



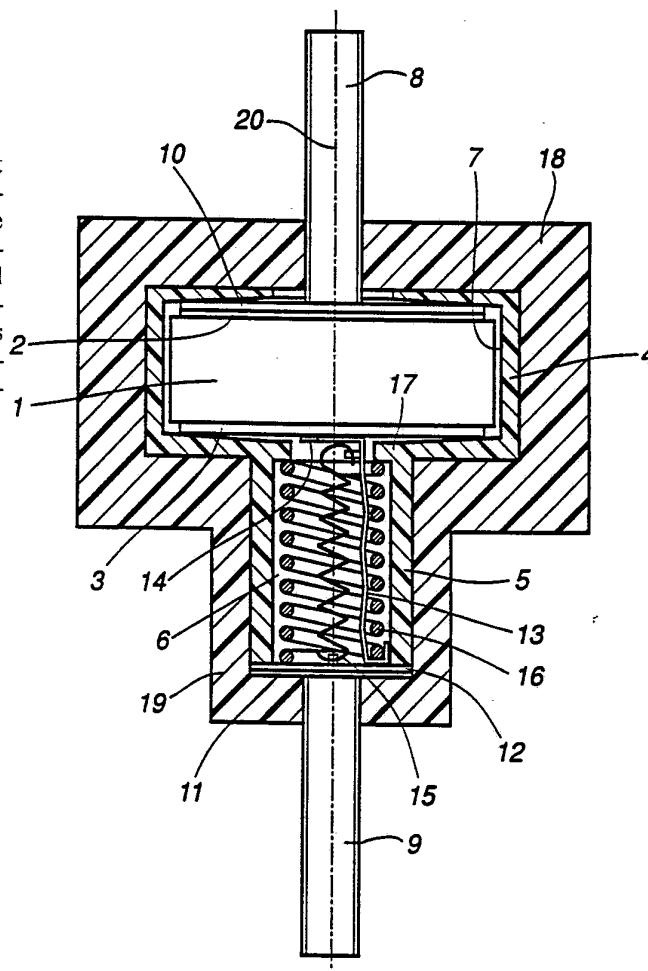
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(54) Title: SURGE ARRESTER ARRANGEMENT

(57) Abstract

The invention relates to a surge arrester arrangement comprising a surge arrester with a number of ZnO blocks arranged between two end electrodes as well as a cut-out device arranged in series with the arrester for automatically disconnecting the arrester in the event of arrester failure. The central part in the cut-out device is a ZnO block (1) with a higher relative energy capability than the blocks in the arrester. In this way, the block in the cut-out device can only break if the arrester connected in series with the device has failed, whereby incorrect tripping of the device is prevented.



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Surge arrester arrangement

The present invention relates to a surge arrester arrangement comprising a surge arrester with an elongated
5 insulating casing, in which a number of preferably cylindrical arrester elements of metal oxide varistor material are arranged between two end electrodes, as well as a cut-out device, arranged in series with the arrester, for
10 automatic disconnection of the arrester in the event of arrester failure.

For a surge arrester placed between phase and ground, an arrester failure in all probability will result in a permanent ground fault. The arrester must then be
15 disconnected or be replaced before the system can be energized again.

For arresters in stations, the relatively short shutdown required for a replacement is acceptable in view of the low
20 risk of an arrester failure. In addition, the risk of operating the system without arrester protection for vital components in the station cannot be taken. Thus, a three-phase surge arrester in a station must be replaced by a new
25 arrester.

The situation is somewhat different for surge arresters placed in the towers of a power line to protect against back flashover caused by thunder, or against switching surges. A failure of such an arrester resulting in a permanent ground
30 fault may entail a lengthy shutdown before the defective arrester has been located and replaced. On the other hand, it is usually acceptable that the arrester is disconnected only. Therefore, if the arrester is provided with a cut-out device which automatically disconnects the arrester in the
35 event of a failure, the operation of the line may continue and any defective arresters be located and replaced at some suitable time.

