May 27, 1952 D. W. MAXHAM 2,598,185

SPINNING MACHINE

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FIG. 1

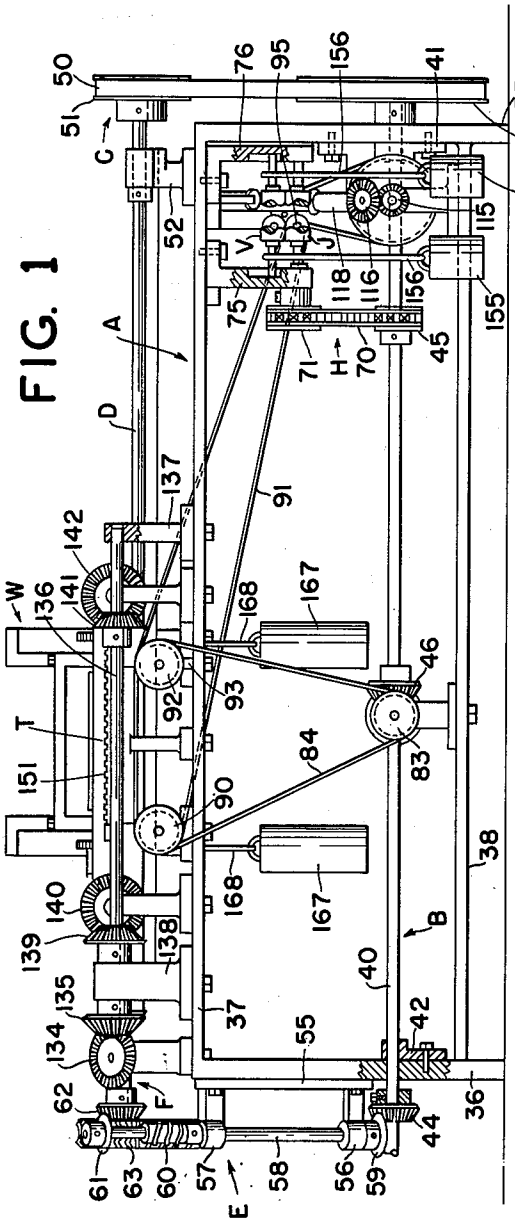


FIG. 9

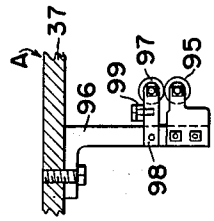


FIG. 8

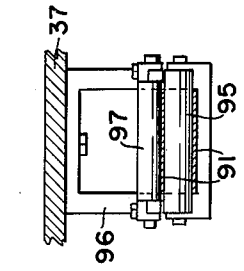


FIG. 7

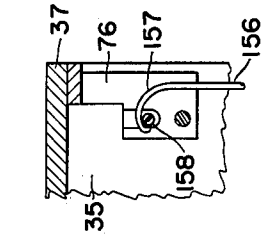
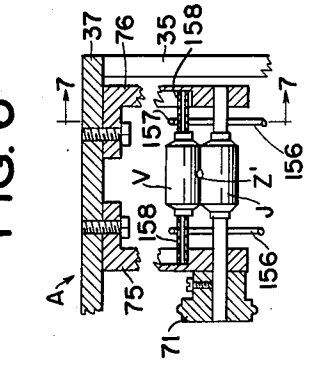


