June 27, 1944. P. M. CHRISTENSEN 2,352,517

THERMAL CIRCUIT BREAKER

Filed May 9, 1941 3 Sheets-Sheet 1

Fig. 1

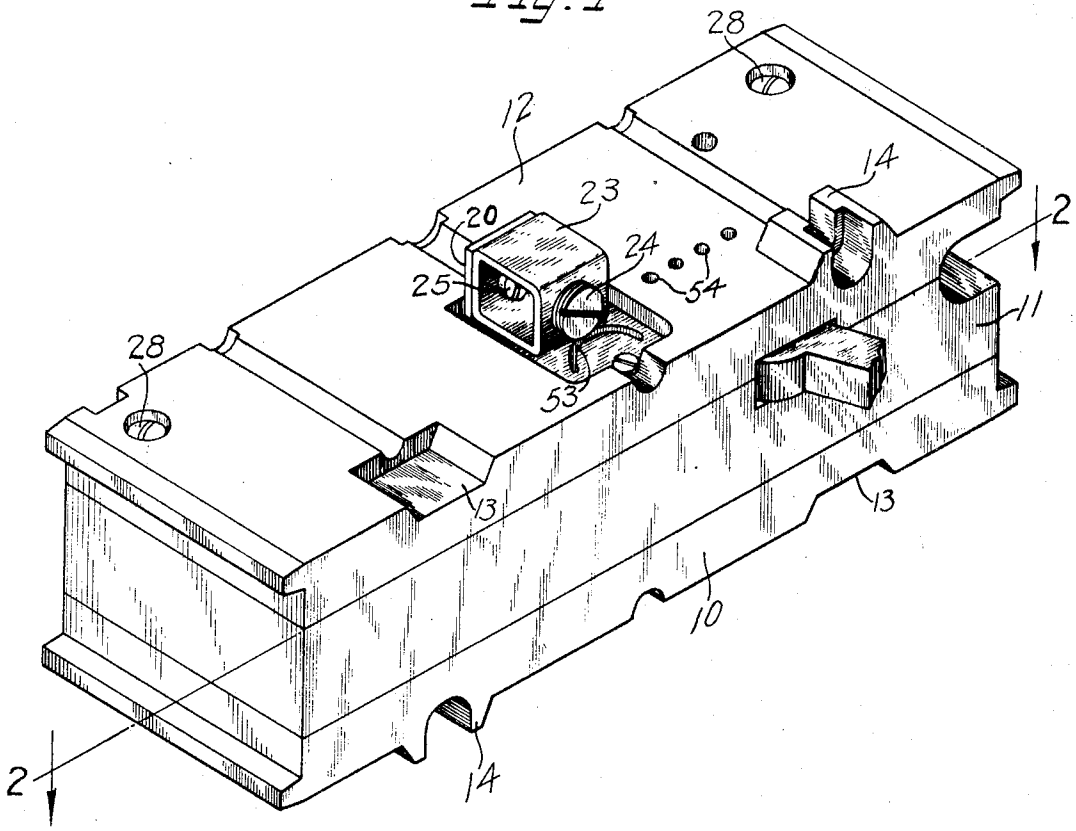
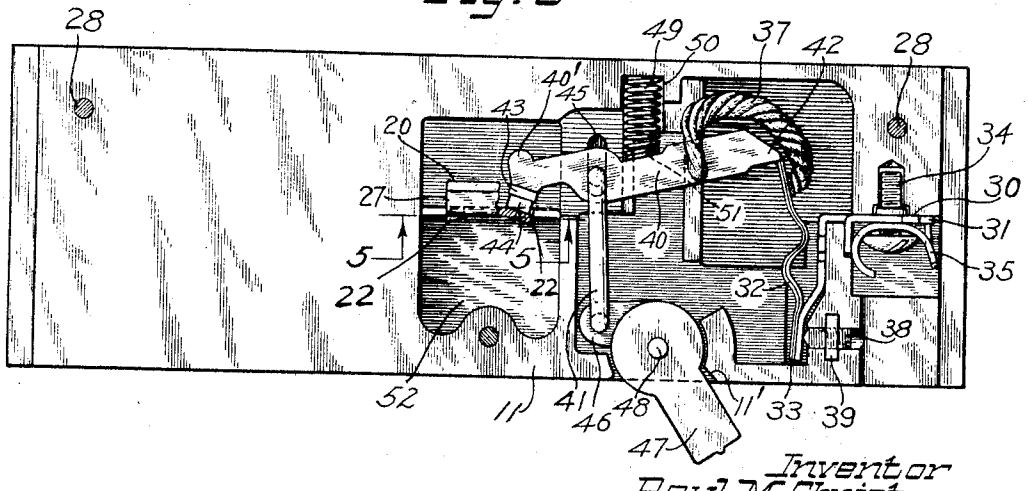


