

Sept. 28, 1943.

E. T. PLATZ

2,330,237

CIRCUIT BREAKER

Filed Jan. 27, 1941

8 Sheets-Sheet 1

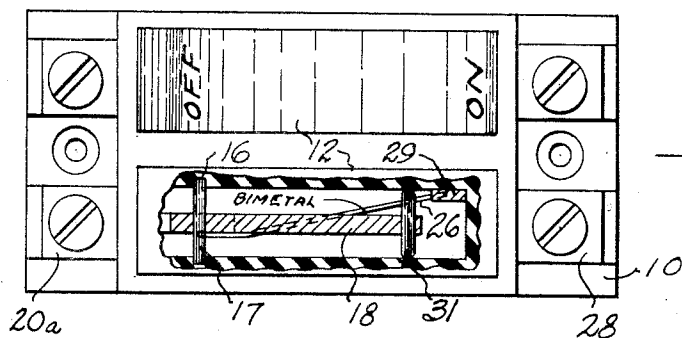


Fig. 1

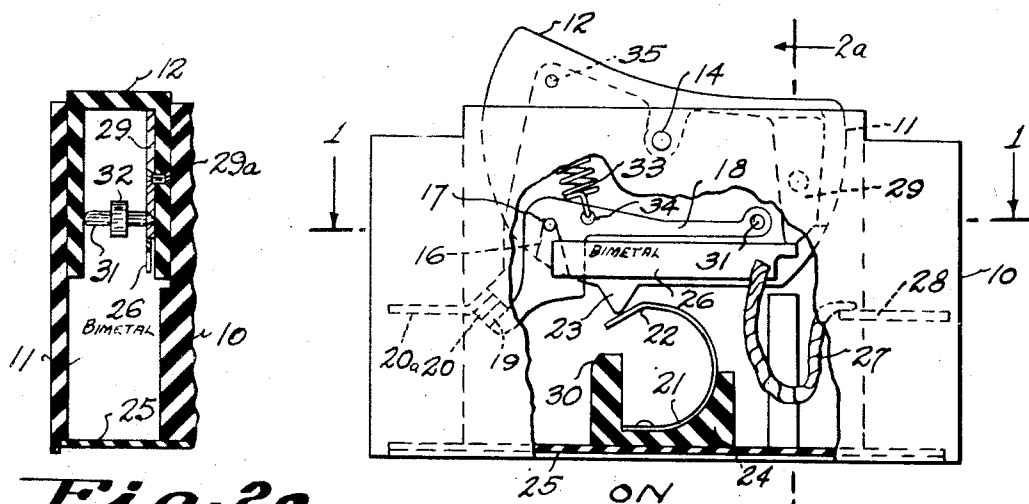


Fig. 2a

Fig. 2

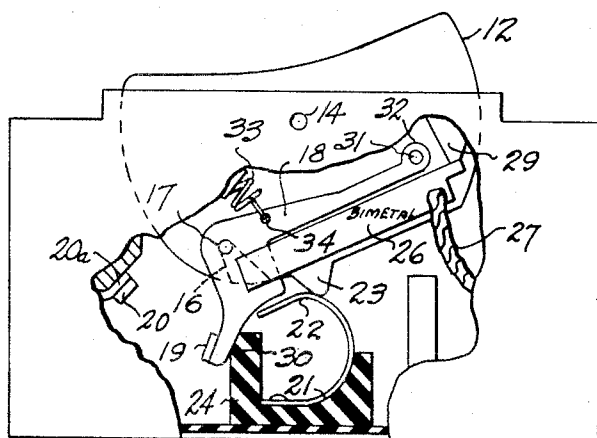


Fig. 3

OFF

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Sept. 28, 1943.

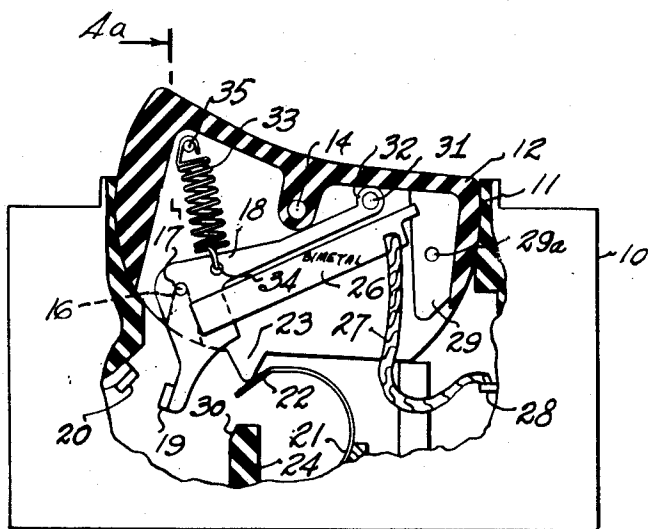
E. T. PLATZ

2,330,237

CIRCUIT BREAKER

Filed Jan. 27, 1941

8 Sheets-Sheet 2



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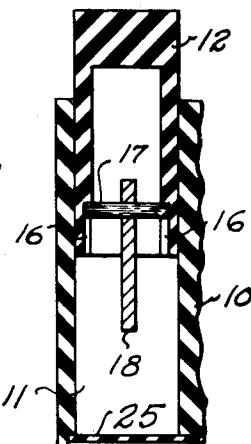
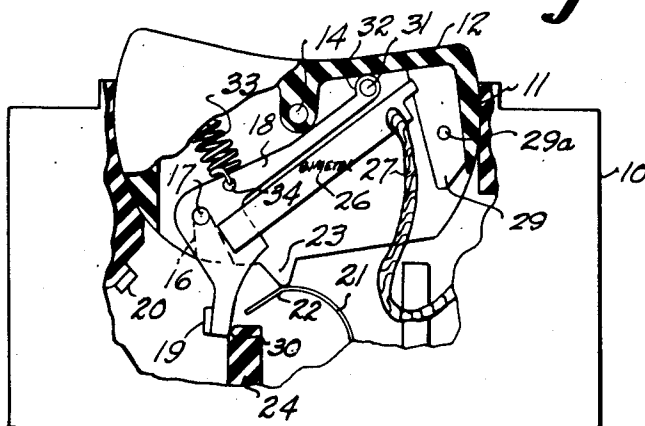