FIG. 6



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SPINNING MACHINE

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FIG. 2

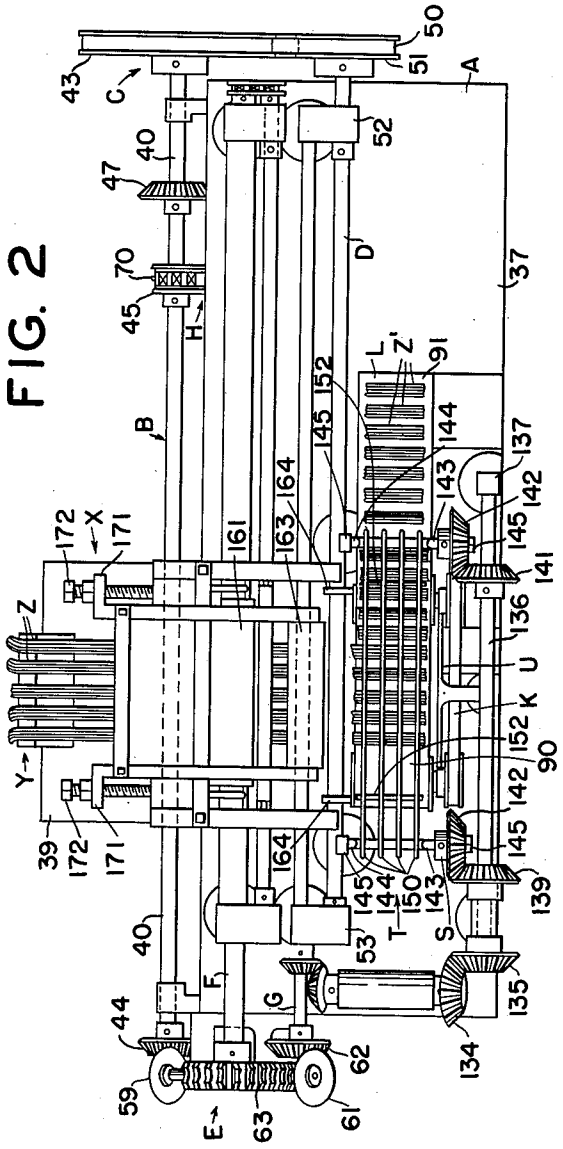


FIG. 16

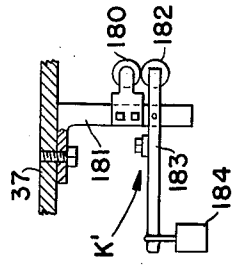


FIG. 15

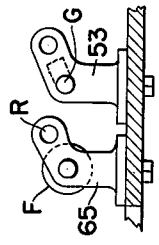


FIG. 14

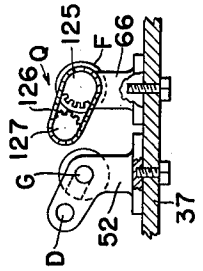
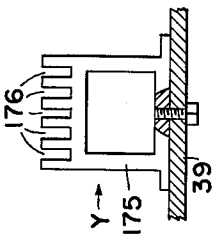


FIG. 13



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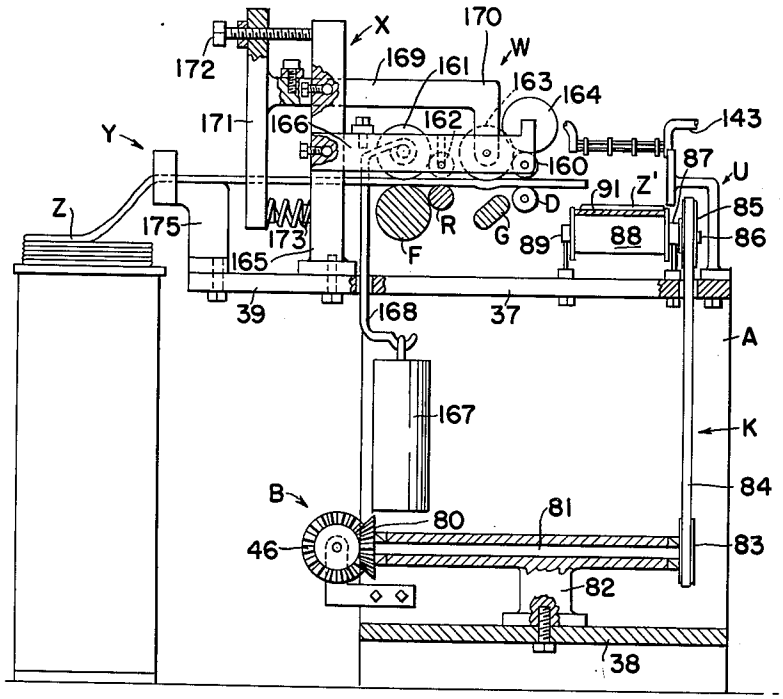
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SPINNING MACHINE

