United States Patent [19]

Kodama

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[45] **Feb. 5, 1974**

[54] **YARN TREATING METHOD**

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[52] **U.S. Cl.**..... **28/72.6,** 28/28, 28/33, 28/37, 28/40, 242/35.5 R

[51] **Int. Cl.**.....**D02h 9/00,** D02h/5/02

[58] **Field of Search**...28/28, 29, 33, 37, 40, 72.5, 28/72.6; 242/35.5 R

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[57] **ABSTRACT**

A plurality of sheet-like yarn groups each consisting of a number of parallel yarns are drawn out from respective supply beams and laminated in layers to form a laminated yarn group. The laminated yarn group is divided into a plurality of parallel narrow yarn groups and subjected to treatment in liquid. Each treated narrow yarn group is wound up on an associated take-up beam.

4 Claims, 11 Drawing Figures

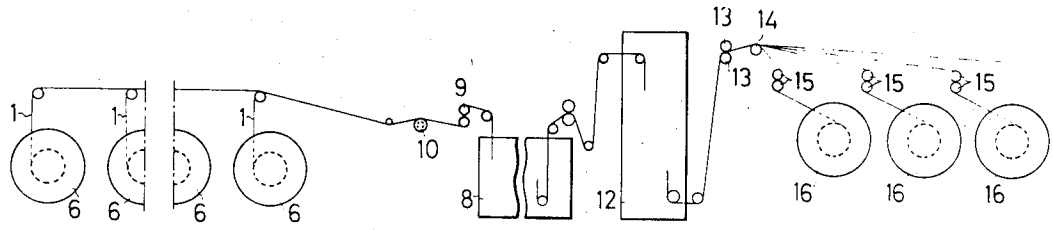


FIG. 1

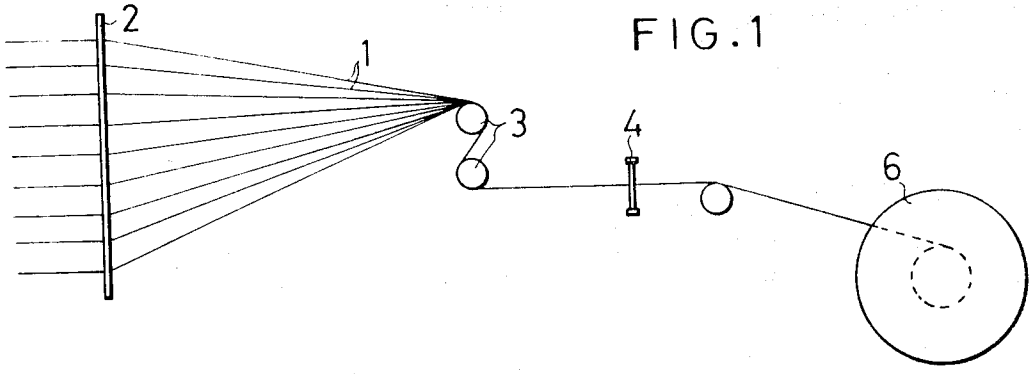


FIG. 2

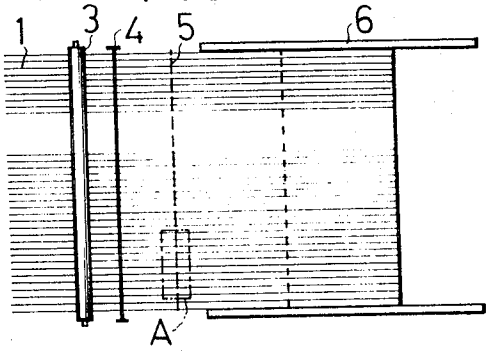


FIG. 6

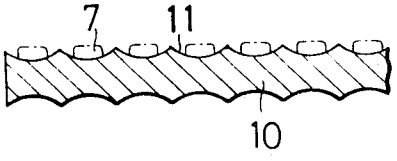


FIG. 3

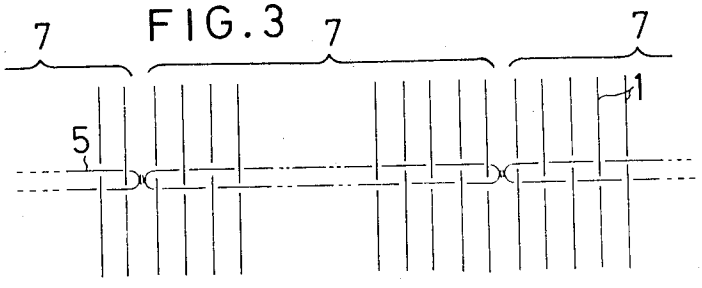
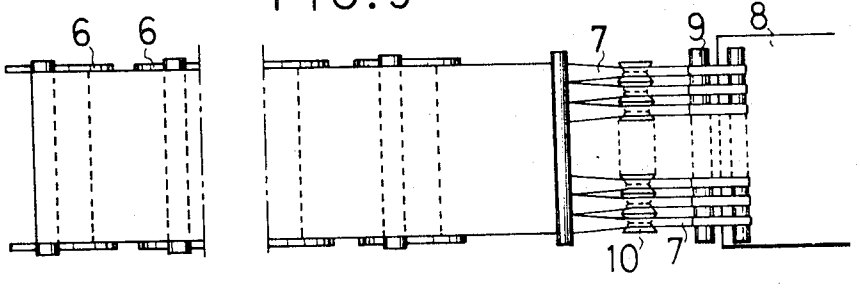


