United States Patent [19]

Sykora

[11] **3,780,962**

[45] **Dec. 25, 1973**

[54] **LIGHT RIGID MANDREL ABLE TO ENGAGE PAPER OR FIBRE TUBES**

[75] Inventor: **Josef Sykora,** Drummondville, Quebec, Canada

[73] Assignee: **Celanese Canada Limited,** Montreal, Quebec, Canada

[22] Filed: **June 1, 1972**

[21] Appl. No.: **258,647**

[52] **U.S. Cl.** **242/72**

[51] **Int. Cl.** **B65h 75/24**

[58] **Field of Search** 242/72, 68, 68.2

[56] **References Cited**

UNITED STATES PATENTS

2,903,200	9/1959	McDougall	242/72 X
1,878,264	9/1932	Claybourn	242/72
2,066,659	1/1937	Templeton	242/72
2,638,282	5/1953	Prevost	242/72

FOREIGN PATENTS OR APPLICATIONS

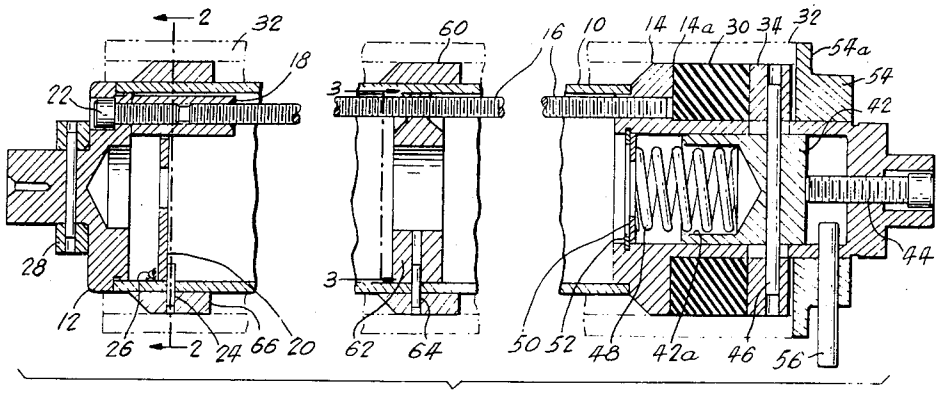
1,102,659	2/1968	Great Britain	242/72

Primary Examiner—George F. Mautz
Assistant Examiner—Edward J. McCarthy
Attorney—Thomas J. Morgan et al.

[57] **ABSTRACT**

A light rigid mandrel able to engage paper or fibre tubes so as to overcome the deflection of the tubes and prevent bunching of fabric as well as greatly reduce the damage generally caused by gripping. The mandrel comprises a tubular high strength aluminum body rigidly held under compression . The tubular aluminum body is provided with a deformable material able to engage an inner part of the paper or fibre tubes, so that light and inexpensive paper tubes could be used successfully for the first time.

