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TOGGLE MECHANISM FOR A CIRCUIT BREAKER

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FIG. 1.

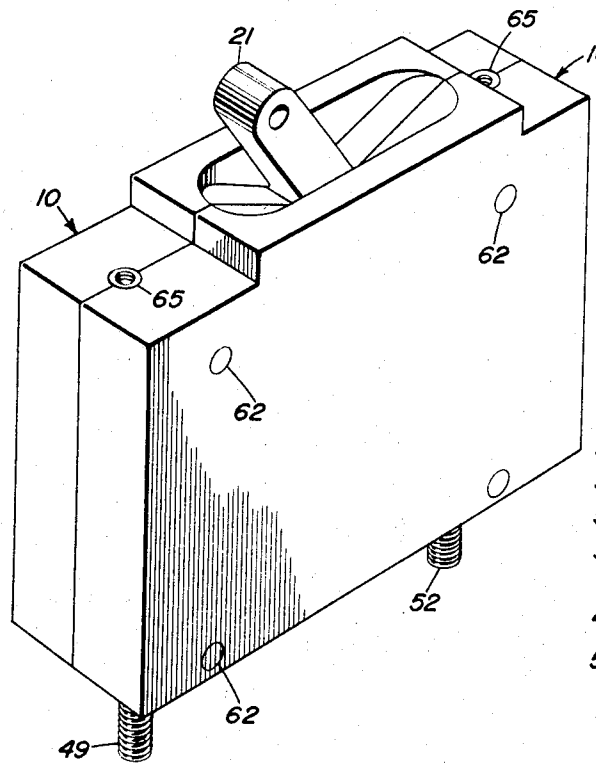


FIG. 5.

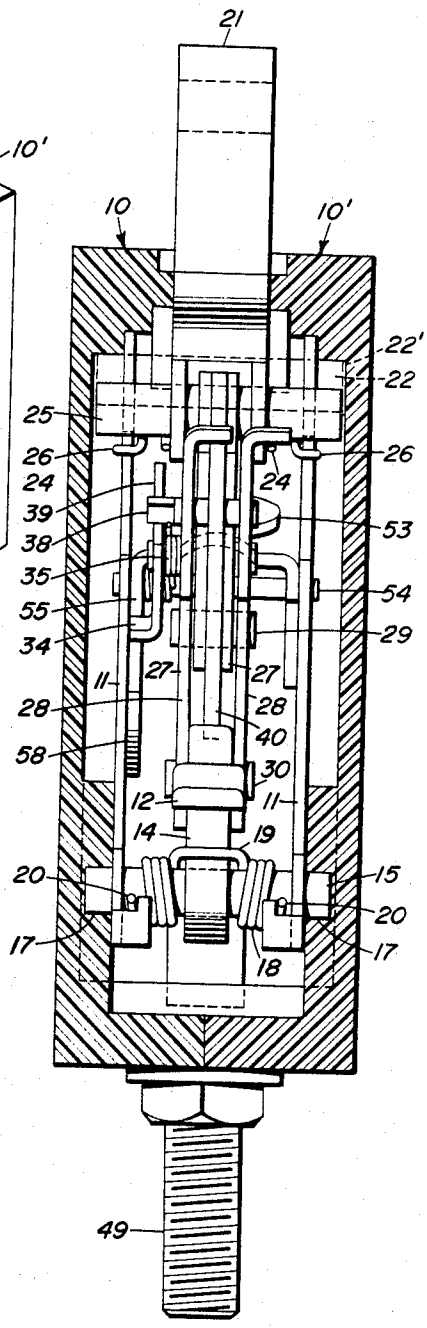
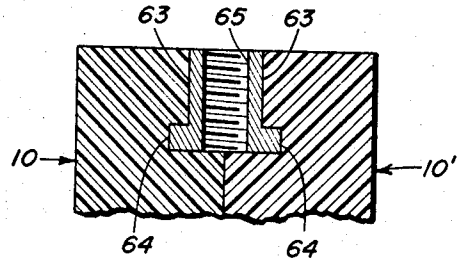


FIG. 6.



