June 21, 1966 D. E. CLARKE 3,257,523

CIRCUIT BREAKER ASSEMBLY AND ACTUATING MECHANISM

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FIG. 2.

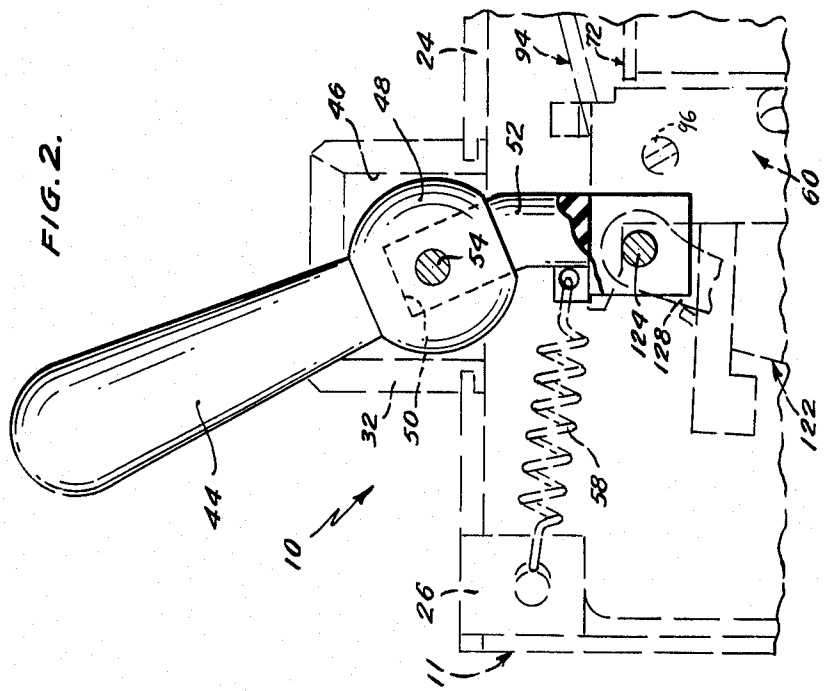
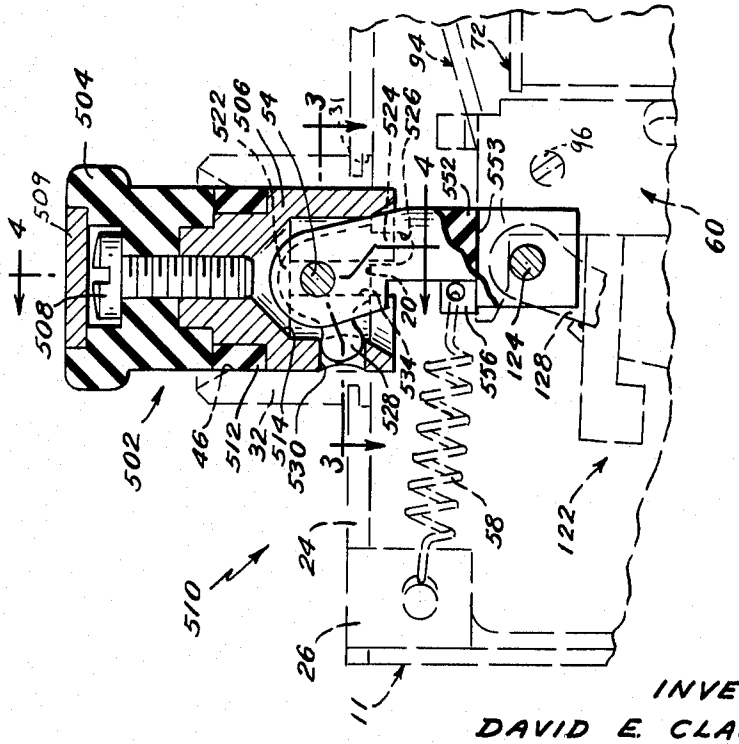


FIG. 1.



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CIRCUIT BREAKER ASSEMBLY AND ACTUATING MECHANISM

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FIG. 3.