6 Claims, 4 Drawing Figures



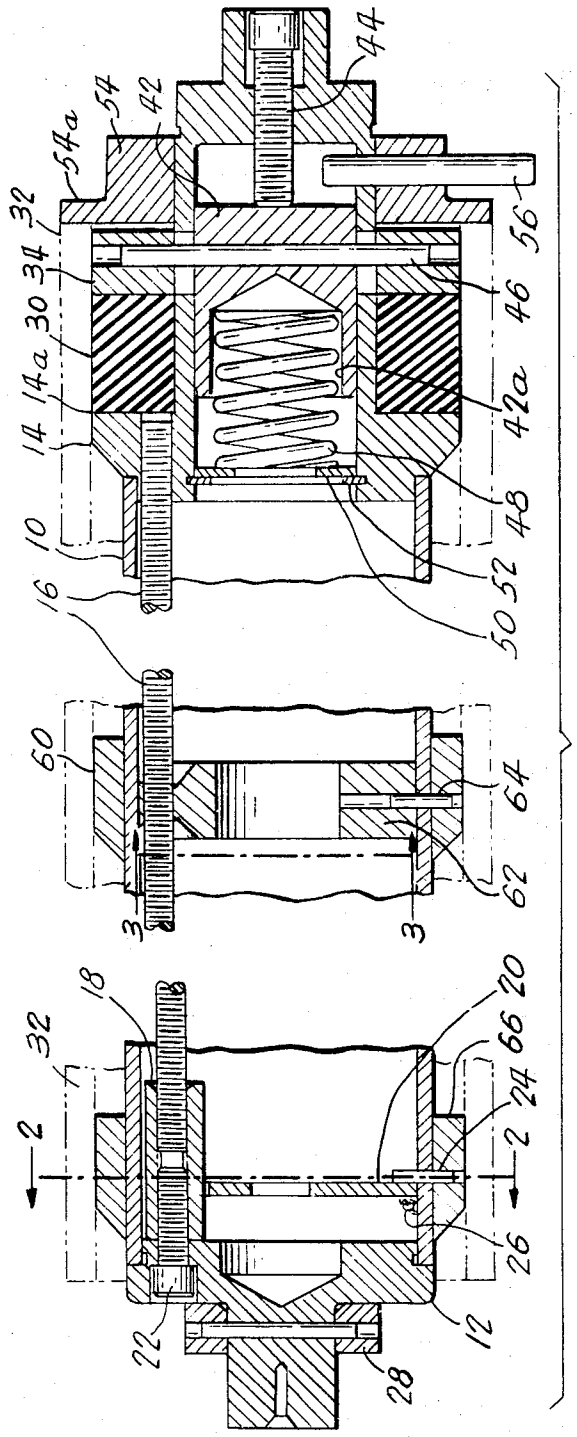

44
54
42
54a
32
56
34
46
30
14a
42a
14
48
10
52
16
50
60
64
62
3
3
18
20
32
66
24
2
2
26
12
22
28

FIG. 1

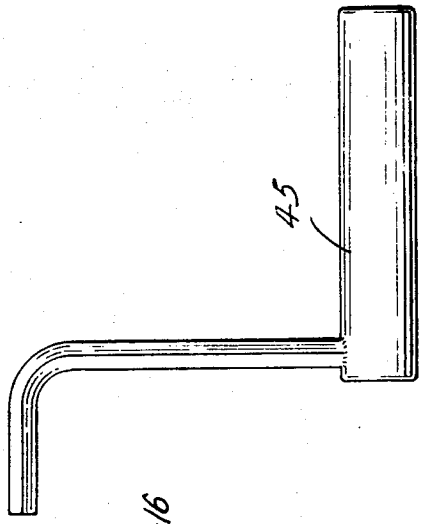


FIG. 4

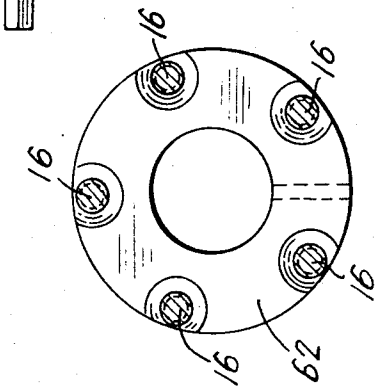


FIG. 3

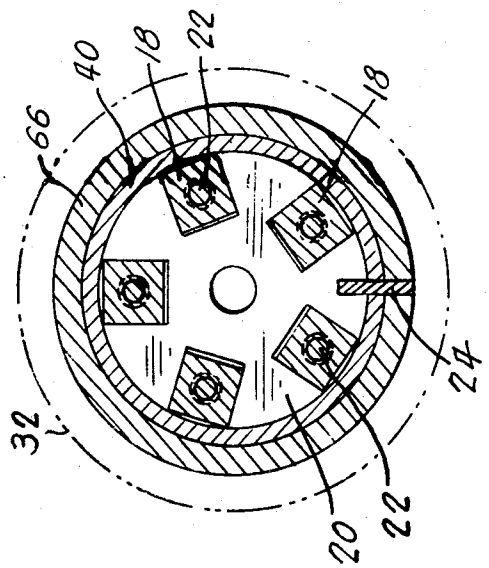


FIG. 2

LIGHT RIGID MANDREL ABLE TO ENGAGE PAPER OR FIBRE TUBES

This invention relates to a light mandrel for gripping tubes and preferably paper and fibre tubes that are used in the textile industry.

