

[54] YARN WINDING APPARATUS AND METHOD

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[51] Int. Cl. B65h 54/20

[58] Field of Search 242/35.5 R, 43, 158 R, 242/158.2, 158.4 R, 158.5, 18 R, 76; 28/28, 22, 30, 32, 72.6, 40; 57/31, 32; 19/65 T

[56] References Cited

UNITED STATES PATENTS

1,144,944 6/1915 Meisel 242/76

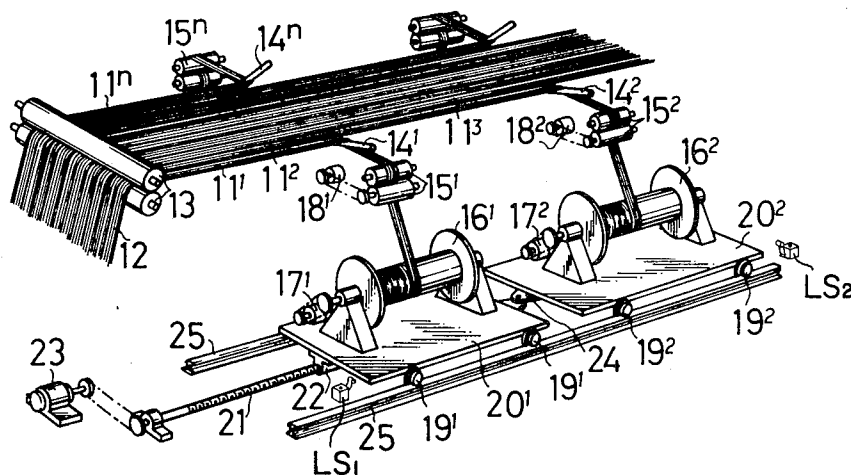
2,249,988 7/1941 Thomas 242/35.5 R
2,563,642 8/1951 Columbu et al. 242/35.5 R
3,543,981 12/1970 Morrison 19/65 T

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[57] ABSTRACT

In an apparatus for winding up a plurality of tape-like narrow yarn groups divided from sheet-like wide yarn group and treated in liquid, the apparatus comprises a first means and a second means. The first means is that of changing the direction of each liquid-treated tape-like narrow yarn groups at right angles with respect to the advancing direction of the tape-like narrow yarn groups. The second means is that of winding up each tape-like narrow yarn group on take up beams arranged with their axes being parallel to said advancing direction of the tape-like narrow yarn groups.

6 Claims, 6 Drawing Figures



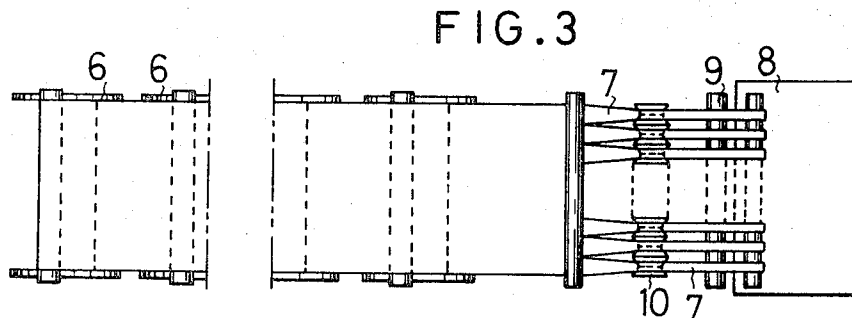
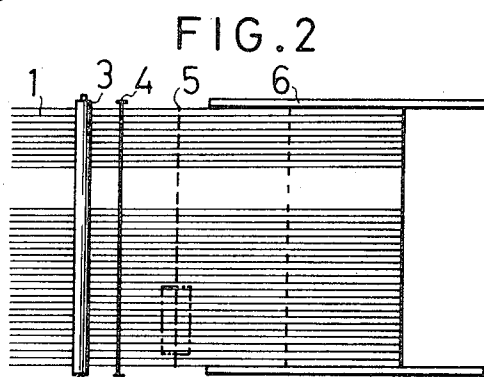
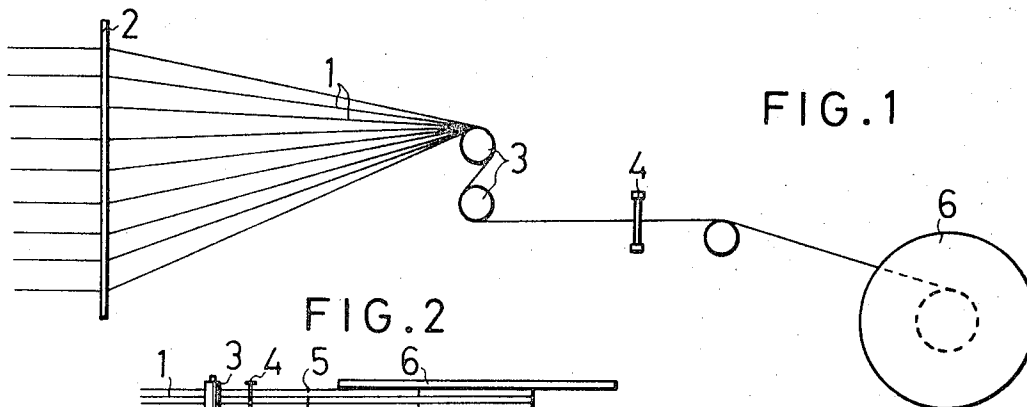