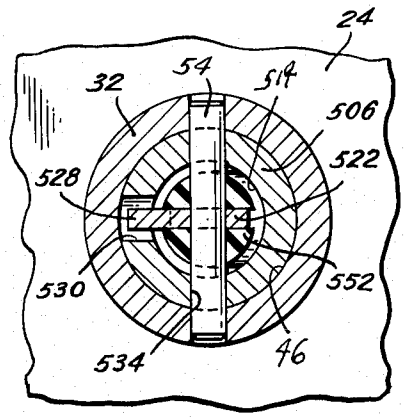


FIG. 4.

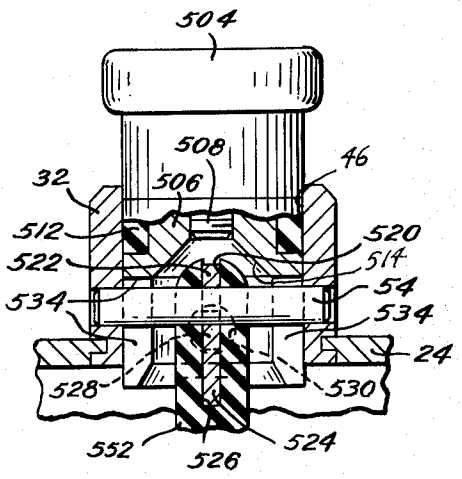


FIG. 6.

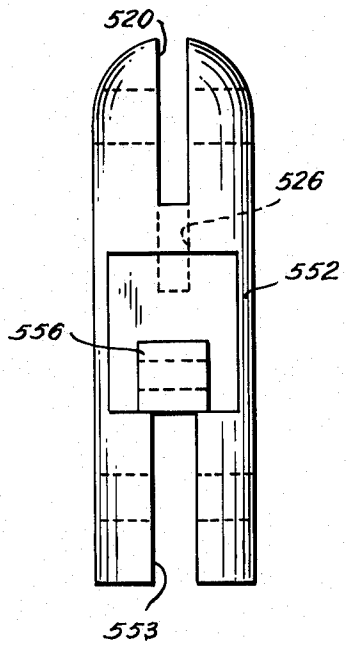
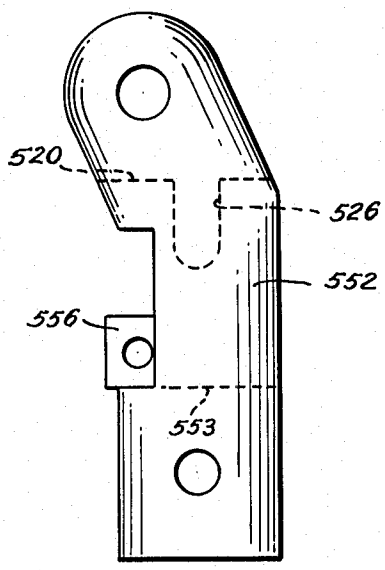


FIG. 5.



