

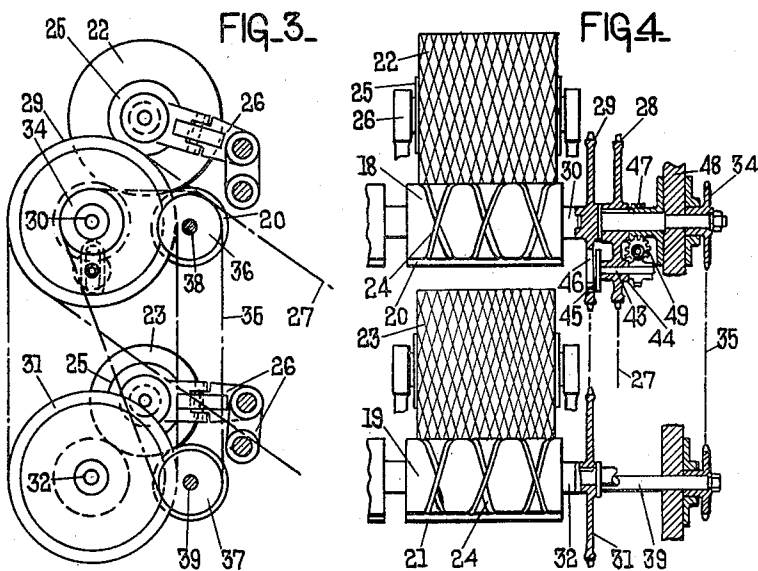
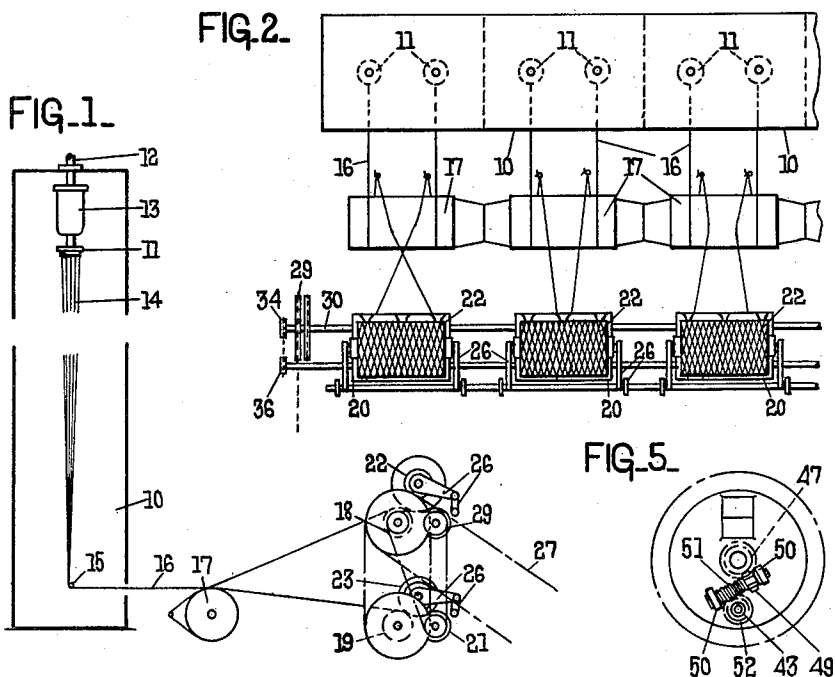
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TEXTILE MACHINERY

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TEXTILE MACHINERY

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This invention relates to the manufacture of packages of textile yarns and threads, and particularly to the winding of yarns or threads in the form of cross-wound packages, such as cones or cheeses.

In the production of cross-wound packages, difficulty is apt to arise especially when the cross-wound take-up package is driven with constant peripheral speed, from the fact that, at certain times in the winding operation, successive turns of yarn fall directly over one another, instead of adjacent to each other. This phenomenon, which is called "ribbon forming", causes the yarn to be distributed in uneven layers on the package, and to form helical "ribbons" of piled up yarn, which have a tendency to slip off the end of the package, destroying the built up form thereof. Thus, for example, when traversing of the yarn on the package is effected by means of a slotted drum which also drives the package, by contact, at constant peripheral speed, the package grows in size till its diameter is equal to that of the drum, or a multiple thereof. The package then rotates with the same speed as the drum, or a sub-multiple thereof, and the yarn laid on at each traverse falls directly upon the yarn laid on by the preceding traverse, the remainder of the surface being unused. It is an object of the present invention to overcome the disadvantage of ribbon forming described above.

It is a further object of the invention, in the case where the driving of the package is obtained by a frictional force depending upon the weight of the package, to compensate for the increasing weight of the package, so that while an adequate driving force is available at the beginning of winding, this force is not proportionately increased as the weight of the package increases and any possibility of crushing the package by the magnitude of such force is avoided.

With the objects outlined above, the take-up package may be carried between a driving drum and a traversing roller, and the ratio between the speed of the traversing drum and the speed of the driving drum is caused to vary, so as to avoid multiple relationship between the rate of traverse and the rate of rotation of the take-up package.