Surge arresters with cut-out devices are previously known, for example from the patent specifications US-A-2 305 436 and EP-B-0 013 401. However, these prior art cut-out devices have a complicated design, which renders manufacture
5 difficult and increases the risk of malfunction.

The purpose of the present invention is to provide a surge arrester arrangement with a cut-out device which is simple and inexpensive to manufacture and which functions in a
10 reliable manner. This is achieved by a cut-out device with the characteristic features described in the characterizing part of claim 1. The cut-out device according to the invention includes a metal oxide block with a larger area than the blocks in the arrester, that is, with a higher
15 relative energy capability. With such a design, the block in the cut-out device can only break if the arrester connected in series with the device has failed, whereby incorrect tripping of the device is prevented.

20 The invention will be explained in greater detail by describing an embodiment with reference to the accompanying drawing, which shows in axial section a cut-out device for a surge arrester designed according to the invention.

25 The cut-out device shown in the drawing is intended to be connected in series with a surge arrester, for example as shown in the above-mentioned EP-B-0 013 401. The surge arrester may be of the normally occurring design with an elongated insulating casing, in which a number of preferably
30 cylindrical ZnO blocks are arranged between two end electrodes.

The central part of the cut-out device consists of a cylindrical ZnO block 1 with larger diameter than the ZnO blocks
35 in the surge arrester with which the cut-out device is intended to be connected in series. The ZnO block 1 is arranged between two electrode plates 2, 3 of metal, making contact with the end surfaces of the block, and is surroun-

ded by a rotationally symmetrical polymer casing 4, which on the lower side of the block changes into a sleeve-formed part 5 with a smaller diameter than the block. The sleeve-formed part 5 accomodates a chamber 6. The cut-out device is
5 provided with an upper and a lower connection bolt 8 and 9, respectively, which are each fixed to a connection plate 10 and 11, respectively, of metal. The upper connection plate 10 is pressed against the electrode plate 2 which makes contact with the upper end surface of the ZnO block 1. The
10 lower connection plate 11 makes contact with a metal plate 12 which in turn makes contact with the lower end surface of the sleeve-formed part 5 of the polymer casing 4. The metal plate 12 is electrically connected to the electrode plate 3, making contact with the lower end surface of the ZnO block,
15 through a flexible contact sheet 13 arranged in the chamber 6. The connection between the contact sheet 13 and the electrode plate 3 consists of a solder 14. A tension spring 15 arranged in the chamber 6 has its lower end secured to the metal plate 12, whereas the upper end of the spring is fixed
20 to that end of the contact sheet 13 which is soldered to the electrode plate 3.

Further, a compression spring 16 is arranged in the chamber 6, the lower end of the spring resting against the metal
25 plate 12 and the upper end of the spring resting against an annular shoulder 17 in the polymer casing 4.

The polymer casing 4 is divided into two parts along an axial plane 20 and the openings where the ZnO block is
30 mounted taper in wedge form to ensure a contact pressure on the block.

The cut-out device has a rotationally symmetrical outer polymer casing 18, which, for example, may be applied
35 directly to the inner polymer casing 4 by injection moulding or casting. The bottom part 19 of the outer casing, which part surrounds the sleeve-formed part 5 of the inner casing,

is, in the example shown, made with a smaller material thickness than the other part of the outer casing.

If the surge arrester which is connected in series with the cut-out device is overloaded and fails, a relatively great current will flow through the ZnO block 1, the temperature of which rapidly increases. If, in that connection, the block is destroyed, an arc is generated which provides a pressure increase in the chamber 6, which causes the outer polymer casing 18 to burst apart, whereby the connection bolt 9 with the plate 11 is mechanically separated from the other part of the device. The tension spring 16 here contributes to rapidly break apart the polymer casing 18. The ZnO block 1 is prevented from falling out through the attachment in the inner casing 4.

If the temperature of the block 1 has become high without the block having failed, which also indicates that the arrester is defective, the solder 14 will loosen (at about 200°C) and the tension spring 15 pulls the contact plate 13 away from the electrode plate 3, whereby an arc is obtained in the chamber 6 and the polymer casing 18 is burst apart.