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FIG. 3



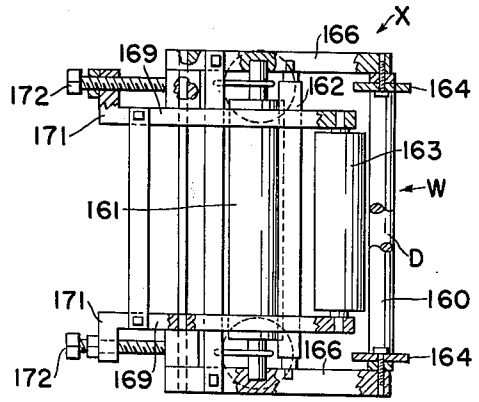


FIG. 12

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FIG. 4

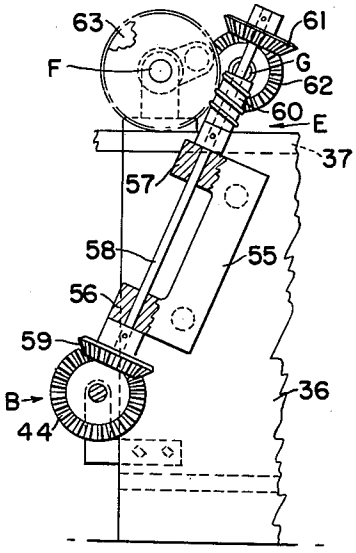


FIG. 5

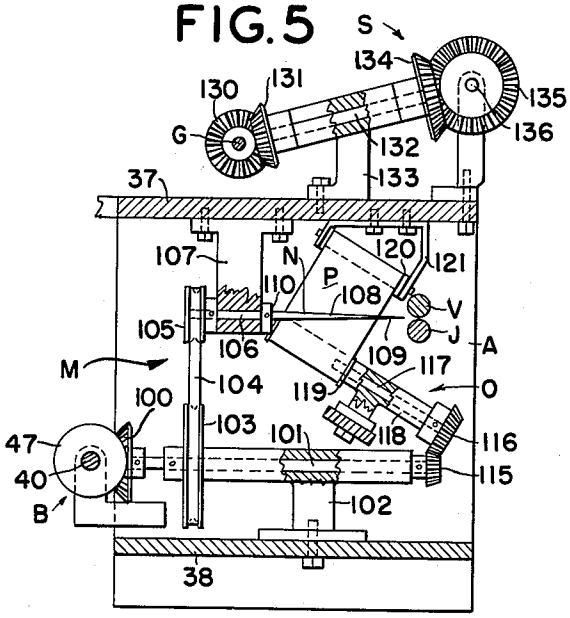


FIG. 10

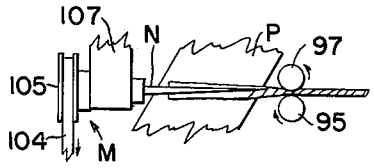


FIG. 11

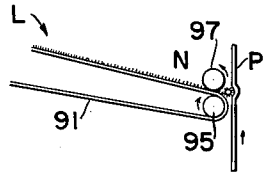


FIG. 18

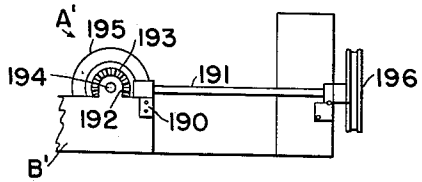
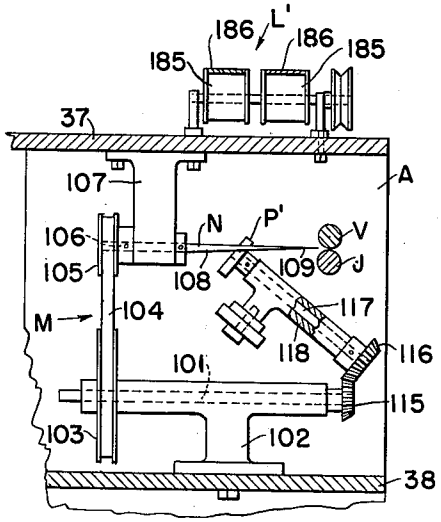


FIG. 17



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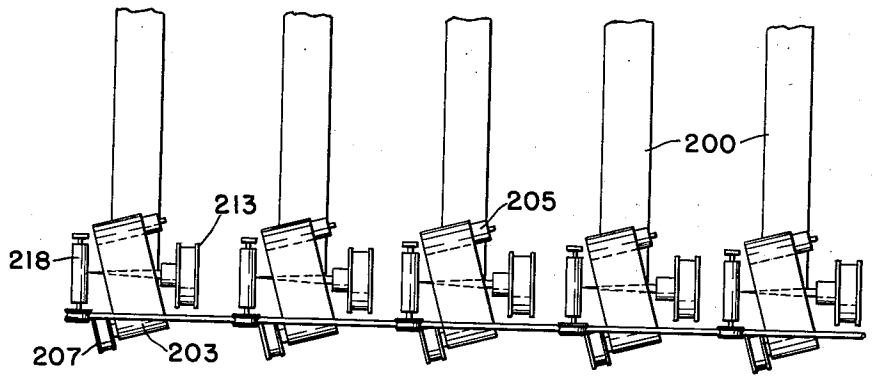


FIG. 19

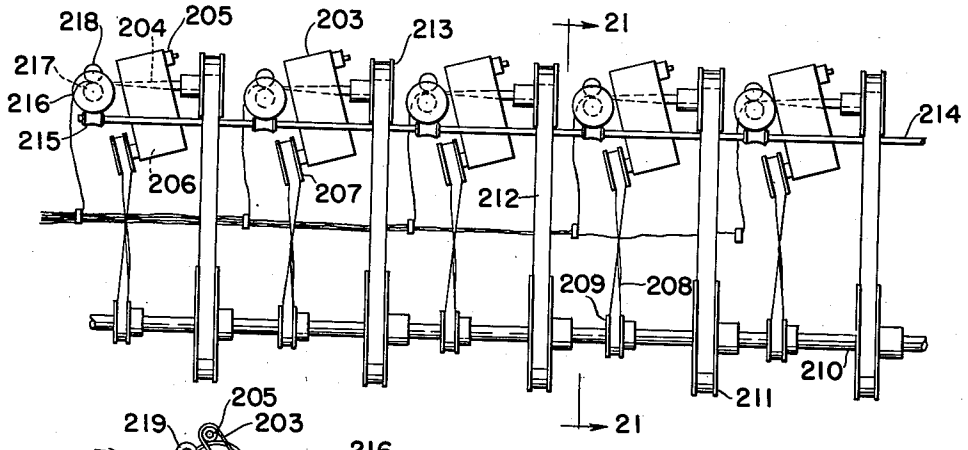


FIG. 20

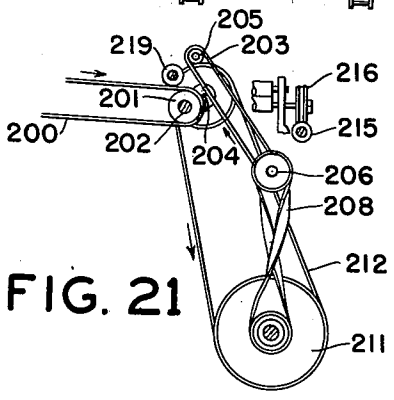


FIG. 21

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Patented May 27, 1952

2,598,185

UNITED STATES PATENT OFFICE

2,598,185

SPINNING MACHINE

Daniel W. Maxham, Hogansville, Ga.

