

April 28, 1964

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3,130,535

APPARATUS FOR MAKING YARNS FROM PICKER LAPS

Filed Nov. 15, 1961

4 Sheets-Sheet 1

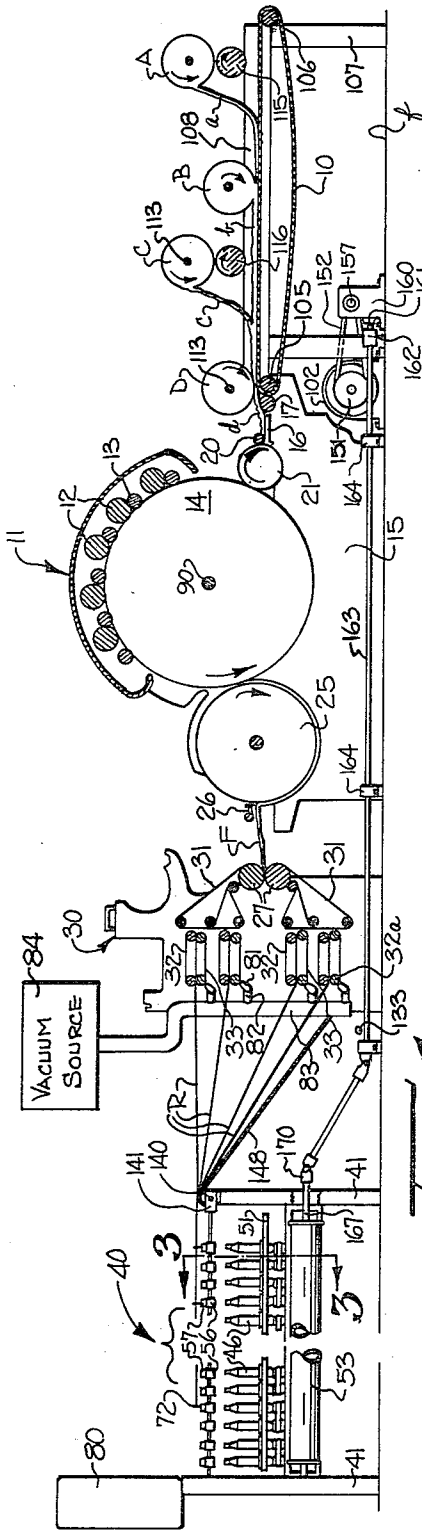


FIG. 1

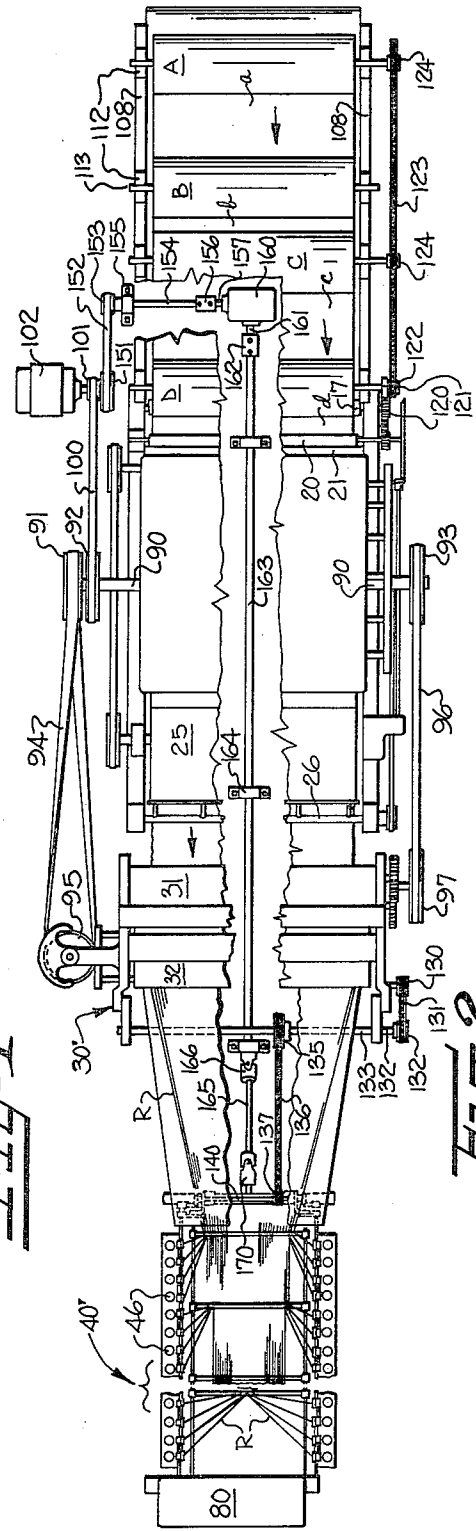


