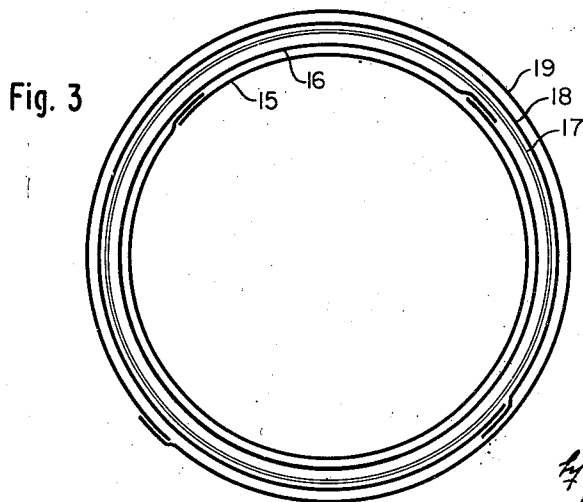
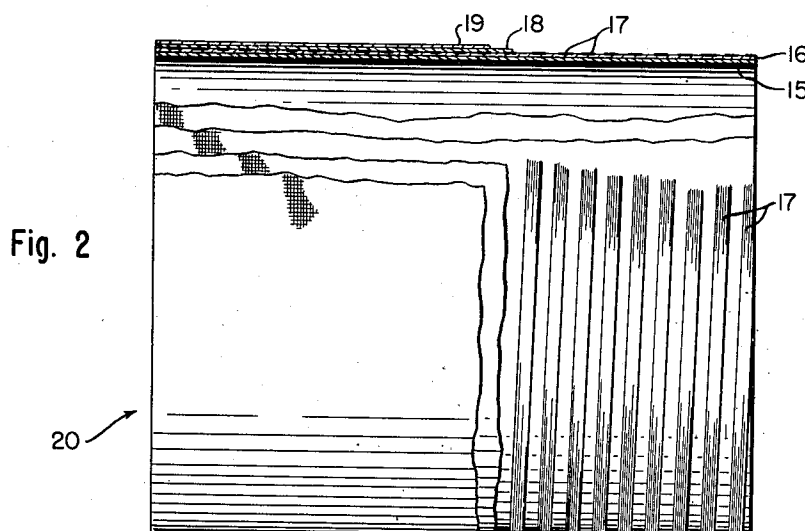
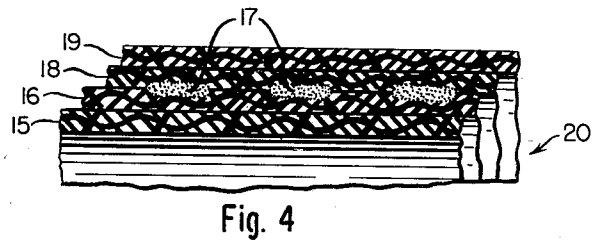
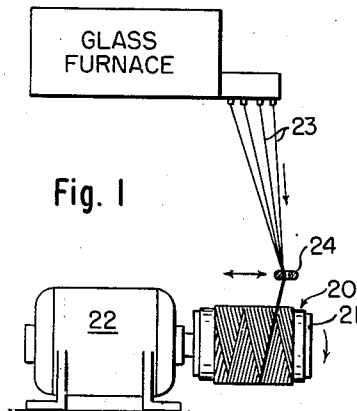


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FORMING TUBE FOR GLASS YARN

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FORMING TUBE FOR GLASS YARN

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2 Claims. (Cl. 138—55)

This invention comprises a new and improved forming tube for use in the glass textile industry for winding fibre glass filaments as they are assembled in yarn formation.

In making glass filaments for subsequent use as textile yarns, the molten glass is drawn through a series of small orifices so as continuously to form extremely fine filaments. A large number of these filaments is collected during the drawing operation and assembled to form a textile yarn of many parallel filaments. These collected filaments are then wound on a so-called "forming tube" for further processing. The linear speed at which the filaments are drawn is very high, in the order of 12,000 feet per minute, so that the winding tube must be revolved at a very high speed, frequently around 8000 R. P. M. On account of this high speed of winding and other reasons, the service requirements which these forming tubes must meet are extremely rigid. The character of the surface of the forming tube is also of great importance in that it must have a sufficiently high coefficient of friction so that the glass yarn will cling to it during the winding operation, but it must be smooth enough so that the yarn can subsequently be rapidly stripped from the tube.

It is important that the forming tube should be of light weight to avoid developing excessive centrifugal force that might deform it, and it must be shaped as a cylindrical open-end shell so that it can be removed from the windup collet as soon as it is filled with glass fibre yarn so that it may be conveniently replaced by an empty tube. The forming tube must not expand appreciably in any zone under centrifugal force, particularly because any flaring of the tube ends would cause the yarn to concentrate at the tube center and furthermore because any yarn wound on a flared portion of the tube would immediately become tangled and incapable of being further processed.

During the winding operation the yarn is wound very tightly on the tube, so much so that when the tube is removed from the collet there is a tendency for the tensioned glass fibre yarn to compress and kink the tube. This must be avoided since it greatly interferes with the free running and further processing of the yarn. For these reasons the wall itself of the forming tube of our invention is made highly resistant to compression.

