

The invention relates to an excess-current circuit breaker having the features described in the precharacterising clause of Claim 1.

A circuit breaker of the type mentioned initially, which is known from DE-A-3,342,144 has very small dimensions and is thus used as a replacement for flat melting fuses as are used, for example, for the protection of circuits in cars. Its housing consists of two housing half shells which are designed essentially identically, cover one another for housing assembly and in this position are connected to one another, especially welded, the stationary contact arm and the bimetallic contact arm - both being elongated flat board-shaped stamped parts - having contact ends which extend through the separating joint between the two housing half shells and project out of the housing. This switch is assembled simply by inserting the individual circuit breaker parts, including both contact arms into the lower housing half shell, subsequently fitting the other housing half shell as a cover and subsequently connecting the two cover shells. It is not necessary to adjust the pretensioning of the contact bearing of the bimetallic snap disc on the stationary contact arm before housing assembly since the two contact arms are not fixed in the housing until the two housing half shells are connected, that is to say when the housing is closed. The fixing of the two contact arms only between the edges of the housing half shells which cover one another would also not be able to provide an adequately robust opposing bearing for an adjustment to be carried out by plastic deformation of the bimetallic contact arm. In addition, in this case, an adjustment which would be possible there in any event only subsequently would, however, require through openings, which do not exist, for a tool into the housing half shells, as is known, for example, in the case of a protection circuit breaker, which is already known from DE-A-2,646,840, for a bimetallic adjustment which can be carried out once the housing assembly has been completed.

From this DE-A-2,646,840, it is furthermore known for the bimetallic carrier to be provided with a weak point, which is formed by two side recesses, as a predetermined twisting or predetermined bending point.

5 Furthermore, it is known in principle from DE-A-1,924,701 for a bimetallic carrier of the snap switch to be mounted on a supporting block consisting of insulating plastic such that it is embedded in the plastic by means of extrusion coating.

10 The invention is based on the object of designing an excess-current protection circuit breaker of the type mentioned initially such that it can be adjusted easily and permanently within tight tolerance bands. This object is achieved by means of the characterising features of
15 Claim 1. The solution means that the fixing of the essential functional parts, namely the bimetallic contact arm and the stationary contact arm, in a robust relative position with respect to one another, takes place even before housing assembly. The plastic base, which for this
20 purpose is extrusion coated in a positively-locking manner around the centre regions on both sides of said functional parts, forms a wall of the subsequent circuit breaker housing which is pushed over this base like an integral housing cap, and is firmly connected to it.

25 As a result of this solution, the side recesses are located inside the outlet point and form a reliable opposing bearing, which acts on the bimetallic contact arm, precisely at the point provided for the adjustment deformation.

30 Not least, the protection circuit breaker according to the invention is particularly robust mechanically.

 The reliable retention of the contact arms is further improved by the characterising feature of Claim 2. The tripping characteristics, which are adjusted
35 once and are in consequence set, can virtually not be changed accidentally. As a result of the characterising feature of Claim 3, it is additionally impossible for the stationary contact arm to be displaced longitudinally

axially with respect to the base. The development according to Claim 4, serves the same purpose. The bimetallic contact arm is also immovably fixed in the base material by means of its constriction in the axial direction.

5 The circuit breaker according to the invention can be produced such that it is particularly space-saving. It is thus also suitable as a replacement for simple flat melting fuses.

10 The invention is explained in more detail in an exemplary embodiment with reference to the attached figures, in which:

Fig. 1 shows an internal view of the circuit breaker in the switched-on position,

15 Fig. 2 shows a side view of the base, with the connecting arms and the bimetallic element in the switched-on position.

Fig. 3 shows an internal view of the circuit breaker in the switched-off position,

20 Fig. 4 shows a cross-section through the switch along the line IV-IV in Fig. 3,

Fig. 5 shows a perspective exploded view of the excess-current protection circuit breaker,

Fig. 6 shows a plan view of the weak point of the bimetallic contact arm.

25 The excess-current protection circuit breaker which can be operated by means of the pushbutton 1 has a housing which is assembled from a cap 2 and a base 3. Both parts are manufactured from an electrically insulating material which can be injection moulded or cast. The
30 bimetallic contact arm 4 and the stationary contact arm 5 are embedded in the approximately board-shaped base 3. Both arms 4, 5 consist of an elongated, flat board-shaped metallic stamped part.

35 The flat sides of the insertion ends, which are passed out of the housing, of the contact arms 4, 5 are located in the same plane. They run parallel side-by-side and form flat plug-tongues 6, 7. In their central region 8, the two contact arms 4, 5 each have a vertical bend 9,

10, which bends point in opposite directions (Fig. 5). The main planes of extent of the free ends 11, 12, which are inside the housing, of the contact arms 4, 5 are thus located parallel to one another at a distance 19. The bend 9 of the bimetallic contact arm 4 is in this case located in the internal space of the housing, while the bend 10 of the stationary contact arm 5 is arranged in the region which is extrusion coated by the base material.