Fig. 2



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Fig. 3

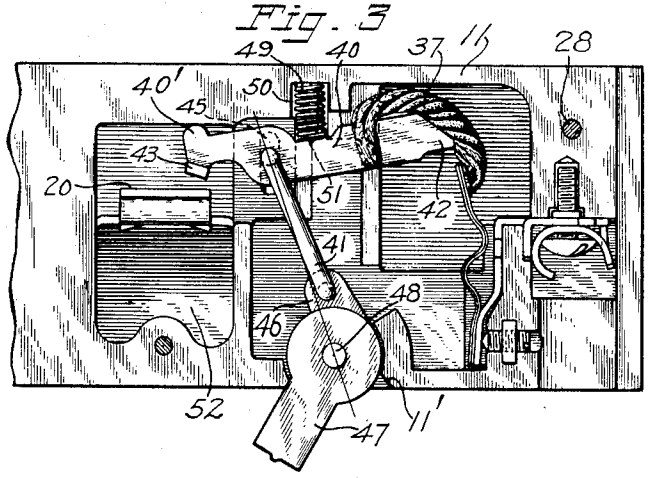


Fig. 4

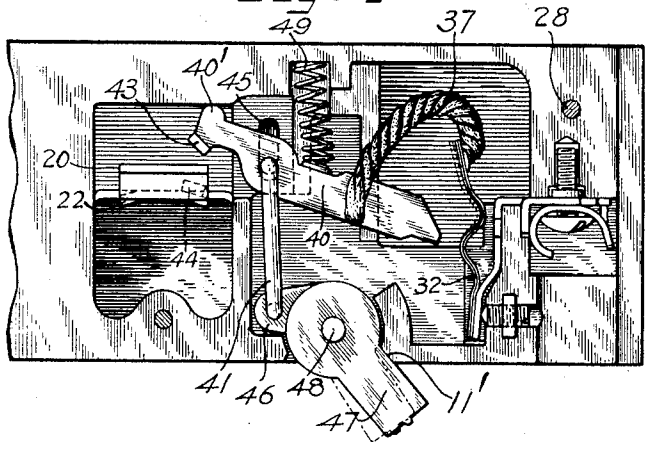


Fig. 5

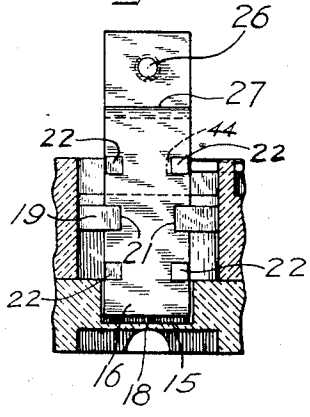
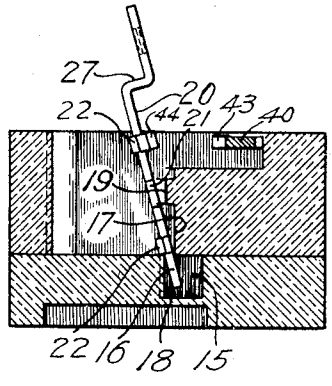


Fig. 6



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Fig. 7.

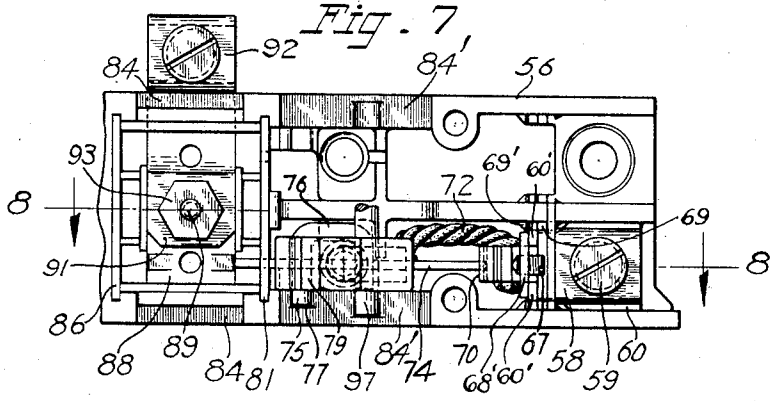


Fig. 8

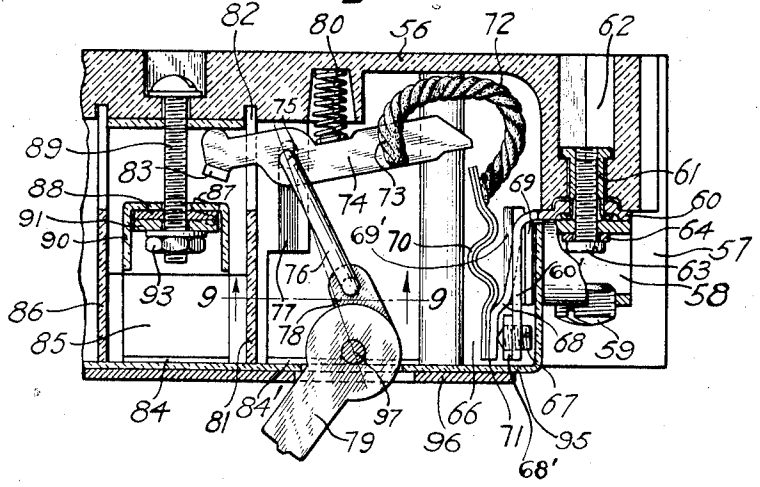
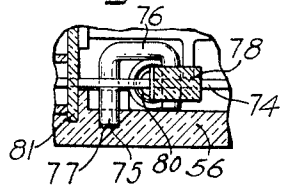


Fig. 9



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Patented June 27, 1944

2,352,517

UNITED STATES PATENT OFFICE

2,352,517

THERMAL CIRCUIT BREAKER

Paul M. Christensen, Newington, Conn., assignor to Colt's Patent Fire Arms Manufacturing Company, Hartford, Conn., a corporation of Connecticut

Application May 9, 1941, Serial No. 392,618

12 Claims. (Cl. 200—116)

My present invention relates to circuit breakers and contemplates the provision of circuit breakers including switching mechanism automatically operable in response to conditions existing in the circuits in which they are connected as well as being manually operable to establish the switch mechanism in "on" and "off" positions.