FIG. 2

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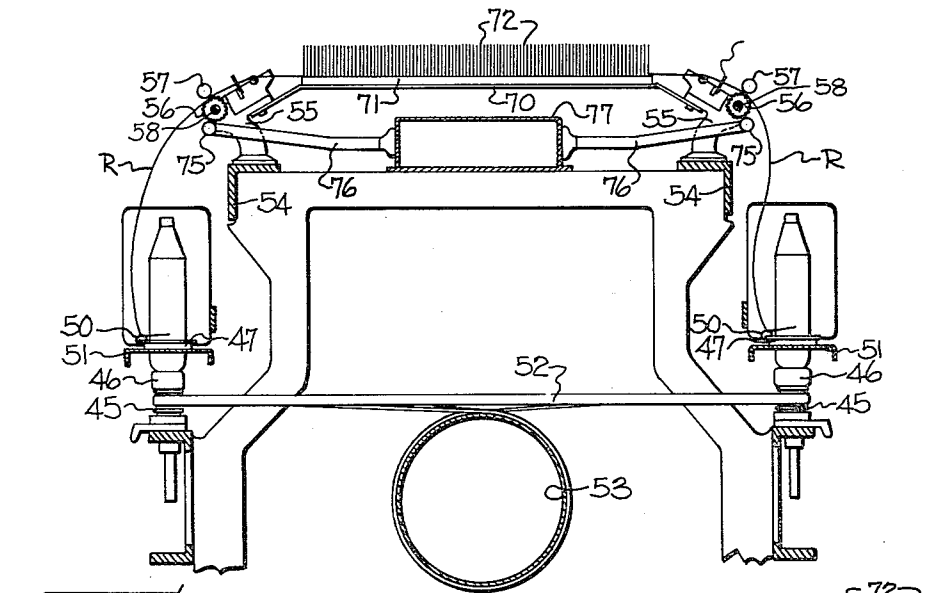


Fig-3

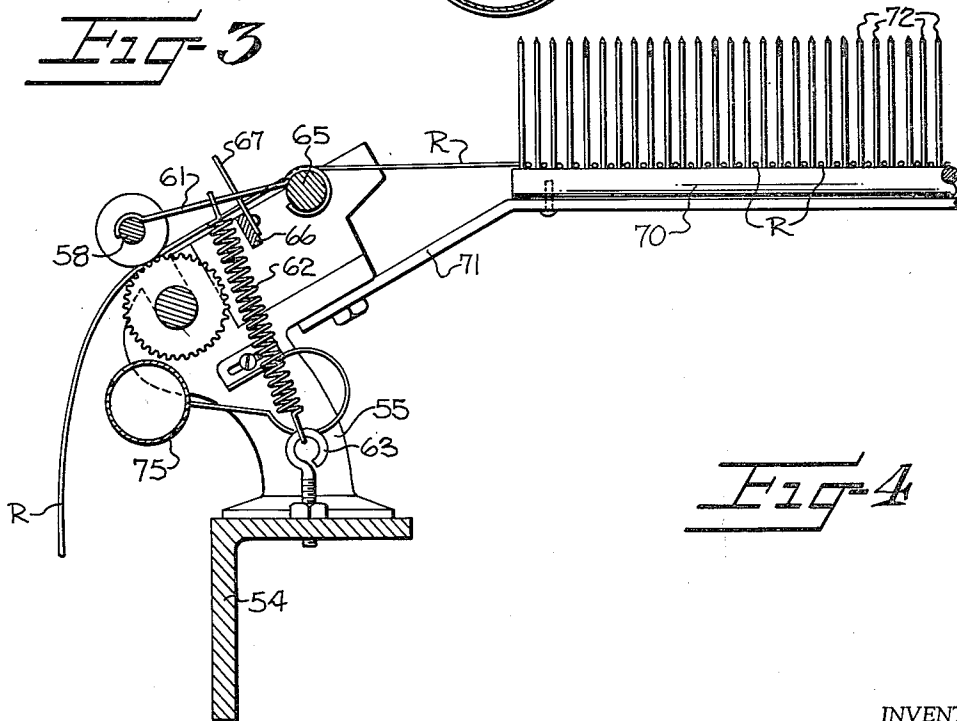


Fig-4

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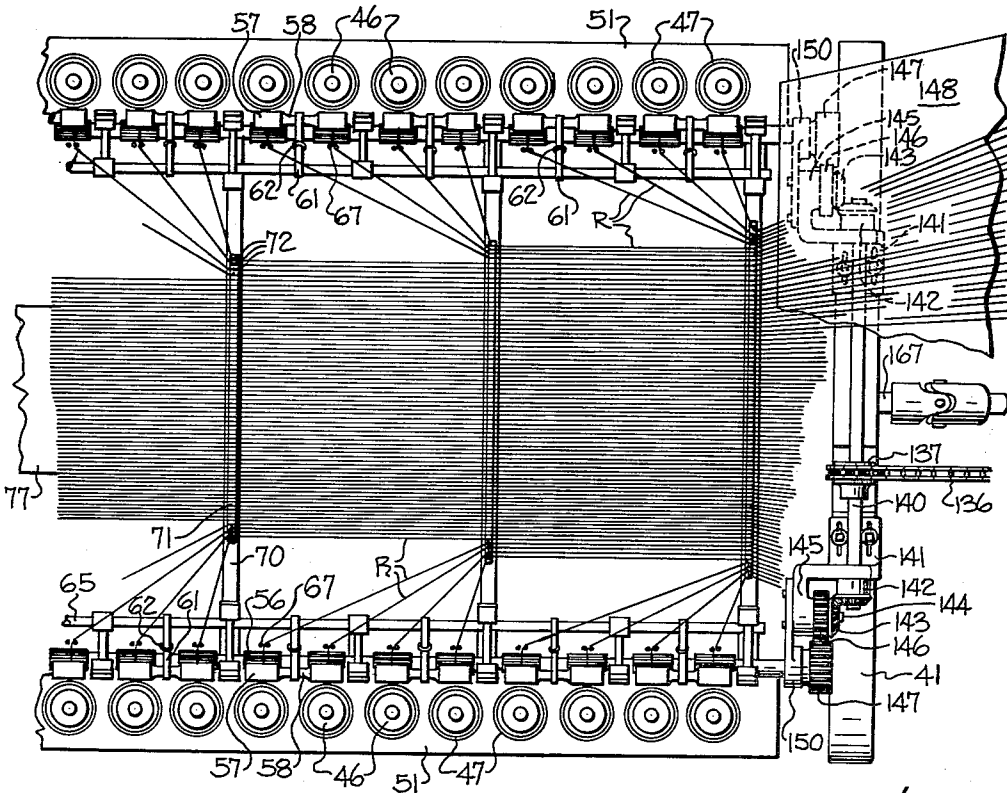


