My invention has for its object a new and improved mechanism intended particularly for spinning mohair or soft or bearded yarns. It is also applicable to machines for spinning other fibres such as cotton, wool, silk and rayon, and to twisting machinery.

Therefore in factories producing yarns from mohairs, goat's hair and other soft or wool fibres, it has not been thought practical to employ ring spinning machines. Although many attempts have been made to adapt ring spinning machines to this work they have not been used to any considerable extent. This has been in part because ring spinning machines have not been adapted to handle yarns of this character, and in part because bobbins or yarn packages which are large enough to be economical could not be produced owing to the "licking in" of the beards on the yarn in the balloon and on the bobbin. Accordingly the purpose of my invention is to produce a ring spinning machine which will spin bearded yarns successfully and will produce from such yarns a yarn package or bobbin which will contain considerably more yarn than has previously been thought possible and thus reduce the cost of manufacture.

Herefore and even with cap spinning, it has been possible to wind a yarn package containing only about two ounces of yarn. By the mechanism herein described, I am able to produce bobbins containing upwards of five ounces of yarn so that two and one-half single knots and two and one-half double knots are eliminated unless the yarn is twisted directly from the bobbin in which case two and one-half double knots are eliminated. The elimination of knots in the yarn and the saving in handling of the bobbins are a matter of great importance in the manufacture of goods from these yarns.

The machine embodying my invention can be run at higher speeds than has been thought possible for machines intended for spinning these types of yarns heretofore, and the yarn produced is harder, finer and less bearded than similar yarn spun on machines heretofore commonly employed.

Herefore, the size of the bobbin or yarn package produced by a ring spinning machine has been controlled by the length of the balloon, which is determined by the distance from the pot-eye or other point of delivery of the yarn to the traveler on the spinning ring. On yarns of the character described, the most favorable length of the balloon is from eight to eight and one-half inches but a variation of about two and one-half inches is permissible without any serious effect. A yarn package holding about two ounces of yarn is as large as can be successfully spun without increasing the balloon beyond the safe limits. Even with cap spinning larger packages cannot be successfully made.

The machine embodying my invention maintains a balloon within the ordinary effective limits but is able to produce a yarn package which is very much longer and contains more than twice as much yarn. I accomplish these results in part by giving to the spindle a vertical movement relative to the ring ring, this being in addition to the vertical movement of the ring rail produced by the action of the ordinary "builder motion".

Another feature of my invention is the provision of novel separators between the several spindles which while permitting movement of both the ring rail and spindle rail, prevent any entanglement between the adjacent balloons. I am well aware that separators between adjacent spindles to prevent "licking in" have been sometimes provided, but on devices such as I am familiar with gaps have been left which in certain positions have permitted licking in.

Referring now to the drawings:

Fig. 1 is a front elevation of the essential parts of the machine embodying my invention;

Fig. 2 is a sectional taken on line 2—2, Fig. 1;

Fig. 3 is a diagram showing the relative positions of the balloon, spindle, ring rail and spindle rail when the parts are in the position they occupy as winding begins;

Fig. 4 is a similar view of the position occupied by the parts when the ring rail is at the top of the first traverse.

Fig. 5 shows the position occupied by the parts when the ring tail is at the top of the second upward traverse.

Fig. 6 shows the position occupied by the parts when the ring rail and spindle rail are at their upper and lower limits respectively.

In the following description only one spinning unit of the ring spinning frame embodying my invention will be described.