In this manner, the laying of one turn of yarn directly over the last is avoided and the difficulty of ribbon forming overcome. It is generally convenient to cause the driving drum to rotate with constant speed, so as to drive the

package with constant peripheral speed and collect the yarn at a constant rate.

The invention is of particular advantage when employed in winding artificial yarn into cross-wound packages continuously with the production of such yarn. For this purpose it is necessary that the yarn should be wound at a constant linear rate, so that the wound package must be rotated at a constant peripheral speed. Since the difficulty with which the present invention is concerned chiefly arises when the package is driven with constant or substantially constant peripheral speed, the present invention is of particular advantage in connection with the winding of artificial yarns continuously with their production by the methods described in the above mentioned specification.

In one arrangement of the present invention in which the package is driven by the co-operative effort of a driving drum and a traversing drum, the package resting between the two drums, the two drums are arranged so that only a minor part of the driving effort is exerted by the traversing drum, while the major part falls upon the driving drum. The speed of rotation of the traversing drum may then be varied without substantial effect upon the rate of rotation of the package, slip being permitted between the package and the traversing drum. The two drums may be arranged in such a position that, as the size of the package increases, its weight is disposed more nearly vertically upon the driving drum, so that the nipping effect between the two drums, which gives the driving force, is reduced to compensate for the increased weight of the package.

The reactions between the package on the one hand and the traversing drum and the driving drum respectively on the other are normal to the surfaces at the points of contact. When the package is small it sits more deeply between the drums than when it is large and in consequence the reactions are more nearly horizontal. The vertical components of the reactions exactly balance the weight of the package and as the package increases in size the reactions become less horizontal and their vertical components are able to increase so as to balance the increasing weight of the package without necessarily increasing the total value of either reaction. In consequence it is possible to maintain the total magnitudes of the reactions substantially constant.

By way of example one specific form of the invention will now be described in greater detail

with reference to the accompanying drawing, in which:—

Fig. 1 is a sectional side elevation of a machine according to the present invention adapted for use continuously with the production of an artificial yarn;

Fig. 2 is a sectional plan view of the apparatus shown in Fig. 1;

Fig. 3 is a side elevation of the winding mechanism shown in Figs. 1 and 2;

Fig. 4 is a front elevation of a winding mechanism similar to the one shown in Fig. 1 showing two packages being wound which are of approximately the same size; and

Fig. 5 is a detail of the winding mechanism.

Referring to Figs. 1 and 2, a series of spinning cells 10 each containing two spinning nozzles 11 are fed with spinning solution by means of a supply pipe 12 and filter candle 13. The solution is extruded from each of the nozzles 11 in the form of filaments 14, which pass round a guide bar 15 and leave the spinning cell as a thread 16. The two threads 16 produced in each spinning cell pass round a feed roller 17 and thence proceed, one to an upper traversing roller 18 and the other to a lower traversing roller 19. The rollers 18 and 19 co-operate with driving rollers 20 and 21 in carrying two packages 22, 23. The packages 22, 23 are built upon package supports 25 which are carried at each end on two pivoted links 26, the provision of two links permitting the package to take up a position in which it rests upon both the traversing drum 18 or 19 and the driving drum 20 or 21. The packages 22, 23 are rotated by surface contact with the rollers 20, 21, and wind up the threads 16, the said threads being rapidly traversed from end to end of the packages 22, 23 by their engagement with grooves 24 on the surface of the traversing rollers 18 and 19. In this manner the threads 16 are wound into cross-wound packages.

The winding apparatus is driven by means of a chain 27 engaging with a main sprocket 28, which is connected to an adjacent sprocket 29 by means hereafter to be described. The sprocket 29 directly drives a shaft 30 on which the traversing rollers 18 are mounted, and is connected to a further sprocket 31 driving a shaft 32 on which the lower traversing rollers 19 are mounted. The driving rollers 20, 21 are driven from a small sprocket 34 rotating with the main sprocket 28 and connected by means of a chain 35 to two sprockets 36, 37 on the ends of shafts 38, 39 on which the driving rollers 20, 21 are mounted. The shafts 38 and 39 are disposed slightly lower than the shafts 30, 32, in order that a greater part of the weight of the packages 22, 23 may rest upon the driving rollers 20 and 21. By this means when the peripheral speeds of the driving and traversing drums are caused to differ it is the speed of the driving drum which determines the peripheral speed of the package resting upon it, slip occurring between the package and the traversing drum. The speed of the traversing drums 18 and 19 is caused to vary slightly by means of the connection between the sprockets 28, 29. The connection comprises a crank 43 fitted in a bearing 44 in the sprocket 28, the eccentric crank pin 45 of the crank 44 fitting into a slot 46 in the sprocket 29. A stationary worm 47 is secured to the bearing 48 by means of which the sprocket 28 is carried, and the worm 47 engages with a worm gear 49 carried in bearings 50 on the sprocket 29. The worm gear 49 is integral with a second worm 51 which engages with a second