Fig. 4a

Fig. 4



RESETTING

Fig. 5

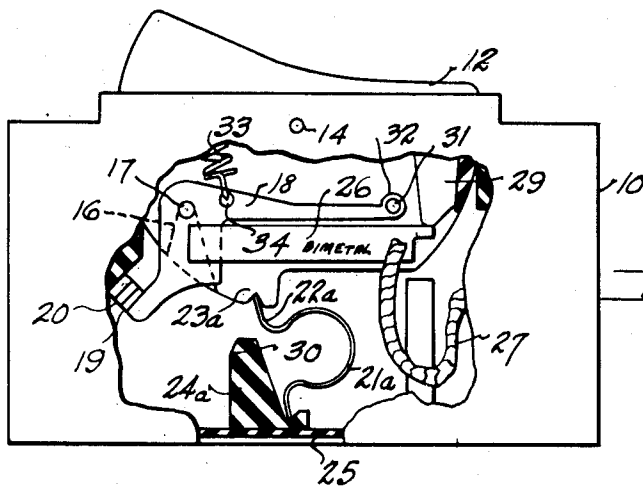


Fig. 7

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CIRCUIT BREAKER

Filed Jan. 27, 1941

8 Sheets-Sheet 3

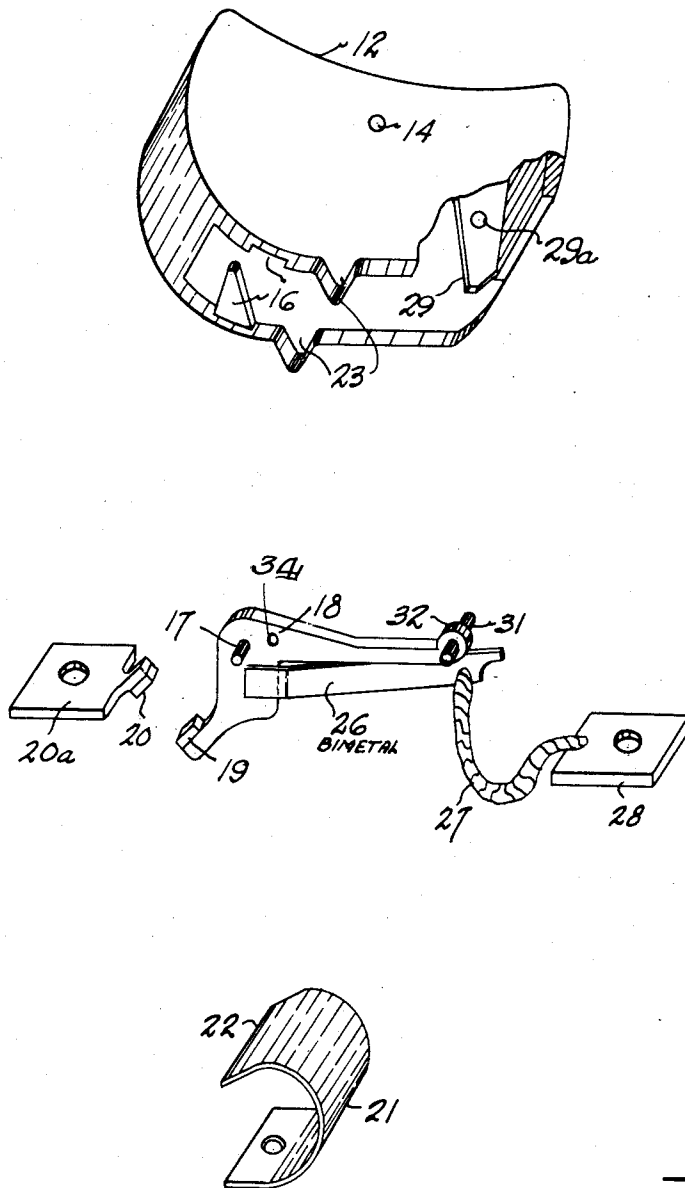


Fig. 6

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8 Sheets-Sheet 4

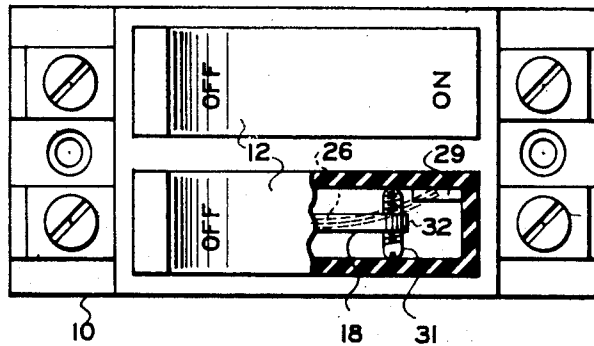


FIG. 8

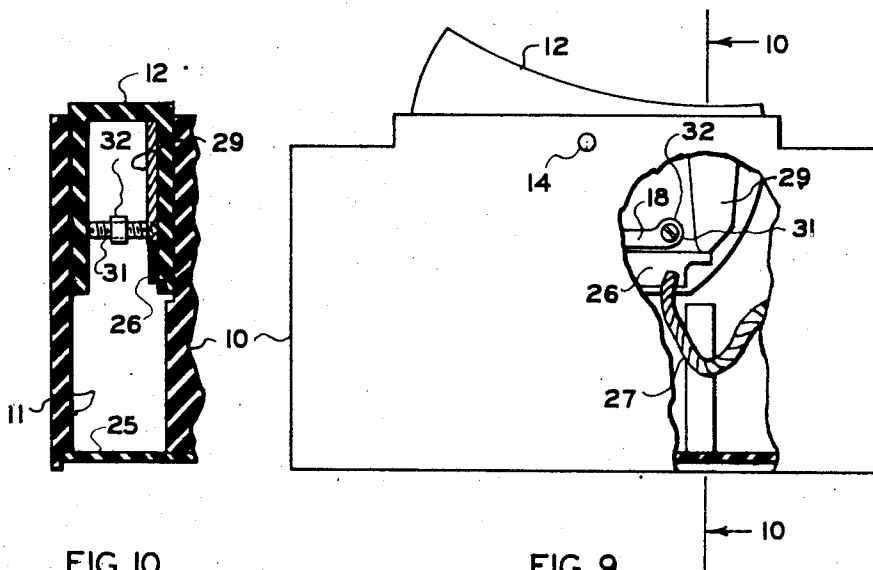


FIG. 10

FIG. 9

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CIRCUIT BREAKER

Filed Jan. 27, 1941

8 Sheets-Sheet 5

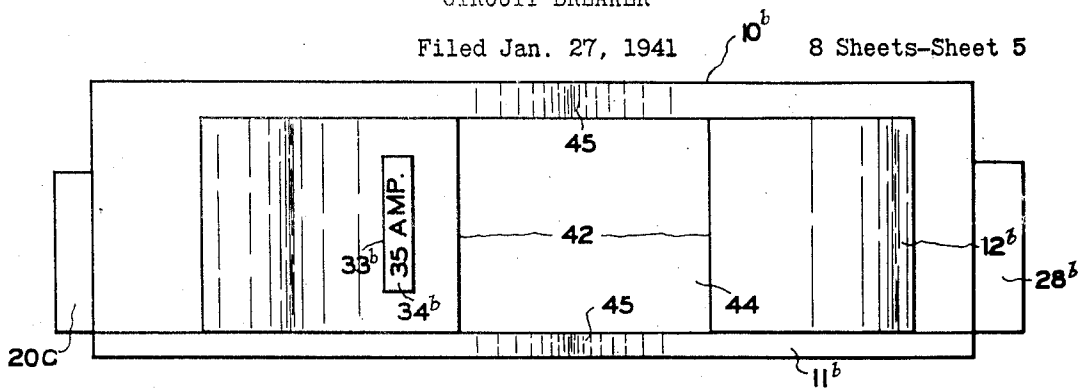
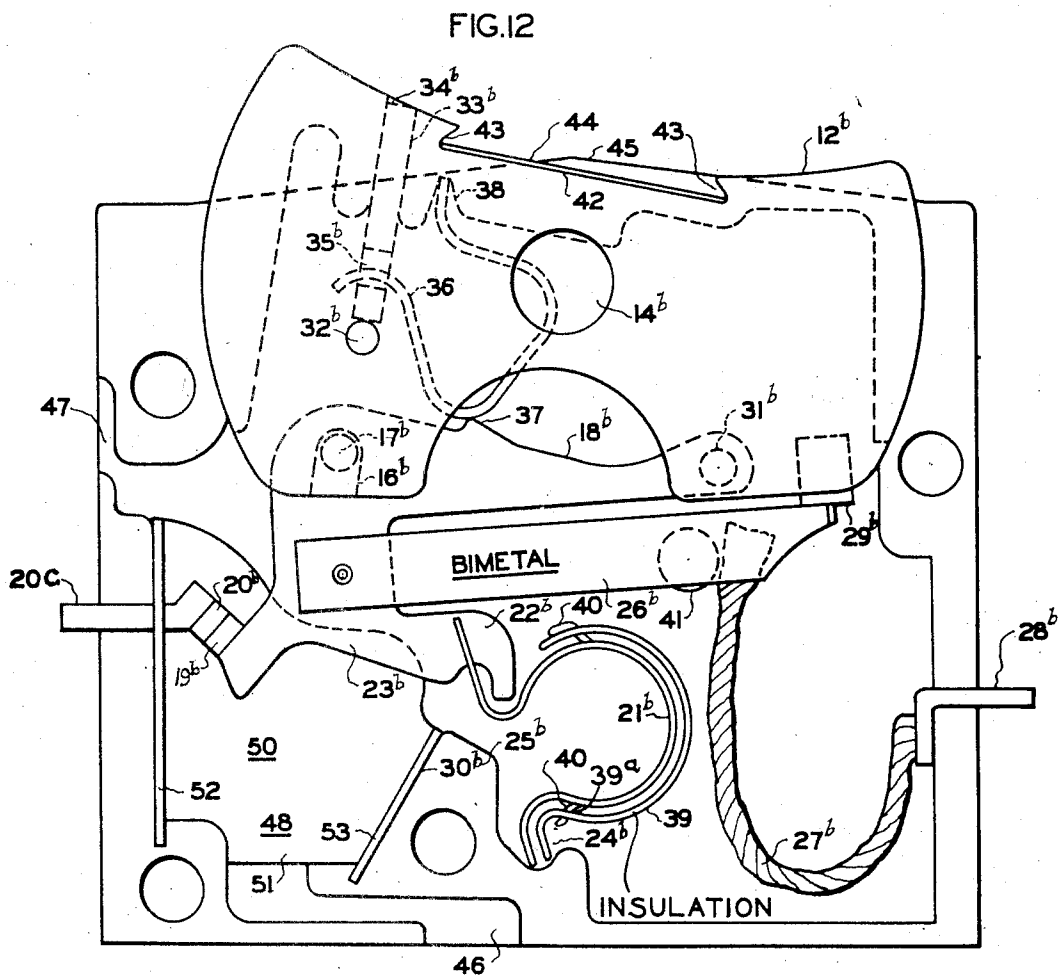