Application December 5, 1950, Serial No. 199,169

16 Claims. (Cl. 57—36)

1

This invention relates to machines for spinning fibrous material into yarn or the like and more particularly to machines for twisting or drafting fibrous material.

An important object of the invention is to provide an efficient and high speed machine for this purpose.

Another important object of the invention is to provide a fibrous material twisting machine which will twist yarn or the like of continuous length.

Another major object is to provide a machine for twisting a card web into a continuous length of yarn or the like.

A further object of the invention is to provide an apparatus for spinning or twisting fibrous material so that the yarn or the like may go directly to the next process without handling the yarn.

A still further object is to provide a fibrous material twisting machine which will be relatively simple in construction and sturdy in construction so that it may be kept in service for long periods of time without the necessity for repairs.

Other objects and advantages of the invention will be apparent during the course of the following detailed description of the invention, taken in connection with the accompanying drawings, forming a part of this disclosure, and in which drawings:

Fig. 1 is a front elevation of the novel machine, certain bearings being broken away to better illustrate portions of the structure.

Fig. 2 is a top plan thereof.

Fig. 3 is a view, mostly in vertical section, of the new machine, illustrating a conveyor drive means, bottom rolls and associated top rolls with a support for the latter.

Fig. 4 is a fragmentary elevation of the left-hand end of the machine as viewed in Fig. 1.

Fig. 5 is a vertical transverse section of the new machine, inwardly of the right-hand end as viewed in Fig. 1, showing a twist needle and associated twist belt or rotatable member, and a pair of delivery rolls in transverse section.

Fig. 6 is a view, partly in section, of the delivery rolls and bearings therefor.

Fig. 7 is a sectional view, substantially on the line 7—7 of Fig. 6.

Fig. 8 is a plan view of a pair of conveyor belt rollers and bearings thereof.

Fig. 9 is an end elevation thereof.

Fig. 10 is a view of the twist needle and associated twist belt or rotatable member in operation.

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Fig. 11 is a view illustrating the association of twist needle, twist belt and conveyor belt.

Fig. 12 is a top plan of the top rolls assembly and support therefor.

Fig. 13 is an elevation of a roving guide.

Figs. 14 and 15 illustrate bearings for the bottom front, back, plucking and contact draft rolls of the new machine.

Fig. 16 is a modification of the showing in Fig. 9.

Fig. 17 is a modification of the showing in Figs. 3 and 5.

Fig. 18 is an elevation of an adapter to synchronize the new machine with a conventional card.

Fig. 19 is a broken plan view showing, in schematic arrangement, a method of feeding fibrous material to a multiplicity of twisting needles for spinning into yarn.

Fig. 20 is an elevational view of Fig. 19.

Fig. 21 is a broken sectional view taken along line 21—21 of Fig. 20.

This application is a continuation-in-part of my copending application, Serial No. 5,149, filed January 29, 1948, now abandoned, for Spinning Machines, and is related to my application, Serial No. 614,642, filed September 6, 1945, for Spinning Machines, maturing in Patent No. 2,453,086, dated November 16, 1948.

The machine herein disclosed comprises a frame A; main drive means B; bottom front roll drive means C, operatively connected therewith, for the bottom front roll assembly D; bottom back roll assembly and plucking roll drive means E, for the bottom back roll assembly F and bottom plucking roll assembly G; delivery roll drive means H for the bottom delivery roll J; conveyor drive means K for a conveyor L; twist needle drive means M for the twist needle N; twist drive means O for the twist means (belt or rotatable member) P; drive means Q for the bottom control draft roll R; placer comb drive means S for the placer comb T; stacker U associated with the conveyor L and placer comb T; top delivery roll V; top rolls assembly W for association with the rolls D, F, G and R; support X for the top rolls assembly W; unplucked sliver or fibre guide means Y for the unplucked fibres Z; plucked fibres Z'; modification K' of the conveyor drive means K; modification P' of the twist means P; modification L' of the conveyor L; and means A' to synchronize the novel machine herein disclosed with a conventional card B'.

The frame A may comprise substantially parallel end uprights 35 and 36 joining a substantially horizontal upper support 37 and lower sup-

port 38. Intermediate its ends, the upper support 37 has a rearward extension 39, shown particularly in Figs. 2 and 3, for supporting a part of the top roll assembly support and fibre guide means.

Any suitable motive means may be employed, as an electric motor (not shown) with the main drive means B operatively connected thereto and including a shaft 40, extending longitudinally of the frame A, preferably adjacent and above the lower support 38 and extending through suitable openings in, and projecting outwardly of, the end uprights. This shaft may be rotatably carried by bearings 41 and 42 fixed to the end uprights 35 and 36. Fixedly carried by the shaft 40, preferably outwardly of the end upright 35, is a pulley 43 while, preferably outwardly of the end upright 36, is a bevel gear 44 fixed to the shaft 40, and, inwardly of the end upright 35 is a sprocket wheel 45. There are also provided and fixedly mounted upon the shaft 40 a second bevel gear 46 and a third bevel gear 47 (the latter shown in Figs. 2 and 5).

