

Electrical switching device

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Description

5 The invention relates to an electrical switching device, in particular to a main circuit breaker, according to the precharacterizing clause of Claim 1.

10 A switching device such as this has been disclosed in DE 28 54 711, and has a first contact point to which a parallel current path is connected and in which a current limiting resistor is used.

15 An arrangement such as this is also provided in the S 700 main circuit breaker from ABB Stotz-Kontakt GmbH Heidelberg. There, the resistor is produced as a resistance wire, composed for example of CrAl255, Cu or of other alloys, with the wire being wound to form a coil whose shape and required resistance value mean
20 that it occupies a relatively large physical space. Furthermore, a resistor such as this in the form of a coil produces a strong magnetic field, so that the coil has to be wound in opposition in parallel, in a complex manner. If bare wires are used, the coil must be wound
25 onto a former which is resistant to high temperatures, in order to prevent the turns from being attracted to one another when current is applied, and thus causing a winding short. If the resistance wire is insulated, then expensive materials which are difficult to handle,
30 such as glass silk, are used as insulating elements.

The object of the invention is to provide a switch of the type mentioned initially in which the disadvantages of the known arrangement are avoided.

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According to the invention, this object is achieved by the features of Claim 1.



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Thus, according to the invention, a resistor body is located in the parallel current path, which is connected in parallel with the first contact point, and
5 is composed of doped ceramic whose temperature coefficient is constant or negative.

This avoids the use of a resistance wire in the form of a coil with all its disadvantages, and the resistor
10 body also requires less space within the switching device.

The resistance material for forming the resistor body is commercially available and is composed of a mixture
15 of clay, aluminium and carbon which, after being compressed to its final shape, is subjected to a sintering process.

If the circuit breaker is provided with an enclosure
20 that is composed of two shell halves, the shell halves have strips which run at right angles to the inner surface of the broad face and which, after the shell halves have been joined together, bound a space in which the resistor body is accommodated and held.

25 A spring contact is preferably provided for making contact.

Further advantageous refinements and improvements of
30 the invention can be found in the other dependent claims.

The invention as well as further advantageous refinements and improvements and further advantages
35 will be explained and described in more detail with reference to the drawing, which illustrates one exemplary embodiment of the invention.

In the figures:

Figure 1 shows a view of an electrical circuit breaker,
5 Figure 2 shows a section view along the section line II-II,
Figures 3 and 4 show two alternatives for making contact with a resistor body, and
Figure 5 shows an electrical circuit diagram
10 of the switching device.

A circuit breaker has an enclosure 10 which may be formed either from an enclosure lower part in the form of a shell and a cover, or from two approximately
15 identical shell halves. A first contact point 11 with a stationary contact piece 12 and a moving contact piece 13 is located within this enclosure 10; the moving contact piece 13, which is arranged on a contact lever 14 which can pivot, is pivoted by an electromagnet when
20 a short-circuit current occurs, such that the contact point 11 is opened. This contact point 11 has an associated parallel current path 15 in which a resistor body 16 is located; when the contact point 11 is opened, an arc is formed there, which moves into an arc
25 splitter stack 17; furthermore, the current is commutated into the secondary current path 15, and is limited by the electrical resistance of the resistor body 16.

30 Figure 5 shows an electrical equivalent circuit of the switching device. The first contact point 11 as well as a second contact point 19 are located in a main current path 18. The parallel current path 15 is connected in parallel with the first contact point 11, and the
35 resistor body 16 is arranged in it. A selective bimetallic strip 20, which is not illustrated in Figure 1, is connected electrically in series with the resistor body 16 and acts on a switching mechanism 21,

which is shown in Figure 1 and is arranged and/or articulated on one switching toggle 22. A further bimetallic strip 36 is located in the main current path 18, although this is likewise not shown in Figure 1.

5 This bimetallic strip likewise acts on the switching mechanism 21, with the switching mechanism 21 being connected to the contact point 19 on the line of action 23.

10 The lines of action of the bimetallic strips 20, 36 on the switching mechanism are annotated by the reference numbers 24 and 25.

