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(54) **Yarn spinning tube.**

(57) Yarn Spinning tubes are described, the spinning tubes (10) comprising a first outer member (12) of generally tubular form made of a plastics material, a second inner member (14) of generally tubular form made of a plastics material, the two members being substantially concentric and being radially separated by spacer means (16). The spinning tubes may be produced by plastics injection moulding.

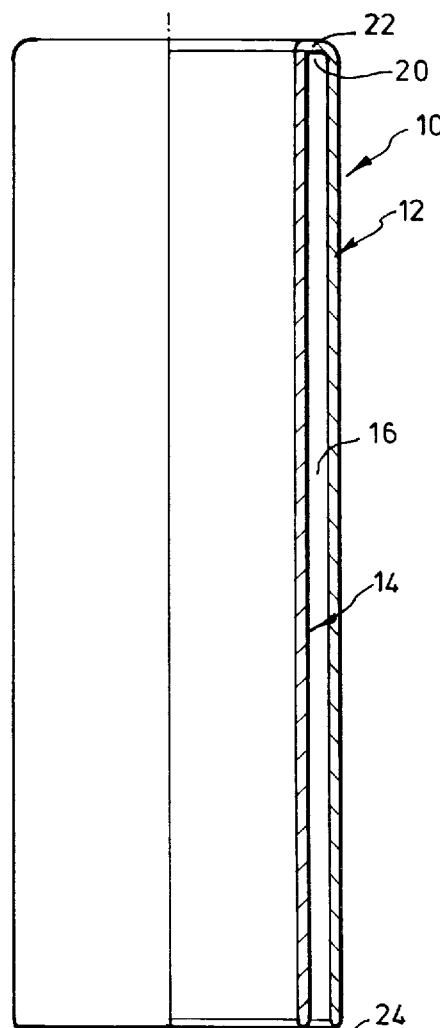


FIG.2

The present invention relates to yarn spinning tubes (also commonly known as carrier tubes).

In the manufacture of yarns, it has been common to wind the yarn onto spinning tubes in the form of plain cardboard tubes. Depending upon the quantity of yarn wound onto the spool, the wall section thickness of the tube has been varied. Typically, such spinning tubes may have a section thickness of from 3mm to 11mm to give the desired degree of strength and stiffness. The yarn wound onto the spinning tube for storage on manufacture, is later "off-wound" for the purpose of, for example, the manufacture of fabric from the yarn.

When the yarn is off-wound from the spinning tube, a problem frequently arises due to damage to the tube end, such damage often resulting in snagging of the yarn and consequent breakage. It is clearly inconvenient and costly to keep reinstating broken threads, and imperfections are also produced in the fabric.

In cardboard spinning tubes having the thinnest wall sections of about 3mm, it is possible to mould a rounded nose by folding the tube material into the bore to produce a spool which is more resistant to damage and consequently less prone to snagging of the yarn. However, in so doing, it becomes more difficult to maintain a truly concentric bore, which may give problems with regard to balance of the spinning tube when winding on the yarn. Furthermore, it is impossible to provide the thicker cardboard wall sections with such a rounded, snag-resistant nose by folding or moulding.

Known cardboard spinning tubes are also considered to be "single-trip" items in that they are discarded after the yarn has been off-wound.

It is an object of the present invention to provide a yarn spinning tube which is economic to manufacture, and has an improved performance with regard to the problem of snagging than the known cardboard spinning tubes.

It is further objective to provide a spinning tube which is more durable than known tubes and which may be reused a number of times before being discarded.

According to the present invention there is provided a yarn spinning tube, the spinning tube comprising a first outer member of generally tubular form made of a plastics material, a second inner member of generally tubular form made of a plastics material, the two members being substantially concentric and being radially separated by spacer means, wherein the first outer and second inner members are separate interfitted members.

The spinning tube of the present invention may advantageously be made from thermoplastic plastics material. Typical examples of plastics materials which may be used in spinning tubes of the present invention may include polypropylene, styrenes, polyesters

and many others.

Some man-made yarns require processing by, for example, heat treatment to develop the optimum physical properties of the yarn material. Plastics material spinning tubes of the present invention are more able to withstand such manufacturing process treatments than conventional cardboard spinning tubes, and furthermore, are able to be reused a number of times. This is also true where the yarn requires dyeing after manufacture; when wound on conventional cardboard spinning tubes, the yarn frequently needs to be off-wound onto other plastics material carriers prior to dyeing as the cardboard cannot withstand the conditions during the dyeing process. Plastics material spinning tubes of the present invention are able to withstand the conditions during a dyeing process.

