

TRAVERSE TAKE-UP APPARATUS
FOR MATERIAL OF INDEFINITE LENGTH

This invention relates to a take-up apparatus for material of indefinite length such as thread, rope, tape or the like (possibly to be subjected to dyeing or liquid treatment) in which the material is helically wound in a plurality of layers about a winding beam with tapered flanges and more particularly, has its purpose to provide an apparatus for material of indefinite length in which the traverse movement distance of a material guide means is increased as the diameter of the roll of material being wound on the winding area of the beam between the opposite tapered flanges increases so that the material is transversely and suitably fed to the tapered winding area on the flanges at the opposite ends of the beam and thereby the material is uniformly wound in layers in a stabilized condition.

It has been conventionally known that material of relatively small width and of indefinite length such as thread, tape, rope and the like to be subjected to dyeing or liquid treatment is transversely wound in layers on the porous winding barrel of a winding beam having flanges at the opposite ends. But the winding beam with flat flanges has the disadvantage that when the material wound in layers is subject to liquid treatment such as dyeing, since the opposite ends of the material layers offer a low resistance to the liquid passing through the material layer ends, the material layer areas are excessively treated. Thus, in order to eliminate such disadvantage, the inner side faces of the flanges have been conventionally tapered.

However, when material of indefinite length is wound on the winding beam having tapered flanges, a traverse distance varying means is necessary to gradually increase the traverse distance of the material so that the material can be uniformly wound in layers on the tapered faces and as such traverse distance varying means, an electrical or mechanical means has been proposed. However, the conventional electrical or mechanical means has a complicated mechanism and

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encounters difficulties in handling. Thus, there has been demand for a stable and positive take-up apparatus for material of indefinite length.

Especially, when the material of indefinite length to be handled is an uneven tape such as a tape having a reinforcing core along one side edge thereof, a stringer having slide fastener elements secured along the reinforced side edge thereof or a fastener chain comprising two stringers engaging with each other, layers formed of such a material become relatively unstable and often cause partial variation in the density of material layers under the pressure of liquid passing through the layers same which would lead to uneven dyeing and treatment and furthermore would cause undesirable deformation such as the formation of corrugations in the tape. In order to eliminate such difficulties it is desirable to wind the material or tape in twilled layers at an angle to each other. However, the conventional take-up apparatus can not satisfactorily attain such winding mode.

According to the present invention, there is provided a traverse take-up apparatus for material of indefinite length such as thread, rope, tape or the like comprising a winding beam having tapered flanges at the opposite ends thereof and a rotary shaft, a beam rotating means, a material guide means for traverse movement parallel to said rotary shaft of the beam and a traverse distance adjusting mechanism adapted to increase the traverse distance of said material guide means as said material is wound in successive layers on the winding beam. said traverse distance adjusting mechanism having two screw shafts which are parallel traverse screw shafts disposed parallel to said beam rotary shaft with the traverse distance on one of said traverse screw shafts set for a predetermined minimum winding width and the traverse distance on the other of said traverse screw shafts set for a predetermined maximum winding width, said traverse distance adjusting mechanism further including a rocker

rod engaged to said traverse screw shafts, a slider mounted on said rocker rod and slidable along the length of the rocker rod and a third screw shaft mounted on said material guide means at right angles to the traverse direction of said guide means and being in threaded engagement with said slider, the rotations of said ^{two} traverse screw shafts ~~and said third screw shaft~~ being interlocked with each other under a predetermined speed relationship, speed change means being provided between the beam rotary shaft on the one hand and the traverse screw shafts on the other hand to vary the speed relationship therebetween.

It is possible by means of the present invention to provide a take-up apparatus for material of indefinite length which has a simple construction which is stable and positive in operation and which can adjust the traverse distance. Furthermore, it is possible to make the take-up apparatus easily adaptable to parallel winding by slow traverse and layer winding such as twill winding by quick traverse.

The invention will be described by way of example with reference to the accompanying drawings which show one preferred embodiment of the present invention for illustration purpose only, but not for limiting the scope of the same in any way. In the drawings:-

Fig. 1 is a plan view of a take-up apparatus embodying the present invention;

Fig. 2 is a side elevational view of said apparatus as shown in Fig. 1 showing a portion thereof in section; and

Figs. 3 to 5 are fragmentary plan views of a portion of said apparatus showing a winding mode of material of indefinite length onto tapered winding faces on a winding beam of said apparatus.

In the drawings, Fig. 1 is a plan view of the take-up apparatus having a beam B mounted thereon constructed in accordance with the present invention and Fig. 2 is a side

1 elevational view of the take-up apparatus showing a portion thereof in section. The beam B comprises a winding barrel 11 which has at the opposite ends tapered flanges 14, 15 provided with tapered winding faces 12, 13 on the inner
5 sides thereof, respectively, and hollow cylindrical lugs 16, 17 projecting outwardly from the tapered flanges 14, 15, respectively.