An ovally formed bimetallic snap disc 13 is mounted on one side on the free end 11, inside the housing, of the bimetallic contact arm 4. Said bimetallic snap disc 13 extends transversely with respect to the direction of the contact arms 4, 5 in the direction of the stationary contact arm 5. Its pivoting end 14 has the bimetallic contact 15 which is hence movable. Located opposite this is the stationary contact 16, which is fitted on the free end 12 of the stationary contact arm 5, of the excess-current protection circuit breaker. The pivoting end 14 overlaps the free end 12 of the stationary contact arm 5 and, when the circuit breaker is in the quiescent position, is located with its bimetallic contact 15 pretensioned against the stationary contact 16.

At its outlet point 17, inside the housing, from the base 3, the bimetallic contact arm 4 has side recesses 29 on both sides, which pass through it at right angles to the main direction of its extent. This creates a weak point which operates as an adjustment predetermined bending point. According to Fig. 6, this weak point is formed by two side recesses 29, each in the form of a half-hole.

In its region which is surrounded by the base material, the bimetallic contact arm 4 has the step-shaped constriction 21 (Fig. 5) which, like the bend in the stationary contact arm 5, prevents displacement of the contact arm inside the embedding material.

As can be seen from Figs. 1, 3 and 6, the side recesses 29 are located precisely at the outlet point 17 of the bimetallic contact arm 4 from the base 3. The base material thus to some extent passes through the side recesses 29. This results in an additional fixing effect for the bimetallic contact arm 4 and a neater rotation point for its free end 11 during the adjustment process.

The pushbutton 1, which can be displaced in the insertion direction 22, for switching on the circuit breaker is arranged physically between the two free ends 11, 12 of the bimetallic arm 4 and the stationary contact arm 5. Said pushbutton is essentially of L-shaped construction, the free end of its L-vertical limb 23 passing through a recess 24 in the cover 25 of the cap 2. A blind hole 26, which likewise runs in the insertion direction 22, is provided in the base region of this lid 23 for holding the compression spring 27. The latter is supported on the upper side of the base 3 and acts on the pushbutton 1 against the insertion direction 22. The L-horizontal limb 28 of the pushbutton 1 can be displaced out of the intermediate space between the contacts 15, 16, against the pressure of the compression spring 27, and in this case causes manual contact closure, in that the bimetallic contact 15 comes to rest on the stationary contact 16 as a result of the applied pressure.



Claims

1. Excess-current circuit breaker having a two-piece housing consisting of insulating material and having, therein and running parallel to one another in their longitudinal direction (22), a stationary contact arm (5) and a bimetallic contact arm (4) which causes the excess-current switching-off as a result of its heating,

- which are constructed as elongated, approximately flat, board-shaped stamped parts,

- wherein a bimetallic snap disc (13), which extends towards the free end (12) of the stationary contact arm (5) and makes contact with this in the switched-on position in an overlapping manner subject to prestressing, is fixed at the free end (11) of the bimetallic contact arm (4), and

- which form flat plug-tongues (6, 7), which are located side-by-side, on the outside of the housing, characterised in that

- the bimetallic contact arm (4) and stationary contact arm (5) are embedded by means of their central region (8) in a positively-locking manner in a base (3) which is produced from a plastic material which has a stable shape and can be moulded or cast,

- the bimetallic contact arm (4) has on both sides at its outlet point (17), inside the housing, from the base (3) a side recess (29) in order to form a desired bending point which is used for adjusting the prestressing of the contact support,

- the side recesses (29) are located inside the outlet point (17), as a result of which the base (3) forms a bending edge there, and

- in the completed switch the base (3) with the embedded contact arms (4, 5) forms the closing part of an integral housing cap (2).

2. Excess-current circuit breaker according to Claim 1, characterised in that



the contact arms (4, 5), in their central region (8), are embedded in the base material at least over a length which corresponds to a third of their total length.

3. Excess-current circuit breaker according to Claim 1 or 2,

characterised in that,

in the space inside the housing, the main extent planes of the bimetallic contact arm (4) and the stationary contact arm (5) run parallel to one another at a distance

(19), and in that, in the case of the bimetallic contact

arm (4) and the stationary contact arm (5) being located

in a plane outside the housing, a step-shaped bend (10),

running at right angles to the insertion direction (22),

of the stationary contact arm (5) is embedded in the base

material.

4. Excess-current circuit breaker according to Claim 2 or 3,

characterised in that

the bimetallic contact arm (4) has a step-shaped

constriction (21) towards the interior, in its central

region (8) which is embedded in the base material.

5. Excess-current circuit breaker according to Claim 1, characterised in that

the two side recesses (29) are formed by a half-hole

being stamped out on both sides.