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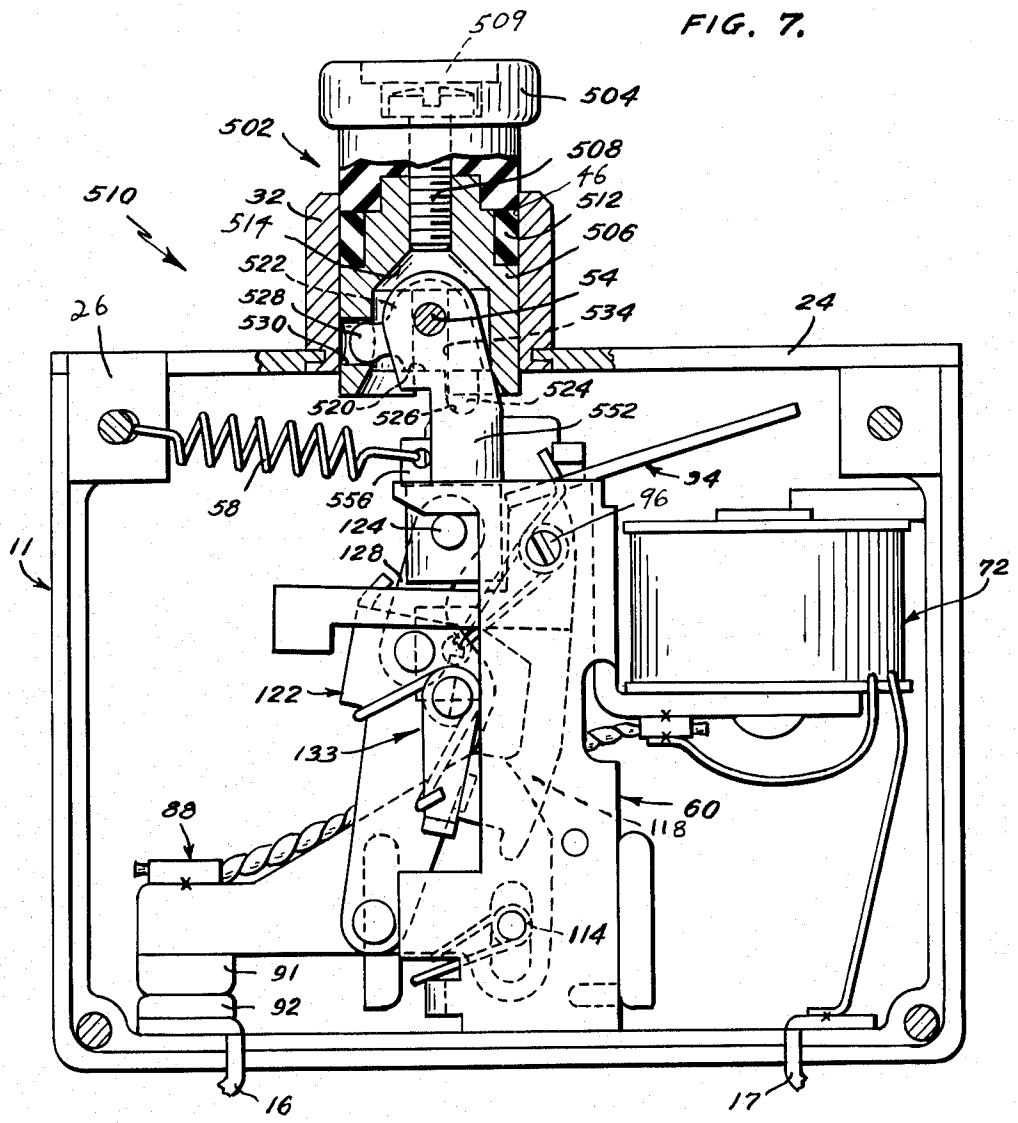
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June 21, 1966 D. E. CLARKE 3,257,523

CIRCUIT BREAKER ASSEMBLY AND ACTUATING MECHANISM

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FIG. 7.



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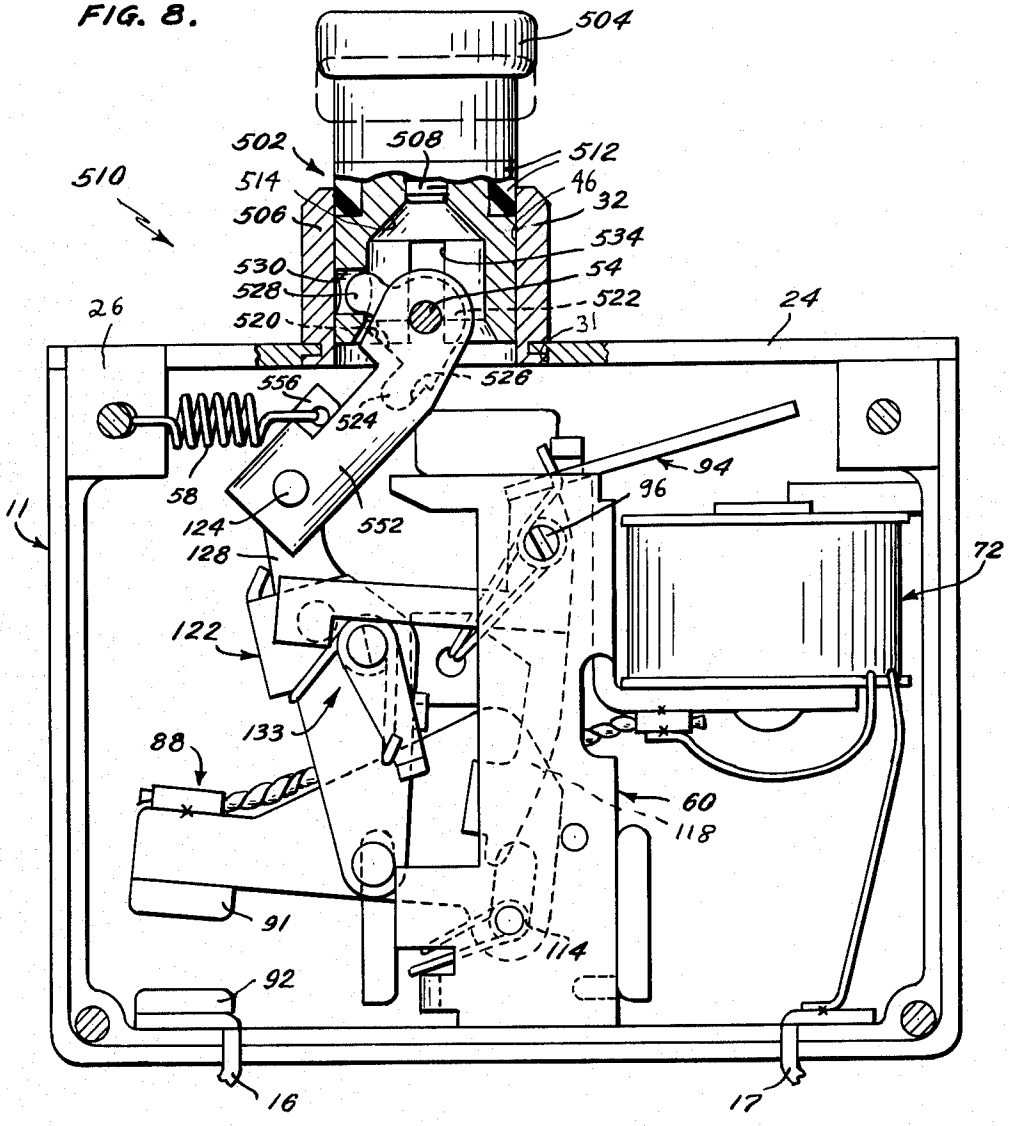
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June 21, 1966 D. E. CLARKE 3,257,523