Fig-5

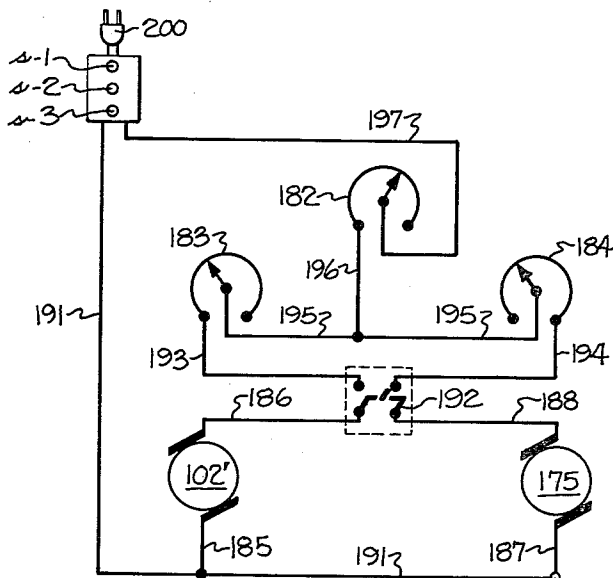


Fig-8

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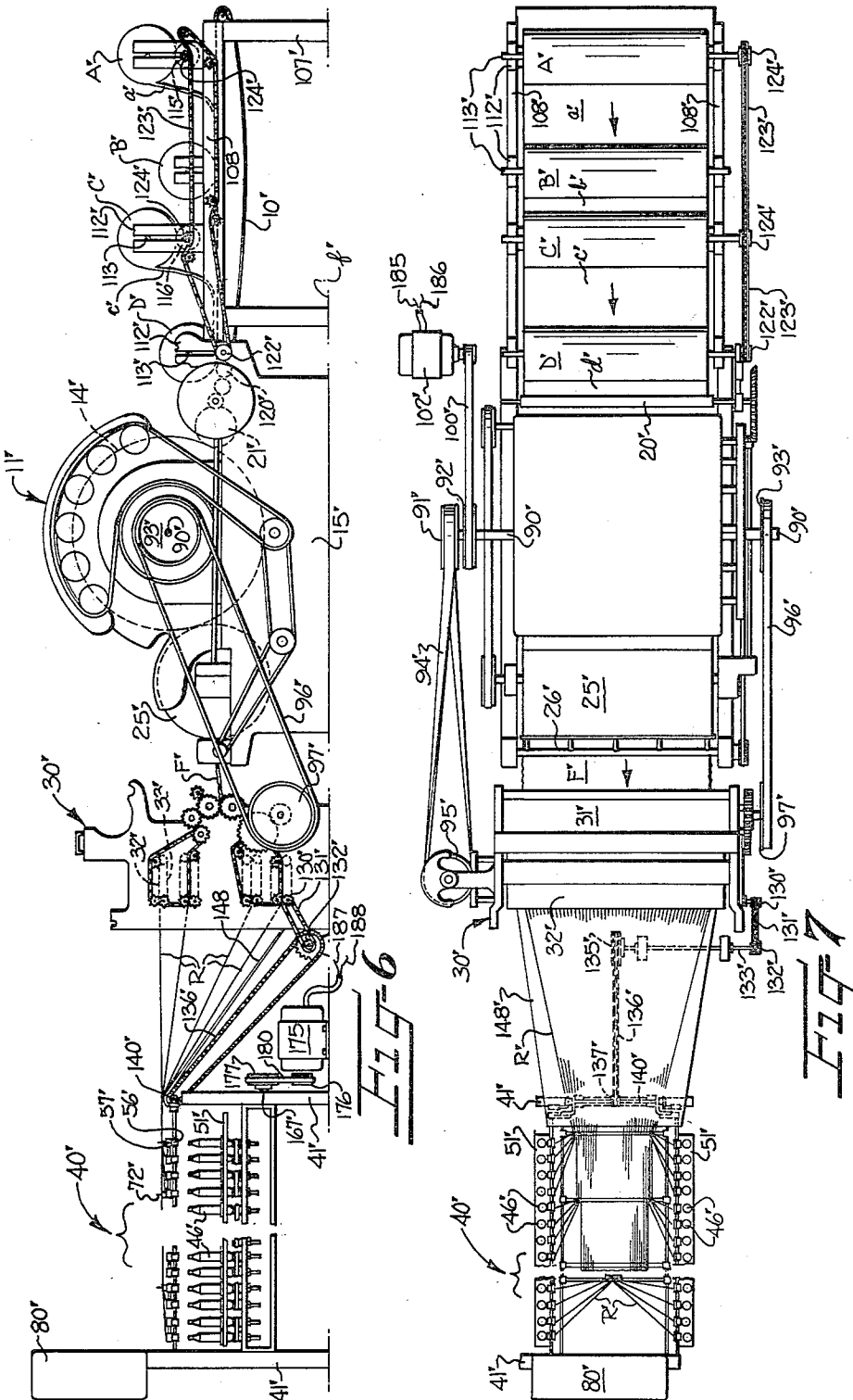
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APPARATUS FOR MAKING YARNS FROM PICKER LAPS

Filed Nov. 15, 1961

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3,130,535
**APPARATUS FOR MAKING YARNS FROM
 PICKER LAPS**

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 Filed Nov. 15, 1961, Ser. No. 152,431
 12 Claims. (Cl. 57—34)

This invention relates to a novel apparatus for making yarn and it is an important object of this invention to provide an improved apparatus for making yarn from very short fibers, such as combing noils and other waste fibers, as well as fibers of lengths up to, say, six inches, in an economical continuous process.

