United States Patent

Nakahara et al.

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[54] METHOD OF THREADING A TWO-FOR-ONE YARN TWISTER

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[52] **U.S. Cl.** **57/156,** 57/58.83

[51] **Int. Cl.** **D01h 1/10,** B65h 51/00

[58] **Field of Search** 57/34, 106, 58.72, 58.83, 58.84, 57/58.86, 34.5, 142, 156, 51.5; 242/47.03

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[57] **ABSTRACT**

In a two-for-one yarn twister, a specially shaped yarn guide path is formed radially extending from a central longitudinal aperture of a spindle to a peripheral yarn guide of a storage disc. Further, a successive yarn guide path from the peripheral yarn guide towards an upper yarn guide member is given as a clearance between an inside and outside balloon limiting mantle. Initial yarn guiding is performed by firstly tying a leading end of a yarn drawn out of a package to a trailing end of a flexible yarn conductor, next, inserting a leading end of the conductor successively into a central aperture of an upper tension device of the twister.

2 Claims, 4 Drawing Figures

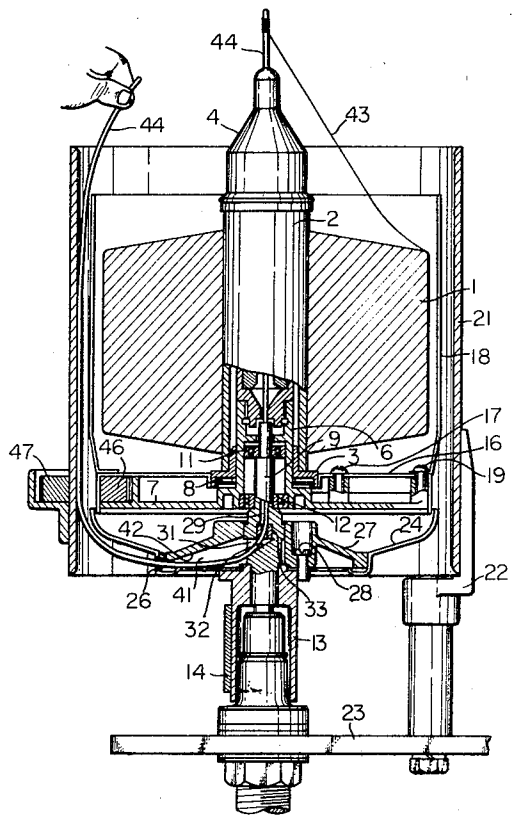

Fig. 1

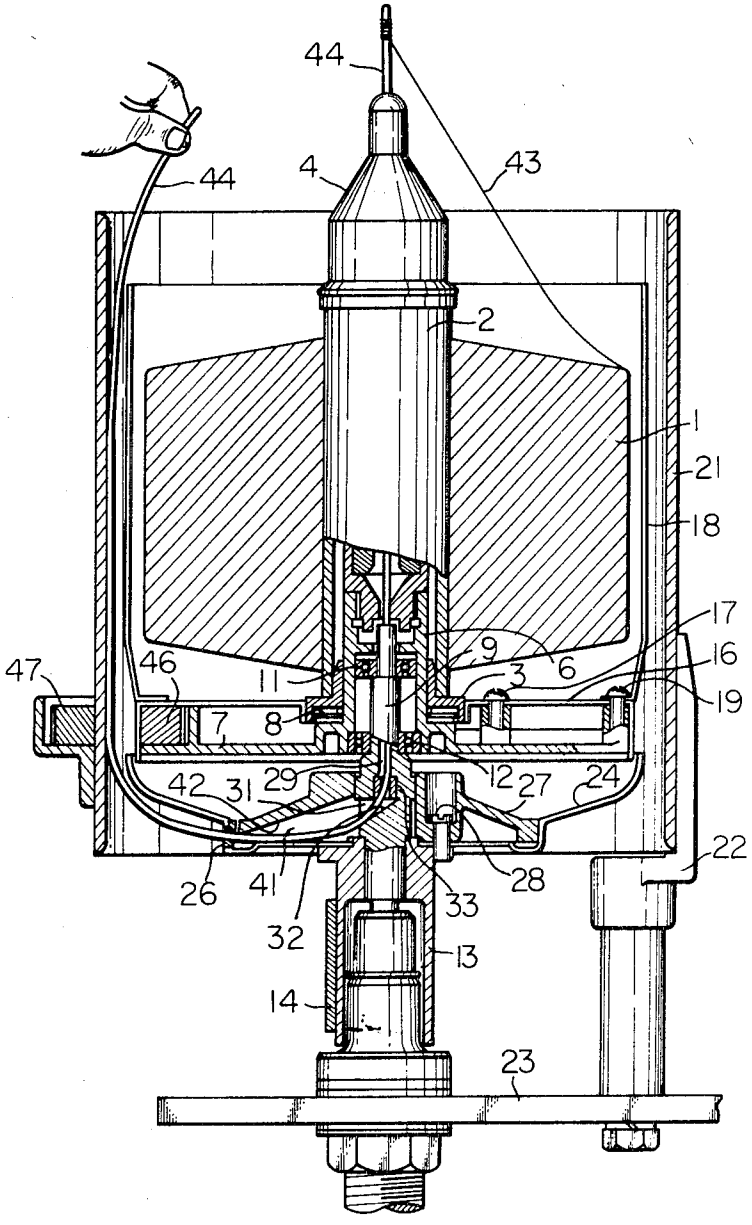

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Fig. 2A

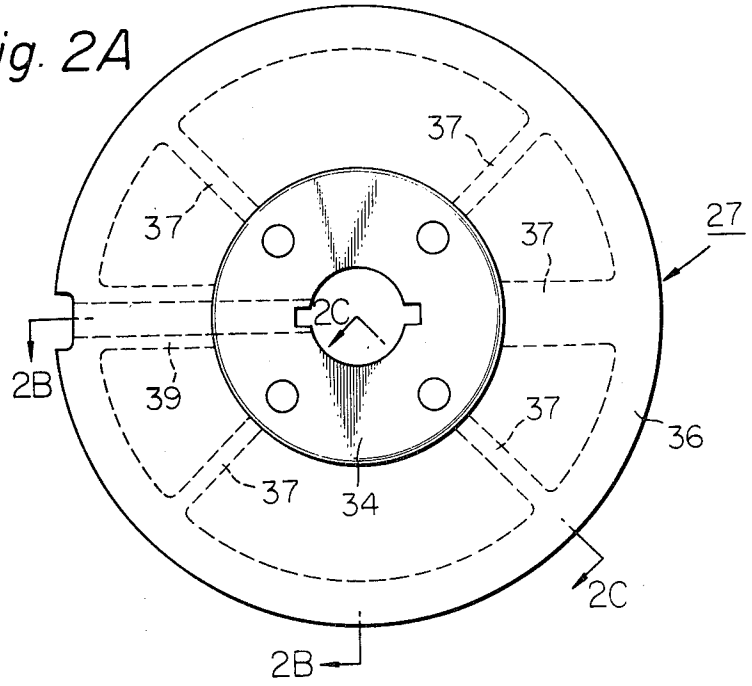


Fig. 2B

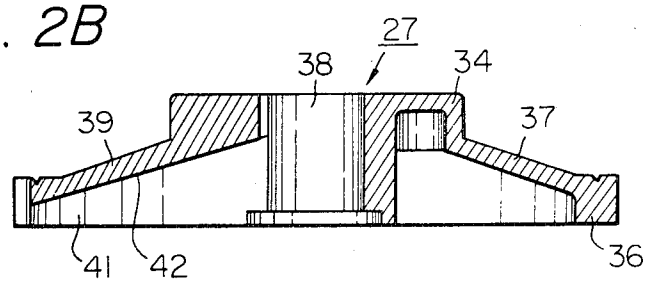
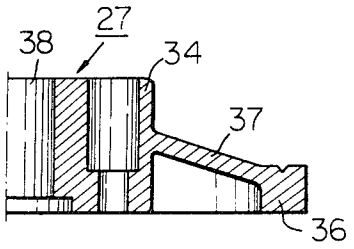


Fig. 2C



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METHOD OF THREADING A TWO-FOR-ONE YARN TWISTER

The present invention relates to an improvement in the yarn guiding mechanism and operation in a two-for-one yarn twister, more particularly relates to an improvement in the yarn guiding mechanism and operation in the two-for-one yarn twister of a type such as disclosed in the U.S. S. Pat. application Ser. No. 645,987 filed on June 14, 1967.

