Jan. 6, 1953

H. S. GANO ET AL

2,624,815

CIRCUIT BREAKER

Filed May 7, 1945

Fig. 1.

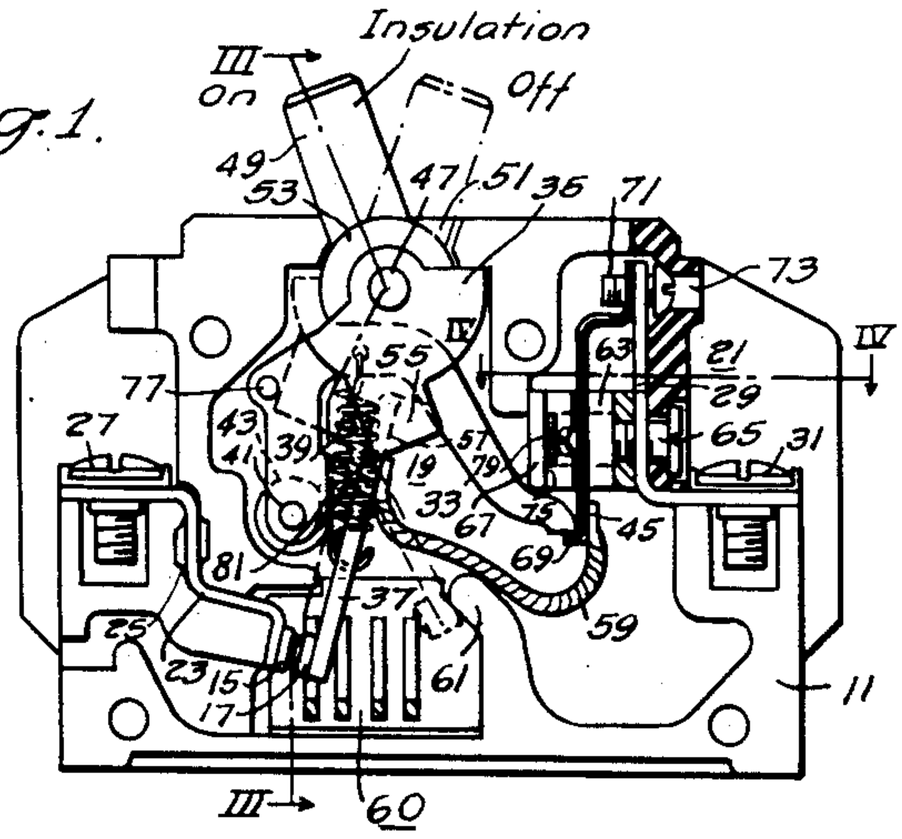


Fig. 2.

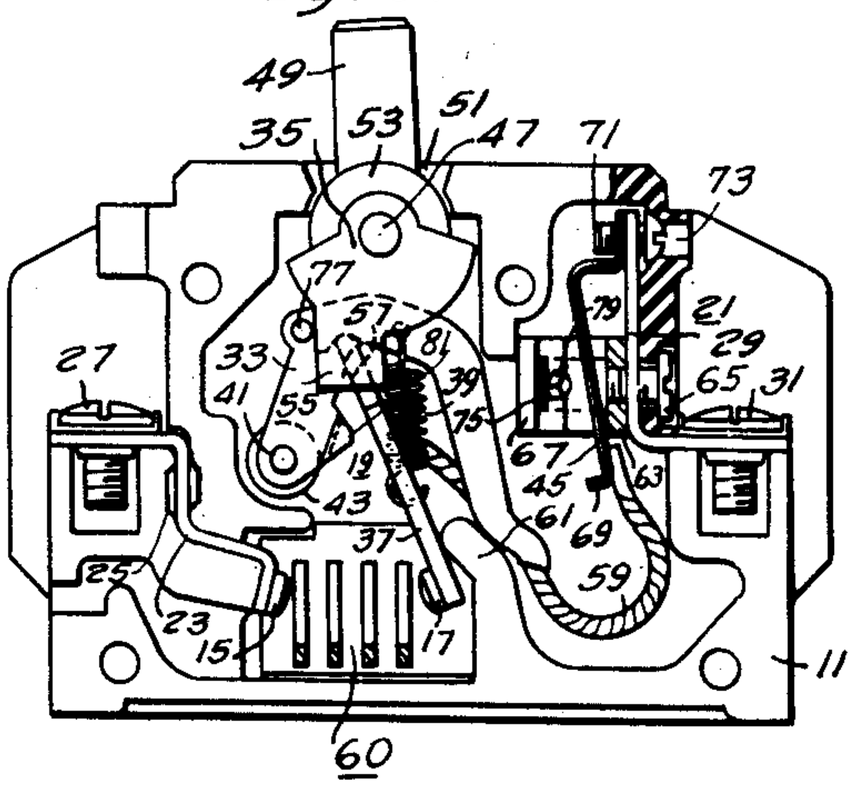


Fig. 3.