A further advantage of using plastics material is that spinning tubes may be easily colour-coded to automatically enable yarns wound thereon to be identified. Dye colorants in the plastics material enable such colour-coding to be carried out during moulding.

Spinning tubes of the present invention may preferably be made by the technique of plastics injection moulding. It has been found that when manufactured by injection moulding, the necessary accuracy may be easily maintained. Yarns may typically be wound onto the spinning tube at speeds up to 6000 m/min giving rise to high rotational speeds of over 1600 rev/min of the spinning tube. Upwards of 4kg of yarn may be wound onto the spinning tube leading to high out-of-balance forces with consequent vibration and possible damage to the winding machine bearings if high dimensional accuracy is not maintained during moulding.

The spinning tube of the present invention may comprise an outer, generally tubular member having spacer means formed in the bore thereof, and a separately formed inner, generally tubular member which is fitted into the bore of the outer member.

In a first alternative embodiment the inner, generally tubular member may have spacer means formed on the outer diameter thereof, and be fitted into the substantially plain bore of a generally tubular outer member.

In a second alternative embodiment, both the bore of the outer member and the outer diameter of the inner member may both be provided with spacer means.

For reasons of cost, ease and accuracy of manufacture of plastics injection moulding dies, it is preferred to have the spacer means formed integrally with the bore of the outer, generally tubular member.

The two component parts may, for example, be assembled by fitting the solidified, but still warm outer member over the inner member and allowing the assembly to fully cool, thereby effecting a strong interference fit due the shrinkage of the outer member about the inner member.

Different plastics materials may be used for the inner and outer members if desired.

The spacer means may comprise generally axially extending ribs which may be moulded integrally with either the bore of the outer member or with the outer diameter of the inner member or both.

The ribs may be truly axially extending, in that they are substantially parallel to the spinning tube axis, or may extend helically in the axial direction of the spinning tube in the manner of "rifling" in a gun barrel.

It has been found that dimensional accuracy of better than 0.25mm on radial crushing, and better than 0.5mm axial distortion may be obtained with a spinning tube fully wound with over 4kg of elastomeric yarn, the tube having nominal dimensions of 83mm overall diameter and 290mm overall length, an outer member wall thickness of 2.5mm, an inner member wall thickness of 2.5mm and sixteen axially extending ribs of 2mm radial height.

In use, yarn spinning tubes are generally either driven from the bore by, for example, engaging tapered cones mounted on a driven spindle, or may be driven from the outer surface thereof by, for example, a driven friction wheel or roller. In the former case, it may be beneficial to provide either the outer surface of the inner member, or the inner surface of the outer member with means to provide positive mechanical driving engagement between the inner and outer members. Such means may comprise grooves or axially directed, upstanding engagement means, such as rails for example, which cooperate with the spacer means or ribs to give positive engagement for driving purposes between the outer and inner members.

Preferably, one end of the outer member may be provided with a smooth rounded shape to facilitate the yarn being off-wound without snagging. This is a significant advantage of the spinning tube of the present invention in being able to provide such a surface as an integral part of the manufacturing process and which is very difficult to economically provide on known cardboard spinning tubes of thicker wall sections.

It has been found that plastics material spinning tubes of the present invention may be manufactured more economically than conventional cardboard spinning tubes, and moreover as stated above, may be re-used.

In order that the present invention may be more fully understood, examples will now be described by way of illustration only with reference to the accompanying drawings, of which:

Figure 1 shows a radial cross-section through a first embodiment of a spinning tube according to the present invention;

Figure 2 shows an axial section through the plane denoted by the line 2-2 of Fig. 1;

Figure 3 shows an enlargement of part of a radial

cross-section through a second embodiment;

Figure 4 shows a similar view to Fig. 3 of a third embodiment; and

Figure 5 which shows a similar view to Fig. 3 of a fourth embodiment.

