Nov. 12, 1963 G. E. GAUTHIER 3,110,792

LOCK-OPEN CONTACT LATCH

Filed March 3, 1961

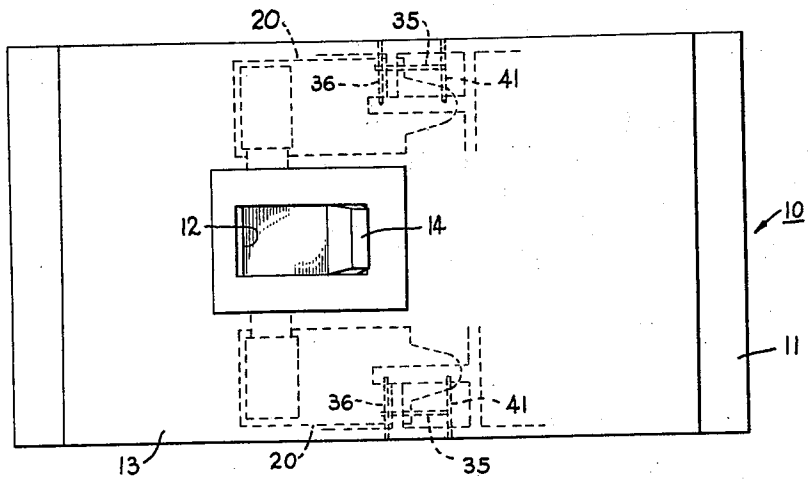


FIG. 1

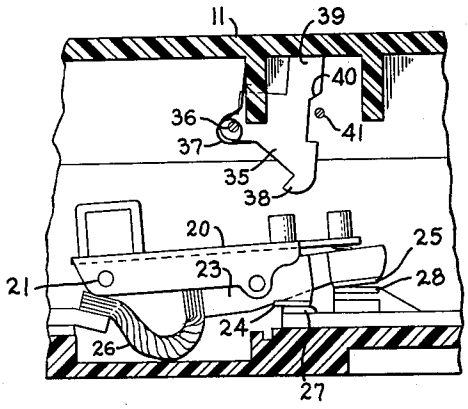


FIG. 2

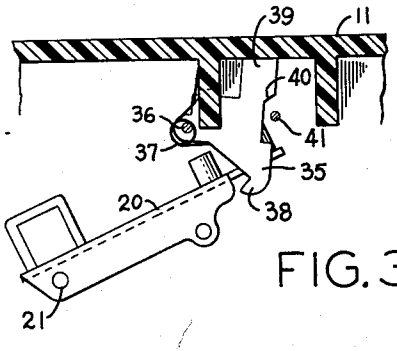


FIG. 3

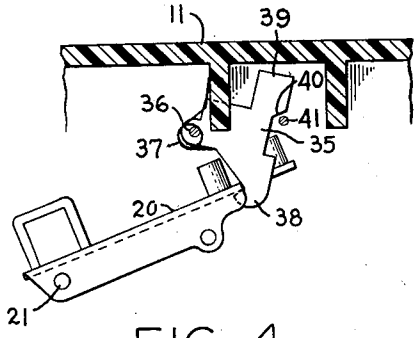


FIG. 4

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United States Patent Office 3,110,792 Patented Nov. 12, 1963

3,110,792

LOCK-OPEN CONTACT LATCH

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Filed Mar. 3, 1961, Ser. No. 93,097
2 Claims. (Cl. 200—153)

This invention relates to circuit breakers and, more particularly, to locking means for preventing the undesired closing of circuit breaker contacts due to the impact of shock forces exerted on the circuit breaker casing from without.

In practice, circuit breakers are usually provided with over-center operating springs in which energy is stored to effect opening and closing of the circuit breaker contacts with a snap action, thus reducing to a minimum the possibility of drawing a contact-damaging arc. The loading of the operating springs is usually such that they tend to hold the contacts in either of the open or closed positions until overcome by sufficient external force to begin to move the contacts to the other position at which time the operating springs cooperate with the external force to snap the contacts to the other position. In the case of extremely severe shock conditions, however, the spring loading may not be sufficient to hold the contacts from movement. Such shock conditions may be encountered, for example, on naval vessels, where circuit breakers of the type disclosed herein are often used.

