March 14, 1939. K. WULSTEN 2,150,307

CIRCUIT INTERRUPTER

Filed May 21, 1938 2 Sheets-Sheet 1

Fig. 1.

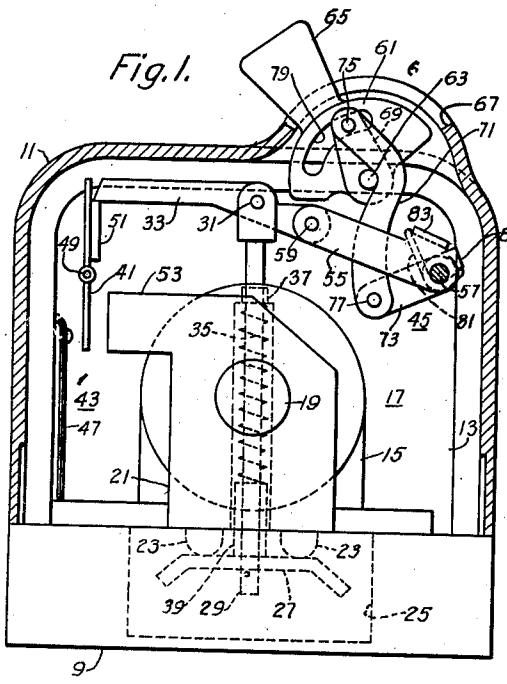


Fig. 2.

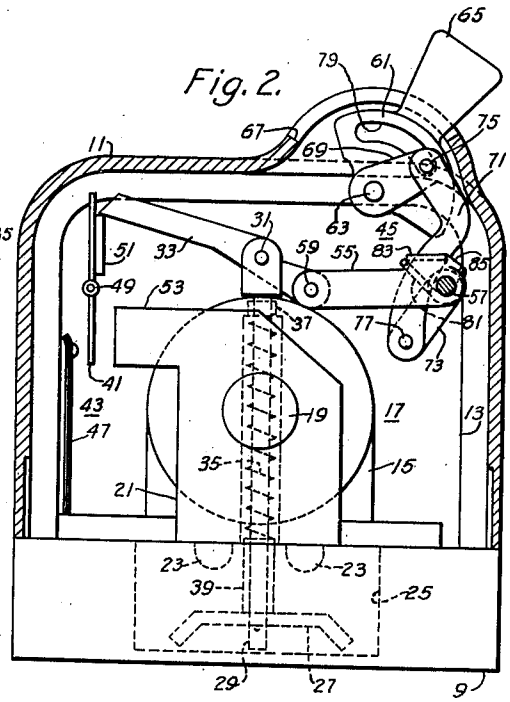
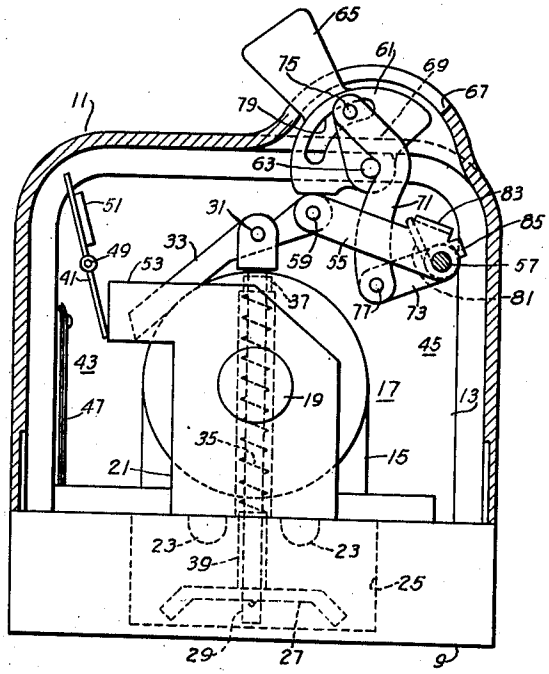


Fig. 3.



WITNESSES:
Fred C. Witham
G. S. Parker

INVENTOR
Kurt Wulsten
BY
Ralph W. Swingle
ATTORNEY

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CIRCUIT INTERRUPTER

Filed May 21, 1938 2 Sheets-Sheet 2

Fig. 4.

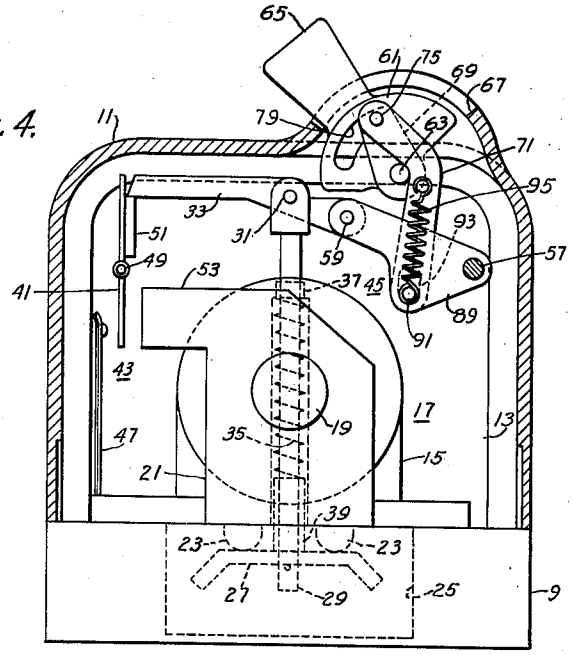


Fig. 5.

