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MANUFACTURE OF FLEXIBLE TUBES OF ARTIFICIAL SUBSTANCES

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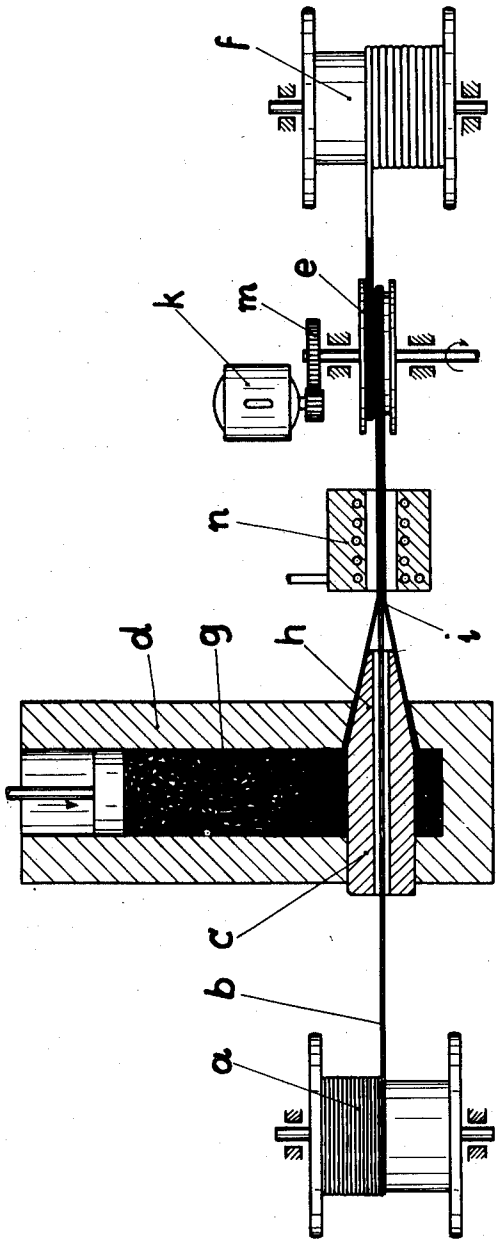


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## MANUFACTURE OF FLEXIBLE TUBES OF ARTIFICIAL SUBSTANCES

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5 Claims. (Cl. 18—59)

This invention relates to a method of manufacturing insulating tubes or hoses of polystyrol or like polymerization products of aryl olefines for electric conductors and is a division of our application, Serial No. 693,213, filed 11th October, 1933.

Polystyrol itself and substances similar to it are generally hard and brittle and, therefore, it is not possible to produce from such substances, by ordinary extrusion, insulating coverings which will withstand the bending stresses to which an electric cable is exposed. According to the invention, it is possible to produce a sufficiently flexible tubular covering by exerting a pull on the tube of insulating material which is pressed out of the mouthpiece. The force of this pull must be so great that the speed of the tube which is drawn out is greater than the outlet speed of the heated mass leaving the extrusion mouthpiece.

The accompanying drawing illustrates, by way of example, in plan view, partly in section, a general arrangement for carrying the method according to the invention into effect.

The copper wire *b* runs from the reel *a* through the member *c* of a pressing device *d*, over a drawing-off disc *e* to the reel *f*. The polystyrol *g* which is placed in the pressing device *d* and passes through the mouthpiece *h* places itself around the conductor *b* at *i*. The speed of the drawing-off disc *e* is adjusted, by means of the motor *k* and a change-speed gear *m*, in such a manner that the tube of polystyrol coming out of the mouthpiece *h* is subjected both to stretching and to a reduction in the diameter, being thereby drawn over the conductor at *i*. A cooling device *n* may be provided between the mouthpiece *h* and the drawing-off disc *e*. By using a number of presses one behind the other, or by suitably constructing the mouthpiece, the conductor may be surrounded with a number of coverings in one operation.

It is an advantage to provide thin layers of fat or the like between the copper conductor and the first insulating layer, as well as between the individual insulating layers, which layers of fat prevent the individual coverings from firmly adhering to one another and to the metal. Besides fat, use may be made of any other material having a high dielectric value, which would prevent the adhesion and which does not attack either the insulating material or the metal.

The method according to the invention is of special importance for the manufacture of air space insulated conductors for signalling cables. By means of the device described with reference to the drawing, it is possible to manufacture air space insulated conductors in a single operation by providing between the reel *a* and the member *c* a known device for the formation of a thread or cord winding. It is, however, also possible to provide the thread or cord winding beforehand in a separate operation. The thread may also consist of polystyrol; however, it may be made of any other suitable insulating material, for instance paper. The copper conductor thus wound with a thread and prepared beforehand in the manner just referred to is then covered with a tubular covering of polystyrol, immediately behind the pressing device.

As compared with the known conductors provided with paper and air space insulation, the insulation of the air space insulated conductors according to the invention shows substantially better electric values. The average dielectric constant is 1.3–1.4 and the tangent of the angle of loss $0.2.10^{-3}$ (as compared with 1.6 and $3.10^{-3}$ in the case of paper and air space insulated conductors).

If it is desired to strand together a number of air space insulated conductors according to the invention, it is an advantage first of all to heat the conductors to about 50–70°. After the cooling, the conductors retain exactly the position which they have assumed in the heated state. The capacity values of such a group of conductors remain to a very large extent constant, also under unfavourable conditions, for instance during the laying of submarine cables.

In order to fix the position of the individual conductors relatively to one another and thereby also the capacities of the telephone circuits, a further method for this purpose consists in covering all or a portion of the group of conductors, each with a tubular covering of polystyrol, preferably without using an intermediate layer which would prevent the adhesion.

What we claim is:

1. A method of manufacturing flexible tubes or hoses of polystyrol and other polymerization products of aryl olefines, which tube or hose forms the covering of a metallic conductor, consisting in drawing the said material heated at a high temperature through a mouthpiece of annular shape under pressure in such a manner that the drawing speed is greater than the outlet speed of the mouthpiece, the metallic conductor being passed through a bore provided in the central part of the mouthpiece.

2. A method of providing a metallic conductor with any desired number of flexible tubes or

hoses manufactured as claimed in claim 1, comprising the step that layers of fat or of other substances capable of preventing sticking are provided between the metallic conductor and the first flexible tube and between the flexible tubes.

3. A method of manufacturing air space insulated conductors consisting in first providing a metallic conductor with a cord or thread winding of polystyrol or like insulating substance, and then covering it with a tube or hose manufactured by the method claimed in claim 1.

4. A method of manufacturing groups of conductors from individual conductors covered by a flexible tube manufactured according to the method claimed in claim 1, comprising the step that before the conductors are stranded into groups they are heated to about 50–70° C.

5. A method of manufacturing groups of conductors from individual conductors covered by a flexible tube manufactured according to the method claimed in claim 1, comprising the step that before the conductors are stranded into groups they are heated to about 50–70° C., and the further step that a similar flexible tube is provided on the group of conductors.

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