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TOGGLE MECHANISM FOR A CIRCUIT BREAKER

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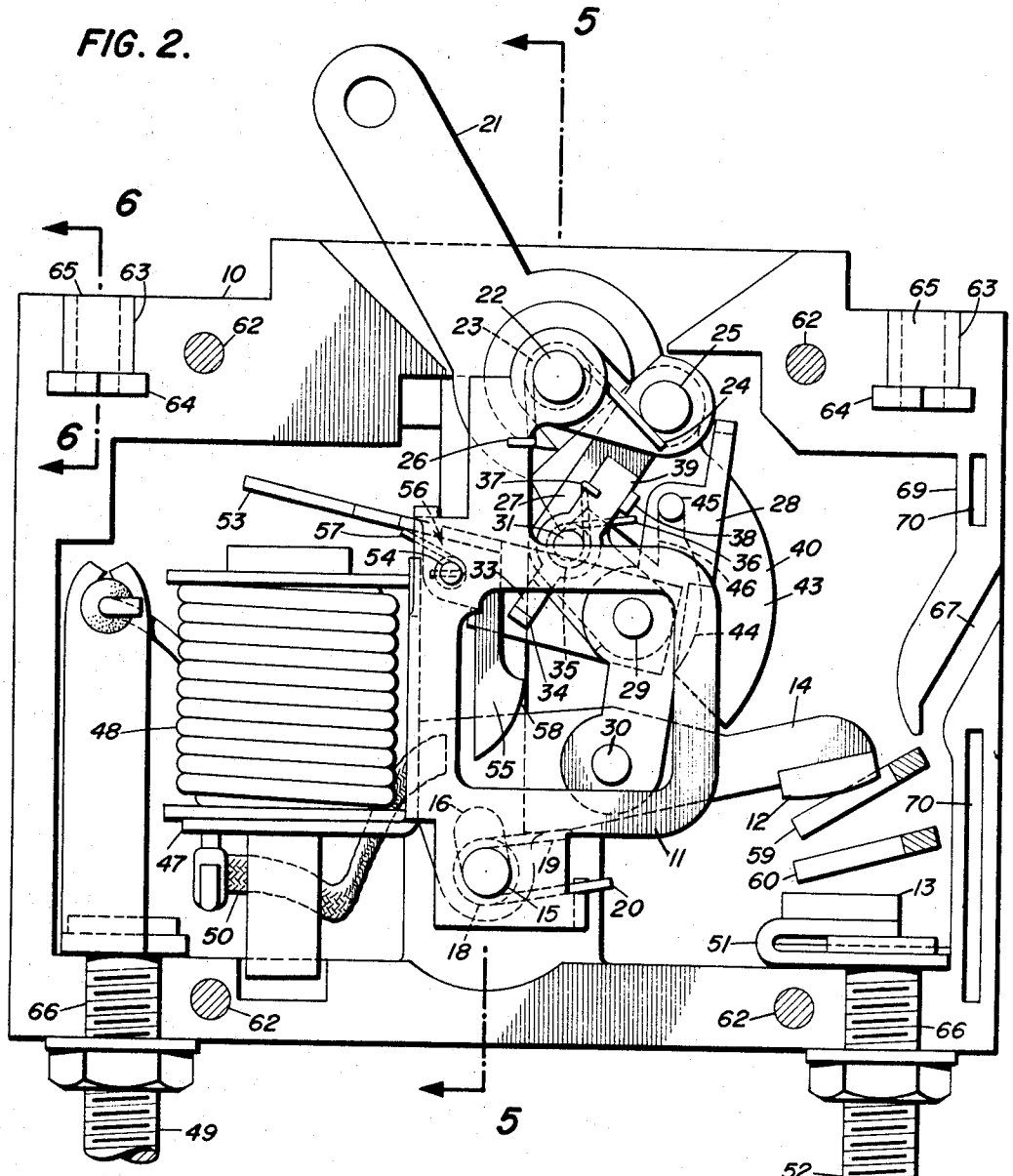
FIG. 2.



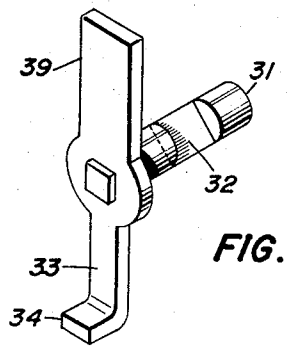


FIG. 7.

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FIG. 3.

