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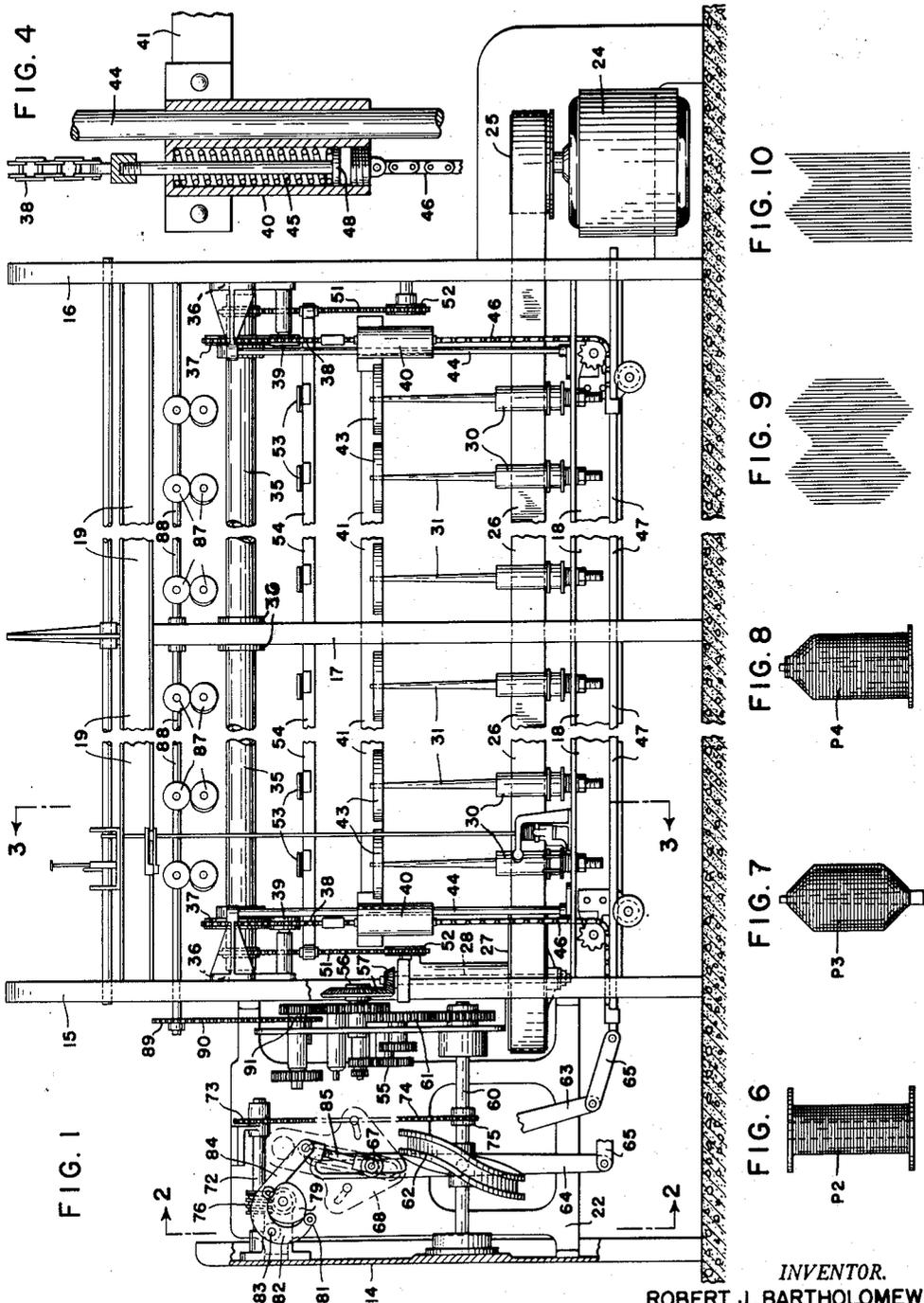
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MACHINE FOR MAKING YARN PACKAGES

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## MACHINE FOR MAKING YARN PACKAGES

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1

2

This invention relates to machines for making yarn packages, and more particularly to an improved machine capable of simple adjustment or changes for effecting the doubling or twisting of the yarn and also for producing a variety of yarn packages.

In accordance with the present invention, also, a machine is provided for making yarn packages in which the packages may be made of cylindrical shape with straight ends, of cylindrical shape with both ends tapered, and of cylindrical shape with one end tapered, and in which the yarn may be twisted or doubled if desired.

