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WAVE GUIDE FOR HIGH FREQUENCY ELECTRIC CURRENTS

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FIG. 2.

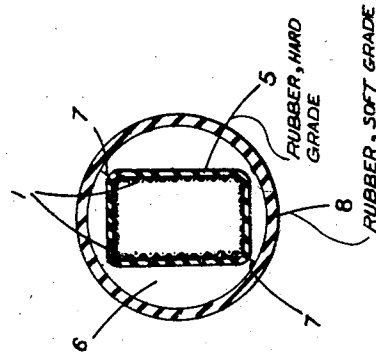
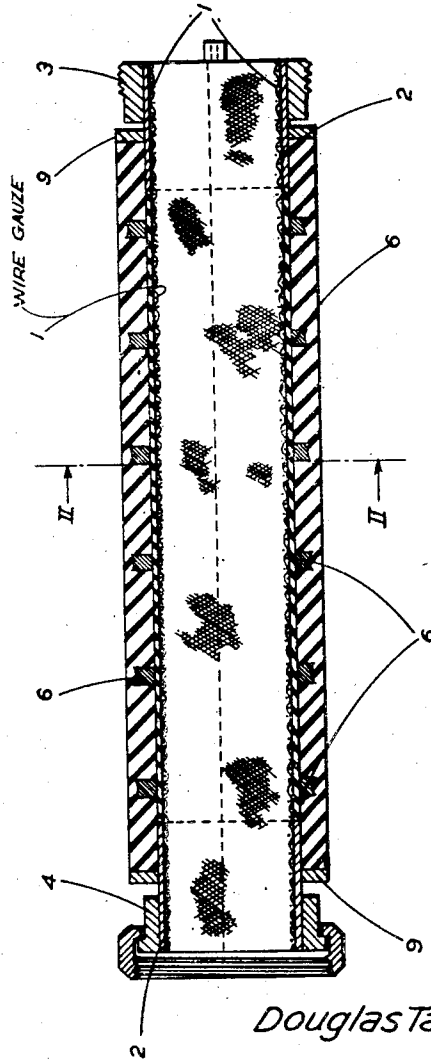


FIG. 1.



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WAVE GUIDE FOR HIGH-FREQUENCY
ELECTRIC CURRENTS

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4 Claims. (Cl. 178-44)

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This invention relates to wave guides for high frequency electric currents of the kind in which the guide is a tube of rectangular cross section with a conductive inner surface layer. The object of the invention is to provide a length of such a guide which has sufficient flexibility combined with a minimum distortion of cross section to permit it to undergo bending and/or twisting within desired limits without great loss of electrical efficiency. Such a length may, for instance, be required for connection between two lengths of rigid guide on two parts of a structure between which relative movement can take place from time to time.

The improved guide is made as a tube of wire gauze of fine mesh which is accurately shaped to enclose a rectangle of the required dimensions and is held yieldingly in this form by a covering of rubber (or other equivalent material) moulded on to it and vulcanised (or otherwise toughened) in position. To give the required combination of flexibility with the power to hold its shape in cross section, the covering of the tube of wire gauze consists of a base layer of rubber supported by circumferential ribs at intervals and it is in the construction of these ribs that the present invention is found.

In this construction each circumferential rib or collar is formed of partial ribs of rigid material, for instance fibre, wood or metal, which rest on the rubber base layer over the gauze and are secured adherent to it. Each part-rib extends at least for the full length of one of the sides of the rectangle. The part-ribs are bound in position and combined to form the circumferential ribs by application to the base layer before this has been vulcanised and by covering the part-ribs with a binding strip of unvulcanised rubber compound so that the rubber surrounding the ribs, both on the inner and outer sides, is united during vulcanisation. The ribs may also be made to adhere to the adjacent rubber by appropriate treatment.

A complete rib is built up of two or more parts to provide a complete circumferential collar fitting against and adherent to the base layer of rubber on all sides of the tube. Each part-rib may consist of a piece of material having a flat inner face corresponding to the length of the side of the rectangle to which it is to be applied and a curved outer face which permits it to receive in a convenient manner a binding strip of rubber compound which runs continuously over it and on to the portion of the rib located on the adjacent wall of the tube.