It is well-known that fuses of various types have been interposed in electric circuits to protect electrical appliances and lamps, and that the fuses are ruptured and rendered useless upon the occurrence of an overload or short circuit requiring replacement in order to re-establish the circuit. Also if the fuses are inserted while the abnormal conditions still exist the new fuses will also be ruptured.

I am aware of the fact that automatic circuit breakers containing various types of switch mechanism to serve the purpose of fuses have been used and proposed for use prior to my present invention. I am also aware of the fact that many of these circuit breakers embody constructions which are not only expensive from the standpoint of manufacture because of the consruction and arrangement of the parts thereof and the difficulty of assembly, but also that circuit breakers as constructed prior to my invention did not afford all of the desirable features which the user should have. Such features include durability, ease of operation, and replacement of parts with facility when and if necessary.

I am also aware that it is not new to provide a circuit breaker including a casing with a stationary contact mounted therein as well as a movable contact on a movable contact bar with an operating member to actuate the contact bar to open and close the circuit; and in which a thermostatic element is included to automatically break the circuit under abnormal conditions in the circuit.

With the foregoing in mind, my invention may be stated generally to reside in the provision of a circuit breaker characterized by simplicity of construction and assembly of the parts under which the automatic breaking of the circuit by tripping of the contact bar is assured. The means for effecting movement of the contact bar to "off" position when abnormal conditions prevail in the circuit may be of various types so long as they are responsive to and actuated by abnormal conditions existing in the circuit.

My invention provides a construction whereby the handle can be manually moved to only two definite positions, one establishing the switch mechanism in "on" position and the other in "off" position. This is accomplished by the provision of a toggle mechanism including the contact bar and handle with a link connected therebetween and movable therewith, said link having sliding guided movement at one end in a part of the casing and oscillating or swinging movement during operation or functioning of the switch mechanism, as hereinafter pointed out and explained in detail.

Also as will be hereinafter pointed out in detail, the construction and arrangement of parts is such that the contact bar has both pivotal movement on and sliding movement with the link which connects the operating handle with the contact bar during manual operation of the switch, as well as when the contact bar is moved automatically to "tripped" position when abnormal conditions prevail in the circuit caused by overload or short circuit.

The invention provides for utilizing a portion of the movable contact bar adjacent the movable contact carried thereby as a fulcrum for swinging movement of the contact bar on the link forming part of the toggle when the switch is moved from "on" to "off" position and in utilizing the other end of the contact bar as a fulcrum when the switch is moved from "off" to "on" position.

Another important feature of the invention is the arrangement of the linkage whereby the handle is movable manually to only two positions, namely "on" and "off," but whereby when abnormal conditions prevail or occur in the circuit the contact bar is automatically tripped causing movement of the handle to a third or indicating position not obtainable by manual operation of the handle but from which position the handle is movable to its "off" position to re-establish the contact bar in its normal "off" position from which it is movable to "on" position by movement of the handle to its normally manually established "on" position.

Another object of the invention is to provide a sectional casing, different from that in my prior Patent 2,130,369. The present construction, in one form, facilitates the insertion of particularly designed bus bars in the casing, said casing and bus bar having interfitting parts which locate the bus bar and stationary contact thereon in proper position.

I wish it to be understood that the drawings forming part of the present application are illustrative of the operation of the switch mechanism; and that any means responsive to abnor-

mal conditions in the circuit in which the circuit breaker is established may be used to actuate the switch mechanism automatically. The claims forming a part of this application are relied upon for the purpose of defining the invention.

In the drawings:

Fig. 1 is a perspective view of one form of the present invention showing the handle or manually operable member in "on" or circuit closing position;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 2 showing the switch in open position by operation of the handle;

Fig. 4 is a view showing the switch in open position as a result of automatic operation due to abnormal conditions in the circuit;

Fig. 5 is a transverse sectional view of the casing showing the bus bar in established position in the casing and taken on the line 5—5 of Fig. 2;

Fig. 6 is a view similar to Fig. 5 illustrating the manner of inserting a bus bar in accordance with the present invention;

Fig. 7 is a top plan view of a modification of the invention in respect to the construction of casing and location of the switch parts therein;

Fig. 8 is a view taken on the line 8—8 of Fig. 7; and

Fig. 9 is a fragmentary view taken on the line 9—9 of Fig. 8.

