Nov. 2, 1965 W. E. ROYSTER 3,214,898

COMMON DRIVE FOR CARD, TAPE CONDENSER AND TWISTER

Filed Jan. 15, 1964 5 Sheets-Sheet 1

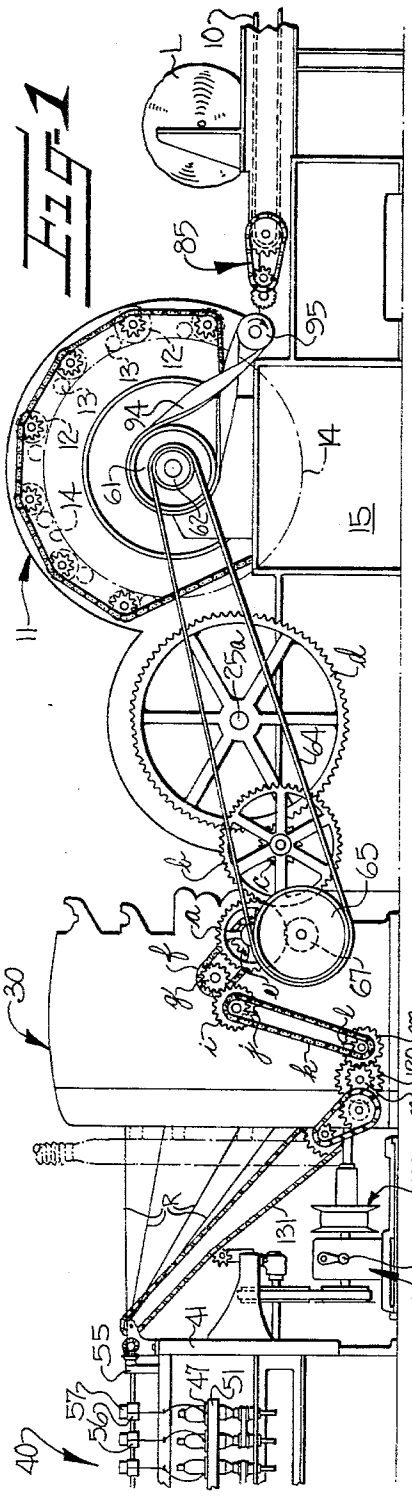


FIG-1

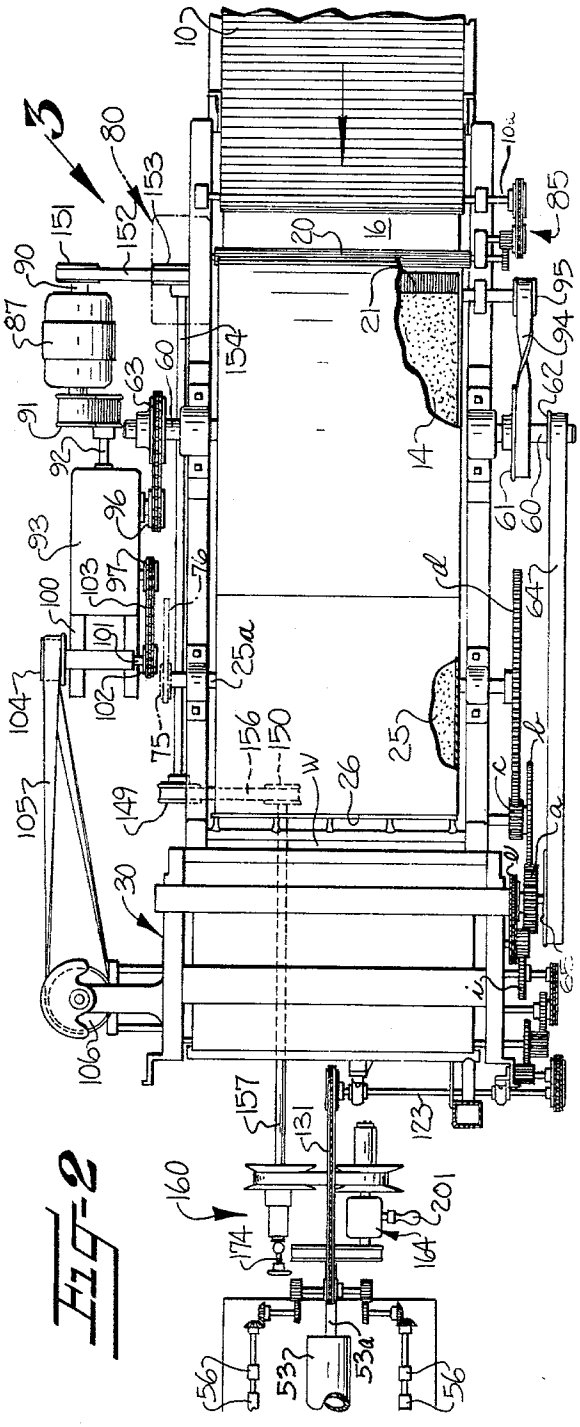


FIG-2

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COMMON DRIVE FOR CARD, TAPE CONDENSER AND TWISTER