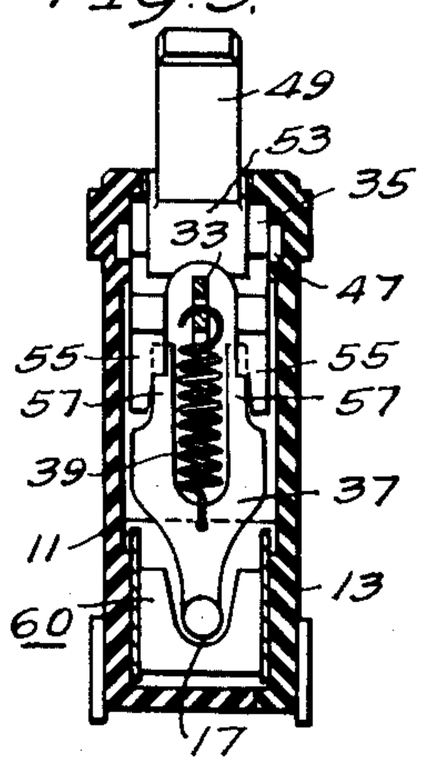


Fig. 5.

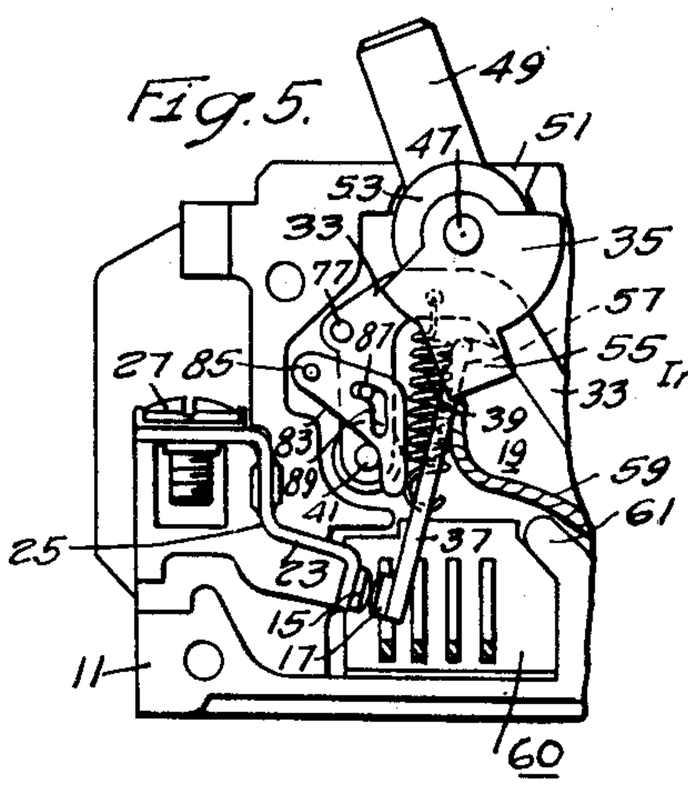
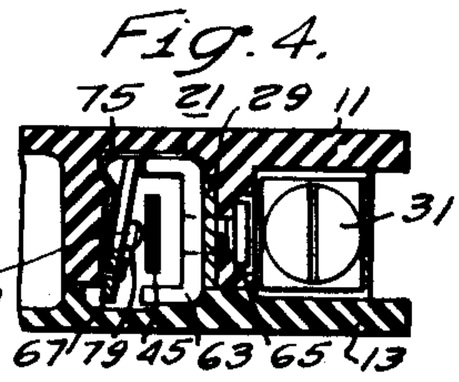


Fig. 4.



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Patented Jan. 6, 1953

2,624,815

UNITED STATES PATENT OFFICE

2,624,815

CIRCUIT BREAKER

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Application May 7, 1945, Serial No. 592,446

13 Claims. (Cl. 200—88)

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This invention relates to circuit interrupters, and more particularly to manually and automatically operable circuit breakers for controlling lighting and other small or moderate power electric circuits. Our application S. N. 277,416 filed March 19, 1952, is a division of this application.