FIG. 5



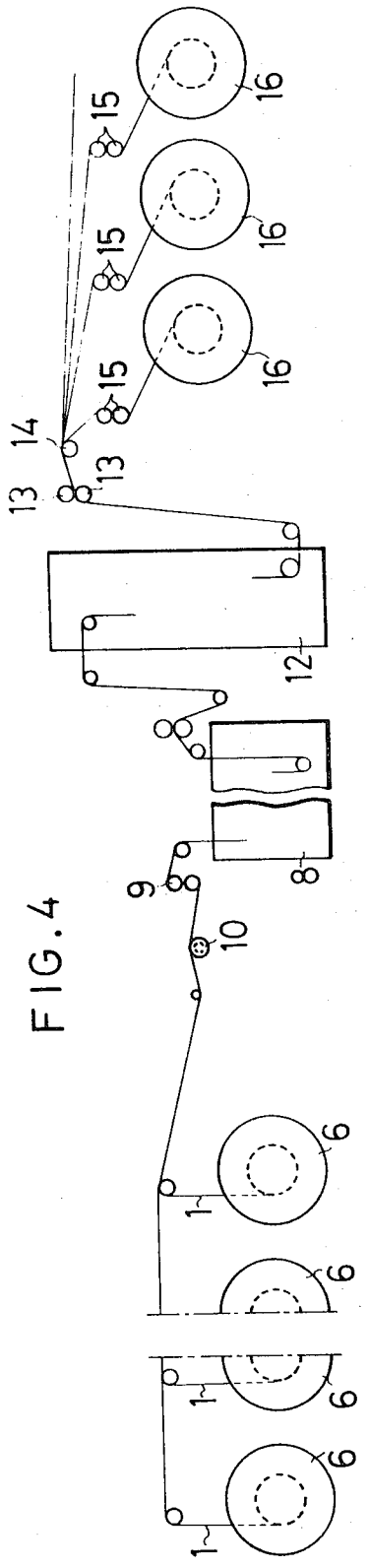


FIG. 4

FIG. 7

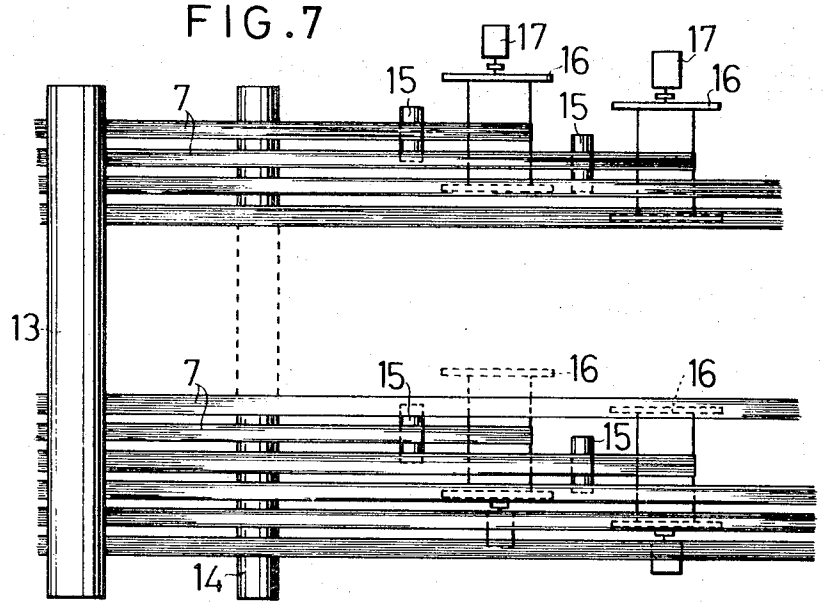