CIRCUIT BREAKER ASSEMBLY AND ACTUATING MECHANISM

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FIG. 8.



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United States Patent Office 3,257,523 Patented June 21, 1966

3,257,523

CIRCUIT BREAKER ASSEMBLY AND ACTUATING MECHANISM

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Filed Oct. 21, 1963, Ser. No. 317,489
2 Claims. (Cl. 200—87)

This invention relates to circuit breakers and the like and, more particularly, to a new and improved actuating or reset mechanism therefor.

Among the several objects of the invention is the provision of a circuit breaker assembly including a new and improved manual actuating and reset mechanism therefor of the push-pull, manually operated push-button type.

A further object of the invention is the provision of a circuit breaker having a push-pull, manually operated, push-button actuating and reset mechanism which permits manufacture of the circuit breaker assembly either as a push-button operated or a toggle operated device, with a minimum change in the construction of the actuating mechanism and of the circuit breaker assembly, with a minimum change of parts, without changing substantially the envelope or external configuration or dimensions of the circuit breaker and without changing the operation of the circuit breaker itself.

Other objects will be in part apparent and in part pointed out hereinafter. The invention accordingly comprises the elements and combinations of elements, features of construction and arrangements of parts which will be exemplified in the structures hereinafter described and the scope of the application of which will be indicated in the appended claims.

In the accompanying drawings in which one of the various possible embodiments of the invention is illustrated:

FIG. 1 is a fragmentary, partly sectional, elevational view of a circuit breaker according to the instant invention with portions thereof shown in phantom;

FIG. 2 is a fragmentary, partially sectional, elevational view similar to FIG. 1 of a circuit breaker employing a toggle-type, manual reset mechanism;

FIG. 3 is a sectional view taken on line 3—3 of FIG. 1;

FIG. 4 is a sectional view taken on line 4—4 of FIG. 1;

FIG. 5 is an enlarged elevational view of a portion of the device shown in FIG. 1;

FIG. 6 is a left hand elevational view of FIG. 5;

FIG. 7 is an elevational, partly sectional, view of a circuit breaker according to the instant invention showing the device in the "on" or contacts-closed position; and

FIG. 8 is a view similar to FIG. 7 showing the device in the "off" or contacts-open position.

Similar reference characters indicate corresponding parts throughout the several views of the drawings. Dimensions of certain of the parts as shown in the drawings may have been modified or exaggerated for the purpose of clarity of illustration.