FIG. II



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CIRCUIT BREAKER

Filed Jan. 27, 1941

8 Sheets-Sheet 6

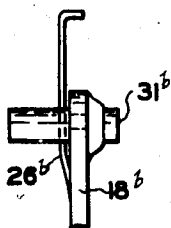


FIG. 13

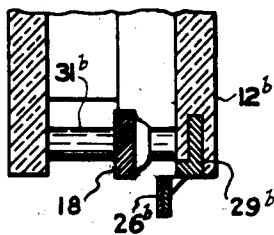


FIG. 14

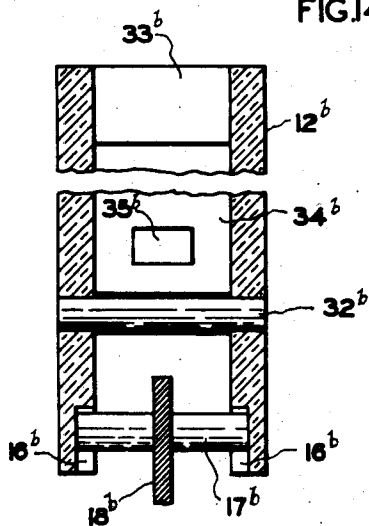


FIG. 15

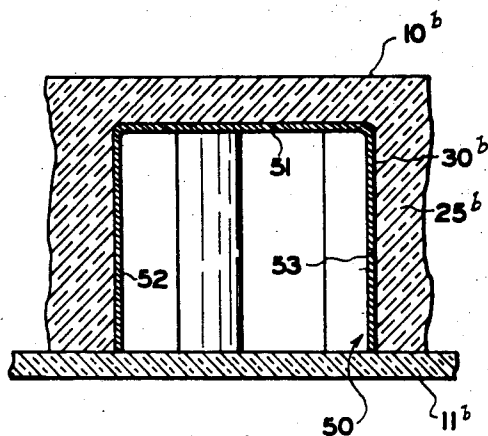


FIG. 16

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CIRCUIT BREAKER

Filed Jan. 27, 1941

8 Sheets-Sheet 7

FIG.17

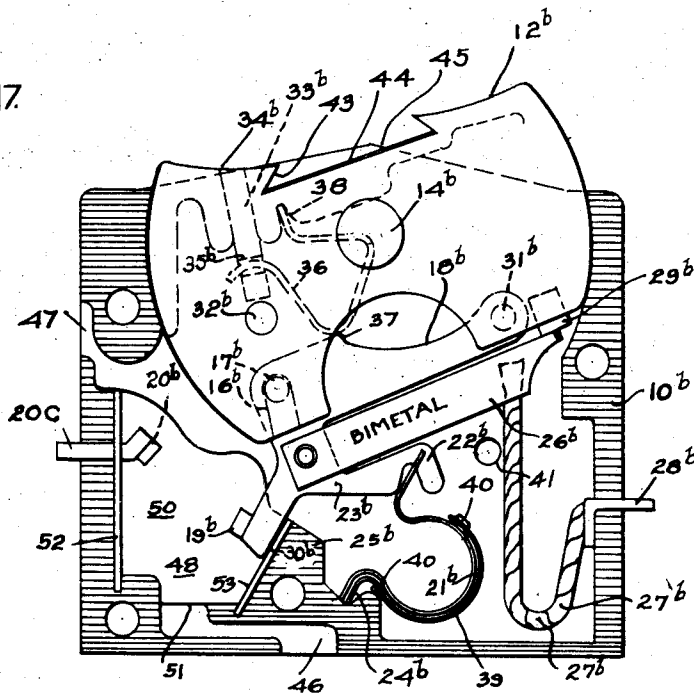
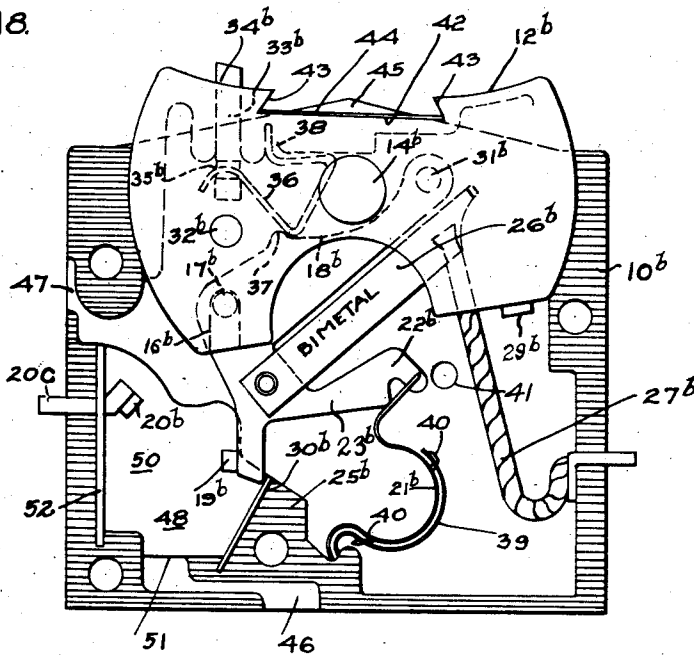


FIG.18



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CIRCUIT BREAKER

Filed Jan. 27, 1941

8 Sheets-Sheet 8

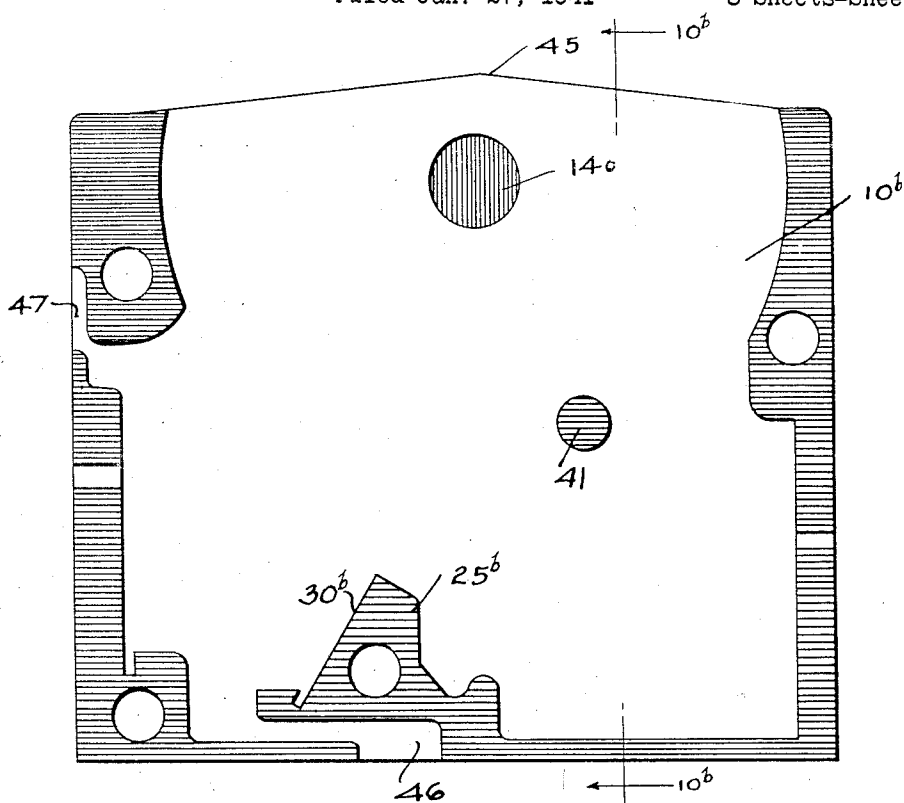


FIG. 19.

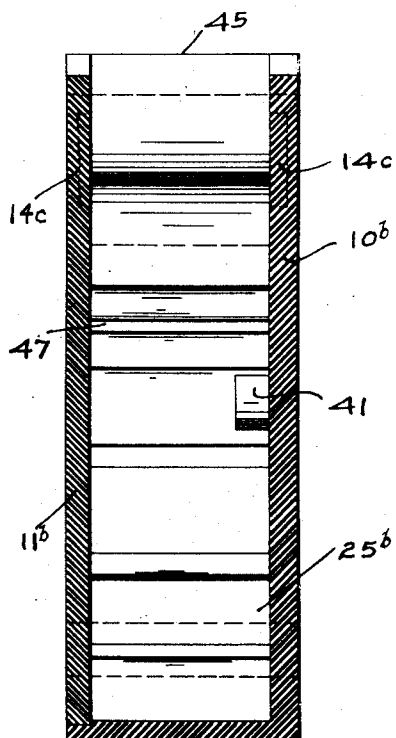


FIG. 20.

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UNITED STATES PATENT OFFICE

2,330,237

CIRCUIT BREAKER

Elwood T. Platz, Detroit, Mich., assignor to Bulldog Electric Products Company, Detroit, Mich., a corporation of West Virginia

Substituted for abandoned applications Serial No. 232,806, October 1, 1938, and Serial No. 302,783, November 3, 1939. This application January 27, 1941, Serial No. 376,036

40 Claims. (Cl. 200—116)

This application relates to circuit breakers.