To prevent such accidental closing of the contacts, latches have been previously used which engage the contact operating mechanism whenever the contacts are in the open position. Such a latch must be withdrawn from its engagement with the operating mechanism before it is possible to intentionally close the contacts, requiring a relatively complicated and expensive structure.

It is a principal object of this invention to provide an electric circuit breaker including improved locking or blocking means for preventing undesired closing movement of circuit breaker contacts due to the impact of shock forces which may be exerted on the circuit breaker casing.

Another object of this invention is to provide a breaker including such locking or blocking means which is independent of the contact operating mechanism, for preventing undesired closing of circuit breaker contacts due to the impact of shock forces on the circuit breaker casing.

An additional object is to provide a circuit breaker including locking means for preventing the unwanted closing movement of circuit breaker contacts which is simple in operation, easy and economical to manufacture, and which is usable with many types of circuit breakers.

Briefly stated, in accordance with the invention, a circuit breaker is provided including locking or blocking means which moves only under the influence of shock forces, into the path of the contact arm carrying the movable contacts, to thereby prevent the movable contacts from moving to the closed position. Both the contact arm and the locking means are preferably spring-loaded so that the contact arm returns to the open position and locking means moves out of the contact arm path upon the termination of the application of the shock forces.

The specification concludes with claims particularly pointing out and distinctly claiming the subject matter of the invention. The construction and operation of the invention in one embodiment will be understood from the following description, taken in connection with the accompanying drawing, in which:

FIGURE 1 is a plan view of an electric circuit breaker incorporating the invention, the internal contact operating arms being shown by broken lines;

FIGURE 2 is a cut-away view of the circuit breaker of FIGURE 1, the contacts being shown in the closed position and the locking means being shown in its disengaged position;

FIGURE 3 is a partial view similar to FIGURE 2 in which the movable contacts are shown in the open position and the locking means is shown in its disengaged position; and

FIGURE 4 is a view similar to FIGURE 3, but showing the locking means moved to its engaged position in response to shock to thereby engage the movable contact arm and thus prevent closing of the contacts.

Referring first to FIGURE 1, the invention is shown as incorporated in a circuit breaker **10** having a casing or housing **11**. An opening **12** is provided in the upper surface **13** of the casing through which the handle **14** of a manually operable contact-operating mechanism (not shown) extends.

With particular reference now to FIGURES 2, 3, and 4, the circuit breaker casing **11** is shown cut away to expose to view the circuit breaker contacts and a locking device according to the invention for preventing the undesired closing of the contacts. A movable contact arm **20** is pivotally mounted to the casing **11** at pivot point **21** so as to be movable between two extreme positions known as the closed and the open positions, the closed or engaged position of the contact arm **20** being shown by FIGURE 2 and the open or disengaged position being shown by FIGURE 3. A contactor member **23** including contacts **24** and **25** is carried by and is pivotally mounted on the movable contact arm **20** at pivot point **22**. Stationary contacts **27** and **28** are mounted on the lower insulated wall of the casing **11** and are located so as to be contacted by the movable contacts **24** and **25** to complete an electric circuit through the circuit breaker when the contact arm **20** is in the closed or engaged position shown in FIGURE 2. A flexible conductor member **26** is attached to the back surface of the member **23** for carrying the current flowing through the circuit breaker to an externally available terminal (not shown).

A spring arrangement (not shown) is provided for over-center biasing the contact arm **20** and, therefore, the movable contacts **24** and **25** into either one of the closed or open positions, depending upon the position of the operating handle **14**.

According to one form of the invention which may be preferred, locking or blocking means is provided comprising a latch **35** which is pivotally mounted on the circuit breaker casing **11** at pivot point **36**, and is biased into the position shown in FIGURES 2 and 3 by a spring **37**. Alternately, the latch **35** may be arranged to be biased into the position shown by the force of gravity if the circuit breaker is to be mounted in a suitable horizontal position. A hook **38** is provided on one end of the latch **35** and, as can be seen in FIGURE 3, is normally biased to be positioned out of the path of the contact arm **20** as it moves between the closed and the open positions. A projection **39** at the other end of the latch **35** contacts the circuit breaker wall, so that the latch **35** is normally in engagement with the housing **11**. Thus, it can be seen that the latch **35** normally has no effect upon the movement of the contact arm **20** between the open and the closed positions and does not interfere with the normal operation of the circuit breaker.

