any part of the trip mechanism during relatching.

In greater detail, further objects are to provide a switch construction in which the switch unit is floating and is yieldingly pivoted at an intermediate point so that the pivot point does itself move or shift during the opening or closing of the switch unit, the construction being such that heavy contact pressure is maintained up to the instant the switch is suddenly opened, and the resiliently urged pivot construction cooperating with an actuator to secure quick opening and quick closing motion, the switch unit having both translatory and rotational motion.

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 sectional view through the circuit breaker, such view corresponding to a sec-

tion on the line 1—1 of Figure 2 and showing the circuit breaker in closed position.

Figure 2 is a plan view of the structure shown in Figure 1 with a portion of the main operating levers sectioned off.

Figure 3 is a sectional view corresponding to Figure 1 showing the circuit breaker in its manually opened position.

Figure 4 is a view corresponding to Figure 1 showing the circuit breaker in an intermediate position after automatic release.

Figure 5 is a view corresponding to Figure 1 showing the circuit breaker in its final position after automatic release.

Figure 6 is a sectional view on the line 6—6 of Figure 1.

Figure 7 is a sectional view on the line 7—7 of Figure 5 drawn to a reduced scale.

Figure 8 is a sectional view showing the circuit breaker mounted within a transformer casing.

Figure 9 is a sectional view on the line 9—9 of Figure 8.

Figure 10 is a view showing a further form of mounting for the circuit breaker.

Figure 11 is a wiring diagram.

Figure 12 is a view 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, a circuit breaker with a single switch means having been chosen for the sake of illustration.

Referring to the drawings, it will be seen that the circuit breaker comprises a channel-shaped, switch operating means 1 which is joined as a unitary structure to the switch means 2 as by welding or in any other suitable manner. The switch means 2 includes a movable contact 3 which is adapted to engage a stationary contact 4. The stationary contact 4 is slidably carried by the member 5 and is spring urged upwardly by means of the spring 6. A terminal 7 is attached to the stationary contact 4 and is adapted to receive a flexible conductor. The movable contact 3 is connected by means of the flexible conductor 8 with a bi-metallic thermostatic element 9. This thermostatic element is provided with a terminal member 10 which is adapted to be connected to an outwardly extending conductor.

Upon reference to Figure 7, it will be seen that the thermostatic element 9 has two arms and is arranged as an inverted U-shaped member so that the current will pass up one arm and down the other. It is provided with an upper or head portion 11 formed of insulating material through which an adjustable screw 12 is threaded, such screw being provided with an insulating finger 13 extending inwardly and bearing against a portion of the trip mechanism hereinafter described, see Figure 1.

It is to be noted that the switch operating means 1 and the switch means 2 constitute a floating switch unit and are pivotally supported intermediate their ends by means of the spring pressed member 14 which is constantly urged upwardly by means of the spring 15 to thus support the unitary structure consisting of the switch operating means 1 and the switch means 2 for both rocking and translatory motion. A carrier 16 is pivotally mounted as indicated at 17 upon the body portion of the device and is provided with a pair of trackways 18 on opposite sides thereof which are rigidly attached to the carrier and which terminate in spaced arms 19 which receive the pivot pin 17. The body portion of the carrier projects downwardly below the trackways 18 and it is to be noted that the lower faces of the trackways are provided with rounded gear teeth.

An actuator indicated generally by the reference character 20 is positioned between the switch operating means 1 and the carrier 16 and is provided with a pair of segment gear sections 21 arranged in spaced relation to receive the lower portion of the carrier between them and are provided with rounded gear teeth adapted to mesh with the gear teeth of the trackways 18. The gear teeth have direct bearing engagement with each other. The lower portion of the actuator 20 is provided with a pair of spaced arms 22 which are slotted and receive the trunnions of a roller 23. The roller is adapted to travel back and forth along the bottom portion of the channel-shaped switch operating means 1 and to move across the pivot point of the switch operating means so that when it is on the right-hand side of the pivot point, as shown in Figure 1, the spring 15 causes the switch to close. When the actuator is rocked to the left-hand side of the pivot point of the switch operating means, as shown in Figure 3, the spring 15 will cause the switch operating member and the switch means to suddenly rotate to switch open position.

Main operating means indicated at 24 is provided for manually operating the switch and for resetting the carrier after automatic tripping, as will appear hereinafter. This main operating means may comprise a pair of levers positioned on opposite sides of the channel-shaped switch operating means and pivoted at a fixed point adjacent their lower ends as indicated by the reference character 25. It is to be noted that the left-hand portion of the walls of the switch operating member 1 are provided with curved slots 26 within which a spacing sleeve 27 carried by a transverse fixed pin 28 is positioned to thus limit the motion of the left-hand end of the switch operating means 1 as viewed in Figure 1.