worm gear 52 mounted on the end of the crank 43. By this means, as the sprocket 28 rotates, the worm gear 49 and worm 51 are caused to rotate by means of the stationary worm 47, and the worm 51 in turn rotates the worm gear 52 and crank 43. The sprocket 29 is thus caused to rotate with the sprocket 28, but, on account of the slowly rotating crank connection between them goes alternately a little faster and a little slower than the sprocket 28, so that the speed of the sprocket 29 and of the traversing rollers 18, 19 is caused to vary. The peripheral speed of the package however depends upon the speed of the plain driving rollers 20, 21 which are driven directly from the sprocket 34 rotating always at the same speed as the main sprocket 28. Thus, while the package rotates at a constant peripheral speed and therefore with a constantly decreasing angular speed, multiple relationship between the angular speeds of the package and of the traversing drum for any prolonged period is avoided, on account of the continual variation of speed of the traversing drum. In this manner the difficulty of ribbon forming is overcome.

It will be noted that the lower of the two packages shown in Figs. 1 and 3 (though not in Fig. 4) are small packages newly started, while the upper packages are large and nearly finished. The lower and smaller package sits more deeply between the two rollers 19 and 21 than the upper and larger package between the rollers 18 and 20. As a result, the nipping force exerted on the lower package is greater in proportion to its weight than that exerted on the upper package, but since the upper package is heavier than the lower package the difference is compensated, and the reaction between the package and its driving rollers may be made substantially constant, irrespective of the size of the package.

What we claim and desire to secure by Letters Patent is:—

1. Apparatus for the production of cross-wound packages of yarn, said apparatus comprising a driving roller for driving a package by surface contact therewith, a traversing roller adapted to traverse the yarn on to the package, means for driving said driving and traversing rollers, means for carrying the package so as to allow the package to rest freely against both of said rollers throughout the winding operation, said rollers being so spaced apart as to nip the package between them with a force which remains substantially constant as the diameter and weight of the package increases.

2. Apparatus for the production of cross-wound packages of yarn, said apparatus comprising a driving roller for driving a package by surface contact therewith, a traversing roller adapted to traverse the yarn on to the package, means for driving said driving and traversing rollers, means for carrying said package so as to allow the package to rest freely against both of said rollers throughout the winding operation, said rollers being so spaced apart as to nip the package between them with a force which remains substantially constant as the diameter and weight of the package increases, and means for causing the ratio between the speeds of said driving and traversing rollers to vary so as to avoid ribbon forming.

3. Apparatus for the production of cross-wound packages of yarn, said apparatus comprising a driving roller adapted to rotate a package by surface contact therewith, a grooved traversing roller adapted to be rotated and to traverse the yarn

on to the package, means for carrying said package so as to allow the package to rest freely against both of said rollers throughout the winding operation, said rollers being so spaced apart as to nip the package between them with a force which remains substantially constant as the diameter and weight of the package increases, means for rotating said driving roller, and connecting means between said rotating means and said traversing roller adapted to impart a slow oscillating motion relatively between said driving and traversing rollers, so as to cause the ratio between the speeds of said driving and traversing rollers to vary, and thereby to avoid ribbon forming.

4. Apparatus for the production of cross-wound packages of yarn, said apparatus comprising a driving roller adapted to rotate a package by surface contact therewith, a grooved traversing roller adapted to be rotated and to traverse the yarn on to the package, means for carrying said package so as to allow the package to rest freely against both of said rollers throughout the winding operation, said rollers being so spaced apart as to nip the package between them with a force which remains substantially constant as the diameter and weight of the package increases, means for rotating said driving roller, a crank having a crank shaft and crank pin mounted on said rotating means so as to rotate bodily therewith, means including a fixed gear adapted to rotate said crank about its shaft, means connected to said traversing roller, said means being slotted to receive said crank pin, so as to rotate with said

rotating means and to receive an oscillating motion with respect thereto by reason of the rotation of said crank, whereby the ratio between the speeds of said driving and traversing rollers is caused to vary, and ribbon forming is avoided.

5. Apparatus for the production of cross-wound packages of yarn, said apparatus comprising a driving roller adapted to rotate a package by surface contact therewith, a grooved traversing roller adapted to be rotated and to traverse the yarn on to the package, means for carrying said package so as to allow the package to rest freely against both of said rollers throughout the winding operation, the said rollers being so spaced apart as to nip the package between them with a force which remains substantially constant as the diameter and weight of the package increases, rotatable means for driving said driving roller, a crank shaft mounted in said rotatable driving means, a crank connected to said crank shaft, a crank pin on said crank, said crank, shaft, and pin rotating bodily with said rotatable driving means, means including a fixed gear adapted to rotate said crank about said crank shaft as said crank, shaft, and pin rotate bodily with said rotatable driving means, and means slotted to receive said crank pin and adapted to drive said traversing roller, said slotted means being caused by said crank pin to rotate with said rotatable driving means and to receive an oscillating motion with respect thereto by reason of the rotation of said crank about said crank shaft.

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