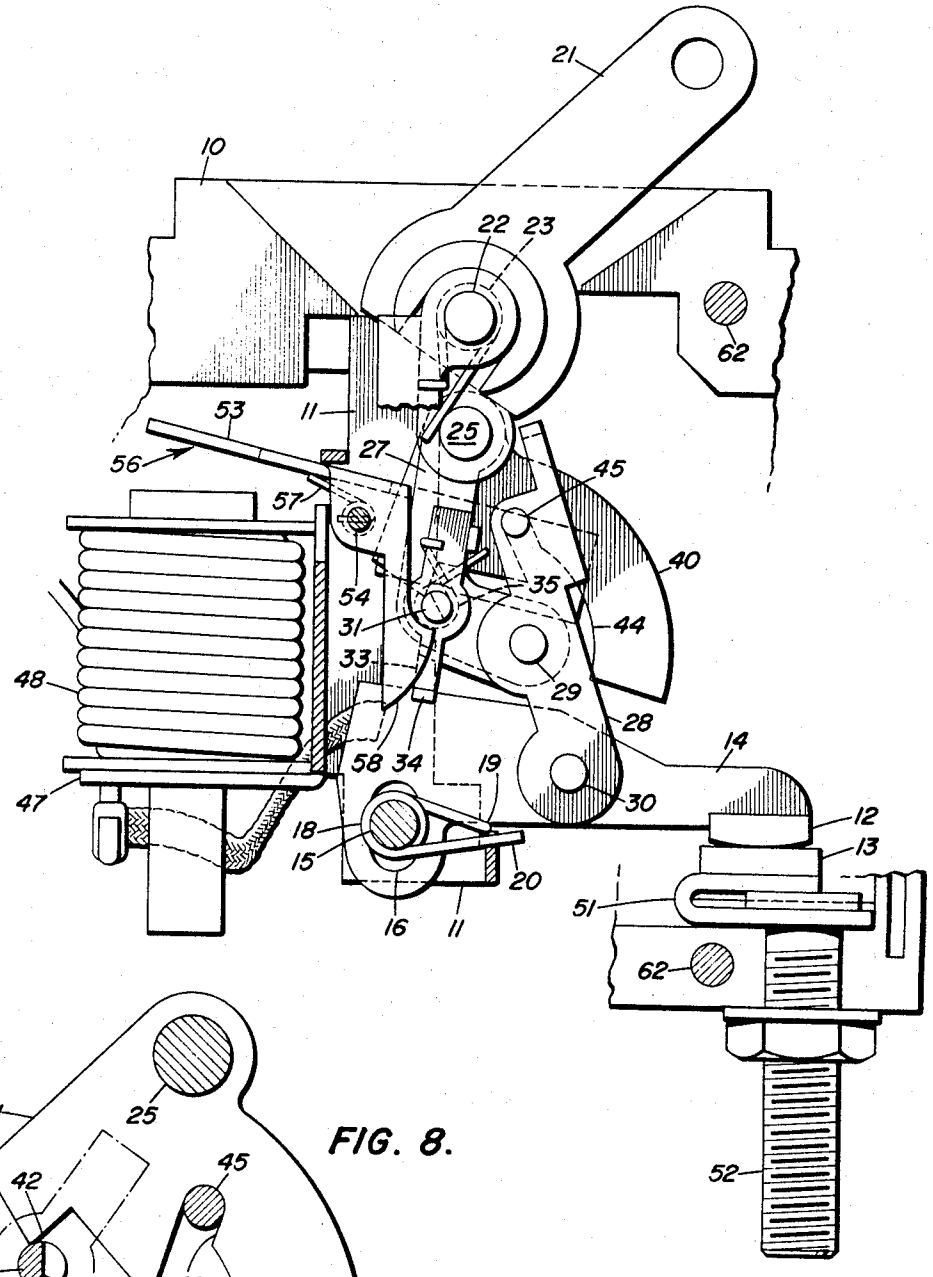

FIG. 8.

