Jan. 27, 1948. F. ADAM ET AL 2,435,114

CIRCUIT BREAKER

Filed Sept. 1, 1944 2 Sheets-Sheet 1

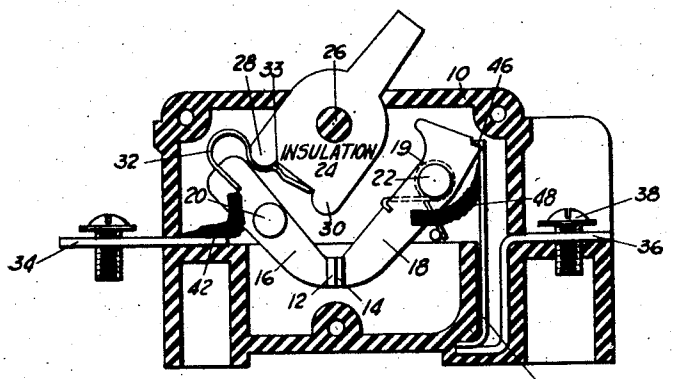

FIG. 1

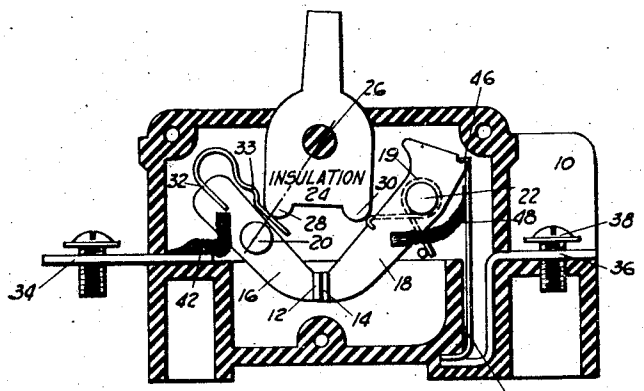

FIG. 2

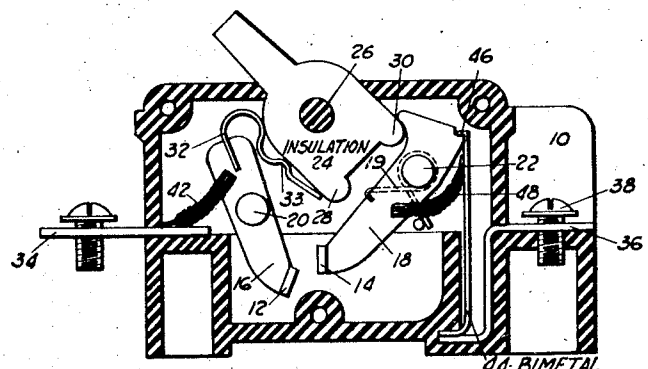

FIG. 3

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CIRCUIT BREAKER

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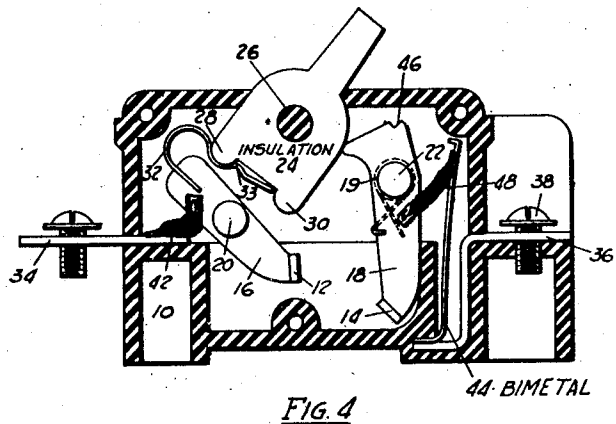