In the case of a failure with flashover along the surface of the block 1, the heated gas is passed through connecting channels out into the chamber 6, where the pressure increases until the polymer casing 18 bursts.

The polymer casing 18 is designed with considerably greater mechanical strength in the radial direction than in the axial direction, such that the bottom part 19 in the first place will be burst away if a pressure increase is obtained in the chamber 6. This can be achieved, for example, by fibre reinforcement of the casing in such a way that the reinforcing fibres, at least in the bottom part 19, extend substantially circularly around the axis of the casing.

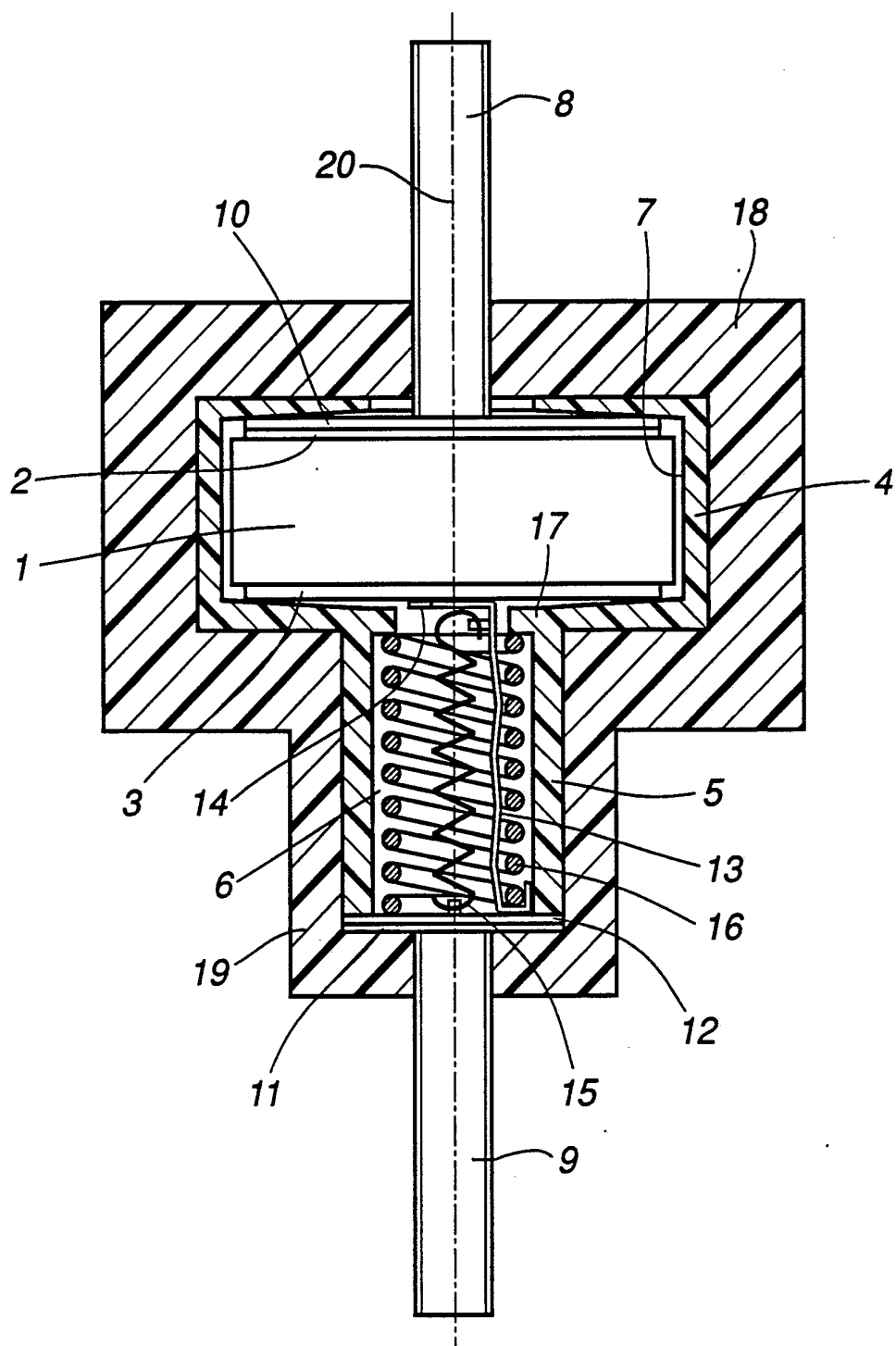
The invention is not limited to the embodiment shown, but several modifications are feasible within the scope of the claims.