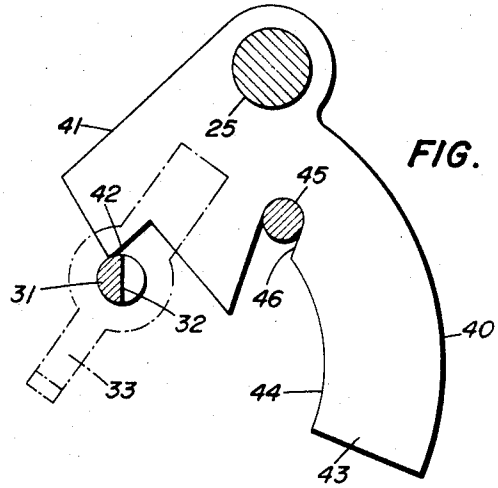

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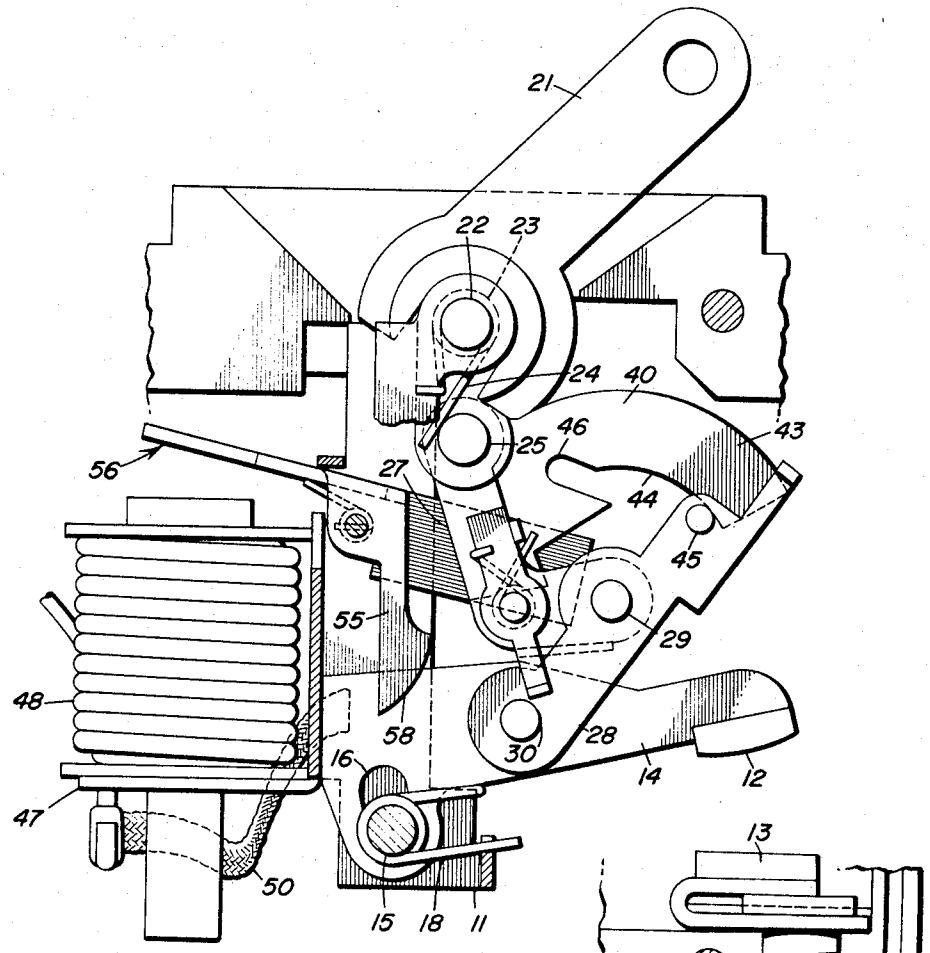
FIG. 4.



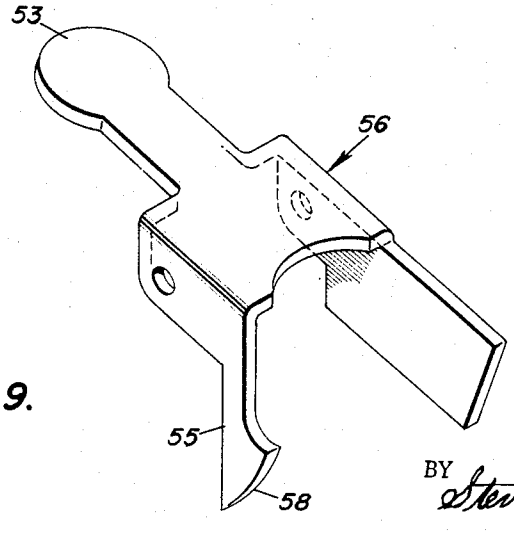


FIG. 9.