Various attempts have been made heretofore to develop an apparatus capable of making yarn in a continuous process from the carding operation through the spinning or twisting operation, but such prior apparatuses have not been entirely satisfactory and have been quite expensive. The yarn would be uneven in thickness or density and specially constructed spinning or twister machines had to be used in order to effect the spinning or twisting process as the roving passed directly from a tape condenser to the spinning machine. In one instance, a spinning frame extended transversely of the path of travel of the fibers so that all the bobbins thereof had to be on only one side of the spinning frame. In another instance, the spinning frame had a converging pair of rows of spindles and bobbins on opposite sides thereof. More importantly, the speed of the roving feed rolls on the spinning frame was not maintained proportional to or controlled by the speed of the tape condenser.

It is therefore another important object of this invention to provide a means for making yarn which overcomes the defects of such prior systems.

It is another more specific object of this invention to provide a novel apparatus for making cotton yarn, in particular, in a continuous process, wherein several relatively thick fibrous webs or laps are drawn from the tops and bottoms of successive lap rolls and fed, in sandwich form, to a roller card which forms the laps into a thin fibrous web or fleece. The fleece is split into a plurality of narrow strips on a tape condenser which rolls and rubs the strips into rovings which pass directly to a conventional twister or spinning frame aligned longitudinally of the direction of travel of the fibers and having two parallel rows of spindles and bobbins on opposite sides thereof.

Each spindle has a feed roll thereabove to which one of the rovings is directed and which directs the rovings to the respective spindles through the usual ring travelers. The feed rolls are driven by and in synchronism with the tape condenser to insure that the rovings are drawn from the condenser at a speed compatible with the speed of the tape condenser. Further, the spindles are driven at such speed as to take up and produce the desired amount of twist in the yarn thus formed from the rovings.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which—

FIGURE 1 is a somewhat schematic longitudinal vertical sectional view showing the novel apparatus arranged in accordance with the present invention and showing one type of drive common to the card machine, the tape condenser and the spinning frame;

FIGURE 2 is a schematic top plan view of the structure shown in FIGURE 1 with central portions of the carding machine, the card feed apron or conveyor and the tape condenser broken away;

FIGURE 3 is a fragmentary transverse vertical sectional view through the spinning frame taken substantially along line 3—3 in FIGURE 1;

FIGURE 4 is an enlarged detail of the upper left-hand portion of FIGURE 3;

FIGURE 5 is an enlarged fragmentary view of the right-hand end portion of the spinning frame shown in the left-hand portion of FIGURE 2, but omitting the gear-covering roving guide chute;

FIGURE 6 is a view similar to FIGURE 1 showing a second form of means for driving the spindles of the spinning frame;

FIGURE 7 is a top plan view of the structure shown in FIGURE 6;

FIGURE 8 is a schematic electrical diagram of a circuit for controlling the drive of FIGURES 6 and 7.

Referring more specifically to the drawings and to FIGURES 1 and 2 in particular, bats or laps of textile fibers *a—d* are drawn from respective lap rolls A—D onto a driven endless lap feed conveyor or apron 10 which delivers the relatively thick fibrous webs *a—d* to a roller carding machine generally designated at 11. The roller carding machine is of conventional construction and includes the usual rollers 12 and clearers or strippers 13 which cooperate with a main cylinder 14 suitably journaled on a frame 15. In their course from the conveyor 10, the laps *a—d* are directed onto a feed plate 16 by a driven supporting roller 17. The front portion of feed plate 16 has a cooperating fluted roller or feed roller 20 which directs the fibers from the laps *a—d* to a licker-in 21 which, in turn, directs the fibers to the main cylinder 14.

A doffer cylinder 25 removes the fibers from the main cylinder and these fibers are withdrawn from the doffer cylinder 25 in the form of a thin web or fleece F by suitable means, such as a conventional doffer comb 26. Although revolving-flat carding machines are generally used in carding cotton fibers, a roller carding machine is used in the present instance, because it is necessary to open and clean the cotton fibers as much as possible, even at the expense of reduced drawing. Generally, a revolving-flat carding machine cannot clean and straighten the fibers to the extent of a roller carding machine. The fleece F is drawn from the doffer comb 26 and doffer cylinder 25 by the slitting or dividing rolls 27 of a conventional tape condenser broadly designated at 30.

The slitting rolls 27 separate the fleece F into a plurality of tapes, not shown, half of which are directed upwardly from the upper roller 27, and the other half of which are directed downwardly by the bottom roller 27. As these fibrous tapes are directed upwardly and downwardly by respective upper and lower rollers 27, they pass in engagement with belts 31 which, in turn, direct the fibrous tapes to and between pairs of upper and lower rubbing aprons 32, 33 in a well known manner. There are four sets of the upper and lower rubbing aprons 32, 33 in FIGURE 1. The rubbing aprons 32, 33 in each set move transversely of each other while advancing the corresponding tapes therebetween to condense the tapes of textile fibers into ropings or rovings R. Since the operation and construction of tape condensers are well known in the wool processing art, a further description thereof is deemed unnecessary.

The rovings R are guided over the top of one end of an elongate spinning frame or machine, broadly designated at 40, which extends forwardly from adjacent the front or discharge end of tape condenser 30. The spinning frame is conventional, although modified by removing drafting rolls therefrom, so that it serves as a twister frame in this instance. Thus, the terms "spinning frame" and "twister frame" are used synonymously throughout this application to mean a conventional twisting machine or a conventional spinning machine modified by removal of its drafting rolls, with the exception

of its front top and bottom delivery rolls. The latter rolls serve as feed rolls, as will be later described.

