

The invention relates to a circuit breaker according to the preamble of claim 1. Such a circuit breaker has to shorten the interruption of current in case of a circuit-breaking caused by a short circuit or by an overload of the line, and to limit the current to a minimum in case of a short circuit so that the line to be protected is not damaged in case of a failure. Such circuit breakers are produced today in large quantities and in part fully-automatically so that the number of required individual parts necessary for the functioning of the circuit breaker as well as the ease of assembly of these individual parts is decisive for an economic success of such a production line product. In particular, the adjustment expenditure for the calibration of the overcurrent trip, and the connections, performed as welds or soldering joints, of the individual components passed by the current delay the production procedure.

In the course of time, the reconstruction principle of single interruption has prevailed in the development of circuit breakers. The movable parts, such as contacts, bimetals, etc., are connected with flexible copper strands in such arrangements in order to allow the current flow (see also German publication No. 33 42 469). The most advanced constructions use in this case one single stranded wire, which connects the movable contact with the free end of the bimetal, such as taught, for example, in German Patent No. 2,504,954, German Patent No. 2,841,004, and German Publication No. 3,619,239. If the operating current is now fed over the bearing of the movable contact, as proposed in German Publication No. 3,803,849 (published August 10, 1989), then it can occur in this strand-free construction that fluctuating press-on forces prevail in the bearing because of the current forces acting on the movable contact, which favor welding of the two parts. This is undesirable.

Consequently, it is an object of the invention to produce a strong, current-limiting circuit breaker of the above-mentioned kind without any strand connection and which requires only two welds or soldering joints and does not require any adjustment expenditure.

This object is achieved according to the invention by the features of claim 1. Further embodiments of the present invention are characterized by the subclaims.

This arrangement advantageously achieves a strong, current-limiting circuit breaker which can be fully mechanically mounted with a minimum of individual parts, without interfering connection strands, and without additional adjustment expenditure. In this case, the current feed is used in the contact region in addition to the press-on force of the contact spring to press the movable contact into its bearing on the sliding rail to achieve a safe contact-making also in case of large operating currents or overcurrents. A welding of the movable contact in its current-passing bearing is safely avoided. The use of the current passage in the contact region is also based on its U-shaped course, to drive the arc, generated upon switching-off, by way of a blow-out effect quickly away from the contact zone into the arc-quenching and arc-extinguishing chamber. On the other hand, based on the opposite current direction, the current passage in the arc deflector and in the movable contact is used to deflect and to throw the movable contact away from the arc deflector guide sheet and from the solid contact independent of the magnet release in case of a short circuit. Thereby, the arm distance of the U-shaped blow-out loupe is retained during the switching-off so that, in contrast to conventional constructions, the arc drive does not decrease. At the same time, the counter torque of the contact spring becomes smaller due to the rotation of the movable contact. All these steps lead to a very quick course of the arc

from the contact position in case of a simultaneously assured press-on pressure of the movable contact in its bearing so that a welding is avoided. Based on the elimination of the flexible connection strand, the mass of the movable parts becomes additionally smaller and, consequently, a quicker opening of the contact occurs. It has been shown that an insulating web, disposed between the movable contact and the fixed contact, favorably influences the arc course, in particular, if the insulating web is comprised of a gas-generating plastic. Advantageously, an arrangement of the kind described in the German Publication No. 3,637,275 is selected as an overcurrent release. The advantage resides in that the overcurrent trip is already calibrated and thus an adjustment in the power circuit breaker itself can be dispensed with.

The invention is illustrated and explained in more detail based on the drawing by way of an embodiment.

The illustration shows schematically a circuit breaker with an arc-extinguishing device, a switching mechanism, and an overcurrent trip. An Arc-extinguishing plate stack 2, a contact arrangement 3, 4, and arc deflectors 5, 6 are disposed in the arc chamber 1 parallel to the chamber floor wall. The arc deflector 6, to which the fixed contact piece 3 is attached, is connected on the one hand to the coil of the overcurrent trip 7 via the welding spot 8. The coil itself is connected with its second end via the welding spot 9 to a connection terminal 10. The arc deflector 5 forms the flank of the lower arc-extinguishing plates of the arc-extinguishing plate stack 2 and forms with the rearward extension 5a the bearing 11 for the movable contact 4. The arc deflector 5 exhibits an extension 5b disposed perpendicular to and in front of the arc-extinguishing plates of the arc-extinguishing plate stack 2. This extension 5b carries the connection terminal 12. The contact spring 13 is supported with its one end at the casing 14 and presses the movable

contact 4, in a switched-on state, to the fixed contact 3. Fig. 1 illustrates this state as well as the force, generated by the current flow, acting in the arrow direction on the bearing. The switching mechanism 15 is illustrated only for a better understanding, but the switching mechanism 15 is without meaning for the short-circuit switch-off.

Fig. 2 illustrates the switched-off state with an insulating web 16 between the movable contact and the fixed contact. In this position, the extinguishing process is already terminated. The movable contact 4 is maintained in the open switching position by the switching mechanism 15.