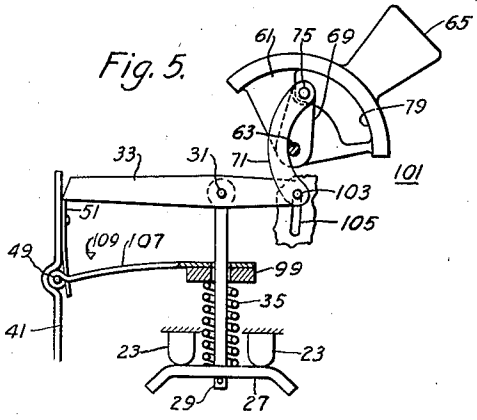


Fig. 6

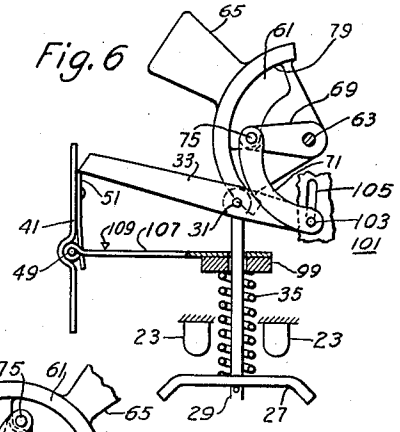
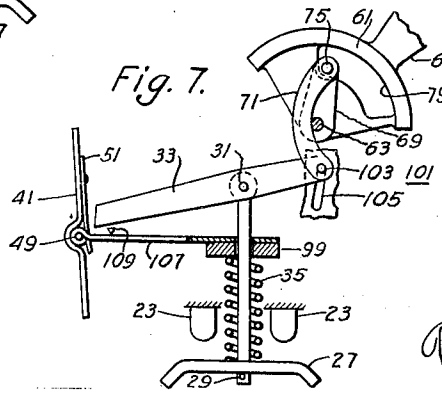


Fig. 7.



WITNESSES:

G. S. Parker

INVENTOR

Kurt Wulsten

BY

Ralph W. Swingle

ATTORNEY

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UNITED STATES PATENT OFFICE

2,150,307

CIRCUIT INTERRUPTER

Kurt Wulsten, Berlin-Charlottenburg, Germany, assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application May 21, 1938, Serial No. 209,194
In Germany July 16, 1937

14 Claims. (Cl. 200—89)

The invention relates to circuit interrupters and more particularly to circuit interrupters and operating mechanisms therefor of the type which are manually operable to open and to close the circuit, and automatically operable to open the circuit in response to predetermined overload conditions.

In my copending application Serial No. 164,142, filed September 16, 1937, there is disclosed several embodiments of a circuit interrupter which comprises a movable contact biased to open circuit position, actuating mechanism for opening and closing the contact including a spring means for providing the required contact pressure when the interrupter is closed, and a trip means which normally serves to connect the actuating means and the contact pressure securing spring means to the movable contact and which is operable in response to predetermined conditions to immediately disconnect or release the actuating means and the contact pressure securing spring means from the movable contact to permit a quick opening of the contacts. An important advantage of such a construction over the prior art interrupters lies in the fact that the immediate release of the contact pressure securing spring means from its operative connection with the movable contact materially reduces the total time required for opening the contacts and interrupting the circuit. The release of the contact pressure securing spring means from the movable contact takes place before the contact begins its opening movement thus eliminating the time as required by the prior art interrupters for the relaxing of the contact pressure securing resilient means before the contacts begin to separate.

The present invention constitutes a further development and improvement of the invention disclosed in the aforementioned copending application.

An object of the invention is the provision of a circuit interrupter embodying an improved operating mechanism which is manually operable to effect quick opening or closing of the contacts and which is automatically operable in response to predetermined conditions to effect a very rapid opening of the contacts.

Another object of the invention is the provision of a circuit interrupter with an improved operating mechanism which includes a spring means for securing pressure engagement of the contacts when the interrupter is closed, and which is automatically operable in response to predetermined conditions to immediately free the contacts from the influence of the contact pressure securing spring means to cause a quick opening of the contacts.

Another object of the invention is the provision of a circuit interrupter as described above in which the release of the contacts from the influence of the spring means for securing pressure engagement of the contacts takes place entirely independently of the beginning of the opening movement of the contacts whereby opening of the contacts is not delayed by the spring means.

