May 15, 1956 H. A. HIDDE NIJLAND 2,745,992

ELECTRIC SWITCHING APPARATUS FOR HIGH TENSION

Filed Aug. 23, 1954

2 Sheets-Sheet 1

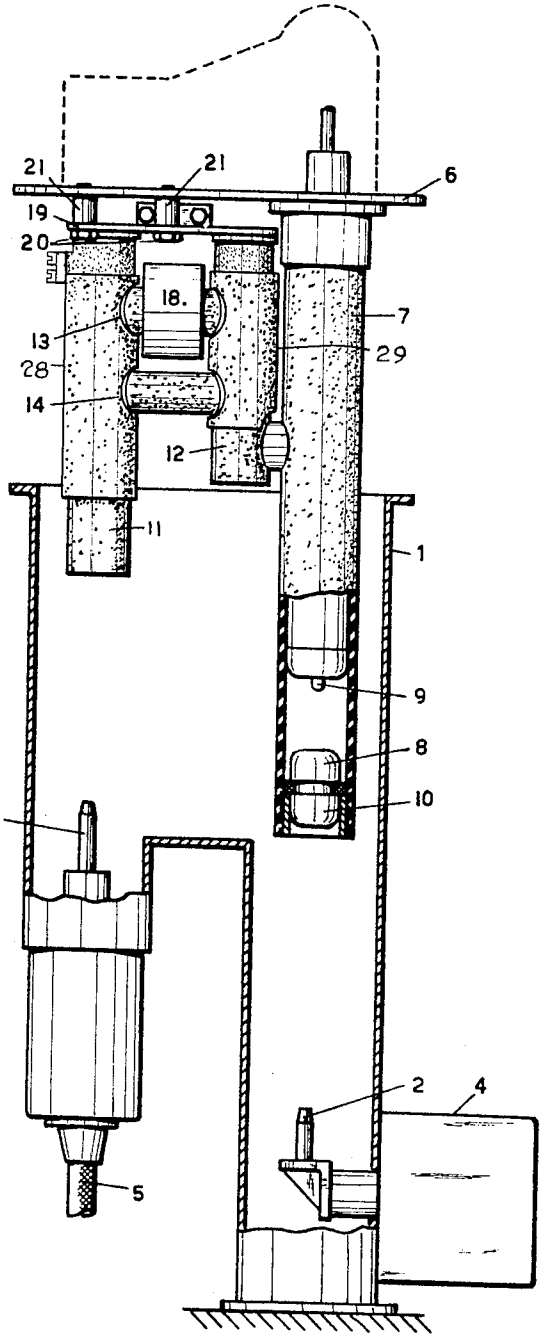

FIG.1

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ELECTRIC SWITCHING APPARATUS FOR HIGH TENSION

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2 Sheets-Sheet 2

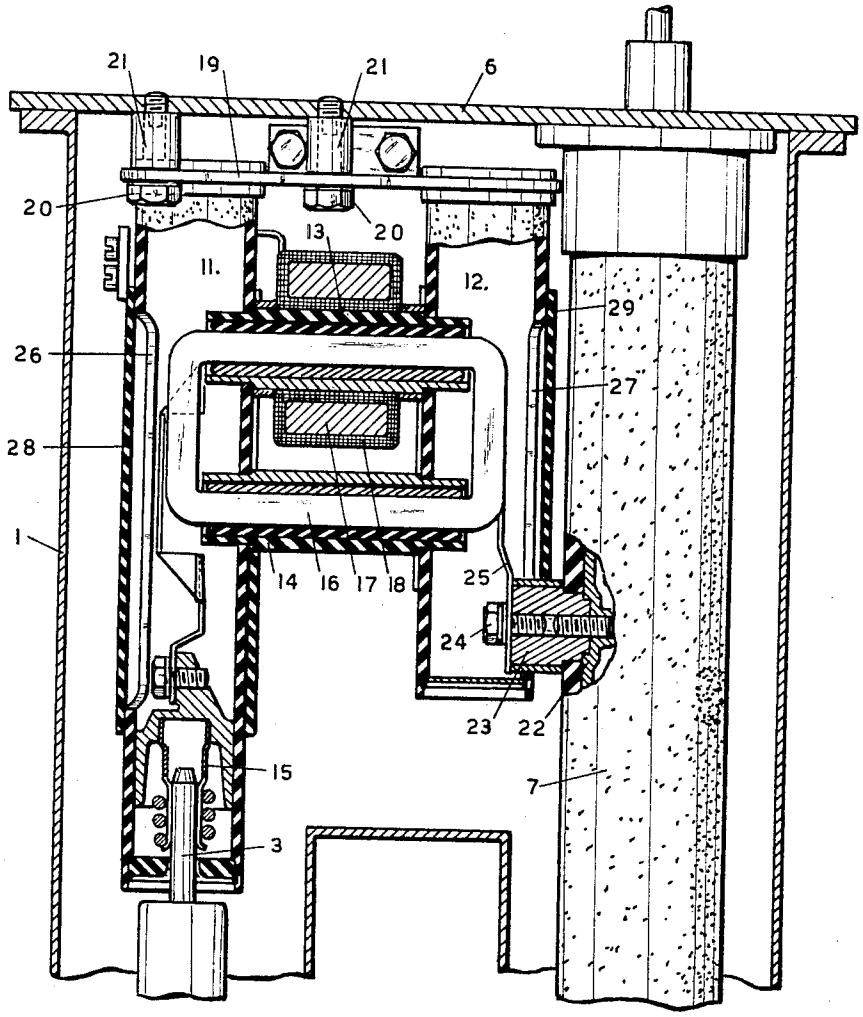

FIG.2

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ELECTRIC SWITCHING APPARATUS FOR HIGH TENSION

Hendrik A. Hidde Nijland, Laren, Netherlands, assignor to N. V. "COQ," Utrecht, Netherlands, a company of the Netherlands

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Claims priority, application Netherlands August 24, 1953

6 Claims. (Cl. 317—157.6)

The invention relates to electric switching or circuit-breaking apparatus for high tension, of the known type comprising in combination:

A stationary metal casing provided with a detachable cover and with leading-in conductors insulatedly passed through its wall, said casing being filled, or adapted to be filled, with an insulating fluid such as mineral oil, and at least one composite switching element secured to said cover and comprising a stationary switching contact, a movable switching contact adapted to cooperate therewith, two connecting contacts electrically connected with the said switching contacts, respectively, and a current transformer electrically inserted intermediate one of said switching contacts and one of said connecting contacts, said connecting contacts cooperating with terminals provided on the leading-in conductors so as to permit the switching element to be bodily removed from, and be positioned in, said casing whilst the leading-in conductors are alive.

In known switching apparatus of this type, the switching element has to be dismantled almost entirely when a current transformer of different capacity or of different class has to be provided. In addition, it is not well possible with said apparatus to provide a current transformer whose primary winding comprises more than one turn.

The invention has for its object to avoid said disadvantages of the known constructions. It consists herein that the, or each, composite switching element is composed of two sections electrically interconnected by readily separable members, the first section comprising the switching contacts and one connecting contact, the second section comprising the current transformer and the second connecting contact, said second section being secured to the cover so as to be bodily removable therefrom. With this construction, the second section can be readily replaced by a similar section comprising a different current transformer, without it being necessary for the switch proper to be dismantled.

Preferably, the second section of the switching element, i. e. the section which comprises the current transformer and the second connecting contact, will be composed of: a plate member detachably connected to the cover and disposed in parallel relation therewith, two insulating tubular members connected to said plate member, one of these tubular members accommodating the connecting contact and the other accommodating the member for electrically interconnecting both sections of the switching element, at least one transverse, insulating tube interconnecting said tubular members, through which tube passes the conductor interconnecting the connecting contact and the said connecting member, and at least one annular magnetic core surrounding the said transverse tube and enclosed by the secondary winding of the transformer.