FIG. 8

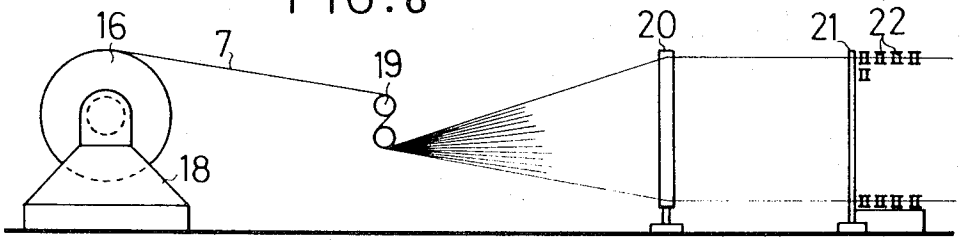
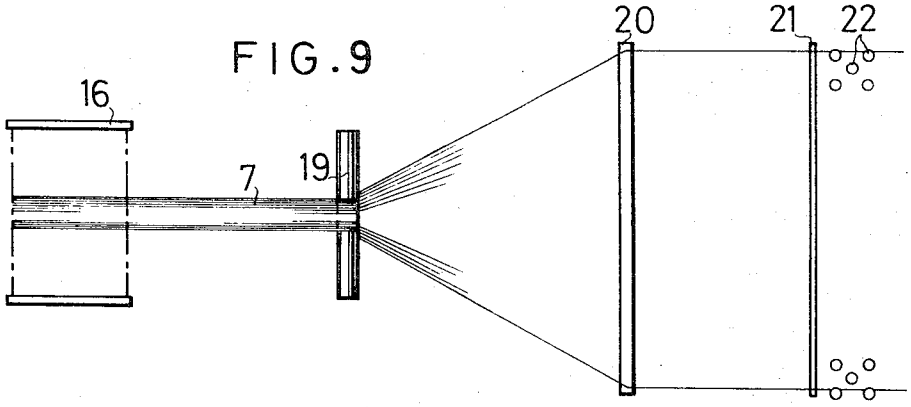