For a detailed understanding of the circuit breakers herein disclosed, reference should be had to the appended drawings. In these drawings,

Figs. 1-10 show a two spring embodiment, and Figs. 11-20 show a single spring embodiment. Specifically,

Fig. 1 is a plan view of a twin breaker partially cut away on line 1—1 of Fig. 2;

Fig. 2 is a cut-away elevation view of the parts in "On" or closed circuit position;

Fig. 2a is a section on line 2a—2a of Fig. 2;

Fig. 3 is a view like Fig. 2 but showing the parts in the "Off" or open circuit position;

Fig. 4 is a similar view showing the parts in "Tripped" or overload released position;

Fig. 4a is a section on line 4a—4a of Fig. 4;

Fig. 5 shows the parts during the first portion of the relatching movement;

Fig. 6 is a composite view showing moving parts of the breaker;

Fig. 7 shows a modified form of construction;

Figs. 8-10 are views like Figs. 1-2-2a of another modification;

Fig. 11 is a top plan view of a circuit breaker;

Fig. 12 is a front view, with cover removed for purposes of clarity, showing the parts in closed circuit position;

Figs. 13 to 16 are fragmentary details;

Fig. 17 is a front view like Fig. 12 but showing the parts in the open circuit position following manual operation;

Fig. 18 is a view like Fig. 17 but showing the parts in open circuit position following an automatic overload release movement of the parts;

Fig. 19 is a front view of the casing of the breaker, with cover removed;

Fig. 20 is a section on line 20—20 of Fig. 19 but showing the cover in place.

The two spring breaker—Figs. 1-10

These figures of the drawings show a twin casing 10 having compartments 11, each containing and closed by a rocker type cup shaped handle or actuator 12 mounted on a pivot 14 and having in its inside walls V-contour notches 16 whose apexes receive the ends of a pin 17 fixed to and forming part of a contact cradle or contact operating bar or arm 18 having a contact 19 mating with a stationary contact 20 mounted on the terminal connector 20a. The handle is biased by a leaf spring 21 whose upper end 22 engages lugs 23 formed on the lower edges of the handle 12 and whose lower end is seated in and is se-

cured to the floor of a seat or block 24 of the compartment floor 25. Integrally secured to the cradle 18 at its contact end is a bimetal latch 26 connected by a flexible lead 27 to a terminal connector 28. The free end of the latch cooperates with a latching portion in the form of an abutment 29 within the handle and secured to a wall thereof by a rivet 29a to latch the cradle and the handle to each other, releasably. The edge of the floor block is formed as a stop 30.

A guide pin 31 in the free end 32 of the cradle is adapted to engage and ride against the inner walls of the handle for guiding the cradle in its movement with respect to the handle.

In addition to the actuator biasing spring 21 there is provided an overload release tension spring 33 having its ends connected respectively to the cradle at 34 and to the handle at 35.

Operation

On: Fig. 2.—Spring 21 urges the handle and cradle, latched together as a unit by the engagement of latch 26 with abutment 29, to rotate clockwise around pivot 14; stopping is assured by the contact engagement at 19—20.

Off: Fig. 3.—When the left end of handle 12 is pressed down, the handle and cradle rotate counterclockwise as a unit around pivot 14, the parts stopping when the contact end of the cradle engages stop 30 of the compartment floor block. Snap action is provided by the spring 21 riding on the hill and valley cam 23 of the handle.

Return to the "On" position of Fig. 2 is accomplished merely by pressing down on the right end of handle 12 to cause lug 23 to cross over the hill of spring 21 whereupon spring 21 will give a snap movement to the handle and the parts associated and moving therewith.

Trip: Fig. 4.—When the latch 26 warps out from under abutment 29 on handle 12, spring 33 pulls the cradle and latch upwardly and further into handle 12, the cradle rocking counterclockwise on pin 17 as a journal, to open the circuit. This action will take place even if the handle be held.

Relatch: Fig. 5 and Fig. 3.—Relatch is accomplished manually by pressing down on the left end of the handle; in the early part of the movement, the left end of the cradle will engage stop 30 to terminate movement of the cradle and latch. (Fig. 5.) Further pressing down of the handle to the position of Fig. 3 causes abutment 29 to pass beyond the free end of the cooled latch 26 to complete reset or relatch.

It will be observed that spring 21 functions

only on manual operation and that spring 33 functions only on overload release. In this way, prolongation of the life of the breaker is assured because the spring action is provided by two springs working at different times, rather than by one spring only.

The manual operation spring may be formed as shown at 21a in Fig. 7 in which case the upper part 22a of such spring will cooperate with notches 23a formed in the lower edges of the handle and the lower end of the spring will cooperate with notches formed in the compartment floor block.

It will also be observed from Figs. 8-10 that the pin 31 may well be formed as a screw threaded into the part 32 of the cradle 18. One end of the screw will be formed as a slotted head. The other end of the screw will be squared off to abut the inner wall of the handle 12. Adjustment of the screw 31 in part 32 of cradle 18 may be effected for calibrating the relative position of the bimetal 26 and the abutment 29 with respect to which the bimetal 26 warps.

It will also be observed that the use of the rocker type handle, such as the handle 12 herein disclosed, is of considerable advantage, as contrasted with the tumbler type handles now in use. When a tumbler type handle is gripped by the operator, the projecting end of the handle is surrounded by the fingers of the operator and although he may push on the handle with some of his fingers, others of his fingers may act to retard movement of the handle and this may happen without any deliberate attempt on the part of the operator to retard free movement of the handle. In the case of a rocker type handle, such as the one here indicated, no matter how the operator exerts his force against the handle, he will do nothing more than push one end of the handle and will at no time retard the movement of the handle, unless of course the operator deliberately attempts to restrain or retard movement of the handle.

By the use of a rocker type handle, quick make and break is obtained even though an extremely simple operating mechanism is employed, whereas in the case of tumbler type handles, due to the probability that manipulation of the handle by the operator will tend to retard movement of the handle to some extent, complicated operating mechanisms are necessarily employed to provide quick make and break and overcome such retarding tendency.

The single spring breaker—Figs. 11-20

The figures of the drawings show a circuit breaker having a single spring 21a replacing the two springs 21 and 33 of the two spring breaker previously described. The single spring engages the arm between the handle pivot and the pivotal interconnection of the handle and arm for providing all of the desired spring forces. That spring, in closed circuit position, biases the arm counterclockwise on its pivot and the handle clockwise on its pivot; and in open circuit position biases both the arm and the handle counterclockwise on their pivots.

This embodiment is also provided with an indicator block shown in these figures which could be as well provided on the two spring breaker if desired.

Referring now to Figs. 11-20 of the drawings, it will be seen that the circuit breaker therein shown comprises a casing including a one piece molded insulation body 10b having a back, a bot-

tom, and two ends, with an open front and top. The front is adapted to be closed by a flat insulation front plate 11 secured thereto by means of bolts or rivets passing through holes of the body and cover. Within the casing and closing the top is a rocker type cup shaped or hollow casing which forms an actuator or handle 12 having on its front and back walls lugs 14b seated in corresponding recesses 14c in the front and back of the casing to form a pivotal mounting for the handle. On the inside of the handle walls are formed facing grooves 16b opening to the lower edge of the handle and receiving the ends of a pin 17b fixed to and forming part of a contact arm or bar or cradle 18b having a contact 19b mating with the stationary contact 20b mounted on the end of a terminal connector 20c which passes through an end wall of the casing. For biasing the contact arm or cradle there is provided a leaf spring 21 whose upper end is notched to receive the notched part 22b forming the end of a portion 23b extending downwardly from the cradle or contact arm 18b.

The lower end of the spring seats in a notch 24b of a block 25b integral with the casing body. Integrally secured to the cradle 18b near its contact end 19b is a bimetal latch 26b connected by a flexible lead 27b to a terminal connector 28b on and exposed at the other end of the casing. The free end of the latch, which is bent over as indicated, cooperates with a metallic abutment insert 29b fixed to the handle near an end thereof and at the lower open edge of the handle whereby the latch may operate to latch the cradle and the handle to each other releasably. The side 30b of the block 25b forms a stop for that portion of the cradle which carries the contact 19b.

A guide pin 31b in the free end of the cradle is adapted to engage and ride against the inner surfaces of the handle for guiding the cradle in its movement with respect to the handle.

A pin 32b passes through the handle in line with and to form a stop for a replaceable and readily removable block 33b of insulation having the breaker rating marked on its upper end and disposed within a slot 34b in the upper or closed surface of the handle near an end thereof, and in the lower end of the block is formed a slot 35b receiving one end of a flat leaf U-shaped spring 36 whose bight is positioned near a lug 37 formed on the cradle 18b and the other end of the spring seats within a notched portion 38 on the inside of the upper surface of the handle.

An insulating shield 39 formed of a strip of fiber having slots 39a at its ends covers the convex surface of the spring 21b to prevent electrical contact between the spring and the flexible lead 27b, the shield being held on the spring by lugs 40 of the spring projecting through the slots of the shield.