Referring now to Figures 1 and 2 of the drawings, and where the same or similar features are denoted by common reference numerals. A yarn spinning tube is shown generally at 10. The spinning tube comprises two constituent mouldings; an outer, generally tubular member 12 and an inner, generally tubular member 14. Both the outer member 12 and inner member 14 are separately produced by a plastics injection moulding technique from thermoplastic material. The outer member 12 has radially inwardly directed spacer means 16, in this case in the form of axially continuous ribs of generally rectangular section, moulded integrally therewith on the bore surface 18 and extending along substantially the whole axial length. Also moulded integrally with the outer member 12 and the ends 20 of the ribs 16 is a rounded nose-piece and flange 22 to facilitate snag-free off-winding of the yarn (not shown). The inner member 14 is essentially a plain cylinder fitted inside the outer member. The two constituent parts are fitted together by fitting the outer member 12 over the inner member 14 whilst the former is still warm from the moulding process. In a typical thermoplastic material such as polypropylene, an interference fit of approximately 0.2mm may easily be achieved by this method.

In the embodiment shown in Figures 1 and 2 there are sixteen radially directed and symmetrically disposed ribs, but this number may be varied depending upon the strength and stiffness characteristics required. The most important proviso is that the ribs should be either symmetrically or evenly disposed around the bore periphery in the interests of balance where the spinning tube is intended to rotate at high speed.

Figure 3 shows a second embodiment wherein ribs 30 are provided on the outer diameter 32 of the inner member 14 in addition to the ribs 16 on the bore 18 of the outer member 12.

Figure 4 shows a third embodiment of a spinning tube wherein the inner member 14 is provided with grooves 40 in the outer diameter 42 thereof, the grooves 40 cooperating with the radially inner ends of the ribs 16 of the outer member 12. The purpose of this embodiment is to provide, in addition to the existing interference fit, a positive mechanical engagement between the outer and inner members where, for example, a rotational driving force may be imparted to the outer member through the inner member.

An embodiment for a similar purpose to that of Figure 4 is shown in a fourth embodiment in Figure 5, wherein the grooves 40 are replaced by upstanding rails 50 which are moulded integrally with the outer surface 52 of the inner member 14.

The constructions of the embodiments shown in Figures 4 and 5 may be reversed with the grooves 40 or rails 50 being formed on the bore 18 of the outer member 12 and the corresponding ribs 16 on the outer diameter of the inner member 14. Furthermore where such grooves or rails are provided, it may be permissible to employ a lower degree of interference fit between the outer and inner members on assembly.

Although the ribs 16 and 30 have been shown in the above Figures as being of rectangular cross-section, it will be apparent to those skilled in the art that other cross-sectional shapes may be employed. For example, ribs of frusto-conical cross-sectional shape may be employed in some circumstances.