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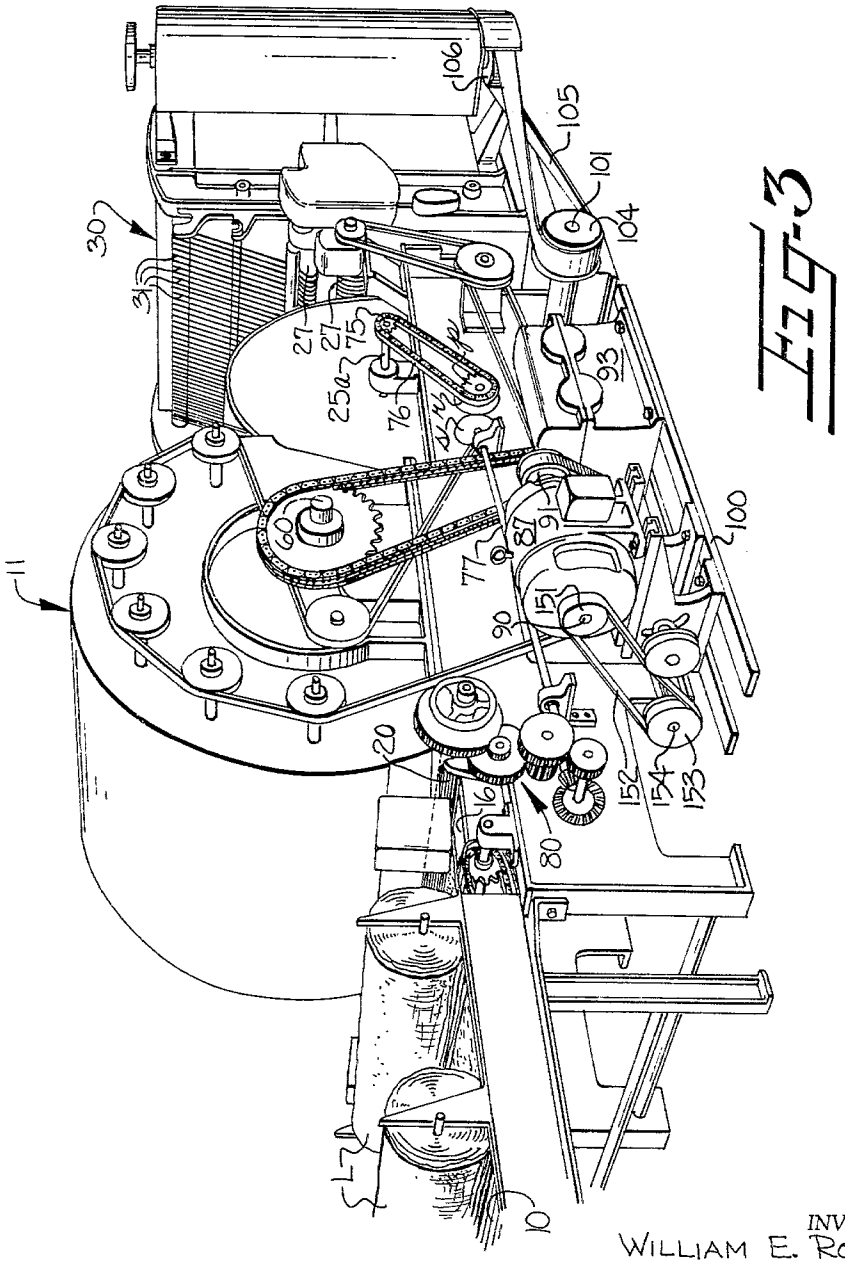


FIG. 3

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COMMON DRIVE FOR CARD, TAPE CONDENSER AND TWISTER

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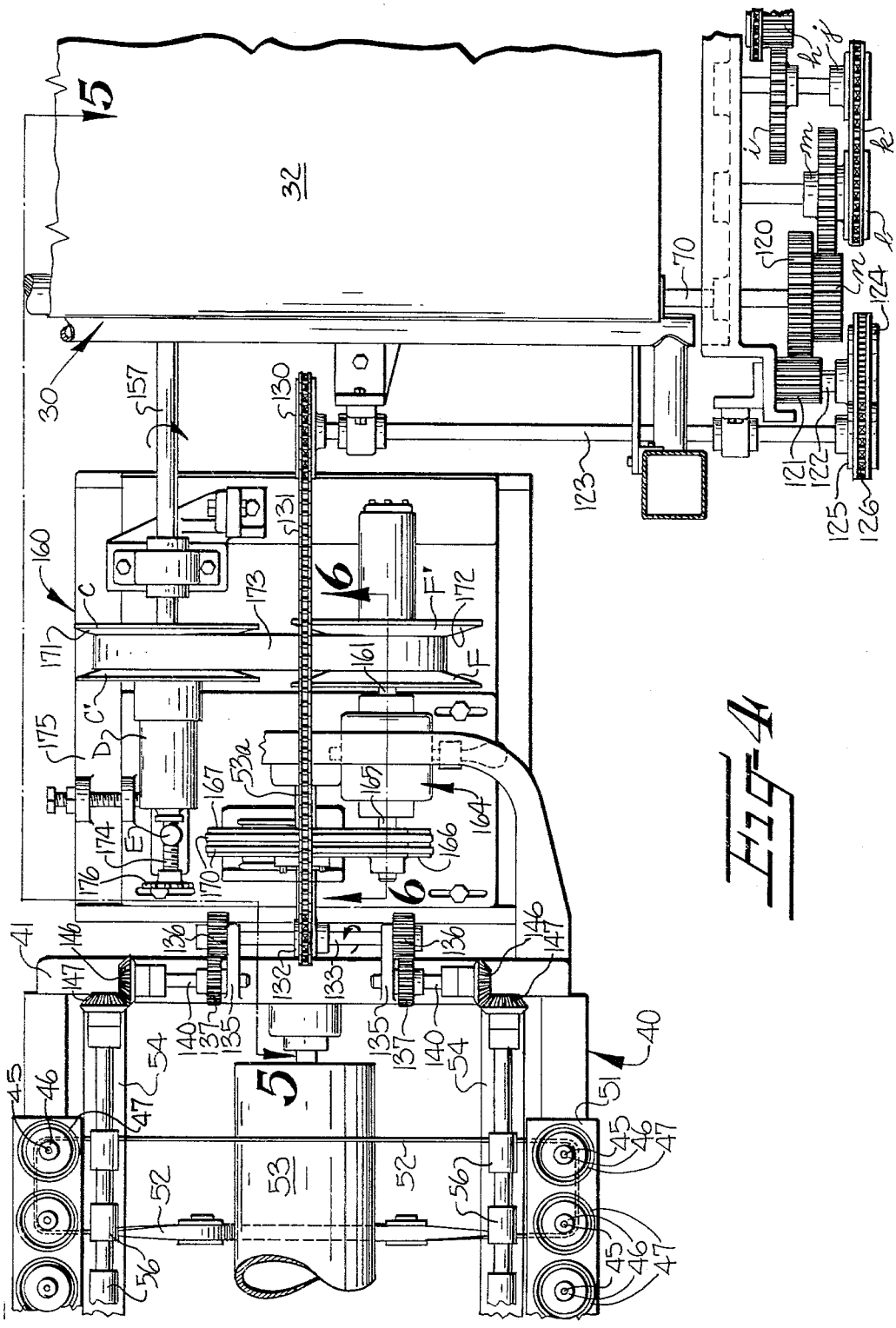