In accordance with the present invention, also, a machine is provided for making yarn packages, with twisting, doubling, and the like, and in which a plurality of yarn packages of predetermined shape may be produced with the operations conducted at high speed.

In accordance with the present invention, also, a machine is provided for making yarn packages, with doubling, twisting, and the like, and in which the ring supporting rails are supported and operated in an improved manner.

In accordance with the present invention, also, an improved machine is provided for making yarn packages, with twisting, doubling, and the like, in which a resilient connection may be employed between pairs of rails for obtaining the desired type of yarn package.

Other objects and advantageous features of the invention will be apparent from the specification and claims.

The nature and characteristic features of the invention will be more readily understood from the following description, taken in connection with the accompanying drawings forming part hereof, in which:

Figure 1 is a fragmentary side elevational view of a machine in accordance with the present invention;

Fig. 2 is a vertical sectional view taken approximately on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary elevational view taken approximately on the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary sectional view, enlarged, of the chain and ring rail connector box;

Fig. 5 is a fragmentary elevational view, enlarged, showing the fulcrum controlling mechanism;

Figs. 6, 7, and 8, are diagrammatic views of yarn packages capable of being made on the machine in accordance with the present invention; and

Figs. 9 and 10 are diagrammatic views illustrat-

ing the production of the yarn packages shown in Figs. 7 and 8.

Like numerals refer to like parts throughout the several views.

5 It should, of course, be understood that the description and drawings herein are illustrative merely, and that various modifications and changes may be made in the structure disclosed without departing from the spirit of the invention.

10 Referring now more particularly to the drawings, a frame is provided having outer and inner transverse end frame sections 14 and 15 at one end, a transverse end frame section 16 at the other end, and intermediate transverse frame sections 17 connected by longitudinal horizontal rails. The end frame sections 14 and 15 are connected by longitudinal frame sections 22.

20 The rails include spindle rails 18, feed roll rails 19, and jack rails 21 for supporting yarn packages P1 from which the yarn to be utilized is taken.

25 The end frame section 16 has a vertical electric motor 24 carried thereon, the motor 24 being provided with a horizontally adjustable driving pulley 25 for actuating a spindle belt 26. The spindle belt 26 is carried at the end of the machine opposite the driving pulley 25 on a pulley 27, mounted on a vertical shaft 28 on the frame section 15 and intermediate its ends is supported on idler rollers (not shown).

30 The spindle rails 18 have spindle assemblies 30 mounted thereon at spaced locations on swing supports. The spindle assemblies have whorls adapted to be driven by the belt 26 in engagement therewith for driving the spindle blades 31.

35 The jack rails 21 are provided with suitable supports 32 for the yarn packages P1 from which the yarn is to be delivered for twisting, doubling, or the like, in the making of other yarn packages.

40 A hollow tubular horizontal shaft 35 is provided, journaled in suitable bearings 36 on the transverse frame sections 17 and end frame sections 15 and 16 and is provided at spaced intervals therealong with sprockets 37 over which sprocket chains 38 are mounted. The sprocket chains 38 extend over guide sprockets 39 to connector boxes 40. The connector boxes 40 are guided on vertical guide rods 44 carried by the frame extending between the connector boxes 40 on each side and secured thereto ring rails 41 and 42 are provided which extend horizontally in the machine. Each of the ring rails 41 and 42 is provided, at spaced intervals, with spinning or twisting rings 43, one for each spindle 31.

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3

The use of the shaft 35 and the supporting of the ring rails 41 and 42 thereon, as herein described, provides an end to end rigidity by which smooth movement of the ring rails is effected and with uniform elevation of the rails from end to end.

A resilient connection is provided between the ends of each of the chains 38 and the connector boxes 40, and includes on each side a compression spring 45 interposed between a plunger 48 to which the chains 38 are connected and the upper end of the box 40.

The assembly which includes the boxes 40 and the rings 43 is preferably balanced or of equal weight on each side of the vertical center line of the chains 38.

Actuating chains 46 are also provided, extending from the lower ends of the connector boxes 40 to an actuator rod 47, one of the actuators 47 being provided on each side of the machine.

The shaft 35 is also provided at spaced locations thereon with sprockets 50 of smaller diameter than the sprockets 37. Each of the sprockets 50 has a sprocket chain 51 mounted thereon and guided at the lower end on guide sprockets 52. The chain 51 has secured thereto on each of the side reaches thereof, a horizontally disposed movable rail 54 on which yarn guides 53 are mounted.