Operatively connected with the pulley 43 of the main drive means B, is the bottom front roll drive means C which preferably comprises a belt 50 trained over the pulley 43 and over a second pulley 51.

The second pulley 51 is fixed to one end of the bottom front roll D which front roll extends longitudinally of the frame A, above the upper support 37, and may be rotatably carried by suitable bearings 52 and 53 (shown in Figs. 14 and 15), both carried by the frame support 37. These bearings 52 and 53 also rotatably support the bottom plucking roll assembly G, to be subsequently described.

Combined bottom back roll and plucking roll drive means E, operatively connected with the bevel gear 44 of the main drive means B is shown particularly in Figs. 1, 2 and 4 and includes a bracket or stand 55 which may be supported by the end upright 36 at the outer face of the latter and may be provided with two spaced-apart, axially-aligned bearings 56 and 57 rotatably carrying a shaft 58 which, at its lower end, fixedly carries a bevel gear 59 meshing with the bevel gear 44, while the shaft 58 also fixedly carries a worm 60 adjacent its upper end, above which is a second bevel gear 61, fixed to the shaft 58 and meshing with a bevel gear 62, fixed to the bottom plucking roll G. This drive means E also includes a worm gear 63 meshing with the worm 60, which worm gear 63 is fixedly carried by the bottom back roll F.

The bottom back roll F and the plucking roll of assembly G may be similar to the bottom back roll and the bottom plucking roll described in my patent referred to above, and these rolls F and G extend longitudinally of the frame A above the upper support 37. The bottom back roll F is rotatably supported by spaced-apart bearings 65 and 66 (shown in Figs. 14 and 15) which also rotatably support the bottom control draft roll R, to be described, and the plucking roll G is rotatably carried by the bearings 52 and 53 mentioned.

Delivery roll drive means H is shown mainly in Fig. 1 and is operatively connected with the main drive means B by means of a sprocket chain 70 trained over the sprocket wheel 45 which is mounted upon shaft 40. This chain 70 is also trained over a second sprocket wheel 71 which is fixedly mounted upon the shaft of the bottom delivery roll J.

The bottom delivery roll J, which is preferably relatively short, extends longitudinally of the frame A, preferably below the upper support 37 and is rotatably carried by bearings 75 and 76, which also support the top delivery roll to be subsequently described and extend downwardly from the upper support 37, to which they are secured.

The next operative connection with the main drive means B is by way of the second bevel gear 46, is designated as the conveyor drive means K, and shown mainly in Figs. 1 and 3. Meshing with the gear 46 is a bevel gear 80 fixedly mounted upon one end portion of a substantially horizontal shaft 81 extending transversely of the frame A and supported by bearing 82 carried by the lower support 38. The opposite end portion of the shaft 81 fixedly carries a pulley 83 over which is trained a belt 84 extending upwardly to and over a second pulley 85, mounted upon a shaft 86 extending through a bearing 87 and fixedly supporting a drum 88 with a second bearing 89 being provided to support the other end of the shaft 86 and both bearings carried by the support 37.

As shown in Figs. 1, 2 and 3, the drum 88 just mentioned, together with a conveyor belt 91, a second drum 92 (preferably similar to the drum 90, with their axes of rotation substantially parallel and supporting a run of the belt 91), mounted for rotation upon bearings 93 supported by the upper support 37, and a bottom roller 95, rotatably supported by bearings 96 and over which the conveyor belt 91 is trained, comprise the conveyor L. The bearings 96 depend from the upper support 37. In order to permit the conveyor belt 91 to extend to the bottom roller 95 below the upper support 37, the latter may be slotted to accommodate the belt. Above the bottom roller 95 is a top roller 97 with its periphery in frictional engagement with the belt 91. This roller 97 is preferably rotatably supported by arms 98 pivotally carried by the bearing 96. A cross member 99 may connect the arms 98 and its weight and that of the arms press the roller 97 in good frictional contact with the belt.

Now, referring mainly to Figs. 5 and 10, there is illustrated a twist needle drive means M, which includes a bevel gear 100 meshing with the bevel gear 47 of the main drive means B, and fixedly mounted upon a shaft 101 rotatably carried by elongated bearing 102 mounted upon the lower support 38 and extending transversely of the frame A. There is also fixedly mounted upon the shaft 101, a pulley 103 over which is trained a belt 104 extending upwardly to and around a second pulley 105.

The shank portion 106 of the twist needle N may provide a shaft upon which the pulley 105 is fixedly mounted and the shank is rotatably carried by bearings 107 depending from the upper support 37. The twist needle N, in addition to its shank portion 106, comprises an elongated conical forward portion 108, tapering toward the rear of frame A, with the point 109 closely adjacent the bottom delivery roll J. In fact, a prolongation of the point would substantially touch the uppermost face of the bottom delivery roll, intermediate the length of that roll. In order to retain the needle N in place, a collar 110 may be provided about the forward end of the shank portion 106 and abutting the face of the bearing 107.