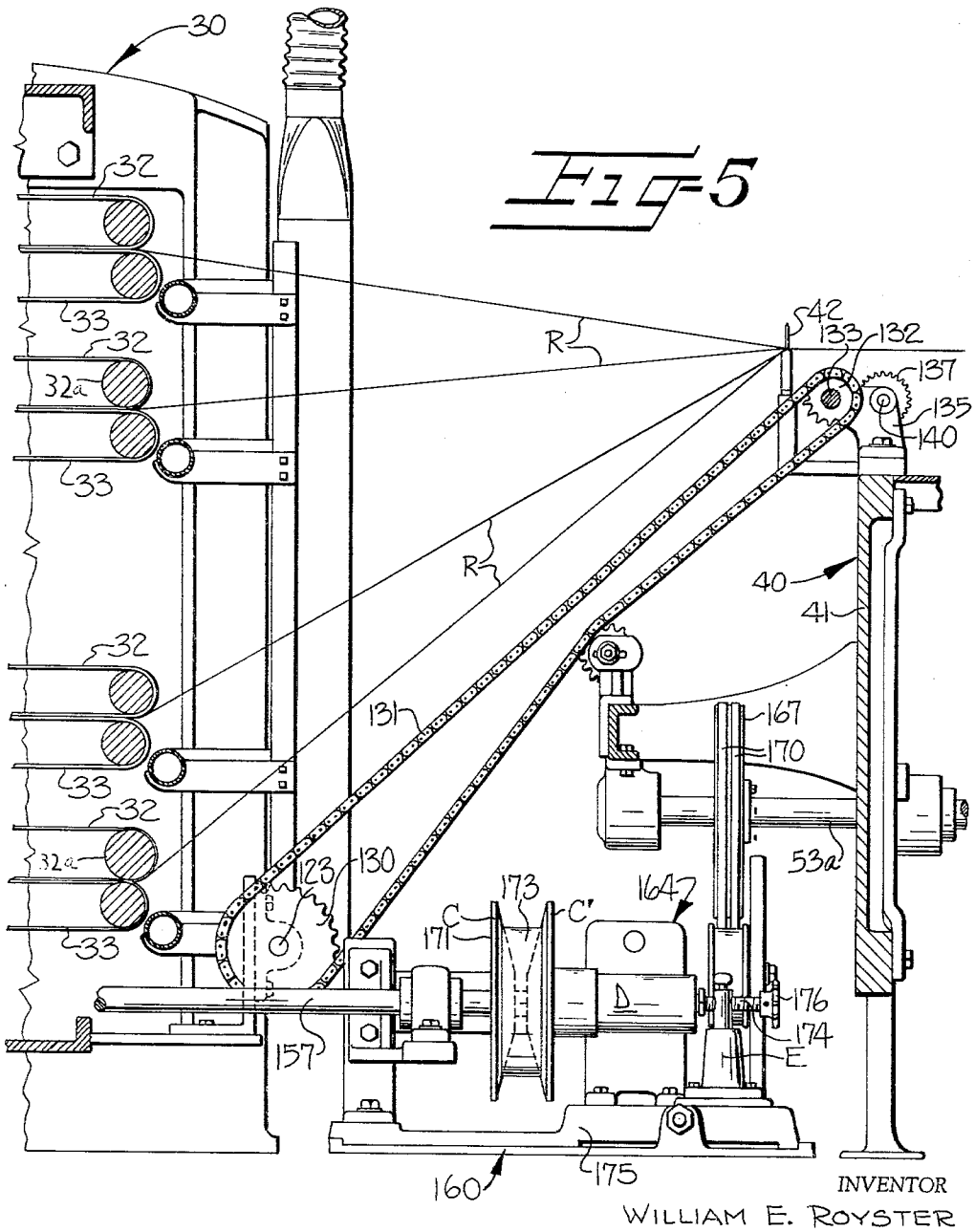
FIG. 4

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COMMON DRIVE FOR CARD, TAPE CONDENSER AND TWISTER

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Fig-5



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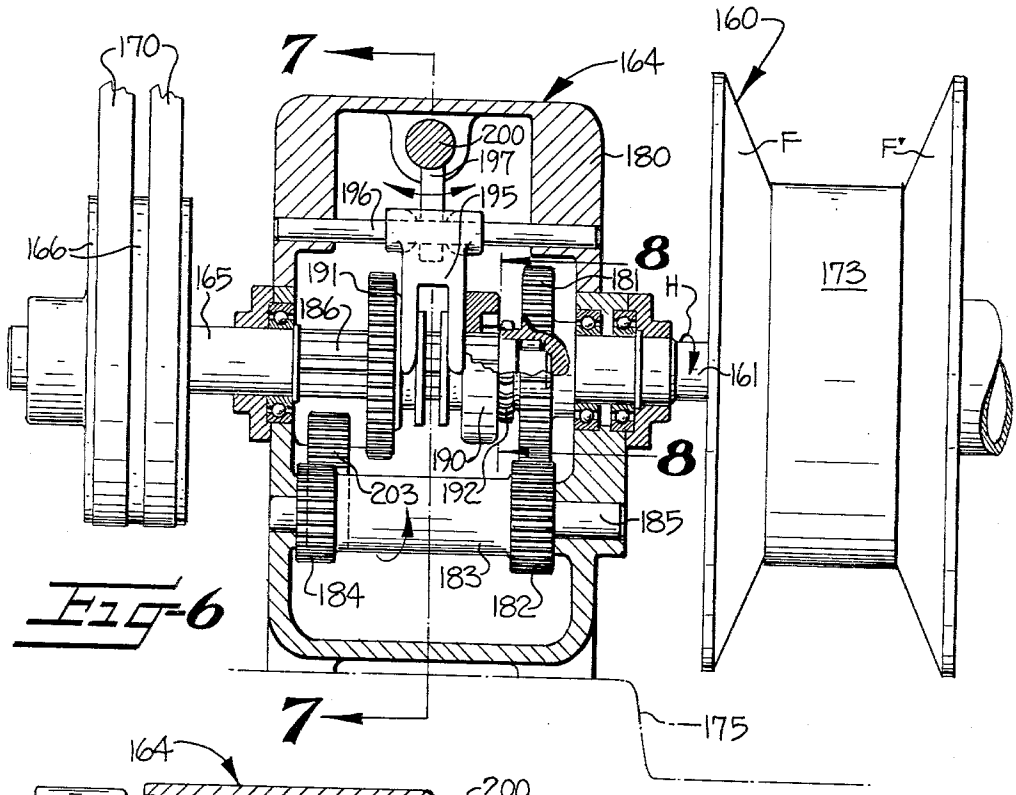