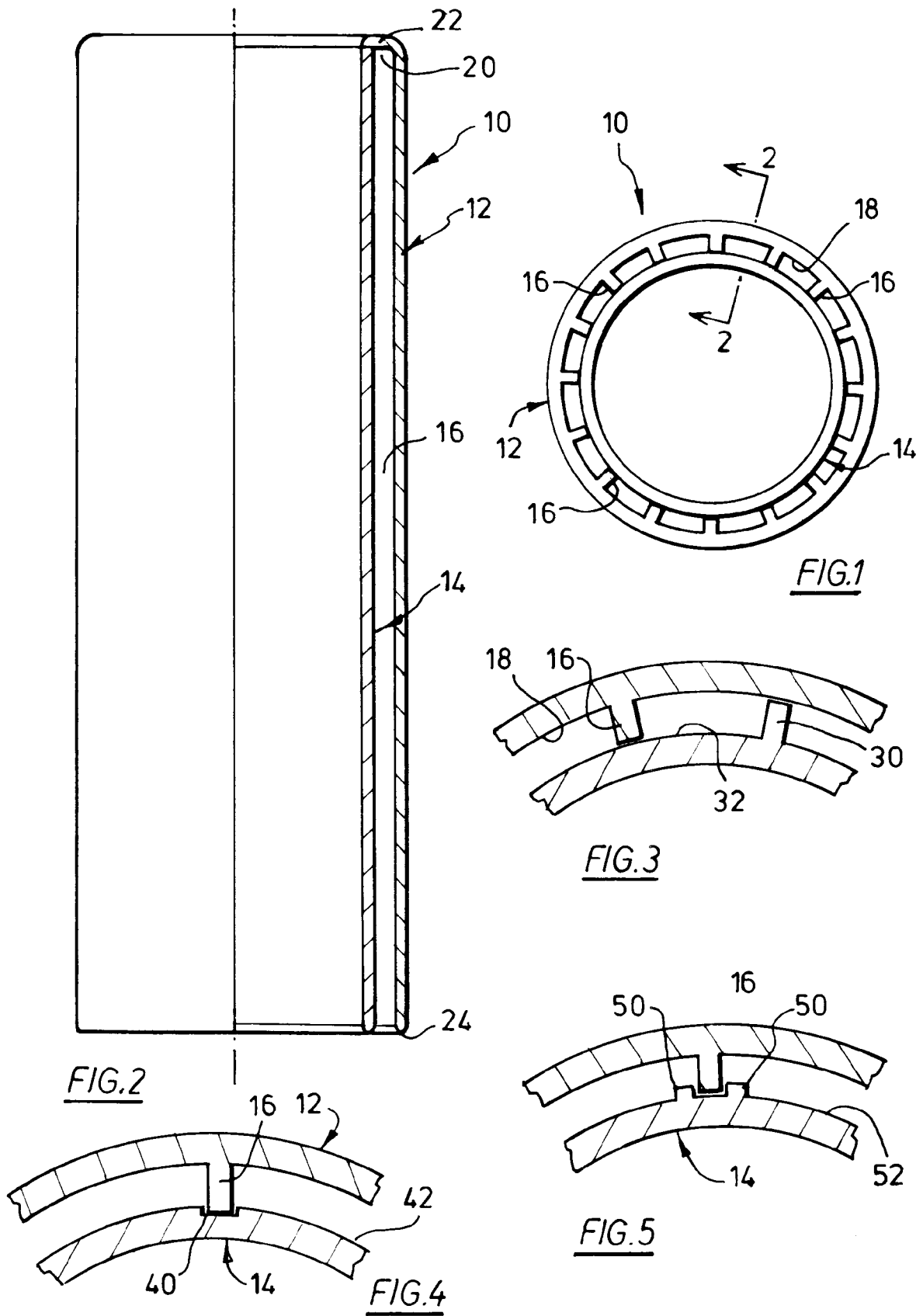
All the ribs in the above examples have been shown as being axially directed in that they are parallel with the spinning tube axis. However, ribs having a helical form (not shown) may also be employed and describing, for example, a one quarter or a one half revolution of the tube diameter along the axial length thereof.

Claims

1. A spinning tube (10), the spinning tube comprising a first outer member (12) of generally tubular form made of a plastics material, a second inner member (14) of generally tubular form made of a plastics material, the two members being substantially concentric and being radially separated by spacer means (16) characterised in that the first outer and second inner members are separate interfitted members. 5
2. A spinning tube according to claim 1 characterised in that the spacer means are ribs (16) formed integrally with the bore (18) of the outer member (12). 10
3. A spinning tube according to claim 1 characterised in that the spacer means are ribs (30) formed integrally with the outer surface (32) of the inner member. 15
4. A spinning tube according to claim 1 characterised in that the spacer means are ribs formed integrally on both the bore (18) of the outer member (12) and on the outer peripheral surface (32) of the inner member (14). 20
5. A spinning tube according to any one preceding claim characterised in that the spacer means are parallel to the spinning tube axis. 25
6. A spinning tube according to any one preceding claim from 1 to 4 characterised in that the spacer 30

means are disposed helically with regard to the spinning tube axis.

7. A spinning tube according to any one preceding claim from 2 to 6 characterised in that the surface of the tubular member adjacent the free end of the spacer means is provided with rib engagement means. 35
8. A spinning tube according to claim 7 characterised in that the spacer means engagement means comprises grooves (40) in the surface. 40
9. A spinning tube according to claim 7 characterised in that the spacer means engagement means comprises upstanding rails (50) on the surface. 45
10. A spinning tube according to any one preceding claim characterised in that one axial end of the outer member is provided with a smooth, rounded profile shape (22). 50
11. A spinning tube according to claim 10 characterised in that the one axial end of the outer member also includes a flange portion (22). 55
12. A spinning tube according to any one preceding claim characterised in that the spacer means are either symmetrically or evenly disposed around the spinning tube. 60
13. A spinning tube according to any one preceding claim from 4 to 15 wherein there are sixteen symmetrically disposed spacer means. 65





European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 93 30 2042

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	FR-A-2 190 109 (TCHECO-PLASTIC) * the whole document *	1	B65H75/18

A	US-A-3 464 450 (FRANCESCO STEFFENINI) * column 4, line 10 - line 53 *	1,6	

			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B65H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19 JULY 1993	Examiner TAMME H.-M.N.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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