An object of the invention is to provide an improved circuit breaker having few parts, which is compact, accurate and reliable in operation and inexpensive to manufacture.

Another object of the invention is to provide a circuit breaker embodying an improved operating mechanism which actuates the contacts with a snap action on both opening and closing independently of the speed of movement of the operating handle, which opens the contacts upon the occurrence of an overload even though the handle may be held in on position, and which causes the handle to move to an intermediate position to indicate that the contacts have been opened because of an overload.

Another object of the invention is to provide a simplified balanced construction in which the current-carrying switch arm and moving contact are pivotally mounted directly on the handle of insulating material.

Another object of the invention is to provide a circuit breaker in which the parts of the breaker are assembled at low cost by being laid in recesses in a two-part housing of insulating material without the use of any frame other than the housing.

A further object of the invention is to provide an arrangement of the breaker parts in the housing of insulating material by which the arc is drawn adjacent the bottom of the housing, with a vent for the arc gasses in one end of the housing beneath the terminal.

It is also an object of the invention to positively initiate opening movement of the contacts by prying movement of a lever pivoted at a fixed point, upon current responsive tripping of the breaker.

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

Figure 1 is a side elevational view partly in section, of a circuit breaker embodying the principles of the invention, the cover plate having

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been removed more clearly to illustrate the invention, the breaker mechanism being shown in the closed-circuit position;

Fig. 2 is a side elevational view of the circuit breaker similar to Fig. 1, showing the breaker mechanism parts in the tripped-open position;

Fig. 3 is a transverse sectional view of the circuit breaker taken substantially along line III—III of Fig. 1 and looking in the direction of the arrows;

Fig. 4 is a fragmentary sectional view taken substantially along the line IV—IV of Fig. 1 and looking in the direction of the arrows.

Fig. 5 is a fragmentary side elevational view of the circuit breaker showing a modification of the means for prying the switch arm and positively starting it in opening direction on automatic operation.

Referring to Fig. 1 of the drawing, the circuit breaker comprises a housing 11 and a cover plate 13, both of molded insulating material, a stationary contact 15, a cooperating movable contact 17, an operating mechanism indicated generally at 19, and a trip device indicated generally at 21.

The housing 11 and the cover 13 serve as a frame for the breaker and are molded to provide various recesses, and surfaces for removably receiving and supporting all of the parts of the breaker. The parts are inserted through the open side of the housing 11 before the cover 13 is put in place and are retained in mounted position in the proper relation to each other when the cover is assembled on the housing and secured thereto. The stationary contact 15 is rigidly secured to the inner end of a terminal 23 disposed in an angular transverse slot 25 in the housing. The terminal 23 extends outside the housing and has a screw 27 threaded into an opening in the terminal to provide means whereby this terminal may be connected in an electrical circuit.

At the end of the breaker opposite the terminal 23 is a terminal 29 having a screw 31 threaded into an opening therein for connecting this terminal in an electrical circuit. The terminal 29 extends through an opening in the housing into the interior of the housing where it is bent at right angles and serves to support the trip device 21 to be described later.

The operating mechanism comprises a releasable member 33, a manually operable operating lever or handle 35 of molded insulating material, a U-shaped contact actuating or switch arm 37 for supporting the movable contact 17 and an overcenter spring 39 connected under tension be-

tween the switch arm 37 and the releasable member 33. The releasable trip member 33 is pivotally mounted on a fixed pivot pin 41 supported in an opening in the housing 11 and in a corresponding opening in the cover 13 and is spaced from the housing and cover by means of spacers 43. The releasable trip member 33 is normally releasably restrained in the operating position by the engagement of the free end thereof with a bimetal element 45 rigidly secured to the upper end of the conductor 29 and forming a part of the trip device 21 which will be described later.

