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(54) Switch for high-voltage electric current

(57) A switch (1) for high-voltage current having a fixed contact (6) and a moving contact (9) that can be actuated with the aid of an actuation rod (8) made of insulating material, the actuation rod (8) accommodating a spring (16) immediately proximate to the fixed contact (6) and to the moving contact (9), the spring (16) resting, with one end, against a plate (15) rigidly coupled to the actuation rod (8) and resting, with the other end, against a support (5a) rigidly coupled to the structure of the insulator body.

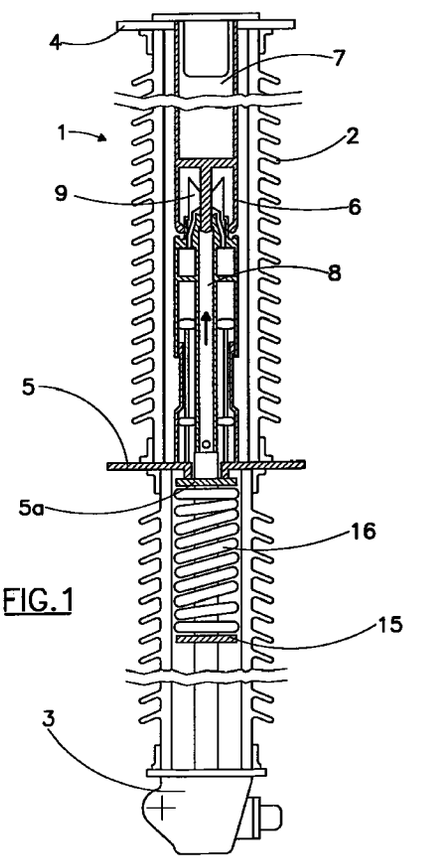

FIG.1

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Description

The present invention relates to a switch for high-voltage electric currents.

Switches for high-voltage electric currents are generally supported by a frame that rests on the floor. A column-shaped insulator, generally made of ceramic material, is provided at the free end of the frame. Inside the insulator, in a switching chamber, there is provided a switching mechanism constituted by a fixed contact and by a moving contact.

The upper end of the insulator column has a tap for the supply of electric current, whilst a current distribution tap is provided approximately at the center of the insulator.

The fixed contacts can be made to engage and disengage moving contacts which are operatively connected to an actuation rod made of insulating material which runs from the moving contacts to the lower end of the column, where a small housing is usually provided, having a conventional mechanism for the actuation of the insulating rod, which is actuated by a pre-loaded spring made of steel and therefore conducting electricity and allows to quickly disengage the fixed contact and the moving contact from each other, which disengagement must occur in the shortest possible time.

Conventional springs for actuating the moving contact actuation rod are usually made of steel; accordingly, they must be placed on the ground side, and this entails kinematic linkages having a very complex structure as well as very long actuation rods.

Since the masses involved in conventional switches, as regards the moving contact actuation parts, are large and very heavy, there is a considerable mass involved; this fact drains a large amount of kinetic energy (required to move the various mechanical elements), which therefore cannot be utilized to achieve instantaneous opening at maximum speed; i.e., the mutual disengagement of the fixed contact and of the moving contact of the switch for high-voltage electric currents does not occur at maximum speed as would be desirable.

Accordingly, a principal aim of the invention is to obviate the drawbacks arising from the use of conventional mechanisms for actuating the actuation rod of the moving contact during switch opening, providing for elastic means which are lighter and can also be provided as close as possible to the moving contact, in order to make the maximum amount of kinetic energy available during switch opening.

This aim is achieved by means of a switch having a fixed contact and a moving contact which can be actuated with the aid of an actuation rod, characterized in that, immediately proximate to the fixed contact and to the moving contact, the actuation rod, which is operatively connected to the moving contact, has a spring that rests with one end against a plate which is rigidly coupled to the actuation rod and with the other end against a support that is rigidly coupled to the body of the insulator.

With such an embodiment of a high-voltage switch it is possible to replace the heavy conventional steel spring, provided up to now at the lower end of the insulator, with an elastic element that does not conduct electricity. Therefore, the weight of the mechanism is reduced considerably by the use of a spring made of a material that does not conduct electricity; the spring element can be fitted inside the insulator, as close as possible to the fixed contact and to the moving contact. In this manner, all the energy accumulated by the loaded spring can be used for the opening of the switch, preventing this energy from being wasted owing to the presence of unavoidable frictions and to the need to use a large portion of the released energy to move heavy constructive elements.

