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F. P. SOUTHWORTH ET AL

TUBE PROCESS AND PRODUCT

Filed April 10, 1926

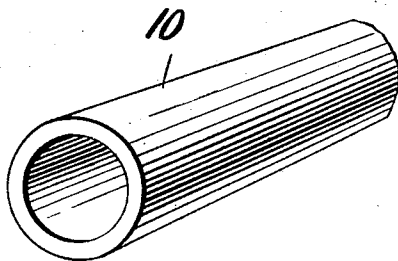


FIG. 1.

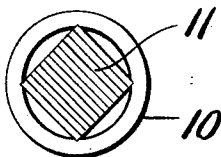


FIG. 2.

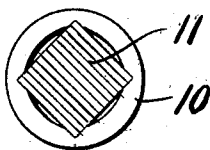


FIG. 3.

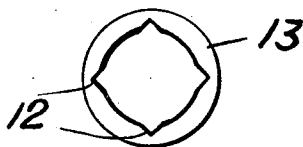


FIG. 4.

WITNESS:

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TUBE PROCESS AND PRODUCT.

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The present invention relates to tubes formed of fibre or other material and more particularly to tubes for use with square or other polygonal shaped mandrels or arbors as cores for mounting rolls of paper, cloth or any other material.

In many industries, such for example as the manufacture of billing machines, cores for paper rolls have been made of rubber, vulcanized fibre, and other materials, the paper being wound upon the cores and separately sold for use with the machines. In use the empty core is taken from its shaft and a full core substituted by simply slipping off one core and replacing with another. Some cores have heretofore been made with a cylindrical bore and others with a square bore, but those with a cylindrical bore had to be provided with notches or other means interfitting with the shaft in order to turn therewith, all of which required accuracy of workmanship and care in handling. This type of core was generally unsatisfactory and the machines using such cores were redesigned to use a square bar to receive a core having a square bore. The prohibitive cost of manufacturing square bore cores of vulcanized fibre led to the use of rubber which could be cheaply molded to the required shape and its use became general in spite of its inherent tendency to break easily. It has always been unsatisfactory on account of this disadvantage. Vulcanized fibre is the material generally desired but its use has been restricted due to the fact that heretofore a square bore has only been possible by employing a blank of relatively heavy section in order to work the material down to the required shape. The cost of material and labor therefore have made it commercially impractical.

Some of the objects of the present invention are to overcome the defects and disadvantages of tubes of the character referred to in the foregoing; to provide an improved method of forming tubes with a means to fit a square or polygonal shaft in order to turn therewith; to provide an improved tube of cylindrical exterior and polygonal interior; to provide a method of greatly reducing the cost of square bored tubes; to provide a method of tube manufacture whereby the amount of material required to form a square bore core is reduced to a minimum;

to provide a tube having a cylindrical bore formed with a number of longitudinally disposed grooves; to provide a tube whereby there is a large saving in material; and to provide other improvements as will hereinafter appear.

In the accompanying drawings Fig. 1 represents a tube blank shaped for carrying out the method of the present invention; Fig. 2 represents the same with a mandrel fitted therein; Fig. 3 represents an end of the tube as rolled upon the mandrel; and Fig. 4 represents an end of the tube as completed by the method of the invention.

Referring to the drawings, a blank 10 of fibre or other material to which the present invention is applicable is shown as a tube having a cylindrical internal and external configuration which is to be worked in accordance with the present invention to receive a square or other polygonal shaped mandrel. Following the completion of the tube blank 10, a mandrel 11, of square or other polygonal shape conforming in shape and size to the arbor or shaft upon which the finished tube is to be mounted to form a rotatable core, is driven into the blank 10, the relation between the internal diameter of the blank 10 and the transverse dimension of the mandrel 11 being such that there is little, if any, roughing out of the blank 10 by the edges of the mandrel 11. In other words, the predetermined dimensions are such that the mandrel can be easily forced into the blank with just enough bite at its edges to thereafter prevent relative turning or displacement.

With the mandrel 11 in place within the blank 10, the parts are now given a light rolling under calender press rolls to stretch and form the fibre to a new sectional shape having as many grooves 12 rolled therein as there are edges upon the mandrel; in this instance four, as a square mandrel is used. This rolling action, while slightly reducing the outside diameter of the tube, works the material engaged by the mandrel edges to form the grooves 12 and presents a sharp contrast to the method heretofore employed of laboriously changing the tube section by compressing and working the material until a true square section results. By the present method a small quantity of the fibre at each edge of the mandrel is worked in opposite

directions away from the entering edge and the quantity so displaced flows and merges into, or is absorbed by the wall of the tube.

After the grooves 12 have been formed the mandrel 11 is removed and the completed tube 13 is ready for use as a core for paper rolls or the like, it then only being necessary to insert an arbor of proper size and shape to fit the prepared bore of the tube.

Heretofore, in the manufacture of tubes having a cylindrical exterior and a square bore therethrough it has been necessary to provide a tube blank of relatively heavy wall section, which, when fitted over a square mandrel, is subjected to a heavy, laborious and careful rolling to compress the walls so that the material flows into and fills the space about the mandrel. This changes the entire conformation of the tube and the finished product is entirely changed as regards its original dimensions. In so forming tubes, allowance for shrinkage and flow of material must be made, and this excess material required makes the cost of the article practically prohibitive for commercial purposes. As an example of the saving in material by this new method it may be said that a rough unfinished blank of the size necessary to complete a core having a three-eighths inch square bore required twenty-one per cent more material than a rough unfinished blank to produce by the present method a grooved cylindrical bore to receive a three-eighths inch mandrel. In

addition to this saving in material the time of rolling is reduced from twenty hours to ten hours per thousand feet of tubing so that the cost of manufacture has been reduced to approximately seventy-five per cent of that of tubes having a true square bore.

From the foregoing it will be apparent that a new method of forming tubes used as cores and a new article has been devised whereby a more satisfactory and efficient tube has been produced than heretofore.

Having thus described our invention, we claim:

1. The method of forming tubes which consists in forming a tubular blank, inserting a polygonal mandrel in said blank, and rolling said blank to form a plurality of longitudinal internal grooves opposite the respective edges of said mandrel.

2. A new article of manufacture comprising a vulcanized fibre tube having a cylindrical bore provided with a plurality of longitudinally disposed grooves spaced in a predetermined relation.

3. A new article of manufacture comprising a vulcanized fibre tube having a cylindrical bore provided with a plurality of longitudinally disposed grooves shaped and arranged to seat the respective edges of a polygonal part inserted in said tube.

Signed at Wilmington, county of New Castle, State of Delaware, this 7th day of April, 1926.

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