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Patented Nov. 19, 1968

3,412,351

TOGGLE MECHANISM FOR A CIRCUIT BREAKER

George S. Harper, Cambridge, Md., assignor to Airpax Electronics Incorporated, Cambridge, Md., a corporation of Maryland

Continuation-in-part of application Ser. No. 377,993, June 25, 1964. This application Apr. 26, 1966, Ser. No. 545,434

3 Claims. (Cl. 335—175)

ABSTRACT OF THE DISCLOSURE

A toggle mechanism for circuit breakers including first and second pivotally mounted levers which are operatively connected through a pair of pivotal links. Means are provided on the links for locking them against pivotal movement with respect to each other. Further means are provided to unlock the locking means to permit relative pivotal movement to thereby effect the tripping of the mechanism.

This invention relates to a circuit breaker and toggle mechanism therefor and is a continuation-in-part of the circuit-breaker mechanism disclosed in my copending application Ser. No. 377,993 filed June 25, 1964, now Patent 3,251,232, relative to its application to circuit breakers of greater capacity.

It is a further object of this invention to provide a simplified linkage which will withstand the shock and vibration without tripping when subjected to environmental conditions causing violent stresses on the circuit breakers.

These and other objects of the invention will be manifest from the following description and accompanying drawings wherein:

FIG. 1 is a perspective view of the inventive circuit breaker in its housing;

FIG. 2 is a view with one side of housing removed showing the mechanism in relatched open position where the contacts are open;

FIG. 3 is a partial sectional view showing the mechanism in a position where the contacts are closed;

FIG. 4 is a partial sectional view showing the mechanism in an intermediate or tripped open position;

FIG. 5 is a section along the line 5—5 of FIG. 2;

FIG. 6 is an enlarged section on the line 6—6 of FIG. 2 but showing the threaded holding ferrule in place;

FIG. 7 is an enlarged detail of the sear pin and striker bar assembly;

FIG. 8 is a detail view of the engagement of the sear pin and striker bar assembly in engagement with the forked lever; and

FIG. 9 is a detail of the electromagnet armature bell crank assembly.

In the housing **10**, which is formed of a molded plastic of good electrical insulation properties, is supported a frame **11** upon which is mounted the operating elements of the circuit breaker to move the movable contact **12** into and out of engagement with fixed contact **13**.

The movable contact is secured to a lever **14** pivotally and slidably mounted on the frame by a pin **15** and an elongated opening **16**. Pin **15** is mounted in the frame **11** intermediate the ends while the ends extend beyond the frame and fit snugly into recesses **17** molded in the housing portions **10** and **10'** as seen in FIG. 5. A spring **18** is wound around the pin **15** and is provided with a biasing arm **19** bearing against the lever **14** and a reaction arm **20** bearing against the frame **11**. Portions of the frame **11** have been omitted from FIGS. 3 and 4 for the sake of clarity. The entire frame **11** is shown in FIG. 2.

An actuating lever **21** is pivotally mounted on the frame **11** by a pin **22**. The pin **22** is mounted in the frame intermediate the ends while the ends extends beyond the frame and fit snugly into recesses **22'** molded in the housing **10** (as seen in FIG. 5). A spring **23** is wound around the pin **22** and has a biasing arm **24** bearing against a pin **25** and a reaction arm **26** bearing against the frame **11**.

An L-shaped link **27** is pivotally mounted on pin **25** and is pivotally connected to a speced pair of links **28** by a pin **29**. The links **28** are pivotally connected by a pin **30** to straddle the lever **14**.

A shaft of sear pin **31** is rotatably supported in link **27** at the bend of the L and is provided with a reduced section **32** between the links which results from grinding a flat surface **32** on shaft **31** (FIG. 7) which acts as a sear for edge **42** of forked member **40**. An arm or striker bar **33** is mounted rigidly and nonrotatably on shaft **31** and carries a tab **34** bent up from the end of the arm. The end of shaft **31** is square to accommodate the square hole in arm **33**. After assembly, the end of shaft **31** is peened tight against arm **33** thus permanently keying the shaft and arm together. A spring **35** is wound around shaft **31** and is provided with arms **36** and **37** bearing respectively against a stop **38** integral with one arm of link **27** and against an extension **39** of arm **33**. The spring is wound to urge the extension **39** against the stop **38**.