At present, the mandrels are adapted to receive metallic tubes on which can be wound fabrics, for instance. These tubes are expensive and for that reason they have to be returned to the manufacturer. This further adds to the cost. Furthermore, the user of these tubes has to limit his inventory to a minimum and this reduces freedom.

Paper tubes have been tried, but the gripping arrangements of the conventional mandrels on the tube rapidly damage the interior of these tubes and also cause a deflection near the middle of their longitudinal length. This deflection results in bunching of fabric in the center and formation of creases.

The conventional gripping arrangements consist of tapered sleeves or conically shaped inserts which engage at each end of the interior of the tubes. These inserts are slidably mounted on a large metallic rod which runs within the tube and serves to support it. Other conventional mandrels employ a gripping bar pressed into the tube. In either case, due to the high contact pressure of 300 to 1,000 psi, the paper tubes are soon damaged and have to be discarded.

There has now been provided a light, rigid mandrel able to engage paper or fibre tubes so as to substantially overcome the deflection of tubes and prevent bunching of fabric as well as greatly reduce the damage generally caused by gripping.

Broadly stated there has now been found a light mandrel for gripping tubes, said mandrel comprising a tubular high strength aluminum body rigidly held under compression, said tubular aluminum body provided with a deformable material able to engage an inner part of a tube, so that light and inexpensive paper tubes could be used.

Preferably a plurality of elements having high tensile strength exert a compressive force along the longitudinal axis of the tubular body, said elements being equally spaced so as to exert said compressive force uniformly and thereby reduce considerably the deflection in said tubular body.

Still in a preferred embodiment there is provided a light mandrel for gripping tubes comprising:

a. a tubular body made of high strength aluminum having end portions,
b. said end portions provided with means to receive a plurality of high tensile strength elements,
c. a plurality of high tensile strength elements to compress uniformly said tubular body along its longitudinal axis,
d. at least one of said end portions comprising a recess to receive a sleeve of deformable incompressible elastic material and compressing ring to outwardly actuate said deformable material,
e. means to actuate said compressing ring. By elastic is meant substantially able to return to its original shape.

Referring now to the drawings which illustrate embodiments of the invention:

FIG. 1 is a longitudinal sectional view of a mandrel.

FIG. 2 is a view taken along line 2 — 2 of FIG. 1.

FIG. 3 is a view taken along line 3 — 3 of FIG. 1.

FIG. 4 is a view of a crank of the type that can be used to engage deformable material against a tube.

Referring now to FIG. 1 the mandrel comprises a tubular aluminum body **10** having end portions **12** and **14**. A plurality of tension rods **16** provided with threaded couplings **18** are first tightened in the end portion **14**. The threaded couplings **18** have a non-circular configuration: generally square so as to be locked in a key plate **20**, better shown on FIG. **2**. In this manner, when bolts **22** are tightened under high torque the threaded couplings **18** are prevented from rotating. The key plate **20** is itself held between roll pins **24** which act as stoppers and a cement **26**. The rods are under high tensile stress to reduce considerably the deflection of the tubular body **10**. A removable sleeve **28** is locked on the end portion **12** so as to define a male configuration which will snuggly fit into the female configuration of a loom. This sleeve **28** is removable for access to bolts **22**.

The end portion **14** is provided with a recess **14a** for a rubber sleeve or for other suitable deformable equivalents **30** able to frictionally lock a tube **32** by means of a compression ring **34** slidably mounted on the recess **14*a***, to radially deform the rubber sleeve on moving towards it.