FIG. 4

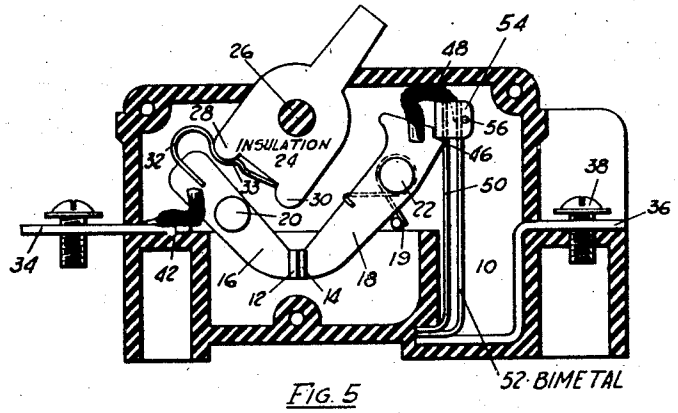

FIG. 5

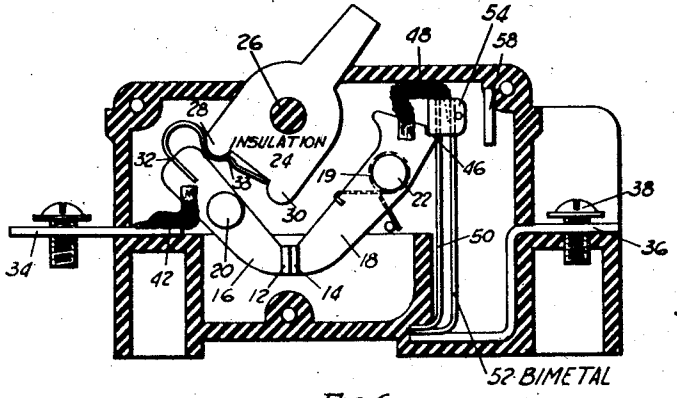

FIG. 6

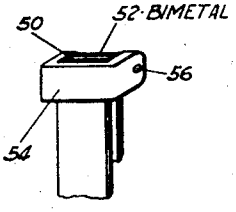

FIG. 7

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UNITED STATES PATENT OFFICE

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CIRCUIT BREAKER

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Application September 1, 1944, Serial No. 552,312

1 Claim. (Cl. 200—116)

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This invention relates to improvements in automatic circuit breakers of the snap action switch type.

It is an object of this invention to provide an improved operating mechanism for an enclosed circuit breaker of this type.

It is another object of this invention to provide a mechanism for a small size enclosed circuit breaker which will utilize a minimum number of parts and which may be easily assembled.

The circuit breaker provided by this invention has two movable contacts; one of these contacts is movable in response to the manual operating means, the other of these contacts is biased in the open circuit position by a suitable spring. It is held in the closed circuit position by a current overload latch. On the occurrence of an overload or short circuit the latch releases the second contact for movement to the open circuit position under bias of the spring. The circuit breaker provided by this invention is a trip-free device, that is, the circuit can not be held closed by the manual operating means during the continuance of an overload because one of the movable contacts will move to the open circuit position independently of the manual operating means.

The circuit breaker provided by this invention is of the snap acting type, that is, resistance is encountered before the manual operating means moves the contacts to either open or closed circuit position. This prevents arcing at the contacts because of tampering with the manual operating means.

The pair of contact arms are so shaped and so positioned in the enclosure that for both manual and automatic operation, arcing will be kept to a minimum because the contact arms produce a horn gap effect which quickly extinguishes the arc.

Manual operation of the switch is effected through a handle which projects through the front of the circuit breaker. This handle is a part of a pivoted actuator which is used during the manual operation of the circuit breaker to the "on" and "off" positions, and for resetting the arm which moves to the open circuit position automatically on the occurrence of an overload or short circuit.

A latch of the type illustrated and described in an application now pending by Floyd S. Green, bearing Serial Number 530,390, filed April 10, 1944, may be used with this invention. Such an arrangement will keep the thermal element free of any strain. A quicker action can be achieved

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by including the magnetic trip action described in connection with this invention previously identified.

Further objects and advantages of this invention will be apparent from the following detailed description and from inspection of the accompanying drawings.

Referring now to the drawings—

Fig. 1 is a vertical sectional view of the circuit breaker provided by this invention.

Fig. 2 is the same view with the handle partially moved to the "off" position.

Fig. 3 is the same view with the contacts and handle in the manual "off" position.

Fig. 4 is a similar view with the contacts in the tripped "off" position. The manually operated contact is in the "on" position.

Fig. 5 is a vertical sectional view of the circuit breaker of this invention provided with a latch member supported independently of the thermal element.

Fig. 6 is a vertical sectional view of the circuit breaker of this invention provided with a combination magnetic and thermal latch.

Fig. 7 is an enlarged perspective view of the latch member used in the embodiment of Fig. 6.

Numeral 10 indicates a section of insulating material which forms a housing for the circuit breaker. 12 and 14 are movable contacts, the contact 12 being actuated by a manual operating means while the contact 14 is released from its latched position by an overload or short circuit. These contacts are supported on arms 16 and 18. The arms are pivoted on supports 20 and 22 respectively. These supports may be secured in any suitable manner to the enclosure 10. A handle or manual operating means 24 is pivoted on the support 26 in the manner shown. The handle is provided with two formations 26 and 30 for a purpose later to be described. A spring 32 of the shape shown, is secured at one end to the arm 16. The other end engages the bottom of the manual operating means 24 as shown. The formation 28 co-operates with a concave portion of this spring as shown in Fig. 1. Terminals 34 and 36 are provided with suitable means for securing a lead wire thereto. Thus the terminal 36 is provided with a screw terminal 38.

