Jan. 17, 1967 A. STROBEL ETAL 3,299,244

ANTI-REBOUND LATCH

Filed Oct. 11, 1965 6 Sheets-Sheet 1

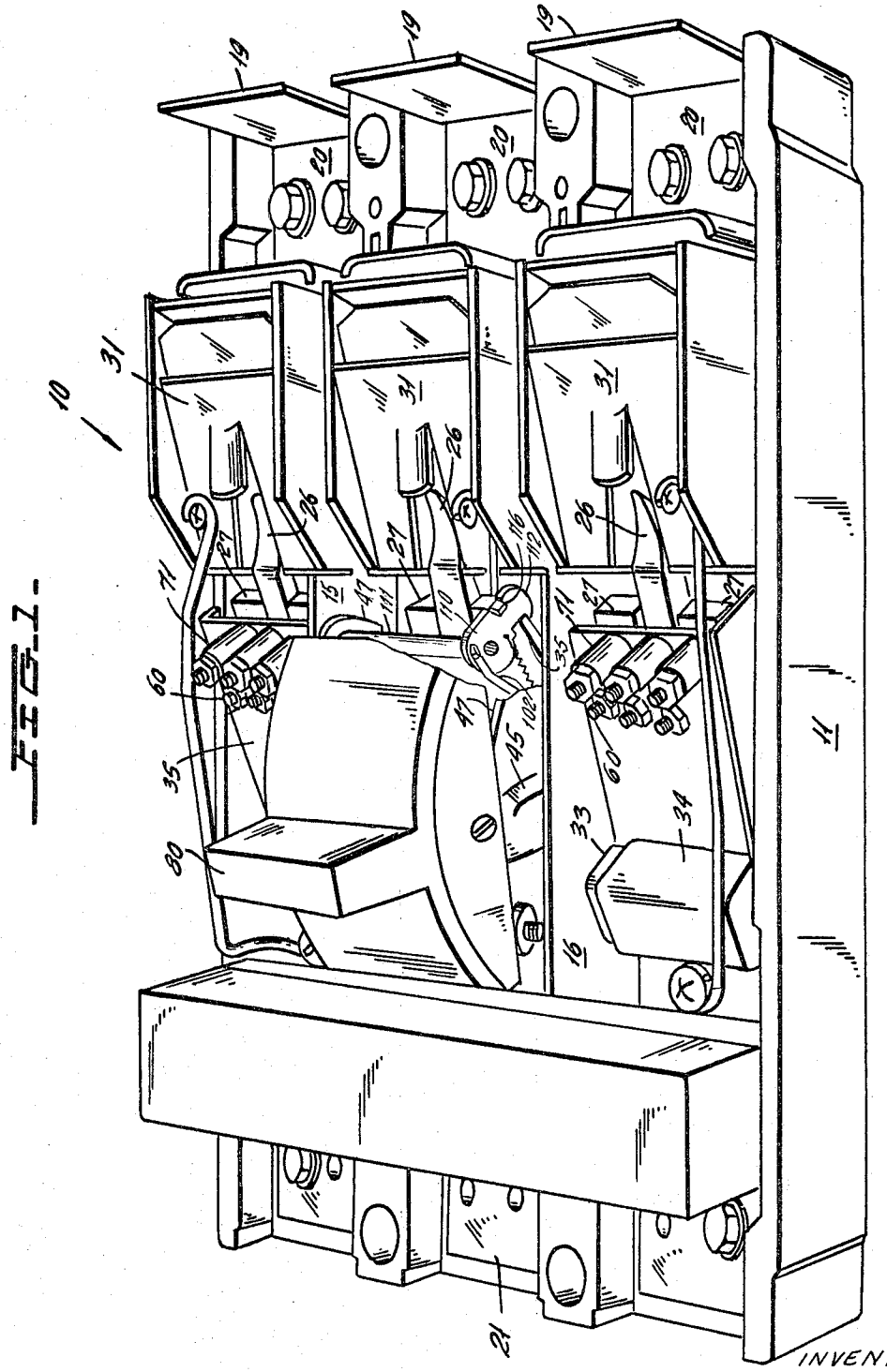


FIG. 1.

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ANTI-REBOUND LATCH

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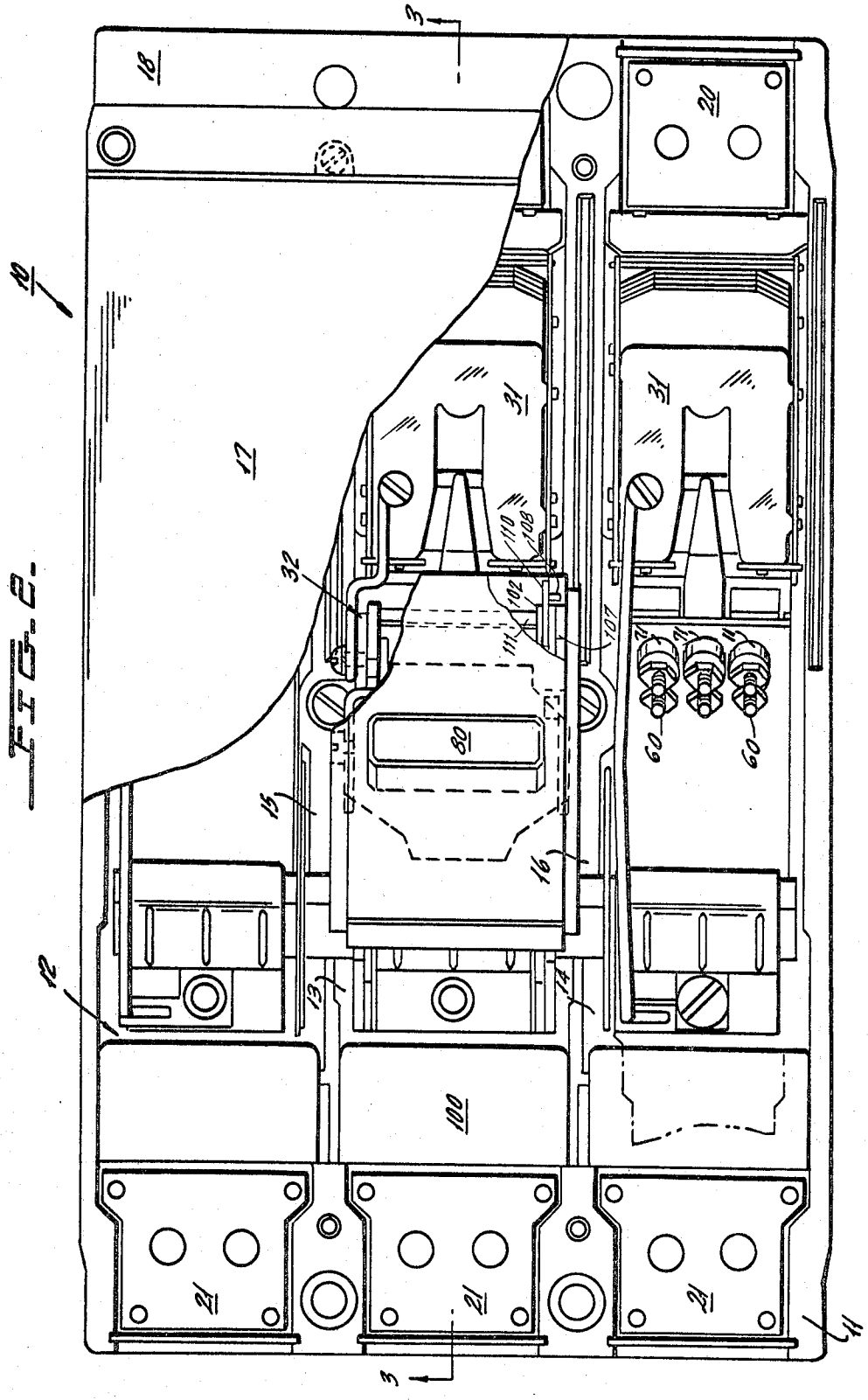