CLAIMS

1. A surge arrester arrangement comprising a surge arrester with an elongated insulating casing, in which a number of preferably cylindrical arrester elements of metal oxide varistor material are arranged between two end electrodes, as well as a cut-out device, arranged in series with the arrester, for automatic disconnection of the arrester in the event of arrester failure, **characterized in that** the cut-out device comprises an arrester element (1), arranged in an electrically insulating casing (4) between two connection members (8, 9), of the same type as the arrester elements in the arrester but with higher energy capability than these.
2. An arrangement according to claim 1, **characterized in that** the arrester element (1) of the cut-out device has larger cross-section area than the arrester elements in the arrester.
3. An arrangement according to claim 1 or 2, **characterized in that** the insulating casing (4) delimits a chamber (6) which communicates with a cavity (7) in which the arrester element (1) is arranged in such a way that the formation of an arc in the cavity (7) causes a pressure increase in the chamber (6).
4. An arrangement according to claim 3, **characterized in that** the arrester element (1) is connected in series with a flexible conductor (13), arranged in said chamber (6), via a soldered connection (14) which is capable of being influenced by the temperature of the arrester element.
5. An arrangement according to claim 4, **characterized in that** the flexible conductor (13) is under the influence of a spring (15) which is adapted to break up the soldered connection (14) if the strength of the connection is reduced because of increased temperature of the arrester element (1).

6. An arrangement according to any of the preceding claims, **characterized in that** the insulating casing (4) is divided into two parts along an axial plane (20) through the cavity (7) intended for the arrester element (1), said
- 5 cavity on both sides of the parting line tapering in wedge form to achieve contact pressure between the end surfaces of the arrester element (1) and electrode plates (2, 3) making contact therewith.
- 10 7. An arrangement according to any of the preceding claims, **characterized in that** the cut-out device has an outer casing (18) made of polymer material with considerably greater mechanical strength in the radial direction than in the axial direction, whereby the casing (18), upon pressure
- 15 increase in said chamber (6), is burst apart in such a way that the two connection members (8, 9) of the cut-out device are mechanically separated.
- 20 8. An arrangement according to claim 7, **characterized in that** in said chamber (6) a pressure spring (16) is arranged to facilitate the breaking apart of the outer casing (18) at overpressure in the chamber (6).

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 93/00021

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: H01H 85/44

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: H01C, H01H, H01T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP, A1, 0013401 (MITSUBISHI DENKI KABUSHIKI KAISHA), 23 July 1980 (23.07.80), abstract --	1-8
A	US, A, 4503414 (HUEY P. SYKES ET AL), 5 March 1985 (05.03.85), abstract --	1-8
A	EP, A2, 0328771 (MITSUBISHI DENKI KABUSHIKI KAISHA), 23 August 1989 (23.08.89), abstract -----	1-8

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

31/03/93

International application No.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A1- 0013401	23/07/80	SE-T3- 0013401 CA-A- 1144596 JP-C- 1516113 JP-A- 55095284 JP-B- 63060514 US-A- 4308566	12/04/83 07/09/89 19/07/80 24/11/88 29/12/81
US-A- 4503414	05/03/85	NONE	
EP-A2- 0328771	23/08/89	JP-A- 1302677 US-A- 4864455	06/12/89 05/09/89