Another object of the invention is the provision of a circuit interrupter of the type previously described which is simple, accurate and reliable in operation, and inexpensive to manufacture.

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 be best understood from the following detailed description of several embodiments thereof when read in conjunction with the accompanying drawings, in which

Figure 1 is a side elevational view, partly in section, of a circuit interrupter constructed in accordance with the invention, the interrupter being shown in closed circuit position,

Fig. 2 is a view similar to Fig. 1, showing the interrupter in the manually opened position,

Fig. 3 is a view similar to Fig. 1 showing the interrupter in the tripped open circuit position immediately following a tripping operation,

Fig. 4 is a side elevational view, partly in section of a modified form of circuit interrupter,

Fig. 5 is a schematic view of a further modification of the invention, the interrupter being shown in the closed circuit position,

Fig. 6 is a view similar to Fig. 5 showing the interrupter in the manually opened position, and

Fig. 7 is a view similar to Fig. 5 showing the interrupter in the tripped open circuit position.

Only so much of the structure of the circuit interrupter has been illustrated in the drawings as is considered necessary to a complete understanding of the invention.

Referring to the drawings and particularly to Figs. 1 through 3 thereof, the entire circuit interrupter mechanism including the contacts, operating means and tripping means is preferably formed as a structural unit which is mounted on a base 9 of insulating material and enclosed by a co-operating cover 11 also of insulating material. The interrupter mechanism is disposed between and carried by a pair of spaced bearing

plates 13 (only one of the plates being shown in the drawings) which rests upon the base 9, the mechanism being removably secured to the base in the manner disclosed in my copending application Serial No. 164,142.

A body 15 of molded insulating material forms a spool for the energizing winding of an electromagnet indicated generally at 17 which serves to trip the interrupter in response to heavy magnitude overload or short circuit conditions in the circuit controlled by the interrupter. The electromagnet 17 may also serve to assist in extinguishing the arc drawn between the contacts during circuit interruption as in the structure disclosed in my above-mentioned copending application.

The electromagnet comprises a core 19 of magnetic material which extends through a hollow hub portion of the insulating body 15, and a pair of pole pieces 21 of inverted L-shape, which are disposed in opposite sides of the body 15 and engage the opposite ends of the core 19.

A pair of spaced stationary contacts 23 are carried by the insulating body 15 and extend into an arc chamber 25 formed in the base 9. A cooperating movable bridging contact 27 also disposed in the arc chamber is secured to the lower end of a vertically movable switching rod 29. The switching rod 29 extends through aligned openings provided in the insulating body 15 and the core 19, and is pivotally connected at its upper end by means of a pivot pin 31 to an intermediate portion of an actuating lever 33. The switching rod 29 and the movable contact 27 carried thereby are biased downwardly to open circuit position by means of a circuit opening coiled compression spring 35 which encircles the rod 29 and which is constrained between a fixed sleeve 37 carried by the insulating body 15 and an insulating sleeve 39 on the lower end of the rod 29.

The actuating lever 33 is normally releasably supported at its free end by a pivoted latch member 41, which forms a part of a tripping means indicated generally at 43. The opposite end of the actuating lever 33 is pivotally connected to a manual operating means indicated generally at 45 which serves to rotate the lever 33 about the free end thereof supported by the latch member 41 to effect opening and closing of the interrupter.

The tripping means comprises the latch member 41 which is formed of magnetic material, the electromagnet 17, and a thermally responsive bimetallic trip element 47. The latch member 41 is pivotally mounted intermediate its ends on a fixed pivot pin 49 carried between the bearing plates 13 and is biased in a clockwise direction by a suitable spring (not shown). The upper portion of the latch member 41 carries a latch plate 51, the upper edge of which normally engages and releasably supports the free end of the actuating lever 33 as shown in Figs. 1 and 2. The lower end of the latch member 41 is disposed between the upper free end of the bimetallic trip element 47 and the two angularly extending pole shoes 53 of the pole pieces 21. The bimetallic trip element 47 and the winding of the electromagnet 17 are connected in circuit with the contact means and terminals of the interrupter by suitable connections (not shown) so as to be energized in response to the current flowing through the contacts. Upon the occurrence of a heavy magnitude overload or a short circuit in the circuit controlled by the breaker, the electromagnet 17 becomes energized a sufficient amount to rotate the latch member 41 in a counter-clockwise direction to effect release of the free end of the actuating lever 33, as shown in Fig. 3. When a lower magnitude overload of predetermined duration occurs in the circuit controlled by the interrupter, the bimetallic trip element 47 flexes in a direction toward the electromagnet 17 and moves the latch member 41 in a counter-clockwise direction to effect release of the free end of the actuating member 33 in the same manner. The release of the free end of the actuating lever 33 allows the movable bridging contact 27 to be moved to open circuit position under the influence of the circuit opening spring 35.