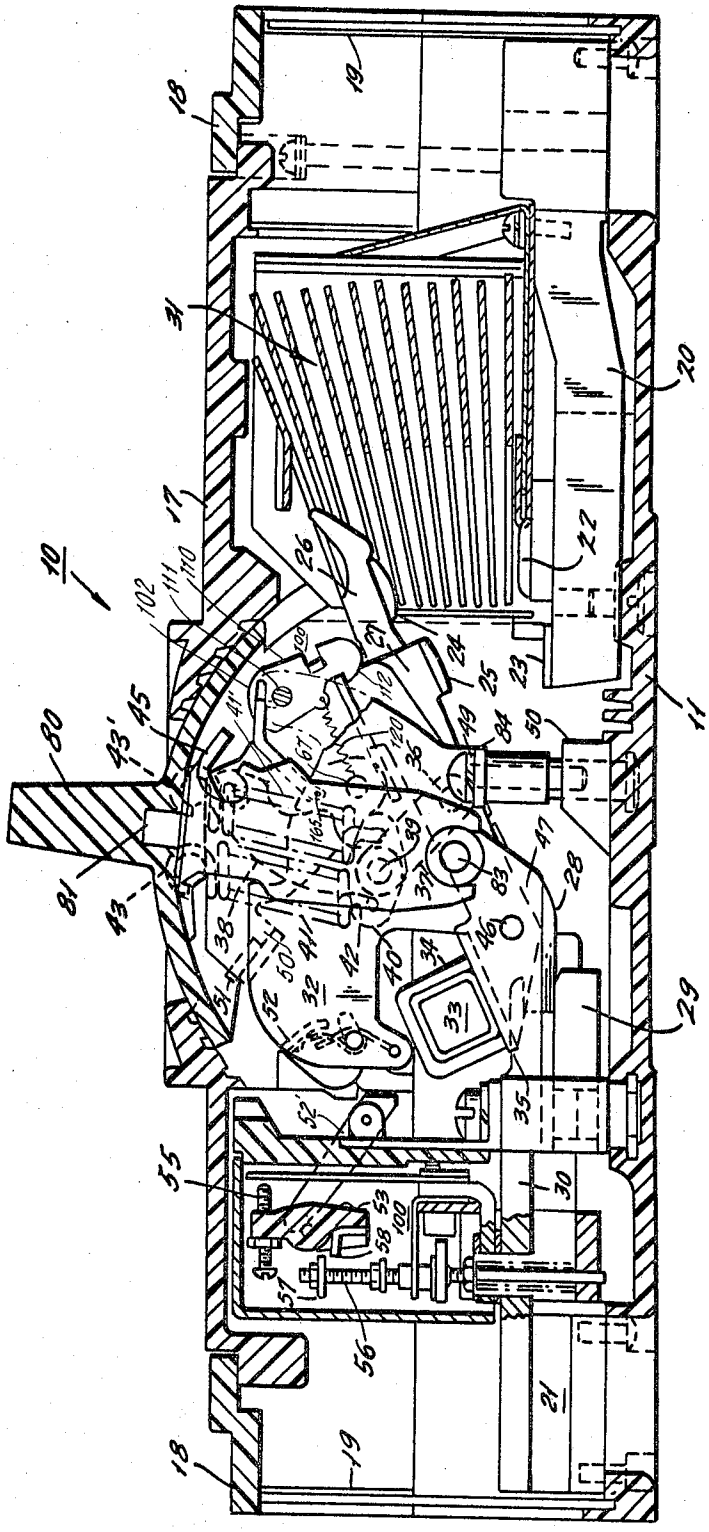

FIG. 2.

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ANTI-REBOUND LATCH

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FIG. 9.



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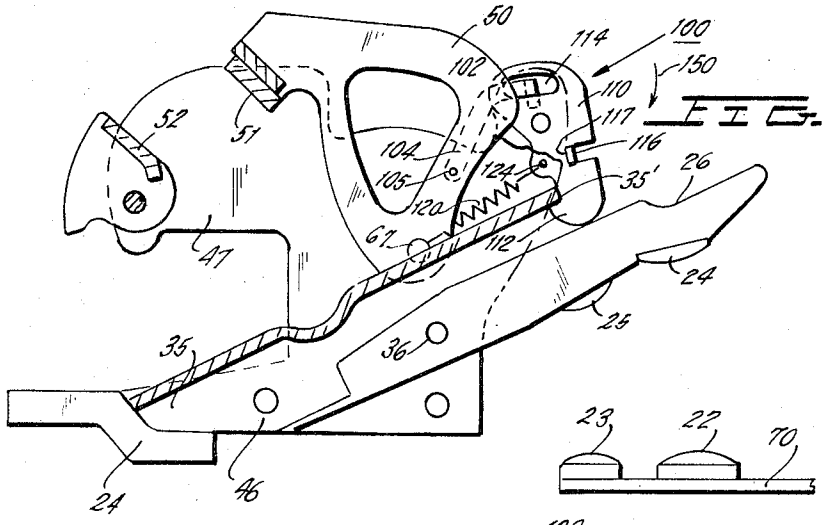



FIG. 5.

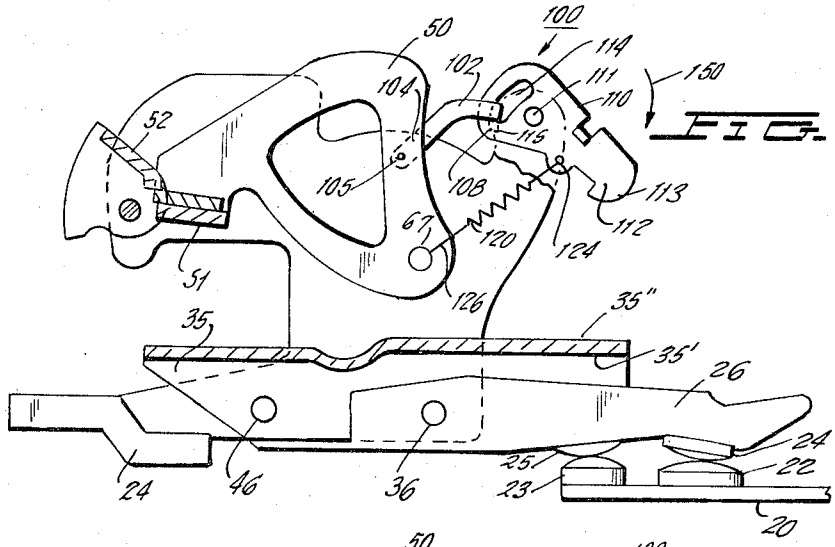



FIG. 4.

