ABSTRACT: Prefabricated disconnectable electric station unit compartment comprising in a metal casing constituting the main housing thereof a set of conductors, a block of solid dielectric material enclosed in said metal casing to insulate said casing from said conductors of the detachable or disconnectable members (breaking device, connecting device, etc.), characterized essentially in that said detachable or disconnectable members are electrically connected to said conductors at junctions disposed in a liquid dielectric medium of moderate volume, independent of any similar medium which may be provided for another use, such as insulating and breaking a switching device.
This invention relates to a prefabricated disconnectable electric station unit of the so-called "shielded" or "sealed-in" type comprising a metal casing and particularly useful in high-voltage wiring systems.

BACKGROUND OF THE INVENTION

It is known in the art that most of these station units consist of more or less separated compartments such as "set of bars" compartment, "cable box" compartment, etc., and comprise disconnectable elements (circuit breakers, switches, etc.). Certain known stations of this character, generally of the type enclosed in a metal sheath or casing, are strongly insulated, but they are objectionable in that the junction between fixed and movable elements takes place in atmospheric air, notably at the junction level, notwithstanding the considerable endeavors made with a view to obtain an optimum current distribution in this zone, so that surface discharge problems, especially in polluted media, make these junctions vulnerable, thus creating a weak point in the station without any valuable compensation. Moreover, as the electric connections between the various compartments are provided by lead-in devices (usually insulating blocks enclosing a conductor) serious difficulties are experienced when service or repair has to be performed inside the station unit.

On the other hand, it is well known to use liquid dielectric substances such as oil as an insulating medium, but for safety reasons severe rules frequently impose a limitation as to the permissible volume of liquid dielectric used per communicating cell in a same station, in case this liquid is an inflammable one.

SUMMARY OF THE INVENTION

Now the Applicants found that replacing atmospheric air as a dielectric medium between the disconnectable elements of such stations with a very reduced quantity of a suitable liquid dielectric substance will reduce considerably the surface discharge threshold therein.

This invention relates to an electric station unit of the type set forth hereinabove which is adapted to perform by itself all the service sequences and control actions now obtainable from a wiring system, while affording a remarkable handiness in case of maintenance, service or other interventions, due to an elaborate partitioning.

This invention is also concerned with the technological means implemented therein, the combination of which leads to a station "architecture" capable of solving the intricate problem put by actual users, this station having nevertheless particularly reduced overall dimensions compared with those of hitherto known constructions.

The compartment of a prefabricated electric station unit according to this invention, which comprises in a metal casing constituting the main housing thereof a set of conductors, a block of solid dielectric material enclosed in said metal casing to insulate said casing from said conductors of the detachable or disconnectable members (breaking device, connecting device, etc.) is characterized essentially in that said detachable or disconnectable members are electrically connected to said conductors at junctions disposed in a liquid dielectric medium of moderate volume, independent of that which may be provided for other functions, such as insulating and breaking a switching device.

According to a first form of embodiment of this invention, said conductors embedded in the solid dielectric consist of a set of bars and of a set of contact members of the plug-in type, intended for an insulating and breaking a switching device.

According to a specific features characterizing this first form of embodiment, the solid dielectric block in which said set of bars is embedded is disposed within the metal casing and spaced from the walls of said casing by means of insulating wedges or pegs.

According to a modified form of embodiment of this specific features, said solid dielectric block is suspended from the cover of said casing, a free gap being left between the solid dielectric block and the casing walls and filled with liquid dielectric substance.

According to another feature said solid dielectric block, in which the set of bars and the set of plug-in contact members are embedded, has also embedded therein a grounded grip disposed between said set of bars and said set of plug-in members.

According to a second form of embodiment of this invention the conductors embedded in said solid dielectric block consist of the connecting members of the cables and the junction pins for connecting said conductors to other compartments.

According to a feature common to the first and second forms of embodiment broadly set forth hereinabove, the plug-in contact members are each disposed within a cup of relative small volume filled with a liquid dielectric substance independent of that existing for another use in the apparatus.

According to an advantageous form of embodiment of this feature all the cups associated with the plug-in members of the various junction elements are disposed in a common horizontal plane and communicate with one another in order to provide a stabilized general horizontal level.

According to a constructional feature characterizing this invention, the cup or cups are either moulded or machined from a block of the same solid insulating material as that used for embedding one or a plurality of fixed conductors.

As exemplary form of embodiment of this invention is illustrated diagrammatically by way of example in the accompanying drawing. In the drawing:

FIG. 1 is a vertical section showing a cell or unit incorporating a double embodiment of the subject matter of this invention as far as the "set of bars" compartment and the "cable head" compartment are concerned, respectively.

FIG. 2 is a modified construction wherein the solid dielectric block is suspended from the cover of the casing, and

FIG. 3 is another form of embodiment wherein the solid dielectric block is wedged inside the metal casing of the apparatus.

Referring first to FIG. 1, the cell of casing comprises two compartments, namely a compartment A enclosing the set of bars, and a compartment B enclosing the cable head.

The compartment A comprises an external metal casing or sheath 1 enclosing in its lower or bottom portion a block 2 of solid dielectric material in which the set of bars 3 are embedded. In FIG. 1 the block 2 is shown as being moulded directly in the casing 1; in FIG. 2 this block is suspended by means of tie rods 4 from the cover of the casing; in FIG. 3, the block 2 is separated from the inner wall of casing 1 by means of wedges or pegs 5 and 6. In the example illustrated in FIG. 1 three cups 2a, 2b, and 2c are moulded integrally in this block 2 and have coplanar horizontal bottoms.