FIG. 9



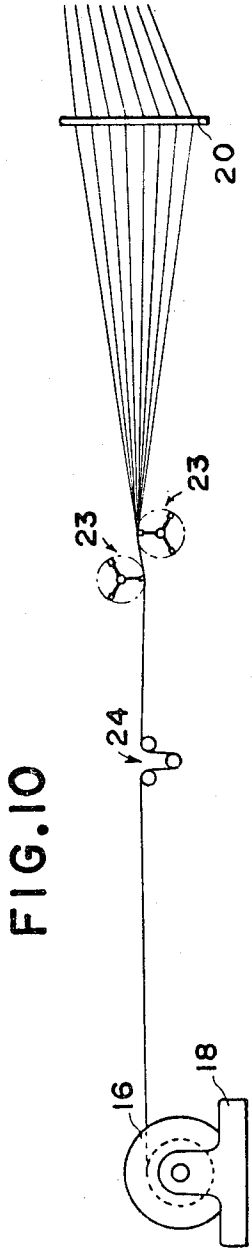


FIG. 10

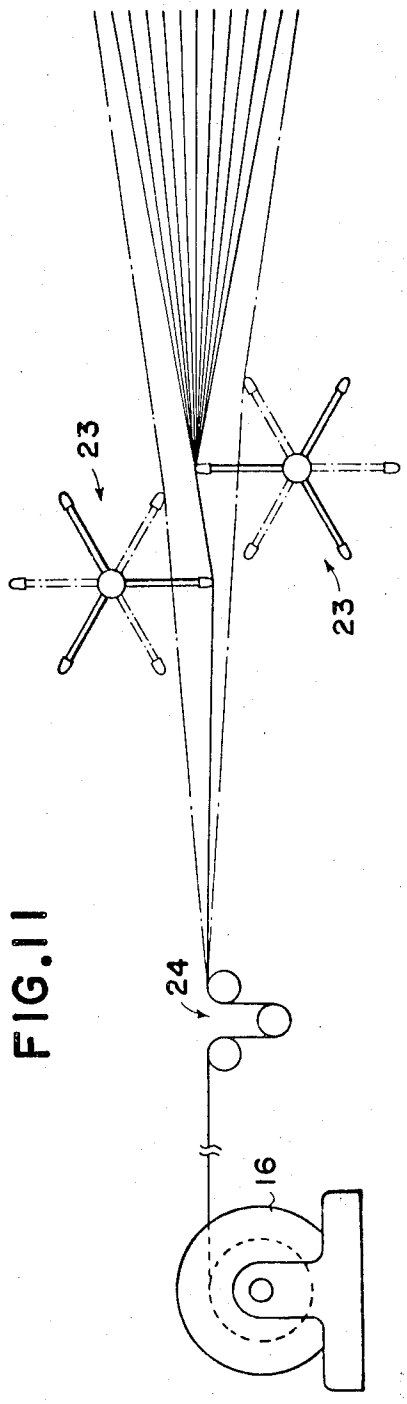


FIG. 11

YARN TREATING METHOD

This invention relates to a yarn treating method and more particularly to a method for treating a number of yarns which are subjected to treatment in liquid.

For continuously treating a number of yarns in a liquid, such as for mercerization, it has been 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 with each other into the form of a wide sheet-like yarn group, which is then wound up on a warper beam. A plurality of warper beams thus wound are arrayed and the sheet-like yarn groups are taken out from the beams to be laminated in layers. Thereafter, the laminated yarn groups in layers are subjected to mercerization.

Such a method will have some advantages in that, since the yarns are arranged in the sheet-like yarn groups and laminated in layers, they will hardly entangle with each other while in processing, and that, after treatment in liquid, the processes for separating the laminated yarn groups into each sheet-like yarn group and for separating the latter into each yarn will be effected with ease.

However, in the yarn treating methods like mercerization, the yarns are subjected repeatedly to liquid immersion and exposure to the atmosphere while passing through several to 10 or more treating liquid vessels under positive tension. Accordingly, such wide laminated yarn groups tend 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, even if each sheet-like yarn group is so controlled as to form a uniform layer when it is fed, it is extremely difficult to maintain such uniformity throughout the working process. Furthermore, such sheet slits cause non-uniformity of working treatment (non-uniform penetration of the treating liquid or unevenness of tension) and have bad affects upon the separatability of the yarns, resulting in degradation of products and reduction of productivity.

Such sheet slits may be prevented if the laminated yarn groups are formed with fairly increased thickness. In such a case, however, the treating liquid can hardly penetrate uniformly through such wide and thick layers of the yarn groups, causing non-uniformity in the treatment.

Furthermore, when the yarns are merely arranged parallel to each other in the form of wide sheet and laminated in layers, the processes for separating the broad sheet groups into each yarn after treatment and for winding them up on respective bobbins disposed in the predetermined arrangement will be troublesome.

Accordingly, an object of the present invention is to provide a yarn treating method in which sheet-like yarn groups laminated in layers are treated without any sheet slit in treating liquid.

Another object of the present invention is to provide a yarn treating method in which yarn groups having been treated can be very certainly and rapidly separated into individual yarns.

A further object of the present invention is to provide a yarn treating method in which yarn groups laminated in multiple layers can be uniformly and positively treated in treating liquid.

According to the present invention, a plurality of sheet-like yarn groups each consisting of a number of parallel yarns are drawn out from respective supply beams and laminated in layers to form a laminated yarn group. The laminated yarn group is divided into a plurality of parallel narrow yarn groups and subjected to treatment in liquid. Each narrow yarn group is wound up on an associated beam.