The manual operating means 45, which is manually operable to cause opening and closing of the contacts of the interrupter, comprises a lever 55 which is pivotally mounted at one end on a fixed pivot pin 57 carried between the bearing plates 13, and which has its opposite end pivotally connected by means of a pivot pin 59 to the end of the actuating lever 33. A manual operating handle 61 is rotatably mounted on a fixed pivot pin 63 and has a knob portion 65 which extends through an elongated opening 67 provided in the cover 11. The operating handle 61 is coupled to the lever 55 through the agency of a crank arm 69 rotatably mounted on the fixed pivot pin 63, a curved link 71 and a second crank arm 73 which is rotatably mounted on the pivot pin 57. The curved link 71 has its upper end pivotally connected by means of a pin 75 to the free end of the crank arm 69 and its lower end pivotally connected by a pivot pin 77 to the outer end of the second crank arm 73. The crank arm 69 and the curved link 71 form a toggle linkage which is coupled to the operating handle 61 for actuation thereby by means of a lost motion coupling comprising an arcuate slot 79 formed in the handle 61 and a projection of the pivot pin 75 which engages in the slot. The crank arm 73, which is rotatable about the same fixed axis 57 as the lever 55, is coupled to the lever 55 through the agency of a torsional spring 81 which has its body portion coiled about the pivot pin 57. One end of the spring engages a projection 83 carried by the lever 55 while the other end of the spring engages a projection 85 carried by the crank arm 73 so that the spring biases the lever 55 in a clockwise direction and the crank arm 73 in a counter-clockwise direction relative to each other. The spring 81 serves to provide the required contact pressure between the movable bridging contact 27 and the stationary contacts 23 in the closed circuit position of the interrupter. It will be noted that in the closed circuit position of the interrupter shown in Fig. 1, the toggle linkage formed by the crank 69 and the curved link 71 is in a slightly overset position, an imaginary line joining the pins 75 and 77 being disposed slightly to the left of the fixed pivot pin 63. In this position, the curved portion of the link 71 engages the fixed pivot pin 63 and the reactive force of the contact pressure spring 81 serves to maintain the toggle in the overset position so that the movable bridging contact 27 is held in pressure engagement with the stationary contacts 23.

The operation of the interrupter is briefly as follows. To manually open the interrupter, the operating handle 61 is moved in a clockwise direction about its pivot axis 63. When the left hand end of the slot 79 engages the knee pivot

pin 75, the continued movement of the operating handle 71 rotates the crank arm 69 in a clockwise direction about the pivot axis 63. As soon as the imaginary line joining the pivot pins 75 and 77 crosses to the right of the fixed pivot pin 63, the contact pressure spring 81, which is stronger than the circuit opening spring 35, first rotates the crank arm 73 in a counter-clockwise direction about the axis 57 until the projection 85 on the crank arm 73 engages the projection 83 on the lever 55. This movement takes place independently of any further movement of the handle 61, and causes the toggle formed by the crank arm 69 and the link 71 to move toward collapsed position. As soon as the projection 85 engages the projection 83, the lever 55 and the crank 73 become in effect a rigid bell crank lever, and the spring 81 no longer exerts any restraining force on the actuating lever 33. The circuit opening spring 35 then quickly moves the rod 29 and the movable bridging contact 27 downwardly to open circuit position causing clockwise rotation of the actuating lever 33 about the point of engagement of its free end on the latch plate 51, and collapse of the toggle formed by the crank arm 69 and the link 71. This position of the parts is illustrated in Fig. 2.

To close the interrupter, the operating handle 61 is rotated in a counter-clockwise direction about the pivot axis 63. Since the knee pivot pin 75 is in engagement with the right-hand end of the slot 79 of the handle, the crank arm 69 is also rotated in a counter-clockwise direction about the pivot axis 63. The counter-clockwise rotation of the crank arm 69 causes upward movement of the link 71 and clockwise rotation of the lower crank arm 73. The clockwise rotation of the lower crank arm 73 is transmitted through the spring 81 to the lever 55 to cause it to be rotated in a clockwise direction along with the crank arm 73. As soon as the imaginary line joining the pivot pins 75 and 77 crosses to the left of the axis of the fixed pivot pin 63, the toggle comprising the crank arm 73 and the link 71 moves to the overset or "made" position shown in Fig. 1. The clockwise rotation of the lever 55 caused by the upward movement of the link 71 rotates the actuating lever 33 in a counter-clockwise direction about the point of engagement of its free end with the latch plate 51 to effect upward movement of the switching rod 29 and the movable bridging contact 27 until the movable bridging contact engages the stationary contacts 23. The length of the crank arm 69 and the curved link 71 are such that the movable bridging contact 27 engages the stationary contacts 23 prior to the time that the crank arm 69 reaches top dead center position, so that the contact pressure spring 81 becomes stressed to produce the required contact pressure between the contacts 27 and 23.

When a heavy magnitude overload or short circuit occurs in the circuit controlled by the interrupter, the electromagnet 17 is energized by the current a sufficient amount to rotate the latch member 41 in a counter-clockwise direction to effect release of the free end of the actuating lever 33. When the actuating lever 33 is thus released, the switching rod 29 and movable contact 27 are immediately freed from the influence of the manual operating means 45 and the contact pressure spring 81 so that the movable bridging contact 27 is moved rapidly to open circuit position by the contact opening spring 35. This position of the parts is illustrated in Fig. 3.

