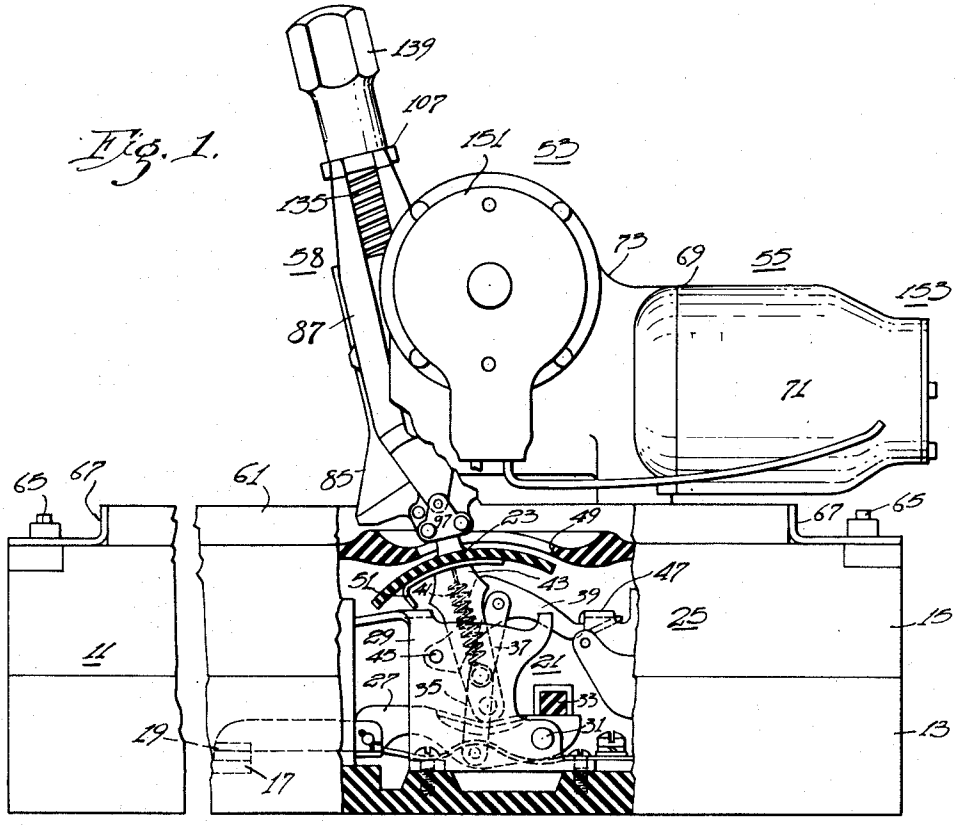
Jan. 14, 1941. L. R. LUDWIG ET AL 2,228,466

CIRCUIT BREAKER

Filed Oct. 9, 1937 3 Sheets-Sheet 1

Fig. 1.



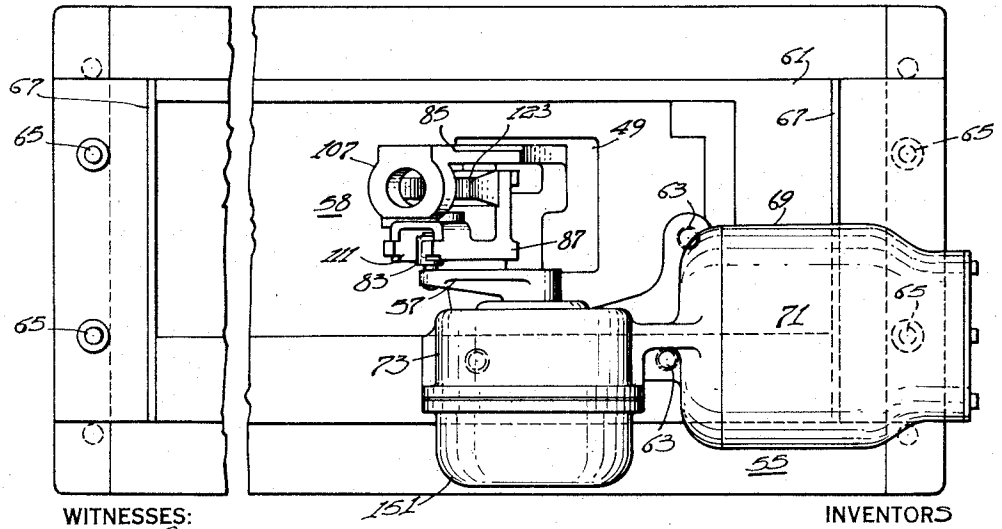


Fig. 2.

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CIRCUIT BREAKER

Filed Oct. 9, 1937 3 Sheets-Sheet 2

Fig. 3.