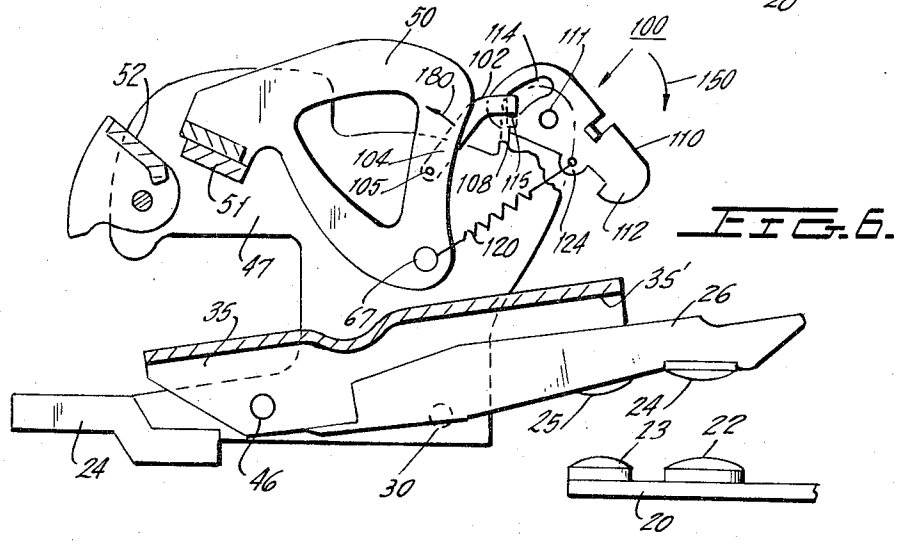



FIG. 6.

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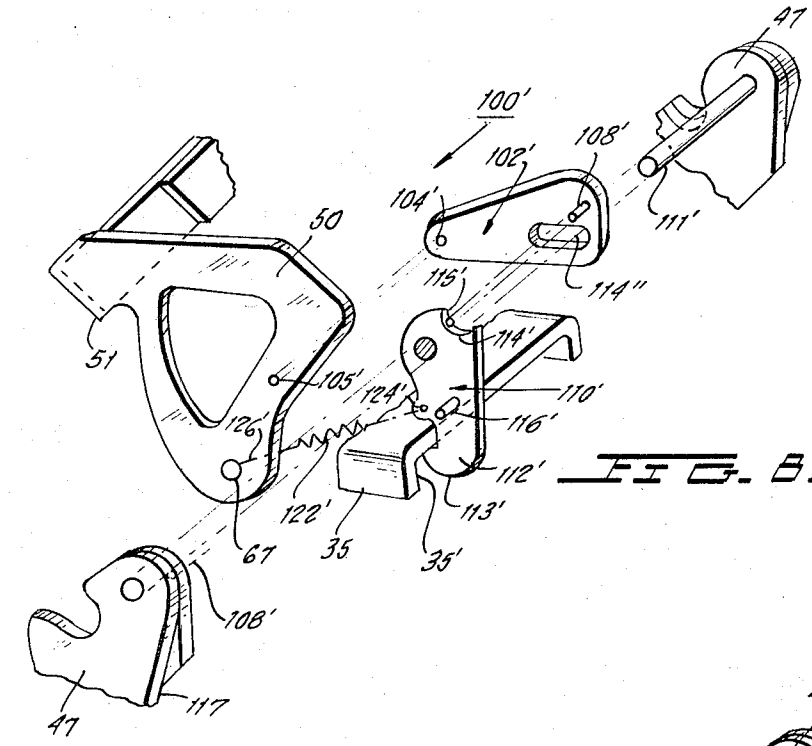



FIG. 8.

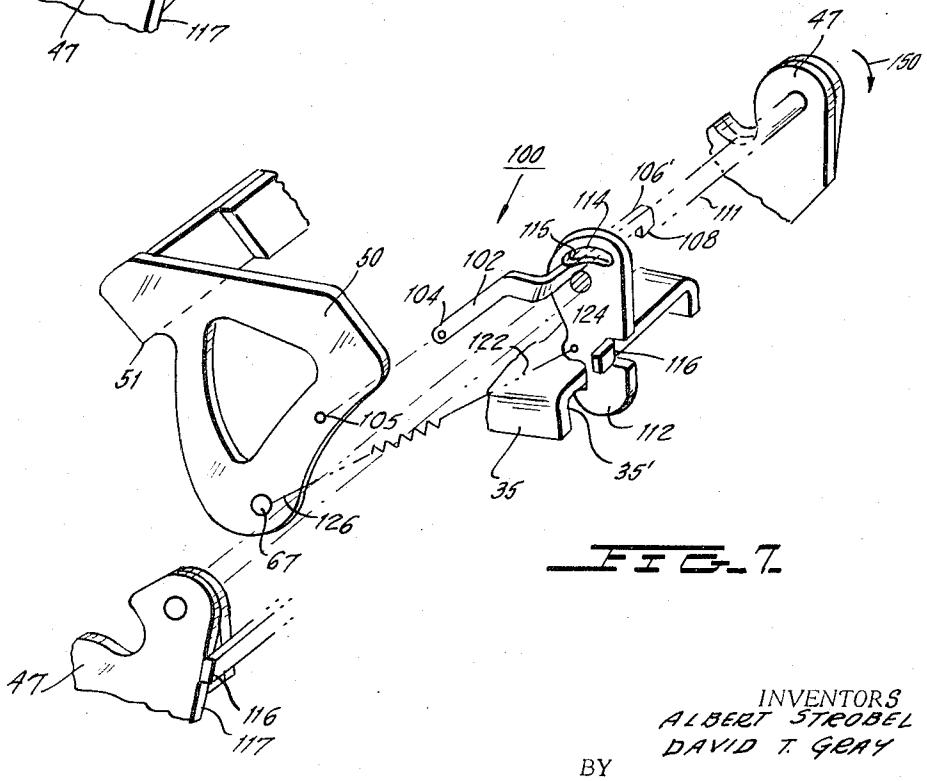



FIG. 7.

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ANTI-REBOUND LATCH

Filed Oct. 11, 1965 6 Sheets-Sheet 6

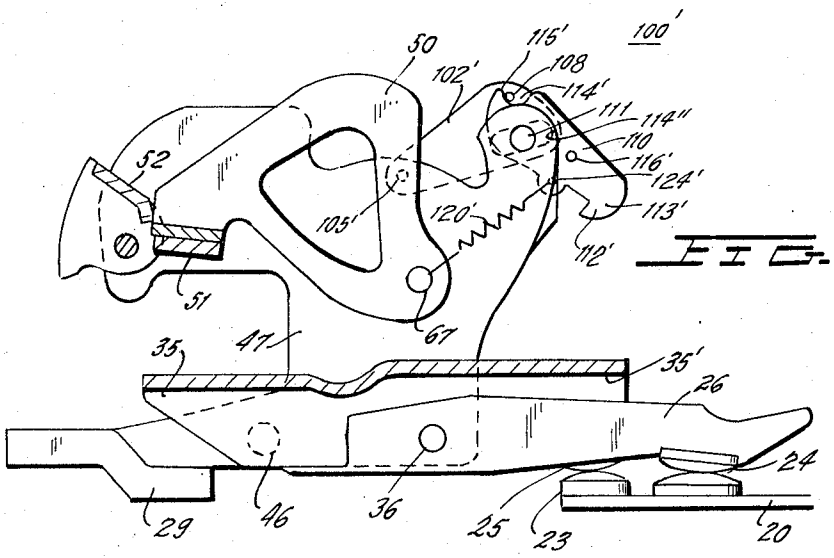



FIG. 9.

