United States Patent [19]

Mrenna et al.

[11] **3,849,747**

[45] **Nov. 19, 1974**

[54] **CIRCUIT BREAKER WITH HANDLE INDICATING MEANS**

[75] Inventors: **Stephen A. Mrenna; Glenn R. Thomas,** both of Beaver, Pa.

[73] Assignee: **Westinghouse Electric Corporation,** Pittsburgh, Pa.

[22] Filed: **Nov. 28, 1973**

[21] Appl. No.: **419,744**

[52] **U.S. Cl.** **335/166,** 200/DIG. 42

[51] **Int. Cl.** **H01h 9/20**

[58] **Field of Search** 355/166; 200/DIG. 42; 335/26

[56] **References Cited**

UNITED STATES PATENTS

3,525,959	8/1970	Ellsworth et al.	335/166
3,605,052	9/1971	Dimond et al.	335/166
3,614,685	10/1971	Ellsworth et al.	335/166

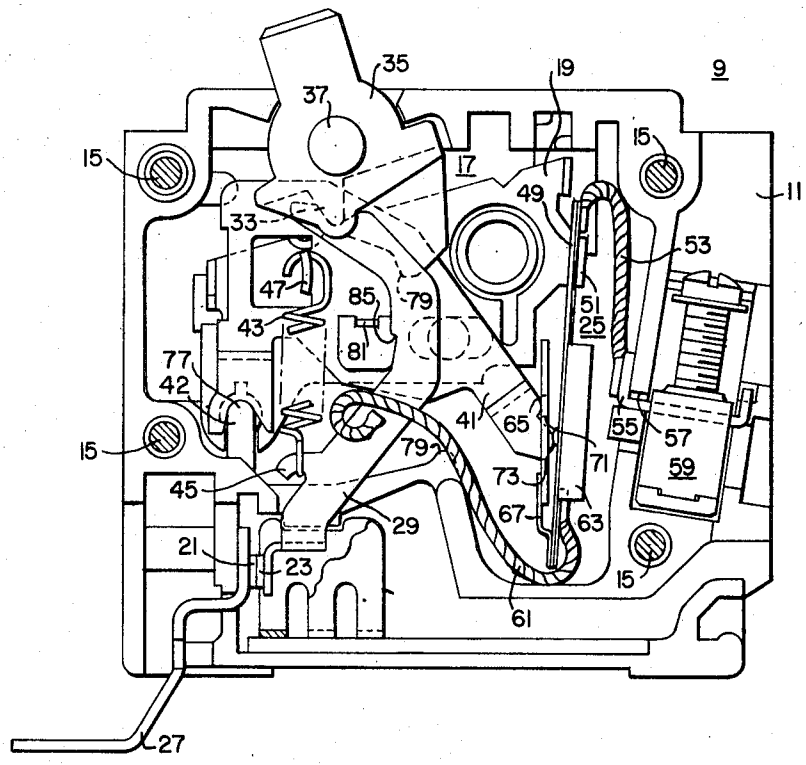
Primary Examiner—Harold Broome

Attorney, Agent, or Firm—W. A. Elchik

[57] **ABSTRACT**

An improved circuit breaker comprises means operating, when the contacts are welded closed and the cradle is released, to block the trip member or cradle against movement to a reset or relatched position and to maintain the operating handle in the closed position to thereby provide a true external indication of the closed condition of the contacts. The blocking means on the cradle strikes the contact arm in an opening direction when the cradle is released and the contacts are welded whereby if the weld is not firm the striking action will break the weld and open the contacts.