Still referring mainly to Fig. 5, there is shown twist drive means O for the twist means P, which is preferably an endless belt providing a rotatable member. This means O comprises a bevel

gear 115 fixedly mounted upon the shaft 101 and meshing with a bevel gear 116 fixedly mounted upon a shaft 117, rotatably supported by bearing 118 so that it is inclined from the vertical. Upon the shaft 117 is fixedly mounted a flanged drum 119 carrying the twist means or belt P, which extends upwardly and is also trained over a second flanged drum 120 rotatably supported by bearings 121 depending from the upper support 37. As may be seen in Fig. 5, the longitudinal axis of the twist needle N (which is also its axis of rotation) forms an angle other than a right angle with the longitudinal axis of the twist means P with the needle extending fully across the twist belt and, as shown in Fig. 11, the twist needle is very close to the twist belt.

Now referring back to the bottom back roll F and to Figs. 14 and 15, it was stated that the bottom back roll was driven by the means E. The bottom back roll F is operatively connected with the drive means Q for the bottom control draft roll R, since the roll F fixedly carries a sprocket wheel 125 over which is trained a sprocket chain 126 extending to and over a second sprocket wheel 127, less in diameter than the diameter of the wheel 125 and fixedly carried by the bottom control draft roll R.

Not only is the bottom back roll F employed dually, but the plucking roll G also has dual functions since it is operatively connected with the placer comb T by means of the placer comb drive means S.

The placer comb drive means S comprises a bevel gear 130 fixedly carried by the bottom plucking roll G, and shown in Fig. 5. Meshing with the bevel gear 130 is a second bevel gear 131 fixedly carried by a shaft 132 extending transversely of the frame A and carried by bearings 133 mounted upon the upper support 37. The longitudinal axis of the shaft 132 forms an acute angle with the upper support 37 and at its upper end it fixedly carries a bevel gear 134 meshing with a bevel gear 135 fixedly mounted on an elongated shaft 136 (shown in Fig. 1) extending longitudinally of the frame A and carried by bearings 137 and 138 supported by the upper support 37. Also fixedly mounted on the shaft 136 is a second bevel gear 139 which meshes with a bevel gear 140, and a third bevel gear 141 spaced from the bevel gear 139 and meshing with a bevel gear 142. The gears 140 and 142 are substantially alike, have their axes of rotation parallel and the ratio of rotation of the bevel gear 139 on the plucking roll G to that of the bevel gears 140 and 142 is 1:1:1. Each gear 140 and 142 is fixed to a separate crank shaft 143 (one being shown in Fig. 3 and both in Fig. 2). Associated with these crank shafts 143 are two other crank shafts 144 arranged so that one each of crank shafts 143 and 144 pivotally support one end portion of a spacer comb T while the other crank shafts 143 and 144 pivotally support the other end portion of this comb T. Each crank shaft 143 and 144 is supported by bearings 145 carried by the upper support 37.

The spacer comb T preferably comprises a plurality of spacer comb elements 150 which may be bars provided with downward-extending short, smooth teeth 151 and with the elements 150 arranged in parallelism, extending longitudinally of the frame A and rigidly connected by cross elements 152.

Associated with the spacer comb T and conveyor L is a stacker U, which may be fixedly supported by the upper support 37 and is constructed and arranged to be positioned closely adjacent one side of the conveyor belt 91 at the fibre delivery area thereof, so as to stop the forward movement of the fibres and deposit them on the belt.

Associated with the bottom delivery roll J, is a similar roll, being the top delivery roll V, shown in Figs. 1 and 6. As stated, this roll V is rotatably supported by the same bearings 75 and 76 as employed for the roll J, but the openings for the ends of the shaft of the roll V are vertically-extending recesses or grooves so that there may be vertical reciprocation or play of the roll V. The roll V bears on the periphery of the roll J and may be held in good frictional engagement therewith by weights 155 depending from supports 156 having hooked ends 157 extending over sleeves 158 on the end portions of the shaft of the top roll V. Rotation of roll J imparts rotation to the roll V.

The top roll assembly W and support X are shown mostly in Figs. 2, 3 and 12 and are, in parts, similar to that of the top rolls assembly and support therefor disclosed in my copending application referred to heretofore.

The top roll assembly W comprises a top front roll 160 for association with the bottom front roll D, top back roll 161 for association with the bottom back roll F, a top draft control roll 162 for association with the bottom control draft roll R, and a top plucking roll 163 for association with the bottom plucking roll G. The rolls 160 to 162 inclusive are of substantially the same diameter as their respective associated rolls, but the roll 163 is, preferably, larger in diameter than the general diameter of the bottom plucking roll G. There are also provided a pair of rollers 164 adapted to peripherally engage the top front roll 160.

The rolls 160 to 163 inclusive are rotatably supported by the support X which includes a pair of spaced apart uprights 165 secured to the rearward extention 39 of the upper support 37. Pivotally supported by the uprights 165 are two spaced apart, parallel, forwardly extending arms 166 which rotatably carry the top rolls 160 to 162 inclusive as well as the rollers 164, so that they will bear against the peripheries of the respective rolls with which they are associated. They may be urged into such association by a pair of weights 167 depending from hangers 168 ending in hooks carried by the shaft of the top back roll 161.