Fig-6

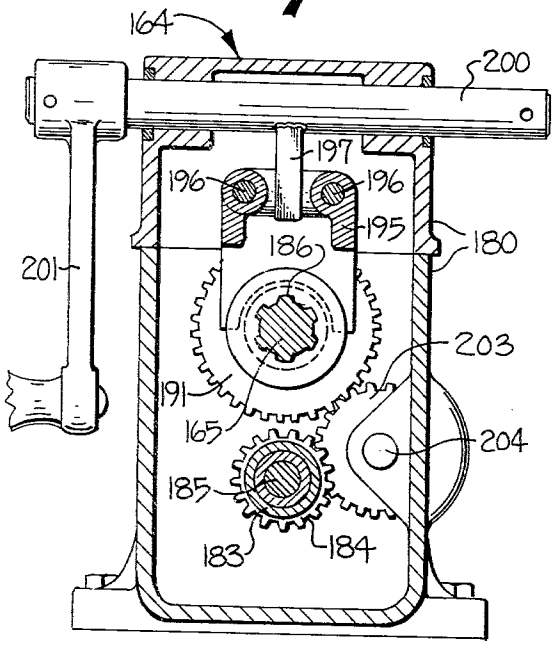


Fig-7

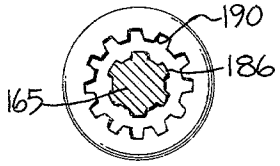


Fig-8

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United States Patent Office

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COMMON DRIVE FOR CARD, TAPE CONDENSER AND TWISTER

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Filed Jan. 15, 1964, Ser. No. 337,877
12 Claims. (Cl. 57—50)

This invention relates to an improved drive mechanism for textile machinery for making yarn from a loose mass of textile fibers such as a picker lap, wherein the fibers are processed through a carding machine and a tape condenser and wound onto bobbins of a spinning frame or twister in a continuous operation, as is disclosed in my copending U.S. application Serial No. 152,431, filed November 15, 1961, now U.S. Patent No. 3,130,535 and entitled Apparatus for Making Yarn From Picker Laps, of which this application is a continuation-in-part.

In order to make yarn in a continuous process from a loose mass or lap of textile fibers utilizing a carding machine, a tape condenser and a ring twister or spinning frame, the speed of the fiber feeding means and doffing means of the carding machine must be synchronized with the speed of the fiber feeding means and rubbing aprons of the tape condenser which splits the carded web into strips and rolls the strips into roving strands. The speed of the spinning frame feed rolls and bobbins also must be synchronized with the tape condenser so the feed rolls properly draw the strands from the condenser and direct them to the bobbins as twist is imparted to the strands. The apparatus of said copending application describes and claims a drive mechanism of the type described.

However, depending upon the type of articles to be made from the yarn, the size of the yarn, and the type of fibers therein, it is desirable to vary the amount of twist imparted to different strands. Also, the advantages of "filling mixing" being well known, it is desirable to wind some yarns with an S twist therein and to wind other yarns with a Z twist therein.

Therefore, it is an object of this invention to provide control means interposed in a common drive mechanism for a carding machine, a tape condenser and a spinning frame or the like, which control means varies the speed of the bobbin-supporting spindles of the spinning frame independently of and relative to the speed of the carding machine, the tape condenser and the spinning frame feed rolls and thereby varies the amount of twist imparted to the strands in their course from the twister feed rolls through the travelers and to the bobbins.

It is another object of this invention to provide control means, interposed in a common drive mechanism of the character last described, for controlling the direction of rotation of the bobbins independently of the operation of the carding machine, the tape condenser and the spinning frame feed rolls thereby to control the direction of twist imparted to the yarn between the feed rolls and the bobbins.

In the illustrated embodiment of the invention, a shaft, driven by a motor which drives the carding machine, the tape condenser and the twister feed rolls, drives the input portion of a speed variator whose output portion is connected in driving relation to the spinning frame spindles through the medium of a manually operable reversing device whose control element may occupy one of two positions for driving the spindles in one direction and which control element may occupy the other position for driving the spindles in the opposite direction. The speed variator includes a manually operable control element for varying the speed of the output portion of the speed variator relative to the input portion thereof. Since the speed of the feed rolls is substantially constant, variation in the speed of the bobbins varies correspondingly the amount of twist imparted to the strands.

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 schematic side elevation of a carding machine, a tape condenser and a spinning frame or twister arranged in series and showing the improved drive mechanism in association therewith;

FIGURE 2 is a schematic top plan view of the structure shown in FIGURE 1;

FIGURE 3 is a perspective view looking at the opposite side of the carding machine and tape condenser from that shown in FIGURE 1;

FIGURE 4 is an enlarged plan view of the structure shown in the left-hand portion of FIGURE 2 showing the speed variator interposed in the drive mechanism in greater detail than it is shown in FIGURE 2;

FIGURE 5 is a fragmentary vertical sectional view, mostly in elevation, looking at the opposite side of the speed variator from that shown in the left-hand portion of FIGURE 1 and being taken substantially along line 5—5 in FIGURE 4;

FIGURE 6 is an enlarged vertical sectional view of the spindle-reversing device taken substantially along line 6—6 in FIGURE 4;

FIGURE 7 is a transverse vertical sectional view taken along line 7—7 in FIGURE 6; and

FIGURE 8 is a fragmentary vertical sectional view taken substantially along line 8—8 in FIGURE 6.

Referring more specifically to the drawings and to FIGURES 1, 2 and 3 in particular, textile fibers are formed into a thick fibrous web or lap as they are drawn from lap rolls L onto a driven endless lap feed conveyor or apron 10 which delivers the lap to a carding machine generally designated at 11. The carding machine may be of conventional construction and may include the usual rollers 12 and clearers or strippers 13 which cooperate with a main cylinder 14 suitably journaled on a frame 15. The lap passes from conveyor 10 onto a feed plate 16 (FIGURES 2 and 3). The front portion of feed plate 16 has a cooperating fluted roller or lickerin feed roller 20 thereabove which directs fibers from the lap to a lickerin 21 (FIGURE 2) which, in turn, directs the fibers to main cylinder 14.