3 Claims, 5 Drawing Figures



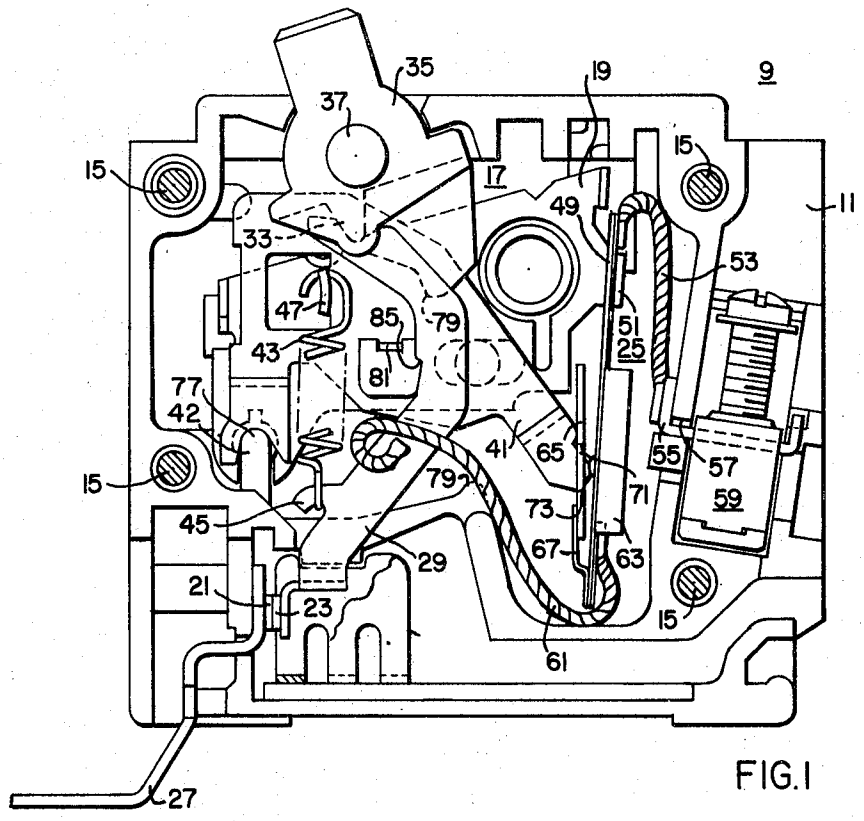

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FIG.1

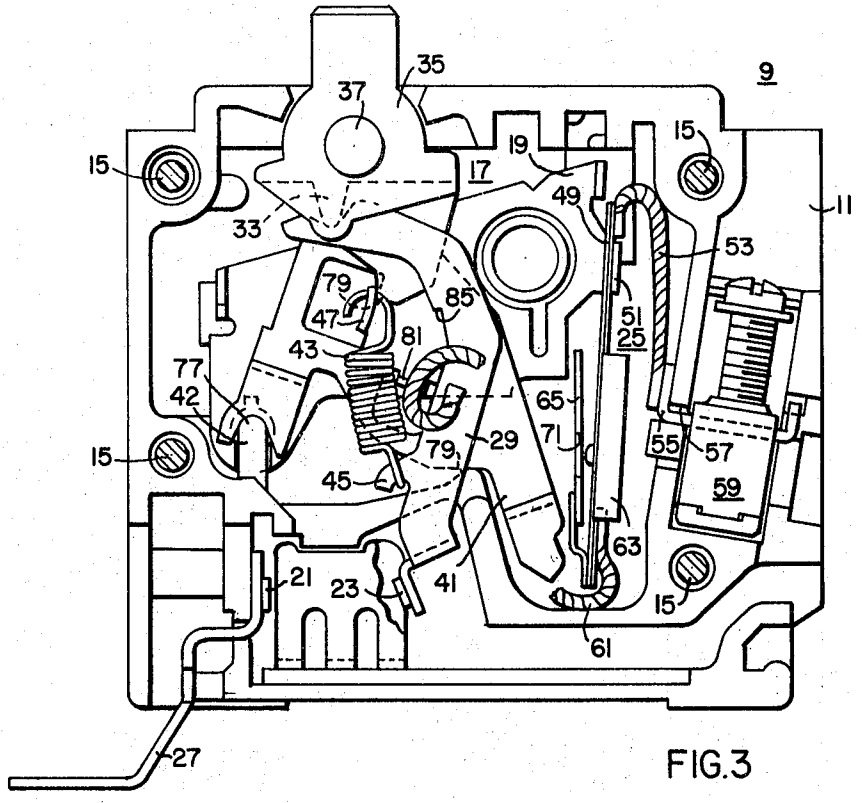

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FIG.3

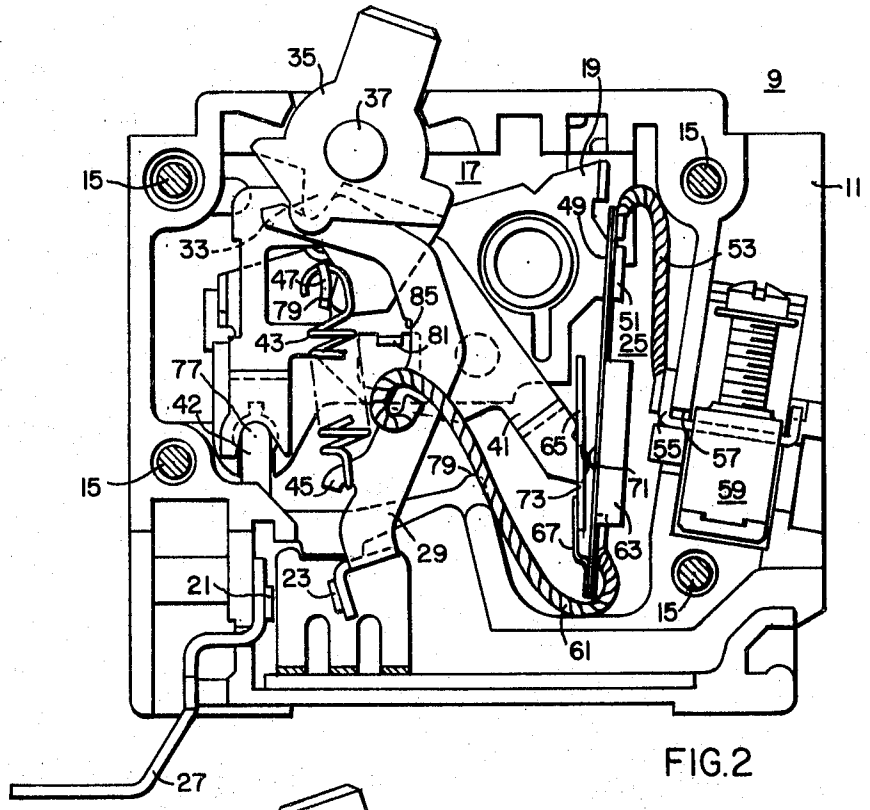

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FIG.2

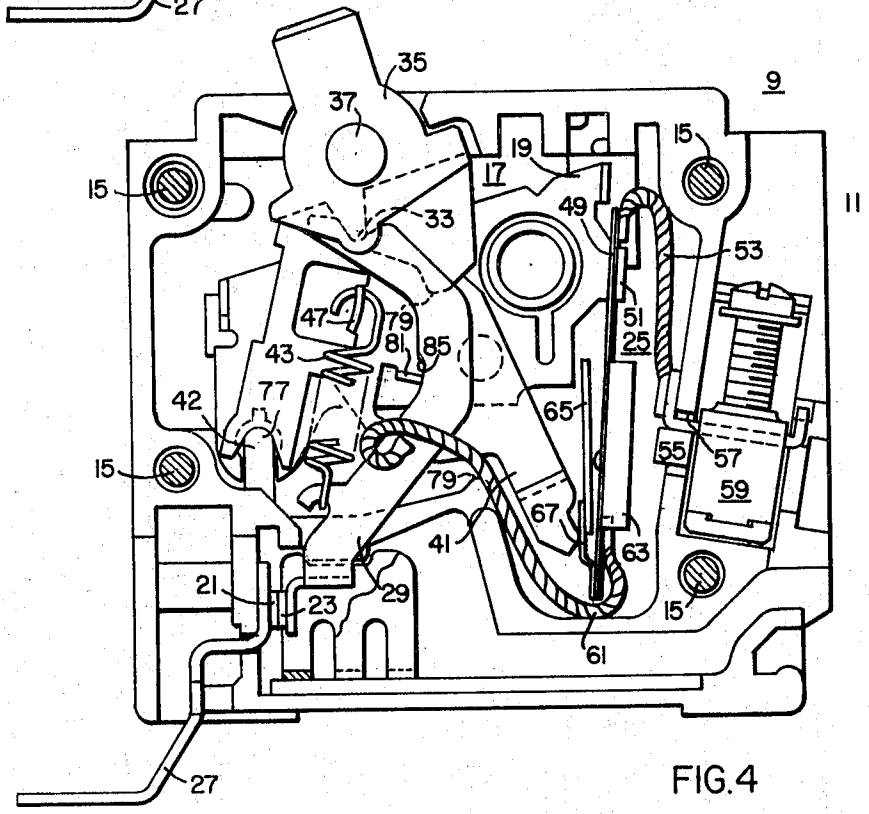

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FIG.4

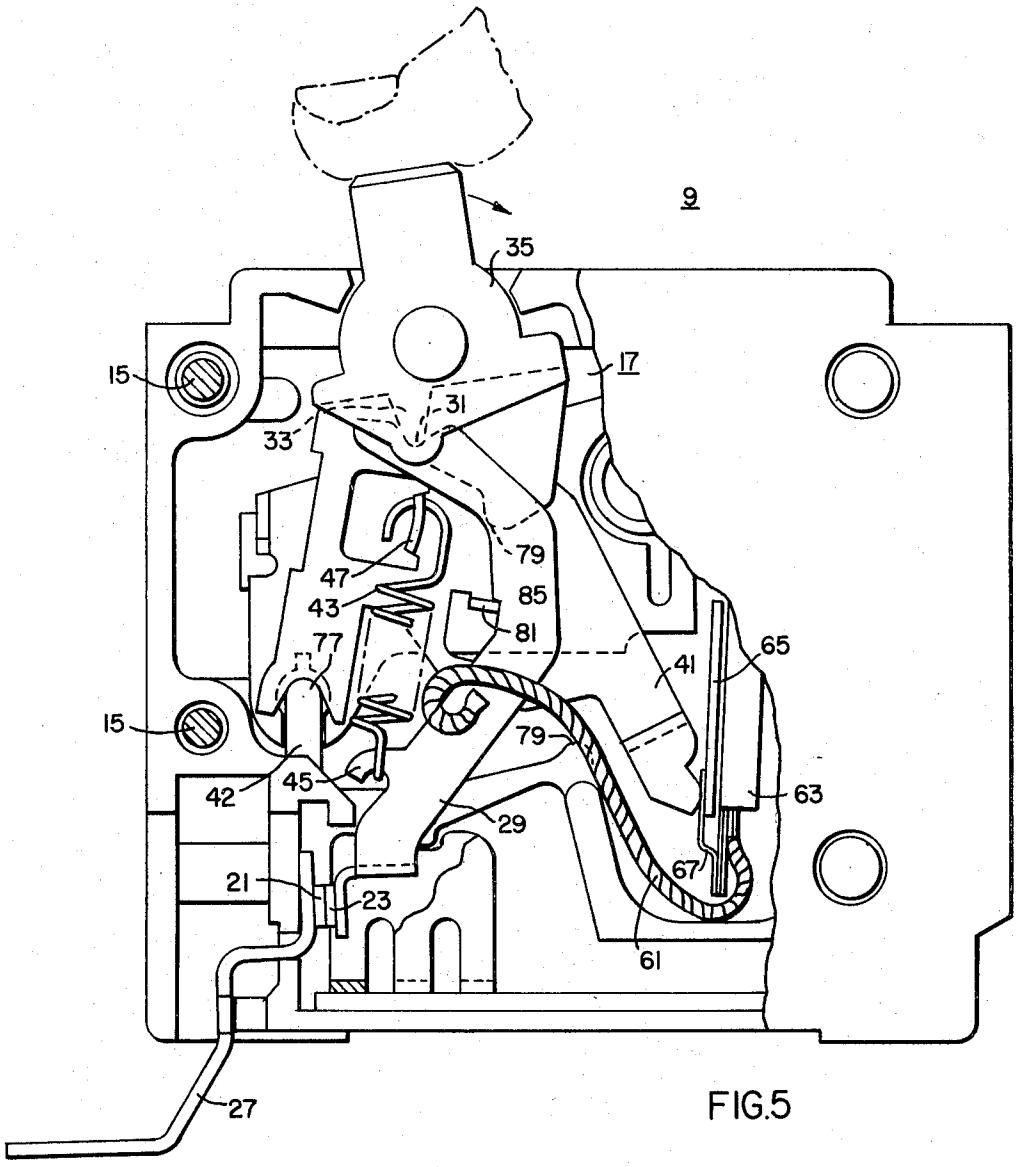


FIG.5

CIRCUIT BREAKER WITH HANDLE INDICATING MEANS

CROSS-REFERENCE TO RELATED APPLICATION

Certain features of the circuit breaker herein disclosed are disclosed in the copending patent application of Francis L. Gelzheiser Ser. No. 419,749, filed concurrently herewith.

BACKGROUND OF THE INVENTION

1. Field of the Invention:

