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MANUFACTURE OF FLEXIBLE BANDS, THREADS, FOILS,
AND TUBES OF ARTIFICIAL SUBSTANCES
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Fig. 1.

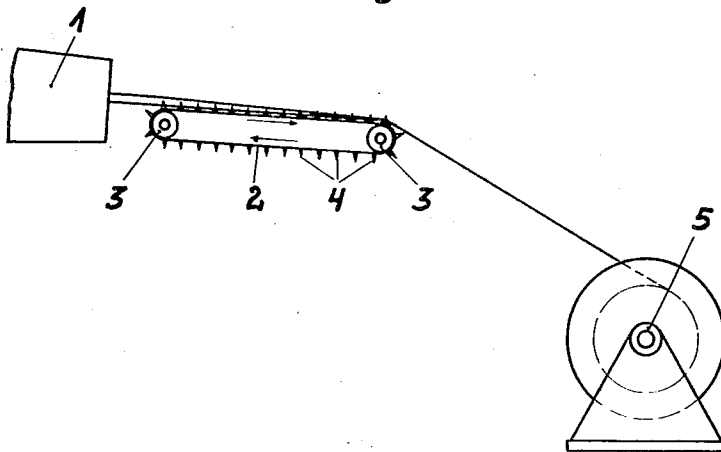
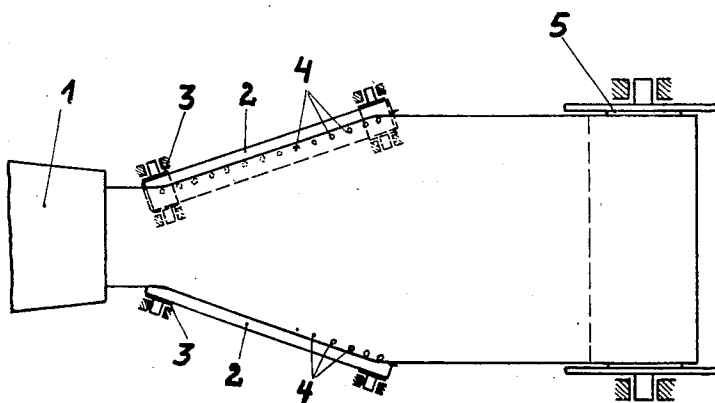


Fig. 2.



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MANUFACTURE OF FLEXIBLE BANDS,
THREADS, FOILS, AND TUBES OF
ARTIFICIAL SUBSTANCES

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6 Claims. (Cl. 18—57)

This invention relates to a method of manufacturing flexible bands, threads, foils and tubes of polystyrol or other polymerization products of aryl olefines.

5 Polystyrol itself and substances similar to it are crystal clear artificial substances which have no plastic, but on the contrary, brittle properties. Owing to their good electrical properties it is desirable in the application to electric cables to form them into flexible bands or threads. More particularly in the case of submarine cables it is important to have a substance which has good electrical values; is not deformed, or only little deformed, when the insulating material is at 10 a temperature of about 100 to 110° C. which is required for the pressing-on of the insulating sheath; possesses great hardness and is sufficiently flexible to be wound around the conductor.

Experiments have shown that the mere extrusion of polystyrol from a nozzle does not produce any mechanically useful threads or bands. On the contrary, the bands thus formed are brittle, like the initial material, and break under comparatively small stresses. It has now been found 20 that it is possible to form bands or threads having the desired properties, from polystyrol or other polymerization products of aryl olefines, if the material is drawn through a nozzle at high temperature whilst pressure is at the same time applied to the nozzle, in such a manner that the drawing out speed is greater than the outlet speed of the nozzle. The thread which is thereby produced has a smaller cross-section than the nozzle from which it has been drawn. At the same time 30 the structure of the material is also altered and the changed mechanical properties are to be attributed to this change in the structure. As found by experiment, the most favourable mechanical properties are obtained when the diameter of the thread has been reduced to about a third of the diameter of the nozzle by the increased speed of drawing. It has also been found that more particularly in the case of polystyrol these mechanical properties are best obtained when the 40 temperature of the material is kept at about 140–155°. A thread manufactured under these experimental conditions is so flexible that it can be wound round its own diameter at normal temperature without breaking. The above experimental conditions have been found to hold good also in the case of bands. The bands may be manufactured with the desired width or be cut from a wider band produced according to the invention.

55 It is possible to use the method described for

the manufacture of bands or threads of polystyrol or like substances which have ferro-magnetic properties. For this purpose polystyrol is heated to such a temperature that it becomes liquid, whereupon a powder of a ferro-magnetic alloy, 5 for instance an iron-nickel alloy, is added thereto. This mixture is then converted into threads, bands or the like according to the same method as above described in connection with pure polystyrol.