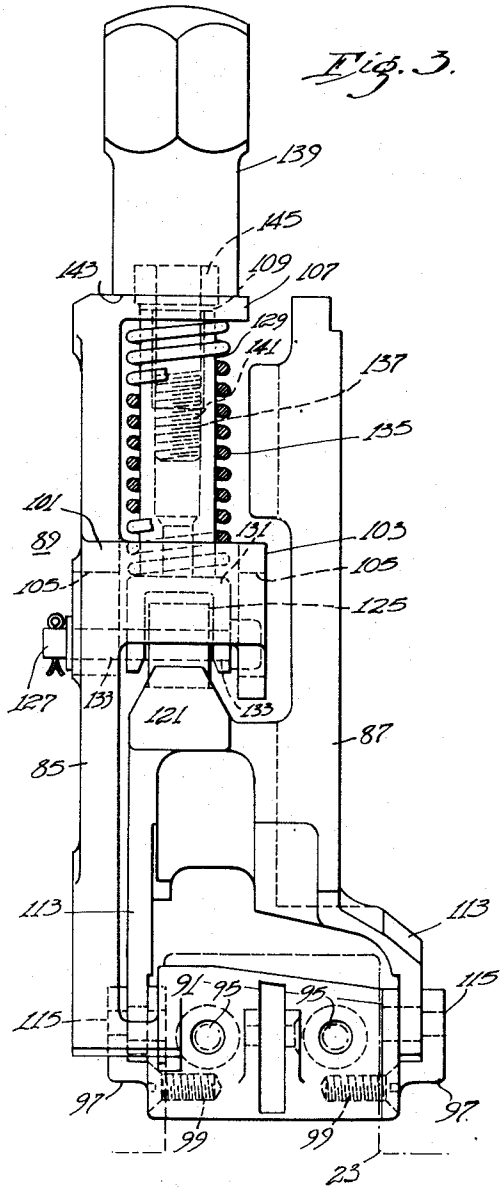
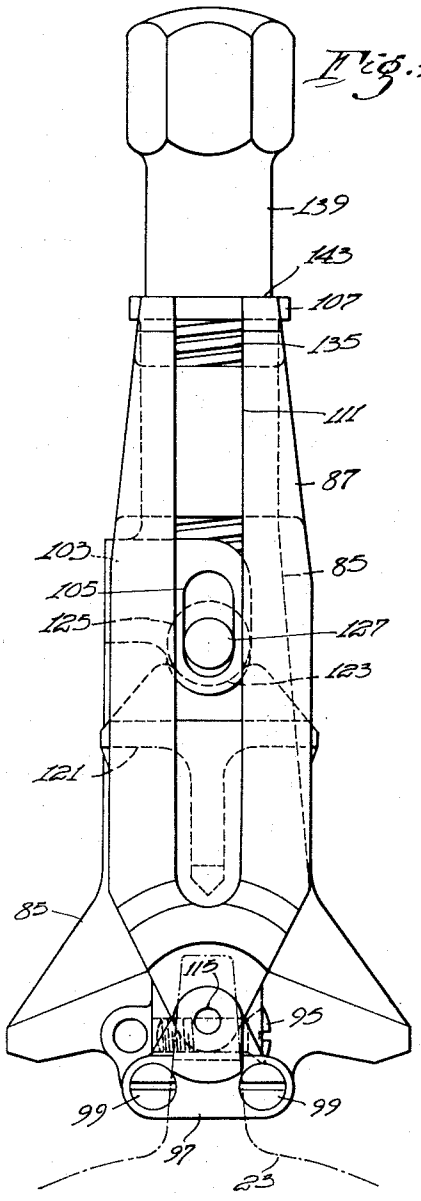


Fig. 4.



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CIRCUIT BREAKER

Filed Oct. 9, 1937 3 Sheets-Sheet 3

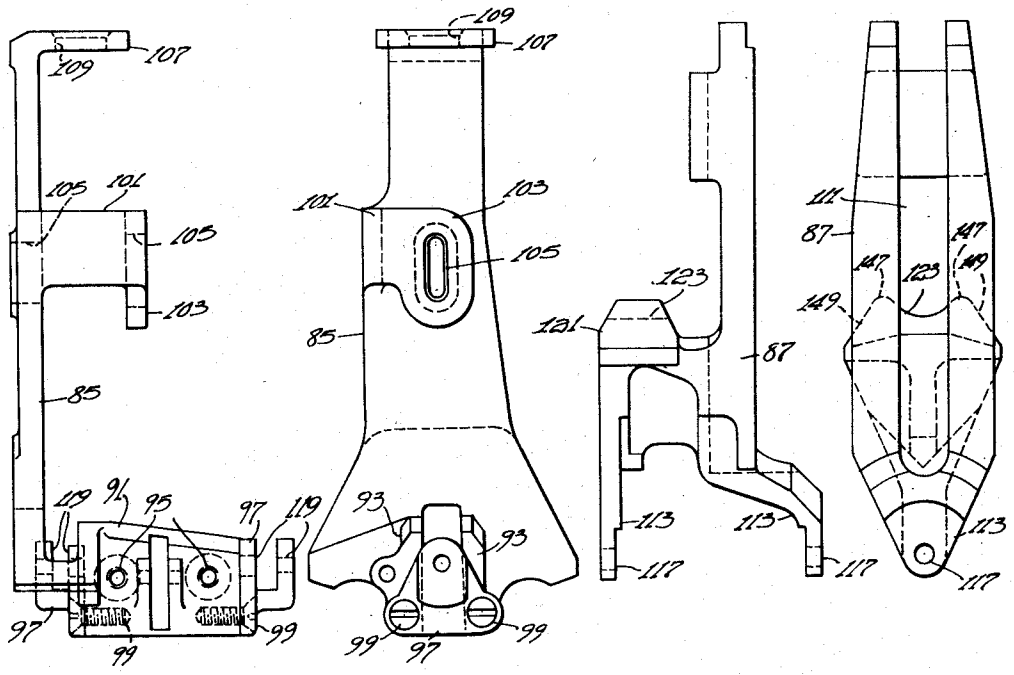


Fig. 5. Fig. 6. Fig. 7. Fig. 8.

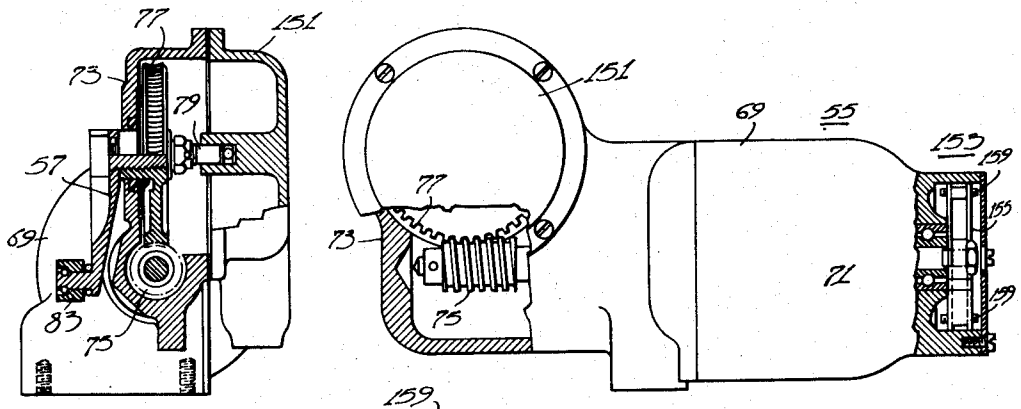


Fig. 9. Fig. 10.