Circuit breakers of the type comprising latch and trip means automatically releasable to effect tripping operations and manually resettable following tripping operations.

2. Description of the Prior Art:

In the U.S. Pat. to Bullis, Jr. No. 3,200,217 there is disclosed a circuit breaker having an operating mechanism that is generally similar in operation to the mechanism of the circuit breaker of the subject invention. The circuit breaker of this invention is an improvement over that disclosed in the Bullis, Jr. patent in that the subject breaker comprises means operating, when the contacts are welded closed and the trip member is released, to block the cradle against movement to a resetting position and to maintain the operating handle in the closed position to provide a true indication of the closed condition of the contacts.

The idea of preventing a reset of the trip member or cradle when the contacts of a circuit breaker are welded closed and of maintaining the operating handle in the closed position when the contacts are welded closed is disclosed in the U.S. Pat. to Ellsworth et al, No. 3,525,959 and to Ellsworth No. 3,614,685. The operating and trip mechanisms in the above-mentioned Ellsworth et al and Ellsworth patents, however, are substantially different from the operating and trip mechanism of the circuit breaker of the subject invention.

SUMMARY OF THE INVENTION

A circuit breaker is provided comprising an insulating housing and a circuit-breaker mechanism supported in the housing. The mechanism comprises a stationary contact and a movable contact. The movable contact is supported on a contact arm. A releasable cradle is pivotally supported in proximity to one end thereof and latched, at the other end thereof, on trip means. An operating spring is supported at one end thereof on the contact arm and at the other end thereof on the cradle. An operating member is operatively connected to the contact arm and extends through an opening in the front of the housing to permit manual operation of the breaker. With the cradle in the latched position, the operating member is manually operable between open and closed positions to operate the spring and contact arm to thereby move the movable contact arm between open and closed positions. Upon the occurrence of overload current conditions above a predetermined value the trip means releases the cradle whereupon the spring moves the cradle to a tripped position and the contact arm to the open position. Following movement of the cradle to the tripped position, the operating member is manually movable to the open position during which movement the operating member