When a lower magnitude overload of predetermined duration occurs in the circuit, the bimetallic element 47 flexes in a direction toward the electromagnet 17 and causes counter-clockwise rotation of the latch member 41 to release the free end 33 of the actuating lever. The release of the actuating lever 33 immediately frees the switching rod 29 and the movable bridging contact 27 from the influence or force exerted by the operating means and the contact pressure spring 81, the actuating lever 33 being rotated in a counter-clockwise direction about the pivot pin 59 under the influence of the circuit opening spring 35. The circuit opening spring 35 effects a rapid movement of the rod 29 and the movable bridging contact 27 to the open circuit position as shown in Fig. 3, the same as in the case of the release by the electromagnet.

In order to reclose the interrupter, it is necessary to reset the free end of the actuating lever 33 in latching engagement with the latch 51 of the latch member 41. To reset the interrupter, the operating handle 61 is moved in a clockwise direction. The clockwise movement of the operating handle 61 effects collapse of the toggle formed by the crank 69 and the link 71, which causes a counter-clockwise rotation of the lever 55. The counter-clockwise rotation of the lever 55 rotates the actuating lever 33 in a clockwise direction about the pivot pin 31 which remains stationary to cause the free end of the lever 33 to be re-engaged on the upper edge of the latch plate 51 of the latch member 41 which in the meantime has been returned to latching position by its biasing spring. The interrupter is now completely reset and may be reclosed in the manner previously described.

A modified form of the interrupter is illustrated in Fig. 4. The interrupter shown in Fig. 4 is identical in all respects to the interrupter shown in Fig. 1 and described above, with the exception of the operating lever 55, the contact pressure spring 81 and the connection of the link 71 to the lever 55. Since the interrupter shown in Fig. 4 is identical in construction to the interrupter previously described and shown in Fig. 1, with the exceptions noted above, it is not deemed necessary to again describe those parts which are identical. The same reference characters have been used to designate corresponding parts wherever applicable. In the construction shown in Fig. 4, a bell crank lever 89 has been substituted for the lever 55 and the crank arm 73 shown in Fig. 1 and described in connection therewith. The bell crank lever 89 is pivoted for rotation about the fixed pivot pin 57 at one end and has its free end pivotally connected to the right-hand end of the lever 33 by means of the pivot pin 59. The lever 89 is provided with a projecting pin 91 which engages a slot 93 provided in the lower portion of the curved link 71, and the pin 91 is connected to the link by means of a contact pressure securing spring 95. The spring 95 has its lower end connected to the pin 91 and its upper end engages a projecting pin 97 carried by the mid-portion of the link 71. The length of the crank arm 69 and the link 71, as in the originally described embodiment, are such that during closing of the interrupter the bridging contact 27 is moved into engagement with the stationary contacts 23 before the crank arm 69 reaches top dead center position so that the spring 95 is stressed as the toggle formed by the crank 69 and the link 71 move over center to the overset or "made" position. The spring 95 thus

functions to secure the required pressure engagement of the bridging contact 27 with the stationary contacts 23 in the closed position of the interrupter.

The operation of the interrupter shown in Fig. 4 is substantially the same as the operation of the originally described embodiment of the invention. To manually open the interrupter, the operating handle 61 is rotated in a clockwise direction. The clockwise rotation of the operating handle 61 moves the toggle formed by the crank 69 and the link 71 overcenter following which the contact pressure spring 95 acts to move the link 71 downwardly independently of any further movement of the handle 61. As soon as the upper end of the slot 93 engages the pin 91, the contact pressure spring no longer exerts any restraining force on the actuating lever 33. The right-hand end of the actuating lever 33 is then free to move downwardly and the circuit opening spring 35 quickly effects downward movement of the switching rod 29 and the movable bridging contact 27 to open circuit position, during which movement the actuating lever 33 is rotated in a clockwise direction about the point of engagement of its free end with the latch plate 51, and the toggle formed by the crank arm 69 and the link 71 is moved to collapsed position.

To close the interrupter, the operating handle 61 is moved in a counter-clockwise direction about its pivot axis 63, causing counter-clockwise rotation of the crank arm 69 and upward movement of the toggle link 71. The upward movement of the toggle link 71 is transmitted through the contact pressure spring 95 to the bell crank lever 89 causing clockwise rotation of that lever. The clockwise rotation of the lever 89 moves the right-hand end of the actuating lever 33 upwardly, rotating the lever 33 about the point of engagement of its free end with the latch 51 to cause upward movement of the switching rod 29 and movable bridging contact 27 to their closed circuit position. The movable bridging contact 27 engages the stationary contacts 23 before the crank arm 69 reaches its top center position so that the toggle, in moving overcenter to the overset or "made" position, stresses the contact pressure spring 95 which produces a pressure engagement of the movable bridging contact 27 on the stationary contacts 23.