The body portion of the device may consist of an insulating base portion 29 provided with a pair of side walls 30 and the pivot means 17 and the pin 28 may be mounted in the side walls 30.

In order to operate the actuator 20 from the main operating means 24, a plurality of springs 31 are interposed between a transverse pin 32 carried by the levers 24 and the trunnions of the roller 23 and the springs are so arranged that they always exert an upward pull and thus hold the trunnions of the roller within the slots in the arms 22 of the actuator 20 and also hold the segment gear sections 21 in engagement with the gear sections or trackways 18. If desired the springs 31 may be attached at opposite ends to members 32' and 23' which respectively engage the pin 32 and the trunnions of the rollers 23.

It is apparent from the description thus far given that when the main operating means 24 is rocked from the right-hand position shown in Figure 1 to the left-hand position shown in Figure 3, that the line of pull of the springs will be shifted and will cause the actuator 20 to roll along the trackways 18 and will cause the actuator 20 to rock, thereby causing the roller 23 to roll across from the right-hand portion to the left-hand portion of the switch operating means 1. It is to be noted that the lower portion of the channel-shaped switch operating means against which the

roller 23 bears is provided with a raised or upwardly projecting central portion and with downwardly sloping portions on opposite sides thereof. This assists in causing the roller to suddenly travel to the left as it passes over this centrally raised portion, such centrally raised portion being directly above the pivot point of the unitary structure of the switch operating means 1 and the switch means 2. As the main operating means 24 is shifted to the left from the position shown in Figure 1, the line of pull extends from the axis of the roller 23 to a point to the left of the point of engagement between the segment gears 21 and the tracks 18 and the actuator 20 is suddenly caused to rock in a clockwise direction. The actuator acquires considerable speed as it crosses the pivot point of the floating unitary switch operating and switch means, and the spring 15 after the roller has passed the pivot point, suddenly rocks this floating structure upwardly and suddenly opens the switch, as shown in Figure 3.

When it is desired to close the switch, the main operating means 24 is rocked to the right from the position shown in Figure 3 to that shown in Figure 1 and the reverse action takes place as the line of pull of the springs passes to the right of a line joining the center of the roller 23 and the point of engagement of the segment gears 21 with the trackways 18. The actuator 20 acquires considerable speed and suddenly rocks past the pivot point of the switch unit. When it rocks to the right of the pivot point of the switch unit, the spring 15 suddenly rocks the switch to closed position as shown in Figure 1.

By having a rolling engagement between the actuator and the trackways 18, it is apparent that the springs 31 do not have to be unduly extended.

Any suitable means may be provided for rocking the main operating means or levers 24. For instance, the levers 24 may be connected by means of insulating links 33, see Figure 8, with rock arms 34 rigidly carried by a rock shaft 35. The rock shaft 35 projects through the casing 36 of the transformer 37 and is provided with an externally located operating handle 38, as shown in Figure 9.

The circuit breaker is adapted for automatic release under predetermined conditions, for example on overload. This is accomplished by providing a latching means for the pivotally mounted carrier 16. This carrier is provided with a projecting foot 39, see Figure 1, which is normally latched beneath a pin 40 carried by a main latching lever 41, such main latching lever being spring urged in a counterclockwise direction and being provided with transverse lips 42 and 43. If desired, the main latching lever may be formed of two lever sections which are integrally joined by the transverse portion 43. An auxiliary latch lever 44 is pivotally mounted as indicated at 45 and is spring urged in a counterclockwise direction. It is provided with a latching portion 46 which has a flat upper face normally positioned below the portion 43 of the main latch lever 41. It is to be noted that the pin 40 of the main latching lever is substantially directly above the pivot point 47 of the main latching lever and that the point of engagement between the transverse portion 43 of the main latching lever 41 and the latching portion 46 of the auxiliary latching lever 44 is substantially directly below the pivot 45 of such auxiliary latching lever. Therefore, there is very little force required to unlatch this composite mechanism and allow the carrier 16 to rock upwardly, such carrier being permanently biased upwardly by means of the springs 31 and also being biased upwardly by means of the spring 15 when the circuit breaker is in closed position.

The auxiliary latching lever 44 may be formed with two main portions joined by a transverse upper web 48 which is adapted to be engaged by the adjusting screw structure 12—13. When an overload occurs, the bi-metallic member 9 warps to the right as viewed in Figure 1 and rocks the auxiliary latching lever 44 so that it releases the main latching lever 41. The main latching lever 41 releases the carrier 16 and the carrier immediately moves upwardly under the influence of the springs 31 and 15.