The beam B is rotated by a beam rotating means 1 which comprises a support 18 fitted in and rotatably supporting
10 the lug 16 and a support 19 fitted in and holding the lug 17. The support 19 is operatively connected to a rotary drive means 20 which is in turn driven from a motor M through a reduction gear 9 and a wheel - belt arrangement.

A guide means 2 for guiding material of indefinite
15 length includes a frame work 21 provided at the lower end thereof with four wheels 7,7,7,7 which run along a pair of rails 8,8 laid on the floor F parallel to the rotary shaft of the beam B supported by the beam-rotating means. Provided on the side of the framework 21 facing the beam B
20 is a guide bar 23 having one end provided with a guide 22 for guiding material on the beam B and the other end pivoted at the upper end of a stay 25 by means of a pivot pin 24. Also provided on the guide means 2 is a roller mechanism 27 comprising rollers disposed in different heights
25 and including a vertically movable tension regulation roller 26 for transferring material T of indefinite length.

A screw shaft 28 is rotatably journalled in a lower portion of the framework 21 in a direction at right angles to the direction of the movement of the guide means 2 and
30 has one end connected to a fine adjusting rotary motor M'.

A traverse distance adjusting mechanism 3 includes a pair of parallel traverse screw shafts 31, 32 and a rocker rod 33 in threaded engagement with the screw shafts. The traverse screw shafts 31, 32 are parallel to the rotary shaft for rotating the
35 beam B and are journalled at the opposite ends thereof on the floor F by means of bearings 34, 34 and 35, 35 respectively and an interlocking chain 5 is trained about the sprockets at the ends of the screw shafts 31, 32 where the shafts are journalled by the bearings 35,35.

The traverse screw shafts 31, 32 are formed with forward and reverse grooves and engaging pieces 36, 37 engage in the screw grooves so that as the traverse screw shafts 31, 32 rotate, the engaging pieces 36, 37 move reciprocally along the shafts. The reciprocal movement distance l' of the engaging piece 36 on the screw shaft 31 is set for a predetermined minimum winding width l or the width of the winding barrel 11 of the take-up beam B having tapered flanges and the reciprocal movement distance L' of the engaging piece 37 on the screw shaft 32 is set for a predetermined maximum winding width L of the beam or the distance between the outer peripheral edges of the tapered flanges and extreme ends of these distances l' and L' are aligned with ends of the widths l and L respectively in the direction perpendicular to the shafts 31, 32.

The rocker rod 33 is pivoted at one end to the engaging piece 36 associated with the traverse screw shaft 31 and formed at the other end with an elongated stepped slot 38 for receiving the head of the engaging piece 37 associated with the traverse screw shaft 32.

Reference numeral 10 denotes a variable speed change gearing for transmitting the rotation of the rotary shaft for rotating the beam B to the traverse screw shafts 31, 32 and a timing belt or chain arrangement interlocks between the beam, traverse screw shafts and variable speed change gearing.

With the above-mentioned construction and arrangement of the components of the illustrated take-up apparatus, the apparatus can suitably wind thread or tape of indefinite length on the winding barrel of the beam in different winding modes such as parallel winding and diagonal or twill winding at different angles.

Figs. 1 and 2 show the take-up apparatus in an intermediate stage during the winding operation. Material T of indefinite length is supplied from a supply source (not shown) and transferred through a tension guide roller group 41 and the roller mechanism 26 of the material guide means 2 onto the winding barrel 11 and tapered winding

faces 12, 13 of the beam B to be wound thereabout. The rotation of the beam B is transmitted through the motor M, reduction gear 9 and belt 4 to the rotary drive means 20 and also transmitted through the chain 5, speed change gearing 10 and chain 6 to the traverse screw shafts 31, 32 to rotate the shafts..

As mentioned hereinabove, the traverse screw shafts 31, 32 are formed with forward and reverse screw grooves and the opposite ends of the rocker rod 33 are engaged to the screw shafts 31, 32 by means of the engaging pieces 36, 37, respectively.

The screw pitch of the traverse screw shafts 31, 32 is so set that, when the rocker rod 33 is positioned in the center of the reciprocal distances l' and L' on the traverse screw shafts 31, 32, respectively, the longitudinal axis of the rocker rod 33 extends perpendicular to the axis of the rotary shaft for rotating the beam B and when the rocker rod 33 moves leftwards or rightwards from the centers of the reciprocal movement distances on the traverse screw shafts 31, 32, respectively, the rocker rod 33 performs a fan-like movement so that the engaging piece 37 inclines towards the flanges of the beam B. When the screw pitch of the traverse screw shafts 31, 32 is the same, the ratchets about which the chain 6 is trained are formed with different diameters to increase the rotational speed of the traverse screw shaft 32 so as to tune the traverse of the engaging pieces 36, 37 on the two traverse screw shafts whereby the traverse screw shafts operate in the same way.

Furthermore, a slider 29 is in threaded engagement with the screw shaft 28 on the framework 21 of the material guide means 2 to transmit the movement of the rocker rod 33 to the material guide means 2 and the slider 29 connects between the traverse adjusting mechanism 3 and material guide means 2. The screw shaft 28 is continuously rotated by the rotary motor M' as the material is wound in successive layers on the beam B or intermittently rotated when one winding layer is formed by a plural number of traverses, to increase the winding width of the material in conformity with the tapered

winding faces.

