

WL/BMC/A 5165 GB

Title: "Improvements relating to circuit breakers"

Description of Invention

This invention is concerned with improvements relating to circuit breakers.

A conventional circuit breaker, hereinafter referred to as being of the kind specified, comprises a body provided on an underside thereof with a mounting recess bounded at one side edge portion by an inwardly-turned lip, providing a fixed retaining formation having a re-entrant surface, an opposite side edge portions of the recess being bounded by straight side edges. The circuit breaker comprises a catch assembly, resiliently urged from a retracted position to an advanced position, in which advanced position a retaining element of the catch assembly projects a short distance into the recess. In such a circuit breaker, the retaining element may be on the same side of a medial plane of the circuit breaker as the bus bar by which the circuit breaker is connected to a supply of electricity, in which case the fixed re-entrance surface will be on the same side of the medial plane as the connector by which external wiring is connected thereto.

Conventionally circuit breakers of the kind specified are mounted on a mounting rail conventionally termed a "din-rail", which comprises parallel upwardly-facing flanges provided with narrow out-turned lips. The retaining formation is engaged beneath one of the lips with the underside of the circuit breaker inclined relative to the rail, and the circuit breaker is moved angularly so as to cause the retaining element to engage the other lip, the profile of the retaining element causing it to be momentarily depressed against the resilient force urging it to its advanced position, as it passes behind the other lip. The circuit breaker is then clamped to a conventional bus bar, supported in parallel relationship to the rail.

When it is required to remove one circuit breaker from an array of circuit breakers from the rail, the retaining element is manually retracted, and held retracted, and the circuit breaker is tilted to permit rectilinear movement of the circuit breaker relative to the rail to disengage the fixed

retaining formation from the rail. This necessitates a temporary removal of the bus bar, and this is inconvenient since it involves disruption of the connections of other circuit breakers and/or of the isolator with the bus bar.

According to this invention there is provided a circuit breaker comprising a body provided on an underside thereof with a mounting recess, a fixed retaining formation having a re-entrant surface being provided on one side of the recess, and mounted on an opposite side of the recess a catch assembly comprising a retaining element which is resiliently urged by a spring from a retracted to an advanced position, in which advanced position the retaining element projects a short distance into the recess to retain the circuit breaker in position on a mounting rail, and wherein means is provided which is operative on movement of the retaining element to its retracted position releasably to hold the retaining element against the action of the spring.

Preferably the retaining element is provided on the same side of the medial plane as the means by which the circuit breaker may be connected to a bus bar, the retaining element when in its retracted position permitting translational movement of the circuit breaker a distance sufficient to permit rotational movement of the circuit breaker.

Preferably the retaining element is also movable to an intermediate position between the advanced and retracted positions.

Advantageously the retaining element is removably mounted on the body of the circuit breaker, comprising a head portion and a tail portion extending from the head portion, the head portion when the retaining element is mounted on the body of the circuit breaker being resiliently urged to a position in which it is adapted to engage beneath the lip of a mounting rail.

Desirably movement of the head portion is limited by engagement of part of the tail with one or more formations on the body of the circuit breaker.

If desired disengagement to permit the retaining element to be removed from the body, or to be moved beyond its retracted position, may be effected by deformation of the tail from engagement with the formation or formations of the body.

Desirably the construction and arrangement is such that such resilient deformation is effected in consequence of movement of the retaining element to its retracted position.

According to this invention there is also provided, in combination, a circuit breaker as set out in the last preceding paragraphs, and a mounting rail for the circuit breaker, the mounting rail comprising parallel upwardly-facing flanges and narrow out-turned lips, the recess of the circuit breaker being of a sufficient size and the retaining element being capable of being retracted a sufficient distance so as to enable, when the retaining element is in its retracted position, translational movement of the circuit breaker in the direction from the retaining element to the fixed retaining formation prior to removal of the circuit breaker from the mounting rail.

Preferably the size of the recess is such that with the retaining element in its retracted position, translational movement of the circuit breaker a distance between 1 and 5 mm is permitted, preferably between 2 and 3 mm.