Referring now to the drawings, and particularly to Figs. 1 and 2, at 11 are shown drawing rolls which deliver the sliver 12 to the spinning mechanism. At 13 is shown a pot-eye, at 14 the ring rail and at 15 the spindle rail. The spinning ring is shown at 16 and the traveller at 17. One of the spindles is shown at 18 and the driving belt for it at 19. On the spindle is mounted the usual bobbin or tube 10 on which the spun yarn, forming the full bottom or yarn package, is wound.
Beneath the spindle rail is located the usual “builder motion” which may be of any well known type capable of moving the ring rail up the bobbin and also of moving upward gradually the upper and lower limits of the successive traverses. In the builder motion shown in Figs. 1 and 2 the ring rail is carried on vertically movable rods 20, 21 which are connected by the hinges 22, 23 to a horizontal sliding member 24 which is adjustably connected at 25 to a slide 26 which is itself moved by the screw 27. The screw 27 is in threaded engagement with a block 21 pivoted mounted in the forked upper end of an arm 28 hinged to the frame as indicated at 9. The arm 28 carries a roller 29 against which rests a swinging member 30 pivoted at 31 which carries a roller 7 contacting with a heart cam 8 on a shaft 34. This shaft 34 is constantly driven and also carries a worm 35 which meshes with a worm gear 36. The gear 36 drives the screw shaft 27 through a train of gears indicated at 6. The mechanism so far described is a so-called “builder motion” of usual construction and forms no part of my invention except as it is part of the combination hereinafter claimed. The spindle rail 15 is moved vertically by mechanism connected to the builder motion. In the form shown in the drawings I provide two vertical screws 38 and 39 the upper ends of which are secured to the spindle rail 15 while the lower ends are in threaded engagement with internal threads on helical gears 40 rotatably mounted in brackets 41 screwed to the frame. The helical gears 40 mesh with helical gears 42 fast on a shaft 43 rotatably mounted in bearings on the frame. The shaft 43 is driven by a gear 44 which is connected with the train of gears forming a part of the builder motion. This mechanism is such that as the winding of the yarn on the bobbin in the successive progressive traverses caused by the movement of the ring rail and the normal operation of the builder motion proceeds, the spindle rail 15 is steadily lowered by the screws 38 and 39. This makes it possible to wind a bobbin which is much longer than the ordinary bobbin now commonly used.

The action of the mechanism of this part of my invention will be clearly understood from an examination of Figs. 3, 4, 5, and 6. It will be understood that the vertical movement of the ring relative to the bobbin is the same as the heart cam 8 of the builder motion. The motion of the ring rail cause the screw 27 which would produce gradual upward movement of the successive traverses, if there were no other movement of the parts, and (c) the gradual downward movement of the spindle rail which combines with the like movement of the ring rail just mentioned and which together with it produces a gradual upward resultant movement of the traverses throughout the whole length of the bobbin. For convenience, in the following description the several motions are separated from each other. In Fig. 3 I have shown the starting position. At this time the ring rail 14 is in its lowest position and the spindle rail 15 is in its highest position. Thereafter the movement of the driving mechanism produces the first traverse and carries the parts to the position shown in Fig. 4. At this time the ring rail 14 is in the position shown in full lines, the original starting position being shown in dotted lines. At the same time the screws 38 and 39 have moved to the position shown in full lines. Also the ring rail has been moved a little by the screw 27, this being in addition to the movement given it by the builder motion. The spindle rail 15 makes its first downward traverse and second upward traverse then arriving at the position shown in Fig. 5. In this figure the full line position shows the position of the parts at the top of the second upward traverse while the light dotted line positions show the position of the parts at the end of the first upward traverse and the heavy dotted lines show the original starting positions. It will thus be seen that the spindle rail and spindle have been lowered and that the moving parts 38 and 39 so that the portion of the bobbin which is being filled with yarn is a little higher up on the bobbin than it was during the preceding traverse.

In Fig. 6 the position of the parts at the top of the last upward traverse is shown. It will be seen that the ring rail 14 is in the highest position to which it will be carried by the slide 24 and screw 27 and that the spindle rail 15 has been moved to its lowest position bringing the top of the bobbin down to a point slightly above the level of the traveller 17 on the spinning ring 16. The starting positions of the spindle rail and of the ring rail are shown in heavy dotted lines in this figure.

Since the positions of the ring rail and consequently of the spinning ring relative to the pol-eye 13 is no different in the machine embodying this invention than in machines here-tofore constructed the dimensions of the balloon b are not changed. When winding the lower end of the bobbin the balloon is no longer than 115 is customary in winding short bobbins, but I am able to wind a longer bobbin by lowering the spindle rail during the winding of the bobbin in proper relation to the movements of the ring rail and the accumulation of spun yarn on the bobbin.