A doffer cylinder 25 removes the fibers from main cylinder 14 and these fibers are withdrawn from the doffer cylinder 25 in the form of a thin web W (FIGURE 2) by suitable means, such as a conventional oscillating doffer comb 26. Although a revolving-flat carding machine may be used in carding the fibers, a roller carding machine preferably is used in the present instance, because it is desirable to open and clean the 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 thin web W is drawn from doffer comb **26** and doffer cylinder **25** by the slitting or dividing rolls **27** (FIGURE 3) of a conventional tape condenser broadly designated at **30**. Slitting rolls **27** separate the web W into a plurality of tapes, not shown, half of which are directed upwardly from the upper roll **27**, and the other half of which are directed downwardly by bottom roll **27**. As these fibrous tapes are directed upwardly and downwardly by respective upper and lower slitting rolls **27**, they pass in engagement with belts **31** (FIGURE 3) which direct the fibrous tapes to and between pairs of upper and lower rubbing aprons **32, 33** in a well-known manner. Portions of four sets of the upper and lower rubbing aprons **32, 33** are shown in FIGURE 5. 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 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.

Referring to FIGURES 1 and 5, the rovings R pass from between the rubbing aprons **32, 33** and are guided over the top of one end of a spinning frame or twister broadly designated at **40**. The adjacent end frame member **41** of spinning frame **40** supports a suitable transverse comb **42** (FIGURE 5) for guiding rovings R over the spinning frame. As disclosed in said copending application, additional transverse combs may be spaced along the spinning frame for guiding the rovings R to corresponding feed rolls to be later described.

Spinning frame **40** extends forwardly from adjacent the front or discharge end of tape condenser **30** and is conventional, although it may be 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 creel and drafting rolls, with the exception of its front top and bottom feed rolls. Only portions of one end of spinning frame **40** are shown in FIGURES 1, 2, 4 and 5.

As best shown in FIGURES 1 and 4, 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 yarn twisting means embodied in 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 builder motion, not shown. The spindles **45** are driven by tapes or belts **52** which extend about a centrally disposed longitudinally extending spindle driving drum or tape drum **53** suitably journaled in the frame of spinning 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 conventional roll stands **55**, only one of which is shown in FIGURE 1. The roll stands rotatably support fluted feed rolls **56**, there being a row of coaxial interconnected feed rolls **56** at each side of the machine. The feed rolls **56** may be in the form of fluted bosses interconnected by roller necks as is well known.

There is a feed roll **56** disposed above each spindle **45** and each feed roll **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.

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 1/16 inches long. It is well known that combing noils are generally very short fibers of as little as ¼ 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 and to facilitate varying the amount and direction of twist being imparted to the yarn being wound on the bobbins **45**, I have provided a new and improved drive mechanism for the apparatus 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, 33** and directed to the delivery rolls or feed rolls **56** of the twister frame under sufficient but minimum tension, the feed rolls **56** are driven by a direct connection with the tape condenser. The drive mechanism will now be described.

It will be observed in FIGURE 2 that the main cylinder **14** of the carding machine has a shaft **60** projecting from opposite ends thereof, one end of which has a pair of coaxial pulleys **61, 62** thereon and the other end of which has a single pulley or sprocket wheel **63** thereon. Pulley **62** has an endless belt **64** mounted thereon which is also mounted on a pulley **65** operatively connected to the rollers *32a* (FIGURE 5), which drive the rubbing aprons **32, 33**, to the slitting rolls **27** (FIGURE 3), and the doffer cylinder **25** for imparting rotation thereto in timed relation to rotation of main card cylinder **14**.

To this end, it will be observed in FIGURES 1 and 2 that a production gear **67**, positioned in fixed coaxial relation to pulley **65**, meshes with a gear *a* which drives the shaft *25a* of doffer cylinder **25** through a gear train including gears *b*, *c* and *d*. Production gear **67** also drives the rubbing aprons **32, 33** through a conventional gear train including elements *e* through *n* (FIGURES 1, 2 and 4). Element *n* is a change gear fixed on a shaft **70** which drives rubbing aprons **32, 33** through conventional gearing, not shown.

Although main card cylinder **14** is driven to rotate at a constant speed by means to be later described, production gear **67** and gear *a* are change gears which may be replaced with gears of different sizes to thereby change the speeds of the rubbing aprons **32, 33** and slitting rolls **27** of condenser **30** and doffer cylinder **25** of carding machine **11** relative to the speed of main cylinder **14** to thereby change the size of rovings R and yarns produced by the apparatus. The lap feed apron **10** and lickerin feed roll **20** are driven from the doffer cylinder **25** so the speed of apron **10** and roll **20** is changed whenever the speed of doffer cylinder **25** and rubbing aprons **32, 33** is changed relative to main card cylinder **14**.

Accordingly, it will be observed in FIGURES 2 and 3 that shaft *25a* has a sprocket wheel **75** fixed thereon which is engaged by an endless sprocket chain **76** engaging a sprocket wheel *p* (FIGURE 3) which drives a longitudinally extending shaft **77** by means of a pair of intermeshing bevel gears *r, s*. The rear end of shaft **77** is connected to one end of lickerin feed roll **20** by a gear train generally designated at **80** (FIGURE 3). The other end of feed roll **20** is connected to the front shaft *10a* of lap feed apron **10** (FIGURES 1 and 2) by a gear train generally designated at **85**.

The entire apparatus, including apron **10**, carding machine **11**, tape condenser **30** and spinning frame **40**, is driven by a common motive means embodied in an electric motor **87** in FIGURES 2 and 3. The shaft **90** of motor **87** has a pulley **91** on one end thereof. Pulley **91** drives the input shaft **92** of a gear box **93** containing suitable gearing, not shown, for transmitting rotation to a pair of output sprocket wheels **96, 97** (FIGURE 2).

Motor 87 and gear box 93 are mounted on a frame 100 fixed to the floor upon which rests the apparatus. An endless sprocket chain engages sprocket wheels 63, 96 for transmitting rotation from sprocket wheel 96 to main cylinder shaft 60. The lickerin 21 is driven from main cylinder 14 by an endless belt 94 engaging pulley 61 and a pulley 95 fixed on one end of lickerin 21 (FIGURES 1 and 2).