In the yarn twisting mechanism of the two-for-one yarn twister of the above-described type, the yarn is firstly drawn out from a package rotatably mounted on the twister, advanced downwardly through a central longitudinal aperture of a package-supporting holder and a tensioning device disposed to a top of the holder, further advanced into a longitudinal hollow of a spindle, drawn out from the hollow of the spindle through a lateral opening of the spindle, passed through a yarn guide disposed to a periphery of a storage disk which is rotatable with the spindle and conducted upwardly to a suitable yarn guide member positioned above the before-mentioned tensioning device with its ballooning being limited by a cylindrical mantle disposed to the twister encompassing the package.

Although the two-for-one yarn twister of the above-described type is provided with an appreciable advantage in the prevention of excessive tension application on the processing yarn and in the effective compensation of the yarn tension fluctuation, there is an inevitable operational difficulty in initially conducting the yarn along the above-described path, that is, from the package to the upper yarn guide member. Conventionally, the above-described initial conducting of the yarn is carried out in two steps. In the first place, using a suitable yarn conductor or a pneumatic sucking device, the yarn is conducted from the package to the yarn guide of the storage disc. Next, the yarn is brought from the yarn guide of the storage disc to the upper yarn guide member by hand. Such a two-stepped initial conducting of the yarn is so complicated and troublesome to operate that it oftentimes forms a bar in enhancing the operational efficiency in the two-for-one yarn twisting operation. Further, as it is practically difficult or impossible to conduct the yarn by hand from the yarn guide of the storage disc to the upper yarn guide member through a narrow clearance between the peripheral surface of the yarn package and the balloon limiting mantle, it is usual to form a vertical slit through the mantle and to pass the yarn upwardly through the slit. The mantle is purposed for limiting the inevitable ballooning of the yarn during the two-for-one yarn twisting operation and, accordingly, the yarn rubs the inside wall of the mantle. During this rubbing, the yarn is apt to be damaged, or sometimes broken, because of the presence of the above-described vertical slit formed through the mantle, that is, the presence of such a slit disturbs smoothness of the inside wall surface of the mantle. Thus, demand for the provision of the balloon limiting mantle is inconsistent with demand for easy initial yarn conduct.

A principal object of the present invention is to provide an improved yarn guiding mechanism of a two-for-one yarn twister wherein the initial conduct of the yarn from the package to the upper yarn guide member is carried out with ease in a single step.

Another object of the present invention is to provide an improvement in a yarn guiding operation on a two-for-one yarn twister whereby the operation can be carried out easily with enhancement in the operational efficiency.

A further object of the present invention is to bring about an improvement in the yarn guiding mechanism and operation in a two-for-one yarn twister whereby the two-for-one yarn twisting operation can be performed without damaging or breaking the ballooning yarn.

In order to attain the above-described objects of the invention, the improvement in the yarn guide mechanism of the present invention comprises, in combination, a spindle having a central longitudinal aperture and an outwardly diversing lateral opening connected to the central longitudinal aperture, and a flange secured to the spindle and rotatable together with the spindle. The divergence of the lateral opening is so formed

that the ceiling of the opening is substantially horizontal and the floor of the opening is outwardly and downwardly declined. A boss portion of the flange is secured to the periphery of the spindle and the flange is provided with a particularly shaped yarn conducting path. Inlet of the yarn conducting path is in a facing arrangement with the diverged outside terminal of the lateral opening of the spindle and an outside terminal of the yarn-conducting path is directed toward the storage disc yarn guide. The ceiling of the yarn conducting path is downwardly declined from the inside terminal towards the outside terminal thereof and the floor of the yarn-conducting path is defined by the upper surface of the storage disc. If desired, a small piece made of a material having a smooth surface and a large resistance against friction, such as ceramic, may be disposed within the spindle at a connection of the central aperture with the lateral opening. An outside mantle is disposed to the framework of the twister encircling the inside balloon-limiting mantle disposed to a stationary disc of the twister. This outside mantle is purposed for limiting the ballooning of the yarn running from the yarn guide of the storage disc to the upper yarn guide member.