Referring to the drawings and particularly at the present to Figs. 1–6 inclusive, there is shown a sectional casing for the switch mechanism of the circuit breaker. In my prior Patent 2,130,369 I disclosed a sectional casing composed of two sections enclosing all of the movable parts of the switch mechanism except the manually engageable portion of the operating member or handle. In Figs. 1–6 of the present application the sectional casing is shown as composed of three parts, namely, a middle section 11, and covers 10 and 12, suitably secured together. As will be presently explained in detail, the middle section 11 supports the movable parts of the switch mechanism to which access may be had. The covers 10 and 12 are provided on their outer surfaces with grooves 13 and projections 14 to facilitate nesting or grouping of the casings where the requirements are such that more than one circuit breaker is necessary. The structure defined in the foregoing which facilitates nesting or grouping of the casings is such that two casings may be nested and, when so nested, the bus bar 20 and terminal 23, to be described in detail subsequently, project from opposite sides of the nested pair of casings. If it is desired to closely associate more than two casings, said casings are first disposed in nested pairs and then additional casings are mounted adjacent thereto as closely as the terminals of the adjacent casings will permit. As best shown in Figs. 5 and 6, the cover 10 has formed therein a well or recess 15 to receive the lower end 16 of the bus bar 20. When the cover 10 and middle section 11 are properly assembled in superposed relation, the wall 17 of an opening in the middle section 11 is located transversely in spaced relation to, but above, the wall 18 of the recess or well 15 so as to provide a restricted opening through which the end 16 of the bus bar is insertable upon tilting movement of the bus bar, as illustrated in Fig. 6. The width of the well or recess 15 is such as to permit this tilting movement of the bus bar during insertion thereof during assembly of the parts and the relative positions of the walls 17 and 18 is such as to permit the bus bar to be pivotally moved into the upright position illustrated in Fig. 5, in which it is properly located for cooperation with the other parts of the switch mechanism, as hereinafter will become more apparent. Complemental elements are provided on the bus bar and the wall 17 of the part 11 of the casing to interengage when the bus bar is moved from the tilted position of Fig. 6 to its upright position of Fig. 5. In this application I have illustrated such elements as being projections 19 formed on the wall 17 and notches 21 in the bus bar. However, the arrangement may be reversed and other suitable means provided so long as the bus bar is insertable in the manner described and after insertion and proper location by interengageable elements is maintained against lateral movement so that the switch will function properly.

I have shown ears or struck-up portions 22 on the bus bar which are provided for definitely locating the stationary contact 44 in the process of manufacture. When each ear 22 is struck up from one side of the bus bar, a corresponding depression is formed on the other side and a stationary contact 44 is mounted in said depression by securing the contact to ear 22 by welding, soldering, or in any other suitable manner. It will thus be seen that said depression forms a convenient means for locating and properly positioning each stationary contact 44. The lower ears 22 may serve as stops for limiting the movement of the bus bar while inserting the same into recess 15. Said lower ears 22 also serve as fulcrums for the tilting movement of the bus bar when moved from the position of Fig. 6 to that of Fig. 5 by resting on the top of the section 10 of the casing, as shown in the drawings. However, this is not essential because the end 16 of the bus bar may be of such length as to contact the bottom of the well 15 and thus providing the fulcrum for tilting movement of the bus bar to bring the interfitting elements 19 and 21 into engagement to prevent lateral movement of the bus bar during operation of the switch.

Further means for firmly maintaining the bus bar in position during operation of the breaker is shown best in Fig. 1 and comprises a terminal 23 having in one wall an enlarged screw-threaded opening to receive a clamping screw 24. A screw 25 is insertable through an opening in the opposite wall to be threaded into the opening 26 (Fig. 5) in the top offset end of the bus bar. When the parts thus far described are assembled in the position shown in Fig. 1, the lower end of the terminal 23 rests on the offset portion projecting from the shoulder 27 of the bus bar. When the parts shown in Figs. 1–6 inclusive are completely assembled, the upper offset end of the bus bar 20 is secured to the terminal 23 by the screw 25 and the upper offset end extends through a slot in the cover 12 proportioned to receive with a fairly close fit the shoulder 27. Thus the bas bar is firmly held in position by the interengaging elements 19 and 21, the abutment of the lower end 16 against the wall 18 of recess 15 and the reception of the shoulder 27 in the slot in the cover as well as by the terminal 23 secured to the bus bar by screw 25.

Under the construction and arrangement of parts of the casing, as shown in Figs. 1–6 inclusive, sections 10, 11 and 12 are shown held together by screws 28 which may be threaded into the section 10 or into nuts or sleeves (not shown). However, the means for holding the sections in

assembled relation is not an essential feature of the present invention.

The other terminal **30** may be of any suitable construction to clamp or hold the end of a wire, but in the present case I have shown a plate **31** electrically and mechanically connected at one end to the bimetallic or thermostatic strip **32**, as indicated at **33**, by welding or soldering or other suitable means not interfering with the conductivity. A screw **34** is threaded through one leg of the plate **31** and a clamp **35** so that the wire or cable leading into the device may be inserted between the head of the screw **34** and the clamp or clip **35** to be tightly gripped. The bimetallic strip or thermally responsive element **32** is connected to a flexible conducting wire or cable **37** at its end opposite the connection **33**. The bimetallic element or strip **32** may be readily adjusted or calibrated at the time of assembly to regulate the current value in response to which strip **32** is distorted, by means of a screw **38** cooperating with a nut **39** partially embedded in the section **11**, it being understood, of course, that after the calibration is accomplished and test has been made that the screw **38** is sealed against movement relative to the elongated arm of the plate **31** against which it bears adjacent the point of connection **33** between said elongated arm of the plate **31** and the bimetallic element **32**.