A shaft 101, journaled on frame 100, has a sprocket wheel 102 thereon (FIGURE 2). Sprocket wheels 97, 102 are engaged by an endless sprocket chain 103. A pulley 104 is fixed on shaft 101 and has an endless belt 105 mounted thereon which is also mounted on a pulley 106. Pulley 106 imparts lateral rubbing action to the rubbing aprons 32, 33 in a well-known manner which need not be described here.

In order to drive the spinning frame feed rolls 56 at such speeds as to withdraw the rovings R from the rubbing aprons 32, 33 while maintaining the rovings under relatively light tension, a gear 120 fixed on shaft 70 (FIGURES 1 and 4) engages a gear 121 fixed on a stub shaft 122 journaled in a lower forward portion of the frame of tape condenser 30. Shaft 122 is connected to a transverse jack shaft 123 by means of sprocket wheels 124, 125 and a chain 126. Shaft 123 is suitably journaled on the frame of condenser 30 (FIGURES 4 and 5).

A sprocket wheel 130, fixed on the inner shaft 123 (FIGURE 4) is engaged by a sprocket chain 131 which also engages a sprocket wheel 132 fixed on a transverse shaft 133 journaled in a pair of brackets 135 adjustably secured to the upper end of the rear end frame member 41 of spinning frame 40 (FIGURES 4 and 5). Each end of shaft 133 has a tension change gear 136 fixed thereon which meshes with a tension change gear 137 fixed on a stub shaft 140 journaled in each bracket 135. Also, fixed on each shaft 140 is a bevel gear 146 which meshes with a bevel gear 147 fixed on one end of the corresponding row of feed rolls 56, it already having been stated that the rolls 56 may be integrally formed or interconnected by roller necks in the usual manner. It is thus seen that the feed 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.

In order to obviate the necessity of changing the two sets of tension change gears 136, 137 of FIGURE 4 whenever a change in the tension is desired in the roving strands passing from the tape condenser 30 to the feed rolls 56 of spinning frame 40, and to also make the change gears more readily accessible to the operator, it is contemplated that shaft 133 of FIGURE 4 may be journaled on the end frame member 41 below the level of the upper end of end frame member 41 along with a common shaft substituted for the two shafts 140 with only a single pair of change gears, such as gears 136, 137, interconnecting the latter two shafts. With the latter arrangement, bevel gears 147 may be suitably journaled adjacent gears 146 and may be connected to feed rolls 56 by suitable gearing or sprocket wheels and corresponding endless sprocket chains, without departing from the spirit of the invention.

The present invention provides means whereby 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 feed rolls 56 so as to vary correspondingly the amount of twist imparted to the yarn being wound on the bobbins 46. Also, 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 predeterminedly proportional to the speed of the carding machine 11 and the condenser 30 at all times. To this end, the shaft 90 of electric motor 87 (FIGURES 2 and 3) also has a pulley 151 fixed thereon which is engaged by an endless belt 152.

Endless belt 152 also engages a pulley 153 fixed on a forwardly extending power shaft 154. Power shaft 154 is suitably journaled on one side of the carding machine 11 and is coupled, as by an endless belt 156 and pulleys 149, 150 to an input shaft 157 of a variable speed drive mechanism or speed variator broadly designated at 160 (FIGURES 1, 2, 4 and 5). The output shaft 161 of speed variator 160 is the input shaft of a manually controllable reverser or reversing gear unit, broadly designated at 164, and whose output shaft 165 is operatively connected to the shaft 53*a* of the spindle-driving cylinder 53, as by means of a pair of pulleys 166, 167 and a pair of endless V-belts 170.

The speed variator 160 may be of conventional or other construction provided that it is capable of being adjusted manually to vary the speed of output shaft 161 relative to the speed of input shaft 157 to thereby vary the speed of the bobbins 46 relative to the speed of feed rolls 56 according to the desired amount of twist to be imparted to the yarn. In this instance, speed variator 160 is shown as being of a type manufactured by Speed Selector Inc., Chagrin Falls, Ohio, and which is illustrated and described in their Catalog "Form No. 80." Variator 160 comprises input and output expansible pulleys 171, 172 which are engaged by an endless belt 173.

The cone or flange C of pulley 171 (FIGURES 4 and 5) is fixed on input shaft 157, and flange C' may be keyed for axial adjustment on the hub of flange C. The outer end of the hub D of outer flange C' has one end of an adjustment screw 174 suitably connected thereto and threaded through a support post E. Screw 174 has a knob or hand wheel 176 fixed thereon to facilitate manual adjustment of screw 174 for increasing or decreasing the effective diameter of pulley 171. It is apparent that screw 174 is so connected to hub D that pulley 171 may rotate without rotating screw 174. Post E is fixed to the base 175 of speed variator 160.

Pulley 172 is fixed on output shaft 161, but either or both of its cones or flanges F, F' are spring-loaded to yieldably press against opposed edges of the belt 173 so that axial adjustment of flange C' of pulley 171 changes the speed of output shaft 161 relative to that of input shaft 157. Since the construction of adjustable and spring-loaded pulleys is well known, as more detailed illustration and description of pulleys 171, 172 is deemed unnecessary. Pulleys 171, 172 may be constructed as disclosed in U.S. Patent No. 2,885,898, dated May 12, 1959, for example.

The reverser 164 (FIGURES 1, 2, 4, 5, 6 and 7) may be of any suitable construction and details thereof are shown in FIGURES 6, 7 and 8 by way of example only. The housing 180 has shafts 161, 165 journaled in opposed end walls thereof with the inner end of output shaft 165 being journaled in the proximal end of input shaft 161. The housing 180 is fixed on vibrator base 175.

An input gear 181, fixed on or integral with the inner end of shaft 161, meshes with a pinion 182 fixed on a sleeve 183. Sleeve 183 also has a pinion 184 fixed thereon and is journaled on a shaft 185 mounted in the end walls of housing 180. Shaft 165 is splined at 186 and has a pair of internally splined transmission gears 190, 191 mounted for axial movement thereon. Gear 190 is toothed internally (FIGURE 8) and is adapted to engage an externally toothed clutch gear 192 integral with input gear 181 when shaft 165 is to be rotated in the same direction as shaft 161. Gears 190, 191 are shown in neutral position in FIGURE 6.

