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 [21] Appl. No. **850,966**
 [22] Filed **Aug. 18, 1969**
 [45] Patented **June 8, 1971**
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 [32] Priority **Aug. 16, 1968**
 [33] **Switzerland**
 [31] **12,378/68**

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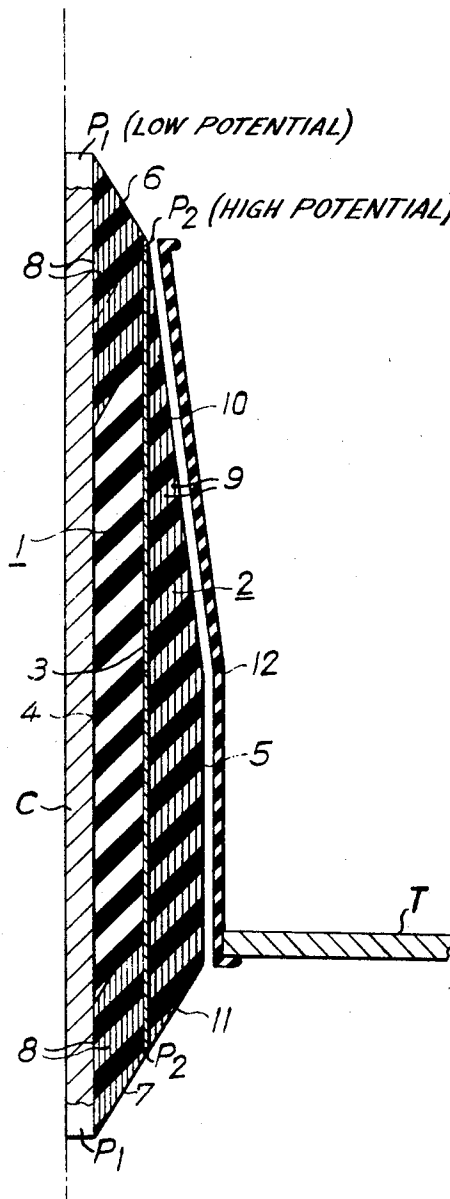
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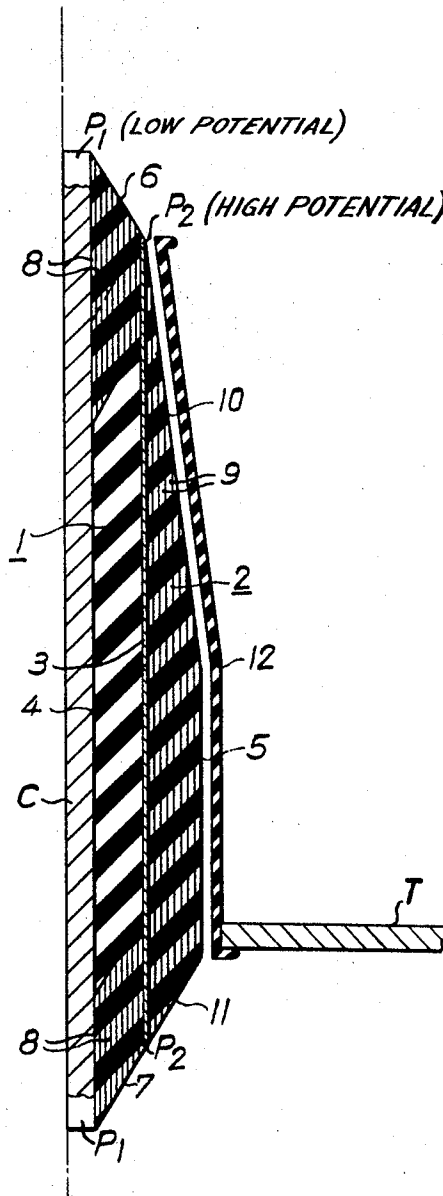
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[54] **CAPACITIVE-INSULATING AND CONNECTOR ASSEMBLY FOR TRANSFORMERS AND THE LIKE**
 10 Claims, 1 Drawing Fig.