FIG. 4

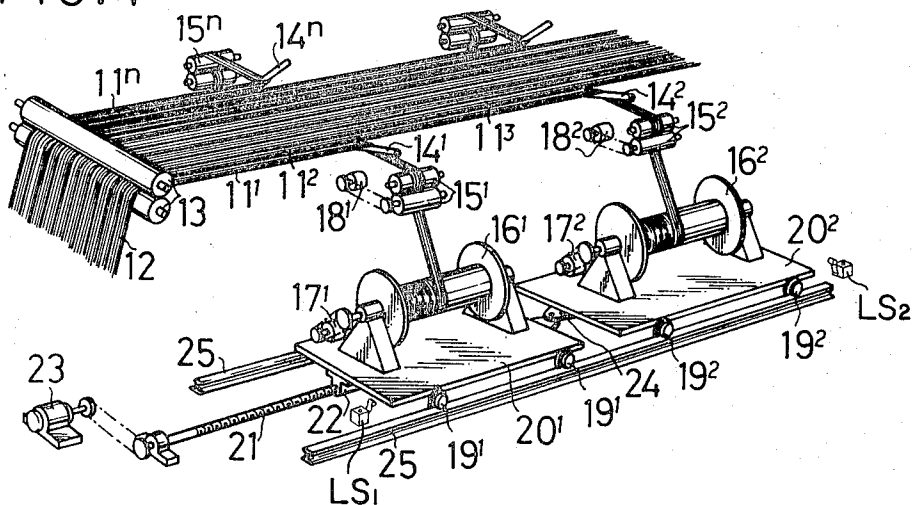


FIG. 5

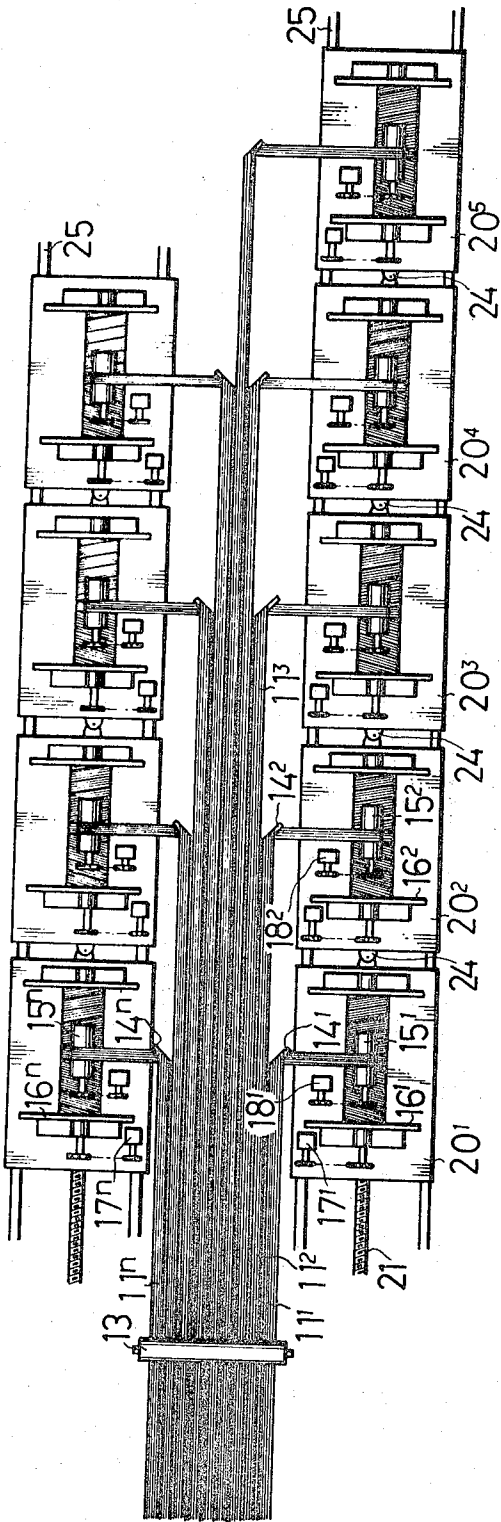
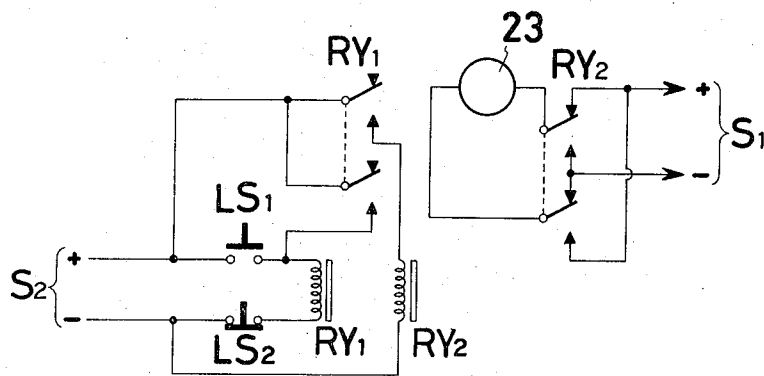


FIG. 6



YARN WINDING APPARATUS AND METHOD

The invention relates to a yarn winding apparatus and method, and more particularly to an apparatus and method for winding up tape-like narrow yarn groups treated in liquid on take up beams arranged.

For continuous treating a number of yarns in a liquid, such as for mercerization, it may be proposed, as taught in the case of warp sizing for preparation of woven fabric, to pull out a plurality of yarns from bobbins on a creel and arrange them in parallel to each other into the form of a wide sheet-like yarn group, which are then wound up on a warper beam. A plurality of warper beams thus wound up by parallel yarn are arranged and the sheet-like yarn groups is taken out from the beams to be laminated in layers. Thereafter, the laminated yarn groups in layers are subjected to mercerization. However, in the yarn treating method like mercerization, the yarns are subjected repeatedly to liquid immersion and exposure to the atmosphere while passing through several to more than ten treating liquid vessels under positive tension. Accordingly, such a wide laminated yarn group tends to develop slits therein during treatment. This is considered to be attributable to the fact that each individual yarn swells, shrinks and extends during mercerization and is coupled with other factors such as surface tension of the treating liquid and yarn density. Therefore, it is extremely difficult to maintain uniformity of a layer of sheet-like wide yarn group throughout the working process. Such sheet-like slits cause non-uniformity of working treatment and have unfavorable effects upon the separatability of the yarns, resulting in degradation of products and reduction of productivity.