The other end of the flexible copper cable or wire is electrically and mechanically connected with an operating contact bar or blade **40** which is pivotally mounted on one end of a slidable link **41** forming part of the toggle mechanism by which the circuit-controlling device is manually operable. Under normal current conditions the free end of the current responsive element **32** is contacted by the end **42** of the contact bar or blade **40**, as shown in Fig. 2. The other end of the contact bar or blade **40** has connected therewith a contact point **43** to cooperate with the stationary contact **44** on the bus bar **20**. The depending end of the link **41** on which the contact bar or blade **40** is pivotally mounted extends into a groove **45** provided therefor in the top of the middle section **11** of the casing for guided sliding movement transversely of the casing during actuation of the contact bar, as will be hereinafter pointed out in detail. The slot **45** is proportioned to the amount of movement required in accordance with the relation of the movable parts of the switch.

The other end of the link **41** is inserted in a lug **46** on the operating handle **47** pivotally mounted on a pin **48** extending through the handle and engageable in sockets in the sections **11** and **12**.

A spring **49** bears at one end against a recess provided by complementary formations on the sections **11** and **12**, as indicated by the numeral **50**, with its other end surrounding a lug **51** adjacent the connection between the link **41** and the operating plate or bar **40**.

In assembling the parts of the circuit breaker shown in and described in connection with Figs. 1–6, the section **11** is superimposed upon the section **10** so that the bus bar **20** may be inserted as illustrated in Figs. 5 and 6 and previously described in connection therewith. The section **12** may then be applied so that the top of the bus bar extends through the slot provided therefor in the section **12** with the shoulder **27** located in the slot to assist in stabilizing the bus bar during operation of the circuit breaker manually and automatically, as hereinabove described. The sections may then be secured together by any suitable means, but in the present application I have illustrated screws **28** extending through these sections and serving the purpose in connection with nuts (not shown) to hold the sections in assembled relation. After the sections have been assembled the terminal **23** is connected to the top of the bus bar, preferably by a screw **25** which has threaded engagement with the top of the bus bar. The screw **24** is then inserted in the terminal **23** to clamp the conductor to which the bus bar is adapted for electrical connection to establish the circuit breaker in circuit; the other conductor being electrically connected to the terminal **30**.

With the parts in the assembled relation described above, the operation is as follows, it being assumed that the switch is in "off" position shown in Fig. 3 wherein the movable contact **43** and the end **42** of the bar **40** are not contacting the stationary contact **44** nor the end of the bimetallic element **32**. Thus the manually controlled "off" position of the operating handle **47** is to the left, as shown in Fig. 3. To close the circuit the handle is moved to the right or to the position of Fig. 2. This moves the link **41** to the position of Fig. 2 from the position of Fig. 3 by a toggle action.

It will be noted that when the switch is in completely "off" position under the manual control that the link **41** extends obliquely across the casing with the end which pivotally supports the bar **40** adjacent the rear of the slot **45**. When the operating handle is moved from left to right the link is straightened in its position so that it is substantially at right angles to the longitudinal side walls of the casing and the end of the link on which the bar **40** is pivotally supported has been moved to adjacent the front end of the slot **45**. This manual movement of the operating handle from the "off" to the "on" position establishes the handle in the full line position of Fig. 2 which corresponds to the dotted line position of Fig. 4. The full line position of the operating handle in Fig. 4 is established upon automatic actuation of the switch mechanism under the means responsive to abnormal conditions in the circuit, as will be presently pointed out. Also, as will be pointed out in detail, during the movement of the operating handle the contact bar has both sliding and pivotal movement.

The projection **40'** on the end of the bar **40** which carries the movable contact **43** serves as a fulcrum for the bar as the end **42** thereof is brought into engagement with the end of the member **32**, and thereafter as the link continues its straightening movement the movable contact **43** is brought into engagement with the stationary contact **44** as the end of the link on which the contact bar is pivoted slidably moves in the slot **45**. When the circuit is broken by manually moving the operating handle from the position of Fig. 2 to the position of Fig. 3 the action is reversed for then the end **42** contacting the bimetallic strip serves as a fulcrum for the initial movement of the movable contact away from the stationary contact and then the sliding and swinging movement of the link **41** moves the end **42** away from the bimetallic element re-establishing parts in the "off" position of Fig. 3.

As previously mentioned, the structure affords three possible positions which the operating handle may occupy. Two of these positions have

been fully described, namely, the manually "on" and "off" positions of Figs. 2 and 3 respectively. As shown in Fig. 3 where the switch is in "off" position, the link connecting the contact bar and operating handle extends obliquely across the casing and in such position the toggle compresses the spring 49 preventing the spring from moving the contact bar on its pivot. When the linkage is straightened, as shown in Fig. 2, the spring 49 acts upon the contact bar 40 to maintain it in "on" position. These two positions are possible during manual operation of the switch under normal conditions. However, when abnormal conditions occur the link 41 moves slightly forward and is swung to the left when the end 42 of the contact bar 40 is released by the current responsive means employed to engage the end 42 of the contact bar under normal conditions. Release of the end 42 of the contact bar permits the spring to expand from the position of Fig. 2 to the position of Fig. 4 rocking the contact bar on its pivot and also exerting its force against the contact bar to move the link forwardly and swinging it slightly to the left so that the toggle then maintains the switch in open position until it is manually restored to closed position. This movement of the link under abnormal current conditions moves the operating handle from the dotted line position of Fig. 4 to the full line position where it contacts the beveled surface 11' at one side of the opening in the sections 11 and 12 through which the operating handle extends. The dotted line position of Fig. 4 may be termed the "on" indicating position because when the switch handle is contacting the beveled surface 11' there is a clear indication that the switch has been tripped.

