May 26, 1964 F. H. MURPHY 3,134,880

LOCKING SET-SCREW ADJUSTABLE CONTACT ASSEMBLY

Filed July 20, 1962

FIG. 1.

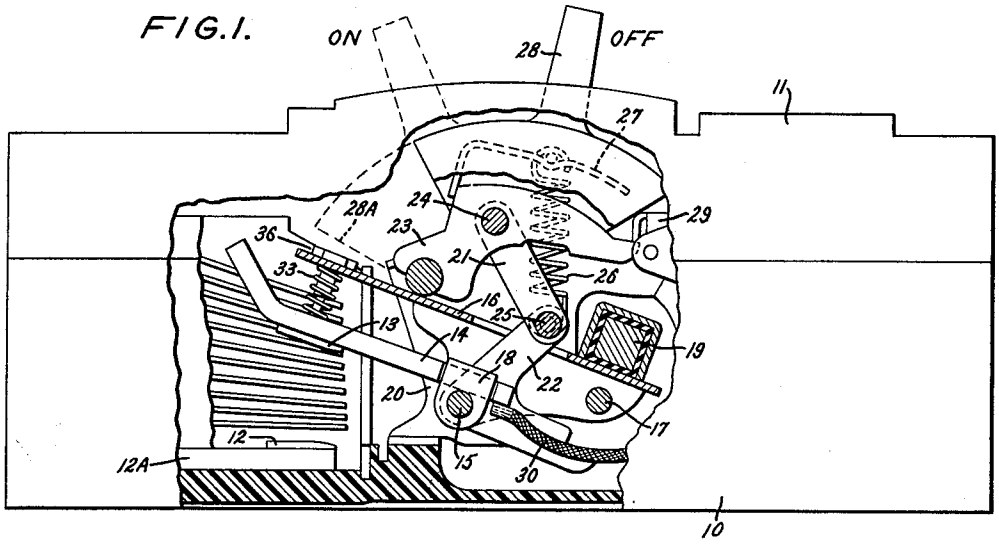


FIG. 2.

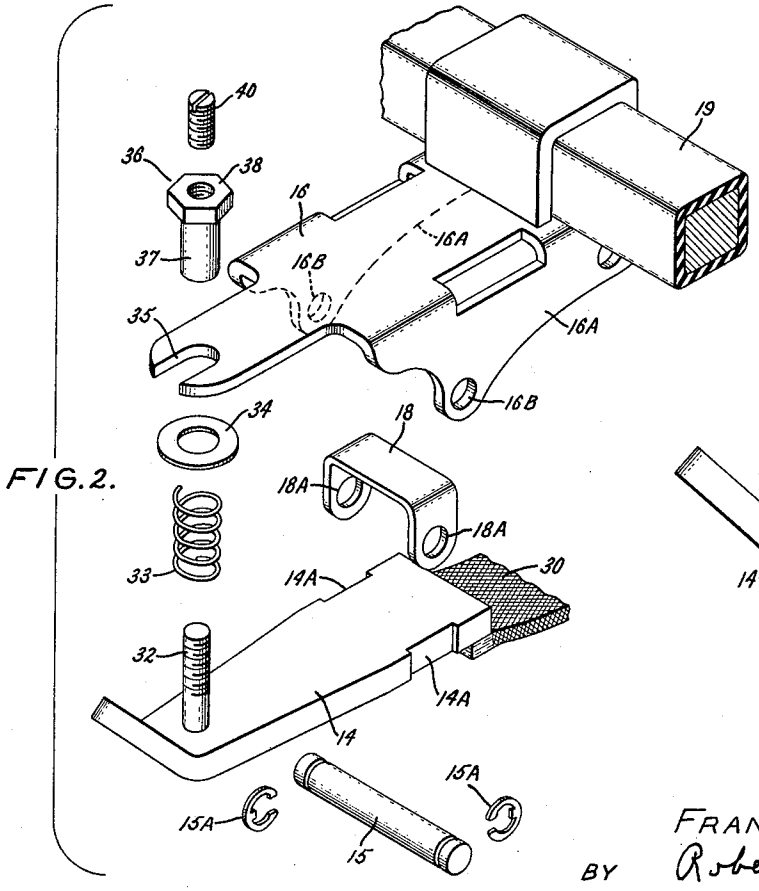
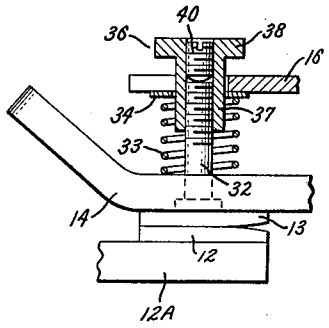


FIG. 3.



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3,134,880 LOCKING SET-SCREW ADJUSTABLE CONTACT ASSEMBLY

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My invention relates to electrical contact assemblies, and particularly to contact assemblies including a movable contact carried by a contact arm, and means for adjusting the permitted movement of the contact with respect to the contact arm.