A forked member **40** is pivotally mounted on pin **25** between the parallel arms of link **27**. One leg **41** of the fork is provided with an edge portion **42** for engagement with the sear portion **32** of shaft **31**, and the other leg **43** of the fork is provided with a curved cam section **44** for engagement with a pin **45** carried by links **28**. Between the legs at the end of cam section **44** is a locking recess **46**.

The frame **11** is provided with a shelf **47** on which is mounted an electromagnet **48** having a winding, one end of which is connected in series with terminal **49** and the other end in series with a braided, flexible copper wire **50** secured to lever **14**, movable contact **12**, fixed contact **13**, contact support **51** and terminal **52**. An armature **53** is pivotally mounted on the frame by a pin **54** and is integral with an armature lever **55** to form therewith a bell crank **56**. Spring **57** is mounted on pin **54** to bias the bell crank **56** towards the position shown in FIG. 2. The free end of the armature lever forms an arcuate trigger cam surface **58**. In the closed contact position, the linkage is in the position shown in FIG. 3 with the tab portion **34** adjacent the arcuate trigger cam surface **58** at the end of armature lever **55**.

On overload the electromagnet **48** is energized to attract armature **53** to pivot armature lever **55** bringing the trigger cam surface **58** into contact with tab **34** to rotate striker bar **33** and shaft **31**. Rotation of the shaft **31** presents the reduced section **32** to the edge **42** of the fork **40**, allowing the fork **40** to rotate counterclockwise about pin **25** to release pin **45** from recess **46**, as illustrated in FIG. 4. The release of pin **45** allows the linkage to collapse and the lever **14** to pivot about pin **15** to separate the contacts **12** and **13**. The arc drawn by the separating contacts is extinguished by its reaction to the arc chutes **59** and **60** in the usual manner. Vent opening **67** is provided in the casing **10** closely adjacent the arc chutes and serving as a pressure release for the gases produced by arcing. The force of spring **23** reacts against pin **25** to rotate the lever **21** to the position shown in FIG. 2. The movement of pin **25** about pin **22**, under the urging of spring **23**, realigns links **27** and **28** and fork element **40** to replace pin **45** in recess **46** as shown in FIG. 2. In order to close the contacts, the handle is rotated clockwise about pin **22** to force the linkage down to rotate lever **14**. When the contacts close, they become a pivot about which lever **14** is rotated against the force

of spring **18** to load the spring and linkage for future toggle action.

The housing is formed of two mirror-image sections **10** and **10'** (FIGS. 1 and 5) which are secured together by rivets **62** passing through openings in the housing. One of the sections, such as **10**, is provided with an elongated groove **70**, and the other section is provided with an elongated tongue which is snugly received in the groove. This tongue-and-groove arrangement is for the purpose of accurately aligning the housing sections on assembly.

Each housing section is provided with recesses **63** molded in the meeting faces. The recesses **63** are provided with enlarged hexagonal portions **64**. When the sections are secured together as shown in FIG. 5, the recesses **63** combine to provide openings which receive threaded metal ferrules **65** (FIG. 6) with hexagonal heads by which the assembly is secured to a support. The recesses **66** combine to provide openings for the reception of the threaded terminals **49** and **52**.

What is claimed is:

1. A circuit breaker comprising a housing of molded plastic electrical insulating material, said housing having spaced recesses therein, a frame in said housing, a pair of spaced pins mounted in said frame and extending through the frame and into said recesses, a fixed contact and a movable contact in said housing, a toggle mechanism for moving said movable contact into and out of contact with said fixed contact, said toggle mechanism comprising a first lever pivotally and slidably mounted on said frame and carrying said movable contact, a handle

mounted on said frame and having a portion extending outwardly of said housing, a pair of links pivotally connected to each other and to said contact lever and handle respectively, means for locking said pair of links against pivotal movement with respect to each other, and means for unlocking said means to permit pivotal movement of said pair of links with respect to each other, said locking means comprising a forked lever pivotally mounted on said frame, a pin carried by one of said pair of links for reception in the fork of said forked lever, a sear on said frame for holding said forked lever against pivotal movement, said unlocking means including a solenoid and armature responsive to a predetermined current flow through said solenoid for tripping said sear.

2. A circuit breaker according to claim **1** wherein said forked lever is pivotally connected to said handle.

3. A circuit breaker according to claim **1** wherein said fixed contact is mounted on a substantially U-shaped support, said support having one arm carrying said fixed contact spaced inwardly from said housing.

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