The aforementioned and other objects and features of the 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 the method according to the present invention;

FIG. **3** is an enlarged plan view of a portion A enclosed by a chain line in FIG. **2**;

FIG. **4** is a schematic side view showing principal portions of the yarn treating method according to the present invention;

FIG. **5** is a plan view showing a process in which a plurality of sheet-like yarn groups are laminated and then divided into narrow tape-like yarn groups;

FIG. **6** is a sectional view of a guide member whereby the laminated sheet-like yarn group is divided into the narrow tape-like yarn groups;

FIG. **7** is a plan view showing a process in which the narrow tape-like yarn groups are wound up on associated beams;

FIGS. **8** and **9** are a side view and a plan view, respectively, showing a process in which each yarn group wound up on the associated beam is separated into individual yarns;

FIG. **10** is a schematic side view of a final yarn separating process in which a beater and dancer rollers are used; and

FIG. **11** is an enlarged side view of the beater in FIG. **10.**

Referring now to FIGS. **1** to **3** showing a warping 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 around guide rollers **3** so as to be arranged into a sheet-like wide yarn group comprising, for example, 500 parallel yarns. This process can easily be effected by using a known warper which is usually employed for preparation of warps for woven fabrics.

In order to facilitate the operation for dividing laminated yarn groups into an individual yarn, as will be further discussed hereinafter, a lease yarn **5** is inserted across the yarns alternately above and below at longitudinal intervals of 1,000 to 5,000 meters as shown in FIG. **3.** Insertion of each lease yarn is effected by moving a reed **4** vertically, once upwardly and once downwardly for each insertion, while using the guide rollers **3** as sheet holders. The lease yarn **5** is cut into pieces in order that each piece may be threaded through the same number of yarns (for example 25 yarns) which constitute each narrow tape-like yarn group, as will be further discussed later. The longitudinally adjacent pieces of the lease yarn **5** are tied together at both ends. 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,** for example **8** beams, each having the sheet-like wide yarn

group wound up thereon, are arranged parallel to one another with their axes being at right angles with the advancing direction of the yarns, as shown in FIGS. **4** and **5.** The sheet-like wide yarn groups drawn out from these supply beams **6** are laminated successively in layers to form a laminated sheet-like wide yarn group.

The laminated wide yarn group is divided in accordance with the indication of the lease yarns **5** into a plurality, for example 20 rows, of narrower tape-like yarn groups **7** each comprising the equal number of yarns.

In order to attain uniform treatment in liquid and to prevent entangling of the yarns or other troubles in the course of the process, it is desirable that the shape or configuration of each narrow tape-like yarn group is kept evenly throughout the treating process. For this end, each tape-like yarn group **7** is evenly throttled by a guide member **10** provided just in front of nip rollers **9** at the entrance of treating liquid vessel **8,** whereby each tape-like yarn group has a substantially rectangular sectional shape before it is supplied into the vessel **8.** This guide member **10** is preferably formed with a plurality of curved depressions **11** around its surface at equal intervals along the lengthwise direction thereof, as best shown in FIG. **6.** Accordingly, the yarns are converged smoothly into the tape-like yarn groups **7** of uniform width and thickness while passing through the curved depressions **11.**

Thus converged tape-like yarn groups **7** are immersed in the treating liquid in the vessel **8** while maintaining the predetermined width and thickness and are finally subjected to drying treatment in a dryer **12.** Kinds of the treating liquid used, the number of liquid vessels and the degree of tension imparted to the yarns are determined in accordance with the kinds of treatment, such as mercerization, dyeing, resin treatment, etc.

Each of the tape-like yarn groups having been subjected to the drying treatment further advances through a pair of nip rollers **13** and guide roller **14** and then passes around delivery rollers **15** arranged in pairs and spaced apart from other ones at fixed intervals with sidewise displacement. The tape-like yarn groups **7** are then wound up on associated take-up beams **16** which are positively rotated by a suitable power source **17** such as torque motor shown in FIG. **7** in response to the tension of the yarn groups being wound. The tape-like yarn group comprises a number of yarns laminated in layers and is relatively thick, so that, in order to maximize the amount of yarns taken-up, each take-up beam **16** is provided with a width several times greater than that of each tape-like yarn group and is traversed while taking up the latter.

Then, each beam **16** is set on a beam stand **18** from where the tape-like yarn group is drawn out and passed through a pair of guide rollers **19.** The yarn group is now broken up and separated into individual yarns, which are then passed through a perforated guide board **20.** In the embodiment shown in FIGS. **8** and **9,** the tape-like yarn group is led from the take-up beam **16** directly to the guide rollers **19,** but, preferably, in order to facilitate breaking-up of the yarn group into the individual yarns to be passed through the perforated guide board **20,** the guide rollers **19** are spaced as much away from the beam **16** as possible and a beater and dancer rollers may be provided therebetween as shown in FIG. **10.** The beater **23** expedites the separation of the yarns at the final yarn separating process as shown in FIG. **11,** while the dancer rollers **24** serve to absorb impact or inertia force in the travelling yarns.

