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TOGGLE MECHANISM FOR CIRCUIT BREAKERS

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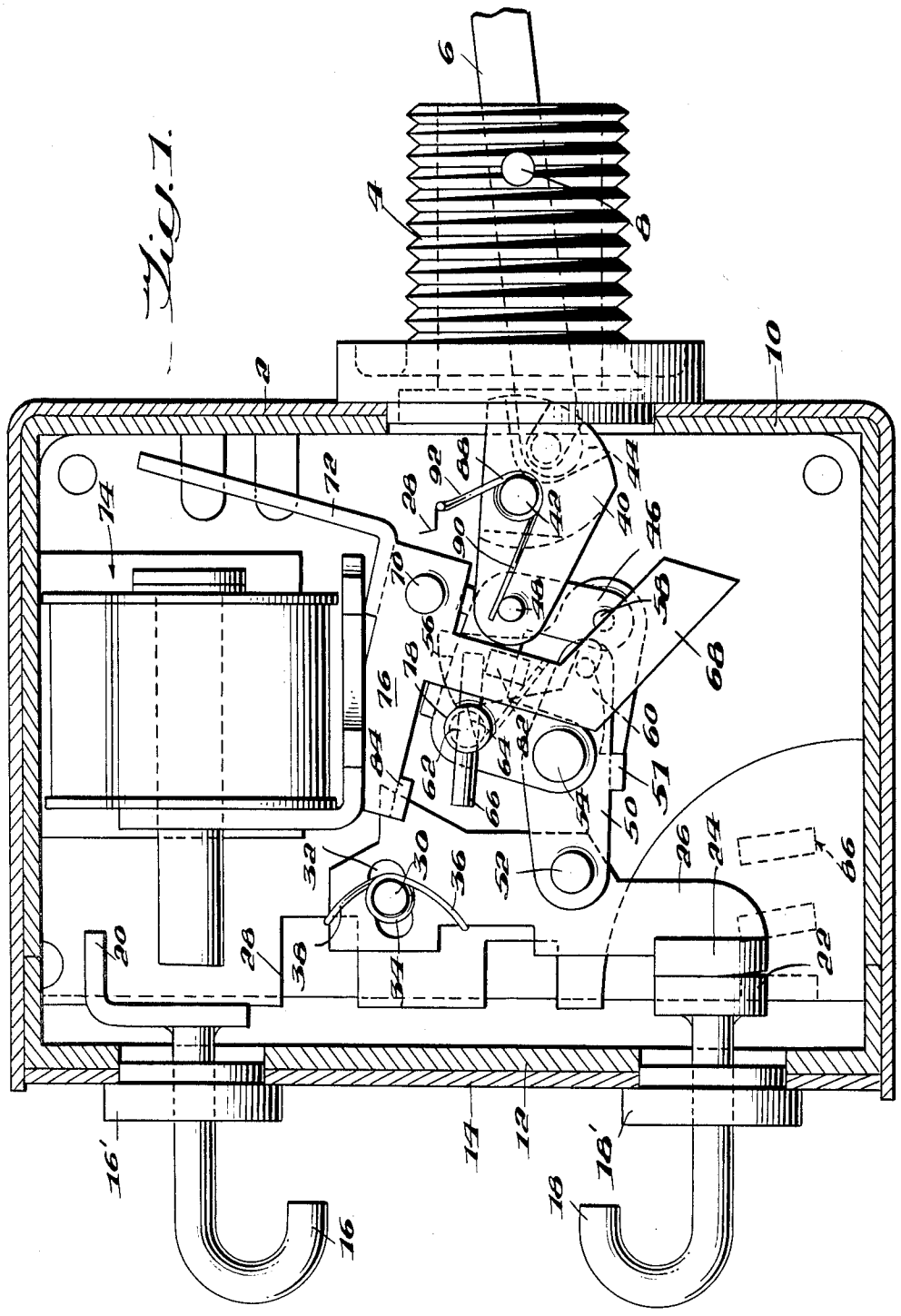
Fig. 1.



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TOGGLE MECHANISM FOR CIRCUIT BREAKERS

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Fig. 2.