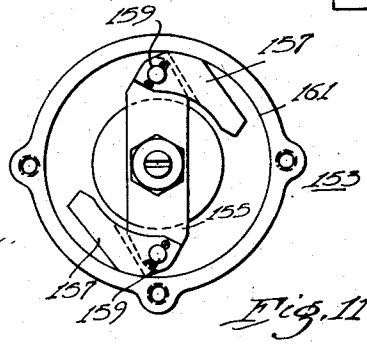


Fig. 11.

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Patented Jan. 14, 1941 2,228,466

UNITED STATES PATENT OFFICE

2,228,466

CIRCUIT BREAKER

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Application October 9, 1937, Serial No. 168,204

23 Claims. (Cl. 200—92)

The invention relates to circuit breakers, and more particularly, to operating means therefor.

In a large number of applications of circuit breakers, it is desirable to provide the breaker with a motor-driven operating mechanism for opening, closing, or resetting the breaker, and which may be set in operation from a remote point and which also permits manual operation of the breaker. A mechanism of this type is disclosed in the copending application of Ture Lindstrom, Serial No. 59,387, filed January 16, 1936, and assigned to the assignee of this invention, which application became Patent No. 2,192,046 on February 27, 1940. The mechanism there disclosed comprises, in general, a motor-driven crank for oscillating a connecting rod which is releasably connected to the operating handle of the breaker by a handle attachment. The handle attachment is such that when a handle member is inserted, it automatically effects disconnection of the breaker handle from the connecting rod to permit manual operation of the breaker by the handle member. A resilient link is interposed between the crank and the connecting rod for permitting the necessary overthrow of the crank relative to the breaker handle to enable the mechanism to reset the breaker.

While the above-described mechanism is satisfactory in many respects, it possesses certain disadvantages. The mechanism requires extremely accurate design and adjustment of the various parts to provide satisfactory operation and is relatively expensive to manufacture. Furthermore, the arrangement does not insure against breakage of the operating handle if too great a load is imposed thereon by the mechanism. The present invention constitutes an improvement over the above-mentioned structure and obviates the objectionable features thereof.

It is an object of the present invention to provide an improved motor operating mechanism for circuit breakers, which is simple, safe and reliable in operation and inexpensive to manufacture.

Another object of the invention is the provision of an improved motor-operating mechanism which, after being initially set in operation, is automatic to effect either opening, closing or resetting of the breaker, and which readily permits manual operation of the breaker when desired.

Another object of the invention is the provision of an improved motor-driven oscillating mechanism for operating a circuit breaker, embodying a novel clutch means which serves to normally connect the breaker operating member to the mechanism for movement thereby and which permits necessary overtravel of the mechanism relative to the breaker operating member.

Another object of the invention is the provision of an operating mechanism as described in the preceding paragraph, in which the clutch means is operable to automatically release the breaker operating member from the mechanism when the load imposed on the member by the mechanism exceeds a predetermined safe maximum value, and which is also operable by a manually operated handle to release the breaker operating member from the mechanism to permit manual operation of the breaker by the manually operated handle.

The novel features that are considered characteristic of the invention are set forth in particular in the appended claims. The invention itself, however, both as to structure and operation, together with additional objects and advantages thereof, will best be understood from the following detailed description of a preferred embodiment thereof, when read in connection with the accompanying drawings, in which:

Figure 1 is a side elevational view, partly in section, of a circuit breaker embodying the motor operating mechanism of the invention;

Fig. 2 is a plan view of the circuit breaker and its motor operating mechanism shown in Fig 1; the emergency handle being removed from the handle attachment;

Fig. 3 is an enlarged fragmentary end view, partly in section, of the handle attachment of the motor operating mechanism;

Fig. 4 is a side elevational view of the handle attachment shown in Fig. 3;

Fig. 5 is an end elevational view of an operating lever which forms a part of the handle attachment shown in Figs. 3 and 4;

Fig. 6 is a side elevational view of the operating lever shown in Fig. 5;

Fig. 7 is an end elevational view of the rocking lever which forms a part of the handle attachment shown in Figs. 3 and 4;

Fig. 8 is a side elevational view of the rocking lever shown in Fig. 7;

Fig. 9 is an end elevational view, partly in section, of the motor unit and crank driven thereby;

Fig. 10 is a side elevational view, partly in section, of the motor unit; and

Fig. 11 is a fragmentary end elevational view of the motor unit with the end cover removed to

illustrate the centrifugal braking means for the motor.

Referring to the drawings, the circuit breaker illustrated generally at 11 is of the three-pole-snap-action type of the same general construction as the circuit breaker shown and described in Patent 1,918,232, issued to B. P. Baker and M. W. Brainard, July 11, 1932, and assigned to the assignee of this invention. Since the details of structure and operation of this type of circuit breaker are set forth completely in the aforementioned patent, only so much of the circuit breaker structure is here shown and described as is considered necessary for a complete understanding of the present invention.

Referring to Fig. 1, the circuit breaker illustrated comprises a base 13 and a cooperating cover 15, both of molded insulating material, a stationary contact means 17, a cooperating movable contact means 19, actuating means for the contact means indicated generally at 21, a manual operating handle 23 of molded insulating material, and a tripping mechanism indicated generally at 25. The section illustrated in Fig. 1 is taken substantially through the center pole of the breaker in order to illustrate the common actuating means for the contacts of the breaker. The center movable contact 19 is carried by a switch arm 27 which is pivoted to a U-shaped frame 29 by means of a pivot pin 31. The switch arms and movable contacts carried thereby for the other two poles of the breaker are secured for simultaneous movement with the central switch arm 27 by means of an insulating tie bar 33, which extends across all three poles of the circuit breaker.

The common actuating mechanism 21 which is disposed in the center pole space of the breaker comprises a pair of toggle links 35 and 37, a releasable support 39 for the upper end of the toggle and over-center spring means 41, which connect the knee of the toggle with the upper end of a U-shaped operating member 43. The lower toggle link 35 is pivoted at its lower end to the switch arm 27 while the upper toggle link is pivotally connected at its upper end to the releasable support 39.