As polystyrol possesses a very low angle of loss, as compared with other insulating substances used in the electrical industry and as it also possesses a small dielectric constant and is highly insulating, the magnetic material obtained therewith shows small dielectric and magnetic losses and these losses change but little with the frequency, so that the said material is especially useful for the continuous inductive loading of such signalling conductors which are intended for 20 high frequencies, for instance for the loading of submarine cable lines working with carrier frequencies.

The bands manufactured according to the method hereinbefore described can be bent around small diameters at right angles to the longitudinal direction of the band, without breaking; however, in the longitudinal direction they are still brittle and liable to crack.

A further object of the invention is to provide a method of manufacturing flexible bands and foils from polymerization products of aryl olefines, for instance polystyrol, which bands and foils bend and yield in either direction so that they have completely lost their brittleness. This object is attained according to the invention by causing a band of the artificial substance, which is extruded through a nozzle at a high temperature to be subjected, during the extrusion or immediately after the extrusion from the nozzle, not only to a longitudinal pull but also to a transverse stretching. It has been found that the best mechanical properties are obtained by the drawn and transversely stretched bands and foils if their thickness, during the drawing in the longitudinal and transverse direction, is reduced to about 1/9 of the initial thickness. In order to obtain perfectly homogeneous foils it is further advantageous to subject the material to a uniformly strong pull in the longitudinal and transverse direction.

It is entirely immaterial what apparatus is used for carrying the method into effect. One mode of carrying the method into effect will now be described, by way of example, with refer- 55

ence to Figs. 1 and 2 of the accompanying drawing, the apparatus employed being known per se. The material to be treated, for instance polystyrol, is first of all pressed out of a mouth-piece 1 having a nozzle of rectangular cross-section, at a high temperature, preferably 150° C. The outgoing band then comes to the stretching device, which essentially consists of two endless bands 2 running over rollers 3, and which, as shown in Fig. 2, are so arranged as to diverge from one another. The rollers are suitably driven so that the upper part of the bands moves away from the nozzle. Small pins 4 are provided on the bands, which engage the band coming from the nozzle and take it along. After leaving the stretching device, the complete foil is wound on a suitable device 5. If it is necessary, the foil is cooled between the stretching device and the winding-on device.

Owing to their good dielectric properties, the bands and foils manufactured according to this method are especially suitable as insulating material of electrical apparatus, for instance wound condensers. Moreover, bands manufactured according to the invention may be used as a substitute for paper band insulation hitherto usually employed in cables. Further, the foils may be used for the building up of layered insulating substances. A further object of the invention is the application of the method of manufacture of threads and bands hereinbefore described to the production of flexible tubes or hoses. In this case instead of the nozzle, use is made of a mouth-piece having preferably an annular opening, the method of operation being otherwise the same. The tube is pressed out of the mouthpiece and at the same time drawn out in such a manner that the drawing-out speed of the tube is greater than its outlet speed from the mouthpiece. As a result thereof the diameter and wall thickness of the tube are reduced.

What we claim is:

1. A method of manufacturing flexible bands, tubes and threads of polystyrol and other polymerization products of aryl olefines which com-

prises first heating the said material to a high temperature, then extruding it through a nozzle while in such heated condition, and simultaneously subjecting the extruded material while still in the heated condition to drawing at a speed greater than the speed of extrusion, whereby the material becomes highly flexible.

2. A method of manufacturing flexible bands, tubes and threads of polystyrol which comprises first heating the material to a temperature of 140° to 150° C., then extruding it through a nozzle while maintaining it at said temperature, and simultaneously subjecting the extruded material to drawing at a speed greater than the speed of extrusion, whereby the material becomes highly flexible.

3. A method of manufacturing flexible bands, tubes and threads of polystyrol and other polymerization products of aryl olefines which comprises heating said material to fusion, mixing therewith a finely divided ferro-magnetic alloy, extruding the mixture through a nozzle and subjecting the extruded material to drawing at a speed greater than the speed of extrusion whereby the material becomes flexible.

4. A method of manufacturing flexible bands, tubes and threads of polystyrol and other polymerization products of aryl olefines which comprises heating said material to fusion, mixing therewith finely divided iron-nickel alloy, extruding the mixture through a nozzle, and subjecting the extruded material to drawing at a speed greater than the speed of extrusion, whereby the material becomes flexible.

5. As an article of manufacture, a flexible sheet composed of polystyrol and a ferro-magnetic alloy.

6. As an article of manufacture, a sheet, thread or tube of polystyrol rendered highly flexible by simultaneously heating it to a temperature between about 140° to about 155° C. and stretching it.

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