The insulated operating lever 35 is pivotally mounted on trunnions 47 molded integral therewith which are supported in suitable openings in the housing 11 and cover plate 13. The operating lever has a handle 49 molded integral therewith which projects through an opening 51 in the top of the housing 13 whereby the mechanism may be manually operated to open and close the contacts. A semi-cylindrical portion 53 of the operating lever substantially closes the opening 51 in all positions of the operating lever. The inner portion of the operating lever 35 is bifurcated and the two legs 55 thereof are provided with V-shaped recesses for receiving and supporting the legs 57 of the U-shaped switch arm 37 which legs are at all times biased into said recesses by the spring 39. Thus, the insulating material of the legs 55 of the handle member directly supports the movable contact or switch member 37 for pivotal movement in opening and closing the circuit. The fact that the inner end of handle member 35 and the switch arm 37 are both U-shaped provides a balanced construction and permits the trip member to be a single flat piece movable between the legs of the two U-shaped members. This construction also permits the use of a single spring centered in the mechanism and used for supplying contact pressure. for actuating the contacts open and closed with a snap action independently of the speed of movement of the operating handle, and for biasing the trip member and moving the contacts open upon the occurrence of an overload.

The switch arm 37 is connected by means of a flexible connection 59 to the free end of the bimetal element 45, thus completing the electrical circuit through the breaker which circuit extends from the terminal 23 through the stationary and movable contacts 15—17, switch arm 37, flexible connection 59, the bimetal element 45 and the conductor 29. Since the switch or contact actuating arm 37 extends downwardly from its pivot point, the arc is established adjacent the bottom of the housing in the arc chute 60, one end of which is connected by the vent passage extending to the opening in the end of the housing beneath the terminal screw 27, as shown.

The circuit breaker may be manually operated to open and close the contacts by operation of the insulating handle 49. Movement of the handle and the operating lever 35 clockwise from the full-line position (Fig. 1) to the position in which it is shown in dot-and-dash lines carries the upper end of the switch arm 37 to the left of the line of action of the spring 39 whereupon the spring acts to move the switch arm 37 with a snap action to the open position, shown in dot-and-dash lines in Fig. 1. The opening movement of the switch arm is arrested by a projection 61 molded integral with the housing 11 which acts as a limit stop for the switch member. Movement of the operating handle 49 and the operating lever 35 in a counterclockwise direction

from the dot-and-dash position (Fig. 1) to the full line position moves the upper end of the switch arms 37 to the right of the line of action of the spring 39 which thereupon act to move the switch member to the closed position with a snap action. Movement of the handle 49 in either direction is limited by the member 35 striking the housing 11 at either side of the pivot 47.

In addition to the bimetal element 45, the trip device 21 also includes an electromagnet comprising a U-shaped core member 63, rigidly secured by means of a screw 65 to the conductor 29 and to the housing 11, and a movable armature 67. The bimetal element 45 from its point of attachment with the conductor 29 is formed inwardly away from the conductor and then extends downwardly substantially parallel therewith between the two legs of the U-shaped magnet core 63. The free end of the bimetal has a latch element 69 thereon which engages and releasably restrains the member 33 under normal circuit conditions. The round head of an adjusting screw 71 which threadedly engages in an opening in the conductor 29 at a point near its upper end, bears against a concave surface in the housing 11. An opening 73 through the casing provides for the insertion of an instrument to rotate the screw 71. Rotating the screw bends the conductor 29 and moves the bimetal element 45 relative to the member 33 to adjust the latch overlap to thereby vary the time delay tripping point of the breaker without affecting the magnetic air gap or changing the instantaneous tripping characteristic of the breaker.

Upon the occurrence of an overload current below a predetermined value the bimetal element 45 becomes heated, and when heated a predetermined amount, deflects in a direction to release the member 33. When the member 33 is released, the spring 39 acts to rotate it clockwise about its pivot 41 until it is arrested by striking the projection 61. During this movement the line of action of the spring 39 moves to the right of the pivot of the switch arm 37 whereupon the spring biases the switch arm in opening direction and moves it so that the line of action of the force exerted by it on operating lever 35 shifts across the pivot 47, and actuates both the switch arm 37 and the operating lever to the tripped position in which these parts appear in Fig. 2. The movements of the releasable member 33 and of the switch arm 37 are arrested by the projection 61 in order to provide an indication that the breaker has been automatically tripped open. The movement of the handle in opening direction on automatic opening operations is stopped in an intermediate position (Fig. 2) by striking a stop pin 77 projecting from the releasable member 33. The parts are shown in the tripped open position in Fig. 2. It is to be noted from Figs. 1 and 2 that the operating lever 35 is substantially in engagement with the projection 77 on the releasable member 33 in both the off and tripped positions, but is at a distance therefrom in the on position, so that holding the handle in on position cannot prevent movement of the member 33 and tripping movement of the breaker to open the contacts. This makes the breaker trip free of the handle which means that the contacts will open upon the occurrence of an overload irrespective of the position in which the handle may be held. Positive separation of the contacts is insured by the provision of a projection 81 on the releasable member or carrier 33 which projection, upon release of the carrier, strikes the

switch arm 37 at a point intermediate the ends thereof and starts the switch arm in opening direction.