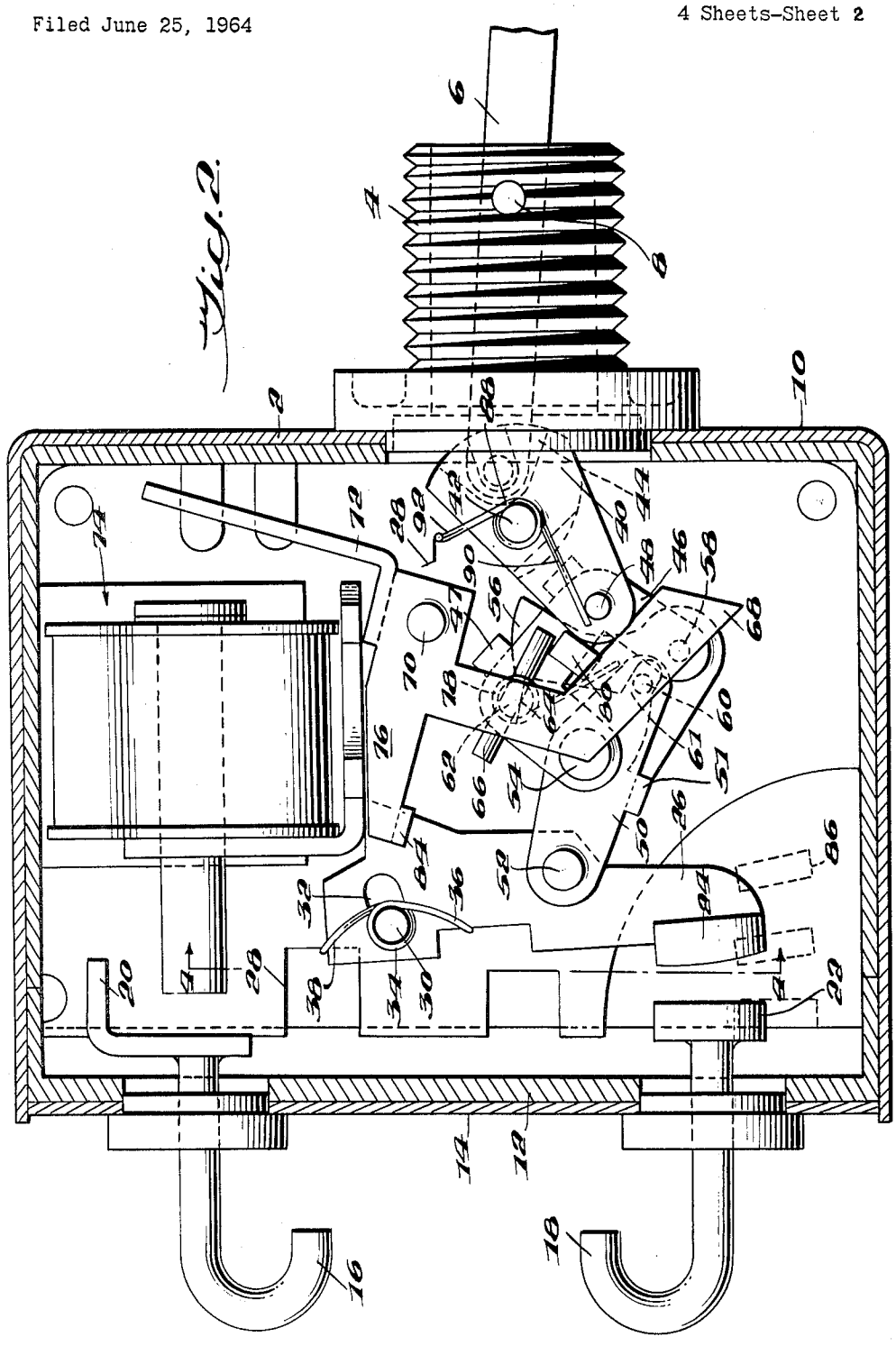

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Fig. 3.

