Nov. 1, 1960 L. W. BRACKETT 2,958,749

ELECTRICAL CIRCUIT BREAKERS

Filed March 13, 1958

Fig. 1

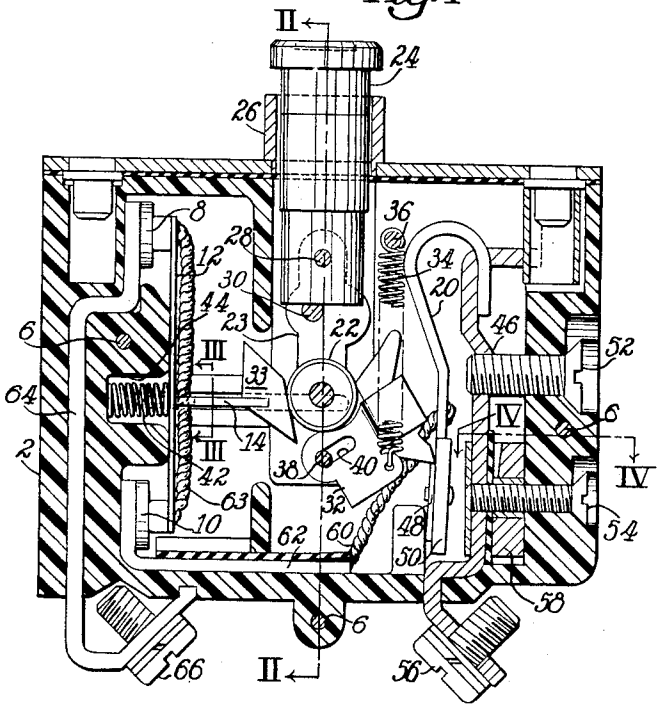


Fig. 2

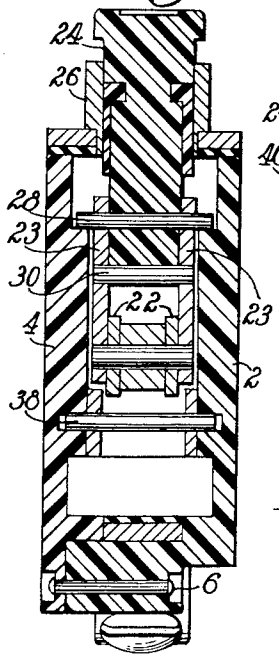


Fig. 3

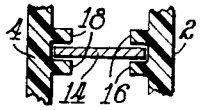
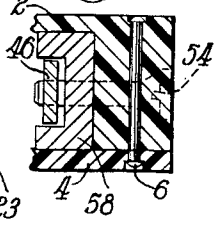


Fig. 4



Inventor

Laurence W. Brackett

By his Attorney

Edward W Fearing

United States Patent Office 2,958,749 Patented Nov. 1, 1960

2,958,749

ELECTRICAL CIRCUIT BREAKERS

Lawrence W. Brackett, Georgetown, Mass., assignor, by mesne assignments, to Wood Electric Corporation, a corporation of Massachusetts

Filed Mar. 13, 1958, Ser. No. 721,134

4 Claims. (Cl. 200—116)

The present invention relates to improvements in electrical circuit breakers, particularly of the trip-free type and is herein illustrated as embodied in a highly compact construction for a breaker more fully disclosed in United States Letters Patent No. 2,613,296, granted June 24, 1949, upon application of Morris B. Wood.

In the circuit breaker of the prior patent one movable contact actuated by a lengthwise sliding button is provided to cooperate with a single fixed contact in opening the circuit running through the contacts and a thermostatic latch is arranged to release a circuit-retaining member whenever an excessive current flows for a sufficient period of time to heat the latch above a releasing temperature. The circuit breaker of the prior patent is extremely compact and efficiently designed to provide effective trip-free operation even under conditions of high amplitude sustained vibrations and low temperatures commonly experienced in the aeronautical field.