[52] U.S. Cl. **174/31,**
 174/73, 174/143
 [51] Int. Cl. **H01b 17/28**
 [50] Field of Search 174/19, 31,
 73, 142, 143; 336/69, 70

ABSTRACT: Two conductors connected respectively to low and high potential windings of a transformer are led through an insulating bushing in the transformer housing. The conductors are concentrically disposed and capacitive insulators are disposed respectively between the two conductors and between the outer conductor and the bushing. The two insulators and the outer conductor are integrated into a single unit in which the inner insulator controls the full potential between the conductors predominately in radial direction but, as well, partially in axial direction. The outer insulator controls the potential both radially and axially.





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CAPACITIVE-INSULATING AND CONNECTOR ASSEMBLY FOR TRANSFORMERS AND THE LIKE

BACKGROUND OF THE INVENTION

The leads extending from the high-tension windings of a transformer are often led through the transformer tank which is at ground potential through an insulating bushing and the high-tension potential of the lead is reduced toward the tank cover by the utilization of concentrically wound layers of insulating material which are provided with conductive coatings and which are conically tapered above and below the tank cover. Such insulators control the full potential between the winding lead and the tank cover which is at ground potential both in axial and radial directions with respect to the insulating material. The inner end of the insulation is tapered at one angle to space the exposed ends of the conductive layers in accordance with the characteristics of the oil in the transformer tank and the outer or opposite end of the insulating material is tapered at an appropriate angle to space the exposed edges of the conductor layers in accord with the characteristics of air.

One often encounters transducers or converters which are connected with one winding at high-tension potential and the other at ground or low-tension potential. In these cases, it is customary to provide two adjacent leads one of which is wound with insulating material as described above from bottom to top and the other from top to bottom and these two leads are enclosed within an insulating bushing leading through the transformer cover. This solution is not economical with respect to space requirements and production costs.

BRIEF SUMMARY OF THE INVENTION

The present invention solves the above problem by providing concentric capacitive-insulating members having an intermediate conductive layer therebetween and with the inner insulation member being adapted to surround the other conductor so that the full potential difference between the conductors or windings of the transformer is controlled to flow through the inner member in radial as well as axial direction and such that the interior surface of the inner member and the external surface of the outer member are established with the same potential in the region where the members are of the largest diameter.

The above assembly is disposed within a ceramic insulator bushing which may be filled with liquid insulating material or it may be enclosed within a bushing of wound fibrous insulating material which is saturated with a suitable synthetic resinous material.

BRIEF DESCRIPTION OF THE DRAWING

The single FIGURE of the drawing is a longitudinal section showing one half of an assembly according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the drawing, there is shown an elongated cylindrical body 1 of insulating material having opposite end portions provided with tapered outer surfaces as indicated by the reference characters 6 and 7. The body may be wound of concentric layers of insulating material and in the opposite end portions thereof the concentric windings are provided with layers of conducting material 8 which extend for predetermined axial lengths as shown. The lower tapered end 7 of the body is tapered at an angle to space the exposed edges of the conductive layers 8 in accord with the characteristics of the transformer oil whereas the opposite end 6 is tapered in accordance with the characteristics of air. The intermediate portion of the body 1 between the conducting layers 8 is constructed such that its opposite ends whereat the layers 8 begin are sloped as shown, the lower end being at substantially the same angle of slope as the lower end 7.

The opposite ends 6 and 7 of the body 1 may be sloped oppositely as indicated by the dashed lines depending on the

form of construction employed for the active portions to be connected.

The body 1 is surrounded by a layer 3 of electrically conducting material which may be in the form of metal foil windings, a copper tube or the like and directly upon this electrically conducting layer 3 is the outer capacitive insulating portion 2 which is formed of concentrically wound layers of insulating material covered with electrical-conducting layers 9 and with the lower end 11 of the body 2 being tapered to expose the end edges of the layers 9 according to the characteristics of the oil in the transformer tank and with the upper end 10 tapered to provide spacing between the exposed edges of the layers 9 according to the characteristics of air. The entire assembly is disposed within the ceramic bushing 12 which projects through the transformer tank cover T so that the tapered portions of the insulating bodies are above and below same. Alternatively, the bushing 12 may be formed of a suitable wound fibrous insulating material which is saturated with a synthetic resinous material which is subsequently set and cured.

