United States Patent [19]

Foley

[11] **3,713,604**

[45] **Jan. 30, 1973**

[54] **SUPPORTING DEVICES**

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[22] Filed: **Aug. 31, 1970**

[21] Appl. No.: **68,122**

[30] **Foreign Application Priority Data**

Sept. 15, 1969 Great Britain....................45,293/69

[52] **U.S. Cl.**......**242/118.2,** 242/118.11, 242/118.31

[51] **Int. Cl.**..**B65h 75/10**

[58] **Field of Search**..242/118.2, 118.11, 118.1, 46.6, 242/46.7, 46.8, 46.3, 118.31; 68/198

[56] **References Cited**

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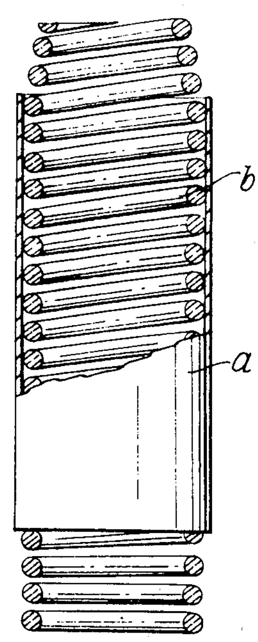
[57] **ABSTRACT**

A method and apparatus for minimizing the distortion that may occur in a hollow textile bobbin when such a bobbin having thermoplastic yarn wound thereon is subjected to conditions likely to cause the yarn to contract, in which a helical spring mandrel that may be "-wound-up" is inserted into the bobbin.

7 Claims, 3 Drawing Figures



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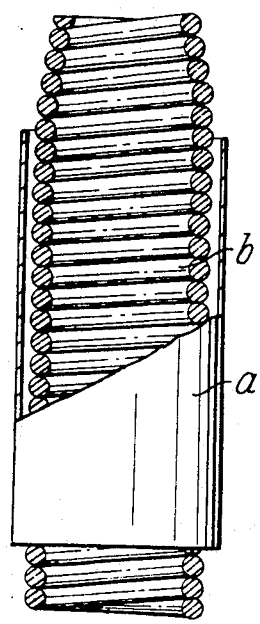

Fig. 1.

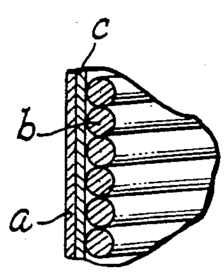

Fig. 3.

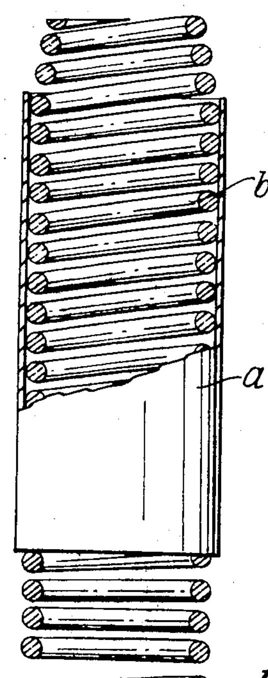

Fig. 2.

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SUPPORTING DEVICES

The present invention relates to mandrels for supporting hollow, textile bobbins.

Depending upon the end use to which certain thermoplastic yarns may be put e.g. polyamide or polyester yarns, they may at some stage during processing be wound on to conventional, cylindrical, hollow bobbins and heat-treated at high temperatures. For example, in the manufacture of some shrink free nylon yarns, the yarns may be exposed to superheated steam at temperatures up to 200°C for a number of hours.

Under yarn treatment conditions of this severity, high contractile forces may develop in the wound yarn which can in turn distort or deform the hollow bobbin, often to such an extent that the bobbin is unsuitable for further use.

Supporting the bobbin on a close fitting mandrel of sufficient strength to resist the forces of distortion has been suggested, but as might be expected it is often difficult to remove the bobbin after yarn treatment without damaging the mandrel and/or the bobbin.

According to the present invention, the Applicants have found that by using a suitable helical steel spring mandrel that may be twisted to reduce its diameter when the bobbin is to be either loaded and unloaded and released when the bobbin is in position, sufficient support for the bobbin can be provided to minimize distortion yet enable the bobbin to be removed from the mandrel without difficulty.

By minimizing distortion the Applicants mean that the bobbin is preferably not subjected to forces that might distort or deform it beyond its elastic limit.

Thus, the present invention provides a method for minimizing distortion in a hollow textile bobbin holding thermoplastic yarn when such a bobbin is subjected to conditions likely to cause the yarn to contract in which prior to such subjection there is longitudinally inserted into the bobbin a helical spring mandrel of sufficient size to be a firm fit therein which is subsequently removed from the bobbin by first reducing its overall diameter.

The invention further provides an apparatus for carrying out the above method comprising a helical spring mandrel of sufficient size to be a firm fit within the bobbin and means for reducing its overall diameter.

One convenient way of reducing the overall diameter of the helical spring mandrel is to twist or wind one end of the spring relative to the other, thus tightening the spring.

In some cases it may be preferable to tighten the spring to ease its insertion into as well as its removal from the hollow bobbin.

The spring mandrel should be of sufficient size when released to support at least that internal area of the bobbin liable to distortion and preferably the whole internal area of the bobbin.

Any conventional helical spring of circular cross-section wire, of sufficient size and strength and with a coefficient of friction high enough to prevent the spring unwinding under distorting loads may be employed in the present invention.