The structure also provides a chamber 52 on the interior of the casing in front of the bus bar 20, which chamber is substantially closed by complemental surfaces or formations on the sections 10, 11 and 12. Since the action between the movable contact 43 and the stationary contact 44 occurs within the chamber 52, I provide an opening 53 for the escapement of gases created by arcing. In Fig. 1 I have shown the opening 53 as being arcuate thus obtaining substantial length for the opening across the top of the chamber 52. Some of the gases may escape into the relatively shallow chamber in which the bar 40, bimetallic element 32 and flexible conducting wire or cable 37 are housed. To permit escapement of the gases which may enter this portion of the casing, I provide a plurality of small openings 54 in the cover.

In Figs. 7–9 I have illustrated a modification in the structure above described in connection with Figs. 1–6. The principle and the operation is the same in both instances, but in the construction shown in Figs. 7–9 I provide a unitary casing whereas in the other form of the invention a 3-part sectional casing is shown and described. In Fig. 7 the numeral 56 designates a section of a casing made of molded insulating material. Only a section of the casing is shown because it is well understood that compartments may be formed according to the size and number desired and in each of which the switch mechanism about to be described would be similarly mounted.

The ends of the casing are recessed as indicated by the numeral 57. A terminal 58 similar to the terminal 23 of Fig. 1 is mounted in the recess 57. A clamping screw 59 is mounted through one wall of the terminal 58 and an L-shaped conducting bar 60 is secured mechanically and electrically to the terminal 58. The means for securing the conducting bar to the terminal under the present form of the invention comprises a sleeve in the nature of a hollow rivet 61 mounted in a recess 62 in the casing and provided with a head resting on the shoulders provided by the lower end of the recess 62. The lower end of the sleeve 61 is reduced in thickness and is burred over under the end 60 of the conducting bar. The interior of the sleeve or rivet is screw-threaded to receive the screw 63 which is insertable through the terminal 58 when the clamping screw 59 is removed in the same manner as the screw 25 in Fig. 1. A spring washer 64 is arranged between the head of the screw 63 and the top of the terminal 58. It will be understood, of course, that there is mechanical as well as electrical connection between the screw 63 and the conducting bar 60, the latter having an elongated portion extending downwardly in the chamber 66 in the casing. Said elongated portion is longitudinally severed to provide three fingers including two spaced outer fingers 60' and a middle finger 68 which is angularly offset from the plane of the outer fingers 60' as indicated in Figs. 7 and 8. The fingers 60' are received in grooves formed on the inner walls of the casing which encloses chamber 66, said grooves being formed by ribs 69 and 69'. A crosspiece 68' is suitably secured to the free ends of fingers 60' such as by welding. A calibrating screw 67 is threaded through crosspiece 68' to bear against the free end of finger 68. As shown in Fig. 8, the free end of finger 68 is offset transversely from the main plane of the finger and is disposed at an angle to said main plane as indicated at 71. A bimetallic element 70 is suitably secured to said offset end 71 of finger 68.

With the fingers 60' held stationary between the ribs 69 and 69', it will be seen that the calibrating screw 67 may be rotated to vary the position of the offset end 71 and the attached bimetallic element 70 for the same purposes as set forth in the foregoing with respect to bimetallic element 32. The upper end of the bimetallic element 70 is mechanically and electrically connected with a flexible cable or wire 72, the other end of said cable or wire being electrically and mechanically connected as indicated at 73 with the bar 74 corresponding to the bar 40 of Fig. 2. The bar 74 is pivotally mounted on the leg 75 of the link 76 corresponding to the link 41 of Fig. 3. The end of the leg 75 has stabilized guided movement in a relatively long and deep groove or slot 77 formed in the relatively thick wall of the casing, as shown most clearly in Fig. 9. The other end of the link 76 is inserted in the lug 78 on the operating handle 79 within the chamber 66. A coil spring 80 is seated in a recess provided in another wall of the casing and bears at one end against said wall of the casing and at its other end engages over a lug or projection on the bar 74 similar to the lug 51 in Fig. 3. Thus, as in the construction shown and described in connection with Figs. 2–4, the operating handle 79, link 76, and bar 74 constitute a toggle acted upon and acting against the spring 80 during operation of the breaker.

A partition of insulating material 81 is mounted in the casing and is provided with a slot 82 in which the end of the bar 74 carrying the movable contact point 83 has guided movement. Openings 84 and 84' are provided for the escapement of gases created as the result of arcing upon short circuit or overload. A stationary contact is mounted in chamber 85 between parti-

tions 81 and 86, and is designated by the numeral 87. The stationary contact 87 is arranged in alignment with the movable contact 83 in its path of travel when the bar 74 is oscillated. The stationary contact 87 is secured to the plate of conducting material 88 arranged across the chamber 85 and is secured in place within the chamber 85 by a bolt 89 which extends through a wall of the casing and a fiber insulating member 90, preferably but not necessarily of U-shape in cross-section. The bus bar 91 which extends through the casing and is electrically connected with a terminal 92 engages the plate 88 and is connected thereto by the bolt 89 which extends through all of said parts and having a nut 93 threaded on the end thereof to clamp and hold the parts together, as clearly shown in Fig. 8.