To prevent bobbins on adjacent spindles from interlocking into each other and to permit a more compact machine and to increase the permissible speed, I provide separators 50, see Fig. 1 which are secured by screws a at their upper ends to a bracket 51 secured to a fixed rail 51 of the machine. The ring rail is slotted as shown at 5, see Figs. 1 and 2, to permit the separators to extend down through the ring rail so that the balloons are completely protected from each other in spite of the reciprocating movement of the ring rail. Two of these separators 55 and 56 happen to be directly above the posts 20 and 21 which pass through sleeves 57 and 58 in the rail 15 and are connected to the ring rail 14 serving to raise and lower the ring rail when actuated by the builder motion. Accordingly I cut the posts 20 and 21 as shown at 5 and thus permit the ring rail to be moved up by the builder motion notwithstanding the separators 55 and 140 56. Being carried by a fixed part of the machine and being immovable there are no gaps or breaks from which the yarn to leak in at certain positions of the ring rail.

While I have shown and described herein my invention as embodied in a machine for spinning mohair, I do not limit myself to this use of my invention since it is capable of application to machines for spinning cotton, wool, silk and other fibres, nor do I limit myself to the use of my in-
Invention as applied to spinning machinery as it may equally well be adapted for use on twisting frames or other machines of the same general character.

I claim:

1. A machine of the character described and in combination, a ring rail having spinning rings thereon, a builder motion capable of giving the ring rail traverses progressively advancing upward, a vertically movable spindle rail having spindles thereon and means for moving the spindle rail downward progressively during the progressive upward advance of the traverses of the ring rail.

2. In a machine of the character described and in combination, a ring rail having spinning rings thereon, a builder motion capable of giving the ring rail progressive traverses, a vertically movable spindle rail having spindles thereon, screws fixed to the spindle rail, screw nuts on said screws and means operated by the builder motion for rotating the screw nuts to move the spindle rail slowly downward as the ring rail progresses upward.

3. In a machine of the character described and in combination, a ring rail having spinning rings thereon, a builder motion capable of giving the ring rail successive traverses, a vertically movable spindle rail having spindles thereon, screws fixed to the spindle rail, screw nuts on said screws and means operated by the builder motion for rotating the screw nuts to move the spindle rail slowly downward as the winding progresses.

4. In a machine of the character described and in combination, a ring rail having spinning rings thereon, a builder motion capable of giving the ring rail reciprocations progressively advancing upward, a vertically movable spindle rail having spindles thereon and means for moving the spindle rail downward progressively during the progressive upward advance of the reciprocations of the ring rail.

5. In a machine of the character described and in combination, a ring rail having spinning rings thereon, a builder motion capable of giving the ring rail a traversing movement progressively advancing upward, a vertically movable spindle rail having spindles thereon and means for moving the spindle rail downward progressively during the progressive upward advance of the traversing movement of the ring rail.

6. The method of spinning yarn and building yarn packages on ring spinning frames having ring rails and spindle rails separately and movably mounted, which comprises reciprocating the ring rail, moving the reciprocating ring rail progressively upwardly, and moving the spindle rail progressively downwardly during the progressively upward movement of the ring rail.

7. In a ring spinning frame, the combination of a ring rail having spinning rings thereon, a spindle rail having spindles thereon, and means for traversing the yarn longitudinally of the spindle including means for progressively advancing the traverses of yarn upwardly on the spindle, and means for progressively lowering the spindle during the progressively upward advances of the traverses of yarn on the spindle.

8. In a ring spinning frame, the combination of a ring rail having spinning rings thereon, a spindle rail having spindles thereon, and means for traversing the yarn on said spindles by producing relative movement between said ring rail and spindle rail and reciprocating the ring rail progressively upwardly and moving the spindle rail progressively downwardly during the progressive upward reciprocations of the ring rail.

9. The method of spinning yarn and building yarn packages on ring spinning frames having spindle rails with spindles thereon and ring rails carrying rings, which consists in separately moving and actuating said spindle rails and ring rails to produce traverses of yarn on the spindles and to advance said traverses progressively upwardly on the spindle and mechanically dividing and distributing said relative movement as to synchronously and progressively carry the spindle rails downwardly and the ring rails upwardly.

10. In a ring spinning frame having movable ring rails carrying spinning rings and movable spindle rails with spindles thereon, means for producing traverses of yarn on said spindles and progressively advancing the traverses upward on said spindles by the relative movement of said ring rails and spindle rails, the spindle rails moving progressively downwardly as the ring rails move progressively upwardly.

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