The releasable support 39 is pivoted on the main frame by means of a pivot pin 45. The right-hand end of the releasable support 39 is normally held in latched position by means of a latching member 47 of the tripping means 25 to maintain the toggle in operative position. The U-shaped operating member 43 is pivotally mounted at its lower end to the sides of the main frame 29 and has the operating handle 23 secured to its upper end. A knob portion of the operating handle 23 projects through an opening 49 provided therefor in the cover 15. The tripping mechanism 25 may be of the type more fully described in Patent 2,047,739, issued to H. J. Lingal, July 14, 1936, and assigned to the assignee of this invention.

The operation of the circuit breaker as thus far described is briefly as follows. To open the contact means of the circuit breaker the operating handle 23 is moved in a clockwise direction. The clockwise movement of the operating handle 23 moves the line of action of the over-center springs 41 to the right, and as the line of action of the springs crosses the pivotal connection between the upper toggle link 37 and the releasable support 39, the force exerted by the springs 41 causes the toggle links to collapse and thereby move the switch arm 27 to the open circuit position with a snap action.

To close the breaker, the operating handle is moved in a counter-clockwise direction, and substantially the reverse action takes place. The movement of the operating handle 23 in a counter-clockwise direction moves the line of action of the over-center springs 41, and when their line of action crosses the pivotal connection of the link 37 with the releasable support 39, the force exerted by the springs causes the toggle links to be moved to their overset position, as shown in Fig. 1, thereby moving the switch arm 27 to the closed circuit position with a snap action.

When an overload occurs in the circuit of any one of the poles of the breaker, the tripping mechanism 25 causes the latching member 47 to release the right-hand end of the pivoted support 39, thus allowing the support 39 to be moved upwardly under the influence of the over-center springs 41. This upward movement of the releasable support 39 effects collapse of the toggle links 35 and 37 and movement of the switch arm 27 to the open circuit position.

Before the breaker can be reclosed following a tripping operation, it is necessary to reset the actuating mechanism. In order to reset the actuating mechanism the operating member 43 is provided with a depending projection 51 for engaging the releasable support 39. To reset the breaker, the operating handle 23 is moved in a clockwise direction to cause the projection 51 to engage and move the releasable support 39 to its latched position shown in Fig. 1. The operating handle is moved slightly beyond the normal open position in order to effect resetting of the releasable support 39, in engagement with the latching member 47.

The motor operating mechanism for the circuit breaker is indicated generally at 53 and comprises in general a motor unit 55 for driving a rotatable crank arm 57, and a handle attachment 58 mounted on the breaker operating handle 23, and having a part connected to the crank arm 57 for oscillation thereby. The handle attachment 58 includes a clutch means for releasably connecting the breaker handle 23 with the motor-driven part of the handle attachment, as will be described hereinafter.

The motor operating mechanism 53 is secured to a frame 61 by means of a plurality of bolts 63 (Fig. 2), the frame 61, in turn, being secured to the breaker base 13 by means of a plurality of bolts 65. The frame 61 is generally rectangular in shape and includes a pair of angular brackets 67 for mounting on the bolts 65 which pass through the breaker base 13, the cover 15, and through suitable openings provided therefor in the brackets 67.

The motor unit 55 comprises a suitable casing 69 (Figs. 9 and 10) within which is mounted a driving motor 71 of the universal type. A gear casing 73 is secured to one end of the casing 69 and an extension of the armature shaft of the motor 71 projects into the gear casing 73. Upon this extension is mounted a worm 75 which engages a worm gear 77. The worm gear 77 is secured for rotation with a counter-shaft 79 rotatably mounted in suitable bearings within the gear housing 73. One end of the counter-shaft 79 extends through a side of the gear casing 73 and has rigidly mounted thereon a crank arm 57. The end of the crank arm 57 is provided with a suitable crank roller 83 which is adapted to en-

gage a slot provided therefor in a rocking lever which forms a part of the handle attachment 58. The worm 75 and the worm gear 77 provide a simple and inexpensive reduction gear between the crank arm 57 and the motor 71, so that the crank arm is driven at a considerably reduced speed compared to the speed of the motor 71.

The handle attachment 58 serves to connect the crank arm 57 with the breaker operating handle 23, and comprises, in general, an operating lever 85, a rocking lever 87, and a clutch means indicated generally at 89 for releasably connecting the operating lever 85 to the rocking lever 87 for movement thereby. The operating lever 85 (Figs. 5 and 6) consists of an integral casting and is provided at its lower end with a yoke 91 for attaching the operating lever to the breaker operating handle 23. The yoke 91 has a pair of spaced lugs 93 shaped and spaced apart so as to snugly engage the knob portion of the breaker operating handle 23. The lugs 93 are provided with aligned threaded openings for receiving a pair of fastening screws 95 which are adapted to pass through suitable openings provided therefor in the breaker operating handle 23. The screws 95 serve to securely fasten the yoke 91 of the operating lever 85 to the breaker operating handle 23.

A pair of bearing brackets 97 are secured to the opposite sides of the yoke portion 91 of the operating lever 85, the brackets 97 being secured to the opposite ends of the lugs 93 of the yoke 91 by means of fastening screws 99. The bearing brackets 97 serve to pivotally support the rocking lever 87. Adjacent its mid-portion the lever 85 is provided with an integral bracket projection 101. A portion 103 of the bracket 101 extends opposite and parallel to the body portion of the lever 85. The central portion of the lever 85 adjacent the bracket 101 and the parallel portion 103 of the bracket 101 are provided with vertical guide slots 105 which serve to slidably support and guide a roller which forms part of the clutch means to be hereinafter described. The upper end of the lever 85 has a horizontal portion 107 extending at right angles thereto and this portion is provided with a circular opening 109 for a purpose to be hereinafter described.