If the second section comprises at least two transverse tubes, the conductor interconnecting the connecting contact and the connecting member may be passed through the annular core in a plurality of turns, so that the primary winding of the transformer is of the multiturn type.

For the purpose of illustration, reference is had to the drawing, in which:

Fig. 1 is a somewhat diagrammatic elevation, partly in section, of a switch or circuit breaker in accordance with the invention, the switching element thereof being partly removed from the casing, and

Fig. 2 is a vertical section, drawn to a larger scale, of that part of the switching element, which is essential as far as the invention is concerned.

In the drawing, 1 designates a metal casing which during operation of the apparatus is filled with mineral oil. Projecting into said casing and insulatedly passed through the wall thereof are lead-in conductors, whose pin-shaped terminals are indicated by 2 and 3, respectively. Said conductors are connected to a system of busbars (not shown) accommodated in a box 4, and to a cable 5, respectively.

Detachably mounted in the casing is a composite switching element suspended from the cover plate 6 of the casing 1. This element is composed of two sections, the first comprising: a vertical, insulating tube 7 accommodating a switching contact 8, an axially movable, pin-shaped switching contact 9 cooperating therewith, and a connecting contact 10 connected to the switching contact 8 and adapted to cooperate with the terminal 2, the second section comprising: two vertical, insulating tubular members 11, 12, two transverse, insulating tubes 13, 14 interconnecting said tubular members, a second connecting contact 15 adapted to cooperate with the terminal 3, and a current transformer comprising a primary winding 16, an annular magnetic core 17 and a secondary winding 18.

The tubular members 11, 12 are secured to a plate 19 which, by means of bolts 20 and spacer sleeves 21, is detachably secured to the cover plate 6 and disposed in parallel relation therewith. The movable switching contact 9 is in permanent sliding contact with a connecting contact 22 provided with a connecting block 23, which projects from the tubular member 7 into the tubular member 12 through a suitable opening thereof. Secured to said block 23 as by a bolt 24 is a conducting strip 25, which is also connected to the second connecting contact 15 and is passed in a plurality of turns through the transverse tubes 13, 14, so as to also constitute a multiturn primary winding of the current transformer. The magnetic core 17 and the secondary transformer winding 18 are disposed around the transverse tube 13.

Each tubular member 11, 12 is provided with an axial slot 26, 27, respectively. These slots enable the proper positioning of the primary winding 16 of the current transformer after the tubular members 11, 12 and the transverse tubes 13, 14 have been assembled and secured to the plate 19. After the primary winding 16 has been so positioned, the slots 26, 27 are closed by slotted, insulating partial sleeves 28 and 29, respectively, slidably mounted on the tubular members 11 and 12, respectively.

The cooperation of the connecting contacts 10, 15 with the terminals 2, 3 is such that, after removal of the cover 6, the entire composite switching element can be lifted out of the casing 1, whilst the terminals 2, 3 remain alive. Should it now be desired for another current transformer, having a different capacity or being of another class, to be fitted, all that is necessary is: removing the entire switching element from the casing 1, unscrewing the bolts 20 and 24, whereby that section of said element which comprises the current transformer is bodily disconnected from the cover and from the other section of the switching element, and securing a similar section comprising another current transformer both to the cover 6 and to the block 23, whereupon the switching element can again be inserted into the casing.