Referring now to the drawings, there is shown in FIG. 2 a circuit breaker generally indicated by reference numeral **10** which is substantially identical with the circuit breaker shown and described in copending application Serial No. 298,536, particularly FIGS. 1–9, filed July 26, 1963, in the names of Clifford A. Bodge and Martin W. Lawson and assigned to the assignee of the instant invention. The portions of FIG. 2 shown in solid lines comprise the manually operated toggle reset assembly which is replaced by the push-button actuating mechanism according to the instant invention.

Referring now to FIG. 1, there is shown a circuit breaker generally indicated by reference numeral **510** which is substantially identical with that of FIG. 2 except

for the inclusion of a push-pull, manually operable, push-button actuating and reset mechanism which is generally indicated by reference numeral **502** and which is shown in solid-line portions of FIG. 1. The portions shown in solid lines are the push-button operating mechanism elements which replace the toggle mechanism shown in solid-lines in FIG. 2.

The portions of the device shown in phantom in FIGS. 1 and 2, which are also shown in full in FIGS. 7 and 8, are substantially identical with those shown and described in connection with FIGS. 1–9 of the above mentioned application of Bodge et al. to which reference may be made for a more complete description of the construction and operation of these portions. In this application, numerals corresponding to those in the above-mentioned application of Bodge et al. indicate corresponding parts.

Briefly, circuit breakers **10** and **510** include a fixed contact **92** and a movable contact **91** carried by and electrically connected to a contact arm assembly **88** which is electrically connected to an electromagnetic assembly **72**. Associated with assembly **72** is an armature-tripper **94** mounted for rotation on pin **96**. A tripper leg **118** of armature-tripper **94** is engageable with a rotary latch **133** carried by collapsible linkage assembly **122**. Linkage **122** is connected at its lower end to contact arm assembly **88** and, at its upper member **128**, to the lower end of link **52** (circuit breaker **10**) and **552** (circuit breaker **510**) by pin **124**. A frame **60** secured in housing **11** mounts contact arm assembly **88**, electromagnetic assembly **72** and armature-tripper **94**. Links **52** and **552** are mounted for rotation about pin **54** and are biased for rotation from the position shown in FIG. 7 to the position shown in FIG. 8 by spring **58** which is connected at one end to link **52** at **56** (link **552** at **556**) and at the other end to cover member **24** at tab **26**.

In the contacts-closed position shown in FIG. 7, assembly **122** is latched by rotary latch **133** and acts as a rigid body. The forces generated by spring **114** acting through contact arm assembly **88** and linkage assembly **122** to link **52** (**552**) at pin **24**, are greater than the force of spring **58** and bias link **52** (**552** in circuit breaker **510**) to the position shown in FIGS. 1, 2 and 7.

Starting in the contacts-closed position shown in FIG. 7, when an overload condition appears in the line into which the circuit breaker is connected electromagnetic assembly **72** is energized and attracts armature-tripper **94** whose rotation about pin **96** causes leg **118** to engage rotary latch **133** to unlatch collapsible assembly **122**. This permits assembly **122** to collapse thereby releasing link **52** (**552**) to the action of spring **58** whereby the assembly moves to the contacts-open position shown in FIG. 8. In this position linkage assembly **122** is again latched and acts as a rigid body whereby manual movement of link **52** (**552**) against spring **58** to reset the device moves linkage assembly **122**, rotary latch **133** and contact arm assembly **88** to the contacts-closed position shown in FIG. 7.

As shown in FIG. 2, the toggle mechanism of circuit breaker **10** includes a toggle **44** having a bulb portion **48** in a hollowed out portion **50** of which is received the upper end of link **52** for pivotal movement about pin **54** which passes through the bushing, the toggle and the upper end of link **52**.

It can be seen that the location of pin **54** is determined by the operation of the circuit breaker assembly and that pin **54** and the lower portion of link **52** (**552**) are integral elements of the circuit breaker assembly as well as elements of its manual actuating and reset mechanism. As will appear more clearly hereinafter, the instant invention advantageously permits push-button operation without disturbing the above noted relationship.