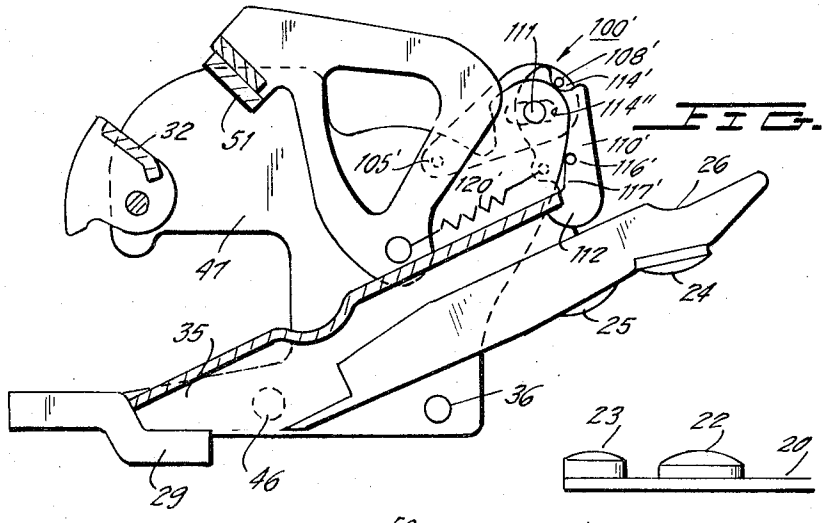



FIG. 10.

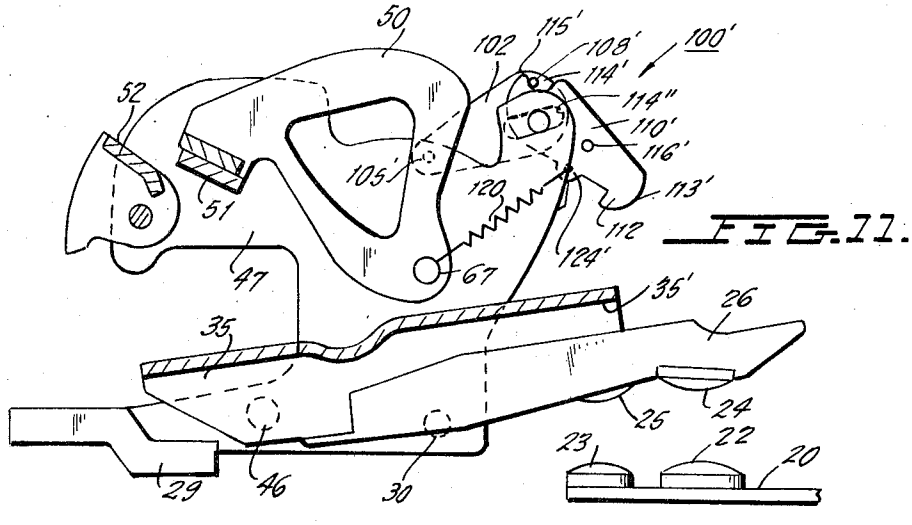



FIG. 11.

United States Patent Office 3,299,244 Patented Jan. 17, 1967



3,299,244

# ANTI-REBOUND LATCH

Albert Strobel, Cherry Hill, N.J., and David T. Gray, Roslyn, Pa., assignors to I-T-E Circuit Breaker Company, Philadelphia, Pa., a corporation of Pennsylvania

Filed Oct. 11, 1965, Ser. No. 494,313
14 Claims. (Cl. 200—169)

Our invention relates to molded case circuit breakers in general, and particularly to an improved anti-rebound latch means therefor which permits increased ease of manufacture, reliability of operation while providing compensation for misalignment resulting from normal manufacturing tolerances.

Present day circuit breaker mechanisms typically include at least one pair of cooperating contacts, one of which is stationary and the other is carried by a movable contact arm into and out of engagement with the stationary contact. The movement of the contact arm is in turn controlled by a latchable cradle mechanism operatively connected to a quick make-break overcenter toggle linkage for rapid movement of the contacts between the engaged and disengaged positions under the influence of the main operating springs. Under normal load conditions the cradle is latched into cooperative engagement with a member controlled by the automatic trip means. When subjected to a predetermined fault condition, the automatic trip mechanism moves in a manner serving to release the latched engagement with the cradle, thereby permitting overcenter movement of the toggle mechanism in rapid fashion so as to bring about disengagement of the cooperating contacts.

With the increasing utilization of molded case circuit breakers for high interrupting capacity (e.g. up to 100,000 amps at 600 volts, and having a continuous current rating of 1600 amps), substantially increased operating speeds are required, resulting in the utilization of main operating springs of increased force capabilities. Further, the blow-off forces accompanying such high interrupting capacities, especially upon the occurrence of a short circuit condition, are quite appreciable, thereby tending to effect extremely rapid separation of the cooperating contacts. When subjected to such rapid separation, there is a tendency of the movable contact arm to rebound back towards its cooperating stationary contact. Rebound at this time will interfere with arc interruption in that restrike is more likely as the distances between the parted contacts is decreased. Under these circumstances, it has become the practice to employ an anti-rebound latch which physically grasps the movable contact arm in the tripped-open condition so as to prevent rebound towards the stationary contact.

In the past, such anti-rebound latches have necessitated an intricate assembly of critically placed components. For example, one such arrangement is shown in U.S. Patent No. 2,932,706, entitled Hold-Open and Anti-Rebound Latches, issued Apr. 12, 1960 in the name of August Bodenschatz and assigned to the assignee of the instant invention. The anti-rebound latch shown in that patent is pivotally keyed about the cradle pivot and requires the placement of a compression spring member at a relatively inaccessible location. Such an arrangement requires tight tolerances to be maintained between the various individual elements comprising the circuit breaker operating means. Hence any deviation from such tight tolerances will have an adverse effect on the reliability of operation provided by the anti-rebound latch. Further since the circuit breaker may undergo a number of closing and tripping operations during its useful operating life, the mechanical parts undergo a significant amount of wear. This is particularly prevalent where the high



operating speeds of the larger frame sizes subject these parts to substantial impact loading. The wearing of the circuit breaker parts may so affect the critical adjustment of its elements as to defeat the tight tolerances required for safe and reliable operation of the anti-rebound latch mechanism.

Another type of anti-rebound latch structure is shown in U.S. Patent No. 3,182,157, entitled Overcenter Cam and Anti-Rebound Means, issued May 4, 1965 in the name of J. C. Brumfield, and also assigned to the assignee of the instant invention. The anti-rebound mechanism shown in that patent consists of a rounded surface of one of the toggle links which abuts a stationary surface during the trip condition. Should the movable contact tend to rebound, the engagement of these surfaces causes rebound of the contact arm to be limited to a small amount resisted by the force of the main operating springs. While such an arrangement may be effective for smaller frame sizes, the substantial force capabilities available during rapid blowing apart of the contacts in a circuit breaker designed for high interrupting capacity necessitates the inclusion of a definite mechanical latch means. Such a definite latch means will positively prevent rebound of the contact arm, and the deleterious effect resultant therefrom, as contrasted to reliance on the spring force for resisting such rebound.