The interrupter shown in Fig. 4 is tripped in response to predetermined conditions in the same manner as described in connection with the original embodiment shown in Fig. 1. The latch member 41 is rotated in a counter-clockwise direction either by the electromagnet 17 or by the bimetallic trip element 47 to release the free end of the actuating lever 33. The release of the free end of the actuating lever 33 immediately frees the switching rod 29 and the movable bridging contact 27 from the influence of the manual operating means and the contact pressure spring 95, and the circuit opening spring 35 moves the switching rod 29 and the movable bridging contact 27 rapidly downward to the open circuit position. Following a tripping operation, the interrupter is manually reset by moving the operating handle 61 to the open position in the same manner as described in connection with the original embodiment shown in Fig. 1.

Another modification of the invention is shown in Figs. 5, 6 and 7. In these figures, the base, cover, and all other parts which are not necessary for a complete understanding of the invention, have been omitted. It is to be understood that in the physical embodiment of the invention, the interrupter shown in Figs. 5, 6 and 7 would embody a base, cover, electromagnet, bearing plates, and a thermally responsive trip element of the same general construction as described in connection with the original embodiment shown in Fig. 1. Referring to Figs. 5, 6 and 7, the switching rod 29 carries a movable bridging contact 27 at its lower end, which is movable into and out of engagement with the fixed stationary contacts 23. The rod 29 and the movable contact 27 are biased to open circuit position by means of a circuit opening spring 35 which encircles the rod 29. The lower end of the spring 35 engages the movable contact 27 while the upper end thereof engages a fixed or rigid support 99 which is provided with an opening for accommodating the rod 29. The upper end of the switching rod 29 is pivotally connected by means of a pivot pin 31 to an intermediate point of the actuating lever 33, the free end of which is normally and releasably supported by a pivoted latch member 41. The opposite or right-hand end of the actuating lever 33 is pivotally connected to a manual operating means indicated generally at 101 and carries a pin 103 which is guided in a pair of slots 105 which may be formed in the bearing plates or frame of the interrupter.

The latch member 41 is pivoted intermediate its ends on a pivot pin 49 which is, in turn, carried by the free end of a resilient strip 107, the opposite end of the strip 107 being rigidly secured to the fixed support 99. The latch member 41 is preferably formed of magnetic material for cooperating with a tripping electromagnet similar to the electromagnet 17 shown in Fig. 1, and the upper portion of the latch member carries a latch plate 51, the upper edge of which normally engages and supports the free end of the actuating lever 33 as shown in Fig. 5. The latch member 41 is biased in a clockwise direction by suitable spring means (not shown). The manual operating means 101 comprises an operating handle 61 which is rotatably mounted on a fixed pivot pin 63. A crank arm 69 is also rotatably mounted on the fixed pivot pin 63 and is coupled to the operating handle 61 through the agency of a lost motion connection comprising a pivot pin 75, the end of which engages an arcuate slot 79 formed in the handle 61. A curved link 71 has its lower end pivotally connected to the right-hand end of the actuating lever 33 through the agency of the pivot pin 103, while its upper end is pivotally connected to the free end of the crank arm 69 by means of the pivot pin 75. The crank arm 69 and the curved link 71 form an overcenter toggle which is operable by the handle 61 for causing movement of the movable contact 27 to open and to closed circuit position. When the interrupter is in the closed position as shown in Fig. 5, the toggle is in the overset or "made" position in which an imaginary line joining the pivot pins 75 and 103 is disposed slightly to the right of the axis of the fixed pivot pin 63. The toggle is maintained in the overset or "made" position by the reactive force of the resilient spring strip 107 and in this position serves to maintain the movable contact in closed circuit position by holding the right-hand end of the actuating lever 33.

The operation of the interrupter is briefly as follows. To manually open the circuit, the operating handle 61 is moved in a counter-clockwise direction about the pivot axis 63. During this movement, the right-hand end of the arcuate

slot 79 engages the ends of the pivot pin 75 and moves the crank arm 69 also in a counter-clockwise direction to effect overcenter movement and collapse of the toggle formed by the crank 69 and the link 71. As soon as the toggle moves over center, the right-hand end of the actuating lever 33 is free to move downwardly and the circuit opening spring 35 quickly moves the switching rod 29 and the movable bridging contact 37 carried thereby downwardly to the open circuit position as shown in Fig. 6.

To close the interrupter, the operating handle 61 is moved in a clockwise direction about the pivot axis 63. Since the left-hand end of the arcuate slot 79 engages the end of the pivot pin 75, the clockwise movement of the operating handle moves the crank arm 69 also in a clockwise direction to effect upward movement of the curved link 71 from the position shown in Fig. 6 back to the position shown in Fig. 5. The upward movement of the link 71 moves the right-hand end of the actuating lever 33 upwardly rotating the lever 33 in a counter-clockwise direction about the point of engagement of the free end thereof with the latch plate 51 to effect upward movement of the switching rod 29 and movable contact 27. Before the crank arm 69 reaches top dead center position, the movable contact 27 engages the stationary contacts 23 so that as the toggle moves over center to its overset or "made" position, the spring 107 is stressed or flexed, as shown by reference to the marker 109 in Fig. 5, to effect pressure engagement of the movable bridging contact 27 on the stationary contacts 23.