The rocking lever 87 (Figs. 7 and 8) consists of an integral casting provided with a vertical slot 111 for receiving the crank roller 83 carried by the crank arm 57. The lower end of the rocking lever 87 is provided with a pair of spaced bearing legs 113 adapted to fit within the bifurcated portions of the bearing brackets 97 as best shown in Fig. 3. The bearing legs 113 of the rocking lever 87 are secured for pivotal movement in the bearing brackets 97 by means of pivot pins 115 which engage openings 117 and 119 provided therefor in the bearing legs 113 and the bearing brackets 97. The lever 87 is also provided with a horizontal shelf portion 121 which is off-set from the body portion of the lever. The shelf portion 121 has an arcuate recess 123 formed therein which is adapted to receive the clutch roller 125 carried by the operating lever 85. The rocking lever 87 is adapted to be oscillated by the rotation of the crank arm 57 when the motor 71 is rotated, and the operating lever 85 is normally connected for movement with the rocking lever 87 by means of a releasable clutch device.

The clutch device (Figs. 3 and 4) for releasably coupling the operating lever 85 to the rocking lever 87 comprises a spring pressed roller 125 carried by the operating lever 85, for engaging the arcuate roller receiving recess 123 formed in the shelf portion 121 of the rocking lever 87. The roller 125 is rotatably carried by a roller shaft 127 the ends of which are in slidable engagement with the vertical guide slots 105 of the operating lever 85.

A cylindrical roller carrying member 129 has its upper end slidably received in the circular opening 109 of the portion 107 of the lever 85. The lower end of the roller carrying member 129 has a bifurcated member 131 secured thereto. The legs of the bifurcated member 131 are provided with a pair of aligned openings 133 for engaging the roller shaft 127 on opposite sides of the roller 125. The roller 125 is biased in a downward direction by means of a compression spring 135 which encircles the roller carrying member 129. The upper end of the spring 135 engages the portion 107 of the lever 85 while the lower end of the spring engages the bifurcated member 131. The spring 135 serves to normally maintain the roller 125 firmly seated in the roller receiving arcuate recess 123 of the rocking lever 87.

The roller carrying member 129 is provided with a vertical threaded opening 137 for receiving the lower end of an emergency operating handle 139. The emergency operating handle 139 is provided with a reduced portion 141 forming an annular shoulder 143 which engages the upper surface of the portion 107 of the lever 85. The emergency handle 139 is also provided with an annular recess 145 between the reduced portion 141 thereof and the annular shoulder 143.

The annular recess 145 permits upward movement of the roller carrying member 129, being of sufficient width to receive the upper end of the said roller carrying member. The threads of the reduced portion 141 engage the internal threads of the roller carrying member 129, so that when the emergency operating handle 139 is turned in a clockwise direction the roller carrying member 129 is moved upwardly to withdraw the roller 125 from the arcuate recess 123 of the rocking lever 87. This effects release of the operating lever 85 from its connection with the rocking lever 87 so as to permit manual operation of the breaker by means of the emergency handle 139. The edges of the arcuate roller receiving recess 123 are rounded as indicated at 147 (Fig. 8) and terminate in the sloping sides 149 of the horizontal shelf 121. The rounded edges 147 permit the roller 125 to roll out of the recess under certain conditions, and the sloping sides 149 permit the roller to roll back into the recess to reset the clutch mechanism following its release.

The motor 71 is provided with a suitable control circuit for energizing the same to effect opening, closing or resetting of the breaker. One form of control circuit for the motor is disclosed in the aforementioned copending application of Ture A. Lindstrom, Serial No. 59,387. The control circuit of the motor includes suitable opening and closing switches for controlling opening or closing of the breaker, and a suitable limit switch operable to open the motor circuit immediately after the contacts of the breaker have been operated which occurs before the breaker handle reaches either end position due to the overcenter spring mechanism 21 of the breaker. The limit switch may be of the type disclosed in the aforementioned Lindstrom application and disposed within the gear casing 73 and the cover 151 for the gear casing.

In order to assist in bringing the motor to rest promptly at the end of the stroke of the rocking lever 87, the motor is provided with a suitable brake mechanism, indicated generally at 153. The brake mechanism may be of a type similar to the brake mechanism disclosed in the aforementioned Lindstrom application, Serial No. 59,387. The brake mechanism comprises a brake shoe carrying arm 155 secured on the end of the motor shaft, which carries a pair of brake shoes 157 at its opposite ends. The brake shoes 157 are pivotally mounted on the ends of the arm 155 by means of pivot pins 159 and are biased by suitable spring means, not shown, in a clockwise direction about their pivot axes. The brake shoes 157 are adapted to engage an internal braking surface 161 formed integral with the motor casing 69 when the motor speed increases during operation of the breaker actuating mechanism.

The operation of the motor operating mechanism for the breaker is briefly as follows. To open the circuit breaker the opening control switch of the motor control circuit is operated to energize the motor. The rotation of the motor effects rotation of the crank arm 57 through 180 degrees at a reduced speed to cause clockwise movement of the rocking lever 87, as viewed in Fig. 1. Since the operating lever 85 is coupled to the rocking lever 87 by means of the roller 125 engaging in the arcuate recess 123, the operating lever 85 is also rotated in a clockwise direction with the rocking lever 87. The clockwise movement of the rocking lever 87 and the operating lever 85 moves the breaker operating handle 123 in a clockwise direction to effect opening of the circuit breaker in the manner previously described.

As soon as the overcenter springs 41 of the breaker actuating mechanism 21 have been moved overcenter to actuate the contacts of the breaker, the force required to complete opening movement of the breaker operating handle 23 becomes substantially decreased so that the driving motor 71 tends to speed up. The increased speed of the motor causes the brake shoes 157 to be moved outwardly by centrifugal force causing the brake mechanism 153 to retard rotation of the motor shaft. At substantially the same time, the limit switch of the motor is open, deenergizing the motor circuit. The brake mechanism 153 acts to retard the speed of the motor shaft so that the rocking lever 87 is brought to rest substantially at the completion of its stroke.

In closing the breaker, substantially the reverse action takes place. The closing control switch of the motor circuit is operated to energize the motor to cause it to rotate in the same direction. The rotation of the motor causes the crank arm 57 to be rotated through 180 degrees to effect counter-clockwise rotation of the rocking lever 87 and since the operating lever 85 is coupled to the rocking lever by means of the spring pressed roller engaging the arcuate recess 123, the operating lever 85 is also rotated in a counter-clockwise direction. The operating lever 85 being connected to the breaker handle 23, moves that handle from the open position to the closed position to effect closing of the breaker contacts in the manner previously described. As soon as the overcenter springs of the breaker actuating mechanism 21 have been moved over center to actuate the contacts of the breaker, the motor speeds up and effects operation of the breaking means 153. At substantially the same time, the limit switch of the motor control circuit opens the motor circuit to effect deenergization thereof. The brake mechanism 153 aids in bringing the motor shaft to rest as soon as the rocking lever 87 has completed its closing stroke.