Within the end portions **14** of the mandrel, a housing is provided to receive a slidable cylinder **42**. A screw **44** joins the exterior of the end portion **14** to the top of the cylinder **42**. The top of the screw **44** is itself shaped to receive a crank **45** of the type shown in FIG. **4**.

The cylinder **42** is joined to the compression ring **34** by roll pins **46**, always urged against screw **44** by biasing means such as spring **48** held within a recess **42*a*** of the cylinder, a flat washer **50** and retaining ring **52**. End portion **14** is provided with a collar **54** having a shoulder **54*a*** acting as a stopper for the paper tube **32**. The collar **54** is secured to end portion **14** by roll pins **56**, which at the same time serve to transmit the driving torque from the loom to the mandrel.

Paper tube **32** is centered by centering ring **60**, mounted on the tubular aluminum body **10** and strengthened within the tube by a spacer disc **62**, better shown in FIG. **3** and both are held by common roll pins **64**. Another centering ring **66** is also mounted on the tubular aluminum body **10** and held by the roll pins **24**.

As is easily seen the various components or elements are limited to minimize the weight and structure and like roll pins **24** and **64** these elements have as far as possible dual functions. The same applies to the end portion **14** shaped to serve as support for the tube **32**.

OPERATION

This mandrel is a device which makes it possible to wind fabric under tension on low cost paper tubes directly on the loom. A paper tube **32** is slid over the mandrel and one clockwise turn of screw **44** with crank **45** generally locks the paper tube **32** to the mandrel. Similarly, one clockwise turn will generally free the paper tube **32**.

EXAMPLE

The following example will serve to illustrate embodiments of the invention:

Fabric was taken up directly from looms on paper tubes driven by a mandrel such as shown on the drawings. These tubes were transferred to the main plant and either used to form batch rolls or stored as received

in warehouses. Due to the low cost of paper tubes, a generous supply was made.

Previously the fabric had to be taken-up on stainless steel cloth rolls and rewound on shells to form large diameter batch rolls for immediate processing or rewound on paper tubes for storage. Due to their high cost, stainless steel cloth rolls were limited in number, empty rolls had to be returned quickly.

Also in accordance with the present invention, the uniformly distributed low contact pressure exerted by the deformed rubber sleeve on a larger contact area, for instance of the order of about 50 psi, on the inside of the paper tube is sufficient to transmit, without slippage, the torque required for winding fabric under tension ranging up to 200 lbs. This low contact pressure is causing the least possible damage to the paper tubes and they can be re-used over and over again.

OTHER USES

The mandrel is well suited for the take-up of fabric, paper, plastic or thin metal sheets on tubes of paper, fibre or metal under tension ranging from zero to several thousand lbs. However, the mandrel with higher torque rating needs more than one deformable rubber sleeve.

I claim:

1. A light weight mandrel for engaging winding tubes comprising

a tubular aluminum body having end portions adapted to receive and position tension rods therebetween, at least one of said end portions additionally having a recessed area thereon,

a plurality of high tensile strength rods positioned in the end portions so as to exert a compressive force along the longitudinal axis of the tubular body,

a deformable material positioned in the recess of the end portion,

means to deform radially outward said deformable material, and

a plurality of centering rings positioned on the tubular body.

2. The mandrel of claim **1** wherein the deformable material is a sleeve of deformable incompressible elastic material and the deforming means comprises a compressing ring and a screw operatively connected to said compressing ring.

3. The mandrel of claim **1** wherein the deforming means comprises a compressing ring, a piston slidably mounted within the recess-bearing end portion and connected to said compressing ring, a screw operatively connected to said piston whereby the screw, on being actuated, exerts on the piston a pressure enabling displacement of the compressing ring which deforms radially outward the deformable incompressible elastic material.

4. The mandrel of claim **1** which further comprises at least one spacer disc positioned inside the tubular body.

5. The mandrel of claim **4** wherein said spacer disc is connected to a centering ring.

6. The mandrel as defined in claim **3** which further includes biasing means for urging said piston against said screw.

* * * * *