In the above-described improvement in the yarn guide mechanism, the improvement in the yarn-guiding operation of the present invention comprises, using a linear yarn conductor of a flexible nature, firstly connecting one end of the conductor to a free end of the yarn drawn out from the package, next compulsively inserting the yarn compulsively conductor into the central longitudinal aperture of the package-supporting holder and lastly, pulling out the free end of the yarn conductor together with the yarn connected to another end thereof when the free end of the conductor nearly reaches the upper brim of the outside balloon limiting mantle. Since a successive path is formed by the combination of the central aperture of the package holder with the central longitudinal aperture of the spindle, lateral opening of the spindle, the yarn-guiding path of the flange, the yarn guide of the storage disc and the clearance between the outside mantle and the package periphery, the flexible yarn conductor can pass through the path smoothly and nearly reach the upper brim of the outside mantle only by compulsively inserting the conductor successively from the inlet of the upper tension device. Further features and advantages of the art of the present invention will be apparent from the ensuing description, reference being made to the accompanying drawings; in which

FIG. 1 is a partly sectional side view of a two-for-one yarn twister whereto an embodiment of a yarn-guiding mechanism of the present invention is applied,

FIG. 2A is a plan view of a flange member used in the embodiment shown in FIG. 1,

FIG. 2B is a sectional side view of the flange member shown in FIG. 2A taken along the line 2B—2B in FIG. 2A,

FIG. 2C is a fragmental sectional side view of the flange member shown in FIG. 2A, taken along the line 2C—2C in FIG. 2A. Referring to FIG. 1, an embodiment of the improved yarn guiding device of the present invention is illustrated. In the embodiment, a yarn package **1** is wound on a yarn bobbin **2** a lower end of which is inserted over a bearing cover **3** and an upper end of which is provided with a detachably engaged upper tension device **4**. The bearing cover **3** is rotatably inserted over an upper cylindrical protuberance **6** of a stationary disc **7** by way of a bearing **8**. The stationary disc **7** is supported by an upper portion of a spindle **9** by way of pairs of bearings **11** and **12** and a lower end of the spindle **9** is fixedly engaged with a spindle whorl **13** which is rotated by a frictional contact with a driving belt **14**. An upper cover **16** is secured to the stationary disc **7** by screws **17** and a cylindrical inside balloon limiting mantle **18** is secured to the upper cover **16** by screws **19** encircling the package **1** with adequately spaced relationship. Spacedly encircling this inside mantle **18**, a cylindrical outside balloon-limiting mantle **21** is disposed being supported by a bracket **22** secured to the framework **23** of the twister. This outside mantle **21** is not provided with any slit for passing the yarn, making it different from the conventional ones.

A plurality of inside magnets **46** are secured to the periphery of the stationary disc **7** and, in a spacedly facing arrangement with the inside magnets **46**, a plurality of outside magnets **47** are secured to the outside mantle **21**. Due to an attracting force between the magnets **46** and **47**, the stationary disc **7** can be maintained stationarily regardless of the rotation of the spindle **9**.

In the above-described mechanical construction of the twister, the improvement in the yarn guiding mechanism of the present invention is as hereinafter described. A storage disc **24** is secured to the upper flanged portion of the spindle whorl **13** and at least one yarn guide **26** is disposed to a bottom periphery of the spindle whorl **13** as is shown in the drawing. At a position in between the bottom surface of the stationary disc **7** and the upper surface of the storage disc **24**, a flange member **27** is disposed being combined with the upper flanged portion of the spindle whorl **13** by a screw **28** in a condition rotatable with the spindle **9**. The spindle **9** is provided with a central longitudinal aperture **29** and an outwardly diverging lateral opening **31** connected to the longitudinal aperture **29**. The ceiling wall of the opening **31** is substantially horizontal and the bottom wall **32** of the opening **31** is formed as outwardly and downwardly declined with respect to a longitudinal axis of the spindle **9**. If desired, a small piece **33** made of a material having a smooth surface and a large resistance against friction, such as ceramic, may be disposed within the spindle **9** at a connection of the longitudinal aperture **29** with the lateral opening **31**. Referring to FIGS. **2A**, **2B** and **2C**, the mechanical structure of the flange member **27** is illustrated. The flange member **27** includes a boss **34**, a rim **36** and a plurality of arms **37** connecting the rim **36** to the boss **34**, and the boss **34** is provided with a central aperture **38** receptive of the spindle **9**. An arm **39** of greater size extends radially from the boss **34** towards the rim **36** and a tunnel **41** is formed through the greater sized arm **39**. The ceiling wall **42** of the tunnel **41** is downwardly and outwardly declined from the inside terminal to the outside terminal of the tunnel **41**. The flange member **27** of the above-described mechanical structure is disposed to the twister as already mentioned in such a manner that the inside terminal of the tunnel **41** meets the outside terminal of the lateral opening **31** of the spindle **9** while the outside terminal of the tunnel **41** faces the yarn guide **26** of the storage disc **24**. The dimension of the tunnel **41** should be so selected so that the dimensions of the inside terminal of the tunnel **41** is larger than those of the outside terminal of the lateral opening **31** of the spindle **9**. The bottom wall of the tunnel **41** is defined by the upper surface of the bottom portion of the storage disc **24**. Thus, a successive yarn path is formed by the combination of the central longitudinal aperture **29** of the spindle **9** with lateral opening **31** of the spindle **9**, the tunnel **41** of the flange member **27**, the yarn guide **26** of the storage disc **24** and a clearance formed between the outside and the inside balloon limiting mantles **18** and **21**.