As best shown in FIGURES 3 and 5, the spinning frame 40 includes two parallel rows of vertically disposed spindles, the spindles in each row being indicated at 45. Each spindle 45 normally has a bobbin 46 thereon which extends through a spinning ring 47 having a ring traveler 50 mounted thereon. The spinning rings 47 at each side of the machine are supported on a vertically reciprocating ring rail 51. The ring rails 51 are reciprocated vertically by the usual traverse motion or builder motion, not shown. The spindles 45 are driven by tapes or belts 52 which extend about a centrally disposed longitudinally extending main drum 53 suitably journaled in the frame of the twister frame 40.

In order to direct the rovings R to the spindles 45 and bobbins 46, each side of the twister machine has a longitudinally extending beam 54 thereon which supports a plurality of spaced roll stands 55. The roll stands are of conventional construction and rotatably support fluted feed rolls 56, there being a row of coaxial interconnected feed rolls 56 at each side of the machine. As a matter of fact, the feed rolls 56 are in the form of fluted bosses which are interconnected by roller necks as is well known. There is a feed roll or boss 56 disposed above each spindle 45 and each feed roll or boss 56 is engaged by a pressure roll or cushion roll 57 which may be of the same construction as and supported in the same manner as the conventional top rolls of a spinning frame.

As best shown in FIGURE 5, alternate pairs of the pressure rolls 57 are interconnected by reduced neck portions 58 to which downward pressure is applied by an arm 61 (FIGURE 4) having a tension spring 62 connected thereto. The lower end of each tension spring 62 is connected to the corresponding beam 54, as at 63 (FIGURE 4). The arms 61 at each side of the machine are pivotally connected to a shaft 65 extending longitudinally of the spinning frame and being suitably supported in the corresponding roll stands 55. The roll stands 55 at each side of the spinning frame also support an elongate bar 66 to which a plurality of bifurcated thread guides 67 are suitably secured, there being one of the thread guides disposed inwardly of each feed roll 56.

As best shown in FIGURES 3 and 5, each laterally opposed pair of roll stands 55 has opposed ends of a laterally extending bar 70 suitably secured thereto and each of the bars 70 has a comb 71 suitably secured thereto. Each comb 71 includes a plurality of upstanding closely spaced guide pins 72 (FIGURES 3, 4 and 5).

It will be observed in FIGURE 5 that there are four bosses or roll sections 56 between each adjacent pair of roll stands 55. The strands of roving R coming from the tape condenser 30 are guided by the pins 72 of the successive combs 71 and the strands diverge outwardly or are deflected outwardly from the pins 72 to the guides 67 and corresponding feed rolls 56. Since four strands of roving project outwardly from opposite ends of each row of pins 72, it will be noted that the second row of pins 72 from the right in FIGURE 5 has eight lesser pins than the first row and the next succeeding row of pins 72 has eight lesser pins therein than the immediately preceding row, and so on. Ultimately, the last row of pins 72 on the twister frame would then include only eight pins.

Suitable suction end clearers are provided adjacent each row of delivery or feed rolls 56. The end clearers are of types well known in the art and include suction heads 75 whose orifices are disposed closely adjacent to the corresponding delivery rolls 56 and adjacent the path of travel of the rovings R as they pass from the delivery rolls 56 through the travelers 50 and to the bobbins 46 on spindles 45. The suction heads 75 have respective conduits or pipes 76 connected thereto which are connected to a common main suction duct 77 extending longitudinally of the spinning frame substantially through-

out the length thereof and being connected to a suitable suction and filtering device indicated schematically at 80 in FIGURES 1 and 2.

It will also be observed in FIGURE 1 that the lower discharge portion of each pair of rubbing aprons 32, 33 has a suction head 81 positioned adjacent the same which is connected, by a pipe 82, to a conduit 83 which is common to all of the pipes 82. Conduit 83 is connected to a suitable suction and collecting unit 84 identified as a vacuum source in FIGURE 1. It is highly desirable that the suction heads 75 and 81 are used in the present system in order to insure continuous uninterrupted operation of the entire apparatus in the event that one or more of the ends of roving become parted, since the characteristics of the yarn produced with the present apparatus are such that it is most economical to permit broken ends to remain broken while the apparatus continues to operate until a winding cycle of the twister frame 40 has been completed.

One type of yarn produced on the present apparatus was, for example, a No. 7 cotton yarn having about nine turns of twist per inch therein. The yarn was made from a blend of 75% cotton combing noils and 25% new cotton of standard staple length; i.e., the fibers in the new cotton were approximately $1\frac{1}{16}$ inches long. It is well known that combing noils are generally very short fibers of as little as $\frac{1}{4}$ inch length and, therefore, the drafting of such fibers is quite difficult. The present system, however, eliminates the drafting of the fibers. Yarn of this type is used for knit goods and is also used as a filling or other backing yarn in woven fabrics.

In order to insure that the entire yarn producing system functions properly, I have provided two types of drives for the apparatus, the first embodiment of which includes a common drive for the feed conveyor 10, the carding machine 11, the tape condenser 30 and, more importantly, the spindles of the twister frame 40. Also, in order to insure that the roving is withdrawn from the rubbing aprons 32 and directed to the delivery rolls or feed rolls 56 of the twister frame under sufficient but minimum tension, the feed rolls of both forms of the invention are driven by a direct connection with the tape condenser. The first form of drive will now be described.