It is the principal purpose of our invention to avoid these problems by providing a simplified anti-rebound latch mechanism of increased reliability of operation, which does not require the maintenance of critical tolerances and need not be mounted to the cradle pivot. Basically, the anti-rebound latch mechanism of our invention consists of a first and second section, which may typically be two simple linkage members. The first linkage member is pivotally mounted at one of its ends to the cradle, at a point displaced from the cradle pivot and the second linkage member is pivotally mounted to the support frame. The other end of the first linkage member carries a coupling means which is interconnected to a cooperating coupling means of the second linkage member in the manner of a lost motion connection. Such a lost motion connection may take the extremely simplified form of an over-sized aperture and a transversely extending protrusion (such as a right angle ear or pin), translatable within the oversized aperture. The provision of the lost motion connection intermediate the first and second linkage members will advantageously permit a fair amount of overtravel, thereby compensating for misalignment of parts resulting from original manufacturing tolerances, or subsequent wear of the components during their useful operating life. The free end of the second linkage member includes a hook-like formation which serves as a means for grasping a cooperating portion of the movable contact arm, or contact arm carrier. The hook-like formation is biased towards engagement with the contact arm by the provision of a spring member connected intermediate the second linkage member and the cradle such that the tripped contact arm is grasped so as to prevent movement back towards its cooperating stationary contact. As the cradle is moved from its unlatched to its latched position, during the reset cycle of the circuit breaker, the movement of the cradle is coupled to the hook-like formation, in a direction opposed to the spring bias force, thereby releasing the contact arm from the anti-rebound latch mechanism.

The displacement of the anti-rebound latch pivot from the pivotal axes of the cradle advantageously permits the utilization of a reliable anti-rebound latch mechanism in conjunction with a U-shaped cradle structure. The utilization of a U-shaped cradle structure provides numerous operating advantages, as is fully discussed in

U.S. Patent No. 3,155,802 entitled U-Shaped Cradle for Circuit Breaker, issued Nov. 3, 1964 in the name of Ernest R. Wortmann and assigned to the assignee of the instant invention.

Briefly, in such a U-shaped cradle mechanism, the toggle linkage and operating springs are placed between the arms of the U. Since the cradle bushing does not span the toggle linkage and spring area, the cradle bushing does not interfere with the movement of spring or contact linkage, so that greater contact travel and increased operating forces are possible within smaller space limits than was possible with other cradle structures. The cradle pivot will no longer be over the contact carrier and hence an anti-rebound latch mechanism must be provided, as in accordance with our invention, which does not require pivoting thereof to the cradle pivot.

It is, therefore, seen that the principal object of our invention is to provide an improved anti-rebound latch mechanism with increased simplicity and reliability of operation.

Another object of our invention is to provide an anti-rebound latch mechanism which does not require tight tolerances between the operating elements thereof and the circuit breaker operating mechanism.

A further object of our invention is to provide an anti-rebound latch mechanism which includes a predetermined degree of overtravel in the coupling between its constituent elements, with such overtravel serving to compensate for misalignment between the various elements.

An additional object of our invention is to provide a reliable anti-rebound latch mechanism for a circuit breaker mechanism which is pivotally mounted to the cradle thereof at a point displaced from the cradle pivot.

Still another object of our invention is to provide an anti-rebound latch mechanism for a circuit breaker unit which includes first and second interconnected linkage members, with the first of said linkage members being pivotally mounted to the latchable cradle of the circuit breaker, and a second of such linkage members including a hook-like formation for grasping and retaining the circuit breaker contact carrying arm.

Still a further object of our invention is to provide such an anti-rebound latch mechanism wherein a loss motion connection is provided between the first and second linkage members.

Still an additional object of our invention is to provide an extremely simplified and reliable anti-rebound latch mechanism which consists of three basic operating elements, namely a first and second linkage arm interconnected to each other by a loss motion connection, the linkage arms being pivotally mounted respectively to the cradle member and a support member of the circuit breaker operating mechanism; and a bias spring interconnected between the cradle member and the linkage member remote therefrom.

A still further object is to provide a reliable anti-rebound latch mechanism for operation in conjunction with a circuit breaker unit having a U-shaped cradle.

These and other objects of our invention will become readily apparent after reading the following description and the accompanying drawings in which:

FIGURE 1 is a perspective view of a three phase molded case circuit breaker construction, shown with a first embodiment of our invention, and wherein the cover is removed to reveal the internal mechanism thereof.

FIGURE 2 is a plan view of the circuit breaker unit shown in FIGURE 1 with the cover replaced and partially broken away.

FIGURE 3 is a longitudinal cross-sectional view taken through the center phase, along the line 3—3 as shown in FIGURE 2, with the circuit breaker in the tripped open condition.

FIGURES 4 to 6 are side elevations showing, in simplified form, the movement of the contact operating mechanism in conjunction with the subject anti-rebound latch



mechanism. In FIGURE 4 the circuit breaker is in the closed position. In FIGURE 5 the circuit breaker has undergone a tripping operation and is shown in the tripped open condition. In FIGURE 6 the circuit breaker is in the process of being reset to the closed position.

FIGURE 7 is an exploded perspective view portraying the details of one form of our novel anti-rebound latch as shown in FIGURES 1–6.

FIGURE 8 is a perspective view of an alternate form of our invention.

FIGURES 9 through 11 are side elevation views corresponding to the circuit breaker operating conditions shown in FIGURES 4 through 6, respectively, but showing the alternative form of anti-rebound latch mechanism of FIGURE 8.

Now referring to the figures and initially to FIGURES 1–3: circuit breaker **10** wherein one form of our invention is incorporated is typically shown as a commercially available three-phase molded case unit. It should be naturally understood that the novel concepts of our invention may be incorporated in numerous other frame sizes and types, with this embodiment being merely for illustrative purposes. The unit is assembled within a housing comprising molded base **11**, separated into compartments **12**, **13** and **14**, respectively, for locating the operating members of each of the phases. The adjacent compartments are separated by housing walls **15** and **16**. Main cover assembly **17** and end covers **18** similarly include barriers for maintaining the longitudinally extending compartments of the housing, with end shields **19** being located at the line and load ends of the circuit breaker **10**.

The current carrying members of all three phases are identical so that for the sake of brevity only one of the sets of elements, such as the center phase as shown in FIGURE 3, will be described. The current path between the line terminal strap **20** and load terminal strap **21** proceeds from stationary contacts **22** and **23** to movable contacts **24** and **25** carried by contact arms **26** and **27** through flexible braids **28**, contact carrier strap **29** and trip unit strap **30**.

Since the circuit breaker **10** is of a relatively high current carrying capacity, contacts **22–24** function as arcing contacts and are properly situated to move into engagement and disengagement within the opening defined by circuit breaker arc chute assembly **31**. The arcing contacts **22–24** are shown paralleled by two sets of main contacts **23–25**. The main movable contacts **25** are each mounted to individual contact arms **27**, each connected by an individual section of braid **28** to contact carrier strap **29**, while cooperating stationary contacts **23** are mounted to line terminal strap **20**. The movable arcing contact **24** is similarly mounted to its contact arm **26**, which is connected by a braid section **28** to the strap **29**. Its cooperating stationary contact **22** is also mounted to line terminal strap **20**. The contact arms **26–27–26** of each phase are, in turn, pivotally mounted by rod **36** to contact carrier **35**.