On the inside of the casing there is provided a boss 41 which is adapted to be engaged by the lower edge of the handle whereby its motion may be limited and which also operates to prevent the spring 21b from accidentally jumping out of the casing.

The upper or closed surface of the handle is formed with a transverse slot 42 having undercut ends 43 as indicated to provide a surface against which may be mounted a circuit indication card 44, the ends of the card being received in the ends 43 of the handle slot and the resilience of the card, or of its cover if one be used, helping to retain the card in place on the

handle. The sides of the casing are extended beyond the upper surface of the handle as at 45 near the card to prevent the card from sliding out of the handle sidewise.

Vents 46—47 communicate the arc chamber part 48 of the interior of the casing with the outside near the contacts. One of the vents, 46, provides a tortuous path from the lower part of the arc chamber 48 past the block 25 and out through the bottom of the casing. The other vent, 47, goes through the end wall to communicate the arc chamber with the outside at the end wall. A U-shaped fiber shield 50 having its bight 51 against the back of the casing and having its sides 52 and 53 disposed one against an end wall of the casing and the other against the stop surface 30b of the block 25b helps prevent the arcs from adversely affecting the casing body 10b which is formed of one piece. The front plate 11b of the casing consists of nothing more than a fibrous sheet and since this material, unlike molded insulation, is not hurt by arcs there is no necessity for shielding the plate 11b.

Operation

Spring 21b urges the handle and cradle, latched together as a unit by the engagement of the latch 26b with abutment 29b, to rotate clockwise around pivot 14b; stopping is assured by the butt pressure contact engagement at 19—20.

When the left end of handle 12b is pressed down, the handle and cradle rotate counterclockwise as a unit around pivot 14b, the parts stopping when the contact end of the cradle engages stop 30b of the compartment floor block 25b. Snap action is provided by the line of action of spring 21b crossing pivot 14b.

Return to the "On" position is accomplished merely by pressing down on the right end of handle 12b to rotate the handle and cradle clockwise on pivot 14b; the line of action of spring 21b will cross the pivot to give a snap movement to the handle and the parts associated and moving therewith.

When the latch 26b warps out from under abutment 29b on handle 12b, as on overload, spring 21b pushes the cradle and latch upwardly and further into handle 12b, the cradle rocking counterclockwise on pin 17b as a journal, to open the circuit. This action will take place even if the handle be held.

At the same time lug 37 will push spring 36 and block 34b upwardly to indicate that there has been a trip release movement of the parts.

Reset or relatch is accomplished manually by pressing down on the left end of the handle, with the start of the reset operation taking place at a time when the contact end at 19b of the cradle 18b abuts the stop 30b. The pressure on the left end of the handle will be transmitted onto the cradle 18b at pins 17b and thus the cradle will rotate clockwise with the engagement of the cradle at stop 30b forming a fulcrum for the cradle; meanwhile the right end of the handle will move upwardly due to the pressure on the left end of the handle pivoting around its pivot 14b. Thus the right end of the cradle will move downwardly and the right end of the handle will move upwardly and after a time the abutment 29b of the handle will pass beyond the free end of the coiled latch 26b tapered for this purpose, to complete the reset, with the cradle once more latched to the handle.

It will be seen that the spring 21b, the only operating spring for the device, is an overcenter

spring, whereby it will provide a snap force for the movable contact at least in the final part of each movement of the movable contact. The spring 21b will establish and maintain contact pressure in the closed circuit position at contacts 19b—20b and also provides a spring stress where latch 26b engages abutment 29b of the handle when the parts are in closed circuit position and thus provides a trip release bias on the movable contact whereby the latter will move automatically to open circuit position in the event of a release at the latch connection 26b—29b.

It will also be seen that movement of the handle, when the latch connection 26b—29b holds, positively causes movement of the contact without depending for the contact movement upon the tensioning of the spring 21b and waiting for that spring to throw the contact to its desired position.

However, despite the fact that the handle provides positive actuation for the contact, the handle also moves to tension and shift the spring whereby snap action in the final part of the movement and contact will be assured.

The latch connection 26b—29b, when established, creates a unit of parts 12b—18b and that unit moves without relative motion of the parts thereof for manual actuation. For overload release, however, with the latch connection destroyed, the contact is moved by the spring free of the handle 12b, there being no unit of contact 18b and handle 12 at this time, and thus the desired trip free action is insured.

The indicator 34b forms part of the handle and at all times moves with it. Like any other part of the handle, however, it may be held without interfering with free movement of the contact from the closed circuit position in the event of latch release due to overload. If held, it will not function to indicate but at the same time it will not interfere with circuit opening. If not held, or if released, it will then assume its indicating position.

After an overload release of the parts, the handle 12b may be moved to relatch itself at 29b—26b to the movable contact without, however, causing that movable contact to assume its circuit closing position.

The actuator or handle is mounted on a fixed pivot 14b and in turn provides a pivotal mounting at 16b—17b for the contact which is again connected to the actuator by the releasable latch connection 26b—29b and thus the actuator forms the entire support and mounting for the contact as well as for the latch which is integrally secured to and forms part of the contact. The spring 21b, acting on the unit, consisting of the actuator and the contact and acting on the contact alone when it is no longer latched to the actuator, reacts on a part remote from the handle, namely the breaker casing, so that it may function independently of the handle.

The spring 21b functions to maintain contact pressure when the parts are in closed circuit position but in addition to maintain the parts in the open circuit position once the parts have been moved to that position.

An important feature is the fact that the pivot 17b for the handle is not concentric with the pivot 17b for the contact but is spaced therefrom with the spring 21b disposed between the pivots 14b and 17b. The relation of these two pivots with respect to the spring determines the relative contact pressure and latch engagement pressure.

As shown here, the moment arm of spring 21b about pivot 14b, establishing contact pressure, is considerably greater than the moment arm of spring 21b about pivot 17b, establishing latch pressure, and consequently the contact pressure is considerably greater than the latch pressure.

The connection between the contact and the actuator at pivot 17b is in the form of a slot. Thus, if pressure be applied improperly at the right end of the handle 12, Fig. 12, that pressure will not deflect bimetal 26b downwardly and injure it but instead will rock the handle 12b slightly on its pivot 14b and at the same time slide abutment 29b along the edge of bimetal 26b to take up the slight travel of the handle in response to the improper pressure on it, and this arrangement prevents injury to the bimetal.

The parts herein disclosed are so constructed that calibration and adjustment may be made before the parts are assembled whereby interchangeability of assembly is assured. The end of the latch is properly located with respect to the ends of pin 31b during the manufacture of the sub-assembly 18b—26b. The abutment 29 is accurately located with respect to the interior surface or walls of the handle 12b when insert 29 is embedded in the handle. The length of pin 31b is accurately adjusted to the distance between the interior walls of handle 12b, both distances being held to close limits. Thus knowing that these two distances are held to close limits and that latch 26b is properly located with respect to the ends of pin 31b and insert 29b is properly located with respect to the inner dimensions of the handle, assurance may be had that when the cradle 18b—26b is disposed within the handle, pin 21b will not only function as a guide for the moving end of the cradle, but in addition will insure the proper and desirable amount of overlap of the end of latch 26b on the abutment 29b to insure accurate adjustment of the parts.

It will also be observed that the breaker casing, being open sided, facilitates the assembly of the parts therein and with respect to one another.

The rocker handle herein disclosed is of particular importance in this type of breaker wherein there are numerous forces and operating characteristics, namely forces which insure contact pressure in closed circuit position, which insure open circuit movement of the contact on overload, and which insure snap action on manual actuation, and which insure positive actuation of the contact by the handle plus simultaneous shifting and stressing of the overcenter spring. In this type of breaker a rocker handle has been found to give a peculiarly satisfactory response to the hand of the user or operator of the device.

The interrelation of the various points 14, 17, 22, 29, and 19 may be reviewed as follows:

In the closed circuit position point 22 is between handle pivot 14 and contact 19, whereas in the open circuit position handle pivot 14 is between spring point 22 and contact 19, the shifting of these various points and particularly of the spring point 22 being the overcenter action that determines the position of the unit 18—12 and that supplies contact pressure at 19; spring point 22 is between arm pivot 17 and latch point 29 in order to supply the overload release bias; as a result spring point 22 is located between handle pivot 14 and the arm pivot 17.

Now referring to both types of breakers here shown:

It will be observed that in the resetting or

relatching of the arm and actuator the arm as well as the actuator is caused to move. The arm pivots on an abutment to rotate in a clockwise direction while the actuator is rotating counterclockwise on its pivot. Thus the latching ends of the arm and actuator will scissors past each other until they interlatch once more.

The spring 21 opposes handle movement from the "On" towards the "Off" position at least until the spring reaches overcenter, but this is true only when there is a latch engagement. When the latch engagement has been released, similar movement of the handle for causing relatching of the arm and handle will be opposed by the spring but the latter will not shift overcenter and the sole function of the spring at that time is to maintain the arm and actuator in relative assembly and to maintain the actuator in the breaker casing. Thus there is an altogether different feeling of resistance imparted to the hand of the operator during the relatching operation than the feeling of resistance he receives when he rocks the handle for switching action.