The interrupter is tripped in response to predetermined conditions in the same manner as previously described in connection with the original embodiment shown in Fig. 1. The latch member 41 is rotated in a counterclockwise direction either by an electromagnet or by a thermally responsive trip element to release the free end of the lever 33. The release of the free end of the lever 33 immediately frees the switching rod 29 and the movable bridging contact 27 carried thereby from the influence of the manual operating means and the contact pressure securing spring strip 107, so that the circuit opening spring 35 quickly moves the movable contact 27 to the open circuit position. This position of the parts is illustrated in Fig. 7. Before the interrupter can again be reclosed, it is necessary to reset the free end of the actuating lever 33 in engagement with the latch plate 51. To reset the interrupter, the operating handle 61 is moved in a counter-clockwise direction to the open circuit position shown in Fig. 6. This movement of the handle collapses the toggle and moves the link 71 downwardly to rotate the actuating lever 33 about the pivot pin 31, which remains stationary, to reengage the free end of the lever 33 on the upper edge of the latch plate 51, the latch member 41 in the meantime having been returned to latching position by its biasing spring.

It will be noted that in each of the embodiments of the invention previously described, the operation of the tripping means effects immediate release of the movable contact from the influence of the operating means and the spring means for securing pressure engagement of the contacts. The release of the contact pressure spring means takes place entirely independently of the beginning of the opening movement of the movable contact so that this spring means does not delay the starting of the opening movement of the movable contact. This construction provides for a much more rapid opening of the contacts and interruption of the circuit than has been achieved by the prior art devices.

The invention provides an improved circuit interrupting mechanism that is simple, accurate and reliable in operation, and inexpensive to manufacture.

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 accompanying claims be given the broadest reasonable construction permissible in view of the prior art.

I claim as my invention:

1. In a circuit interrupter, a stationary contact, a cooperating contact movable to open and to closed circuit position, means biasing said movable contact to open circuit position, an actuating lever connected intermediate its ends to said movable contact, trip means normally releasably engaging and supporting one end of said lever, operating means engageable with the other end of said lever for moving said lever to open and to close said movable contact, and resilient means acting through the engagement of one of said last-mentioned means with said lever for producing a pressure engagement of said movable contact on said stationary contact when the interrupter is closed.

2. In a circuit interrupter, a stationary contact, a cooperating contact movable to open and to closed circuit position, means biasing said movable contact to open circuit position, an actuating lever connected intermediate its ends to said movable contact, trip means normally releasably engaging and supporting one end of said lever, operating means pivotally connected to the other end of said lever for moving said lever and the movable contact to open and to closed circuit position, one of said last-mentioned means including a resilient means for securing pressure engagement of said movable contact on said stationary contact in the closed position of the interrupter.

3. In a circuit breaker, a stationary contact, a cooperating contact movable to open and to closed circuit position, means biasing said movable contact to open circuit position, an actuating lever pivotally connected intermediate its ends to said movable contact, trip means normally and releasably engaging and supporting one end of said lever, operating means including an operating handle and an overcenter toggle connected to the other end of said lever operable to cause movement of said movable contact to open and to closed circuit position, one of said last-mentioned two means including a resilient means for securing a pressure engagement of said movable contact on said stationary contact when the breaker is closed.

4. In a circuit interrupter, a stationary contact, a cooperating contact movable to open and to closed circuit position, means biasing said movable contact to open circuit position, an actuating lever connected intermediate its ends to said movable contact, trip means normally and releasably engaging and supporting one end of said lever, operating means engageable with the other end of said lever operable to move said lever to cause movement of the movable contact to open and to closed circuit position, and resilient means for securing pressure engagement of said contacts when the interrupter is closed, said trip means

being operable to release said lever and immediately free said movable contact from the force exerted thereon by said resilient means and said operating means to cause opening of said movable contact.

5. In a circuit interrupter, a stationary contact, a cooperating contact movable to open and to closed circuit position, means biasing said movable contact to open circuit position, an actuating lever connected at one point to said movable contact, trip means normally and releasably engaging and supporting a second point of said lever, operating means engaging a third point of said lever operable to cause rotation of said lever about said second point to move said movable contact to open and to closed circuit position, one of said last-mentioned two means including a resilient means for securing pressure engagement of said movable contact on said stationary contact when the movable contact is in closed circuit position.