Referring now to FIGS. 1 and 3–6, a push-pull manually operated push-button actuating and reset mechanism

generally indicated by reference numeral **502** according to the instant invention, includes an upper push-button member **504** formed of a suitable material such as, for example, a resinous, phenolic material or aluminum. Push-button **504** is slidably received in open ended aperture **46** in bushing **32** which is mounted in registry with an aperture **31** in cover member **24**. Push-button assembly **502** also includes a retaining sleeve or member **506** formed of a material of suitable hardness and corrosion-resistance such as for example, hardenable stainless steel. Retaining member **506** is fixedly secured to push-button **504** by means of a threaded screw **508** passing through a threaded aperture in push-button **504** and retainer **506**. In this manner, retainer **506** and push-button **504** can reciprocally come together along the longitudinal axis of bushing **32**.

The head of threaded member **508** is recessed in push-button **504** to permit a cover element **509** to be secured in push-button **504** to enclose member **508**. Cover **509** may, if desired, be omitted, or if included, may contain markings to indicate the rating of the device.

Retaining member **506** includes an upper portion of reduced diameter around which is received an indicating sleeve **512** formed of a suitable material such as, for example, the thermosetting resin sold under the trademark Melmac. Indicating sleeve **512** is of a color contrasting with that of push-button **504** and, if desired, bushing **32**, to provide an indication of the position of push-button **502** in relation to bushing **32** and hence, whether the device is in the contacts-open or contacts-closed position. The lower portion of retainer **506** contains a hollowed out portion **514** which provides a receptacle for the upper end of link **552**. The upper end of link **552** is pivotable about pin or rivet **54** which is mounted along a cross sectional diameter of bushing **32** as best seen in FIG. 3. Retaining member **506** also includes a longitudinally extending slot **534** through which pin **54** passes and about which slot **534** rides when push-button **504** and retainer **506** are moved reciprocally in bushing **32**. Slot **534** extends upwardly from the end of retainer **506** nearest the interior of casing **11**.

Link **552** is formed of a suitable, moldable, strong, electrical insulating material such as, for example, nylon. The lower end as viewed in FIG. 1 of link **552** includes a slot **553** in which is received the upper link **128** of collapsible assembly **122**. The lower portion of toggle link **552**, including tab **556**, slot **554** and the connection to link **128** by pin **124**, are substantially identical with that shown and described in connection with the aforementioned application of Bodge et al.

The upper portion of link **552** includes a slot **520** in which is received bell crank **522**. A lower lever arm **524** of bell crank **522** is received in a recess **526** in slot **520** in the upper portion of link **552**. The upper lever arm **528** of bell crank **522** projects out of slot **520** in link **552** into an aperture or receptacle **530** in sleeve **506** to provide an engagement or connection between bell crank **522** and retainer **506**. Bell crank **522** is retained in slots **520** and **526** in the upper portion of link **552** by the pin **54** which passes through the upper portion of toggle link **552** as well as by lever arm **524** in recess **526**. This permits bell crank **522** to move as a unit with link **552** as the link pivots about pin **54**. The push-button **504** and retainer **506** are retained in bushing **32** by the engagement of retainer **506** by lever arm **528**.

It will be seen that if a force is applied to link **552** tending to pivot it about pin **54**, the resulting pivotal movement of link **552**, between the position shown in FIG. 7 and that in FIG. 8, will be converted through bell crank **522**, lever arm **528** and receptacle **530** to reciprocal movement of retainer **506** and push-button **504** in bushing **32** between the positions shown in FIGS. 7 and 8. Conversely, when a force is applied to push-button **504** tending to reciprocate the button in bushing **32** between the position shown in FIGS. 7 and 8, the resulting reciprocal movement is converted to pivotal movement of link **552** about pin **54** between the positions shown in FIGS. 7 and 8.

The operation of the device is as follows:

When the circuit breaker is in the contacts-open position shown in FIG. 8, it can be reset by depressing push-button **504**. Retainer **506** engages lever arm **528** of bell crank **522** at **530** and as the button **504** moves to the dashed-line position shown in FIG. 8, bell crank **522** and link **552** are pivotal about pin **54** to move to the position shown in FIG. 7. Since link **552** is connected to contact arm assembly **88** and movable contact **91** through collapsible linkage assembly **122** the pivotal movement of link **552** moves assemblies **88** and **122** to the contacts-closed position shown in FIG. 8.