Figure 2 shows a section view along the section line
15 II-II. In this case, the enclosure 10 is formed from an enclosure lower part 10a in the form of a shell and from an upper part 10b in the form of a shell, on which strips 26, 27; 28, 29 are respectively integrally formed, as is likewise shown in Figure 1. The strips 26
20 to 29 form a space 30 in which the resistor body 16 is accommodated.

Contact is made with the resistor body 16 by means of the flat ribbon conductors 31 and 32, which form the
25 parallel current path but are not shown in Figures 3 and 4.

In the embodiment shown in Figure 3, the conductor 31 is in the form of a straight component, while in
30 contrast the conductor 32 has a section 33, which is convex with respect to the contact-making surface 16a, in the area of the contact-making surface 16a of the resistor body 16.

35 In the embodiment shown in Figure 4, the straight conductor 31 is replaced by a conductor 31a which has a section 33a which is convex towards the contact-making surface 16b of the resistor body 16.

At least one of the two conductor pieces 31, 32 is sprung. In the embodiment shown in Figure 3, this is the conductor 32 while, in contrast, in the embodiment
5 shown in Figure 4, the conductor 31a is also sprung.

As can be seen from Figure 1, the conductor 32 may be shaped such that it fixes the resistor body 16 with a bend 34 and an edge or angle 35.

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As stated above, the material that is used here has a temperature coefficient which is approximately constant or is slightly negative. The reason for this is as follows:

15 If the switch as shown in Figure 5 is intended to disconnect a short circuit, then a magnetic release 40 is first of all used to open the contact point 11, to be precise via the line of action 41. In this case, the current is then commutated into the parallel current
20 path and is limited by the resistor body 16, with the contact point 19 still being closed. The current, limited by the resistor 16, flows through the coil 40 and thus keeps the contact point 11 open. If the short circuit is now disconnected in a downstream circuit
25 breaker, then the contact point 11 closes; if the current is not disconnected, the bimetallic strip 20 or 22 is heated, and in this way finally disconnects the contact point 19. In this context, reference should be made to DE 28 54 711, cited initially, and to the S 700
30 switch mentioned initially.

If the resistor body 16 were now to have a positive temperature coefficient, then the current would be limited to such an extent that the armature of the
35 release 40 would trip and the contact point 11 would close, which would be disadvantageous. Owing to the approximately constant or negative temperature coefficient, the current through the release 40 remains

the same or becomes slightly greater, by which means the contact point can be held in the open position for a sufficiently long time.

5 As has been mentioned, the resistor body may be composed of a ceramic doped with carbon, although it is also possible to use a silicon carbide doped with carbon. Furthermore, the resistor body 16 may also be doped with other conductive materials. In addition, the
10 resistor body may have any desired shape as required, for example being cylindrical, hollow-cylindrical, or in the form of a cube or prism.

It should also be mentioned that, if the end faces of
15 the resistor body 16 are metallized, the line pieces 31 and 32 can be soldered directly to them.

Patent Claims

1. Electrical switching device having a first contact point (11) which is moved by an electromagnetic actuator to an open position in the event of a short circuit, and having a second contact point (19), which is connected in series with the first contact point and is open permanently via a switching mechanism by a first thermal release, and having a parallel current path (15) which is arranged in parallel with the first contact point (11) and in which a current-limiting resistor (16) is accommodated, characterized in that the current limiting resistor (16) is in the form of a resistor body which is composed of doped ceramic material, whose temperature coefficient is constant or negative.

2. Electrical switching device according to Claim 1, characterized in that strips which run at right angles to the inner surface are integrally formed on the inner surface of the broad face of the enclosure and, once the enclosure has been assembled, bound a space in which the resistor body is accommodated and held.

3. Switching device according to one of the preceding claims, characterized in that at least one conductor piece, by means of which the resistor body (16) is connected in the parallel current path (15), presses in a sprung manner against the resistor body.

4. Switching device according to one of Claims 1 to 3, characterized in that, if the resistor body (16) is formed with metallic end surfaces, the conductor pieces are soldered to the end surfaces.

5. Switching device according to one of the preceding claims, characterized in that the resistor body (16) is

cylindrical, hollow-cylindrical, in the form of a cube or prism, or the like.