When the circuit breaker is tripped open in response to an overload condition, the operating lever 85 and the rocking lever 87 remain in the closed position shown in Fig. 1, to hold the breaker operating handle 23 also in closed position. Since the breaker is of the trip-free type, the contacts are opened, in response to the overload irrespective of the position of the breaker operating handle. To reset the breaker, the opening control switch of the motor circuit is operated to effect energizing of the motor 71 and movement of the rocking lever 87 and the connected operating lever 85 to the reset position. The rocking lever 87 has a slightly greater stroke than the normal operating stroke of the breaker operating handle 23, in order to move the breaker operating handle 23 slightly beyond the normal open position to its resetting position to effect resetting of the breaker actuating mechanism following the tripping operation.

The rocking lever 87 has a slightly greater stroke than the stroke of the operating handle 23 of the breaker. The overtravel of the rocking lever 87 relative to the operating lever 85 is permitted by reason of the specific clutch device including the roller 125 and the arcuate recess 123. During overtravel of the rocking lever 87 in either direction, the roller 125 rolls up either side of the arcuate recess 123 against the bias of the spring 135. This action of the roller during overtravel acts to effect stopping of the motor, whose speed has already been retarded by the brake mechanism, at the ends of the stroke of the rocking lever.

The clutch device comprising the roller 125 and the arcuate recess 123 of the rocking lever 87 positively prevents breakage of the operating handle 23 of the breaker. The slope of the sides of the arcuate recess 23 and the force exerted by the biasing spring 135 are such as to permit the roller 125 to roll out of the arcuate recess to effect release of the operating lever 85 from the rocking lever 87 whenever the load imposed on the breaker oprating handle 23 by the motor mechanism exceeds a predetermined maximum safe value. The force exerted by the spring 135 normally maintains the roller 125 in engagement in the recess 123 to connect the lever 85 to rocking lever 87 for movement thereby. Thus, the clutch device normally couples the breaker operating handle 23 to the motor mechanism for operation thereby and also operates automatically to release the breaker handle 23 from connection with the motor mechanism whenever the load imposed on the breaker handle 23 exceeds a predetermined safe value.

In certain instances, it may be desirable to manually operate the circuit breaker. To manually operate the circuit breaker, the emergency operating handle 139 is turned in a clockwise direction. The clockwise turning of the emergency handle 139 moves the roller 125 upwardly to disengage it from the recess 123 of the rocking lever 87. This effects release of the operating lever 85 from its connection with the rocking lever 87. Under these conditions, the breaker may be manually operated by means of the emergency handle 139 in the manner previously

described in connection with the manual operation of the breaker.

The sloping sides 149 of the shelf portion 121 of the rocking lever and the rounded ends 147 of the roller receiving recess 123 permit the roller 125 to roll back into its normal position in the recess 123 to reestablish the connection between the levers 85 and 87 following either the automatic or manual release of the clutch mechanism. To reset the clutch mechanism 89 the motor circuit is energized and the lever 87 is moved. The inclined sides 149 of the lever 87 first push the roller 125 and the lever 85 until the lever 85 reaches one of its limits of movement. Continued movement of the rocking lever 87 then causes the roller 125 to move upwardly along the incline 149 against its spring bias until it rolls over the rounded edge 147. The roller 125 is then seated in the recess 123 by the bias of the spring 135.

The motor mechanism has been illustrated and described in connection with a particular type of circuit breaker structure; it will be readily understood however that the motor mechanism is also capable of use with various other types of circuit breakers and switches and also with other forms of control devices.

While the invention has been disclosed in accordance with the provisions of the patent statutes, it is to be understood that various changes in the structural details thereof may be made without departing from the spirit of the invention. It is desired, therefore, that the language of the appended claims be given the broadest reasonable construction permissible in the light of the prior art.

We claim as our invention:

1. In combination, a control device having a control member movable back and forth to a plurality of controlling positions, power means for selectively moving said member in either direction to any one of its controlling positions, a disengageable and resettable clutch device normally connecting said member to said power means for movement thereby, said clutch device being automatically disengageable to release said member from said power means whenever the load imposed on said member exceeds a predetermined safe value and resettable after automatic disengagement by operation of said power means, and means operable to disengage said clutch to release said member from said power means to permit manual operation of said member.

2. In combination, a control device having a control member movable back and forth to a plurality of controlling positions, a motor mechanism for operating said control member in either direction to move said member to any of its controlling positions comprising an oscillatable actuating member, a motor for driving said actuating member back and forth, means including a releasable and resettable clutch device for normally connecting said control member to said actuating member for movement thereby, said clutch device permitting over-travel of said actuating member relative to said control member and being operable to automatically release said control member from said actuating member whenever the load imposed on said control member exceeds a predetermined safe value, and means operable to disengage said clutch to release said control member from said mechanism to permit manual operation of said control member.

3. In combination, a circuit breaker having relatively movable contacts and a mechanism including an operating member movable back and forth to open and to closed position for opening and closing said contacts, power means operable to selectively move said member to open and to closed position, means normally connecting said power means to said member including a releasable and resettable clutch which is operable to automatically release said member from the power means when the load imposed on the operating member exceeds a predetermined safe value.

4. In combination, a circuit breaker having relatively movable contacts and an operating member movable back and forth for opening and closing said contacts, a motor mechanism for operating said member back and forth to open or to close said contacts, means releasably coupling said mechanism to said member so as to permit overtravel of said mechanism relative to said member, said coupling means being operable to automatically release said member from said mechanism whenever the load imposed on said member exceeds a predetermined safe value, and a manual operating member removably mountable on said coupling means operable to release said breaker operating member from said motor mechanism to permit manual operation thereof.