In the form of the invention now being described in connection with Figs. 7–9 inclusive, the unitary casing, which as previously mentioned may contain any number of contact chambers in accordance with the requirements of the conditions under which the circuit breaker is to be used, would preferably have its open end covered by a substantially U-shaped insulating cover 95 which may be secured in position by any suitable means. In the present case I have shown a metallic plate 96 disposed on top of the insulating cover 95 and through which the manually operable actuating member 79 extends, said actuating member being pivoted at 97 on a pin extending between the sides of the casing and held in position therebetween. The ends of the fiber closure 95 extends transversely across the ends of the casing in the recesses 57 and are located between the terminals 58 and ribs or parts 69. I also wish it to be understood that under the form of the invention shown in Figs. 1–6 the casing may contain several switches according to the requirements imposed by the usage to which the switches are applicable. In other words, in both forms of the invention illustrated in this application I have shown but a single chamber, whereas the invention is adapted for use in casings having several switches and chambers therefor formed in the casings.

What I claim is:

1. A circuit breaker of the character described, comprising a casing, a stationary contact in the casing, a contact bar in the casing adapted to engage the stationary contact at one end, means adjacent the other end of the contact bar and automatically movable in accordance with conditions prevailing in the circuit to be engaged by said other end of the contact bar under normal conditions in the circuit to provide a manually established "on" position of the switch, a link having one end forming a pivot for the contact bar, a manually operable actuating member accessible on the exterior of the casing and connected with the other end of the link and forming therewith a toggle whereby the contact bar may be moved by manual operation of said actuating member into "on" and "off" positions, and a spring normally acting against said toggle, the connection of said link between said contact bar and actuating member being such as to permit said contact bar to swing to another "off" position under the action of said spring when released by said first means under abnormal conditions in the circuit and effect movement of the manually operable member automatically under the action of said spring to an indicating "off" position reversely of its normal manually established "off" position.

2. The structure of claim 1 wherein the linkage is constructed and arranged to definitely establish the contact bar in "on" and "off" positions by manual operation, the manually operable actuating member is pivotally connected to said link and co-engageable surfaces are respectively and directly provided on the casing and manually operable actuating member for limiting movement of the manually operable actuating member and toggle mechanism when the contact bar is released for movement into said another "off" position under abnormal conditions in the circuit.

3. A circuit breaker of the character described, comprising a casing, a stationary contact in the casing, a contact bar in the casing adapted to engage the stationary contact at one end, means adjacent the other end of the contact bar and automatically movable in accordance with conditions prevailing in the circuit to engage said other end or release said other end to provide "on" and "off" positions of the switch, a link having one end pivotally connected with the contact bar, and a manually operable actuating member pivotally supported on the casing and having a portion accessible on the exterior of the casing and said actuating member also being connected with the other end of the link within the casing and forming therewith a toggle, whereby the contact bar may be moved by manual operation of said actuating member into "on" and "off" positions and the connection of said link between said contact bar and actuating member being such as to permit said link and contact bar to swing to a second "off" position when the contact bar is released by said first means and effect movement of the manually operable member automatically to an indicating "off" position beyond its normal manually established "on" position.

4. A circuit breaker of the character described including an insulating casing and switch mechanism therein comprising a stationary contact, a bimetallic strip spaced from the stationary contact, a movable contact bar, a manually operable actuating member accessible on the exterior of the casing, and means mechanically connecting said actuating member and contact bar and forming therewith a toggle adapted to make and break an electric circuit by moving said contact bar into bridging and spaced relation with respect to said stationary contact and bimetallic strip and corresponding respectively to "on" and "off" positions of the switch, said means pivotally supporting said contact bar and comprising a terminal portion having sliding guided movement in a guide portion in said insulating casing when moved by said actuating member and the construction and arrangement of said parts providing that when the switch mechanism is in "off" position the portion of the contact bar adjacent one end thereof serves as a fulcrum for pivotal movement of the contact bar as the other end approaches the bimetallic strip to establish the switch in "on" position and said other end of the contact bar during manual operation of the switch serves as a fulcrum for pivotal movement of said first end of the bar toward the stationary contact.

5. A circuit breaker of the character described including a casing and switch mechanism mounted therein and comprising a stationary contact, a thermostatic element spaced from the stationary contact, a movable contact bar adapted to bridge said thermostatic element and contact

to establish the switch in "on" and "off" positions, a manually operable actuating member accessible on the exterior of the casing, and means pivotally engaging said contact bar and mechanically connecting said actuating member and contact bar providing a toggle, the construction and arrangement being such that when the contact bar is bridging the stationary contact and thermostatic element establishing the switch in "on" position the thermostatic element serves as a fulcrum for the contact bar as it is initially moved away from the stationary contact to "off" position and the other end of the contact bar subsequently fulcrums against a part of the casing as said first end of the contact bar is moved away from the thermostatic element upon further movement of the actuating member to "off" position.

6. A circuit breaker of the character described including a casing and switch mechanism mounted therein and comprising a stationary contact, a thermostatic element spaced from the stationary contact, a movable conducting element adapted to bridge said thermostatic element and contact to establish the switch in "on" and "off" positions, an actuating member accessible on the exterior of the casing and manually movable to establish the switch in said "on" and "off" positions, and a link pivoted adjacent opposite ends respectively to said actuating member and conducting element and providing a toggle with said actuating member and movable conducting element, the construction and arrangement being such that when the conducting element is bridging the stationary contact and thermostatic element establishing the switch in "on" position the thermostatic element serves as a fulcrum acting against one face of the conducting element when it is moved away from the stationary contact toward "off" position and one portion of the opposite face of the conducting element is subsequently fulcrumed about a fixed portion of the circuit breaker as the conducting element is moved away from the thermostatic element upon further movement of the actuating member toward "off" position.