The inner body 1 is adapted to surround an electrical conductor C connected to the low potential winding of the transformer and the electrically conductive layer 3 is adapted to be connected to the high potential winding. Because the intermediate portion of the body 1 is largely devoid of the electrically conducting layers 8, the potential difference between the low potential P_1 and the high potential P_2 is largely controlled across this intermediate portion of the body in a radial direction whereas in the opposite end portions thereof, the full potential is controlled both in radial and axial directions. The potential between the high-tension potential P_2 and the tank cover which is substantially at ground potential is controlled across the outer body 2 both in axial and radial directions such that the potential at the outer surface 5 of the outer body 2 is at the same potential as is the inner surface 4 of the inner body 2. Thus, the entire potential difference is controlled twice in a radial direction and four times in an axial direction so as to allow for a more compact and efficient connection.

According to the description hereinabove, the potential P_2 is the higher and the potential P_1 is the lower whereas it will be understood that it is possible to select the opposite relationship in which case the bodies 1 and 2 should be arranged in the reverse order from that shown in the drawing.

The present invention makes it possible to provide considerable saving in space so that only one instead of two separate leads are needed and such that the empty filler spaces which result when two leads are disposed adjacent each other in a common ceramic insulator are avoided. Additionally, substantial savings in manufacturing cost result in that the device is provided by a single integrally wound construction.

It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptations.

I claim:

1. An insulating-connector assembly comprising, in combination:

a tubular inner insulator adapted to surround a first conductor;

an outer insulator surrounding said inner insulator; and

a cylindrical electronically conductive layer disposed between said insulators adapted for connection to an electrical potential substantially different from that of the first conductor;

one of said insulators including means for controlling the electrical potential difference between the two conductors predominantly in radial direction;

the other of said insulators including means for controlling the potential difference both in radial and axial directions;

the interior surface of said inner insulator and the external surface of said outer insulator exhibiting the same potential at least along portions thereof when the assembly is in its operating condition.

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2. The assembly as defined in claim 1 and including a ceramic insulator surrounding said outer insulator in spaced relation thereto; and liquid insulating material filling such space.

3. The assembly as defined in claim 2 wherein said insulators are wound of fibrous insulating material which is saturated with set and cured synthetic resinous material.

4. A capacitive-insulating and connector assembly adapted to extend through an insulating bushing leading from the interior to the exterior of a housing containing as electrical device having first and second conductors disposed respectively at low and high electrical potentials, comprising in combination:

- a cylindrical body of insulating material for surrounding one of said conductors, said body having at least one end portion provided with concentrically wound layers of electrically conductive material leaving an intermediate portion of said body in the absence of such conductive material;
- an electrically conductive layer surrounding said body and adapted to be connected to the other of said conductors whereby the full potential difference between said conductors is controlled radially through said intermediate portion of said body and both axially and radially through said one end portion of the body;
- a second cylindrical body surrounding said conductive

layer, said second cylindrical body being provided throughout its length with concentrically wound layers of electrically conductive material whereby said full potential difference is controlled both radially and axially through said second cylindrical body.

5. The assembly as defined in claim 4 wherein the opposite ends of said second body are tapered to control the spacing between the exposed edges of adjacent conductive layers thereof.

6. The assembly as defined in claim 5 wherein said one end of the first body is tapered to control the spacing between the exposed edges of adjacent conductive layers thereof.

7. The assembly as defined in claim 6 wherein that end of said intermediate portion of said first body is tapered similarly to said one end thereof.

8. The assembly as defined in claim 4 wherein said one end of the first body is tapered to control the space between the exposed edges of the adjacent conductive layers thereof.

9. The assembly as defined in claim 8 wherein that end of said intermediate portion of said first body is tapered similarly to said one end thereof.

10. The assembly as defined in claim 4, wherein said one of said conductors is said first conductor and said other of said conductors is said second conductor.

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