It will be observed in FIGURE 2 that the main cylinder 14 of the carding machine has a shaft 90 projecting from opposite ends thereof, one end of which has a pair of coaxial pulleys 91, 92 thereon and the other end of which has a single pulley 93 thereon. Pulley 91 has an endless belt 94 connected thereto which is also connected to a pulley 95 which is instrumental, in a well known manner, in imparting rubbing action to the rubbing aprons 32, 33. Pulley 93 has an endless belt 96 mounted thereon which is also mounted on a pulley 97 operatively connected to the rollers 32a, which drive the belts 31, 32, and to the slitting rolls 27 for imparting rotation thereto in timed relation to the rotation of the main card cylinder 14.

Pulley 92 is engaged by an endless belt 100 which is also mounted on a pulley 101 driven by an electric motor 102. The other parts of the conventional carding machine, such as the doffer cylinder 25, the licker-in 21, the feed roller 20 and the supporting roller 17, are driven in a manner well known in the art and, accordingly, a description thereof is deemed unnecessary.

Roller 17 is operatively connected to a front roller 105 on which the front portion of endless conveyor belt or apron 10 is mounted, the rear portion of endless belt 10 being mounted on an idler roller 106. The rollers 105, 106 are journaled in a suitable frame 107 having side rails 108 thereon between which the bats or laps *a-d* pass. The side rails 108 also support suitable stands 112 in which the core shafts 113 of the lap rolls A-D are journaled.

It will also be observed that, in order to facilitate the withdrawal of the laps *b, d* from the bottoms of the lap

rolls B, D while the laps *a*, *c* are drawn from the tops of the lap rolls A, C, the rolls A, C rest upon respective driven support rolls 115, 116 which are suitably journaled in the corresponding standards 112 and serve as auxiliary lap feed rolls. On the other hand, the lap rolls B, D rest upon the webs *a* and *c*, respectively, as they are withdrawn from the respective rolls *a*, *c* by the moving main conveyor or apron 10.

In order to drive the feed apron 10 and the supporting rolls 115, 116 in proper timed relation to the carding machine 11, one end of supporting roll 17 has a gear 120 fixed thereon (FIGURE 2) which meshes with a gear 121 fixed on one reduced end of the conveyor supporting roll 105. The latter end of the conveyor supporting roll 105 has a sprocket wheel 122 thereon which is engaged by an endless sprocket chain 123. Sprocket chain 123 also engages several other sprocket wheels including sprocket wheels 124 fixed on reduced corresponding ends of the auxiliary lap feed rolls 115, 116.

It should be noted that the lap rolls A, C are reversed relative to the lap rolls B, D in order to insure that the combined laps *a-d* are of substantially uniform thickness and density throughout the width thereof, since it frequently happens that the lap rolls removed from pickers are somewhat larger on one end than on the other; that is, instead of the laps being entirely cylindrical in form, they are somewhat frusto-conical in form, this being the result of a greater amount of fibers being delivered to one end of the lap roll than are delivered to the other during the forming of the picker laps.

In order to drive the twister frame feed rolls 56 at such speeds as to withdraw the rovings R from the rubbing aprons 32 while maintaining the rovings under relatively light tension, one of the rolls 32*a* at the exit end of a corresponding rubbing apron 32 or 33 has a sprocket wheel 130 connected to one reduced end thereof. Sprocket wheel 130 is engaged by a sprocket chain 131 which also engages a sprocket wheel 132 fixed on a transverse shaft 133 journaled in the frame of the tape condenser 30.

A medial portion of shaft 133 has a sprocket wheel 135 fixed thereon which is engaged by an endless sprocket chain 136. Sprocket chain 136 is also mounted on a sprocket wheel 137 fixed on a shaft 140. As best shown in FIGURE 5, it will be observed that shaft 140 is journaled in a pair of brackets 141 adjustably secured to the upper end of the rear end frame member 41 of twister frame 40, adjacent the condenser 30.

Each end of shaft 140 has a bevel gear 142 fixed thereon which meshes with a bevel gear 143 fixed on a stub shaft 144 journaled in a laterally projecting portion 145 of each bracket 141. Also, fixed on each shaft 144 is a spur gear 146 which meshes with a spur change gear 147 fixed on one end of the corresponding row of rolls 56, it already having been stated that the rolls 56 may be integrally formed or interconnected by roller necks in the usual manner.

A bracket 150 may be provided for supporting the end of the shaft of rolls 56 and to which spur gear 147 is secured. Bracket 150 is adjustably secured to the lateral portion 145 of the corresponding bracket 141. It is thus seen that the delivery rolls 56 at each side of the twister machine 40 are driven in accurately timed relation to the rubbing aprons 32, 33 of the tape condenser 30.

Since the rovings R are under very little tension between the tape condenser 30 and the twister machine 40, a gear-covering roving guide plate 148 extends upwardly and forwardly, at an angle in FIGURE 1, from a lower portion of the tape condenser 30 to the rear end frame member 41 of the twister machine 40. It should be noted that the front upper portion of guide plate 148 curves over the upper end of the latter frame member 41 so as to serve as a cover for the various parts shown in the right-hand portion of FIGURE 5, including gears 142, 143, 146, 147, sprocket wheel 137, chain 136 and shaft 140.

Roving guide plate 148 may be suitably secured to brackets 145, if desired.

Roving guide plate 148 also overlies shaft 133 and sprocket wheel 135, thus insuring that the rovings R will not drop onto any of the aforementioned parts covered by the guide plate 148. Guide plate 148 should have a smooth upper surface so the rovings R may slide freely over the same and, particularly, over the upper portion of the rear end of the twister frame 40.