The end frame section 15 has mounted thereon a train of gears 55 which are driven from a drive shaft 56, the drive shaft 56 being driven by bevel gears 57 from the shaft 28 on which the pulley 27 is mounted. A central longitudinal traverse cam shaft 60 is provided between the end frame sections 14 and 15, driven through gearing 61 from the gears 55.

The cam shaft 60 has mounted thereon a traverse cam 62, preferably of the cylindrical type. On each side of the traverse cam 62, and in engagement therewith, traverse levers 63 and 64 are provided, the lower ends of the levers 63 and 64 being connected respectively by links 65 to the actuating rods 47. The upper ends of each of the traverse levers 63 and 64 are provided with elongated slots 66 in which a transversely disposed pivot rod 67, is mounted in engagement with both slots 66. The traverse levers 63 and 64 each have supporting guides 33, intermediate their ends, movable on horizontal supporting rods 34. The pivot rod 67 is also mounted in guide plates 68, having slots 59 through which bolts 58 extend for adjustably mounting the plates 68 on the frame sections 22. The guide plates 68 have guide slots 70 in which the pivot rod 67 is guided.

A control shaft 72 is provided, centered above and parallel to the cam shaft 60. The control shaft 72 is driven by a sprocket 73 and sprocket chain 74 from a driving sprocket 75 carried on the cam shaft 60. The control shaft 72 is provided, intermediate its ends, with a worm gear 76 in engagement with a pinion 77 on a transverse shaft 78. At the outer ends of the shaft 78, a pair of cams 79 of predetermined shape preferably to provide uniform lift are mounted. Each of the cams 79 has a pair of opposed follower rollers 80 and 81 in engagement therewith, each of the pairs of rollers 80 and 81 being carried on a follower lever 82 of J-shape, pivotally mounted on pivot pins 83. Each of the follower levers 82 has an arm portion 84 pivotally connected to one end of a link 85, the other ends of the link 85 being in pivotal engagement with pivot pin 67. The link 85 is preferably adjustable in length

4

(see Fig. 4) and for this purpose may include internally threaded heads 85a with a threaded rod 85b extending therebetween and in engagement therewith. A vertically movable fulcrum is thus provided for the traverse levers 63 and 64, for varying the position of the pivot rod 67 with respect to the traverse cam 62. In addition, by shifting of the guide plates 68 to incline the guide slots 70, a further variation in the effect of the movement of the traverse levers 63 and 64 may also be effected, for purposes hereinafter explained.

The feed roll rails 19 have mounted thereon feed rolls 87, of any preferred type, which are driven by a shaft 88 having a sprocket 89 thereon, the sprocket 89 being driven by a chain 90 engaging a driving sprocket 91 on a shaft of the gear train 55.

The mode of operation will now be pointed out, reference being had to the packages illustrated in Figs. 6, 7, and 8, and to Figs. 9 and 10.

Assuming first that it is desired to employ the machine for the production of a yarn package P2, as illustrated in Fig. 6, the chain 74 is removed, the guide plates 68 are positioned with the guide slots 70 alined with the back positions of the traverse levers 62 and 63, and the shaft 78, and the cams 79 actuated thereby, are positioned to locate the pivot rod 67 at the desired elevation in accordance with the desired height of yarn package P2.

Upon actuation of the motor 24, the spindle belt 26 is actuated for rotating the spindles 30.

The traverse levers 63 and 64 are oscillated by the traverse cam 62 which is driven from the shaft 28 through the gear train. Timed movement of the traverse levers 63 and 64 is effective for moving the ring rails 41 and 42 and the spinning rings 43 carried thereby.

Yarn for the yarn packages is delivered from the yarn packages P1 by the feed rolls 87, is guided by the guides 53 to the spinning rings 43, and is thus directed onto the spools carried by the spindles 30. The movement of the traverse levers 63 and 64 is determined by the traverse cam 62, which imparts timed movement of desired amplitude through the links 65, rods 47 and chains 46 which effect oscillation of the ring rails 41 and 42 through the desired path.

It will be noted that the ring rails 41 and 42 counterbalance each other so that no other counterbalancing or counterweights are required.

The number of turns per inch delivered to the spools on the spindles 30 may be readily adjusted by proper selection of gears in the gear train 55 to provide the proper timed relationship between the amount of yarn delivered by the feed rolls 87 and the rotary movement of the spindles 30.