However, these defects as described above have been dissolved by the same inventor disclosing a new and improved method in the U.S. Pat. application, Ser. No. 226,490 filed on Feb. 15, 1972, now U.S. Pat. No. 3,789,469 which provides a new yarn treating method comprising steps of drawing out a plurality of sheet-like wide yarn groups each consisting of a number of parallel yarns from respective supply beams, laminating said sheet-like wide yarn groups in layers to form a laminated yarn group, diverging said laminated yarn group into a plurality of parallel tape-like narrow yarn groups, treating said tape-like narrow yarn groups into liquid, and winding up each tape-like narrow yarn group to its associated winding take up beams. Some defects in the yarn treating method of conventional prior art have been dissolved by the new treating method described above, but winding take up beams for the tape-like narrow yarn groups are arranged with their axes being at right angles with respect to the advancing direction of the yarns, so that when the yarns separated into the greater number of tape-like narrow yarn groups are to be wound up on the beams, the winding beams have to be provided over a fairly long distance and therefore an elongated floor space is needed.

In addition, the winding beams, which are fairly wider than the tape-like narrow yarn group, have to be arranged with their axes spacing from each other, so that each winding beam has individual traversing means. It has been very expensive to provide the traverse means for each winding beam.

Accordingly, an object of the present invention is to provide a yarn winding apparatus which needs less space and area for facility of winding apparatus.

Another object of the present invention is to provide the yarn winding apparatus, therein a plurality of take up beams can be driven simultaneously by at most two power sources.

According to the present invention, in an apparatus for winding up a plurality of tape-like narrow yarn groups divided from a sheet-like wide yarn group and treated in liquid, said apparatus comprising a first means for changing the direction of each liquid-treated tape-like narrow yarn group at right angles with respect to the advancing direction of a plurality of tape-like narrow yarn groups, and a second means for winding up said each tape-like narrow yarn group on each take up beams arranged with its axis being parallel to said advancing direction of the tape-like narrow yarn groups.

Furthermore, according to the present invention, in a method for winding up a plurality of tape-like narrow yarn groups divided from a sheet-like wide yarn group, and treated in liquid, said method comprises steps of changing the direction of each treated tape-like narrow yarn group at right angles with respect to the advancing direction of the tape-like narrow yarn groups, and winding up the tape-like narrow yarn group on each take up beams arranged with its axis being parallel to the advancing direction of the tape-like narrow yarn groups.

The aforementioned and other objects and features of the present invention will be apparent from the following detailed description of a specific embodiment thereof, when read in conjunction with the accompanying drawings, in which:

FIGS. 1 and 2 are a side view and a plan view respectively showing schematically a warping process in a known method of the same process.

FIG. 3 is a plan view showing a process in which a plurality of sheet-like wide yarn groups are laminated and then divided into tape-like narrow yarn groups.

FIG. 4 is a perspective view showing the apparatus according to the present invention and also showing how the treated tape-like narrow yarn groups are wound on the take up beams.

FIG. 5 is a plan view of the apparatus according to the present invention.

FIG. 6 is a circuit view for driving a motor of FIG. 4 in the clockwise and counter-clockwise directions.

Concerning FIGS. 1 and 2 showing a warper process, a number of yarns 1 to be treated are pulled out from respective bobbins supported on a creel stand and passed through a perforated guide board 2. These yarns are then passed through guide rollers 3 so as to be arranged into a sheet-like wide yarn group comprising for example, 500 parallel yarns. The process of this can easily effected by using a known warper usually employed for preparation of warps for woven fabrics.

In order to facilitate the final operation for dividing the laminated yarn group into an individual yarn, a lease yarn 5 is inserted across the yarns alternately above and below at longitudinal intervals of, for instance, 1,000 to 5,000 meters long. Insertion of each lease yarn 5 is effected by moving a creel 4 vertically, once upwardly and once downwardly for each insertion, while using the guide rollers 3 to hold the sheet-like wide yarn group. The lease yarn 5 shown in FIG. 2 is cut into pieces so that each piece may be threaded through the same number of yarns which constitute each tape-like narrow yarn group. The sheet-like wide

yarn group thus inserted by the lease yarn 5 is then wound up on a supply beam 6.