The support X also includes a pair of forwardly extending, parallel, spaced apart arms 169, pivotally carried by the uprights 165 above the arms 166 with downwardly extending forward end portions 170 rotatably supporting the top plucking roll 163 above the bottom plucking roll G so that rotation of the plucking roll G will bring the projecting portion of the latter to the periphery of the top plucking roll. The arms 169 are differently supported than is the top plucking roll supporting stand described in the patent referred to above. Forming part of each arm 169 is a rearward offset 171, which may be adjusted for vertical or inclined positions by means of two set screws 172 one screwing through each offset 171 and with their free ends bearing against the upper end portions of the uprights 165. The free ends of the set screws are caused to bear against the uprights by expansion coil springs 173 bearing against the uprights and offsets adjacent the lower portions of the latter and below the pivotal connection of the arms 169 and uprights 165. This permits adjustment of

the top plucking roll 163 toward and away from the bottom plucking roll G.

In Figs. 2, 3 and 13 is shown a sliver or fibre guide means Y which is associated with the top and bottom rolls just referred to and which receives the rovings or slivers of fibres Z. This means Y may comprise an upwardly extending support 175 extending longitudinally of the frame A, back of the support X and secured to the extension 39. This support has a plurality of spaced apart, upwardly opening slots 176 extending from its rear face to its forward face to receive the slivers or fibres Z which may be supplied thereto by any suitable means.

The slivers or fibres Z after passing from the guide means Y between the rolls F and 161, and R and 162 are intermittently engaged by the plucking roll as more fully set out in my patent, referred to above and, from thence, pass between the rolls D and 160. However, it should be said that the back rolls F and 161 rotate at a relatively slow speed, while the peripheral speeds of the control draft rolls R and 162 are the same (or may be higher) than that of the back rolls. The plucking rolls rotate at relatively high speeds where they contact and the speeds of the front rolls is substantially that of the top plucking roll 163. Upon reaching the path of the oscillating placer comb T, the plucked fibres are stopped by the stacker U. The movement of the comb T is timed with the plucking roll G so that as the former descends its teeth will engage the fibres and carry them to the upper surface of the conveyor belt 91 and deposit them thereon. It is preferred, of course, that the speed of the oscillations of the comb T be timed with the speed of the belt 91.

From the conveyor belt 91 the plucked fibres (designated as Z') are conveyed, in rows, to the twist needle N, with a large proportion of them substantially parallel to the longitudinal axis of the needle. It is preferred that the surface speed of the latter be substantially that of the conveyor belt 91 and of the twist belt P. The twist belt P, being disposed with reference to the twist needle N, as stated herein, the fibres Z' are wound around the twist needle and also carried, in a wound condition, off the twist needle. The roller 97 of the conveyor L retains the fibres in proper positions on the conveyor belt 91.

The functions of the delivery rolls J and V are to aid in drawing the rolled fibres off the twist needle N and in delivering them for subsequent treatment. Since portions of the fibres are substantially parallel to the needle's axis, and the needle rotates with the opposite end of the fibres delivered forwardly by the delivery rolls, a predetermined amount of twist will be inserted in the rolled fibres between the twist needle and the delivery rolls.

Referring now to Figure 16, there is disclosed a modification K' of a portion of the conveyor drive means shown in Fig. 9. In the modification the upper roller 180 is rotatably supported by the bearings 181 while the bottom roller 182 is rotatably supported at adjacent end of each of a pair of arms 183 pivotally connected with the bearings 181 and carrying weights 184 adjacent their other ends. The conveyor belt is adapted to extend about roller 180, and roller 182 is urged thereagainst because of the pivotal connections and the weights 184.

Referring to Fig. 17, there are shown modifications of the twist structure insofar as it involves the twist means or belt P of Fig. 5 and the conveyor means L of Fig. 3, etc. In place of the twist means or belt P, there is provided a twist means, being a roller or rotatable member, P' mounted upon the shaft 117, with the periphery of the roller very close to the twist needle N (close as the surface of the twist belt P of Fig. 11). It should be noted that the twist means or roller P' has the plane of its peripheral surface, facing the twist needle N, inclined (as is the surface of the twist belt P) to the longitudinal axis of the twist needle N. Otherwise the associated structure is preferably similar to that shown in Fig. 5.

The conveyor L' of Fig. 17 differs from the conveyor L of Figs. 1, 2 and 3 only in the provision of two pairs of flange ended drums 185 in place of the two separate drums 90 and 92 of form L and two spaced apart conveyor belts 186 therefor in place of the conveyor belt 91. The roll P' extends between the two belts 186.

In Fig. 18 is shown means A' to synchronize the novel machine herein disclosed with a conventional card B'. Bearings 190 are secured to the card B' to rotatably carry a shaft 191, upon one end portion of which is mounted a bevel gear 192, meshing with a bevel gear 193 fixedly mounted upon the shaft 194 of a conventional doffer 195. At the other end portion of shaft 191 there is fixed a relatively large diameter pulley 196 constructed and arranged so it may receive a belt (not shown) which may be trained over the pulleys 43 of two of the novel machines, placed one above the other. Of course the drafting rolls, plucking rolls, comb and belt 50 are then omitted, since the fibres are therein fed to the twist needle in a web form as is well known in the art.