An object of the present invention is to so improve the construction and arrangement of parts in the prior push button circuit breaker that, without increasing the external dimensions it is possible to provide a double break in a circuit to be controlled through the use of two sets of fixed and movable contacts, in place of the single set previously used and in addition to enable an instantaneous trip of the retaining member as well as the time delay trip of the prior breaker. In this way the range of protection afforded by the improved breaker is increased while maintaining and in some respects improving the minimum space requirements for insulation and surface leakage. Accordingly, the present invention proposes the provision of a split rectangular frame for a circuit breaker formed with a hollow shell and a relatively flat cover plate therefor, in which shell is disposed the two fixed contacts, a bridging bar including movable contacts for engagement with the fixed contacts, a pair of movable cam members, a manually operable wedging member between the cam members, a thermostatic latch for locking one cam member, a lengthwise slidable push button connected to operate the wedging member, a slide for carrying the bridging bar, in which frame is also formed a two-part of the guideway at right angles to the length of the push button, one part guideway being on the shell and the other part being on the cover plate, so that the slide is always maintained in a position with the bridging bar in alinement with the fixed contacts and a novel form of magnetic trip to provide both a delayed trip and an instantaneous magnetic trip. Preferably, for the purpose of saving space, the bridging bar and the thermostatic latch are disposed in parallel relation along opposite sides of the rectangular frame, with the guideway between them, and also are disposed at right angles to the bridging bar, the thermostatic latch and the push button regardless of whether a magnetic trip is employed or not.

These and other features of the invention, as hereinafter described and claimed, will be apparent from the following detailed specification, taken in connection with the accompanying drawings, in which:

Fig. 1 is a sectional side view of a circuit breaker embodying the features of the present invention;

Fig. 2 is a sectional end view taken along the line II—II in Fig. 1 and illustrating the cover on the shell of the frame;

Fig. 3 is a sectional detail view of a guideway for a contact bridging bar slide in the breaker of Fig. 1 as seen in the direction of the arrows on the line III—III of that figure; and

Fig. 4 is a further sectional detail view taken along the line IV—IV of Fig. 1.

The trip-free overload circuit breaker illustrated in the drawings is manually operated to close or open a circuit to be controlled and is actuated automatically to open and to hold open the circuit under conditions of excessive current flow regardless of any manual operation of the breaker. The breaker comprises a split rectangular frame formed with a hollow shell 2 and a matching cover plate 4 held to the shell by rivets 6. All of the operating parts are contained in operating relation within the shell part of the frame, so that before the cover is applied the functioning of the breaker may be tested and adjusted.

As in the overload circuit breaker of the prior patent above identified, the illustrated breaker has a fixed contact and a movable contact to engage the fixed contact and to close a circuit to be protected, together with a pair of cam members one of which is connected to the movable contact and the other of which is engaged by a thermostatic latch, for locking the latter cam member against movement away from the contact connected one to enable manual operation of the contacts to open and close the connected circuit. To enable manual operation the contact connected cam member is yieldingly moved toward the locked cam member to open the circuit and is separated from the locked cam member by a wedging member to close the circuit, as in the prior breaker, the contact operating cam member being formed as a bulge in a leaf spring to support the movable contact and to provide a yielding force to open the contacts. Due to the space restrictions and to the necessity for an ability to withstand vibration in this type of electrical apparatus, while retaining the usual requirements for convenient assembly, testing and adjustability, it has been difficult, if not impossible heretofore to provide a satisfactory arrangement of double break contacts in such a circuit breaker.

In the embodiment of the present invention the difficulties met in assembly, testing and adjustment of a double break circuit breaker are avoided by mounting a pair of fixed contacts 8 and 10 in the shell 2 of the breaker frame and by providing a bridging bar 12 for the movable contacts mounted on a slide 14, the guideway for which is formed in two parts. One part 16 (see Fig. 3) of the guideway is formed on the shell 2 and the other part 18 is formed on the cover plate 4. By so doing the parts of the breaker may be assembled and held in assembled relation for testing and adjustment purposes with a half cover plate for securing the bridging bar slide in position while a thermostatic latch 20 for holding the contacts closed is exposed for easy accessibility, testing and adjustment and is disposed in a lengthwise position parallel to one side of the shell. The bridging bar is also arranged parallel to the thermostatic latch along the opposite side of the shell from the latch, while the guideway for the slide 14 is located at right angles to both the bridging bar and the latch and is disposed between them. Also the movements of the bridging bar and its slide are directed in a path alined with the fixed contacts, the slide being disposed for movement at right angles to the movement of the wedging member, so that a most efficient transfer of motion is obtainable between the parts.

The wedging member is in the form of a set of rolls 22 connected to a link 23, in turn pivotally connected to a

manually operable cylindrical insulating button 24. The button is slidable in a metal sleeve 26 arranged at right angles to the guideway 16, 18 for the bridging bar slide and is disposed between the bridging bar and the thermostatic latch. The sleeve 26 is fixed to the shell part of the frame so that it maintains its proper relationship with the slide even when the cover plate 4 is removed.