A suitable number of the supply beams 6, each having the sheet-like wide yarn group wound up thereon, are arranged in a parallel form to one another with their axes being at right angles with the advancing direction of the yarns, as shown in FIG. 3. The sheet-like wide yarn group forwarded from the supply beams 6 are then laminated successively in layers.

The laminated wide yarn group is then divided in accordance with the indication of the lease yarns 5 into a plurality of tape-like narrow yarn groups 7, each of which comprising the equal number of yarns.

Then each tape-like narrow yarn group 7 is evenly gathered by a guide member 10 provided before the following process of liquid treating, and a nip roller 9 is preferably provided between the guide member and a treating liquid vessel 8, whereby each tape-like narrow yarn group has a substantially rectangular shape in section before being supplied into the liquid treating vessel 8. On this process the guide member 10 and the nip roller play an important role to attain a uniform treatment in liquid and prevent entangling of the yarns and other troubles in the course of the processes.

Passing through several treating liquid in vessels, the tape-like narrow yarn groups 12 enter into a dryer and further advance into an apparatus according to the present invention, shown in FIGS. 4 and 5.

In the apparatus, a plurality of diverging pieces 14¹ - 14ⁿ are provided to make an angle of 45° with the advancing direction of a plurality of tape-like narrow yarn groups 12 so that half of the tape-like narrow yarn groups 11¹ - 11^{n/2} and the other half of them 11^{(n/2)+1} - 11ⁿ may be diverged to right and left sides of the advancing yarn groups, respectively. The diverging pieces in one side, i.e., left or right are spaced from each other at fixed intervals in such a manner that the diverging pieces for inner tape-like narrow yarn groups are away from the nip rollers as they come inside of the advancing yarn groups.

A pair of delivery rollers 15¹ - 15ⁿ are provided in adjacent to each diverging piece 14¹ - 14ⁿ with their axes being parallel to the advancing direction of the tape-like narrow yarn groups 11¹ - 11ⁿ. The delivery rollers 15¹ - 15ⁿ act to hold associated tape-like narrow yarn groups so as not to break down uniformity of each tape-like narrow yarn group. The delivery rollers 15¹ - 15ⁿ is positively rotated by a suitable power source such as torque motors 18¹ and 18² in response to the tension of the tape-like narrow yarn group being wound.

Take up beams 16¹ and 16² are provided in association with the delivery rollers 15¹ and 15² to wind up the tape-like narrow yarn group having passed through the delivery rollers 15¹ - 15ⁿ. Each take up beam is positively rotated by a suitable power source 17¹ and 17² such as a torque motor in response to the tension of the yarn group 11¹ - 11ⁿ being wound. The take up beams 16¹ and 16² are traversed in parallel to the advancing direction of the yarn groups so that each tape-like narrow yarn group may be wound on the relatively elongated take up beams in uniform.

Referring to traverse means of the take up beams 16¹ and 16², the take up beam is mounted on a beam stand 20¹ and 20² having four wheels 19¹ and 19² which are placed upon rails 25. The beam stand 20¹ comprises a nut 22 at the bottom center thereof and a screw 21 threaded through the nut 22. By threaded engagement

between the screw and nut, the beam stand 20¹ is traversed along the rails 25 by a motor 23 which reversely rotates in the clockwise and counterclockwise directions.

The beam stands 20¹ and 20² on the right hand side with respect to the advancing direction of the yarn groups 11¹ - 11ⁿ, as shown in FIG. 4, are connected with each other by a connecting member 24 so that both beam stands 20¹ and 20² are traversed; simultaneously along the rails 25 by a single power source of the motor 23.

In place of the threaded engagement between the screw 21 and nut 22, gear means or other means for rotating the wheels 19¹ - 19ⁿ in the clockwise and counterclockwise directions may be used.

The traversing movement of the beam stands 20¹, 20² and the clockwise-counterclockwise directional rotations of the motor 23 are executed by the following method.