The movable contact arm mounting may include individual adjusting studs **60** to establish the open gap circuit position of contacts **24–25** relative to stationary contacts **22–23** as shown in the open position of FIGURE 3; as well as a contact pressure adjustment means shown as **71**; as is the subject of copending U.S. patent application Ser. No. 430,549, filed Feb. 5, 1965, in the name of Carl E. Gryctko and entitled Circuit Breaker Contact Mounting.

Circuit breaker **10** also includes a circuit responsive automatic tripping mechanism **75** and a quick make-break toggle operating mechanism **32**. Operating mechanism **32** is connected to the contacts of all three phases by means of a transverse insulating tiebar **33**, with U-shaped straps **34** connecting the respective contact carriers **35** to the common tiebar **33**. Carrier **35** is pivotally mounted at **46** to suitable bearings in the operating mechanism

frame 47. Mounting frame 47 includes ears 84 which receive screw members 49 for securement to circuit breaker base embossment 50.

The center phase carrier 35 is connected at its pivot rod 36 to the lower of the operating mechanism toggle linkage 37–38, with the toggle links joined at knee 39. Knee 39 includes a pivotally mounted plate member 40 to which the circuit breaker operating springs, shown as a pair 41–41', are connected at one end 42–42' thereof. The other ends 43–43' are located in suitable apertures with the operating handle frame 45, such that the operating springs 41–41' are in overcenter relationship with respect to toggle linkage 37–38. The lower end of handle frame member 45 is pivotally mounted to bosses 83 of operating mechanism frame 47. Operating handle 80 is mounted to upstanding posts 81 of frame member 45.

The operating mechanism 32 also includes a cradle 50, which is pivoted at 67. Cradle 50 carries a latch tip 51 for engagement with latching bracket extension 52 of the trip assembly 75. A coupling member generally shown as 52' interconnects latching bracket extension 52 to the tripper bar 53 of the trip unit assembly so as to effect tripping disengagement of latched members 51–52 upon counter-clockwise movement of tripper bar 53. Such counter-clockwise movement is effected by either the actuation of the instantaneous or magnetic trip or the time-delayed or thermal trip units contained in trip unit assembly 75.

For example, actuation of the instantaneous magnetic trip moves armature extension rod 56 downward to provide engagement of members 57, 58 so as to turn tripper bar counterclockwise. Similarly, the deflective heating of bimetallic element 54 brings it into engagement with adjusting screw 55 rotating tripper bar 53 counterclockwise.

The release of latched member 51–52 serves to unlatch cradle member 50 so as to permit overcenter movement of toggle knee 39 under the influence of main operating spring 41–41'. This overcenter movement of the operating mechanism is provided in an extremely fast manner in order to effect rapid separation of the cooperating contacts 22–24 and 23–25 upon energization of trip unit 75. Should such tripping result from a short circuit condition, the appreciable blow-off forces existing between the contacts will further serve to bring about extremely rapid separation thereof. Because of the substantial inertia of the contact carrier 35 under conditions of such rapid separation, there will be a tendency for the contact arms 26, 27 to rebound back towards their cooperating stationary contacts 22, 23. Rebound at this time will interfere with effective arc interruption in that restrike is more likely to occur as the distances between the cooperating contacts is decreased. To this end the instant invention provides a novel anti-rebound latch mechanism generally shown at 100.

FIGURES 1–7 show one form of our anti-rebound which includes a first section, or linkage member, 102 and a second section, or linkage member, 110 connected thereto. The first linkage member 102 is pivoted at end 104 to the cradle at a pivotal axis 105. It is noted that pivotal axis 105 is displaced from the cradle pivot 67. The opposite end 106 of linkage member 102 includes a means for coupling its motion to the second linkage member 110. This coupling means may be a right angle bend 108 integrally formed from linkage member 102 and translatable within oversize aperture 114 of the second linkage member. Alternatively, a transverse pin member may be press fixed in a cooperating aperture at end 106 of the linkage member 102. The second linkage member 110 is pivoted at an intermediate region thereof to pivotal axis 111 of the support frame member 47. End 112 of the second linkage member 110 contains a hook-like formation which is suitably shaped for grasping and retaining a cooperating surface 35' of the contact carrier.

A biasing means in the form of extension spring 120 has one end 126 thereof connected to the cradle pivot pin 67, and the other end 122 thereof connected to the second linkage member 110 by insertion into aperture 124 thereof. Biasing means 120 thereby urges the second linkage member 110 clockwise about its pivot 111 in the direction shown by arrow 150. This movement of the second linkage member 110 serves to urge the hook-like extension 112 thereof in a direction towards engagement with the cooperating portion 35' of the contact arm carrier. The extent of such counter-clockwise movement is limited by a stop means 116 which is shown as an integrally formed right angle bend transverse to the plane of the second linkage member 110. Stop means 116 may alternatively take the form of a separate pin member press fixed within a cooperating aperture of the second linkage member 110. Stop member 116 abuts surface 117 of the support frame 47 when the desired extreme of such anti-rebound latch movement has been achieved, as shown in the circuit breaker tripped condition of FIGURE 5.

Considering now the operation of the anti-rebound latch, reference is first made to FIGURE 4 which shows the circuit breaker in its engaged, or ON condition. As such, contact carrier 35 will be positioned at its complete clockwise condition so as to bring about engagement of its contacts 24, 25 with their cooperating contacts 22, 23, respectively. The anti-rebound mechanism 100 will be disengaged from contact carrier 35, as shown in FIGURE 4, being rotated to its maximum counterclockwise position, against the force of biasing spring 120, under the influence of coupling bend 108 which is engaged with surface 115 of coupling aperture. Should there now be a circuit fault bringing about actuation of trip unit 75, latch tip 51 of the cradle will be released from engagement with cooperating member 52, thereby permitting clockwise movement of the cradle 50 about its pivot 67, as shown in FIGURE 5. This serves to effect collapse of the toggle linkage bringing about rapid quick-break disengagement of the cooperating contacts by the movement of contact carrier 35 about its pivot 46. Clockwise movement of cradle 50 also brings about clockwise movement of linkage member 110 under the influence of biasing spring 120 until stop member 116 abuts surface 117 of support frame 47. As the contact carrier 35 approaches the anti-rebound latch mechanism 100 of the instant invention, surface 35'' thereof hits camming edge 113 of the hook-like formation 112, thereby moving it counter-clockwise about pivot 111, against the force of bias spring 120, a sufficient extent to permit further upward travel of cooperating portion 35'. Hook-like formation 112 will then immediately move back clockwise under the influence of the biasing spring 120 so as to graspingly engage portion 35' of the contact carrier, as is the condition shown in FIGURE 5. Hence the anti-rebound latch mechanism will be effective to prevent rebound of the contact carrier 35 in a direction towards reengagement with the stationary contacts 22, 23.

Should it then be desired to reset the circuit breaker back towards its engaged condition, the operating handle 80 thereof is first moved to the manual OFF position. This serves to relatch tip 51, carried by the cradle 50, with latching bracket extension 52 of the trip assembly and release the anti-rebound hook 112 from engagement with contact carrier 35. Such relatching of cradle 50 as it is rotated counter-clockwise about its pivot 67 is in such a direction that the first linkage member 102 will be urged in the direction of arrow 180, as shown in FIGURE 6. Such movement will then move its coupling tip 108 into engagement with surface 115 of the enlarged aperture carried by second linkage member 110.