An intermediate position during the opening stroke of the carrier 16 is shown in Figure 4 and it will be seen that as the carrier moves up, a shouldered portion 49 of the actuator 20 engages a pivoted finger 50. Continued upward motion of the carrier 16 causes the actuator 20 to be rocked in a clockwise direction as the finger 50 engages the portion 49 and pushes the actuator 20 to the left. As soon as the line of pull of the springs 31 crosses to the left of the axis of the main operating means or levers 24, such main operating levers will be rocked to the left. As these levers rock to the left, the line of pull of the springs will be to the left of a line joining the axis of the roller 23 with the point of engagement of the segmental gears 21 with the gear trackways 18, and such actuator will also be urged to rotate in a clockwise direction by the pull of the springs 31. The consequence of this is that the actuator is rocked to the position shown in Figure 5. The actuator is brought to rest at this point by engagement with the shouldered portion 51 of the carrier 16. The main operating means or levers 24 are thus moved to an indicating position to show that automatic operation has taken place.

In order to reset the carrier, the main operating means 24 is rocked to the left from its position shown in Figure 5 and the roller 52 mounted on the pin 32 rides along the cam-shaped upper face of the carrier. It is to be noted that this rocking motion will depress the carrier and it is to be noted that the upper cam face of the carrier is provided with an upwardly extending portion 53 adjacent its left-hand end. When the roller 52 encounters this raised portion 53, it will depress the carrier beyond the position shown in Figure 1 and will cause the lower portion of the lip 39 of the carrier to engage the transverse portion 42 of the main latching lever 41 and will rock such lever in a clockwise direction.

If the thermostatic member has cooled sufficiently, the auxiliary latching lever under the influence of its spring will again latch the main latching lever 41 in position and when the operating means is allowed to move to the right a slight distance to the dotted line position shown in Figure 1, the carrier 16 will rise and the lip 39 will latch beneath the pin 40, thus again locking the carrier in position. On the other hand, if the thermostatic element has not cooled sufficiently, no wedging or jamming of the parts can occur as the transverse portion 43 of the main latching lever never passes to a position below the latching portion 46 of the auxiliary lever 44 as a stop pin 54 is provided for limiting the counterclockwise rotation of the main latching lever 41.

It is to be noted that the body portion of the circuit breaker is provided with an insulating

transverse web 55 which acts as a stop to limit the upward motion of the switch means 2. This member also acts as a stop to limit the rocking motion of the actuator towards the right as shown in Figure 1, the shoulder 51 of the carrier 16 constituting stop means for limiting the motion of the actuator 20 when it is rocked to the left.

It is to be noted that when the circuit breaker is in closed position as shown in Figure 1, the springs 31 and 15 both act to hold the actuator 20 in engagement with the carrier and the spring 15 acts to hold the switch unit, consisting of the switch operating means 1 and the switch means 2, in engagement with the actuator 20. The spring means 31, when the circuit breaker is in open position either as a result of manual operation as shown in Figure 3 or as a result of automatic operation as shown in Figure 5, serve to hold the actuator 20 in engagement with the carrier 16.

If desired the circuit breaker may be mounted directly upon the transformer 37 as previously mentioned and as shown in Figure 8. It may be mounted below the oil level indicated at 56 in Figure 8 so that the switch is operated in oil and so that the thermostatic element 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 element to respond not only to a relatively sudden overload but to allow such element 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 the switch under the influence of an overload of reasonable magnitude or the opening 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 member and the thermal member could then respond merely to the heat of the oil, or the oil lever could be so regulated that it is below the thermal member and then the thermal member would respond merely to the heat of the current passing therethrough.

The circuit breaker is also adapted for wall mounting. For instance as shown in Figure 10, it may be mounted in a housing 57 and an insulating handle 58 may extend outwardly through the curved wall of the housing and may be directly attached to the main operating means 24' which corresponds to the operating means 24 hereinbefore described.

The wiring diagram is shown in Figure 11 and it will be seen that the stationary and movable contacts 4 and 3 and the thermostatic element 9 are connected in series with the secondary 59 of the transformer 37.

Any desired form of condition responsive means may be employed for tripping the circuit breaker. For instance as shown in Figure 12, a solenoid type of condition responsive means may be employed and may consist of a solenoid 60 which is adapted to raise a plunger 61 and operate the bell crank member 62, such member being provided with an adjusting screw 63 provided with an insulating portion 64 adapted to engage the transverse portion 48, see Figure 1, of the auxiliary trip lever. If desired, any suitable time delay means may be employed such as the cylinder 65 provided with a piston 66 connected to the plunger 61 and spring urged downwardly by the spring 67, suitable openings being provided in the cylinder to allow fluid to escape. Obviously the size of the openings with relation to the size of the cylinder will determine the time delay desired.