Many switching devices, including manually operable enclosed switches and circuit breakers, utilize as a critical part of the switching apparatus, a movable contact member comprising a rigid contact carrying arm. The contact arm, in turn, carries a movable contact member which is resiliently supported relative to the contact arm. It is desirable in such assemblies that means be provided for adjusting the amount of stressing of the resilient means as the parts move from the open circuit to the closed circuit position.

It is an object of the present invention, accordingly, to provide such a contact assembly including means for adjusting the amount of compression of the resilient means, which adjusting means shall be as compact as possible.

It is a further object of the invention to provide such a contact assembly including adjustable resilient means which is adjustable to any desired setting and which can be readily securely locked in any such setting.

In accordance with the invention in one form, a movable contact assembly is provided including a contact arm and a movable contact member movably supported on the contact carrying arm. An elongated stud is rigidly attached to the contact member and extends through an opening in the contact carrying arm. A compression spring is carried on the stud between the contact member and the contact arm. Adjustable retaining means is provided for limiting the permitted travel of the contact member with respect to the contact arm, therefore determining the relaxed length of the compression spring, comprising an internally threaded sleeve adapted to be threadedly received on said stud and having a flange portion overlying a surface of the movable contact arm. Means is further provided for locking the adjustable retaining member in any desired position, comprising a set-screw threadedly received within the internally threaded bore of the retaining member, which screw may be run up against the end of the aforesaid stud, locking the parts in fixed relation.

The invention will be more fully understood from the following detailed description, and its scope will be pointed out in the appended claims.

In the drawing,

FIGURE 1 is a side elevation view of an electric circuit breaker incorporating a movable contact assembly constructed in accordance with the invention;

FIGURE 2 is an exploded perspective view of the movable contact assembly of the circuit breaker of FIGURE 1; and

FIGURE 3 is a fragmentary elevational view, partially in section, of a portion of the movable contact assembly of FIGURE 1, showing the adjustable biasing means.

In the drawing, the invention is shown as incorporated in an electric circuit breaker having an insulating base 10 and an insulating cover 11. A stationary contact 12 is rigidly mounted on a terminal strap 12A supported in the base 10 by suitable means, not shown. A movable contact 13 is rigidly attached to a movable contact member 14, which in turn is pivotally supported by pivot pin 15 on a contact arm 16. The contact arm 16 is pivotally

supported on a fixed pivot 17 supported in the base 10 by mechanism side frame members 20, only one shown.

The contact arm 16 is rigidly attached to a contact cross-arm 19 which serves the purpose of ganging together two or more of such contact arms, not shown, as may be desired.

The movable contact member 14 is pivotally supported on depending side portions 16A of the contact arm 16 by means of the pivot pin 15, see FIGURE 2, extending through openings 16B in the side wall portions 16A of the contact arm. The pin 15 is retained in fixed relation to the movable contact member by means of a generally U-shaped retaining member 18 which is closely received in notches 14A in the contact member 14 and which has holes 18A therein to receive the ends of the pin 15. When the U-shaped member is assembled with relation to the contact member 14 and these parts are placed within the channel-shaped contact arm 16, the pin 15 is passed through the aligned holes 18A, and 16B, and these parts are then retained in this assembled relation by inserting snap-on lock washers 15A, which hold all of these parts in their assembled relation.

For the purpose of moving the contact arm 16 between open and closed circuit positions about its pivot pin 17, operating means is provided including an upper pair of toggle links 21 and a lower pair of toggle links 22. The upper toggle links are connected to a releasable cradle member 23 by a pivot pin 24. The lower toggle links 22 are connected to the contact arm 16 by the pin 15. The upper and lower toggle links 21 and 22 are interconnected by a knee toggle pin 25. The toggle linkage 21—22 is adapted to be moved between collapsed and straightened positions by the action of an operating spring 26 having one end connected to the knee pin 25 and the other end connected to a handle support member 27 which is arranged to be moved by an insulating handle member 28. The handle support member 27 is pivotally supported on the mechanism side frames 20 by suitable pivot means, not shown.

In the embodiment shown, the releasable member 23 is adapted to be releasably held by a suitable latch member 28 which may be released by suitable current responsive means, not shown, to provide automatic opening action. It will be appreciated, however, that the invention is equally applicable to manually operated switches having no automatic opening function.

The movable contact member 14 is connected to suitable load terminal means, not shown, by a flexible conductor or braid 30.

For the purpose of permitting limited movement of the contact member 14 with respect to the contact arm 16, adjustable resilient means is provided comprising a threaded stud 32 which is rigidly attached to the contact member 14 by suitable means, such as by having its head portion seated in a conforming recess in the contact member 14 and being brazed or welded thereto. A compression spring 33 surrounds the stud 32 and bears against a washer 34, which in turn bears against the underside of the contact arm 16 adjacent an opening 35 in the end thereof.

