

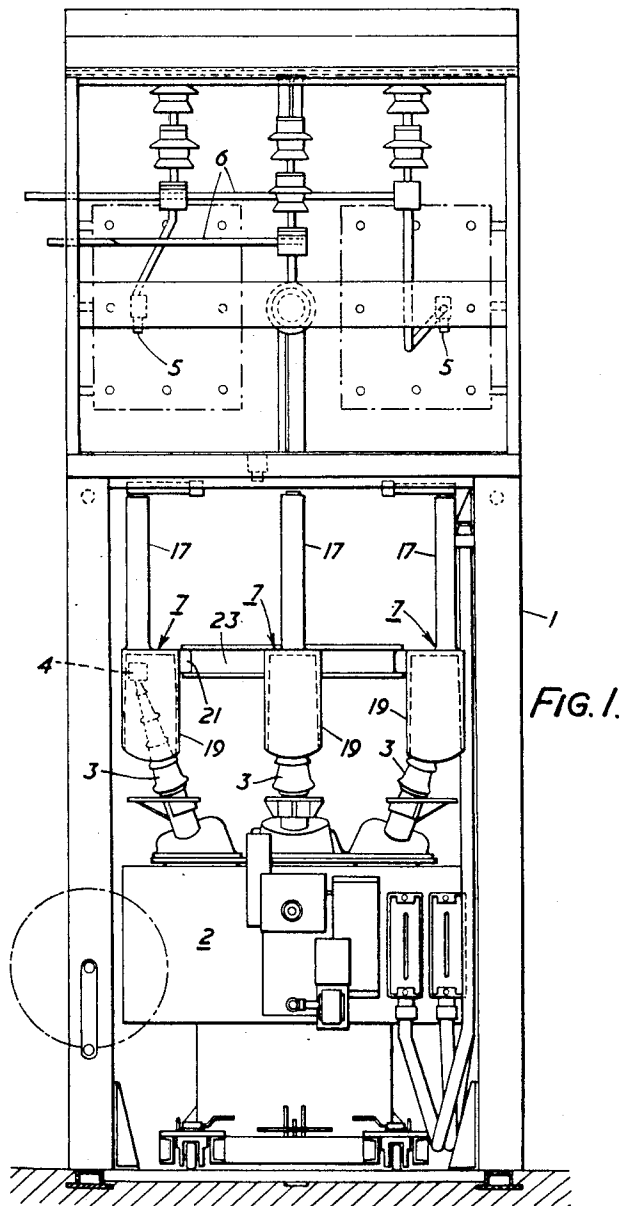
**Oct. 25, 1960**

R. N. BUTTREY ET AL  
HIGH VOLTAGE SWITCHGEAR

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2 Sheets-Sheet 1



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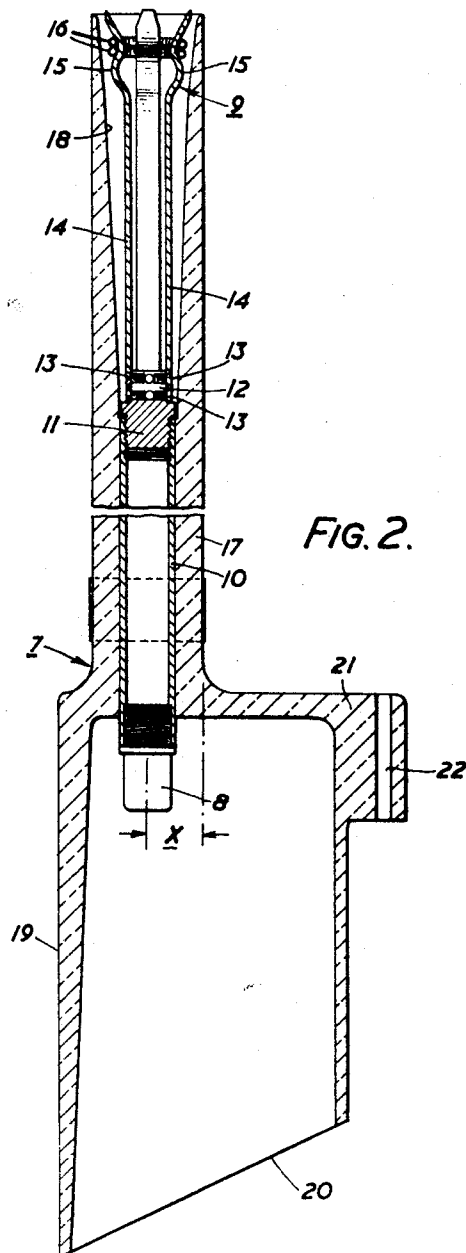