In the above-explained mechanical structure of the yarn guide mechanism of the present invention, the initial yarn guide operation of the present invention is carried out in the manner hereinafter described. Firstly, a free end of a yarn **43** is drawn out by hand from the package **1** and the free end thereof is connected to an end of a yarn conductor **44** of a flexible nature. Next, another end of the yarn conductor **44** is inserted into a central aperture of the upper tension device. By further inserting the yarn conductor **44** by hand, the free end of the conductor **44** advances downwardly through the longitudinal aperture **29** of the spindle **9**. When the end reaches the bottom wall **32** of the lateral opening **31** of the spindle **9**, the advancing direction of the conductor's end is changed towards the tunnel **41** of the flange member **27** due to declination of the bottom wall **32**. During further advancement, the conductor's end is conducted toward the yarn guide **26** of the storage disc **24** due to declination of the ceiling wall **42** of the tunnel **41**. Passing through the yarn guide **26**, the conductor's end now comes in contact with the inside wall of the outside mantle **21** and performs an upward directional change. By further insertion of the conductor **44** into the central aperture of the upper tension device **4**, the conductor's end advances upwardly through the clearance defined by the inside and outside balloon-limiting mantles **18** and **21** and, finally, reaches the upper brim portion of the outside mantle **21**. Then, by pulling out the conductor's end by hand as shown in FIG. **1**, a leading end of the yarn **43** can be easily brought to an upper brim position of the outside mantle **21** and by hand extended to a yarn guide, such as a snail wire, positioned above the twister (not shown).

In case it is required, the lower brim portion of the outside mantle **21** may preferably converge inwardly for the purpose of easy upward guiding of the leading end of the conductor **44** coming out of the yarn guide **26** of the storage disc **24**.

One end of the yarn conductor **44** to be tied to the yarn **43** may be roughened or provided with cuts or recesses for assuring stable connection of the two. Further, the tunnel **41** of the flange member **27** may be of another style as long as it is provided with an outwardly and downwardly declined ceiling wall for conducting the leading end of the yarn conductor **44** smoothly towards the yarn guide **26** of the storage disc **24**.

What is claimed is:

1. The method of threading a yarn using a flexible yarn conductor on a two-for-one yarn twister having a yarn-guiding mechanism wherein a yarn guide is aligned with a longitudinal aperture formed within a spindle of said yarn twister comprising the steps of:

a. drawing said yarn from a yarn package on said twister;
b. tying a leading end of said yarn to an end of said yarn conductor;
c. inserting said yarn conductor longitudinally into a central aperture of an upper tension device;
d. threading said yarn conductor longitudinally through said tension device in a first direction;
e. bending a leading edge of said yarn conductor to pass from said aperture in only one direction substantially normal to said first direction;
f. conducting said leading edge smoothly in a resultant direction combining said normal and first direction;
g. sliding said leading edge continuously through an opening in said yarn guide;
h. passing said yarn conductor through a longitudinal path in a second direction opposing said first direction between an inside and an outside balloon-limiting mantle of said yarn guiding mechanism;
i. pulling out a leading end of said yarn conductor when said leading end reaches an upper brim of said outside balloon-limiting mantle; and,
j. catching said leading end of said yarn by hand when a trailing end of said yarn conductor comes to said upper brim position of said outside balloon-limiting mantle.

2. The method of threading a yarn as recited in claim **1** wherein the step of conducting said leading edge includes the step of guiding said leading edge in a converging path which leads to a second conductor path direction opposing said first direction.

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