What I claim is:

1. An electric circuit breaker for high tension, compris-

ing a stationary metal casing adapted to be filled with an insulating fluid, a cover detachably mounted on said casing, leading-in conductors insulatedly passing through the walls of the casing, a switching element composed of two individual sections suspended from and independently attached to said cover and located in said casing, a first one of said sections including a current transformer, readily separable members, one of which is mounted on one of the sections, electrically interconnecting the two sections of the switching element, means for attaching the first section to the cover for ready removal therefrom after it has been removed from the casing, and a pair of cooperating plug and bushing contacts between the leading-in conductors and the respective sections of the switching element, said plug and bushing contacts permitting the cover together with the two sections of the switching element to be bodily removed from the casing and disconnected from the conductors while the leading-in conductors are energized.

2. An electric circuit-breaker in accordance with claim 1, in which there are cooperating switching contacts on one of the sections, one of said switching contacts being directly electrically connected to one of the readily separable members which is mounted on said one section and the other of said switching contacts being a part of the member of the plug and bushing contact which is mounted on said one section.

3. An electric circuit-breaker in accordance with claim 2, in which the first section of the switching element comprises a plate member detachably secured to the cover and disposed in parallel relation therewith, two insulating tubular members secured to said plate, one of said tubular members housing and supporting one of said contacts of one of the pairs of plug and bushing contacts and the other supporting one of the said readily separable conductive members for electrically interconnecting both sections of the switching element, at least one insulating transverse tube interconnecting the two tubular members, a further conductor interconnecting said contact and said conductive member and passing through said transverse tube, at least one annular magnetic core surrounding said transverse tube and a secondary winding enclosing said core, said interconnecting conductor, said core, and said winding constituting together the said current transformer.

4. An electric circuit-breaker in accordance with claim 2, in which the first section of the switching element comprises a plate member detachably secured to the cover and disposed in parallel relation therewith, two insulating tubular members secured to said plate, one of said tubular members housing and supporting one of said contacts of one of the pairs of plug and bushing contacts and the other supporting one of the said readily separable conductive members for electrically interconnecting both sections of the switching element, at least two insulating transverse tubes interconnecting said contact and said conductive member and passing at least twice through one transverse tube and at least once through the other transverse tube, at least one annular magnetic core surrounding the first mentioned transverse tube and a secondary winding enclosing said core, said interconnecting conductor, said core, and said winding constituting together the said current transformer.

5. An electric circuit-breaker in accordance with claim 2, in which the first section of the switching element comprises a plate member detachably secured to the cover and disposed in parallel relation therewith, two insulating tubular members secured to said plate, one of said tubular members housing and supporting one of said contacts of one of the pairs of plug and bushing contacts and the other supporting one of the said readily separable conductive members for electrically interconnecting both sections of the switching element, at least two insulating transverse tubes interconnecting the two tubular members, said transverse tubes extending into fitting apertures of the tubular members, a further conductor interconnecting said contact and said conductive member and passing at least twice through one transverse tube and at least once through the other transverse tube, slots being provided in said tubular members opposite said apertures and permitting said interconnecting conductor to be properly positioned after the insulating tubular members and transverse tubes have been assembled to a unit, at least one annular magnetic core surrounding the first mentioned transverse tube and a secondary winding enclosing said core, said interconnecting conductor, said core, and said winding constituting together the said current transformer.

6. An electric circuit breaker in accordance with claim 2, having an insulating tubular member housing the cooperating switching contacts and one of the contacts of one of the pairs of plug and bushing contacts and supporting one of the said readily separable conductive members for electrically interconnecting both sections of the switching element, a plate member detachably secured to the cover and disposed in parallel relation therewith, two insulating tubular members secured to said plate, one of said tubular members housing and supporting one of said contacts of one of the pairs of plug and bushing contacts and the other supporting the other one of the said readily separable conductive members, at least one insulating transverse tube interconnecting the latter two tubular members, a further conductor interconnecting said latter contact and said other conductive member and passing through said transverse tube, at least one annular magnetic core surrounding said transverse tube and a secondary winding enclosing said core, said interconnecting conductor, said core and said winding constituting together the said current transformer, and all three tubular members having their axes lying parallel to each other and contained in the same plane perpendicular to said cover and said plate.

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