To retain the button 24 against rotation in the sleeve 26 the link 23 is made in two parts, as shown in Fig. 2, one part being pivotally connected to the button by a pin 28 projecting from either side of the button, the link parts being disposed to slide in shallow recesses in the shell 2 and the cover plate 4. To hold the link 23 in alinement with the button, so that the pressure applied to the button will act directly on the link, the parts of the link are connected together at their midpoints by a stud 30 which passes beneath the inner end of the button and forms a stop for the link when the wedging rolls 22 are pressed by the locked cam member, indicated at 32, the contact connected cam member being indicated at 33 and shown as being fixed to one end of the slide 14. The stud 30 also prevents application of excessive pressure on the bridging bar and contacts. For insuring that the link remains in alinement with the button during manual operation of the breaker, and in generally parallel relation to the bridging bar and thermostatic latch, the locked cam member 32 is pressed yieldingly against the wedging rolls 22 by a spring 34 stretched between the cam member 32 and a pin 36 supported at its ends in openings formed in the side of the shell 2 and in the cover plate 4. The cam member 32 is rotatably mounted at its lower end on a pivot 38 passing through a loose fitting slot 40 in the cam member 32.

Whenever the circuit through the breaker is opened automatically by an overload current flow the wedging rolls 22 move with the cam member 32 to release the bridging bar 12 from contact-making position, the bridging bar being actuated for this purpose by a spring 42 compressed between the left end of a recess 44 in the frame shell 2 and a reduced projection of the slide at the opposite side of the bridging bar from the main body of the slide. The spring 42 is constructed with greater stiffness than the spring 34 acting on the cam member 32 so that a prompt opening of the circuit is insured when the locked cam member is unlocked.

The thermostatic latch 20 is similar to that disclosed in the prior patent, above referred to, and comprises a reversely bent bimetallic strip secured at one end to a terminal plate 46. The other end of the bimetallic strip has riveted to it a latch plate 48 and a magnetic armature 50. The terminal plate 48 is secured in place within the shell 2 of the breaker frame by a pair of screws 52 and 54 threaded through the terminal plate and disposed in loose fitting openings in the end wall of the shell 2, one extremity of the plate protruding from the bottom wall of the shell opposite the button 24 and supporting a connection clamping screw 56. The screw 54 serves to retain the terminal plate in place and the screw 52 to adjust the locking position of the latch 22 and for calibration purposes after assembly of the parts.

The thermostatic latch 20 acts to open the circuit through the breaker by flexing as overload currents flow through the latch, deflecting it from its cold position. To assist in unlocking the cam member 32 when extremely high or short circuit currents flow through the thermostatic latch the magnetic armature 50 is located close to a half-turn magnet core 58 (see Fig. 4) surrounding three sides of the terminal plate 46 and being located within attracting distance of the core 58. The core 58 is U-shaped and has a central opening through which the retaining screw 54 passes to hold both the terminal plate and the magnetic core in place.

The current entering the breaker by the terminal plate 46 flows through the thermostatic latch 20, a flexible lead 60, to an L-shaped contact supporting plate 62. The fixed contact 10 is secured to the end of the contact plate opposite the flexible lead, the current passing from the contact 10 into the bridging bar 12 and a current carrying shunt lead 63 running between the ends of the bridging bar. From the bridging bar 12 the current flows to the other fixed contact 8 and out of the breaker through a second terminal plate 64 to which the fixed contact 8 is secured. The terminal plate 64 is retained in the shell 2 by frictional engagement with a slot formation fitting closely with the shape of the plate 64 and also protrudes through the end wall of the shell, opposite the button 24, there being a connection clamping screw 66 in the exposed end of the terminal plate 64.

The nature and scope of the invention having been indicated and a particular embodiment having been described, what is claimed is:

1. A double break trip-free overload circuit breaker having a split rectangular frame formed with a hollow shell and a cover plate, a pair of fixed contacts in the shell, a bridging bar for connecting the fixed contacts, a pair of movable cam members, a wedging member acting between the cam members to separate them, resilient means for moving the cam members together, a thermostatic latch for locking one of the cam members against movement away from the other, a lengthwise slidable push button connected to the wedging member and a slide on which the bridging bar is mounted and to which the other cam member is connected for movement toward and from the fixed contacts to open and close the circuit therethrough, in combination with a two-part guideway for the slide, one part of which is formed on the hollow shell, the other part of which is formed on the cover plate and both of which extend at right angles to the length of the push button to maintain the bridging bar in its movements with the slide in alinement with the fixed contacts, terminal plates connected to one of the contacts and to the thermostatic latch, a magnetic core secured to the frame in surrounding relation to the latch connected plate and an armature secured to the latch within attracting distance of the core to provide both a delayed trip by heating of the latch and an instantaneous trip by magnetic attraction of the core.