engages the cradle to move the cradle back to the latched position. Blocking means on the contact arm engages blocking means on the cradle to prevent movement of the cradle to the latched position when the contacts are welded closed and the cradle has been moved toward the tripped position. Following an attempt to reset the cradle, when the contacts are welded closed, the spring and mechanism will move the operating member back to the closed position upon release of the operating member by an operator, thereby providing a visual indication that the contacts are in the closed position. The blocking means on the cradle is bent-over tab part that also serves to strike the contact arm in an opening direction when the cradle is released and the contacts are welded whereby if the weld is not a firm weld the striking action will break the weld and permit opening movement of the contact arm.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side sectional view of a circuit breaker embodying principles of this invention. The circuit breaker is shown in the closed position;

FIG. **2** is a view similar to FIG. **1** with the breaker shown in the "off" or open position;

FIG. **3** is a view similar to FIG. **1** with the breaker being shown in the tripped open position;

FIG. **4** is a view similar to FIG. **1** with the breaker being shown in the tripped position when the contacts have been welded closed; and,

FIG. **5** is a partial view similar to FIG. **1** illustrating the position of parts when the breaker has tripped with the contacts welded closed and an attempt is made to reset the cradle.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, there is shown a circuit breaker **9** comprising an insulating housing that comprises a molded insulating side compartment part **11** and a molded insulating side cover part **13** (FIG. **5**) secured together by means of four rivets **15** (FIG. **1**). A circuit-breaker mechanism, indicated generally at **17**, is supported in the housing **11, 13.** The mechanism **17** comprises a stationary supporting frame **19** fixedly supported in the housing on the housing part **11.** The mechanism **17** also comprises a stationary contact **21,** a movable contact **23,** and trip means indicated generally at **25.**

The stationary contact **21** is welded or otherwise fixedly secured to a line terminal **27** that extends out through an opening in the bottom of the housing **11, 13.** The movable contact **23** is fixedly secured to one end of a contact arm **29.** The contact arm **29,** at the upper end thereof, is provided with a depression **31** therein. A molded insulating part **33** of an insulating operating member **35** engages the contact arm **29** in the depression **31** to provide an operative driving connection between the operating handle **35** and the contact arm **29.** The operating member **35** is molded with a pair of pin parts **37** at the opposite sides thereof which fit into bearing openings in the housing parts **11** and **13** to support the operating member for pivotal movement on the housing **11, 13.** The operating member **35** comprises a handle part that extends through an opening at the top of the housing **11, 13,** to enable manual operation of the circuit breaker. A cradle **41** (FIGS. **1–3**) is supported at one end thereof for pivotal

movement on a molded post part **42** of the insulating housing. The cradle **41**, at the other end thereof, is latched by means of the trip means **25**. An overcenter tension spring **43** is connected at the lower end thereof to a projection **45** on the contact arm **29** and at the upper end thereof to a bent-over projection **47** on the cradle **41**.

The trip means **25** comprises an elongated bimetal member **49** secured, in proximity to its upper end, to a bent-over tab part **51** of the frame **19**. A flexible conductor **53** is connected at one end thereof to the upper end of the bimetal **49** and at the other end thereof to a conductor **55** that extends through an opening **57** in the housing **11, 13** and is part of a solderless terminal connector **59** that is externally accessible and supported on the housing **11, 13** in a well-known manner. Another flexible conductor **61** is secured at one end thereof to the lower end of the bimetal **49** and at the other end thereof to the contact arm **29** to electrically connect the contact arm **29** with the bimetal **49**.

The circuit through the circuit breaker **9** extends from the line terminal **27**, through the stationary contact **21**, the movable contact **23**, the contact arm **29**, the flexible conductor **61**, the bimetal **49**, the flexible conductor **53**, the conductor **55**, to a conducting line (not shown) that would be connected to the conductor **55** by means of the solderless terminal connector **59** at an installation.