7. A circuit breaker of the character described including a casing and switch mechanism mounted therein and comprising a stationary contact, a thermostatic element spaced from the stationary contact, a movable conducting element adapted to bridge said thermostatic element and contact to establish the switch in "on" and "off" positions, a manually operable actuating member accessible on the exterior of the casing, a link mechanically connecting said actuating member and conducting element and forming therewith a toggle, the construction and arrangement being such that when the conducting element is bridging the stationary contact and thermostatic element establishing the switch in "on" position the thermostatic element serves as a fulcrum acting against one face of the conducting element when it is moved away from the stationary contact toward "off" position and one portion of the opposite face of the conducting element is subsequently fulcrumed about a fixed portion of the circuit breaker as the conducting element is moved away from the thermostatic element upon further movement of the actuating member toward "off" position, and resilient means co-acting with the conducting element and normally urging the conducting element toward the manually operable actuating member, said resilient means being compressible by the conducting element when the actuating member is moved to "off" position by operation of said actuating member.

8. A circuit breaker of the character described including a casing and switch mechanism therein and comprising a stationary contact within the casing, a thermostatic element within the casing in spaced relation to the stationary contact, a movable conductor adapted to bridge said thermostatic element and stationary contact to make and break an electric circuit, a manually operable member accessible on the exterior of the casing, and a link connecting said manually operable member and said movable conductor and forming therewith a toggle, one end of the link having guided sliding movement in the casing and pivotally supporting said conductor and said link also being located transversely of the casing at substantially right angles to the longitudinal axis thereof when the switch is in the "on" position and movable by the manually operable member to an oblique position across the casing in the "off" position of the switch.

9. A circuit breaker of the character described including a casing and switch mechanism therein and comprising a stationary contact within the casing, a thermostatic element within the casing in spaced relation to the stationary contact, a movable conductor adapted to bridge said thermostatic element and stationary contact to make and break an electric circuit, a manually operable member accessible on the exterior of the casing, a link connecting said manually operable member and said movable conductor and forming therewith a toggle, one end of the link having guided sliding movement in the casing and pivotally supporting said conductor, and said link also being located transversely of the casing at substantially right angles to the longitudinal axis thereof when the switch is in the "on" position and movable by the manually operable member to an oblique position across the casing in the "off" position of the switch, and means engaging said conductor between its point of pivotal connection to the link and its end which engages the thermostatic element, said means being operable automatically to move said link and the conductor connected therewith to a second "off" position upon occurrence of abnormal conditions in the circuit.

10. A circuit breaker of the character described including a casing and switch mechanism therein and comprising a stationary contact, a movable contact bar, a movable contact carried by the contact bar adjacent one end thereof, a bimetallic strip in the casing and having one end located for engagement by the other end of the contact bar under normal conditions in the circuit when the switch is in "on" position, a link pivotally connected to said contact bar intermediate the ends thereof and affording pivotal movement of the contact bar thereon, and a manually operable actuating member accessible on the exterior of the casing and mechanically connected to the link, said link also having sliding guided movement in a part of the casing, whereby the contact bar has pivotal movement and a portion of it also has movement in a fixed path when moved to "on" and "off" positions by said actuating member and link.

11. A circuit breaker of the character described including a casing and switch mechanism therein and comprising a stationary contact, a movable contact bar, a movable contact carried by

the contact bar adjacent one end thereof, a bimetallic strip in the casing having one end located for engagement by the other end of the contact bar under normal conditions in the circuit when the switch is in "on" position, a link pivotally connected to said contact bar intermediate the ends thereof and affording pivotal movement of the contact bar thereon, and a manually operable actuating member accessible on the exterior of the casing and mechanically connected to the link, said link also having sliding guided movement in a part of the casing, whereby the contact bar has pivotal movement and a portion of it also has movement in a fixed path when moved to "on" and "off" positions by said actuating member and link and when the manually operable actuating member is in the "on" position and the contact bar is released by the bimetallic strip upon deflection due to abnormal conditions in the circuit the contact bar has only pivotal movement on the link to effect movement of the movable contact away from the stationary contact.

12. A circuit breaker of the character described including a casing of molded insulating material and switch mechanism therein and comprising a stationary contact, a movable contact bar, a movable contact carried by the contact bar adjacent one end thereof, a bimetallic strip in the casing having one end located for engagement by the other end of the contact bar under normal conditions in the circuit to hold said contact bar in "on" position, a link pivotally connected at one end to said contact bar intermediate the ends of said bar and affording pivotal movement of the contact bar on one end of said link, a manually operable actuating member accessible on the exterior of the casing and mechanically connected to the other end of the link, and a slot formed transversely in said casing and said first end of the link also having sliding guided movement in said slot, whereby the contact bar has pivotal movement and a portion of it also has movement in a fixed path when moved to "on" and "off" positions by operation of said actuating member and link and when the manually operable actuating member is in the "on" position the contact bar is released by the bimetallic strip upon deflection due to abnormal conditions in the circuit the contact bar has only pivotal movement on said first end of the link to effect movement of the movable contact away from the stationary contact.

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