The lost motion connection between coupling member 108 and 114 will then move second linkage member 110 counterclockwise about its pivot 111, in a direction opposite that shown by arrow 150 and opposite to the bias

force of spring means 120. This movement serves to release the latched engagement of hook-like tip 112 with portion 35' of the contact carrier. The contact carrier 35 is then free to move away from the anti-rebound latch mechanism 100 under the influence of the main operating springs 41–41'. The movement of the circuit breaker operating handle 80 to the manual ON position will then return the circuit breaker to the ON condition as shown in FIGURE 4. It should be especially noted at this point that the provision of enlarged aperture 114 provides a loss motion connection between linkage 102 and 110. This will permit a fair amount of overtravel between the individual elements of the anti-rebound latch mechanism 100, thereby avoiding the problem of critically maintaining tight tolerances, as had been typically necessitated by the anti-rebound latch mechanisms of the prior art.

Should the circuit breaker be inadvertently closed upon a fault condition, the anti-rebound latch will be located so as to operatively prevent rebound of the contact carrier 35.

Reference is now made to FIGURES 8 through 11 which show a somewhat varying embodiment of our invention. To readily permit comparison with the embodiment discussed in conjunction with FIGURES 1 through 7, like components are indicated by the same designations and those components having a similar function are indicated by a prime designation.

It should be first noted that the cradle 50, support frame 47, contact carrier 35, and cooperating portion 35' thereof correspond to that shown in the previous embodiment. The anti-rebound latch means 100' includes a first section or linkage member 102' which is pivoted at end 104' to the cradle at 105'. The opposite end of the first linkage member includes the coupling means in the form of a press fit pin 108' (or alternatively a right angle bend) which translates within open ended enlarged aperture 114' of the second section, or linkage member, 110'. Linkage member 110' is mounted about support frame pivot 111' and is biased counterclockwise by spring member 120' having one end 126' connected to cradle pivot 67 and the other end 122' inserted within aperture 124'. Member 102' includes a further enlarged aperture 114'' about pivot 111', which in conjunction with large aperture 114', provides a loss motion connection between the linkage members 102', 110'.

In the circuit breaker ON condition, as shown in FIGURE 9, anti-rebound latch 100' will be out of engagement with the contact carrier 35, but is so positioned that upon subsequent tripping of the breaker, to the position shown in FIGURE 10, the contact carrier portion 35' will be engaged by the hook-like end 112' of the second linkage member 110'. During the reset operation, coupling pin 108' is urged against surface 115' of open ended aperture 114' to rotate linkage member 110' in a direction such that the hook-like formation 112' is released from engagement with the contact carrier 35.

It is, therefore, seen that our invention provides an anti-rebound latch mechanism of substantially increased simplicity, ease of manufacture, increased reliability, and avoiding the critical type tolerances that had to be maintained in the previous structures.

Although there have been described preferred embodiments of our invention, many variations and modifications will now be apparent to those skilled in the art. Therefore, this invention is to be limited, not by the specific disclosure herein, but only by the appended claims.

The embodiments of the invention in which an exclusive privilege or property is claimed are defined as follows.

1. In a circuit breaker comprising at least one pair of cooperating contacts and an operating means for moving said cooperating contacts between disengaged and engaged positions, said operating means comprising a plurality of individual elements, including a movable contact arm carrying one of said cooperating contacts, a latchable cradle connected thereto, such that movement of the cradle between its latched and unlatched conditions is transmitted to said movable contact arm for movement thereof between its positions, a support member, said cradle pivotally mounted to said support member at a first pivot axis for movement between its said latched and unlatched conditions, an anti-rebound latch mechanism positionable to operatively engage said contact arm when in its disengaged position and thereby maintain said cooperating contacts disengaged, said anti-rebound latch mechanism including a first section mounted to said cradle for movement therewith, between said cradle latched and unlatched conditions, a second section including a means for grasping a cooperating portion of said movable contact arm and a lost motion connection between said first and second sections, such that reliable operation of the anti-rebound latch mechanism is maintained when subjected to a predetermined degree of misalignment between the individual elements of thte operating means.

2. In a circuit breaker comprising at least one pair of cooperating contacts and an operating means for moving said cooperating contacts between disengaged and engaged positions, said operating means comprising a plurality of individual elements, including a movable contact arm carrying one of said cooperating contacts, a latchable cradle connected thereto, such that movement of the cradle between its latched and unlatched conditions is transmitted to said movable contact arm for movement thereof between its positions, a support member, said cradle pivotally mounted to said support member at a first pivot axis for movement between its said latched and unlatched conditions, an anti-rebound latch mechanism positionable to operatively engage said contact arm when in its disengaged position and thereby maintain said cooperating contacts disengaged, said anti-rebound latch mechanism including a first linkage member pivotally mounted to said cradle at a second pivot axis, displaced from the cradle pivot, a second linkage member pivotally mounted to said support member at a third pivot axis, said second linkage member including a means for grasping a cooperating portion of said movable contact arm, connecting means for coupling motion between said first and second linkage members, such that the movement of said first linkage member with said cradle, between its latched and unlatched conditions, effects movement of said grasping means relative to said cooperating portion of the movable contact arm.

3. In a circuit breaker comprising at least one pair of cooperating contacts and an operating means for moving said cooperating contacts between disengaged and engaged positions, said operating means comprising a plurality of individual elements, including a movable contact arm carrying one of said cooperating contacts, a latchable cradle connected thereto, such that movement of the cradle between its latched and unlatched conditions is transmitted to said movable contact arm for movement thereof between its positions, a support member, said cradle pivotally mounted to said support member for movement between its said latched and unlatched conditions, an anti-rebound latch mechanism positionable to operatively engage said contact arm when in its disengaged position and thereby maintain said cooperating contacts disengaged, said anti-rebound latch mechanism including a first linkage member pivotally mounted to said cradle, a second linkage member pivotally mounted to said suupport member, said second linkage member including a means for grasping a cooperating portion of said movable contact arm, connecting means for coupling motion between said first and second linkage members, such that the movement of said first linkage member with said cradle, between its latched and unlatched conditions, effects movement of said grasping means relative to said cooperating portion of the movable contact arm, said

connecting means including a lost motion connection between said first and second linkage members, such that reliable operation of the anti-rebound latch mechanism is maintained when subjected to a predetermined degree of misalignment between the individual elements of the operating means.

4. In a circuit breaker as set forth in claim 3, said lost motion connection comprising an enlarged aperture in one of said linkage members, and an extending portion of the other of said linkage members translatable within said enlarged opening.

5. In a circuit breaker as set forth in claim 2, an elongated spring member for biasing said grasping means in a direction towards engagement with said movable contact arm cooperating portion, said elongated spring member having a first end secured to said second linkage member and a second end secured to said cradle.

6. In a circuit breaker as set forth in claim 5, stop means for limiting the movement of said second linkage member in said engaged direction, said stop means including a stop member carried by said second linkage member and positioned for abutting engagement with a region of said support member corresponding to a predetermined amount of rotation of said second linkage member about its pivotal axis.