Further characteristics and advantages of the invention will become apparent from the following detailed description and from the accompanying drawings.

The switch according to the present invention is now described in greater detail by means of an embodiment which is given only by way of example and is illustrated in the accompanying drawings, wherein:

figure 1 is a sectional view of the switch according to the present invention, with the moving contact engaged with the fixed contact and with the opening spring in preloaded condition; and
figure 2 is a sectional view of the switch according to the present invention with the moving contact disengaged from the fixed contact and with the spring in released condition.

As shown by figures 1 and 2, the switch according to the present invention, generally designated by the reference numeral 1, is constituted by a column-shaped insulator 2 provided, in a downward region, with a conventional actuation mechanism 3 which is connected to an actuation stem 8.

In an upward region, the insulator 2 is provided with a current supply tap 4, and approximately at the center of the body of the insulator 2 there is provided an electric current distribution tap 5.

The upper electric current tap 4 is electrically connected to a fixed contact 6 provided inside a switching chamber 7.

The chamber 7 is crossed by an actuation stem 8 made of insulating material and having a moving contact 9 at the end directed towards the fixed contact 6. The moving contact 9 is electrically connected to the tap 5.

In a downward region, the actuation stem 8 is connected to the conventional actuation mechanism 3 having conventional lever systems that allow to move the stem 8.

The actuation stem 8 has, at a distance from the actuation mechanism 3, a washer or disk 15 that is rigidly coupled to the rod 8, the tap 5 also forming, inside

the chamber 7, a support 5a which is crossed by the actuation rod 8.

A spring 16, advantageously a helical spring, is provided between the support 5a and the washer 15.

One end of the helical spring 16 rests on the washer 15, whilst the other end of the spring 16 rests against the support 5a.

By actuating the mechanism 3 it is possible to join the moving contact 9 and the fixed contact 6 accommodated in the chamber 7.

In this situation, as shown in figure 1, electric current can flow from the supply tap 4 to the distribution tap 5. In this position in which the contact is closed, the spring 16, which is provided as close as possible to the fixed contact 6, is loaded; i.e., the spring 16 tends to move the stem 8 so as to disengage the contacts 6 and 9. In the situation shown in figure 1, the disengagement movement is avoided by means of the locking action provided by the actuation mechanism 3, which is known in the art.

According to the invention, the spring 16 is provided as a helical spring made of non-conducting synthetic material.

Use of glass fibers, which have excellent electrical insulation characteristics, for the production of the spring 16 has proved itself highly advantageous. The glass fibers are coated and impregnated with a resin, advantageously an epoxy resin, which also has excellent electrical insulation characteristics.

Before performing the catalysis of the epoxy resin and the consequent curing of the epoxy material, the resulting strand of fiber and resin is then wrapped around a core having a chosen diameter in order to thus provide the body of the spring; the body is then stabilized in its final position, for example by means of a heat treatment of the strand that constitutes the spring, for example in an oven.

By using a spring made of synthetic and insulating material it becomes possible to avoid heavy steel springs, which conduct electricity and have so far been standard in high-voltage switches known from the prior art.

By producing and using a spring made of composite synthetic material, such as for example glass fiber and epoxy resin, it becomes possible to insert the opening spring means of the switch in the switching chamber, moving it closer to the fixed and moving contacts, thus reducing the amount of energy required to move the moving contact into the open position and thus having the maximum amount of energy available for the opening of the switch and being able to accordingly optimize the entire actuation mechanism of the switch.

In conventional switches, the actuation spring was made of steel and therefore constituted an electrically conducting element, had a weight of approximately 900 grams, and had to be installed immediately proximate to the bottom of the insulator.

With the proposed new solution according to the invention, the use of a spring made of synthetic material, advantageously polymeric material, allows to provide an electrically insulating spring. The weight of the spring can be reduced to approximately 300 grams and it has also become possible to install the spring inside the insulator, proximate to the fixed contact and to the moving contact, avoiding an undesirable waste of the energy stored by the spring, the energy being almost entirely available for the contact opening step.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A switch (1) for high-voltage current, composed of a column-shaped insulator containing a switching chamber and having, inside the switching chamber, a fixed contact (6) whereby it is possible to engage and disengage a moving contact (9) which is operatively connected to an actuation rod (8) made of insulating material which runs from the moving contact (9) to the lower end of the column (2), where there is provided an actuation mechanism (3), characterized in that the actuation rod (8), operatively connected to the moving contact (9), has a spring (16) immediately proximate to the fixed contact (6) and to the moving contact (9), said spring resting, with one end, against a plate (15) which is rigidly coupled to the actuation rod (8), and in that the spring (16) rests, with its other end, against a support (5a) rigidly coupled to the insulator body (2).