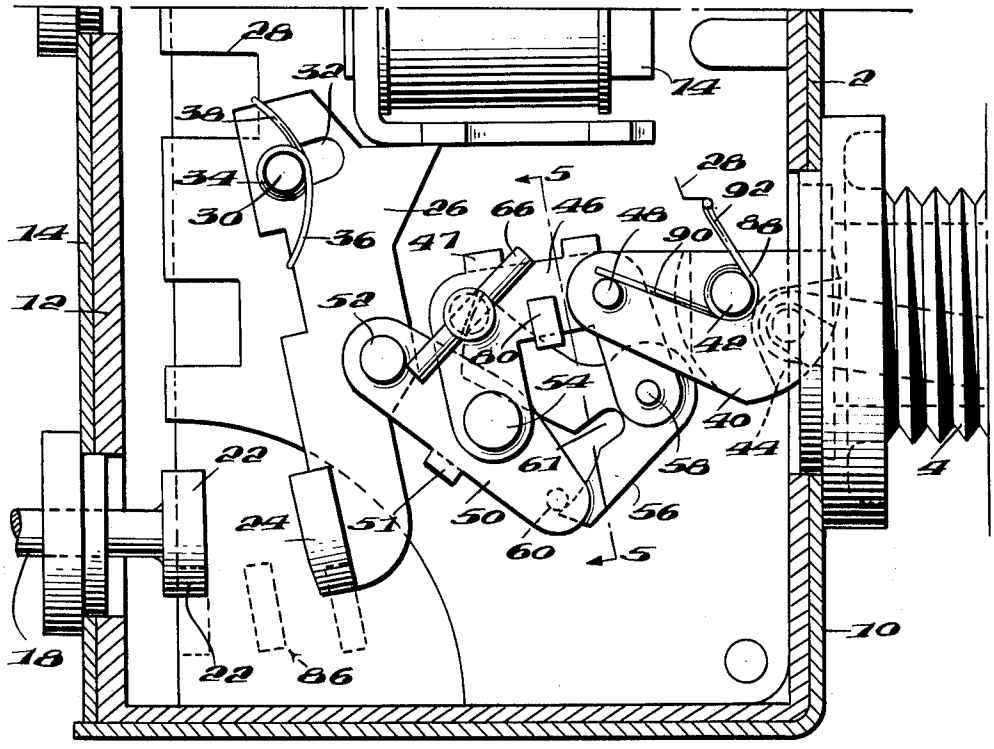

Fig. 5.

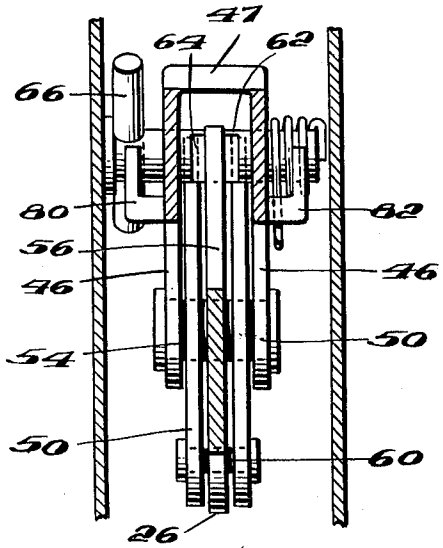

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Fig. 4.

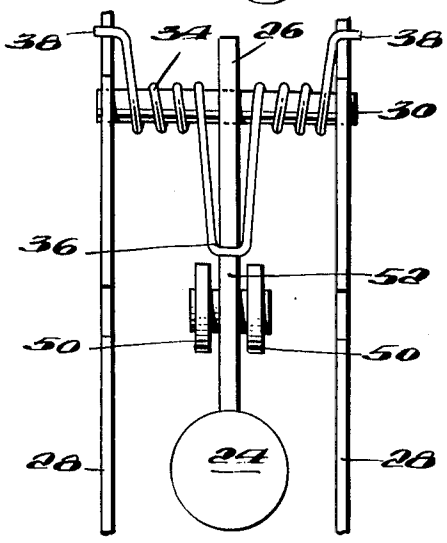


Fig. 6.