5. In combination, a circuit breaker having relatively movable contacts and actuating means including an oscillatable operating member movable back and forth for opening and closing said contacts, a motor mechanism for operating said member back and forth to effect opening or closing of said contacts comprising a rocking lever, motor means for oscillating said lever, means coupling said member to said lever for movement thereby, said coupling means yieldably permitting limited overtravel of said lever relative to said member and being operable to automatically release said member from said lever whenever the load imposed on the member exceeds a predetermined value.

6. In combination, a circuit interrupter having relatively movable contacts and actuating means including an oscillatable member movable back and forth for opening and closing said contacts, a motor mechanism for operating said member back and forth to open or to close said contacts comprising a rotatable crank, a motor for driving said crank, a rocking lever connected to said crank for oscillation thereby, an operating lever secured to said oscillatable member, and releasable and resettable clutch means normally connecting said operating lever to said rocking lever for movement thereby, said clutch means being operable to automatically disconnect said operating lever from said rocking lever when the load imposed thereon by said rocking lever exceeds a predetermined maximum safe value.

7. In combination, a circuit interrupter having relatively movable contacts and actuating means including an oscillatable member movable back and forth for opening and closing said contacts, a motor mechanism for operating said member back and forth to open or to close said contacts comprising a rotatable crank, a motor for driving said crank, a rocking lever connected to said crank for oscillation thereby, an operating lever detachably secured to said oscillatable member, and a releasable and resettable clutch means normally connecting said operating lever to said rocking lever for movement thereby, said clutch

means permitting overtravel of said rocking lever relative to said operating lever.

8. In combination, a circuit interrupter having relatively movable contacts and actuating means including an oscillatable member movable back and forth for opening and closing said contacts, a motor mechanism for operating said member back and forth to open or to close said contacts comprising a rotatable crank, a motor for driving said crank, a rocking lever connected to said crank for oscillation thereby, an operating lever secured to said oscillatable member, and a releasable and resettable clutch means normally connecting said operating lever to said rocking lever for movement thereby, said clutch means yieldably permitting limited overtravel of said rocking lever relative to said operating lever, and being operable to automatically release said operating lever from said rocking lever when the load imposed on said operating lever by said rocking lever exceeds a predetermined maximum safe value, and said clutch means being resettable following release by operation of said motor.

9. In combination, a circuit breaker having relatively movable contacts and means including an oscillatable operating member movable back and forth to open and to closed position for opening and closing said contacts, a motor mechanism operable to selectively move said member to open or to closed position comprising an oscillatable actuating member, a motor for driving said actuating member, means including a releasable and resettable clutch device having a normal position in which it normally connects said breaker operating member to said actuating member in proper position relative to said actuating member for movement thereby, said clutch device permitting overtravel of said actuating member relative to said operating member and acting to assist in stopping rotation of said motor when said actuating member reaches the end of its stroke, and said clutch device being operable to automatically release said breaker operating member from said motor driven actuating member whenever the load on said breaker operating member exceeds a predetermined amount and being resettable to said normal position connecting said members, by the operation of said motor mechanism.

10. In combination, a circuit interrupter having relatively movable contacts and means including an oscillatable operating member movable back and forth for opening and closing said contacts, a motor mechanism for operating said member back and forth to open or to close said contacts comprising an oscillatable actuating member, a motor for driving said actuating member, a releasable and resettable clutch means normally connecting said operating member to said actuating member for movement thereby, said clutch means permitting overtravel of said actuating member relative to said operating member and being operable to automatically release said operating member from said mechanism whenever the load imposed on said operating member exceeds a predetermined safe value, and means operable to disengage said clutch to release said operating member from said mechanism to permit manual operation of the interrupter.

11. In combination, a circuit interrupter having relatively movable contacts and actuating means including an oscillatable operating member movable back and forth for opening and closing said contacts, a motor mechanism for operating said member back and forth to open or to close said contacts comprising an oscillatable actuating member, a motor for driving said actuating member, means releasably coupling said members for movement together, said coupling means permitting overtravel of said actuating member relative to said operating member and being operable to automatically release said operating member from the actuating member whenever the load imposed on said operating member exceeds a predetermined safe value, and means removably mounted on said operating member operable to release said operating member from said actuating member to permit manual operation of the interrupter.

12. In combination, a circuit interrupter having relatively movable contacts and actuating means including an operating member movable back and forth to open and to closed position for opening and closing said contacts, a motor mechanism for selectively moving said member to open and to closed position comprising an oscillatable actuating member, a motor for driving said actuating member, releasable and resettable coupling means for releasably coupling said operating member to said actuating member for movement thereby, said coupling means permitting overtravel of said actuating member relative to said operating member and being operable to automatically release said operating member from the actuating member whenever the load imposed thereon by said actuating member exceeds a predetermined safe value, said coupling means comprising a spring biased roller carried by one of said members for engaging a single roller receiving recess provided in the other of said members.

13. In combination, a circuit interrupter having relatively movable contacts and actuating means including an oscillatable operating member movable back and forth to open and to closed position for opening and closing said contacts, a motor mechanism for operating said member to open and to closed position comprising an oscillatable actuating member, a motor for driving said actuating member, one of said members being provided with a single roller receiving recess and the other of said members carrying a spring-biased roller for engaging said recess to normally couple said operating member to said actuating member for movement thereby, the bias of said roller and the edges of said recess being such that said roller rides out of said recess to release said operating member from the actuating member whenever the load imposed on said operating member exceeds a predetermined safe value, and said roller being resettable in said single recess following release, by the operation of said motor.

14. In combination, a circuit interrupter having relatively movable contacts and actuating means including an oscillatable operating member movable back and forth for opening and closing said contacts, a motor mechanism for operating said member back and forth to open or to close said contacts comprising an oscillatable actuating member, a motor for driving said actuating member, one of said members being provided with a roller receiving recess and the other of said members carrying a spring-biased roller for engaging said recess to normally couple said operating member to said actuating member for movement thereby, the bias of said roller and

the edges of said recess being such that said roller rides out of said recess to release said operating member from the actuating member whenever the load imposed on said operating member exceeds a predetermined safe value, and means operable to withdraw said roller from said recess to release said operating member from the mechanism to permit manual operation of said operating member.