In case of closed contacts, the current flows, as shown by the arrows in the drawing, from the connection terminal 12 via the arc deflector 5 and the bearing 11, the movable contact 4 to the fixed contact 3 and from there via the coil of the overcurrent trip 7 to the connection terminal 10. Upon occurrence of a short circuit, the movable contact 4 is thrown away from the fixed contact 3 and the current is interrupted. The movable contact 4 assumes the position indicated in Fig. 2, wherein the arc, drawn between the movable contact and the fixed contact, jumps from the movable contact to the arc deflector 5 after having reached the open position. Based on the blow-out effect of the current feed lines, the arc is driven into the arc-extinguishing plate stack 2 and is brought to extinction there.

C l a i m s

1. A circuit breaker with single interruption comprising
an overcurrent trip (7);
a switching mechanism (15) which is manually operatable by
means of said overcurrent trip (7);
an arc-extinguishing means with an arc-extinguishing plate
stack (2) which is confined by arc-guidestrips (5,6);
and a contact arrangement being provided on the front side
in front of the arc-extinguishing plate stack (2) in an
arc-chamber (1) with a fixed contact (3) and a movable
contact (4),
said fixed contact (3) being galvanically connected to a
connection terminal (10) via said overcurrent trip (7),
said movable contact (4) being galvanically connected to a
connection terminal (12) via an arc-guidestrip (5, 5a; 5,
5b), and a bearing (11) is formed for said movable contact
(4) at the arc-guidestrip (5a),
characterized in that
said movable contact (4) comprises at its free end up to a
contacting location an angled conductor portion which runs
nearly parallel to a conductor portion leading from the
overcurrent trip (7) to the fixed contact (3), and
that, for increasing the pressure at said bearing (11) of
the movable contact (4) and for effecting a torque onto the
movable contact (4) in an opening direction by means of
current forces occurring in the parallel conductor por-
tions, the angled conductor portion of the movable contact
(4) forms a tangent to a circle, the center of which is
disposed within the range of said bearing (11).



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an overcurrent trip (7);
a switching mechanism (15) which is manually operatable by
means of said overcurrent trip (7);
an arc-extinguishing means with an arc-extinguishing plate
stack (2) which is confined by arc-guidestrips (5,6);
and a contact arrangement being provided on the front side
in front of the arc-extinguishing plate stack (2) in an
arc-chamber (1) with a fixed contact (3) and a movable
contact (4),
said fixed contact (3) being galvanically connected to a
connection terminal (10) via said overcurrent trip (7),
said movable contact (4) being galvanically connected to a
connection terminal (12) via an arc-guidestrip (5, 5a; 5,
5b), and a bearing (11) is formed for said movable contact
(4) at the arc-guidestrip (5a),
characterized in that
said movable contact (4) comprises at its free end up to a
contacting location an angled conductor portion which runs
nearly parallel to a conductor portion leading from the
overcurrent trip (7) to the fixed contact (3), and
that, for increasing the pressure at said bearing (11) of
the movable contact (4) and for effecting a torque onto the
movable contact (4) in an opening direction by means of
current forces occurring in the parallel conductor por-
tions, the angled conductor portion of the movable contact
(4) forms a tangent to a circle, the center of which is
disposed within the range of said bearing (11).



2. The circuit breaker according to claim 1, characterized in that the conductor portion leading from the overcurrent trip (7) to said fixed contact (3) forms an obtuse angle with the contact surface within the range of the current supply to the contacting location resulting together with the free end of the movable contact (4) in a U-shaped course for the current flow, and wherein the axis of said U-shaped course runs nearly parallel to an attachment face of the circuit breaker or to the plates (2) of the arc-extinguishing plate stack (2).
3. The circuit breaker according to claim 1 or 2, characterized in that said arc-guidestrip (5) a portion of which is formed as a bearing (11) for said movable contact (4) comprises another portion running narrowly and parallel to said movable contact (4) for the generation of a torque acting on said movable contact (4) by means of repulsing current forces.
4. The circuit breaker according to claim 3, characterized in that the parallel portions of said arc-guidestrip (5) and said movable contact (4) are disposed almost perpendicular to said arc-extinguishing plates and to said attachment face of said circuit breaker and run in the direction of said bearing portion (11).
5. The circuit breaker according to claims 1 to 4, characterized in that said movable contact (4) is pivotably supported in said bearing (11) on the side of the arc-guidestrips (5) which is turned away from said arc-extinguishing plate stack (2) to avoid a contact of said bearing (11) by the arc-base.



6. The circuit breaker according to any one of the preceeding claims,
characterized in that
in the switched-on position said movable contact (4) is pressed on said fixed contact (3) by means of a contacting spring (13) being supported by a casing (14), wherein the effective force direction of said contacting spring (13) passes close to the bearing (11) and said contacting spring (13) additionally presses said movable contact (4) into the bearing (11), said movable contact (4) not having any mechanical connection to the switching mechanism (15).
7. The circuit breaker according to any one of the preceeding claims,
characterized in that
said contacts (3, 4) of the contact arrangement are galvanically connected to corresponding connection terminals (10, 12) without wires.