2. A double break trip-free circuit breaker having a split rectangular frame formed with a hollow shell and a cover plate, a pair of fixed contacts in the shell, a bridging bar for connecting the fixed contacts, a pair of movable cam members, a wedging member acting between the cam members to separate them, resilient means for moving the cam members together, a thermostatic latch for locking one of the cam members against movement away from the other, and a slide on which the bridging bar is mounted and to which the other cam member is connected for movement toward and from the fixed contacts to open and close the circuit therethrough, in combination with a two-part guideway for the slide, one part of which is formed on the hollow shell and the other part of which is formed on the cover plate to maintain the bridging bar during its movements with the slide in alinement with the fixed contacts, the bridging bar and the thermostatic latch being disposed lengthwise in parallel relation along opposite sides of the shell with the guideway for the slide being located between them and disposed at right angles to the bridging bar and the thermostatic latch and a manually operable push button slidingly mounted in the frame for movement in a lengthwise direction between and parallel to the bridging bar and the thermostatic latch.

3. A double break trip-free circuit breaker having a split rectangular frame formed with a hollow shell and a cover plate, a pair of fixed contacts in the shell, a bridging bar for connecting the fixed contacts, a pair of movable cam members, a manually operable wedging member acting between the cam members to separate them, resilient means for moving the cam members together, a thermostatic latch for locking one of the cam members

against movement away from the other, and a slide on which the bridging bar is mounted and to which the other cam member is connected for movement toward and from the fixed contacts to open and close the circuit therethrough, in combination with a two-part guideway for the slide, one part of which is formed on the hollow shell and the other part of which is formed on the cover plate to maintain the bridging bar during its movements with the slide in alinement with the fixed contacts, the bridging bar and the thermostatic latch being disposed lengthwise in parallel relation along opposite sides of the frame with the guideway for the slide between them, the wedging member being in the form of a plurality of rolls, a link connected at one end to the rolls and a button connected to the other end of the link and slidingly mounted on the shell between the bridging bar and the thermostatic latch in parallel relation to the bar and latch.

4. A double break trip-free circuit breaker having a split rectangular frame formed with a hollow shell and a cover plate, a pair of fixed contacts in the shell, a bridging bar for connecting the fixed contacts, a pair of movable cam members, a manually operable wedging member acting between the cam members to separate them, resilient means for moving the cam members together, a thermostatic latch for locking one of the cam members against movement away from the other, and a slide on which the bridging bar is mounted and to which the other cam member is connected for movement toward and from the fixed contacts to open and close the circuit therethrough, in combination with a two-part guideway for the slide, one part of which is formed on the hollow shell

and the other part of which is formed on the cover plate to maintain the bridging bar during its movements with the slide in alinement with the fixed contacts, the bridging bar and the thermostatic latch being disposed lengthwise in parallel relation along opposite sides of the frame with the guideway for the slide between them, the wedging member being in the form of a plurality of rolls, a link connected at one end to the rolls, a button connected to the other end of the link and slidingly mounted in the frame between the bridging bar and the thermostatic latch in parallel relation to the bar and latch, terminal plates secured in the frame to the same opposite sides along which the bridging bar and the thermostatic latch are disposed, said terminal plates protruding through the end of the frame opposite the button, a half-turn magnetic core secured to the frame in surrounding relation to the terminal plate at the side of the frame with the thermostatic latch and an armature plate secured to the latch within attracting distance of the core to provide both a delayed trip by heating the latch and an instantaneous trip by magnetic attraction of the core.

References Cited in the file of this **patent**

UNITED STATES PATENTS

2,166,545	Getchell	July 18, 1939
2,287,875	Grober	June 30, 1942
2,611,055	Webster	Sept. 16, 1952
2,613,296	Wood	Oct. 7, 1952
2,660,642	Warren	Nov. 24, 1953
2,668,212	Schleicher	Feb. 2, 1954
2,813,168	Mascioli et al.	Nov. 12, 1957
2,833,888	Bessiere	May 6, 1958