The biasing means shown (21 and 33, or 21 alone) functions not only to retain the arm in its seated position with respect to the handle but also to retain the handle in assembly in the casing.

The provision of lost motion at the pivotal interconnection 16—17 is of importance, in that it prevents overcentering of the latch at 29. Suppose a force were applied downwardly on the handle 12 at the right end thereof when the latch engagement is maintained and the circuit is closed. If there were no lost motion at 16—17, then there would be a considerable stress on the latch at 29. However, because pivot 17 can slide downwardly in slot 16, a similar cause does not create a similar result. Instead, the arm will rotate on the stationary contact 20 as a pivot and move relative to the handle with the pivot 17 sliding downwardly in the slot 16. This action will continue until the lower edge of the handle, at its right end, reaches the stop 41 which terminates all movement of the parts.

The spring 36 between the arm 18 and the indicator block 34 prevents mischievous interference with the proper operation of the circuit breaker on overload release. Assume a mischievously applied force holds down the block 34. This will not interfere with free movement of the arm 18 caused by the spring 21 alone, or spring 33 alone, if the latch 26 releases, due to the presence of the light spring 36 between the arm 18 and the block 34.

When the circuit is closed, the biasing means biases the arm 18 counterclockwise on its pivot 17 and at the same time biases the handle 12 clockwise on its pivot 14. Thus, when the circuit is closed, the rotative biases on parts 18—12 are in opposite directions. However, when the circuit is open, there is a bias on both the arm 18 and the handle 12 counterclockwise on their respective pivots 17 and 14.

Because the biasing spring 21 is arranged to be of the overcenter type it is first stressed when the handle is moved to and from open circuit position, when the latch holds, and this stress, as well as opposition to handle movement, continues until the overcenter position is reached, whereupon the spring relieves itself of stress and snaps the handle, and with it the arm 18, to the end of its stroke.

This application is a substitute for my two applications, Serial No. 232,806, filed October 1,

1938, allowed November 27, 1940, and Serial No. 302,783, filed November 3, 1939, allowed October 11, 1940; Figs. 1-10 hereof correspond to Figs. 1-10 of application, Serial No. 232,806; and Figs. 11-20 hereof correspond to Figs. 1-10 of application, Serial No. 302,783.

Now having described the two circuit breakers herein disclosed, reference should be had to the claims which follow.

I claim:

1. In a manually operable automatically opening circuit breaker, a handle having a slot in a wall thereof, an indicator block in said slot and adapted to be projected beyond the handle wall, a light spring retaining the block against its being so projected, and means adapted to move on overload and operatively connected to the block only through the spring to project the block outwardly beyond the wall for overload release indication.

2. In a circuit breaker having a stationary member, an arm, an actuator pivotally mounted at one point and pivotally connected to the arm at another and different point, means releasably latching the arm to the actuator at a third point, and a biasing spring for the arm engaging it at a point between the two first named points for snapping it to rest on manual movement thereof, when the latch holds, and for moving it from the stationary member, free of the actuator, on latch release, said spring providing all of the biasing forces for the movements of the arm, the spring operating, when the parts are in closed circuit position, to bias the arm and actuator in different rotative directions about their pivots and, when the parts are in open circuit position, to bias the arm and actuator in the same rotative directions about their pivots.

3. In a circuit breaker having a stationary member, an arm, a pivotally mounted actuator therefor, the arm being pivotally mounted at one point, means releasably latching the arm to the actuator at a different point, and a biasing spring for the arm arranged to move it from the stationary member, free of the actuator, on latch release, a biasing spring for the actuator arranged to snap it to rest on manual movement thereof to closed circuit position, and to open circuit position as well.

4. In a circuit breaker having a stationary member, an arm, a pivotally mounted actuator pivotally connected to the arm at one point, means releasably interlatching the arm and actuator at another point, a biasing means for snapping the arm to rest on manually initiated movements thereof when the latch holds and for moving it from the stationary member when the latch releases, free of the actuator, said biasing means operating, when the parts are in closed circuit position, to bias the arm and actuator to rotate as a unit around the actuator pivot, in one direction, and operating, when the parts are in open circuit position, to rotate the arm and actuator as a unit around the actuator pivot, in an opposite direction.

5. In a circuit breaker having a stationary member, an arm, a pivotally mounted actuator pivotally connected to the arm at one point, means releasably interlatching the arm and actuator at another point, a biasing means for snapping the arm to rest on manually initiated movements thereof when the latch holds and for moving it from the stationary member when the latch releases, free of the actuator, said biasing means operating, when the parts are in closed

circuit position, to bias the arm and actuator to rotate as a unit around the actuator pivot, in one direction, and operating, when the parts are in open circuit position, to rotate the arm and actuator as a unit around the actuator pivot, in an opposite direction, the biasing means comprising a single spring directly engaging the arm, and providing all biasing forces required for arm operation.

6. In a circuit breaker, a stationary member, a pivotally mounted actuator, an arm pivotally connected thereto at one point, means interlatching the arm and actuator at another point, a biasing means for snapping the arm to rest on all manually initiated movements of the actuator, when the latch holds, and for moving it from the stationary member, when the latch releases, free of the actuator, said biasing means operating, when the parts are in closed circuit position, to bias the arm and actuator in different rotative directions about their pivots, and, when the parts are in open circuit position, to bias the arm and actuator in the same rotative directions about their pivots.

7. In a circuit breaker, a stationary member, a pivotally mounted actuator, an arm pivotally connected thereto at one point, means interlatching the arm and actuator at another point, a biasing means for snapping the arm to rest on all manually initiated movements of the actuator, when the latch holds, and for moving it from the stationary member, when the latch releases, free of the actuator, said biasing means operating, when the parts are in closed circuit position, to bias the arm and actuator in different rotative directions about their pivots, and, when the parts are in open circuit position, to bias the arm and actuator in the same rotative directions about their pivots, the biasing means comprising a single spring directly engaging the arm, and providing all biasing forces required for arm operation.

8. In a circuit breaker, a stationary member, a pivotally mounted actuator, an arm pivotally connected thereto at one point, means interlatching the arm and actuator at another point, a biasing means for snapping the arm to rest on all manually initiated movements of the actuator, when the latch holds, and for moving it from the stationary member, when the latch releases, free of the actuator, said biasing means operating, when the parts are in closed circuit position, to bias the arm and actuator in different rotative directions about their pivots, and, when the parts are in open circuit position, to bias the arm and actuator in the same rotative directions about their pivots, the biasing means operating to hold the arm and actuator in pivotal interconnection, and to hold the actuator in its place in the breaker.

9. In a circuit breaker having a stationary member, an arm, an actuator pivotally mounted at one point and pivotally connected to the arm at another and different point, means releasably latching the arm to the actuator at a point remote from their pivotal interconnection, and a biasing spring for the arm engaging it at a point between the two first named points for snapping it to rest on manual movement thereof, when the latch holds, and for moving it from the stationary member, free of the actuator, on latch release, said spring providing all of the biasing forces for the movements of the arm, the spring operating, when the parts are in closed circuit posi-

tion, to bias the arm and actuator in different rotative directions about their pivots and, when the parts are in open circuit position, to bias the arm and actuator in the same rotative directions about their pivots.

10. In a circuit breaker having a stationary member, an abutment, a pivotally mounted actuator, an arm pivotally connected to the actuator at one point, and interlatched to the actuator at another point, biasing means for moving the arm on its pivot relative to the actuator, on latch release, away from the stationary member, the parts being so arranged that the actuator may be moved thereafter on its pivot to pivot the arm on the abutment so as to restore the latching interengagement of the arm and actuator, the arm and actuator moving relatively for relatching the biasing means and the latch, when it holds, causing the arm to move in unison with the actuator on all other movements of the actuator.

11. In a circuit breaker having a stationary member, an abutment, a pivotally mounted actuator, an arm pivotally connected to the actuator at one point, and interlatched to the actuator at another point, biasing means for moving the arm on its pivot relative to the actuator, on latch release, away from the stationary member, the parts being so arranged that the actuator may be moved thereafter on its pivot to pivot the arm on the abutment so as to restore the latching interengagement of the arm and actuator, the arm and actuator moving relatively for relatching the biasing means and the latch, when it holds, causing the arm to move in unison with the actuator on all other movements of the actuator, the biasing means operating to bias the arm against the stationary member, when the parts are in closed circuit position.

12. In a circuit breaker having a stationary member, an abutment, a pivotally mounted actuator, an arm pivotally connected to the actuator at one point, and interlatched to the actuator at another point, biasing means for moving the arm on its pivot relative to the actuator, on latch release, away from the stationary member, the parts being so arranged that the actuator may be moved thereafter on its pivot to pivot the arm on the abutment so as to restore the latching interengagement of the arm and actuator, the arm and actuator moving relatively for relatching the biasing means and the latch, when it holds, causing the arm to move in unison with the actuator on all other movements of the actuator, the biasing means operating to bias the parts to rest on all manually initiated movements of the actuator.