The perforated guide board **20** is disposed in parallel to a creel **21** and comprises the same number of yarn guide holes as bobbins **22** mounted on the creel **21.** The yarns in the uppermost layer of the tape-like yarn group are passed through holes of the uppermost horizontal row in the perforated guide board **20** and wound up on the uppermost bobbins **22** on the creel **21.** Likewise, the yarns in other layers of the yarn group are passed through corresponding yarn guide holes in the perforated guide board. As mentioned above, the lease yarn **5** is inserted above and below the yarns forming each layer of the tape-like yarn group **7** so as to regulate the separability between layers as well as the adjacent yarns in the group. Accordingly, as the operation for inserting the yarns into the corresponding yarn guide holes in the perforated guide board **20** can be effected at places where the lease yarns **5** are strung through the yarns, the breaking-up of the yarn group into the individual yarns is achieved quickly and positively. Also, if the lease yarns **5** used for each layer of the laminated yarn group are tinted with different colors, it will greatly expedite the operation for separating the yarn group into each layer. The number of the yarn guide holes in one vertical column is equal to or may be more than that of the layers in each tape-like yarn group, while the number of the yarn guide holes in one horizontal row is equal to or may be more than that of yarns in one layer. Before passing the yarns through the yarn guide holes, the lease yarn is cut off and the yarns are wound up on the respective bobbins on the creel **21.**

In the present invention, a laminated yarn group comprising a plurality of sheet-like yarn groups each consisting of multiple parallel yarns is divided into a plurality of tape-like parallel narrow yarn groups, so that even in case the yarns are subjected to liquid treatment through several liquid vessels under a positive tension as in the case of mercerization, no sheet slits are produced.

Furthermore, if the number of the yarns constituting each layer of the tape-like yarn group is made equal to that of the yarn guide holes in one horizontal row of the perforated guide board to be used in the final yarn separating process and if the number of the layers in the tape-like yarn group is made equal to that of the yarn guide holes in one vertical column of the perforated guide board, the operation for separating the yarn group into individual yarns will be effected with ease.

Also, a great number of the yarns are formed into a plurality of tape-like narrower yarn groups and then immersed into the treating liquid, so that even when each tape-like yarn group is composed of multiple layers, the treating liquid penetrates uniformly throughout the yarn group.

Furthermore, the lease yarns are inserted into or strung through, at fixed intervals, each of the layers constituting the tape-like yarn group, so that when the yarn group is to be separated into individual yarns, upper and lower yarn layers can be distinctly partitioned to greatly expedite final separation. In addition, if the lease yarn is inserted alternately above and below each yarn, the free movement of each yarn is restricted,

thereby allowing still easier and still more effective separation of the yarns.

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 is claimed is:

1. A method for treating yarns comprising the steps of drawing out a plurality of sheet-like yarn groups each having parallel yarns from respective supply beams, laminating said sheet-like yarn groups in layers to form a laminated yarn group, dividing said laminated yarn group into a plurality of parallel narrow yarn groups by means of lease yarns provided across said parallel yarns at predetermined intervals, each of said divided yarn groups having the same number of yarns and constituting a layer of said narrow yarn group, immersing said narrow yarn groups into treating liquid for treatment, winding up each narrow yarn group to a take-up beam associated with that narrow yarn group, drawing out each narrow yarn group from its said take-up beam, separating said narrow yarn group into layers by means of said lease yarns, and winding up said yarns separately on respective bobbins.

2. A yarn treating method as claimed in claim **1**, wherein a plurality of said take-up beams are arranged with their axes being at right angles with the advancing direction of said yarns, said take-up beams being away from one another along the yarn advancing direction.

3. A yarn treating method as claimed in claim **1**, wherein each of said lease yarns is inserted alternately above and below said yarns, said lease yarns being differently colored.

4. A yarn treating method as claimed in claim **1** wherein said yarns wound up on said take-up beam are passed through a perforated guide board in accordance with the indication of said lease yarns, said yarns between said take-up beam and said perforated guide board being beaten by a beater to facilitate separation thereof and their impact or inertia force being absorbed by dancer rollers.

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