These three cups contain a small quantity of liquid dielectric substance D1, on account either of their initially reduced dimensions or of the fact that a suitably shaped member is introduced into these cups to decrease the volume available for said liquid dielectric substance, for example in the manner disclosed in a copending patent application filled by the same Applicants this same day under Ser. No. 10,794.

Plug-In contact members 6 and 7 project centrally of each one of said cups 2a, 2b and 2c. Member 6 is connected to one of the bars 3 and member 7 is U-shaped and has one branch 7a emerging into cup 2b and the other branch 7b emerging into cup 2c.

In this example the first compartment A encloses a breaking device designated in general by the reference numeral 8 and comprising rods 8a and 8b adapted, in one of their axial positions, to make contact with corresponding contact members 9 and 10.

These contact members 9 and 10 carry at their lower portion plug-in or like heads 6a and 7a.
This breaking device is enclosed more particularly in an insulating vessel 11 filled up to level D2 with a liquid dielectric substance. The bottom 11a of this vessel 11 is so shaped that portions 11b thereof project into the underlying dielectric and surrounding cups 2a and 2b to reduce their inner volume.

On the other hand, contact members 9 and 10 are designed with a view to seal the passage between the inner space E of vessel 11 and the inner space of cups 2a and 2b. Advantageously, these contact members 9 and 10 are moulded and retained in position by a transverse partition such as 11b. Thus, the liquid dielectric substance filling these cups represents a moderate volume and is independent of variations in the amount of liquid dielectric contained in the upper, larger vessels 11. The level of the liquid dielectric in these cups may be set at D1.

The other compartment B is designed in a similar fashion. A metal casing 12 encloses a cable box for a cable 13 having its head rigid with a contact pin 14 extending through the bottom 15a of a cup 15 consisting of solid dielectric material. This cup 15 is filled with liquid dielectric (introduced at 16) up to a level D3.

An electric connecting member 17 having the characteristic features described in a copending patent application Ser. No. 10,792, filed on even date herewith of the same Applicants, has its ends 17a and 17b dipped into the cups 2c and 15, as shown.

This connecting member comprises plug-in connecting members 18 and 19 adapted to engage the pin heads 7b and 14, respectively. A wire grid element 20 grounded and disposed between the set of plug-in members 9 and 10, on one hand, and the set of bars, on the other hand, is embedded in the block 2 of solid dielectric material.

This wire grid may be embedded in the insulating material of a single body or possibly in two bodies of solid dielectric material in case this block were divided into sections.

Of course, it would not constitute a departure from the scope of the present invention to bring various modifications and variations to the specific forms of embodiments shown and described herein by way of example, as will be readily occur to anybody conversant with the art.

What is claimed as new is:

1. A prefabricated disconnectable high-voltage electric station unit comprising:
   a casing;
   a block of solid dielectric material disposed within and generally filling a lower part of the casing;
   means defining at least one upwardly opening cuplike recess in said block;
   at least one conductor bar embedded in the block of solid dielectric material, each bar having an end portion extending up into and being exposed within a respective one recess;
   an insulating vessel disposed within said casing and having sidewalls and a bottom wall;
   said vessel bottom wall having at least one downward projection, each said projection corresponding to the location of a respective cuplike recess;
   electrical contact means extending from within said vessel through each projection and exposed therebelow; said downward projection and the exposed portion of said electrical contact means filling a major portion of each respective cuplike recess;
   the exposed portion of said electrical contact means removable contacting the exposed end portion of said conductor bar within said cuplike recess;
   and a liquid dielectric material filling the remainder of said cuplike recess exteriorly of said vessel.

2. The prefabricated disconnectable high-voltage electric station unit of claim 1 wherein said block of solid dielectric material is molded in situ in said casing so as to intimately conform to the lower portion thereof.

3. The prefabricated disconnectable high-voltage electric station of claim 1 further including a cover for said casing and said means suspending said block of solid dielectric material in the lower portion of said casing, the block of solid dielectric material being held spaced a short distance from contact with the casing, and said liquid dielectric material extending over and completely enclosing said block of solid dielectric material.

4. The prefabricated disconnectable high-voltage electric station of claim 1 further including relatively thin spacer means inserted between said casing and said block of solid dielectric material for disposing said block of solid dielectric material a short distance from contact with the casing, and said liquid dielectric extending over and completely enclosing said block of solid dielectric material.

5. The apparatus of claim 1 further including means mounting at least one contact rod for longitudinal, vertical reciprocation within said vessel between one, lower portion wherein the lower end of the contact rod is in electrical contact with said electrical contact means within said vessel and another, raised position wherein the contact rod is out of electrical contact with said electrical contact means.

6. The apparatus of claim 5 further comprising a second body of liquid dielectric material received within said vessel, submerging the lower end of the contact rod and the electrical contact means within the vessel.

7. The apparatus of claim 1 wherein at least one additional cuplike recess is formed in said block dielectric material, wherein at least an additional conductor bar for a different phase of electrical current is embedded in said block of dielectric material and has an upper end portion extending up in said additional recess;

   wherein said vessel bottom wall has a additional downward projection corresponding to the location of the additional cuplike recess; wherein an additional electrical contact means extends from within said vessel through the additional projection and is exposed therebelow; the downward projection of the exposed portion of the additional electrical contact means filling a major portion of the additional cuplike recess;
   the exposed portion of the additional electrical contact means removably contacting the exposed end portion of the additional conductor bar within said additional cuplike recess;
   the recesses all extending up to approximately the same level and said liquid dielectric material being filled into said casing until a level above the upper extents of the recesses.

8. The apparatus of claim 7 wherein the electrical contact rods are molded into said block of solid dielectric material as partly exposed inclusions therein.

9. The apparatus of claim 7 further including grounding grid means embedded in said block of solid dielectric material and exposed to said liquid electrolyte between said at least one cuplike recess and said additional cuplike recess.

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