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The spaces between the ribs may be partially or completely filled with rubber. In the example illustrated in the accompanying drawing, the spaces are completely filled up to the level of the binding over the ribs. In this drawing Figure 1 is a central longitudinal section and Figure 2 is a transverse section on the line II-II of Figure 1.

The rectangular tube 1 of wire gauze is in this example provided at each end with a thin covering of sheet metal 2 to which it is attached and by which it is joined to the union element 3 or 4 by which this section of the wave guide is connected to adjacent sections. To these sheet metal coverings are attached the flanges 9 of metal. Over the whole length of the rectangular tube of wire fabric is applied, a layer 5 of unvulcanised rubber tape forming a complete covering of the metal fabric. The rubber compound of which this tape is formed is of hard grade so as to support the pressure of the rib members and permit them to be fixed in position on it without penetration through it. Each rib 6 is formed in two parts, the division being on the lines 7. In some cases, for instance, for large wave guides, the ribs may be made in four sections by further divisions at the other two corners of the rectangle.

The sections are placed in position at intervals as shown in Figure 1 and are held temporarily in position by a binding wire which lies in the slightly concave outer face of the rib. Each of the ribs before placing in position is painted with a bonding solution. When all of the ribs are in place, unvulcanised rubber of a softer grade than the layer 5 is put on in the form of tape to fill the spaces between the flanges 9 up to the level of the outer edges of the ribs 6. This application is made partly by wrapping and partly by folding and pressing on by hand so as to build up to the circular form shown in Figure 2. At this stage the wire binders are removed from the ribs which are then held in place by the adjacent rubber. Further wrappings of rubber tape are then applied over the whole length of the guide between the end flanges 9 forming a binding layer 8 Figure 2. The whole cylindrical body is then placed in a mould and vulcanised.

It is to be understood that the term "rubber" used herein is not to be limited to natural rubber. Its function is to provide a covering and binding for the tube and the ribs which gives a strong but yielding support to the tube of gauze and which can be moulded thereon. In addition to natural rubber various synthetic rubbers and

rubber-like materials having the required properties may be used. They may be capable of application in the cold followed by hardening and toughening by a heat treatment and analogous to vulcanisation in its effect, or they may be thermo-plastic and applied hot regaining their toughness and comparative hardness on cooling.

What I claim as my invention is:

1. A wave guide comprising a tube formed of wire fabric of fine mesh and having the cross section of a rectangle, an external covering of vulcanised rubber fitting closely on said tube, circumferential ribs of rigid material on said covering, formed of parts each running at least the length of one of the sides of the rectangle, and a binding layer of vulcanised rubber on the outside of each sub-divided circumferential rib.

2. A wave guide comprising a tube formed of wire fabric of fine mesh and having the cross section of a rectangle, an external covering of vulcanised rubber fitting closely on said tube, circumferential ribs of rigid material on said covering, formed of parts each running at least the length of one of the sides of the rectangle, a binding layer of vulcanised rubber on the outside of each sub-divided circumferential rib and vulcanised rubber filling the spaces between the said ribs and integral with said covering and said binding layers.

3. A wave guide comprising a tube formed of wire fabric of fine mesh and having the cross

section of a rectangle, an external covering of vulcanised rubber fitting closely on said tube, circumferential ribs of rigid material on said covering, formed of parts, each running at least the length of one of the sides of the rectangle and having a flat inner face or faces and curved outer face, the latter forming, when the parts are in position, a continuous smoothly curved outer surface for the rib, and a binding layer of vulcanised rubber outside said rib on said curved surface.

4. A wave guide comprising a tube formed of wire fabric of fine mesh and having the cross section of a rectangle, an external covering of vulcanised rubber fitting closely on said tube, circumferential ribs of rigid material on said covering, formed of parts, each extending over two adjacent sides of the rectangle, the ribs being divided at diagonally opposite corners, and a binding layer of vulcanised rubber surrounding each of the sub-divided ribs.

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