Figs. 3 to 5 are plan views showing the increase of the winding width of the traverse take-up apparatus. Each of these Figures shows the time point when the guide 5 22 adapted to guide the material onto the beam winding surface has reached the left-hand tapered winding face 12.

In Fig. 3, the slider 29 lies in a position on the rocker rod 33 in which the first layer of material T has not been on the beam barrel 11 and the traverse screw shaft 10 31 reverses its rotational direction with the slider 29 positioned in a corresponding position on the rocker rod 33. In Fig. 4, the material T is wound in a plurality of layers S with the ends of the material layers lying along the tapered winding face 12 and the slider 29 has moved to an 15 intermediate position along the screw shaft 28 by the rotation of the fine adjusting rotary motor M'. Fig. 5 shows the position of the apparatus at the time point approaching the completion of the winding operation in which the slider 29 is approaching the traverse screw shaft 32 20 and the rocker rod 33 has reached a position corresponding to the position of the slider 29.

In the illustrated embodiment, although the reciprocal movement distances ℓ' , L' of the rocker rod 33 on the traverse screw shafts 31, 32, respectively, are set to 25 correspond to the minimum winding width ℓ and the maximum winding width L on the beam B, respectively, in the present invention, the relationship between the reciprocal movement distances of the rocker rod is not limited to that described above, but the magnitude relationship between ℓ' and ℓ and 30 that between L' and L can be optionally varied provided that the $\ell' < L'$ relationship is satisfied.

As described hereinabove, the relative relationship between the rotational speed of the winding beam and the rotational speed of the traverse distance adjusting mechanism can be ^{selectively} ~~optionally~~ 35 varied by the variable speed change gearing 10 to thereby vary the traverse speed of the material guide means relative to the rotational speed of the winding beam so that an _____

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optional traverse winding can be uniformly performed on the beam winding barrel and tapered winding faces. Thus the material wound about the beam with tapered flanges can be effectively subjected to liquid treatment.



CLAIMS:-

1. A traverse take-up apparatus for material of indefinite length such as thread, rope, tape or the like comprising a winding beam having tapered flanges at the opposite ends thereof and a rotary shaft, a beam rotating means, a material guide means for traverse movement parallel to said rotary shaft of the beam and a traverse distance adjusting mechanism adapted to increase the traverse distance of said material guide means as said material is wound in successive layers on the winding beam, said traverse distance adjusting mechanism having two screw shafts which are parallel traverse screw shafts disposed parallel to said beam rotary shaft with the traverse distance on one of said traverse screw shafts set for a predetermined minimum winding width and the traverse distance on the other of said traverse screw shafts set for a predetermined maximum winding width, said traverse distance adjusting mechanism further including a rocker rod engaged to said traverse screw shafts, a slider mounted on said rocker rod and slidable along the length of the rocker rod and a third screw shaft mounted on said material guide means at right angles to the traverse direction of said guide means and being in threaded engagement with said slider, the rotations of said ~~two~~ traverse screw shafts ~~and said third screw shaft~~ being interlocked with each other under a predetermined speed relationship, speed change means being provided between the beam rotary shaft on the one hand and the traverse screw shafts on the other hand to vary the speed relationship therebetween.
2. A traverse take-up apparatus as claimed in Claim 1, in which said third screw shaft is mounted on a framework which forms a portion of said material guide means and is movable parallel to said beam rotary shaft.
3. A traverse take-up apparatus as claimed in Claim 2, in which said third screw shaft is connected to a fine adjusting rotary motor which is supported on said framework, whereby said slider is adapted to be moved along said rocker rod by the rotation of said rotary motor.
4. A traverse take-up apparatus as claimed in Claim 1, 2 or 3, in which said rocker rod is engaged to said traverse screw shafts by means of engaging pieces in threaded engagement with each of said traverse screw shafts.



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5. A traverse take-up apparatus as claimed in Claim 4, in which one of said engaging pieces is pivoted to said rocker rod at its one end and the other of said engaging pieces is engaged in an elongated slot formed in said rocker rod at its the other end.
6. A traverse take-up apparatus as claimed in Claim 1, in which said traverse distances on said one and the other of said traverse screw shafts correspond to the minimum winding width and the maximum winding width on said winding beam respectively.
7. A traverse take-up apparatus as claimed in Claim 1, in which said traverse distances on said one and the other of said traverse screw shafts are different from the minimum winding width and the maximum winding width on said winding beam respectively.
8. A traverse take-up apparatus as claimed in Claim 1, in which the screw pitch of one of said traverse screw shafts is smaller than that of the other of said traverse screw shafts.
9. A traverse take-up apparatus as claimed in Claim 1, in which the screw pitch of one of said traverse screw shafts is the same as that of the other of said traverse screw shafts, and in which ratchets of different diameters provide different rotational speeds to said traverse screw shafts.
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