Before the contacts may be closed following an automatic opening operation, it is necessary to reset and relatch the mechanism. This is accomplished by moving the operating lever 35 clockwise from the tripped position (Fig. 2) slightly beyond the full open position in which it is shown by dot-and-dash lines in Fig. 1. This movement of the operating lever, due to the engagement thereof with the pin 77 moves the member 33 counterclockwise to reengage the free end thereof with the latch element 69 of the bimetal 45. The contacts may now be closed in the previously described manner by movement of the handle counterclockwise to the closed position.

The circuit breaker is tripped automatically by the electromagnet 63—67 in response to overload currents above the predetermined value. The armature 67 of the electromagnet is mounted to pivot against one leg of the core member 63 and is restrained in retracted position by means of a spring 75 having one end immovably mounted between the core member and the side wall of the housing 11. The other end of the spring 75 extends through an opening in the armature for supporting the armature and biasing said armature to unattracted position.

When an overload above a predetermined value of, for instance 1000% of normal rated current, or a short circuit occurs, the core member 63 is energized and immediately attracts the armature 67 thereto. The armature 67 is provided with an insulating button 79 which, upon operation of the armature, engages and deflects the bimetal element 45 a sufficient distance to effect the release of the releasable member 33 and opening of the contacts in the previously described manner. The breaker mechanism is reset and the contacts closed following an instantaneous tripping operation in the previously described manner.

According to the modification shown in Fig. 5 a separate element is operated by the releasable member to pry the switch arm and positively initiate opening movement thereof on automatic operation. This element comprises a lever 83 pivotally mounted on a pin 85 supported in suitable openings in the side wall of the housing 11 and the cover plate 13. A pin 87 secured on the releasable member 33 projects through an L-shaped slot 89 in the lever 83.

When the releasable member 33 is released, upon action of the trip device in response to an overload current, the spring 39 rotates the releasable member clockwise to carry the outer end of the spring to the right of the pivot of the switch arm 37. As the releasable member moves in a clockwise direction the pin 87 engages the right hand wall of the vertical portion of the slot 89 and rotates the lever 83 in a counterclockwise direction about its pivot 85. During this movement of the lever 83 the free end thereof strikes the switch arm 37 at a point intermediate the ends thereof and positively starts the switch arm in opening direction.

When the releasable member 33 is moved in counterclockwise direction to reset and relatch the mechanism, in the manner previously described, the pin 87 restores the lever 83 by clockwise movement to the position wherein the lower end of the lever rests against the pivot pin 41 of the releasable member. The offset portion

of the slot 89 is concentric with the center of the pin 41 when the lever 83 is in the retracted position to permit overtravel of the releasable member 33 to latching position.

While the invention has been disclosed in accordance with the provisions of the patent statutes, it is to be understood that various changes in the structural details thereof may be made without departing from some of the essential features of the invention. It is desired, therefore, that the language of the appended claims be given the broadest reasonable interpretation permissible in the light of the prior art.

We claim as our invention:

1. A circuit breaker comprising a fixed contact, a movable contact, an operating handle of insulating material mounted on a fixed pivot, a contact actuating arm pivotally supported on said handle and moving said movable contact relative to said fixed contact to open and close the circuit, a releasable member mounted on a fixed pivot, an overcenter spring connected between said releasable member and said contact actuating arm and normally biasing said contact actuating arm to closed position, said handle being manually operable to move the contact actuating arm relative to the line of action of said overcenter spring to thereby cause said spring to operate the contact actuating arm with a snap action to manually open and close the contacts, and a trip device operable in response to abnormal circuit conditions to release said releasable member to change the line of action of said overcenter spring and effect automatic opening of said contacts, and a lever having a fixed pivot point about which it is rotated by movement of said releasable member, said lever having a portion engageable with said contact actuating arm upon release of said releasable member to start said movable contact in opening direction.