As shown in FIG. 4 there are provided microswitches LS₁, LS₂ which are often called limit switches, so that the beam stands may have a contact with either of the microswitches at a predetermined position when the beams and the beam stands travel in the back and forth directions. The contact between the microswitches and the beam stands is detected or sensed. The sensing device is connected to an input of a flip-flop circuit. An output of the flip-flop circuit is connected to an input of a relay device for electric polarity exchange. operation is described in detail with reference to FIG. 6. When the beam stands 20¹, 20² travel to a place where the beam stand 20¹ contacts the microswitch LS₁, then the microswitch operates to raise detecting signals, thereby to change the state of the flip-flop circuit FF. Due to the conversion or change of the flip-flop circuit state, relays RY₁, RY₂ are changed in their polarity exchange contact to exchange the polarity of a driving current of the motor 23. S₁ is a DC power supply. Then the motor reverses its rotational direction to move the beam stands in the opposite direction. When the beam stands are moved further in the above-described opposite direction, then the beam stand 20² comes in contact with the other microswitch LS₂. The contact between the beam stand 20² and the microswitch LS₂ will raise such signals that the flip-flop circuit state is returned to the aforementioned state. At the same time, also the polarity conversion contact of the relay device is changed again to move the beam stands in the direction first mentioned above. In FIG. 6, S₂ is a DC power supply for driving the relays LS₁ and LS₂. The microswitch LS₁ is a make-contact and the microswitch LS₂ is a break-contact. Furthermore, the tape-like narrow yarn groups themselves may be traversed and wound up on stationary take up beams.

The apparatus according to the present invention is so constructed that the tape-like narrow yarn groups 11¹ - 11ⁿ advancing through the nip rollers 13 are changed at right angles to their direction of movement by the associated diverging pieces 14¹-14ⁿ and, advancing through the delivery rollers 15¹ and 15², wound up on their associated take up beams 16¹ and 16² while the latter are traversed.

According to the present invention, therefore, less space and area can be quite sufficient for winding up yarns on the take up beams, since a plurality of take up beams are provided on both or either side of the tape-like narrow yarn groups with their axes being in parallel

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with the advancing direction of said tape-like narrow yarn groups so that the beams are arranged in parallel with said tape-like narrow yarn groups.

Furthermore, according to the present invention a plurality of take-up beams can be moved or traversed together in the traveling direction of the sheet-like yarn group by means of a single motor which rotates in clockwise and counter-clockwise directions, since the take-up beams on one side are connected together.

Though the present invention has been described by way of a preferred embodiment thereof, it will be apparent to those skilled in the art that many modifications and alternations may be made within the scope of the spirit of the present invention.

What we claim is:

1. In an apparatus for winding up yarns on respective take-up beams from a plurality of tape-like narrow yarn groups divided from a sheet-like wide yarn group after treatment in liquid, said apparatus comprising a first means for changing the direction of each liquid-treated tape-like narrow yarn group substantially at right angles with respect to the direction of travel of the sheet-like yarn group, and second means for winding up each of the tape-like narrow yarn groups on the take-up beams, said beams being arranged with their axes being parallel to said traveling direction of the sheet-like yarn

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group, said plurality of take-up beams being connected together to be moved simultaneously in the direction of travel of said sheet-like wide yarn group, said first means being diverging pieces provided at substantially 45° with respect to the direction of travel of said tape-like narrow yarn groups, whereby said yarn groups are diverged to both sides of the yarn advancing direction.

2. An apparatus as claimed in claim 1 wherein each of said take-up beams is provided on a beam stand having four wheels.

3. An apparatus as claimed in claim 1 wherein each of said take-up beams is rotated by a torque motor.

4. An apparatus as claimed in claim 2 wherein said apparatus further comprises rails on which said wheels roll reciprocally.

5. An apparatus as claimed in claim 1 wherein said take-up beams are rotatably mounted along both sides of the extended axis of the direction of travel of said sheet-like wide yarn group.

6. An apparatus as claimed in claim 1 wherein said apparatus further comprises a pair of delivery rollers rotatably mounted between each of said diverging pieces and each of said take-up beams, said delivery rollers being driven by a torque motor.

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