There will now be given a detailed description, to be read with reference to the accompanying drawings, of a circuit breaker which is a preferred embodiment of this invention, having been selected for the purposes of illustrating the invention by way of example. In the accompanying drawings:

FIGURE 1 is a side elevation of the circuit breaker which is the preferred embodiment of the invention;

FIGURE 2 is an enlarged view of part of the circuit breaker, showing a catch assembly in an advanced position;

FIGURE 3 is a view corresponding to Figure 2 showing the catch assembly in an intermediate position; and

FIGURE 4 is a view corresponding to Figure 2 showing the catch assembly in a retracted position.

The circuit breaker which is the preferred embodiment of this invention is specifically of the kind specified, comprising a body 4 provided on an underside thereof with a mounting recess 6 bounded at one side edge portion by an inwardly-turned lip 8, providing a fixed retaining formation having a re-entrant surface. On the opposite side edge of the recess is bounded by a straight side edge 7, and the circuit breaker comprises on said opposite side a catch assembly 10 comprising a retaining element 12 urged by spring means to an advanced position, in which it projects a short distance into the recess. In the preferred embodiment the retaining element 12 is on the same side of a medial plane of the circuit breaker as of the connection 16 for a bus bar,

the connection 18 by which external wiring may be connected to the circuit being on the opposite side of said medial plane.

Said one side edge 7 bounding the recess 6 is provided by a housing 20 extending downwardly from the body for on said one side, the housing being provided with an aperture 22. The catch assembly 10 comprises a head portion 24, a forward portion of said head providing the retaining function of the element 12, and a tail 26 extending rearwardly from the head, said tail 26 extending through the aperture 22.

In its normal operative position, a formation 28 provided on the rear face of the body 6 is located in a first aperture 30 provided in the tail, one face 30a bounding said aperture being a straight edge, the opposing edge 30b being inclined.

A spring 27 is operative between the housing and the head 24 to urge the head 24 to the left (Figure 4) and the retaining element into its advanced position, defined by an abutment of the formation 28 with the straight edge 30a of the recess 30. In this position the retaining element may be moved against the action of the spring 27 to an intermediate position (shown in Figure 2) in which the formation 28 engages the sloping face 30b of the recess 30.

The circuit breaker which is the preferred embodiment of this invention is suitable for use in conjunction with a mounting rail 40 comprising a base portion, parallel, upwardly-turned flanges, and outwardly turned lips 44 terminating in edges 46, such a mounting rail conventionally being termed a "din-rail". A typical din-rail has a width (distanced between the outside edges 46) of 35 mm, and in the preferred embodiment the width of the recess 6, measured in the absence of the fixed retaining formation and the retaining element 12, is in the order of 38 mm, this being the 35 mm width of the din-rail, plus the distance X as seen in Figure 4.

With the retaining element in the position shown in Figure 2, the fixed mounting formation 8 may be hooked beneath the lip on one side of the mounting rail 40, and, by virtue of the sloping face of the retaining element 12, the spring 21 may momentarily be compressed to allow the head to pass beneath the said other lip 44 into the position shown in Figure 2.

By insertion of a tool such as a screwdriver 34 (Figure 2) into the aperture 30, the tail may be moved rearwardly beyond the position shown in Figure 3, engagement between a sloping face 29 of the formation 28 with the sloping face 30b causing the tail to be deflected downwardly, and the formation 28 to pass into a second recess 36, in which position the retaining element is held against the action of the spring 27, this position being referred as the retracted position, shown in Figure 4. In this position the connecting screw 16 may be loosened and the separative distance X between the outer edge 46 of the flange 44 of the mounting rail 40 and the leading edge portion of the retaining element is sufficient to allow translational movement of the circuit breaker as a whole in the direction of the arrow B (Figure 1) a sufficient extent to enable the circuit breaker to be at least partially separated from the bus bar connected to the connecting element 16.

At this point the fixed retaining formation 8 is also clear of the opposite side edge of the mounting rail 40, allowing the circuit breaker to be lifted away from the mounting rail. The circuit breaker may then be rotated in the direction C, the side edge 7 following the edge of the din-rail, to complete separation of the circuit breaker from the din-rail.