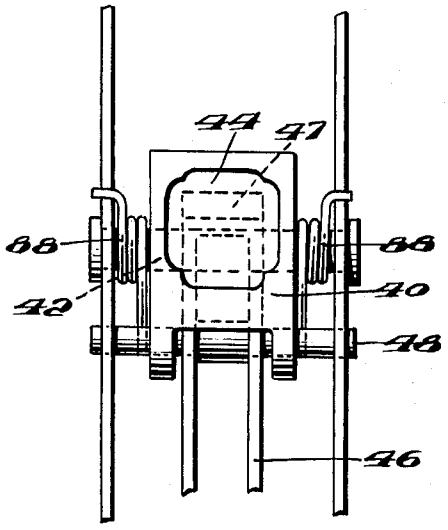


Fig. 7.

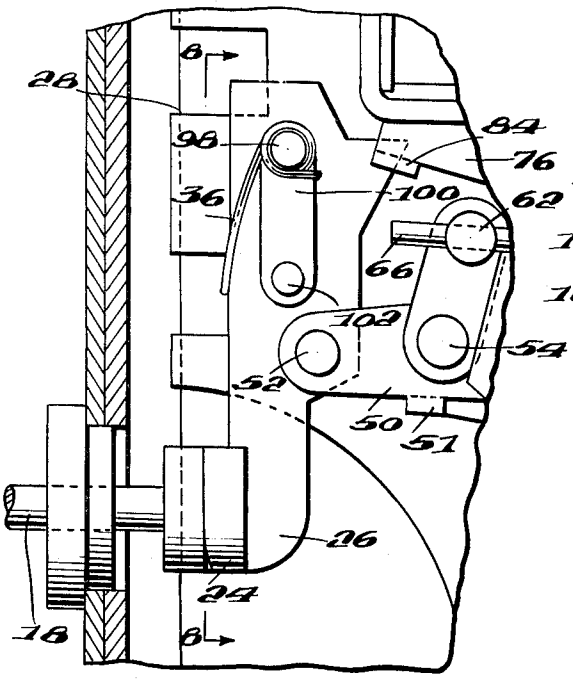
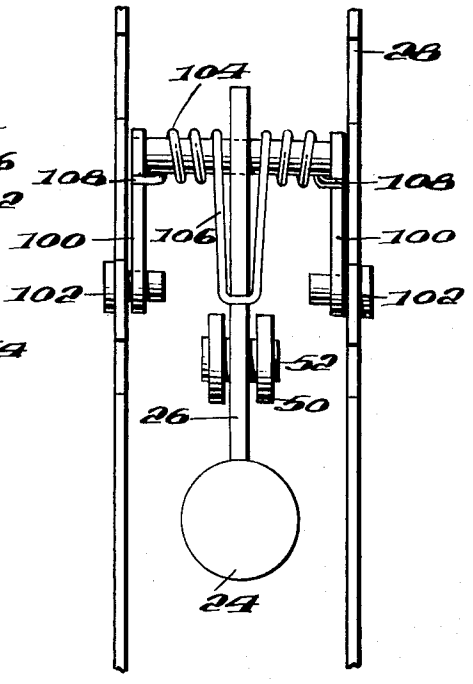


Fig. 8.



United States Patent Office 3,251,232 Patented May 17, 1966

3,251,232

TOGGLE MECHANISM FOR CIRCUIT BREAKERS

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7 Claims. (Cl. 74—2)

This invention relates to a toggle mechanism for a circuit breaker.

Circuit breakers are often mounted on supports which are subject to shocks and/or vibrations of such violence and magnitude as to cause unwanted operation of the mechanism to open the circuit.

It is an object of this invention to provide a mechanism for maintaining the circuit closed under conditions of great mechanical shock and/or vibration but which can be operated to quickly open the circuit under predetermined electric current conditions.

It is also an object of this invention to provide a mechanism as aforesaid whereby the tenacity of the mechanism to maintain the circuit closed can be released by a light tripping force.

It is a further object of this invention to produce a mechanism as aforesaid which is simple and reliable and in which the arrangement of parts lends itself to quick and easy assembly.