By adjusting the adjustable screws 12, see Figure 1, and 63, see Figure 12, the value of the condition for which the circuit breaker will open may be determined.

The purpose of having time delay is to prevent the circuit breaker from opening for any sudden and extremely transitory overload for instance, and to allow the circuit breaker to open as promptly as desired for an overload of a longer period than that for which the time delay has been designed. It is to be distinctly understood that either a single switch means or a plurality of switch means can be employed as the invention is not limited to the number of switch means employed. Also it is to be understood that the circuit breaker could be made to respond to over or under voltage, overload, phase reversal, or any other desired condition.

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 a switch unit mounted as a floating structure and having both rocking and translatory motion and having a movable pivot point, spring means yieldingly supporting said unitary structure at the pivot point, an actuator coacting with said switch unit and rockable back and forth across said pivot point and having both rocking and translatory motion, a carrier spaced from said switch unit, said actuator having continuous rolling engagement with said carrier as said actuator is rocked back and forth, and independent means for respectively controlling the rocking and translatory motion of said actuator.

2. A circuit breaker comprising a switch unit mounted as a floating structure and having both rocking and translatory motion and having a movable pivot point, spring means yieldingly supporting said unitary structure at the pivot point, an actuator coacting with said switch unit and rockable back and forth across said pivot point and having both rocking and translatory motion, a carrier spaced from said switch unit, said actuator having continuous rolling engagement with said carrier as said actuator is rocked back and forth, main operating means for rocking said actuator, and condition responsive means controlling the translatory motion of said actuator.

3. A switch comprising a switch unit including a movable contact and switch operating means for moving said movable contact, a cooperating contact, said switch unit having a pivot point, spring means pivotally supporting said switch unit at said pivot point, a rocking actuator coacting with said switch unit at one end to rock said switch unit as said rocking actuator is rocked back and forth across said pivot point to cause said contacts to engage and disengage, a carrier spaced from said switch unit, said actuator having continuous rolling engagement with said carrier as said actuator is rocked back and forth, and means for rocking said actuator.

4. A switch comprising a switch unit including a movable contact and switch operating means for moving said movable contact, a cooperating contact, said switch unit having a pivot point,

spring means pivotally supporting said switch unit at said pivot point, a rocking actuator coacting with said switch unit at one end to rock said switch unit as said rocking actuator is rocked back and forth across said pivot point to cause said contacts to engage and disengage, a carrier spaced from said switch unit, said actuator having continuous rolling engagement with said carrier as said actuator is rocked back and forth, spring means for holding said actuator in continuous engagement with said carrier, and means for rocking said actuator.

5. A switch comprising a switch unit including a movable contact and switch operating means, a cooperating contact, said switch unit having a pivot point and rockable about said pivot point to cause engagement and disengagement between said contacts, a rocking actuator coacting at one end with said switch unit and movable to opposite sides of said pivot point to cause said switch unit to rock, a carrier spaced from said switch unit, said actuator having continuous rolling engagement with said carrier as said actuator is rocked back and forth, spring means for causing coaction between said actuator and said switch unit, and means for rocking said actuator.

6. A switch construction comprising a floating switch unit having a pivot point intermediate its ends and having both rocking and translatory motion and including a movable contact, a cooperating contact, an actuator bearing against said switch unit and movable to opposite sides of said pivot point for rocking said switch unit to cause engagement and disengagement of said contacts, a carrier for said actuator, said actuator having continuous rolling engagement with said carrier, spring means bearing against said switch unit adjacent said pivot point and urging said switch unit towards motion of translation, said spring means acting in the same direction to rock said switch unit in opposite directions depending on the position of said actuator, and means for moving said actuator.

7. A circuit breaker comprising a switch unit having both rocking and translatory motion and having a movable pivot point, spring means yieldingly supporting said switch unit adjacent said pivot point, an actuator engaging said switch unit and movable back and forth across said pivot point and having both rocking and translatory motion, a carrier for said actuator, said actuator having continuous rolling engagement with said carrier, main operating means for moving said actuator, and condition responsive means for releasing said switch unit for translatory motion.

8. A circuit breaker comprising a switch unit having both rocking and translatory motion and having a movable pivot point, spring means yieldingly supporting said switch unit adjacent said pivot point, an actuator having one portion slidable along said switch unit to opposite sides of said pivot point to rock said switch unit, a movable carrier, said actuator having another portion which has continuous rolling engagement with said carrier, main operating means for moving said actuator, and condition responsive means for releasing said carrier.