Thus by the capability of moving the retaining formation 24 into a position further retracted than the normal (intermediate) position, a circuit breaker may be removed from an assembly of circuit breakers on a mounting rail without disturbance either to the bus bar or to other circuit breakers on the mounting rail. Preferably the construction and arrangement is such as to permit translational movement of the circuit breaker of between 1 and 5 mm, preferably between 2 and 3 mm.

In addition the facility for holding the retaining element in its fully retracted position permits a single initial operative movement to be effected to so move the retaining element, without any subsequent operative movement, allowing the electrician to freely to positionally manipulate the circuit breaker.

Subsequently on return of the circuit breaker to the mounting rail, the tail 26 may be depressed a small distance to allow the formation 28 to return to the aperture 30, for normal operation of the circuit breaker.

In addition when it is desired to utilise the circuit breaker in conjunction with a mounting rail having no flange corresponding to the flange 44, by deformation of the tail 26 the formation 28 may be moved out of the aperture 30, and by simple linear movement the catch assembly may be removed from the housing 20.

Thus whilst the circuit breaker may be provided complete with a catch assembly of the kind above described, for use in operations where such a catch assembly is necessary, the catch assembly may be removed and disgarded for operations where its use is not required.

CLAIMS:



1. A circuit breaker comprising a body provided on an underside thereof with a mounting recess, a fixed retaining formation having a re-entrant surface being provided on one side of the recess, and mounted on an opposite side of the recess a catch assembly comprising a retaining element which is resiliently urged by a spring from a retracted to an advanced position, in which advanced position the retaining element projects a short distance into the recess to retain the circuit breaker in position on a mounting rail, and wherein means is provided which is operative on movement of the retaining element to its retracted position releasably to hold the retaining element against the action of the spring.
2. A circuit breaker according to Claim 1 wherein the retaining element is provided on the same side of the medial plane as the means by which the circuit breaker may be connected to a bus bar, the retaining element when in its retracted position permitting translational movement of the circuit breaker a distance sufficient to permit rotational movement of the circuit breaker.
3. A circuit breaker according to one of Claims 1 and 2 wherein the retaining element is also movable to an intermediate position between said advanced and retracted positions.
4. A circuit breaker according to any one of the preceding claims wherein the retaining element is removably mounted on the body of the circuit breaker.
5. A circuit breaker according to Claim 4 wherein the retaining element comprises a head portion and a tail portion extending from the head portion, the head portion when the retaining element is mounted on the body of the circuit breaker being resiliently urged to a position in which it is adapted to engage beneath the lip of a mounting rail.



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6. A circuit breaker according to Claim 5 wherein such movement of the head portion is limited by engagement of part of the tail with one or more formations on the body of the circuit breaker.

7. A circuit breaker according to Claim 6 wherein disengagement to permit the retaining element to be removed from the body, or to be moved beyond its retracted position, may be effected by deformation of the tail from engagement with the formation or formations of the body.

8. A circuit breaker according to Claim 7 wherein such resilient deformation is effected in consequence of movement of the retaining element to its retracted position.

9. In combination, a circuit breaker according to any one of the preceding claims and a mounting rail for the circuit breaker, the mounting rail comprising parallel upwardly-facing flanges and narrow out-turned lips, the recess of the circuit breaker being of a sufficient size and the retaining element being capable of being retracted a sufficient distance so as to enable, when the retaining element is in its retracted position, translational movement of the circuit breaker in the direction from the retaining element to the fixed retaining formation prior to removal of the circuit breaker from the mounting rail.

10. The combination according to Claim 9 wherein the size of the recess is such that with the retaining element in its retracted position translational movement of the circuit breaker a distance between 1 and 5 mm is permitted, preferably between 2 and 3 mm.

11. A circuit breaker constructed and arranged substantially as hereinbefore described with reference to the accompanying drawings.

12. In combination, a circuit breaker of the kind specified and a mounting rail for the circuit breaker, constructed and arranged substantially as hereinbefore described with reference to the accompanying drawings.

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