FIG. 2.

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## HIGH VOLTAGE SWITCHGEAR

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3 Claims. (Cl. 200—166)

The present invention relates to high voltage switchgear, and has for an object to provide an improved high voltage bushing extension for use with vertically isolating air-insulated, metal-clad switch units.

For certain testing purposes in relation to such units, it is required that the terminal bushings on one side of the circuit-breaker be connected to the high voltage cables or busbars, while the bushings on the other side are left isolated and may, for example, be connected together and earthed. This is achieved in the conventional switch units by fitting bushing extensions onto the terminal bushings on one side of the circuit breaker, the said extensions extending vertically upwards from the circuit breaker to engage the isolating contacts of the busbars. In this manner, when the circuit breaker is only partially raised towards the busbars, the bushing extensions engage the isolating contacts to connect the corresponding circuit breaker bushings to the busbars, while the terminal bushings on the other side of the circuit breaker are left unconnected and accessible for testing purposes.

In the manufacture of such bushing extensions for use with circuit breakers having vertically extending terminal bushings, no difficulty is experienced in making a fabricated structure of suitable insulating material to surround and enclose the conductor of the bushing extension and the "live" ends of the circuit breaker bushing terminals. When, however, the terminal bushings of the circuit breaker extend upwardly in splayed apart relation, it has been found that it is not possible by means of a fabricated structure to provide adequate electrical insulation of the bushing extension.

According to the invention, a bushing extension for use with vertically-isolating, air-insulated, switch units comprises an elongated electrical conducting member for connecting a terminal bushing of the circuit breaker of the unit to a cable or a busbar isolating contact, a sleeve or sheath of electrically insulating material surrounding the said conductor member lengthwise thereof, and having an integral cowl or shroud of electrically insulating material positioned at that end of the conducting member which is adapted to engage the terminal bushing, for receiving and enclosing the upper end portion of the terminal bushing, the said sleeve and the said cowl or shroud being moulded integral, one with the other from a low pressure moulding resin or "potting" resin such as, for example, "Araldite."

According to a further feature of the invention the cowl or shroud is off-set from the axis of the sleeve to accommodate the upwardly inclined end of one of a set of splayed apart terminal bushings so that the said conducting member and its surrounding sheath extend vertically upwards from the terminal bushing.

The invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic representation of a high tension vertically isolating switch unit showing the appli-

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cation thereto of bushing extensions according to the invention; and

Figure 2 is a longitudinal section of one form of bushing extension according to the invention.

The switch unit shown in Figure 1 comprises a framework 1 in which is positioned for vertical movement a circuit breaker 2 having upwardly extending splayed apart terminal bushings 3 provided at their upper end with sockets 4 (shown in broken line for one of the bushings) in which are adapted to engage downwardly extending isolating contact pins 5 connected to busbars 6 or to a feeder cable (not shown). The circuit breaker 2 is adapted to be raised and lowered in known manner to engage and disengage respectively the pins 5 in the respective sockets 4, the circuit breaker being shown in Figure 1 in the lowered position in which it is disconnected from the busbars 6 and the terminal bushings 3 have positioned thereon bushing extensions 7 which extend upwardly from the respective terminal bushings. Each bushing extension 7 as will be more clearly seen in Figure 2 includes an electrically conducting member 10 extending lengthwise of the bushing and having at its lower end a contact plug 8 adapted to engage in the socket 4 of the corresponding terminal bushing, and a socket 9 connected with its upper end for engaging with the corresponding isolating contact pin 5.