Advantageously, a spring with a flat outer face may be used when there is a danger of corrugations being formed in the bobbin. Such corrugations might be formed if there was an increase in the contractile forces generated during yarn treatment or if a soft material had been employed in the manufacture of the bobbin.

Alternatively, a thin steel sheath may be inserted into the bobbin in contact with the wall thereof either before the spring is inserted or released after insertion.

The present invention is particularly useful when yarn wound on a disposable hollow bobbin made of a relatively soft material is subjected to more than one thermal treatment such as additional setting or dyeing.

Further, a bobbin may be supported by a spring mandrel during yarn winding on a drawtwister or draw winder. The mandrel would then serve to resist the forces set up during relaxation of the yarn at room temperature.

In the accompanying illustrative drawing of the present invention, FIG. 1 shows the relationship of the bobbin *a* to the spring mandrel *b* during the insertion and/or removal operation, while FIG. 2 shows the spring mandrel *b* released and in firm contact with the internal wall of the bobbin *a*. FIG. 3 shows bobbin of FIGS. 1 or 2 having a sheath *c* between the inner surface of bobbin *a* and mandrel *b*.

EXAMPLE 1

In this Example 4 lbs. of 840 denier, 140 filament yarn derived from polyhexamethylene adipamide was wound on to a tubular bobbin corresponding to British Standard Specification 1471:1955 and made of HT. 10-WP aluminum alloy. The bobbin had the following dimensions:

Length	13.485–13.500″
Internal Diameter (full length of bobbin)	2.312–2.326″

The yarn was wound on to the bobbin using a conventional ring and traveller system with a balloon tension of 80 grams and a wind-on tension of 160 grams.

The yarn package was then heated in an atmosphere of steam for 3 hours at 200°C and at atmospheric pressure.

On removing the yarn from the bobbin, the relevant bobbin dimensions were:

Length	13.900″
Mean internal diameter (ends of bobbin)	2.318″
Mean internal diameter (center of bobbin)	2.141″

indicating that severe distortion of the bobbin had occurred during the steam treatment.

EXAMPLE 2

In this example a yarn package of the same dimensions as that used in Example 1 was loaded on to a spring mandrel for the steam treatment. An 8 percent Nickel, 18 percent Chromium stainless steel wire spring of 7 wire gauge was employed. It had a spring rate of 2–3 lbs. force per inch and its free length was 14.5 inches and its free overall diameter 2⅜ inches. Two complete turns applied to one end of the spring while the other end was fixed reduced the overall diameter of the spring to 2 9/32 inches.

The spring was inserted in the bobbin by twisting one end while the other end was held in a rigid support.

Removing the spring after the steam treatment was effected in the same way.

The bobbin was subjected to the same steam treatment as described in Example 1.

On removing the yarn from the bobbin, the relevant bobbin dimensions were:

Length	No change
Internal diameter (full length of bobbin)	2.313–2.318"

i.e. no significant change in the dimensions of the bobbin had occurred and the bobbin could be re-used in the normal manner.

EXAMPLE 3

Examples 1 and 2 were repeated with similar bobbins holding 4 lbs. of 1,000 denier, 192 filament yarn derived from polyethylene terephthalate. Relevant bobbin dimensions were as follows:

Before steaming:	
Length	13.485–13.500"
Internal diameter (full length of bobbin)	2.310–2.317"

After steaming without the support of a spring mandrel:

Length	13.730"
Mean internal diameter (ends of bobbin)	2.310"
Mean internal diameter (center of bobbin)	2.252"

After steaming with the support of a spring mandrel:

Length	No change
Internal diameter (full length of bobbin)	2.304–2.317"

These results compare with those of Examples 1 and 2 and thus clearly vindicate the value of the present invention.

What I claim is:

1. A method of minimizing distortion of a rigid hollow cylindrical textile bobbin having yarn wound thereon subjected to high temperature treatment to effect shrinkage of said yarn resulting in load distortion of the bobbin comprising inserting in the interior of said hollow bobbin a helical spring mandrel in firm contact with the interior circumference of the cylindrical hollow bobbin during yarn treatment, said mandrel having twisting means thereon and contracting said mandrel by twisting said helical spring mandrel and thereby effect removal of the helical spring mandrel from the bobbin after yarn treatment.

2. A method according to claim 1 in which said step of inserting the helical spring mandrel includes tightening the spring mandrel to reduce the overall diameter of the spring mandrel prior to its insertion into the bobbin.

3. The method of claim 1 further comprising inserting a protective sheath around the interior circumference of the bobbin.

4. A method according to claim 3 in which said sheath is inserted into the bobbin in contact with the wall thereof prior to the the insertion of the spring mandrel.

5. An apparatus comprising a load distortion resistant rigid hollow cylindrical textile bobbin, a helical spring mandrel and a sheath, said sheath being in firm contact with the interior wall of said bobbin and located between said wall and said mandrel, said helical spring mandrel having twisting means thereon to effect contraction thereof for insertion of said mandrel into or removal from said sheath, said helical spring mandrel being in firm contact with the interior wall of said sheath upon insertion thereof.

6. Apparatus according to claim 5 in which the helical spring mandrel possesses a flat outer face for contacting the internal surface of the hollow bobbin.

7. Apparatus as in claim 5 wherein said bobbin is constructed of aluminum alloy.

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