2. A switch according to claim 1, characterized in that said spring (16) is a helical spring made of electrically insulating material.

3. A switch according to claim 1, characterized in that the spring (16) is composed of glass fibers and in that said glass fibers are coated or impregnated with cured epoxy resin.

4. A switch according to claim 3, characterized in that the glass fibers coated or impregnated with epoxy resin are wrapped around a core having an adapted diameter and are heat-treated in an oven.

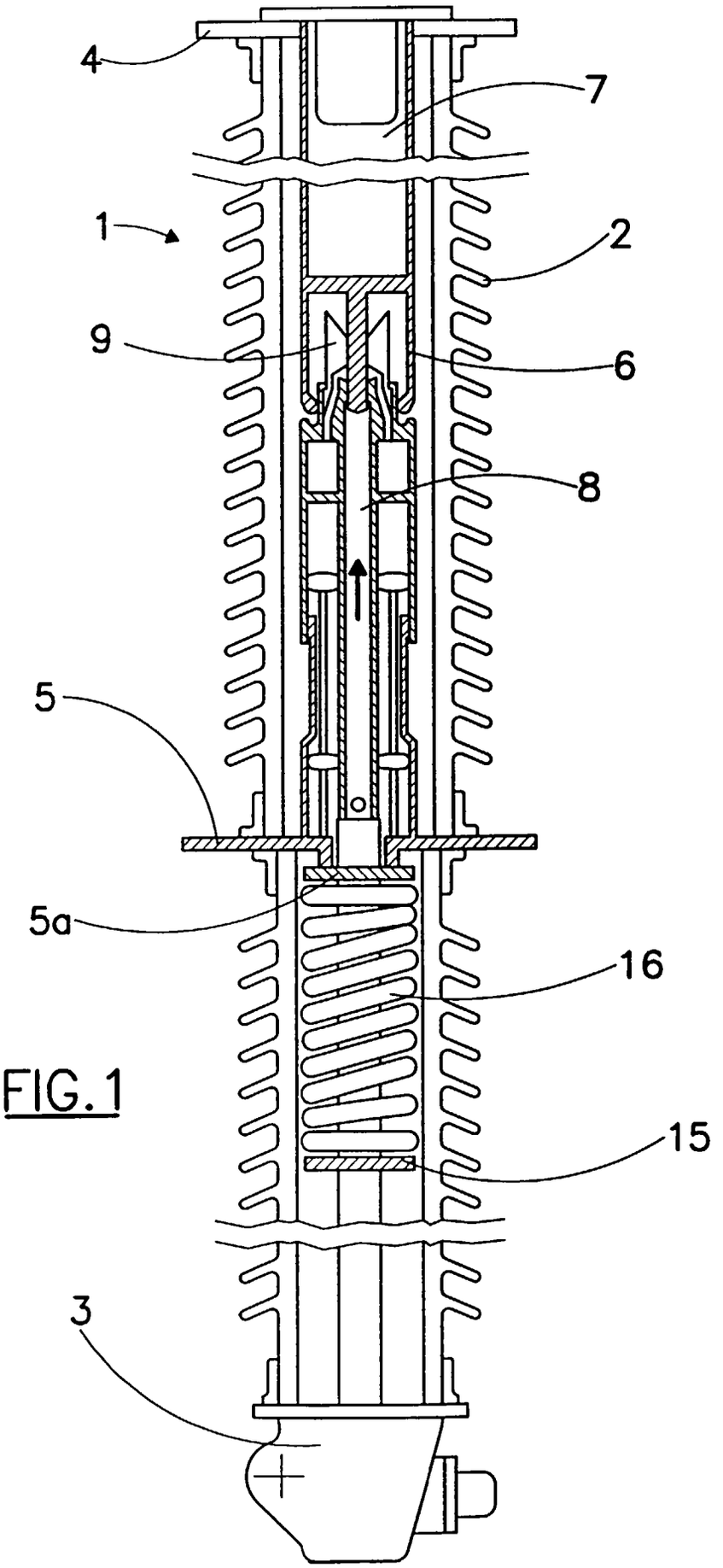

FIG.1

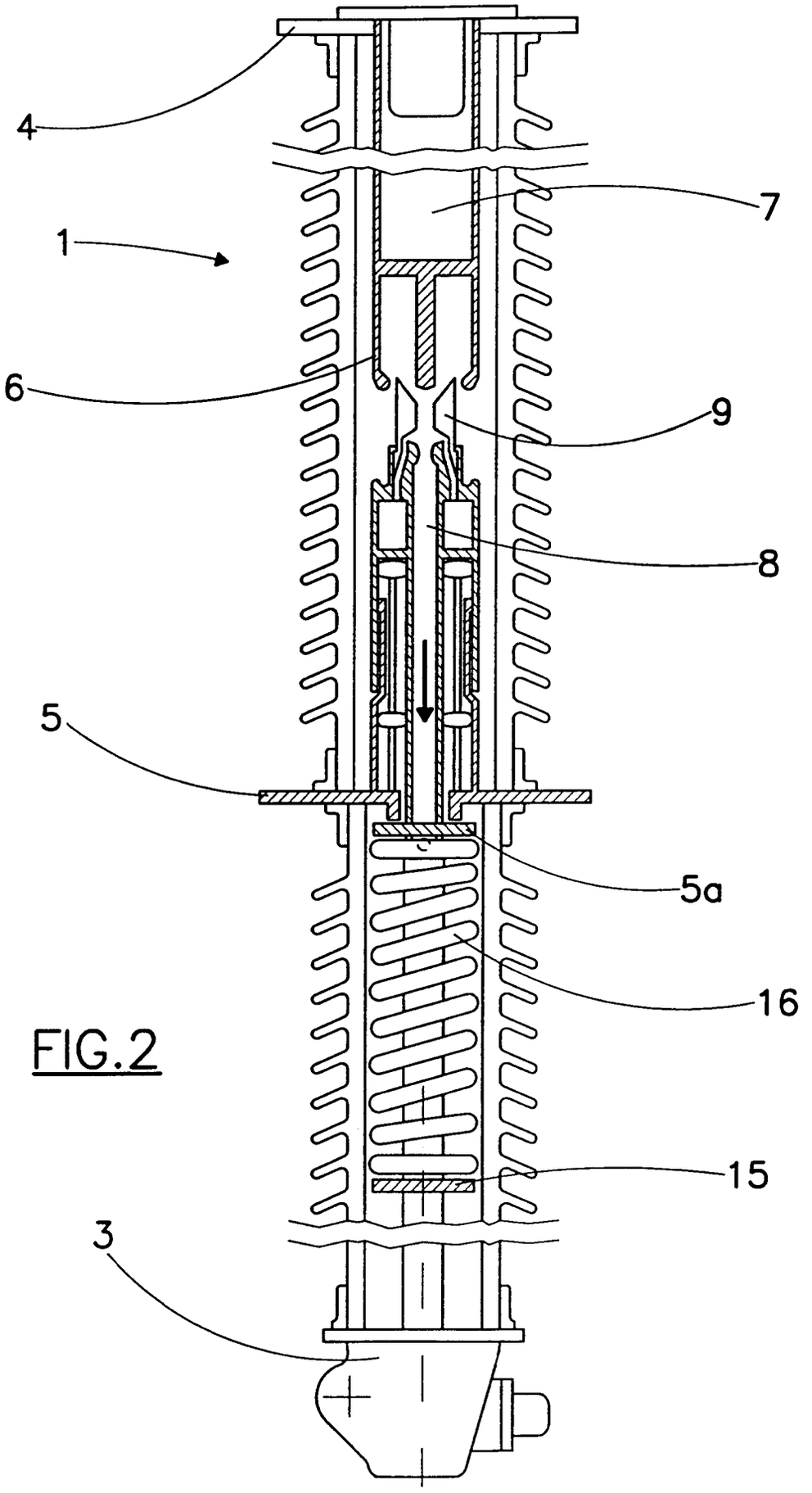

FIG.2

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EUROPEAN SEARCH REPORT

Application Number
EP 97 10 1453

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	FR 2 589 001 A (ALSTHOM) 24 April 1987 * page 1, line 6 - line 17 * * page 4, line 25 - page 5, line 25 * * page 6, line 23 - line 28 * * figures 1,2 *	1	H01H33/40 H01H33/42
A	US 4 535 208 A (WALLIMANN HUBERT ET AL) 13 August 1985 * column 3, line 14 - line 46 * * claim 1 * * figure 1 *	1	
A	US 3 129 307 A (MUÑOZ DE VARGAS) 14 April 1964 * column 3, line 38 - line 54 * * column 4, line 15 - line 53 * * column 4, line 64 - line 69 * * figures 3-6 *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	4 April 1997	Castagné, O

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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