The peripherally grooved hubs of gears 190, 191 are engaged by a shifting fork or yoke 195 whose upper portion is guided on a pair of guide rods 196 (FIGURE 7) and is loosely penetrated by a shifting pin 197. Pin 197 depends from a shifter shaft 200 journaled in the upper portion of housing 180. One end of shifter shaft 200, externally of housing 180, has a hand crank 201 fixed thereon for shifting transmission gears 190, 191 from

the neutral position shown to where gears 190, 192 are interengaged or to where external gear 191 is moved into engagement with a gear 203. Gear 203 is journaled, as at 204, on one side wall of housing 180 and meshes with pinion 184 fixed on sleeve 183.

In operation, the motor 87 drives main card cylinder 14 and laterally reciprocates rubbing aprons 32, 33 at constant speeds at all times. Main cylinder 14 thus drives lap feed conveyor 10, lickerin feed roll 27 (FIGURE 3), doffer cylinder 25, condenser aprons 32, 33 and the feed rolls 56 of spinning frame 40 at speeds primarily determined by the ratio between gears *a*, 67 (FIGURE 1), which ratio determines the count or size of the yarn to be produced by the apparatus.

Since the spindles 45 are also driven by motor 87 through the intervening speed variator 160 and reverser 164, the spindles 45 are always driven at a speed directly proportional to the speeds of the carding machine 11, condenser 30 and feed rolls 56 of spinning frame 40. This insures that the predetermined amount of twist always will be imparted to the yarns even though the carding machine 11 accelerates and decelerates during respective starting and stopping operations thereof. However, since different types of yarns may require different amounts of twist therein, the operator may readily change the speed of the spindles 45, relative to the speed of the feed rolls 56, condenser aprons 32, 33 and carding machine 11, and thereby change the amount of twist to be imparted to the yarns, simply by turning the screw 174 to regulate the output speed of speed variator 160.

Before the motor 87 is started, the operator moves hand crank 201 to the right or left in FIGURE 1 to determine whether Z twist or S twist will be imparted to the yarn as it is wound on the bobbins 46. Assuming that bobbins 46 should rotate in a clockwise direction in FIGURE 4 to impart S twist to the yarns, and that reverser input shaft 161 rotates in the direction indicated by the arrow H in FIGURE 6, it follows that reverser output shaft 165 should rotate in the same direction as shaft 161 to impart S twist to the yarns. Thus, the operator moves hand crank 201 to move yoke 195 and gears 190, 191 to the right in FIGURE 6 until internal gear 190 meshes with external clutch gear 192, thereby coupling shafts 161, 165 together.

If the yarns are to have Z twist imparted thereto, hand crank 201 is moved in the opposite direction to disengage gears 190, 192 and move gear 191 into engagement with gear 203. Since sleeve 183 rotates whenever reverser input shaft 161 rotates, but in the opposite direction, and gear 203 rotates in the same direction as shaft 161, it is apparent that gears 184, 191, reverser output shaft 165 and, thus, spindle-driving drum 53 then rotate in the opposite direction from shaft 161. Spindles 45 and bobbins 46 then rotate in a counterclockwise direction in FIGURE 4 to impart Z twist to the yarns being wound.

It is thus seen that I have provided an improved common drive mechanism for the carding machine 11, tape condenser 30 and spinning frame 40 and which drive mechanism has the speed variator 160 and the reverser 164 interposed therein so that the amount and direction of twist to be imparted to the yarns being formed in a continuous process from a lap of loose textile fibers may be varied simply by manipulation of the control members; i.e., the adjusting screw 174 and the hand crank 201 (FIGURE 2), of the speed variator 160 and the reverser 164, thus obviating the time-consuming and arduous task of removing and installing change gears and associated elements for this purpose.

In the drawings and specification there has been set forth a preferred embodiment 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. In an apparatus for making textile strands from a mass of loose textile fibers such as a picker lap, said apparatus including a carding machine, a tape condenser and a spinning frame arranged in series, and said spinning frame having at least one row of rotating bobbins and associated yarn twisting means for receiving from the tape condenser strands formed by successive processing of the fibers through the carding machine and the condenser; the combination therewith of

(a) a common drive mechanism operatively interconnecting the carding machine, the tape condenser and the bobbins of the spinning frame for driving the same, and

(b) control means interposed in said drive mechanism for controlling the direction of rotation of the bobbins independently of the operation of the carding machine and the tape condenser, wherein all the bobbins rotate in the same direction, thereby to determine the direction of twist imparted to the strands.

2. In an apparatus for making textile strands from a mass of loose textile fibers such as a picker lap, said apparatus including a carding machine, a tape condenser and a spinning frame having at least one row of rotating bobbins and strand twisting means for receiving from the tape condenser strands formed by successive processing of the fibers through the carding machine and the condenser; the combination therewith of

(a) a common drive mechanism operatively interconnecting the carding machine, the tape condenser and the bobbins of the spinning frame for driving the same, and

(b) means interposed in said drive mechanism for varying the speed of rotation of the bobbins relative to and independently of the speed of the tape condenser, wherein all the bobbins rotate at the same speed, to vary the amount of twist imparted to the strands.

3. In an apparatus for making textile strands from a mass of loose textile fibers such as a picker lap, said apparatus including a carding machine, a tape condenser and a spinning frame arranged in series, and said spinning frame having at least one row of rotating bobbins and ring travelers for receiving from the tape condenser strands formed by successive processing of the fibers through the carding machine and the condenser; the combination therewith of

(a) a common drive mechanism operatively interconnecting the carding machine, the tape condenser and the bobbins of the spinning frame for driving the same, and

(b) means interposed in said drive mechanism for varying the common speed, and controlling the common direction of rotation, of the bobbins independently of the carding machine and the tape condenser thereby to vary the amount of and direction of twist imparted to the strands.

4. In an apparatus for making textile strands from a mass of loose textile fibers such as a picker lap, said apparatus including a carding machine, a tape condenser and a spinning frame arranged in series, and said spinning frame having at least one row of rotating bobbins and ring travelers for receiving from the tape condenser strands formed by successive processing of the fibers through the carding machine and the condenser, and feed rolls through which the strands are drawn from the condenser and directed to respective travelers and bobbins; the combination therewith of

(a) a common drive mechanism operatively interconnecting the carding machine, the tape condenser, and the bobbins and feed rolls of the spinning frame for driving the same, and

(b) control means interposed in said drive mechanism and being independent of said carding machine and said condenser for selectively reversing the direction

of rotation of all the bobbins thereby to reverse the direction of twist imparted to the strands.