For the purpose of limiting relative separating movement of the contact member 14 and the contact arm 16, an adjustable retaining member is provided, comprising an elongated internally threaded sleeve portion 37 and an end flange portion 38. The flange portion 38 is preferably made non-circular in outline to facilitate rotational adjustment thereof. The retaining member is threaded onto the stud 32 through the opening 35, whereby it is adjustably positioned along the stud 32. The flange 38, accordingly, determines the amount of relaxation, or the free length of the compression spring 33. Thus, as indicated in FIGURE 3, the position of the retaining member

36 on the stud 32 determines the ratio of compressed length to relaxed length of the spring 33, as indicated.

For the purpose of fixedly locking the retaining member 36 in a pre-set desired position, a set screw 40 is provided which is threadedly received within the internally threaded bore of the retaining member 36, and which is turned into this member until it abuts against the end of the stud 32 as shown in FIGURE 3. When the set screw 40 is tightened in this position, it securely locks the retaining member 36 with respect to the stud 32.

It will be observed that regardless of the adjusted position of the retaining member 36 on the stud 32, no part of the adjusting assembly extends above the contact arm a greater distance than the thickness of the flange 38. In other words, the adjustment takes place substantially within the space between the contact arm 16 and the movable contact member 14.

This is especially important in electric circuit breaker applications such as that illustrated in FIGURE 1. As shown in FIGURE 1, when the movable contact member is in the open circuit or "off" position as shown, it extends closely adjacent the skirt portion 28A of the insulating handle 28 in its "on" position.

Thus, for example, if the circuit breaker is closed at a time when a short circuit condition exists in the circuit, the releasable member 23 will be released, permitting the operating spring 26 to move the toggle links and the movable contact arm 16 to open circuit position, even though the handle is manually held in the "on" position. It is therefore necessary, in order to achieve the degree of compactness shown in this circuit breaker arrangement, to provide a contact adjusting means which does not project a substantial distance above the upper surface of the contact arm 16.

It will be observed that by means of the present invention, a contact spring adjusting means is provided, no parts of which extend above the upper surface of the contact arm 16 a distance greater than the thickness of the flange 38. This is because the elongated sleeve 37 permits the required adjustment to take place substantially within the space between the contact arm 16 and the contact member 14.

It will be observed that I have provided an extremely compact and effective movable contact adjusting means. While the invention has been shown in one particular embodiment, it will be readily appreciated that many modifications thereof may be made, and I therefore intend by the appended claims to cover all such modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electric switching device comprising:
(*a*) a movable contact arm,
(*b*) a contact member movably carried by said contact arm and including a portion extending generally parallel to and spaced away from said contact arm,
(*c*) an opening in said contact arm,
(*d*) an adjustable retaining member having an elongated portion extending through said opening toward said contact member and a relatively thin flange portion overlying the surface of said contact arm adjacent said opening,
(*e*) a stud member carried by said movable contact member and projecting toward said contact arm,
(*f*) said retaining member and said stud member having a threaded inter-engagement in the space between said contact arm and said contact member, and
(*g*) a compression spring surrounding said inter-engaging portions of said members and urging said contact member away from said contact arm.

2. An electric switching device comprising:
(*a*) a movable contact arm,
(*b*) a movable contact member pivotally supported on said contact arm, said movable contact member being elongated and extending generally parallel to said contact arm and spaced away therefrom,
(*c*) an elongated threaded stud fixedly carried by said movable contact member and extending toward said movable contact arm,
(*d*) a hole in said contact arm adjacent said stud,
(*e*) a retaining member comprising an elongated tubular internally threaded portion extending through said opening toward said stud into threaded engagement with said stud in the space between said contact arm and said contact member and a relatively thin flange portion overlying a surface of said contact arm adjacent said hole,
(*f*) a compression spring surrounding said inter-engaging portions of said retaining member and said stud and urging said movable contact member away from said contact arm, and
(*g*) a locking set-screw received internally of said threaded tubular portion of said retaining member and movable into abutting engagement with the end of said stud.

3. An electric switching device comprising:
(*a*) an elongated contact arm,
(*b*) an elongated contact member pivotally supported at one end on said contact arm and including a portion extending generally parallel to and spaced away from said contact arm,
(*c*) means for limiting relative pivotal movement of said contact member on said contact arm comprising a threaded stud rigidly carried by said contact member remote from said pivotally supported end and extending toward said contact arm,
(*d*) an opening in said contact arm adjacent said stud,
(*e*) a retaining member comprising an elongated internally threaded tubular portion extending through said hole in said contact arm and into threaded engagement with said threaded stud in the space between said contact arm and said movable contact member, and a flange portion overlying the surface of said contact arm opposite from said contact member,
(*f*) a compression spring surrounding said stud between said contact arm and said movable contact member,
(*g*) said flange portion having means for facilitating rotational adjustment thereof, and
(*h*) a locking set screw received internally of said threaded tubular portion of said retaining member and into endwise abutting engagement with said stud to lock said retaining member and said stud from relative rotation.

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