The spindles 45 and bobbins 46 may be driven at variable speeds substantially greater than the speed at which the yarn or roving R is delivered by the delivery rolls 56. Owing to the fact that a carding machine must be started rather slowly with its speed gradually increasing to a maximum given speed, it is highly desirable that the speed of the bobbins 46 be proportional to the speed of the carding machine 11 and the condenser 30 at all times. To this end, the shaft of electric motor 102 (FIGURES 1 and 2) also has a pulley 151 fixed thereon which is engaged by an endless belt 152. Endless belt 152 (FIGURE 2) also engages a pulley 153 fixed on a jack shaft 154. Jack shaft 154 is journaled in a bearing block 155 and is coupled, as at 156, to one shaft 157 of a right-angular gear box 160. The output shaft 161 of gear box 160 is coupled, as at 162, to a power shaft 163 which extends longitudinally of and substantially centrally of the carding machine 14.

Shaft 163 is journaled in bearing blocks 164. The bearing blocks 155, 164 may be secured to the floor *f* upon which rests the apparatus. The front end of shaft 163, remote from gear box 160, is connected to an upwardly and forwardly extending extension shaft 165 by a suitable universal joint 166. The upper end of shaft 165 is connected to a drive shaft 167 projecting from one end of the drum 53 by means of a suitable universal joint 170. Thus, since the drum 53 drives the spindles 45 by means of the tapes or belts 52, and rotation is imparted to the drum 53 of the spinning frame 40 from electric motor 102 through the intervening elements heretofore described, it is apparent that the spindles 45 and bobbins 46 are driven at all times at a speed directly proportional to the speed of the carding machine 11 and tape condenser 30. This insures that a constant amount of twist is imparted to the roving thus converted into yarn, since it is well known that the greater the speed of the spindles 45 and bobbins 46 relative to the feed rolls or delivery rolls 56, the greater the amount of twist imparted to the yarn as it passes through the travelers 50 to the bobbins 46.

Second Form of the Invention

The second form of the invention shown in FIGURES 6, 7 and 8 is identical to the first form of the invention with the exception of the manner in which rotation is imparted to the spindles of the spinning frame. Therefore, all parts illustrated in FIGURES 6, 7 and 8 which are identical to those heretofore described with respect to FIGURES 1 through 5 shall bear the same reference characters with the prime notation added where applicable, in order to avoid repetitive description.

The structure shown in FIGURES 6 and 7 differs from that shown in FIGURES 1 and 2, in particular, to the extent that the electric motor 102' of FIGURE 7 is not used for driving the spindles of the spinning frame 40', although the motor 102' of FIGURE 7 serves to drive the corresponding carding machine 11' and, therefore, serves to drive the corresponding condenser 30'. It will be observed in FIGURE 6 that the spindles 45 thereof are driven by an electric motor 175 which is connected to the shaft 167' by means of a pair of pulleys 176, 177 and an endless belt 180 entrained thereover.

Referring to FIGURE 8 (sheet 3), it will be observed that the main drive motor 102' and the auxiliary or spindle drive motor 175 are connected in parallel to a master variable speed control embodied in a rheostat or potentiometer 182 and individual auxiliary variable speed controls are also provided for each motor 102', 175. The

latter controls are embodied in auxiliary rheostats or potentiometers 183, 184 interposed between the master rheostat 182 and the respective electric motors 102', 175. Thus, the speed of the entire apparatus driven by motors 102', 175 may be determined by adjustment of the main rheostat 182, and the relative speed of the spindles and the remainder of the apparatus; i.e., the feed apron 10', the carding machine 11', the tape condenser 30' and the feed rolls 56' of the spinning frame 40', which are driven by the respective motors 102', 175, may be determined by adjustment of the respective rheostats 183, 184.

In this instance, electric motors 102', 175 have respective pairs of conductors 185, 186 and 187, 188 connected thereto. Conductors 185, 187 are connected to a lead wire 191, and conductors 186, 188 are connected to a double safety switch 192. The other side of switch 192 has a pair of parallel conductors 193, 194 leading therefrom to respective sides of rheostats 183, 184. Safety switch 192 should be conveniently located adjacent to or on the spinning frame 40' so the apparatus may readily be stopped by an attendant. The attendant can more readily detect faults in the operation of the apparatus by watching the spinning frame than he can by watching other parts of the apparatus.

The other sides of rheostats 183, 184 are interconnected by a conductor 195. A conductor 196 leads from conductor 195 to one side of rheostat 182. The other side of rheostat 182 had a lead wire 197 which, along with lead wire 191, leads to a suitable source of electrical energy embodied in a plug 200. Suitable "start," "jog" and "stop" switches s-1, s-2, s-3 may be interposed in lead wires 191, 192 in a well-known manner.

It is thus seen that I have provided an improved apparatus for processing textile fibers, cotton in particular, in which the fibers are taken from oppositely positioned laps, and pass through a roller carding machine and a ribbon or tape condenser, where they are converted to strands of roving, and whereupon the rovings pass to one end of a conventional spinning frame, over the spinning frame and are directed outwardly to two parallel rows of spindles and bobbins. It is seen further that I have provided means for driving the spindles of the spinning frame at a speed maintained in a given proportion to the speed of the carding machine and the tape condenser, and wherein the feed rolls of the spinning frame are driven at a speed proportional to the speed of the rubbing aprons of the tape condenser.

The maintenance of correct driving relationships between the carding machine and the spindles and between the rubbing aprons and the feed rolls of the spinning frame is very important to the operation of the entire apparatus, due to the fact that the size and weight of the main cylinder of the carding machine is such that the machine must be started at a slow speed and the speed thereof is then gradually increased until the desired speed has been reached, in order to avoid overloading the drive therefor.