If it is desired to produce a yarn package P3, of the character illustrated in Fig. 7, with a cylindrical central portion and conical ends, the guide plates 68 are positioned with the slots 70 therein vertical and alined with the slots 66. The chain 74 is placed in position for driving the sprocket 73 from the sprocket 75. The position of the fulcrum of the traverse levers as determined by the position of the pivot rod 67 will thus be successively varied and while a simple harmonic motion may, if desired, be imparted from the cams 79, it is preferred to employ a modified motion to produce uniform movement of the fulcrum in a vertical path. A cyclic vertical movement of the fulcrum with uniform motion will provide the yarn package illustrated in

5

Fig. 7 and with the laps varying in length as indicated in Fig. 9.

If it is desired to produce yarn packages P4, of the character shown in Fig. 8, with a cylindrical section having a conical upper end, the guide plates 68 are shifted to incline the slots 70 towards the end frame section 15 and in alignment with the back positions of the traverse levers 63 and 64. The fulcrum provided by the pivot rod 67 thus has a movement in a vertical and inclined path so that the action of the traverse levers 63 and 64, and the spinning rings 43 controlled thereby, is further modified. It will be noted that as the fulcrum moves upwardly, the back or bottom position of the traverse levers 63 and 64 remains unchanged, because the slots in which the fulcrum moves are in line with the levers 63 and 64. As the fulcrum moves with respect to the traverse cam 62, the forward or top position thereof is changed, giving a longer or a shorter stroke. The longest stroke occurs when the fulcrum is closest to the traverse cam 62 and the shortest stroke occurs when the fulcrum is in its uppermost position. The movement thus effected, produces a yarn package P4 of the character indicated in Fig. 10.

In the simultaneous production, on both sides of the machine, of yarn packages of the character illustrated in Figs. 6 and 7, the springs 45 are not required, although it is not ordinarily necessary to remove the same and provide a fixed or non-resilient connection between the chains 38 and the connector boxes 40. The resilient connections provided by the springs 45 are, however, necessary to produce yarn packages P4 on each side of the machine in which such yarn packages have their upper ends conical. The spinning rings 43 must always come to the same bottom positions on each side, if yarn packages P4 are to be produced. As the spinning rings 43 on one side come to their bottom positions, at the same time the spinning rings 43 on the other side must stop at varying upper positions. The variation of the length of stroke on each side of the machine, to produce yarn packages P4 with conical upper ends, is accommodated by the springs 45 which permit drawing the ring rails 41 or 42 down to the bottom on one side while the spinning rings 43 on the rail 42 or 41 on the other side are at varying upper positions.

It will thus be seen that the machine, in accordance with the present invention, may be readily adapted for a wide variety of packages and with twisting, doubling, or other operations, as desired.

We claim:

1. In a machine for making yarn packages, a pair of spaced parallel rows of upright spindles on which yarn packages are to be made, means for rotating said spindles, a horizontally disposed longitudinally extending vertically movable ring rail for each row of spindles, a rotary ring rail supporting shaft longitudinally disposed and parallel to and above said ring rails, flexible ring rail connecting members carried by said shaft, resilient extensible members connected to said connecting members and to said ring rails, and means connected to said ring rails for alternately drawing one of said ring rails downwardly while the other is raised in timed relation.

2. In a machine for making yarn packages, a pair of spaced parallel rows of upright spindles on which yarn packages are to be made, means for rotating said spindles, a horizontally disposed

6

ring rail for each row of spindles, means for supporting said rails in counterbalanced relation including a rail supporting member above said rails and connecting members carried by said supporting member, resilient members interposed between each end of said connecting members and said ring rails in supporting engagement, and means connected to said ring rails for vertically actuating the latter in opposite directions in timed relation.

3. In a machine for making yarn packages having a pair of spaced parallel rows of upright spindles on which yarn packages are to be made, means for rotating said spindle, a horizontally disposed vertically oscillatable ring rail for each row of spindles, operating connections between said opposed ring rails for oscillating said ring rails, a traverse cam, a pair of traverse levers actuated by said cam and each connected to one of said ring rails, fulcrum members for said levers, and means for continuously varying the position of said fulcrum members with respect to said levers.