2. In a circuit breaker, relatively movable contacts, a movable current-carrying switch arm having one of said contacts secured thereon, an operating lever operatively supporting one end of said switch arm, a releasable member mounted on a fixed pivot, an overcenter spring having one end attached to said releasable member and the other end attached to said switch arm, said releasable member when released changing the line of action of said overcenter spring to effect automatic opening of said contacts, a trip device operable in response to abnormal circuit conditions to release said releasable member, and a member mounted on a fixed pivot and operable by movement of said releasable member to engage and positively initiate opening movement of said switch arm.

3. In a circuit breaker, stationary contact means, a cooperating movable contact member, an operating lever pivotally mounted on a fixed pivot, a movable contact actuating arm, said operating lever pivotally supporting said movable contact actuating arm, a releasable member, an overcenter spring having one end attached to said movable contact actuating arm and the other end attached to said releasable member, thermally responsive means normally restraining said releasable member, said releasable member being operable when released to move said overcenter spring relative to said movable contact actuating arm to effect automatic opening movement of said movable contact member, and a lever mounted on a fixed pivot and having a connection with said releasable member for prying said movable contact actuating arm and positively initiat-

ing movement thereof to open position independently of the position in which the operating lever may be held upon operation of said releasable member.

4. In a circuit breaker, relatively movable contacts, an operating lever pivoted at a fixed point intermediate its ends and having a handle portion at one end and a bifurcated portion forming two legs at the other end, a contact actuating arm pivoted on said legs and extending outwardly beyond the ends thereof, a releasable trip member passing between the legs of the operating lever and having clearance therewith so that the releasable trip member is movable to tripping position irrespective of the position of said operating lever, a spring connected at one end to said contact actuating arm and at the other end to the portion of the releasable trip member which passes between the legs of the operating lever, a pivot for said releasable trip member at a point which causes said portion thereof between said legs to which the end of the spring is connected to move in a direction substantially normal to the line of action of the spring, current responsive means for releasing the trip member to move the line of action of the spring across the pivot of the contact actuating arm and cause opening of the contacts, stop means in engagement with said contact actuating arm after current responsive release with said operating lever held in on position only after said contact actuating arm has moved to a position where the line of action of the force exerted by the contact actuating arm on the operating lever has moved across the fixed pivot of the operating lever for biasing the operating lever to move toward off position when released, and means halting the operating lever after it has moved only part way toward off position.

5. In a circuit breaker, relatively movable contacts, a movable current-carrying switch arm having one of said contacts secured thereon, an operating lever of insulating material operatively supporting one end of said switch arm, a pivot for the operating lever having its axis extending through the insulating material thereof, a releasable member mounted on a fixed pivot and having a portion substantially in engagement with said operating lever when both the operating lever and the releasable member are in the normal off position, said releasable member when the circuit breaker is in on position being out of engagement with the operating lever so that the releasable member cannot be held from movement by holding the operating lever, an overcenter spring having one end connected to said releasable member and the other end connected to said switch arm, said releasable member when released changing the line of action of said overcenter spring to effect automatic opening of said contacts irrespective of the position in which the operating lever has been held and said portion of the releasable member being engageable by said operating lever to stop it in a trip indicating position, and a trip device operable in response to abnormal circuit conditions to release said releasable member.

6. In a circuit breaker, relatively movable contacts, operating mechanism therefor comprising an operating handle of insulating material, a current-carrying switch arm mounted on the insulating material of said handle for opening and closing said contacts, an overcenter spring for operating said switch arm and said handle, a member releasable to change the line of action of said overcenter spring to thereby effect automatic opening of said contacts and movement of said handle away from on position, said handle when in on position being disengaged from said releasable member so that the handle cannot prevent the releasable member from moving to released position, a fixed stop in engagement with said releasable member in its released position, a portion on said releasable member in engagement with said operating handle when the releasable member is against said fixed stop and thereby arresting said operating handle in an indicating position, a bimetallic latch normally directly engaging and restraining said releasable member against operation and operable in response to overload currents to release said releasable member.

7. A circuit breaker comprising an insulating housing, a U-shaped pivoted operating handle constructed of insulating material and having an on and an off position, stationary contact means, cooperating movable contact means having an actuator therefor pivoted on said handle, a releasable member, an overcenter spring connected at one end to said actuator for the movable contact means and at the other end to said releasable member at a point near the closed end of the U of said handle, said actuator being biased by the overcenter spring to exert a force on the handle and the line of action of said force being on one side of the pivot of the handle when the actuator is in contact-closed position and being on the other side of the pivot of the handle when the handle is in on position and the releasable member is in its released position and said line of action moving across the pivot of the handle to move it on every opening or closing movement of the actuator, said releasable member being pivoted at a point positioned so that the releasable member when released moves the end of the overcenter spring connected thereto laterally of its length and shifts its line of action across the pivot of the actuator on the handle, said handle when in on position being disengaged from said releasable member so that the handle cannot prevent automatic opening of said contact means and trip means operable in response to overload currents to effect release of said releasable member.