The latch **35** is preferably constructed of flat metallic material, and is pivotally supported with substantially all of its mass on the same side of the pivoted support **36** as the projection **39**.

The latch **35** is much smaller and much lighter than the contact arm **20** and therefore has less inertia. It also has a much lighter biasing force exerted on it than that exerted on the contact arm **20**.

Also, substantially all the mass of the latch **35** is on the same side of its pivotal support as the projection **39**, which

is the point of application of such shock forces to the latch 35.

The latch 35 moves, when the breaker is subjected to high acceleration, such as during impact, by what is known as "billiard-ball action." Thus if a movable body is in contact with a second body when the second body is subjected to high acceleration or impact forces, the movable body will move away from its point of contact with the second body. Accordingly, the last billiard ball in a row of balls all touching each other, will move away from the others when they all are subjected to impact. Since this force is exerted on the latch 35 at a point substantially eccentric to its pivot, it has a large moment-arm and is very effective to cause rotation of the latch.

For these reasons, the latch 35 reacts to shock forces much more rapidly than the relatively heavy contact arm 20. Thus, the latch 35 moves rapidly to the position shown by FIGURE 4 when shock forces are applied to the circuit breaker casing 11 to cause the latch 35 to pivot about the point 36 until the latch surface 40 contacts the stop pin 41. When the surface 40 contacts the pin 41, the hook 38 has moved far enough into the path of the contact arm 20 to engage the heavier contact arm 20 as it reacts to the shock forces and moves toward the closed position. Thus, the latch 35 effectively prevents the closing of the circuit breaker contacts.

Since the latch 35 intercepts the contact arm 20 before it has moved a substantial distance from its open position, the contact arm spring biasing arrangement urges the contact arm 20 back to its open position upon the termination of the shock forces. As the contact arm 20 backs out of contacts with the hook 38 under the influence of the contact arm spring biasing arrangement, the spring 37 causes the latch 35 to return to the position shown by FIGURES 2 and 3, thus freeing the contact arm 20 for movement to the engaged position when desired.

While the latch 35 may be mounted to internal circuit breaker structure which is, in turn, mounted to the casing or housing 11, it is desirable to mount the latch 35 directly on the housing since the shock forces will then be directly transmitted to the latch and, consequently, the latch will be faster and more positive acting since the energy in the shock forces will not be absorbed by any other structure. It will also be obvious that in certain situations it may be desirable to mount the circuit breaker elements on an open frame than in an enclosed housing such as that described above.

While only one embodiment of the invention has been shown, it will be readily apparent that various modifications thereof may be made, and it is intended to cover by the appended claims all such modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. Switching apparatus comprising a housing of substantially rigid insulating material, at least one contact arm pivotally supported in said housing, a movable contact carried by said contact arm, a stationary contact mounted in said housing, said movable contact being movable along a predetermined path of movement between engaged and disengaged positions with respect to said stationary contact, a latch member pivotally mounted in said housing adjacent said path of movement of said contact arm, means biasing said latch member into engagement with a portion of said housing, said latch member including a latch portion movable upon rotation of said latch member into the path of movement of said contact arm to directly engage said contact arm to limit movement thereof, said latch member having most of its mass at the same side of said pivotal support as the engagement with said housing whereby shock forces exerted on said housing cause said latch member to move away from its engagement with said housing and into the path of movement of said contact arm, before said movable contact arm has moved an appreciable distance from said open-circuit position.

2. Switching apparatus comprising a housing of substantially rigid insulating material, at least one elongated contact arm pivotally supported adjacent one end thereof in said housing and carrying a movable contact adjacent the other end thereof, a stationary contact mounted in said housing, said movable contact being movable along a predetermined path of movement between engaged and disengaged positions with respect to said stationary contact, a latch member pivotally mounted in said housing adjacent said path of movement of said contact carrying end of said contact arm, means biasing said latch member into engagement with a portion of said housing, said latch member including a latch portion movable upon rotation of said latch member away from said housing into latched engagement with said contact carrying end of said contact arm, said latch member having most of its mass at the same side of said pivotal support as the engagement with said housing, whereby shock forces exerted on said housing cause said latch member to move away from its engagement with said housing and into the path of movement of said contact carrying end of said contact arm before said movable contact arm has moved an appreciable distance away from said open circuit position.

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