13. In a circuit breaker, a casing, an actuator pivotally connected thereto, an arm pivotally connected to the actuator at one point and releasably latched thereto at another, and a single spring for holding the actuator in place in the breaker, and for holding the arm in pivotal and latching engagement with the actuator, the pivotal constructions being such as to permit the parts to separate readily, except when the spring holds arm to actuator and actuator to casing.

14. In a circuit breaker, a casing, an actuator pivotally connected thereto, an arm pivotally connected to the actuator at one point and releasably latched thereto at another, and a single spring for holding the actuator in place in the breaker, and for holding the arm in pivotal and latching engagement with the actuator, the pivotal constructions being such as to permit the

parts to separate readily, except when the spring holds arm to actuator and actuator to casing, the spring also serving to impart operating biasing forces to the arm.

15. In a circuit breaker, a casing, an actuator pivotally connected thereto, an arm pivotally connected to the actuator at one point and releasably latched thereto at another, and a single spring directly engaging the arm for holding the actuator in place in the breaker, and for holding the arm in pivotal and latching engagement with the actuator, the pivotal constructions being such as to permit the parts to separate readily, except when the spring holds arm to actuator and actuator to casing.

16. In a circuit breaker, a casing, an actuator pivotally connected thereto, an arm pivotally connected to the actuator at one point and releasably latched thereto at another, and a single spring directly engaging the arm for holding the actuator in place in the breaker, and for holding the arm in pivotal and latching engagement with the actuator, the pivotal constructions being such as to permit the parts to separate readily, except when the spring holds arm to actuator and actuator to casing, the spring also serving to impart operating biasing forces to the arm.

17. In a circuit breaker, a stationary member, an actuator, an arm pivotally connected thereto at one point and latched thereto at another, the arm, at a third point thereof, engaging the stationary member, and spring means holding the arm and actuator together, the pivotal interconnection being formed with lost motion whereby the arm and actuator may move relatively on the application of a force to the actuator in an undesirable direction when the latch holds and the arm engages the member, the arm then pivoting on the member.

18. In a circuit breaker, an arm, an actuator therefor, means pivotally interconnecting arm and actuator at one point, means releasably interlatching arm and actuator at another point, an overcenter spring biasing means for the actuator which, on manual actuation, first strongly opposes arm and actuator movement and then strongly aids arm and actuator movement, and which is arranged to cause the arm to move relatively to the actuator on latch release, and which strongly resists such arm and actuator movement as is necessary to cause relatching of arm and actuator after the latch had released them and the arm had moved, the spring being arranged to remain stationary and not shift overcenter during the relatching operation.

19. In a circuit breaker having a stationary member, an arm, an actuator pivotally mounted at one point and pivotally connected to the arm at another and different point, means releasably latching the arm to the actuator at a third point, and a biasing spring for the arm engaging it at a point between the two first named points for snapping it to rest on manual movement thereof, when the latch holds, and for moving it from the stationary member, free of the actuator, on latch release, said spring providing all of the biasing forces for the movements of the arm, the spring operating, when the parts are in closed circuit position, to bias the arm and actuator in different rotative directions about their pivots and, when the parts are in open circuit position, to bias the arm and actuator in the same rotative directions about their pivots, the spring snapping the arm to rest on all manually initiated movements thereof when the latch holds.

20. In a circuit breaker having a stationary member, an arm, an actuator pivotally mounted at one point and pivotally connected to the arm at another and different point, means releasably latching the arm to the actuator at a third point, and a biasing spring for the arm engaging it at a point between the two first named points for snapping it to rest on manual movement thereof, when the latch holds, and for moving it from the stationary member, free of the actuator, on latch release, said spring providing all of the biasing forces for the movements of the arm, the spring operating when the parts are in closed circuit position, to bias the arm and actuator in different rotative directions about their pivots and, when the parts are in open circuit position, to bias the arm and actuator in the same rotative directions about their pivots, the pivotal connection between arm and actuator comprising a seat on the actuator, with the spring and latch operating to hold the arm in seated position with respect to the actuator.

21. In a circuit breaker having a stationary member, an arm, an actuator pivotally mounted at one point and pivotally connected to the arm at another and different point, means releasably latching the arm to the actuator at a third point, and a biasing spring for the arm engaging it at a point between the two first named points for snapping it to rest on manual movement thereof, when the latch holds, and for moving it from the stationary member, relative to the actuator, on latch release, said spring providing all of the biasing forces for the movements of the arm, the spring operating, when the arm and actuator are in closed circuit position, to bias the arm and actuator in different rotative directions about their pivots and, when the arm and actuator are in open circuit position, to bias the arm and actuator in the same rotative directions about their pivots, the actuator comprising a rocker push-only no-pull handle, with the pivotal mounting therefor being between its ends.

22. In a circuit breaker having a stationary member, an arm, an actuator pivotally mounted at one point and pivotally connected to the arm at another and different point, means releasably latching the arm to the actuator at a third point, and a biasing spring for the arm engaging it at a point between the two first named points for snapping it to rest on manual movement thereof, when the latch holds, and for moving it from the stationary member, relative to the actuator, on latch release, said spring providing all of the biasing forces for the movements of the arm, the spring operating, when the arm and actuator are in closed circuit position, to bias the arm and actuator in different rotative directions about their pivots and, when the arm and actuator are in open circuit position, to bias the arm and actuator in the same rotative directions about their pivots, the actuator comprising a rocker push-only no-pull handle, with the pivotal mounting therefor being between its ends, and also between the points of interconnection of the arm and actuator.

23. In a circuit breaker having a stationary member, an arm, a pivotally mounted actuator therefor, the arm being pivotally mounted at one point, means releasably latching the arm to the actuator at a different point, and a biasing spring for the arm arranged to move it from the stationary member, relative to the actuator, on latch release, a biasing spring for the actuator arranged to snap it to rest on manual movement

thereof, the pivotal mounting for the arm being a seat on the actuator, the first named spring and the latch operating to hold the arm in seated position with respect to the actuator.

24. In a circuit breaker having a stationary member, an arm, a pivotally mounted actuator therefor, the arm being pivotally mounted at one point, means releasably latching the arm to the actuator at a different point, and a biasing spring for the arm arranged to move it from the stationary member, relative to the actuator, on latch release, a biasing spring for the actuator arranged to snap it to rest on manual movement thereof, the pivots for the arm and actuator being non-concentric or spaced from each other.

25. In a circuit breaker, a stationary member, an arm, an actuator therefor pivotally mounted between its ends, and formed as a rocker push-only no-pull handle, the arm being pivotally mounted at one point, means releasably latching the arm to the actuator at a different point, a biasing spring for the arm for moving it from the stationary member, relative to the actuator, on latch release, and a biasing spring for the actuator arranged to snap it to rest on its manual movement.

26. In a circuit breaker, a stationary member, an arm, a pivotally mounted actuator therefor, the arm being pivotally mounted at one point, means releasably latching the arm to the actuator at a different point, a biasing spring for the arm for moving it from the stationary member, relative to the actuator, on latch release, and a biasing spring for the actuator arranged to snap it to rest on its manual movement, the arm biasing spring being within and thus shielded by the actuator, and being connected to the arm and the actuator.

27. In a circuit breaker, a stationary member, a pivotally mounted actuator, an arm pivotally connected thereto at one point, means interlatching the arm and actuator at another point, a biasing means for snapping the arm to rest on all manually initiated movements of the actuator, when the latch holds, and for moving it from the stationary member, when the latch releases, relative to the actuator, said biasing means operating, when the arm and actuator are in closed circuit position, to bias the arm and actuator in different rotative directions about their pivots, and, when the arm and actuator are in open circuit position, to bias the arm and actuator in the same rotative directions about their pivots, the biasing means operating to hold the arm and actuator in pivotal interconnection, and to hold the actuator in its place in the breaker, the biasing means comprising a single spring directly engaging the arm, and providing all biasing forces required for arm operation.

28. In a circuit breaker having a stationary member, an arm, an actuator pivotally mounted at one point and pivotally connected to the arm at another and different point, means releasably latching the arm to the actuator at a point remote from their pivotal interconnection, and a biasing spring for the arm engaging it at a point between the two first named points for snapping it to rest on manual movement thereof, when the latch holds, and for moving it from the stationary member, relative to the actuator, on latch release, said spring providing all of the biasing forces for the movements of the arm, the spring operating, when the arm and actuator are in closed circuit position, to bias the arm and actuator in different rotative directions about

their pivots and, when the arm and actuator are in open circuit position, to bias the arm and actuator in the same rotative directions about their pivots, the spring snapping the arm to rest on all manually initiated movements thereof when the latch holds.