Pigtail 42 connects the arm 16 with the bus bar 34. A bimetallic thermal element 44 is secured at one end to the bus bar 36 as shown, while its other end is bent to engage a notch 46 in the arm 18. A pigtail 48 connects the arm 18 with the bimetallic element 44 as shown.

Manual operation of the device is accomplished

by moving the handle from the position shown in Fig. 1, which is the closed circuit position, through the position shown in Fig. 2 to the position shown in Fig. 3, which is the open circuit position. It can be seen that the formation 28 is moved out of the concave portion of the spring 32. Snap action is provided by providing a bump 33 on the spring. This interferes with the movement of formation 28 just enough to require extra pressure on the manual operating means. The arm then moves with a quick action to provide "snap" action. The side of the handle 24 then moves into engagement with spring 32. Since the distance from the pivot 26 to the side is less than the distance from the pivot to the projection 28 the contact 12 is moved to the open circuit position. By reversing the above described action the handle 24 will move the contact 12 to the closed circuit position. The snap action is again effected as the formation 28 is moved over the bump 33 on the spring 32. During this operation of the device the contact 14 supported on the arm 18 has remained in a closed circuit position since the latch formed between the notch 46 and the end of the thermal element 44 has remained closed.

If a short circuit or a prolonged overload should occur, the bimetallic element, which carries the current through the circuit breaker, will deflect as shown in Fig. 4. This allows the arm 18 to move under the influence of the spring 19 to the open circuit position. Even though the handle is in the "on" position, the circuit is opened.

To reset the device it is necessary to move the handle first to the "off" position; the formation 30 on the handle then strikes the upper portion of the arm 18 and returns this arm to the position shown in Fig. 3. The circuit breaker is then in the position shown in Fig. 3. On movement of the manual operating means to closed circuit position, the arm 16 is again moved to the closed circuit position, and unless another short circuit or overload occurs the circuit will be complete through the circuit breaker.

In Figs. 5 and 6 modifications of the invention are shown in which the latch member is supported independently of the thermal element. In Fig. 6 a magnetic trip action has been added to the modification.

50 is a flexible support for the latch member 54. 52 is a bimetallic thermal element to which is attached pigtail 48. Thermal element 52 is entirely free from strain under normal conditions. Should an overload occur, thermal element 52 is deformed to strike pin 56 which moves latch 54 off of the notch 46 in the arm 18. The arm then moves under bias of the spring to open circuit position. The latch member 54 may be of U-shape as shown in Fig. 7. In this embodiment all strain is removed from the thermal element, which makes possible quick and easy operation. Friction and drag is dispensed with.

Fig. 6 is a type of thermally operated latch just described, equipped in addition with a magnetic armature 58. Upon the occurrence of a short circuit any current going through pigtail 48 and thermal element 52 causes the latch member 54, which in this case is formed of some magnetic material, to be attracted to armature 58. The advantages of such a latch mechanism are fully stated in the above identified application. The circuit breaker of this invention can thus be seen to be easily adaptable to this independent latch type mechanism.

It can be seen that upon opening and closing the contacts a slight wiping action is achieved which insures permanent, clean contacts and prevents corrosion of the contacts.

It can be seen from the above description that the device not only has few parts but the parts will move quickly to open circuit position on the occurrence of an overload. This insures that the circuit will be broken before the current reaches abnormally high values. It can likewise be seen that the parts lend themselves to easy assembly and that the small number of parts make assembly much simpler than in many of the more complicated assemblies. On the other hand, the simplicity in no way hinders the operation of the device, but on the contrary makes for more rapid and more certain operation. While I have shown and described a preferred embodiment of the invention, it is understood that the invention is defined by the following claim.

We claim:

An enclosed circuit breaker comprising a pair of arms pivotally secured to an enclosing housing, one end of each of said arms being provided with cooperating circuit make and break contacts, one of said arms being actuatable by a manual means, the other of said arms being responsive to an overload current device, a manual operating means pivotally secured to the housing, said manual operating means having a handle projecting through the housing, said manual operating means being provided with a pair of formations on the end disposed within the housing, a spring strip secured to the manually actuatable arm and extending along the side thereof adjacent said manual operating means, said spring being disposed for selective engagement with one of said formations at points located on both sides of the line between the pivot centers of the manual operating means and the manually actuatable arm to open and to close the contacts in accordance with the position of the handle, the other of said arms being biased to open circuit position, a current responsive element latching the last mentioned arm to maintain it in closed circuit position, said current responsive element being adapted to be deformed upon the current of an overload and to allow the arm to move to the open circuit position independently of the manually actuatable arm and independently of the manual operating means, and said last mentioned arm being engageable by said manual operating means to restore the latched relation with said current responsive element.

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