4. In a machine for making yarn packages having a pair of spaced parallel rows of upright spindles on which yarn packages are to be made, means for rotating said spindles, a horizontally disposed vertically oscillatable ring rail for each row, operating connections between said opposed rails for oscillating said ring rails, a traverse cam, a pair of traverse levers actuated by said cam and each connected to one of said ring rails, fulcrum means for said levers, and means for continuously varying the position of said fulcrum means with respect to said levers, said last means including guide members for said fulcrum means for determining the direction of movement of said fulcrum means.

5. In a machine for making yarn packages having a pair of spaced parallel rows of upright spindles on which yarn packages are to be made, means for rotating said spindles, a horizontally disposed vertically oscillatable ring rail for each row of spindles, operating connections between said opposed ring rails for oscillating said ring rails, a traverse cam, a pair of traverse levers actuated by said cam and each connected to one of said ring rails, fulcrum means for said levers, and means for continuously varying the position of said fulcrum means with respect to said levers, said last means including operating means for moving said fulcrum means in predetermined timed relation to the movement of said traverse cam.

6. In a machine for making yarn packages having a pair of spaced parallel rows of upright spindles on which yarn packages are to be made, means for rotating said spindles, a horizontally disposed vertically oscillatable ring rail for each row of spindles, operating connections between said opposed ring rails for oscillating said ring rails, a traverse cam, a pair of traverse levers actuated by said cam and each connected to one of said ring rails, fulcrum means for said levers, and means for continuously varying the position of said fulcrum means with respect to said levers, said last means including guide members for said fulcrum means for determining the direction of movement of said fulcrum means, and operating means for moving said fulcrum means in predetermined timed relation to the movement of said traverse cam.

7. In a machine for making yarn packages having a pair of spaced parallel rows of upright spindles on which yarn packages are to be made,

7

means for rotating said spindles, a horizontally disposed vertically oscillatable ring rail for each row of spindles, a traverse cam, a pair of traverse levers actuated by said cam, members for moving said ring rails including connecting members between said levers and said ring rails, and extensible connectors between said opposed ring rails, fulcrum means for said levers, and means for continuously varying the position of said fulcrum means with respect to said levers, said last means including adjustably mounted slotted guide members for said fulcrum means for determining the direction of movement of said fulcrum means.

8. In a machine for making yarn packages having a pair of spaced parallel rows of upright spindles on which yarn packages are to be made, means for rotating said spindles, a horizontally disposed vertically oscillatable ring rail for each row of spindles, a traverse cam, a pair of traverse levers actuated by said cam, members for moving said opposed ring rails including connectors between said levers and said ring rails and extensible connectors between said ring rails, fulcrum means for said levers, and means for continuously varying the position of said fulcrum means with respect to said levers, said last means including guide members for said fulcrum means for determining the direction of movement of said fulcrum means, and additional cam controlled members for moving said fulcrum means in predetermined timed relation to the movement of said traverse cam.

9. In a machine for making yarn packages having a pair of spaced parallel rows of upright spindles on which yarn packages are to be made, means for rotating said spindles, a horizontally disposed vertically oscillatable ring rail for each row of spindles, spaced guide sleeves carried by each of said ring rails, a rotatable ring rail supporting shaft parallel to and above said ring rails, flexible connecting members for oscillating said ring rails carried by said shaft and connected at each end to said opposed ring rails in supporting engagement, vertical guide rods with which said guide sleeves are in slidable engagement, the ring rails and guide engaging portions being in balanced relation on opposite sides of said shaft.

8

10. In a machine for making yarn packages having a pair of spaced parallel rows of upright spindles on which yarn packages are to be made, means for rotating said spindles, a horizontally disposed vertically oscillatable ring rail for each row of spindles, operating connections between said opposed ring rails, a traverse cam, a pair of traverse levers actuated by said cam and each connected to one of said ring rails, said levers being movable by said cam between end positions corresponding respectively to the top and bottom ends of the yarn packages, fulcrum means for said levers, and guide members for said fulcrum means including slotted guides having their slots aligned with said levers at one of the end positions of said levers.

11. In a machine for making yarn packages having a pair of spaced parallel rows of upright spindles on which yarn packages are to be made, means for rotating said spindles, a horizontally disposed vertically oscillatable ring rail for each row of spindles, operating connections between said opposed ring rails, a traverse cam, a pair of traverse levers actuated by said cam and each connected to one of said ring rails, said levers being movable by said cam between end positions corresponding respectively to the top and bottom ends of the yarn packages, fulcrum means for said levers, means for continuously moving said fulcrum means, and guide members for said fulcrum means including slotted guides having their slots aligned with said levers at the bottom end positions of said levers.

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