As will be seen from Figure 2, the said electrical conducting member 10 is in the form of a hollow metal tube, having secured in one end thereof the contact plug 8. The other end of the tube is closed by a further metal plug 11 having a portion 12 of square cross-section extending outwardly from the end of the tube and to each side face of which is secured by means of screws 13 one end of a contact spring 14 extending longitudinally outwards from the end of the tube. The other end of each of the four contact springs is shaped—as indicated at 15—so that the four springs at said other end are in the form of a cup which constitutes the socket 9 for receiving the downwardly extending isolating contact 5 of a busbar or feeder cable, and in order to ensure adequate contact pressure between the ends 15 of the springs and the contact, the ends 15 of the four springs are surrounded by resilient rings 16.

The tube 10 is closely surrounded by a sleeve 17 of electrically insulating material which also surrounds the contact springs in spaced relation therewith to permit the springs to flex in a direction radially outwardly of the tube, and for this purpose the sleeve is formed with a tapered bore 18 flaring outwardly from the said other end of the tube and extending the length of the contact springs. The sleeve on said one end, or contact plug end of the tube, supports a cowl or shroud 19 extending longitudinally outward therefrom, and eccentrically disposed with respect thereto, the said shroud being of generally hollow cylindrical shape, and the axis of the cylinder is laterally off-set from the axis of the tube a distance X such that, when the contact plug 8 is inserted in the contact socket 4 of the terminal bushing, the shroud 19 is off-set in the direction of downward inclination of the terminal bushing 3 so that the upper end portion of the terminal bushing is entirely enclosed within the shroud as can be clearly seen in Figure 1.

The shroud is of an axial length, sufficient to extend a substantial distance down the terminal bushing so as to provide an effective protective insulation of the exposed contact portions of the terminal bushing and the lower or open end surface of the shroud is inclined with respect to the axis of the shroud—as indicated at 20—to facilitate the entry of the upwardly inclined upper end of the terminal bushing into the shroud.

At the closed end of the shroud, adjacent to the sleeve

17, and on the portion of the peripheral outer surface which is laterally off-set farthest from the tube, there is provided a supporting projection in the form of a radially outwardly extending lug 21—apertured as at 22 for receiving a bolt or like fixing element (not shown)—for securing the bushing extension to a supporting cross-bar or framework 23 (Figure 1).

The sleeve 17 surrounding the conductor tube and the contact springs, together with the shroud 19 and the outwardly extending apertured lug 21 are formed integral, one with another by moulding a low pressure moulding or "potting" resin such as, for example, "Araldite" and it is found that by so moulding the insulation of the bushing extension, adequate electrical insulation thereof can be obtained.

We claim:

1. In combination with a vertical isolating air-insulated high tension switchgear unit provided with isolating contacts and a circuit breaker having upwardly extending splayed apart terminal bushings for engaging said contacts, a removable bushing extension for connecting a terminal of the circuit breaker with an isolating contact and comprising an elongated electrically conducting member, a plug at one end of said member, a socket at the other end of said member, a sleeve of electrically insulating mouldable material encasing the said member and having a cowl integral with said sleeve which extends axially beyond one end of said electrically conductive

member, said cowl being off-set from the axis of said sleeve, whereby when the electrically conducting member is releasably engaged with the upper end of an upwardly inclined terminal bushing, the cowl or shroud encloses the said upper end and the electrically conducting member extends vertically upwardly therefrom.

2. The combination claimed in claim 1 in which the said electrically conducting member comprises a length of metal tubing having at said other end thereof a plurality of contact springs extending longitudinally outwardly therefrom and shaped at their free ends to form the said socket, the inner surface of said sleeve flaring outwardly at the end thereof opposed to the cowl thereby to surround the contact springs in spaced relation therewith to permit the outward radial flexing of the contact springs.

3. The combination claimed in claim 1, in which the said sleeve and cowl are composed of a low pressure moulding resin.

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