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

FIG. 1 shows the mechanism in a position where the contacts are closed.

FIG. 2 shows the mechanism in a position where the contacts are open.

FIG. 3 shows the mechanism in an intermediate postion.

FIG. 4 is a section taken on the line 4—4 of FIG. 2.

FIG. 5 is a section taken on the line 5—5 of FIG. 3 with certain parts omitted.

FIG. 6 is a view showing the symmetrical relationship of a part of the toggle mechanism.

FIG. 7 is a view showing a modified mounting for the contact carrying arm.

FIG. 8 is a view on line 8—8 of FIG. 7.

In the drawings is shown a metal housing **2** having secured thereto a threaded bushing **4** in which is pivotally mounted a toggle handle or lever **6** on a pivot **8**. A housing **10** of insulating material is fitted in the metal housing **2** and is closed by a cover member **12** of insulating material and maintained in assembled relation by a metal cover member **14** secured to housing **2**.

Terminals **16**, **18** are mounted by insulators **16'**, **18'** in member **14**. Terminal **16** has integral therewith a terminal **20** and terminal **18** has secured thereto a fixed contact **22** for cooperation with a movable contact **24** carried by a lever **26** pivotally and slidably mounted on a frame **28** by means of a pin **30** secured to the frame **28** and extending through a slot **32** in the lever **26**. A spring **34** is wound about pin **30** and is provided with a biasing arm **36** bearing against lever **26** and reaction arms **38** bearing against the frame **28**.

A lever **40** of insulating material is pivotally mounted on the frame **28** by a pivot rod **42** secured to the frame and is provided with a socket portion **44** for reception of the end of lever **6**. Movement of the lever **6** about pivot **8** rotates the lever **40** about pivot **42**.

A U-shaped lever **46** (shown in FIG. 5) is pivotally connected to the lever **40** by a pivot **48** and a lever **50** is pivotally connected to lever **26** by a pivot connection **52**. The lever **50** is formed with parallel sides connected by a bridge piece **51** integral therewith and straddles lever **26** to form a structure which is symmetrical to avoid any tendency for the levers to bind or to bend the connecting pivot. The lever **46** is also formed with parallel sides which are connected by bridge pieces **47** to form an integral symmetrical structure which straddles lever **50**. Levers **46** and **50** are pivotally connected by a pivot connection **54**. An L-shaped forked lever **56** is pivotally connected to the end of one of the legs of the U-shaped lever **46** by a pivot connection **58** and is shaped to allow the entrance and exit of a pin **60**, secured to lever **50**, into and out of the fork groove **61**.

A shaft **62** is rotatably mounted on the U-shaped lever **46** and is provided with a reduced section **64** which will allow the passage of the lever **56** when rotated to the position shown in FIG. 3 but which will prevent rotation of the lever **56** when positioned as shown in FIG. 1. The shaft is also provided with an abutment in the form of a pin **66** fixed thereto.

A bell crank lever **68** is pivoted on a rod **70** fixed to the frame and has one arm **72** adjacent an electromagnet **74** and another arm **76** which can contact and rotate the pin **66** when electromagnet **74** is energized to attract arm **72**.

The pin **66** is urged by a spring **78** into contact with an abutment **80** carried by lever **46**. A second abutment **82** carried by the lever **46** serves as a reaction element for the spring **78**.

The circuit breaker is shown in FIG. 1 with the contacts **22**, **24** biased together by spring **34**. As a consequence the reaction force of spring **34** on pivot **52** loads the levers **46** and **50** to tend to collapse them into the position shown in FIG. 3. However collapse is prevented by the fit of pin **60** in the fork groove **61**. The force of pin **60** against lever **56** tends to pivot the lever **56** about pivot **58** and into contact with shaft **62**. Since the lever **56** is prevented by the shaft **62** from rotating to release the pin **60**, the levers **46** and **50** are maintained locked in the position shown in FIG. 1. Only shocks and/or vibrations of such violence, magnitude, and character that can rotate shaft **62** against the bias of spring **78** can cause unwanted collapse of the toggle mechanism.