The circuit breaker **9** may be manually operated to open and close the contacts by operation of the insulating operating handle member **35**. Movement of the operating member **35** clockwise from the closed or "on" position (FIG. **1**) to the open or "off" position (FIG. **2**) carries the upper end of the contact arm **29** to the left of the line of action of the spring **43** whereupon the spring **43** acts to move the contact arm **29** with a snap action to the open position (FIG. **2**). Movement of the operating member **35** in a counterclockwise direction back to the closed position moves the upper end of the movable contact arm **29** to the right of the line of action of the spring **43** whereupon the spring acts to move the contact **29** to the closed position (FIG. **1**) with a snap action.

The trip device **25** comprises the bimetal **49**, a magnetic yoke **63** and a magnetic armature **65**. The yoke **63** is a generally U-shaped member secured to the bimetal **49** at the bight portion of the yoke **63** with the opposite legs thereof facing the armature **65**. The magnetic armature **65** is secured to a supporting spring **67** that is secured, at its lower end, to the bimetal **49** whereby the armature **65** is supported on the bimetal **49** by means of the spring **67**. The armature **65** has a window opening **71** therein. The one end of the cradle **41** is disposed in the window opening **71** and engages the latch surface **73** of the armature **65** in the latched position shown in FIGS. **1** and **2**.

Upon the occurrence of an overload current above a first predetermined value, the bimetal **49** becomes heated and deflects to the right as seen in FIG. **1** to effect a time delayed thermal tripping operation. The armature **65**, which is supported on the bimetal **49** by means of the spring **67**, is carried to the right with the bimetal to release the cradle **41**. When the cradle **41** is released, the spring **43** acts to rotate the cradle clockwise on the post **42** about an axis **77** until this motion is arrested by the engagement of the cradle **41** with a molded housing part **79** of the housing **11, 13**. During this movement, the spring **43** moves the contact arm **29** to the open position and the operating member **35** to an intermediate position intermediate the "on" and "off" positions to provide a visual indication that the circuit breaker has tripped open. The tripped position of the parts is shown in FIG. **3**.

Before the contacts can be closed following an automatic tripping operation it is necessary to reset and relatch the mechanism. This is accomplished by moving the operating member **35** clockwise from the intermediate position to a position slightly beyond the full open or "off" position. During this movement, due to the engagement of a downwardly extending portion **79** of the operating member **35** with the bent-over extension **47** of the cradle **41** (FIG. **3**), the cradle **41** is moved counterclockwise about the axis **77** until the end of the cradle **41** is again latched in the window opening **71** of the armature **65** on the latch surface **73** (FIG. **2**). Following a resetting operation the circuit breaker can be manually operated in the same manner as was hereinbefore described.

The circuit breaker is magnetically tripped automatically and instantaneously in response to overload currents above a second predetermined value higher than the first predetermined value. Upon the flow of the overload current through the bimetal **49**, magnetic flux, which is induced around the bimetal, takes the path of least reluctance through the magnetic yoke **63**, across an air gap and through the armature **65**. When an overload current above the second predetermined value occurs, the pull of the magnetic flux is of such strength that the armature **65** is attracted to the magnetic yoke **63** whereupon the spring **67** flexes permitting the armature to move to the right to release the cradle **41** whereupon the circuit breaker is tripped open in the same manner as was hereinbefore described with regard to the thermal tripping operation. Following a magnetic tripping operation the circuit breaker is reset and relatched in the same manner as was hereinbefore described.

The circuit breaker **9** comprises means for maintaining the operating member **35** in the "on" or closed position when the cradle **41** is released with the contacts **21, 23** welded in the closed position, and blocking means for preventing a resetting operation of the cradle **41** whereby the external handle of the operating member **35** will provide a true indication that the contacts **21, 23** are closed.