9. A circuit breaker comprising a switch unit having both rocking and translatory motion and having a movable pivot point, spring means yieldingly supporting said switch unit adjacent said pivot point, an actuator having one portion slidable along said switch unit to opposite sides of said pivot point to rock said switch unit, a movable carrier, said actuator having another portion which has continuous rolling engagement with said carrier, main operating means for moving said actuator, means biasing said actuator towards motion in a direction away from said switch unit, and condition responsive means for releasing said carrier.

10. A circuit breaker comprising a switch unit having both rocking and translatory motion and having a movable pivot point, spring means yieldingly supporting said switch unit adjacent said pivot point, an actuator having one portion slidable along said switch unit to opposite sides of said pivot point to rock said switch unit, a movable carrier, said actuator having another portion which has continuous rolling engagement with said carrier, main operating means for moving said actuator, means biasing said actuator and carrier towards motion in a direction away from said switch unit, and condition responsive means for releasing said carrier.

11. A circuit breaker comprising a switch unit having both rocking and translatory motion, spring means supporting said switch unit and urging said switch unit towards translatory motion to switch open position, an actuator engaging said switch unit and movable back and forth towards opposite ends of said switch unit and mounted for both rocking and translatory motion, a movably mounted carrier for said actuator, said carrier having a trackway provided with gear teeth and said actuator having a segmental gear section whose teeth mesh with the teeth of said trackway, said spring means when said actuator is adjacent one end of said switch unit rocking said switch unit in one direction and when said actuator is adjacent the other end of said switch unit rocking said switch unit in the other direction, main operating means for moving said actuator towards opposite ends of said switch unit, and causing said actuator to roll on said trackway, and condition responsive means controlling the motion of said carrier.

12. A circuit breaker comprising a switch unit having a movable contact, a cooperating contact, an actuator having a rocking portion coacting with said switch unit to move said switch unit to cause engagement and disengagement of said contacts, said switch unit being biased towards open position, a movably mounted carrier, said actuator being mounted between said carrier and switch unit and being guided on said carrier, said carrier having a trackway provided with gear teeth and said actuator having a segmental gear section whose teeth mesh with the teeth of said trackway, main operating means for moving said actuator, said carrier being biased for outward motion, means normally latching said carrier against motion, and condition responsive means for releasing said carrier.

13. A circuit breaker comprising a switch unit having a movable contact, a cooperating contact, an actuator having a rocking portion coacting with said switch unit to move said switch unit to cause engagement and disengagement of said contacts, said switch unit being biased towards open position, a movably mounted carrier, said actuator being mounted between said carrier and switch unit and being guided on said carrier, said carrier having a trackway provided with gear teeth and said actuator having a segmental gear section whose teeth mesh with the teeth of said trackway, main operating means for moving said actuator, said carrier being biased for outward motion, means normally latching said carrier against motion, condition responsive

means for releasing said carrier, and means for causing said main operating means to move to indicating position after said carrier has been released.

14. A circuit breaker comprising a switch unit mounted to rock to open and closed position and biased towards open position, a carrier movably mounted in spaced relation to said switch unit, means normally latching said carrier against motion away from said switch unit, an actuator having rolling engagement with said carrier and coacting with said switch unit to move said switch unit to open and closed position as said actuator is moved back and forth longitudinally with reference to said switch unit, main operating means, spring means between said main operating means and said actuator for moving said actuator when said main operating means is moved, said spring means biasing said carrier towards outward motion and holding said actuator in engagement with said carrier, condition responsive means for releasing said carrier for outward motion, and means for moving said actuator to shift said main operating means to indicating position when said carrier has moved outwardly.

15. A circuit breaker comprising a switch unit having a pivot point and including a switch operating means and a movable contact, a cooperating contact, spring means supporting said switch unit adjacent said pivot point, a movably mounted carrier, an actuator mounted between said carrier and said switch operating means and having rolling engagement with said carrier and coacting with said switch operating means to rock said switch operating means to cause said contacts to engage and disengage as said actuator rolls back and forth along said carrier, said switch operating means having a portion adapted to be engaged by said actuator provided with a peaked part over said pivot point and slanting on opposite sides from said peaked part, main operating means, spring means operatively connecting said main operating means and said actuator for moving said actuator back and forth along said carrier, said spring means biasing said carrier towards outward motion, latch means normally restraining said carrier, and condition responsive means for releasing said latch means.

GLENN R. RUNKE.