Upon the occurrence of an overload the electromagnet **74** is energized to attract arm **72** and to cause pivoting of the bell-crank lever **68** about pivot **70**. A pad **84** carried by the arm **76** is carried into contact with abutment pin **66** to thereby rotate shaft **62**. Rotation of the shaft from the locking position shown in FIG. 1 to the unlocking position as shown in FIG. 3 presents the reduced section **62** to the end of the lever **56** to allow the lever to rotate to the position shown in FIG. 3 to thereby release pin **60** and allow the collapse of the linkage **46**, **50** to the position shown. The collapse of the linkage allows movement of lever **26** relative to pin **30** and thus separate the contacts **22**, **24**. The arc chute **86** serves to extinguish the arc drawn by the separating contacts.

Springs **88** are wrapped about pivot **42** and have biasing arms **90** urging pivot **48** about the pivot **42** and have a reaction arm **92** bearing against the frame **28** shown as a segment in FIG. 1. Immediately upon the collapse of the linkage to the position shown in FIG. 3, the arm **90** moves pivot **48** and its connected lever **46** carrying lever **56** to the position shown in FIG. 2 whereby pin **60** is again received in fork groove **61** and lever **56** held captive by shaft **62** to reform the toggle. The parts come to rest in the position shown in FIG. 2.

To reset the device lever **6** is rotated counterclockwise about pivot **8**. This rotates lever **40** clockwise about pivot **42** to carry pivot **48** about this pivot until it comes to rest against a stop not shown. The levers **46**, **50** locked against pivoting relative to each other are moved as a rigid body to force lever **26** to rotate about pin **30** to close contacts **22**, **24**. Continued movement causes pivoting, with some sliding, about the closed contacts to return lever **26** to the position shown in FIG. 1. The

sliding of the contacts over each other gives the contacts a self-cleaning action.

A modified mounting for lever **26** is shown in FIGS. **7** and 8 wherein the lever is pivoted on pin **98**, and pin **98** is pivotally connected to links **100** which are pivotally mounted on pins **102** secured to frame **28**. A spring **104** is wound about pin **98** and is provided with a biasing arm **106** bearing against lever **26** and reaction arms **108** bearing against the links **100**.

What is claimed is:

1. A toggle mechanism comprising a first lever pivotally and slidably mounted on a frame, a second lever pivotally mounted on the frame, a pair of levers pivotally connected to each other and to said first and second levers respectively, means for locking said pair of levers against pivotal movement with respect to each other, and means for unlocking said locking means to permit pivotal movement of said pair of levers with respect to each other, said locking means comprising a forked lever pivotally carried by one of said pair of levers, a pin received in the fork carried by the other of said pair of levers, and means holding the forked lever against pivotal movement.

2. A mechanism as in claim **1** wherein the means holding the forked lever against pivotal movement comprises a shaft rotatably mounted on said one of said pair of levers and having a reduced section, means for maintaining the shaft against rotation with the reduced section out of contact with the lever, and means urging said forked lever into contact with the shaft.

3. A mechanism as in claim **2** wherein the means for unlocking the locking means comprises means for rotating the shaft to present the reduced portion of the shaft to the lever.

4. A mechanism as in claim **3** wherein the means for rotating the shaft comprises an abutment secured to the shaft and a lever pivoted on the frame for contact with the abutment.

5. A mechanism as in claim **3** wherein the means for rotating the shaft comprises a bell-crank lever, an electromagnet mounted on the frame adjacent one arm of the crank for attracting said arm upon a predetermined current condition, and an abutment carried by the shaft in the path of movement of the other arm of the crank for actuation thereby.

6. A toggle mechanism comprising a first lever, link means pivotally mounting said lever on a frame, a second lever pivotally mounted on the frame, a pair of levers pivotally connected to each other and to said first and second levers respectively, means for locking said pair of levers against pivotal movement with respect to each other, and means for unlocking said locking means to permit pivotal movement of said pair of levers with respect to each other.

7. A toggle mechanism as in claim **6** wherein the link means comprises a pair of links pivotally mounted on the frame and pivotally connected to the first lever.

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