15. In combination, a circuit breaker having relatively movable contacts and actuating means including an operating member movable back and forth for opening and closing said contacts and a trip device for effecting opening of said contacts independently of the position of said member, a motor mechanism for operating said member back and forth to open or to close said contacts and to reset the breaker actuating means following a tripping operation, said mechanism comprising an actuating member, a motor for driving said actuating member, means including a releasable and resettable clutch device for releasably connecting said operating member to said actuating member for movement thereby, said clutch device permitting over-travel of said actuating member relative to said operating member and being operable to automatically release said operating member from the actuating member when the load imposed thereon exceeds a predetermined safe value.

16. In combination, a circuit breaker having relatively movable contacts and means including an oscillatable operating member for opening and closing said contacts, a motor mechanism for operating said member back and forth comprising an operating lever detachably secured adjacent one end to said operating member, a rocking lever pivoted on said operating lever adjacent said one end, motor-driven means connected to said rocking lever for rocking the same, means releasably coupling said operating lever to said rocking lever for movement thereby, said releasable coupling means permitting overtravel of said rocking lever relative to said operating lever and being operable to automatically release said operating lever from said rocking lever whenever the load imposed on said operating member exceeds a predetermined safe value, said coupling means comprising a spring-biased roller carried by one of said levers for engaging a roller receiving recess provided in the other of said members.

17. In combination, a control device having an oscillatable control member movable to a plurality of controlling positions, a motor mechanism for selectively operating said member back and forth to any of its controlling positions comprising an oscillatable actuating member, a motor for driving said actuating member, means including a releasable and resettable clutch device having a normal position in which it normally connects said control member to said actuating member in proper position relative to said actuating member for movement thereby, said clutch device permitting overtravel of said actuating member relative to said control member and being operable to assist in stopping rotation of said motor when said actuating member reaches the ends of its stroke, and said clutch device being operable to release said control member from said actuating member when the load on said control member exceeds a predetermined amount, said clutch being resettable to its normal position connecting said members, by the operation of said motor mechanism.

18. In combination, a control device having an oscillatable control member movable to a plurality of controlling positions, a motor mechanism for selectively operating said member to any of its controlling positions comprising an oscillatable actuating member, a motor for driving said actuating member, means including a releasable and resettable clutch device for normally connecting said control member to said actuating member for movement thereby, said clutch device permitting overtravel of said actuating member relative to said control member and being operable to assist in stopping rotation of said motor when said actuating member reaches the ends of its stroke and to automatically release said control member from said actuating member whenever the load imposed on said control member exceeds a predetermined safe value.

19. In combination, a control device having an oscillatable control member movable to a plurality of controlling positions, a motor mechanism for selectively operating said member to any of its controlling positions comprising an oscillatable actuating member, a motor for driving said actuating member, means including a clutch device for normally connecting said control member to said actuating member for movement thereby, said clutch device permitting overtravel of said actuating member relative to said control member and being operable to assist in stopping rotation of said motor when said actuating member reaches the ends of its stroke and to automatically release said control member from said actuating member whenever the load imposed on said control member exceeds a predetermined safe value; and means operable to disengage said clutch to effect release of said control member from said mechanism to permit manual operation of said control member.

20. A releasable and resettable clutch device for normally connecting and oscillatable operating member of a circuit breaker to an oscillatable actuating member of a motor operating mechanism for operating the circuit breaker, said clutch device comprising means carried by one of said members forming a single arcuate roller receiving recess, and a spring biased roller carried by the other of said members and engaged in said recess, said clutch device permitting limited overtravel of said actuating member relative to said operating member and being operable to automatically release said operating member from said motor operating mechanism whenever the load imposed on said operating member exceeds a predetermined safe value, and means manually operable to disengage said roller from said recess to permit manual operation of said breaker operating member free of said motor operating mechanism.

21. A releasable and resettable clutch device for normally connecting an oscillatable operating member of a circuit breaker to an oscillatable actuating member of a motor operating mechanism for operating the circuit breaker, said clutch device comprising means carried by one of said members forming a single arcuate roller receiving recess, and a spring biased roller carried by the other of said members and engaged in said recess, said clutch device permitting limited overtravel of said actuating member relative to said operating member and being operable to automatically release said operating member from said motor operating mechanism whenever the load imposed on said operating member exceeds a predetermined safe value, said spring pressed roller being

resettable in said roller receiving recess after release of said clutch, by operation of said motor mechanism.

22. In combination, a circuit breaker having relatively movable contacts and actuating means including an oscillatable operating member movable back and forth to open and to closed positions respectively for opening and closing said contacts, a motor operating mechanism operable to selectively move said breaker operating member to open or to closed position comprising an oscillatable motor driven actuating member movable back and forth to open and to closed position corresponding to the open and closed positions of said breaker operating member, motor means operable through a definite cycle for moving said actuating member to open or to closed position and a releasable and resettable clutch device having a normal position in which it normally connects said breaker operating member to said motor driven actuating member in proper relation to said actuating member for movement thereby, said clutch device being automatically releasable to release said breaker operating member from said motor driven actuating member whenever the load on said breaker operating member exceeds a predetermined amount, and said clutch device being resettable to said normal position connecting said members by the operation of said motor means.

23. In combination, a circuit breaker having relatively movable contacts and actuating means including an oscillatable operating member movable back and forth to open and to closed positions respectively, for opening and closing said contacts, a motor operating mechanism operable to selectively move said breaker operating member to open or to closed position comprising an oscillatable motor driven actuating member movable back and forth to open and to closed position corresponding to the open and closed positions of said breaker operating member, motor means operable through a definite cycle for moving said actuating member to open or to closed position and a releasable and resettable clutch device comprising a spring biased roller carried by one of said members for engaging in a single roller receiving recess in the other of said members to normally connect said breaker operating member to said motor driven actuating member in proper relation to said actuating member for movement thereby, said roller being automatically disengageable from said recess to release said breaker operating member from said motor driven actuating member whenever the load on said breaker operating member exceeds a predetermined amount, and said roller being resettable in said single recess to reconnect said members, by the operation of said motor means.

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