In the drawings and specification there have been set forth preferred embodiments of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. Apparatus for making yarn from picker laps utilizing a twister machine equipped with a pair of parallel rows of ring travelers and rotating bobbins on opposite sides thereof which comprises, in combination, (1) a carding machine for forming a web from picker laps, (2) a tape condenser positioned forwardly of and closely adjacent the carding machine,

(a) said tape condenser including means for receiving and splitting said web into a plurality of relatively narrow strips,

(b) said tape condenser also having means applying

a rubbing and rolling action to the strips so each strip is converted to a roving strand,

(3) said parallel rows of travelers and bobbins on said twister machine extending forwardly of the last-named means and longitudinally of the path of travel of the strands issuing from the tape condenser,

(a) means on said twister machine for guiding and deflecting the roving strands toward both sides of the twister machine,

(b) twister feed rolls through which said roving strands are drawn from said guiding and deflecting means and directed to respective travelers and bobbins in said parallel rows,

(c) means for transmitting rotation to the feed rolls from the tape condenser, and

(d) means for rotating the bobbins of said twister machine at a speed proportional to the speed of the carding machine.

2. In a yarn producing system including a card and a tape condenser arranged in series; the combination of (1) an elongate spinning machine having its longitudinal axis extending in substantially the same direction as the direction of the path of travel of fibers passing through the card and the tape condenser,

(a) a row of rotatable spindles on each side of said spinning machine and adapted to support bobbins thereon, said rows extending in parallel relationship longitudinally of said spinning machine,

(b) a vertically reciprocable ring rail at each side of the spinning machine and having rings and travelers thereon for the respective spindles,

(c) a feed roll spaced above each row of spindles,

(d) means for guiding rovings from the tape condenser over the adjacent end of said spinning machine and outwardly to the respective feed rolls whereby the rovings are directed to respective bobbins as twist is imparted thereto,

(e) means operatively interconnecting said tape condenser in driving relation with said feed rolls, and

(f) means for driving said spindles in timed relation to said card and said tape condenser.

3. A structure according to claim 2 in which said means for driving said spindles includes a drive operatively interconnecting said spindles, the roller card and the tape condenser.

4. A structure according to claim 2, in which said means for driving said spindles includes first and second electric motors coupled to the roller card, and the spindles, respectively, a main manually operable rheostat interposed in an electrical circuit and in series with both of said motors, a pair of auxiliary rheostats in series with said main rheostat, and said auxiliary rheostats being connected in parallel to said respective first and second electric motors.

5. A structure according to claim 2, wherein said spinning machine includes a substantially horizontal row of spaced roll stands on each side thereof, each of said feed rolls comprising a plurality of spaced bosses, roller necks interconnecting adjacent bosses, a plurality of pressure rolls positioned above said bosses, a rod extending between and carried by the roll stands in each row, a plurality of arms pivotally mounted on said rod and engaging said pressure rolls, and means yieldably urging downwardly said arms to maintain the pressure rolls in yieldable engagement with said bosses.

6. A structure according to claim 2, in which the means for guiding rovings from the tape condenser to the feed rolls of the spinning machine comprises a plurality of longitudinally spaced laterally extending rows of pins disposed adjacent and between the feed rolls at opposite sides of the spinning machine, said pins in each row being adapted to guide the rovings therebetween whereby said rovings, adjacent opposite ends of each row of pins, may diverge outwardly to the portions of the feed rolls disposed between each adjacent pair of rows of pins.

7. A structure according to claim 2, in which said tape condenser includes rubbing aprons for receiving fibers therebetween from said roller card and for forming said rovings therefrom, and said means operatively connecting said tape condenser in driving relation with said feed rolls includes drive means for transmitting rotation from at least one of said aprons to the feed rolls at both sides of the spinning machine.

8. A structure according to claim 7, in which said drive means includes a first shaft journaled on a front portion of said tape condenser and driven by said one of said aprons, a second shaft journaled on a rear portion of said spinning machine and extending laterally thereof and in substantially parallel relation with said first shaft, gear means connecting opposed ends of said second shaft with corresponding ends of said feed rolls, a wheel mounted on each of said first and second shafts, and an endless pliable element entrained over said wheels for transmitting rotation from the first shaft to the second shaft and thence to the feed rolls.

9. A structure according to claim 8, in which said gear means includes at least one change gear.

10. A structure according to claim 2, in which said roller card include a main cylinder, said means for driving said spindles comprising a motor, and means operatively connecting said motor to said roller card, to said tape condenser and to said spindles.

11. A structure according to claim 10, in which said spinning machine includes a main drive shaft operatively connected to said spindles, said means operatively connecting said motor to said roller card, tape condenser and spindles comprising first pulley means and first endless belt means interconnecting the main cylinder of said card with said tape condenser, second pulley means and second endless belt means interconnecting said motor and said main cylinder for transmitting rotation from the motor to the cylinder, a power shaft extending longitudinally beneath said tape condenser and driven by said motor,

and an inclined shaft extending between and being universally connected to the proximal ends of said spinning machine drive shaft and said power shaft.

12. Apparatus for forming twisted yarn from a plurality of picker laps in the form of lap rolls comprising, (1) means withdrawing and feeding at least one of said laps from the top of a lap roll and withdrawing and feeding at least one other of said laps from the bottom of a lap roll while plying said laps in superposed relationship, (2) a roller card for receiving said plied laps and forming therefrom a broad thin web, (3) a tape condenser,

(a) means on said condenser for receiving and forming narrow strips from said web and for forming said strips into rovings,

(4) an elongate spinning frame having a pair of parallel rows of upright rotatable spindles thereon,

(a) a pair of feed rolls spaced above each of said spindles,

(b) driving connections between said tape condenser and said feed rolls,

(c) means for guiding the rovings from said tape condenser over one end of and longitudinally of said spinning frame, and

(d) means guiding each roving to one of said spindles, said last-named means including rings and ring travelers.

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