29. In a circuit breaker having a stationary member, an arm, an actuator pivotally mounted at one point and pivotally connected to the arm at another and different point, means releasably latching the arm to the actuator at a point remote from their pivotal interconnection, and a biasing spring for the arm engaging it at a point between the two first named points for snapping it to rest on manual movement thereof, when the latch holds, and for moving it from the stationary member, relative to the actuator, on latch release, said spring providing all of the biasing forces for the movements of the arm, the spring operating when the arm and actuator are in closed circuit position, to bias the arm and actuator in different rotative directions about their pivots and, when the arm and actuator are in open circuit position, to bias the arm and actuator in the same rotative directions about their pivots, the pivotal connection between arm and actuator comprising a seat on the actuator, with the spring and latch operating to hold the arm in seated position with respect to the actuator.

30. In a circuit breaker having a stationary member, an arm, an actuator pivotally mounted at one point and pivotally connected to the arm at another and different point, means releasably latching the arm to the actuator at a point remote from their pivotal interconnection, and a biasing spring for the arm engaging it at a point between the two first named points for snapping it to rest on manual movement thereof, when the latch holds, and for moving it from the stationary member, relative to the actuator, on latch release, said spring providing all of the biasing forces for the movements of the arm, the spring operating, when the arm and actuator are in closed circuit position, to bias the arm and actuator in different rotative directions about their pivots and, when the arm and actuator are in open circuit position, to bias the arm and actuator in the same rotative directions about their pivots, the actuator comprising a rocker push-only no-pull handle, with the pivotal mounting therefor being between its ends.

31. In a circuit breaker having a stationary member, as arm, an actuator pivotally mounted at one point and pivotally connected to the arm at another and different point, means releasably latching the arm to the actuator at a point remote from their pivotal interconnection, and a biasing spring for the arm engaging it at a point between the two first named points for snapping it to rest on manual movement thereof, when the latch holds, and for moving it from the stationary member, relative to the actuator, on latch release, said spring providing all of the biasing forces for the movements of the arm, the spring operating, when the arm and actuator are in closed circuit position, to bias the arm and actuator in different rotative directions about their pivots and, when the arm and actuator are in open circuit position, to bias the arm and actuator in the same rotative directions about their pivots, the actuator comprising a rocker push-only no-pull handle, with the pivotal mounting therefor being between its ends, and

also between the points of interconnection of the arm and actuator.

32. In a circuit breaker having a stationary member, an abutment, a pivotally mounted actuator, an arm pivotally connected to the actuator at one point, means interlatching the arm and the actuator at another point, biasing means for moving the arm on its pivot relative to the actuator, on latch release, away from the stationary member, the arm and actuator being so arranged that the actuator may be moved thereafter on its pivot to pivot the arm on the abutment so as to restore the latching interengagement of the arm and actuator, the arm and actuator moving relatively for relatching the biasing means and the latch, when it holds, causing the arm to move in unison with the actuator on all other movements of the actuator, the biasing means operating to bias the arm against the stationary member, when the arm and actuator are in closed circuit position, and also operating to bias the arm and actuator to rest on all manually initiated movements of the actuator.

33. In a circuit breaker having a stationary member, an abutment, a pivotally mounted actuator, an arm pivotally connected to the actuator at one point, means interlatching the arm and the actuator at another point, biasing means for moving the arm on its pivot relative to the actuator, on latch release, away from the stationary member, the arm and actuator being so arranged that the actuator may be moved thereafter on its pivot to pivot the arm on the abutment so as to restore the latching interengagement of the arm and actuator, the arm and actuator moving relatively for relatching the biasing means and the latch, when it holds, causing the arm to move in unison with the actuator on all other movements of the actuator, the biasing means comprising a single spring directly engaging the arm, and providing all biasing forces required for arm operation.

34. In a circuit breaker having a stationary member, an abutment, a pivotally mounted actuator, an arm pivotally connected to the actuator at one point, means interlatching the arm and the actuator at another point, biasing means for moving the arm on its pivot relative to the actuator, on latch release, away from the stationary member, the arm and actuator being so arranged that the actuator may be moved thereafter on its pivot to pivot the arm on the abutment so as to restore the latching interengagement of the arm and actuator, the arm and actuator moving relatively for relatching the biasing means and the latch, when it holds, causing the arm to move in unison with the actuator on all other movements of the actuator, the biasing means operating to bias the arm against the stationary member, when the arm and actuator are in closed circuit position, the biasing means comprising a single spring directly engaging the arm, and providing all biasing forces required for arm operation.

35. In a circuit breaker having a stationary member, an abutment, a pivotally mounted actuator, an arm pivotally connected to the actuator at one point, means interlatching the arm and the actuator at another point, biasing means for moving the arm on its pivot relative to the actuator, on latch release, away from the stationary member, the arm and actuator being so arranged that the actuator may be moved thereafter on its pivot to pivot the arm on the abutment so as to restore the latching interengage-

ment of the arm and actuator, the arm and actuator moving relatively for relatching the biasing means and the latch, when it holds, causing the arm to move in unison with the actuator on all other movements of the actuator, the biasing means operating to bias the arm and actuator to rest on all manually initiated movements of the actuator, the biasing means comprising a single spring directly engaging the arm, and providing all biasing forces required for arm operation.

36. In a circuit breaker having a stationary member, an abutment, a pivotally mounted actuator, an arm pivotally connected to the actuator at one point, means interlatching the arm and the actuator at another point, biasing means for moving the arm on its pivot relative to the actuator, on latch release, away from the stationary member, the arm and actuator being so arranged that the actuator may be moved thereafter on its pivot to pivot the arm on the abutment so as to restore the latching interengagement of the arm and actuator, the arm and actuator moving relatively for relatching the biasing means and the latch, when it holds, causing the arm to move in unison with the actuator on all other movements of the actuator, the biasing means operating to bias the arm against the stationary member, when the arm and actuator are in closed circuit position, and also operating to bias the arm and actuator to rest on all manually initiated movements of the actuator, the biasing means comprising a single spring directly engaging the arm, and providing all biasing forces required for arm operation.

37. A switch having a pivoted rocker device, and an overcenter spring for and bearing against the rocker device, the pivot for the device being between its ends, and arranged to be crossed by the spring, for snap action, during movement of the device, the device being of two parts with one a handle and the other a movable contact, means pivotally interconnecting the contact and handle parts of the device at one point of the latter, and means releasably interlatching the contact and handle parts of the device at another point of the latter, the last mentioned means normally holding, so that the two parts of the device form, and move together as, a unit, with the means releasing on overload to permit the contact part of the device to move independently of the handle part of the device, the spring bearing against the contact part of the device so as to move it, on overload, relative to the handle part of the device.

38. In a circuit breaker, a casing, an actuator movably mounted therein in a manner to be manually movable to and from two defined different positions, means defining two different positions of the actuator, a spring for biasing the actuator towards and into each of its two different posi-

tions after the actuator is manually moved out of a position it occupies, a contactor, means pivotally mounting the contactor on the actuator, free of the casing, at one point, and means releasably interlatching the contactor and actuator at another point, whereby the contactor, though free of the casing, moves in unison with the actuator when the latch holds and may move relatively of the actuator when the latch releases, said spring bearing on the contactor to move it relatively of the actuator on latch release, free of the actuator or casing.

39. In a circuit breaker, a casing, an actuator movably mounted therein in a manner to be manually movable to and from two defined different positions, means defining two different positions of the actuator, a spring for biasing the actuator towards and into each of its two different positions after the actuator is manually moved out of a position it occupies, a contactor, means pivotally mounting the contactor on the actuator, free of the casing, at one point, and means releasably interlatching the contactor and actuator at another point, whereby the contactor, though free of the casing, moves in unison with the actuator when the latch holds and may move relatively of the actuator when the latch releases, said spring bearing on the contactor to move it relatively of the actuator on latch release, free of the actuator or casing, the actuator being pivotally mounted, and the spring being arranged to move over center for snap moving the actuator, following manual movement thereof, towards and into its positions.

40. In a circuit breaker, a casing, an actuator movably mounted therein in a manner to be manually movable to and from two defined different positions, means defining two different positions of the actuator, a spring for biasing the actuator towards and into each of its two different positions after the actuator is manually moved out of a position it occupies, a contactor, means pivotally mounting the contactor on the actuator, free of the casing, at one point, and means releasably interlatching the contactor and actuator at another point, whereby the contactor, though free of the casing, moves in unison with the actuator when the latch holds and may move relatively of the actuator when the latch releases, said spring bearing on the contactor to move it relatively of the actuator on latch release, free of the actuator or casing, the casing having a stationary contact, the contactor being mounted on the actuator in a manner to engage the contact when the actuator is in one of its two different positions and the latch holds, the spring operating at that time to bias the contactor against the contact for contact pressure, to bias the contactor to move from the contact on latch release, and to maintain latch holding engagement.

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