8. In a circuit interrupter, a housing of insulating material, a handle member of insulating material pivotally mounted on the insulating material of the housing, a contact member inserted in recesses in the insulating material of the housing, a current-carrying switch member pivotally mounted at one end on the handle member and engageable at the other end with said contact member, an overcenter spring operable to move the switch member into and out of engagement with said contact member upon movement of the handle member but independently of the speed of movement thereof, a trip member connected to one end of said overcenter spring, a pivot for said trip member at a point such that pivotal movement of the trip member moves said end of the spring in an arc which carries the line of action of the spring across the point of pivotal mounting of the switch member on the handle member when in the on position whereby said spring moves said switch member out of engagement with said contact member, said handle member when in on position being disconnected from said trip member so that holding of the handle member cannot prevent movement of said trip member and overcenter spring to tripped position, said overcenter spring then biasing said handle member to move toward off position,

means for stopping said handle member after it has moved part way toward off position, a thermal element for controlling said trip member, a terminal member mounted on the insulating material of said housing and supporting one end of said thermal element, and a flexible conductor connecting the other end of said thermal element to said switch member.

9. In a circuit breaker, a housing of insulating material, a contact mounted in the housing, an operating lever of insulating material pivoted intermediate its ends on the housing and having a handle portion at one end and a bifurcated portion forming two legs at the other end, a U-shaped current-carrying switch arm having the ends of the U pivoted on said legs and having the bight of the U extending outwardly beyond the ends of said legs to engage and disengage said contact in the housing, a releasable trip member passing between the legs of the operating lever and free of engagement with the operating lever which would prevent movement of the trip member irrespective of the position of said operating lever, a single coil spring movable in the space between the legs of the operating lever and the legs of the U-shaped switch arm and connected at one end to the bight of the U-shaped switch arm and at the other end to the portion of the releasable trip member which passes between the legs of the operating lever, a pivot for said releasable trip member positioned at a point which causes the end of the spring connected to the releasable trip member to move in an arc the direction of which is generally normal to the line of action of the spring upon release of the trip member, current responsive means for releasing the trip member to move the line of action of the spring across the pivot of the switch arm and move it to open the circuit, said movement of the switch arm shifting the line of action of the force exerted by it on the operating lever across the pivot of the operating lever and biasing it to move toward off position, and a stop preventing movement of the operating lever to full off position under said bias to give an indication that the circuit breaker has been tripped by the current responsive means.

10. In a circuit interrupter, a casing comprising two members of insulating material positioned together in side-by-side relation and providing a cavity therebetween, a circuit interrupter mechanism in said cavity including a pivoted operating member having a handle portion at its upper end, a contact actuating arm, and means for causing movement of the contact actuating arm upon movement of said operating member, an opening in the top of the casing, said operating member extending upwardly in the casing and having the handle portion at its upper end extending through said opening in the top of the casing, a pair of contacts one of which is movable, said contact actuating arm being pivotally mounted and extending downwardly in the casing and carrying said movable contact at its lower end, and said contact actuating arm being movable to draw the arc between the contacts along a path generally parallel to the bottom of the casing, a pair of terminal members for receiving electrical connections at the two opposite ends of the casing, each of said terminal members being electrically connected to one of said contacts, a vent passage within the casing adjacent the bottom thereof and extending from the end of the arc path adjacent one of said contacts to a vent opening in the end of the casing having the terminal connected to the last said contact, and said vent opening in the end of the casing being beneath the said terminal.