Another characteristic required of forming tubes is flexibility and elasticity as it is sometimes necessary to facilitate removal of the first wound layer of glass fibre yarn from the forming tube during a final stripping step prior to reusing the tube. In order quickly to strip the yarn it is convenient to collapse the tube as a whole and it is very desirable that the tube should immediately resume its original shape upon removal of the collapsing force.

It is the general object of our invention to provide a forming tube so constructed as to obviate the disadvantages above discussed and to embody the advantageous characteristics mentioned.

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Heretofore the attempt has been made to employ plastic resinous materials such as polyethylene, or fibrous compositions such as fibreboard, but all these prior constructions have been subject to one or more of the disadvantages above discussed.

In its preferred form the tube of our invention comprises a hollow flexible resilient open-end cylinder including in its structure an inner ply of rubberized fabric, an intermediate helix of glass fibre having its turns spaced apart and thus exposing a spiral area of the inner ply, and an outer ply of rubberized fabric, the inner and outer plies being vulcanized and bonded together in areas between the turns of glass fibre helix and the outer ply presenting an external surface to which the glass fibre will cling in the winding operation.

These and other features of the invention will be best understood and appreciated from the following description of a preferred embodiment thereof selected for purposes of illustration and shown in the accompanying drawings in which:

Fig. 1 is a diagrammatic view illustrating the winding operation,

Fig. 2 is a view in elevation, partly in section, of the forming tube,

Fig. 3 is a view in end elevation, and

Fig. 4 is a fragmentary sectional view on a magnified scale.

The forming tube herein shown may be constructed upon a mandrel of suitable diameter by placing thereon the component plies of the tube, binding them beneath a tight cover or sheath, vulcanizing in situ, and finally removing from the mandrel.

The inner ply of the tube is formed of rubberized fabric and is herein shown as a double ply made up of the sheets or strips 15 and 16 wrapped with lapped joints disposed at different points about the inner circumference of the tube. The rubberized fabric employed may have a cotton or linen base, or a base of synthetic material such as rayon, nylon or the like, and is not necessarily limited to two layers of material.

Having completed the inner ply, it is next wrapped with a helix of flat glass fibre yarn having its turns 17 spaced apart so as to expose the surface of the inner ply and permit good contact and bond between it and the outer ply. The use of flattened glass yarn is particularly advantageous in the structure of the forming tube on account of its enormous strength per unit of cross section. This effectively prevents any distortion or flaring of the tube in actual use. Furthermore, the extremely low stretch and high elasticity of the glass fibre causes the tube immediately to reassume its original shape whenever it is temporarily collapsed in the step of stripping the yarn.

The outer ply is formed of two layers of rubberized fabric 18 and 19 which are wound over the helix of glass fibre with overlapping break joints as shown in Fig. 3. The internal diameter of the completed sleeve is approximately 6½", although its dimensions may be determined to suit the requirements of the winding machinery.

Having assembled the components of the tube as above described, they are vulcanized under the pressure of an enclosing sheath and in this step a permanent union is formed between the outer and inner plies where they contact between the spaced turns of the glass fibre yarn. After the vulcanizing step the tube is removed from its mandrel and cut to the desired length, for example, to 7¼". It will be understood that the forming tube of our invention may be constructed in such dimensions as may be required by the conditions of its intended use. A ratio of diameter to length of approximately 5:6 has been found satisfactory in many cases.

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In Fig. 1 a forming tube 20 is shown in operative position on a mandrel 21 mounted directly on the shaft of a motor 22. A multiplicity of glass filament 23 are drawn from orifices leading from a furnace containing molten glass and then filaments are collected by passing through a traverse 24 and distributed thereby in the tube 20. When the tube has been filled it is slipped off the mandrel and may be transferred to a spinning or braiding machine for further processing of the glass fibre yarn thereon.

Having thus disclosed our invention what we claim as new and desire to secure by Letters Patent is:

1. A forming tube for winding glass fibre yarn, comprising a hollow flexible and resilient open-end cylinder approximately $6\frac{1}{2}$ inches in diameter and capable of retaining its shape when revolved at 8000 R. P. M., the tube including in its structure an inner double ply of rubberized fabric, a flat intermediate helix of glass fiber yarn having its turns spaced apart, and an outer double ply of rubberized fabric presenting a smooth surface, the said inner and outer plies being vulcanized and permanently bonded together in areas between the turns of the glass fibre helix thus providing a tube that is collapsible as a whole but immediately resumes its initial shape upon removal of a collapsing force.

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2. A forming tube for winding glass fibre yarn, comprising a hollow flexible and resilient open-end cylinder having a ratio of diameter to length of approximately 5:6 and including in its structure an inner ply of rubberized fabric, a flat intermediate helix of glass fibre strands having its turns spaced apart and thus exposing a spiral area of the inner ply, and an outer ply of rubberized fabric, the inner and outer plies being vulcanized and bonded together in areas between the turns of the glass fibre helix, the outer ply presenting a smooth external surface to which glass fibre will cling in the winding operation, and the tube as a whole having the property of collapsing as a whole and of immediately reassuming its original shape upon removal of the collapsing force.

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