5. In an apparatus for making textile strands from a mass of loose textile fibers such as a picker lap, said apparatus including a carding machine, a tape condenser and a spinning frame arranged in series, and said spinning frame having at least one row of rotating bobbins and ring travelers for receiving from the tape condenser strands formed by successive processing of the fibers through the carding machine and the condenser, and feed rolls through which the strands are drawn from the condenser and directed to respective travelers and bobbins; the combination therewith of

(a) a common drive mechanism operatively interconnecting the carding machine, the tape condenser, and the bobbins and feed rolls of the spining frame for driving the same, and

(b) means interposed in said drive mechanism for varying the speed of rotation of the bobbins relative to the speed of the tape condenser and the feed rolls to vary the amount of twist imparted to the strands and wherein all the bobbins rotate at the same speed.

6. In an apparatus for making yarn from a mass of loose textile fibers such as picker laps, said apparatus including a carding machine, a tape condenser and a spinning frame arranged in series, and said spinning frame having at least one row of rotating bobbins and ring travelers for receiving from the tape condenser strands of yarn formed by successive processing of the fibers through the carding machine and the condenser, and spinning frame feed rolls through which the strands are drawn from the condenser and directed to respective travelers and bobbins; the combination therewith of

(a) a common drive mechanism operatively interconnecting the carding machine, the tape condenser, and the bibbins and feed rolls of the spinning frame for driving the same, and

(b) means interposed in said drive mechanism for varying the speed of, and controlling the direction of rotation of, the bobbins independently of the speed of the carding machine, the tape condenser and feed rolls, and wherein all the bobbins rotate at the same speed and in the same direction at any given time, thereby to vary the amount of and the direction of twist imparted to the strands.

7. In an apparatus for making yarn from a mass of loose textile fibers such as a picker lap, said apparatus including a spinning frame equipped with at least one row of ring travelers and rotating bobbins, a carding machine for forming a web from said loose fibers, a tape condenser positioned forwardly of and closely adjacent the carding machine and including means for receiving and splitting said web into a plurality of relatively narrow strips and applying a rubbing and rolling action to the strips so each strip is converted to a roving strand, said row of travelers and bobbins on said spinning frame being positioned forwardly of the tape condenser, and feed rolls through which said roving strands are drawn from said tape condenser and directed to respective travelers and bobbins in said row; the combination therewith of

(a) a common drive mechanism for the carding machine and the tape condenser,

(b) means for transmitting rotation from the tape condenser to said feed rolls for rotating the same, and

(c) means operatively connecting said drive mechanism to said bobbins for rotating the same and including a speed variator having control means for varying the speed of the bobbins collectively relative to the speed of the feed rolls.

8. In an apparatus for making yarn from a mass of loose textile fibers such as a picker lap, said apparatus including a spinning frame equipped with at least one row of ring travelers and rotating bobbins, a carding machine for forming a web from said loose fibers, a tape condenser positioned forwardly of and closely adjacent the carding machine and including means for receiving and splitting said web into a plurality of relatively narrow strips and applying a rubbing and rolling action to the strips so each strip is converted to a roving strand, said row of travelers and bobbins on said spinning frame being positioned forwardly of the tape condenser, and feed rolls through which said roving strands are drawn from said tape condenser and directed to respective travelers and bobbins in said row; the combination therewith of

(a) a common drive mechanism for the carding machine and the tape condenser,

(b) means for transmitting rotation from the tape condenser to said feed rolls for rotating the same,

(c) means operatively connecting said drive mechanism to said bobbins for rotating the same at a speed proportional to that of the carding machine, and

(d) a manually operable reversing device interposed in said last-named means for reversing the direction of rotation of said bobbins independently of the direction of rotation of said feed rolls whereby S twist or Z twist may be selectively imparted to the yarn being wound on the bobbins.

9. In an apparatus for making yarn from a mass of loose textile fibers such as a picker lap, said apparatus including a spinning frame equipped with at least one row of ring travelers and rotating bobbins, a carding machine for forming a web from said loose fibers, a tape condenser positioned forwardly of and closely adjacent the carding machine and including means for receiving and splitting said web into a plurality of relatively narrow strips and applying a rubbing and rolling action to the strips so each strip is converted to a roving strand, said row of travelers and bobbins on said spinning frame being positioned forwardly of the tape condenser, and feed rolls through which said roving strands are drawn from said tape condenser and directed to respective travelers and bobbins in said row; the combination therewith of

(a) a common drive mechanism for the carding machine and the tape condenser,

(b) means for transmitting rotation from the tape condenser to said feed rolls for rotating the same,

(c) a speed variator operatively connecting said drive mechanism to said bobbins for rotating the same and regulating the speed thereof relative to said feed rolls, and

(d) a manually shiftable reverser operatively associated with said speed variator for reversing the direction of rotation of said bobbins independently of the feed rolls whereby the amount of and direction of twist imparted to the yarn being made may be varied.

10. In an apparatus for making yarn from a mass of loose textile fibers such as a picker lap, said apparatus including a spinning frame equipped with at least one row of ring travelers and rotating bobbins, a carding machine for forming a web from said loose fibers, a tape condenser positioned forwardly of and closely adjacent the carding machine and including means for receiving and splitting said web into a plurality of relatively narrow strips and applying a rubbing and rolling action to the strips so each strip is converted to a roving strand, said row of travelers and bobbins on said spinning frame being positioned forwardly of the tape condenser, and feed rolls through which said roving strands are drawn from said tape condenser and directed to respective travelers and bobbins in said row; the combination therewith of

(a) a motive means,

(b) means operatively connecting the motive means to the carding machine, the tape condenser and the feed rolls of the spinning frame,

(c) a manually regulated speed variator having an input portion operatively connected to said motive means and also having a variable speed output portion, and

(d) means operatively connecting said output portion to said bobbins for driving the same whereby the

speed of the bobbins may be varied to vary the twist imparted to the yarn.

11. A structure according to claim **10**, including manually operable means for reversing the direction of rotation of said bobbins.

12. A structure according to claim **10**, including a manually controllable reversing gear unit interposed in said means operatively connecting the output portion to said bobbins whereby the direction of twist being imparted to the yarns may be reversed.

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