When a condition occurs in the line in which the circuit breaker is connected which energizes electromagnetic assembly **72**, armature tripper **94** unlatches rotary latch **133** to permit the collapse of linkage assembly **122** to release link **552** to spring **58**. The resulting pivotal movement of link **552** is converted to upward movement of push-button **504** and retainer **506** to the position shown in solid-lines in FIG. 8.

It will be noted that indicating sleeve **512** is covered by bushing **32** in the depressed position shown in FIG. 7 and is exposed in the position shown in FIG. 8. Since indicating sleeve contrasts in color with bushing **32** and button **504**, a clear visual indication of the position of the push-button assembly **504** is provided.

It can be seen from the foregoing that the toggle operated circuit breaker **10**, shown in FIG. 2, can be converted to push-button operation according to the instant invention with a minimum number of structural changes without changing the exterior configuration of casing **11** and cover **24**, and without disturbing the operation or construction of the circuit breaker assembly.

In view of the above it will be seen that the several objects of the invention are achieved and other advantageous results are obtained.

It is to be understood that the invention is not limited in its application to the details of construction and arrangements of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

As many changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings, shall be interpreted as illustrative and not in a limiting sense, and it is also intended that the appended claims shall cover all such equivalent variations as come within the true spirit and scope of the invention.

I claim:

1. A circuit breaker assembly comprising a pair of electrical contacts, one of which is movable into and out of engagement with the other of the contacts; a linkage assembly coupled with the movable contact and movable between first and second positions for moving the movable contact into and out of engagement with the other contact; an electromagnetic actuating mechanism engageable with a portion of the linkage assembly for effecting movement of the linkage assembly between the first and second positions; a cover member on the assembly having an opening therein to permit access to the linkage assembly; a push-button operated means mounted on the cover member and reciprocally movable toward and away from the linkage assembly and having a slot formed in a portion thereof; a pin mounted on the cover member and about which the slot rides when the push-button means moves reciprocally; a bell crank mounted on the pin and engageable with the push-button means for pivotal movement about the pin when the push-button means moves reciprocally; first and second lever arms on the bell crank,

one of which is engageable with the push-button means and the other of which is received in a recess in a portion of the connecting link; a connecting link, one end of which is coupled with the linkage assembly and the other end of which is coupled with the bell crank whereby pivotal movement of the bell crank results in movement of the linkage assembly between the first and second positions to effect contact engagement and disengagement; the connecting link being pivotally mounted on the pin and including a slot for receiving a portion of the bell crank whereby the bell crank is secured to the connecting link by the connecting link slot, the recess and the pin to effect integral movement of the connecting link with the bell crank.

2. A circuit breaker assembly comprising a housing; first and second electrical contacts mounted in the housing, one of which is movable into and out of engagement with the other of the contacts; a collapsible linkage assembly engageable with one of the electrical contacts and collapsible to permit movement of the linkage assembly between a first position and a second position to move the movable one of the electrical contacts into and out of engagement with the other of the contacts; an electromagnetic actuating mechanism for collapsing the collapsible linkage assembly to cause movement of the linkage assembly between the first and second positions under predetermined conditions; a cover member on the assembly having an opening therethrough for access to the interior of the assembly; a bushing mounted on the cover member in registry with the opening in the cover member; a push-button mounted in the bushing and reciprocally movable in a direction along the longitudinal axis of the bushing; a hollow retaining sleeve mounted on the end of the push-button nearest the interior of the assembly and movable therewith and having a slot running from its end nearest

the interior of the assembly along a portion of the axial length of the sleeve; a pin mounted in the bushing along a cross sectional diameter of the bushing and about which the retainer sleeve slot rides when the push-button is moved reciprocally; a bell crank pivotally mounted on the pin and having first and second lever arms, the first of the lever arms being engageable with a portion of the retainer sleeve; a connecting link formed of an electrical insulating material to electrically insulate the push-button from the linkage assembly having one end thereof connected to the second lever arm of the bell crank and the other end connected to the collapsible linkage assembly whereby reciprocal movement of the push-button and retainer sleeve is converted into pivotal movement of the connecting link about the pin to move the collapsible linkage assembly between the first position and the second position for effecting contact engagement and disengagement; the connecting link including a slot for receiving a portion of the bell crank and a recess in the slot for receiving the first lever arm; the second lever arm projecting out of the connecting link slot into a receptacle formed in a wall of the sleeve to provide the engagement between the bell crank and the retainer sleeve.

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