11. In a circuit interrupter, a casing comprising two members of insulating material positioned together in side-by-side relation and providing a cavity therebetween, a circuit interrupter mechanism in said cavity including a pivoted operating member having a handle portion at its upper end, a contact actuating arm, and means for causing movement of the contact actuating arm upon movement of said operating member and for causing automatic opening movement of the contact actuating arm upon the occurrence of an overload irrespective of the position in which the operating member may be held, an opening in the top of the casing, said operating member extending upwardly in the casing and having the handle portion at its upper end extending through and substantially closing said opening in the top of the casing, a pair of contacts one of which is movable, said contact operating arm being pivotally mounted and extending downwardly in the casing and carrying said movable contact at its lower end, an arc chute at the bottom of the casing in which the arc is established upon movement of the contact on the lower end of the contact actuating arm, said casing being closed on the bottom beneath the arc chute, a pair of terminal members positioned at opposite ends of the casing, each of said terminal members being electrically connected to one of said contacts, a vent opening in one end of the casing between the terminal member and the bottom of the casing, and a vent passage within the casing adjacent the bottom thereof extending from said vent opening in the end of the casing to the end of the arc chute nearest thereto.

12. In a circuit breaker, a stationary contact, an operating member pivoted at a fixed point intermediate its ends and movable to on and off positions, said operating member having a handle portion at its upper end and a bifurcated portion at its lower end, a U-shaped actuator having the upper end of the U pivoted on the bifurcated lower end of the operating member and having the closed end of the U extending downwardly away from the lower end of the operating member, a movable contact mounted directly on the actuator at the lower end thereof, a pivoted releasable member having a portion passing between the two legs of the bifurcated portion of the operating member, a spring connected at its upper end to the portion of the releasable member which is between the legs of the operating member and connected at its lower end to the U-shaped actuator, current responsive means normally holding said releasable member and releasing it to move to a tripped position upon the occurrence of predetermined conditions, a stop for said actuator when the contacts are separated, said actuator when in engagement with said stop having the line of action of the force exerted by it on the operating member lying at the side of the pivot of the operating member which tends to move the operating member to off position when the operating member is in on position and the releasable member is in tripped position, a portion on said operating member in engagement with a portion on said releasable member when the operating member is in off position and the releasable member is in its normally held position, said portion on said operating member being at a distance from said portion on the releasable member when the operat-

ing member is in on position and the releasable member is in its normally held position so that holding of the operating member in on position cannot prevent movement of the releasable member from its normally held position upon operation of the current responsive means, and said portion of the releasable member when it is in its tripped position engaging said portion on the operating member and holding the operating member in a position intermediate on and off positions against the force exerted on the operating member by said actuator.

13. In a circuit breaker, a stationary contact, an operating member pivoted at a fixed point intermediate its ends and movable to on and off positions, said operating member having a handle portion at its upper end and a bifurcated portion at its lower end, a U-shaped actuator having the upper end of the U pivoted on the bifurcated lower end of the operating member and having the closed end of the U extending downwardly away from the lower end of the operating member, a movable contact mounted directly on the actuator at the lower end thereof, a pivoted releasable member having a portion passing between the two legs of the bifurcated portion of the operating member, a single coil spring connected at its upper end to the portion of the releasable member which is between the legs of the operating member and connected at its lower end to the U-shaped actuator, current responsive means normally holding said releasable member and releasing it to move to a tripped position upon the occurrence of predetermined conditions, a fixed stop engaged on one side by the releasable member when it is in tripped position and engaged on the other side by the actuator when it is in its position where the contacts are separated, said actuator when in engagement with said fixed stop having the line of action of the force exerted by it on the operating member lying at the side of the pivot of the operating member which tends to move the operating member toward off position when the operating member is in on position and the releasable member is also against said fixed stop, a projection on

said releasable member extending into the path of movement of one side of one of the legs of the bifurcated portion of the operating member, said projection on the releasable member being in engagement with said leg of the operating member when the releasable member is in its normally held position and the operating member is in its off position, said projection on the releasable member being at a distance from said leg of the operating member when the releasable member is in its normally held position and the operating member is in its on position whereby holding of the operating member in on position does not prevent movement of the releasable member to its tripped position after it is released, and said projection on the releasable member, when both the releasable member and the actuator are against said fixed stop, being in engagement with said leg of the operating member with the operating member in a position intermediate its on and off positions whereby the tripped position is indicated, and said releasable member being returned to its normally held position through said engagement during movement of the operating member from said intermediate position to its off position.

HARLAN S. GANO.
GERALD J. FREESE.

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2,305,347	Jackson	Dec. 15, 1942
2,306,235	Walle	Dec. 22, 1942
2,306,244	Butler	Dec. 22, 1942
2,312,169	Jackson	Feb. 23, 1943
2,370,206	Taylor	Feb. 27, 1945
2,370,340	Wood	Feb. 27, 1945