As can be understood with reference to FIG. **4**, when the contacts **21, 23** are welded closed and an overload occurs, the trip means **25** will release the cradle **41** and the spring **43** will move the cradle **41** clockwise about the axis **77** toward the tripped position during which movement a bent-over tab **81** on the cradle **41** strikes the contact arm **29** in opening direction whereby if the weld between the contacts **21, 23** is not a firm weld this striking action will break the weld and the parts will move to the tripped open position seen in FIG. **3**. As can be understood with reference to FIG. **4**, the cradle **41** is a flat sheet-metal member and the tab **81** is bent over to protrude in the direction out of the paper as seen in FIG. **4** so that the tab **81** is disposed to engage the sheet-metal type contact arm **29** to strike the contact arm **29** in an opening direction. As can be seen in FIG. **4**, when the contacts **21, 23** are welded closed and the tab **81** does not break the weld, movement of the cradle **41** is arrested in the position shown in FIG.

4. In this position, the geometry of the parts and the force of the tension spring **43** are such as to maintain the operating member **35** in the "on" or closed position to provide a true external visual indication that the contacts are closed. As can be understood with reference to FIG. **5**, when the contacts **21, 23** are welded and an attempt is made to reset the cradle **41**, the operating member **35** is manually pivoted clockwise toward the "off" position during which movement the contact arm **29** is moved to move a blocking surface **85** into engagement with the tab **81** to block further resetting movement of the operating member **35**, contact arm **29** and cradle **41** with the parts being blocked in the position seen in FIG. **5** so that if the weld between the contacts **21, 23** is not broken by this action the operating member **35** cannot be moved further toward the resetting position and the movement of parts will stop in the position seen in FIG. **5** without movement of the cradle **41** to the reset or relatched position. Upon release of the operating member **35** following an attempt to reset the cradle **41** when the contacts **21, 23** are welded closed the spring **43** and mechanism will move the parts back to the position seen in FIG. **4** with the operating member **35** beng moved back to the "on" or closed position to thereby provide a visual indication of the closed condition of the contacts. Thus, an operator cannot reset the breaker and the operating member **35**, in the closed position, provides an external true indication that the contacts are in the closed position.

We claim:

1. A circuit comprising an insulating housing having an opening in the front thereof, a circuit-breaker mechanism supported in said housing, said mechanism comprising a stationary contact, a movable contact, a contact arm supporting said movable contact, trip means, a releasable cradle, means pivotally supporting said cradle in proximity to one end thereof, said cradle at the other end thereof being latched on said trip means, an operating spring supported at one end thereof on said contact arm and at the other end thereof on said cradle, an operating member operatively connected to said contact arm and extending through said opening to permit manual operation of said circuit breaker, with said cradle in the latched position said operating member being manually movable between open and closed positions to operate said spring and said contact arm to thereby move said contact arm between open and closed positions, upon the occurrence of an overload current above a predetermined value said trip means releasing said cradle and said spring moving said cradle to a tripped position and said contact arm to the open position, following movement of said cradle to said tripped position said operating member being manually movable to the open position during which movement said operating member engages said cradle to move said cradle back to the latched position, blocking means on said contact arm engaging blocking means on said cradle to prevent movement of said cradle to the latched position when said contacts are welded closed and said cradle has been moved toward the tripped position, and said blocking means on said cradle striking said contact arm in an opening direction when said cradle is released and said contacts are welded closed whereby if the weld of said contacts is not a firm weld the striking action can break the weld to permit movement of said contact arm to the open position.

2. A circuit breaker according to claim **1**, said mechanism maintaining said operating member in the closed position when said contacts are welded closed and said cradle has been moved toward the tripped position, said mechanism returning said operating member to the closed position upon release by an operator when an attempt is made to reset said cradle with said contacts welded closed to thereby provide a true indication of the closed condition of said contacts.

3. A circuit breaker according to claim **2**, said cradle being a sheet-metal type member, and said blocking means on said cradle being a bent-over tab bent over to a position where said blocking means on said cradle will strike said contact arm in an opening direction when said cradle is released and said contacts are welded closed.

* * * * *