7. In a circuit breaker comprising at least one pair of cooperating contacts and an operating means for moving said cooperating contacts between disengaged and engaged positions, said operating means comprising a plurality of individual elements, including a movable contact arm carrying one of said cooperating contacts, a latchable cradle connected thereto, such that movement of the cradle between its latched and unlatched conditions is transmitted to said movable contact arm for movement thereof between its positions, a support member, said cradle pivotally mounted to said support member at a first pivot axis for movement between its said latched and unlatched conditions, an anti-rebound latch mechanism positionable to operatively engage said contact arm when in its disengaged position and thereby maintain said cooperating contacts disengaged, said anti-rebound latch mechanism including a first linkage member pivotally mounted to said cradle at a second pivotal axis displaced from the cradle pivot, a second linkage member pivotally mounted to said support member at a third pivot axis, said second linkage member including a means for grasping a cooperating portion of said movable contact arm, connecting means for coupling motion between said first and second linkage members, such that the movement of said first linkage member with said cradle, between its latched and unlatched conditions, effects movement of said grasping means relative to said cooperating portion of the movable contact arm, said connecting means including a lost motion connection between said first and second linkage members, such that reliable operation of the anti-rebound latch mechanism is maintained when subjected to a predetermined degree of misalignment between the individual elements of the operating means, said lost motion connection comprising an enlarged aperture in one of said linkage members, and an extending portion of the other of said linkage members translatable within said enlarged opening, an elongated spring member for biasing said grasping means in a direction towards engagement with said movable contact arm cooperating portion, said elongated spring member having a first end secured to said second linkage member, and a second end secured to said cradle, stop means for limiting the movement of said second linkage member in said engaged direction, said stop means including a stop member carried by said second linkage member and positioned for abutting engagement with a region of said support member corresponding to a predetermined amount of rotation of said second linkage member about its pivotal axis, said extending portion of the lost motion connection



and said stop member being right-angle bends integrally formed from said second linkage member.

8. In a circuit breaker as set forth in claim 1, said cradle when in its unlatched and latched conditions being in first and second positions respectively, the movement of said cradle between its first and second positions moving said first section of the anti-rebound latch in a first direction, said movement of said first section in said first direction coupled to said second section, via said lost motion connection, for moving said second section in a first direction, the movement of said second section in said first direction being such as to move said grasping means out of engagement with said contact arm, whereby the movement of said cradle between its unlatched and latched conditions serves to release the engagement of said grasping means and cooperating portion of the contact arm, so as to permit resetting of the cooperating contacts to their engaged position.

9. In a circuit breaker as set forth in claim 3, said cradle when in its unlatched and latched conditions being in first and second positions respectively, the movement of said cradle between its first and second positions moving said first linkage member of the anti-rebound latch in a first direction, said movement of said first linkage member in said first direction coupled to said second linkage member, via said lost motion connection, for moving said second linkage member in a first direction, the movement of said second section in said first direction being such as to move said grasping means out of engagement with said contact arm, whereby the movement of said cradle between its unlatched and latched conditions serves to release the engagement of said grasping means and cooperating portion of the contact arm, so as to permit resetting of the cooperating contacts to their engaged position.

10. In a circuit breaker as set forth in claim 3, an elongated spring member for biasing said grasping means in a direction towards engagement with said movable contact arm cooperating portion, said elongated spring member having a first end secured to said second linkage member and a second end secured to said cradle, said cradle when in its unlatched and latched conditions, being in first and second positions respectively, the movement of said cradle between its first and second positions moving said first linkage member of the anti-rebound latch in a first direction, said movement of said first linkage member in said first direction coupled to said second linkage member, via said lost motion connection, for moving said second linkage member in a first diretcion, said movement of said second linkage member in said first direction being directly opposed to the biased movement thereof under the influence of said elongated spring member, whereby the movement of said cradle between its unlatched and latched conditions serves to release the engagement of said grasping means and cooperating portion of the contact arm, so as to permit resetting of the cooperating contacts to their engaged position.

11. In a circuit breaker comprising at least one pair of cooperating contacts and an operating means for moving said cooperating contacts between disengaged and engaged positions, said operating means comprising a plurality of individual elements, including a movable contact arm carrying one of said cooperating contacts, a contact carrier pivotally receiving said contact arm, a latchable cradle connected thereto, such that movement of the cradle between its latched and unlatched conditions is transmitted to said contact carrier for movement of the contact arm between its positions, a support member, said cradle pivotally mounted to said support member at a first pivot axis for movement between its said latched and unlatched conditions, an anti-rebound latch mechanism positionable to operatively engage said contact carrier when in its disengaged position and thereby maintain said cooperating contacts disengaged, said anti-rebound latch mechanism including a first section mounted to said

cradle for movement therewith, between said cradle latched and unlatched conditions, a second section including a means for grasping a cooperating portion of said contact carrier, connecting means for coupling motion between said first and second sections, such that the movement of said first section with said cradle, between its latched and unlatched conditions, effects movements of said grasping means relative to said cooperaing portion of the contact carrier, such that reliable operation of the anti-rebound latch mechanism is maintained when subjected to a predetermined degree of misalignment between the individual elements of the operating means.

12. In a circuit breaker comprising at least one pair of cooperating contacts and an operating means for moving said cooperating contacts between disengaged and engaged positions, said operating means comprising a plurality of individual elements, including a movable contact arm carrying one of said cooperating contacts, a contact carrier pivotally receiving said contact arm, a latchable cradle connected thereto, such that movement of the cradle between its latched and unlatched conditions is transmitted to said contact carrier for movement of the contact arm between its positions, a support member, said cradle pivotally mounted to said support member at a first pivot axis for movement between its said latched and unlatched conditions, an anti-rebound latch mechanism positionable to operatively engage said contact carrier when in its disengaged position and thereby maintain said cooperating contacts disengaged, said anti-rebound latch mechansm including interconnected first and second linkage members, each having a first and second end, said first end of said first linkage member pivotally mounted to said cradle at a second pivot axis displaced from the cradle pivot, and said second end carrying a first coupling means, said first end of said second linkage member having a hook-like formation for grasping a cooperating portion of said contact carrier, and said second end carrying a second coupling means, said second linkage member pivotally mounted to said support member intermediate its first and second ends, said first and second coupling means interconnected to provide a lost motion connection intermediate said first and second linkage members, an elongated spring member for biasing said hook-like formation in a direction towards engagement with said contact carrier cooperating portion, said elongated spring member having a first end secured to said second linkage member, and a second end secured to said cradle, said cradle when in its unlatched and latched conditions being in first and second positions respectively, the movement of said cradle between its first and second positions moving said first linkage member of the anti-rebound latch in a first direction, said movement of said first linkage member in said first direction coupled to said second linkage member, via said lost motion connection, for moving said second linkage member in a first direction, the movement of said second linkage member in said first direction being such as to move said hook-like formation out of engagement with said contact carrier, said movement of said second linkage member in said first direction being directly opposed to the biased movement thereof under the influence of said elongated spring member, whereby the movement of said cradle between its unlatched and latched conditions serves to release the engagement of said hook-like formation and cooperating portion of the contact carrier so as to permit resettting of the cooperating contacts to their engaged position.

13. In a circuit breaker as set forth in claim 12, said lost motion connectiong comprising an enlarged aperture in one of said linkage members, and an extending portion of the other of said linkage members translatable within said enlarged opening.

14. In a circuit breaker as set forth in claim 13, further including stop means for limiting the movement of said second linkage member in said engaged direction, said stop means including a stop member carried by said second linkage member and positioned for abutting engagement with a region of said support member corresponding to a predetermined amount of rotation of said second linkage member about its piovtal axis, said extending portion of the lost motion connection and said stop member being right-angle bends integrally formed from said second linkage member.



No references cited.

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