6. In a circuit interrupter, a stationary contact, a cooperating contact movable to open and to closed circuit position, means biasing said movable contact to open circuit position, an actuating lever connected at one point to said movable contact, trip means including a movable trip element normally and releasably engaging and supporting a second point of said lever, said trip element remaining substantially stationary during normal switching operations, operating means engaging a third point of said lever for rotating said lever about said second point to move said movable contact to open and to closed circuit position, said operating means including a resilient means for securing pressure engagement of said movable contact on said stationary contact when said movable contact is in closed circuit position.

7. In a circuit interrupter, a stationary contact, a cooperating contact movable to open and to closed circuit position, means biasing said movable contact to open circuit position, an actuating lever connected at one point to said movable contact, trip means normally and releasably engaging and supporting a second point of said lever, said trip means remaining substantially stationary during normal switching operations, overcenter operating means pivotally connected to a third point of said lever for rotating said lever about said second point to cause movement of said movable contact to open and to closed circuit position, said operating means including a spring for securing pressure engagement of said movable contact on said stationary contact when the interrupter is closed.

8. In a circuit interrupter, a stationary contact, a cooperating contact movable to open and to closed circuit position, means biasing said movable contact to open circuit position, an actuating lever connected intermediate its ends to said movable contact, trip means including a movable trip element normally and releasably engaging and supporting one end of said lever, said trip element remaining substantially stationary during normal switching operation, operating mechanism pivotally connected to the other end of said lever for rotating said lever about said end supported by the trip element for causing movement of said movable contact to open and to closed circuit position, said operating mechanism including an operating handle, an overcenter toggle, and a spring means for securing pressure engagement of said movable contact on said stationary contact when the interrupter is closed.

9. In a circuit interrupter, a stationary contact, a cooperating contact movable to open and to closed circuit position, means biasing said movable contact to open circuit position, an actuating lever connected intermediate its ends to said movable contact, electro-responsive trip means including a pivotally mounted trip element normally and releasably engaging and supporting one end of said lever, said trip element remaining stationary during normal switching operations, operating mechanism pivotally connected to the other end of said lever for rotating said lever about the end thereof supported by the trip element, said operating mechanism including a spring for securing pressure engagement of said movable contact on said stationary contact when the interrupter is closed, said trip means being operable in response to predetermined conditions to release said lever to immediately free said movable contact from the influence of said operating means and pressure securing spring.

10. In a circuit interrupter, a stationary contact, a cooperating contact movable to open and to closed circuit position, means biasing said movable contact to open circuit position, an actuating lever connected at one point to said movable contact, trip means normally and releasably engaging and supporting a second point of said lever, operating means pivotally connected to a third point of said lever for rotating said lever about said second point to cause movement of said movable contact to open and to closed circuit position, said trip means including a resilient means for securing pressure engagement of said movable contact on said stationary contact when said movable contact is in closed circuit position.

11. In a circuit interrupter, a stationary contact, a cooperating contact movable to open and to closed circuit position, means biasing said movable contact to open circuit position, an actuating lever connected intermediate its ends to said movable contact, trip means including a resiliently mounted trip element normally and releasably engaging and supporting one end of said lever, operating means engageable with the other end of said lever for rotating said lever about the end engaged by the trip element to cause movement of said movable contact to open and to closed circuit position, the resilient mounting of said trip element providing pressure engagement of said movable contact on said stationary contact when the interrupter is closed.

12. In a circuit interrupter, a stationary contact, a cooperating contact movable to open and to closed circuit position, means biasing said movable contact to open circuit position, an actuating lever connected intermediate its ends to said movable contact, trip means normally and releasably engaging and supporting one end of said lever, operating mechanism including a movable operating handle and an overcenter toggle pivotally connected to the other end of said lever for rotating said lever about the end supported by the trip means to cause movement of the movable contact to open and to closed circuit position, said trip means including a resilient means for securing pressure engagement of said movable contact on said stationary contact in the closed circuit position of said movable contact.

13. In a circuit interrupter, a stationary contact, a cooperating contact movable to open and to closed circuit position, means biasing said movable contact to open circuit position, an actuating lever connected intermediate its ends to said movable contact, trip means including a resiliently mounted trip element normally and releasably engaging and supporting one end of said lever, operating mechanism including a movable

operating handle and an overcenter toggle pivotally connected to the other end of said lever for rotating said lever to cause movement of said movable contact to open and to closed circuit position, the resilient mounting of said trip element providing pressure engagement of said movable contact on said stationary contact when said movable contact is in closed circuit position.

14. In a circuit interrupter, a stationary contact, a cooperating contact movable to open and to closed circuit position, means biasing said movable contact to open circuit position, an actuating lever connected intermediate its ends to said movable contact, electro-responsive trip means including a resiliently mounted trip element normally and releasably engaging and supporting one end of said lever, a guide for the opposite end of said lever, operating means including a movable operating member and an overcenter toggle pivotally connected to said opposite end of the lever for rotating said lever about the end supported by the trip element to cause movement of the movable contact to open and to closed circuit position, the resilient mounting of said trip element serving to produce pressure engagement of the movable contact on the stationary contact when the movable contact is in closed circuit position.

KURT WULSTEN.