The machine thus far described is a duplicate of that illustrated and described in my above mentioned copending application, now abandoned, and consists briefly in mechanisms for feeding strands automatically and placing them upon an endless conveyor belt and then carried by the belt to a twisting needle where the broken strands are again twisted into a continuous piece and fed through other pressing rolls for further processing. The subject matter added in this application consists of an arrangement supplying the machine with multiple conveyor belts having corresponding twisting needles, each belt delivering to its needle a continuous supply of fibrous material in any form, which is subsequently twisted into yarn by the needle and twist belt and delivered as a continuous strand for further processing. The present modification is intended to greatly increase the productivity of the machine and at the same time permit feeding the machine with fibrous material in any form. Moreover, such a system as described below could be used to receive the web directly from the tape frame assembly without sending it through the rub apron assembly.

Figs. 19, 20 and 21 will illustrate the above mentioned modification. Numeral 200 designates a multiplicity of conveyor belts corresponding to the single belt 91 illustrated in the other views of the drawing. While I have shown 5 belts in this modification, it is to be understood that as many as desired might be employed.

These several belts 200 could be driven by a drum similar to the drum 88 as shown in Fig. 3; that is, each belt would be provided with a driving drum positioned beneath its own top roll assembly W to receive the fibrous material. The belts would then extend more or less in parallelism downwardly toward their respective twist-

ing needle mechanisms, each needle operating to spin the fibrous material on its respective delivery belt into a continuous strand of yarn.

Still another advantage of the present invention is that it can be used directly with the tape frame assembly of a conventional card machine to receive the fibrous web therefrom upon the several conveyor belts 200 to convey it to the twisting needles. Such a system might assume the construction as shown in Figs. 19, 20 and 21. In these figures the belts 200 could be rotated by any controlled driving means (not shown) such as an electric motor or might even be connected by suitable pulleys and gears to the driving means on the card machine itself.

As illustrated in Fig. 21, each belt 200 is passed over an idler drum 201 having its shaft 202 suitably journaled in bearings supported by a frame (not shown). As before described, the delivery belt passes beneath the twisting needle 204 at an oblique angle and is positioned close enough thereto as to permit the needle to pick up and twist the fibrous material carried by the belt. A secondary belt 203 is used much in the same manner as that of P in Fig. 5, and has one of its faces passing in close proximity with the twisting needle 204. The action of the needle effects a certain amount of twisting of the web, tending to displace it from its position on top of the conveyor belt 200. To prevent the needle from pulling the web from off the belt or otherwise displacing it, I have provided a guide roll 219 placed just ahead of the needle 204 and co-acting with the belt 200 to keep the web in perfect alignment for winding upon the needle.

This secondary belt 203 is passed over an upper roller 205 and a lower roller 206 as shown in Fig. 20, with the lower roller 206 being provided with a pulley 207 rotated by means of a belt 208 and a driving pulley 209. It will be noted that each of the driving pulleys 209 in this figure is mounted on a common shaft 210 which not only serves as a rotating means for the belts 208 but also of the twisting needle 204 as will be subsequently described. It will also be noted that since the direction of rotation of the secondary belt 203 must be opposite to that of the twisting needle 204, the driving belt 208 must be twisted or crossed upon itself to effect such reverse rotation.

Driven from the same shaft 210 common with the secondary belt drive means is a series of pulleys 211 mounted to the shaft 210 and provided with belts 212 passing over the upper pulleys 213 and arranged to rotate the twisting needles 204.

Since each twisting needle is operatively associated with a pair of delivery rolls serving to draw the twisted yarn therefrom, I have provided a common driving means for each pair of rolls consisting of a shaft 214 extended longitudinally along the framework and suitably journaled where necessary. The shaft 214 may be rotated by any given rotating means or may be connected with the lower shaft 210 through a set of timing gears so that desired synchronous speeds between the two may be maintained. Along the shaft 214 I have placed worms 215 enmeshed with worm gears 216 affixed to the end of the shaft of the bottom delivery rolls 217. The top delivery rolls 218 are simply idlers and are driven by the bottom rolls and may be suitably weighted to effect desired pressures upon the strand of yarn coming between them and the bottom rolls.

As illustrated and described, the modified machine constitutes considerable improvement over any machine now known or used in the art of spinning a fibrous material into yarn. The multiplicity of delivery belts and twisting needles insure multiple strands of yarn properly twisted and stretched and completely eliminate the step of sending the material in web form through the conventional rub aprons of a card machine.

While the drawing shows the construction more or less schematically without a general framework, it is to be understood that this has been by way of example and that the detailed structure of the frame, bearings, and the like may assume any shape or dimension without departing from the scope of the invention as defined by the following claims.

I claim:

1. In a spinning machine, an elongated twist needle; means to rotate said twist needle on its longitudinal axis; means to deliver fibrous material to said twist needle; and means to assist said twist needle to twist said material and initially draw the twisted fibres off said needle, including a rotatable member having an outer periphery closely adjacent the periphery of said twist needle at all times, the axis of rotation of said twist needle being non-parallel with respect to the axis of rotation of said rotatable member.

2. In a spinning machine, an elongated twist needle; means to rotate said twist needle on its longitudinal axis; means to deliver lengths of fibrous material to said twist needle, one at a time, with their longitudinal axes substantially normal to the axis of rotation of said needle; and means to assist said twist needle to twist said material and initially draw the twisted fibres off said needle, including a rotatable member having an outer periphery closely adjacent the periphery of said twist needle at all times, the axis of rotation of said twist needle being non-parallel with respect to the axis of rotation of said rotatable member.

3. In a spinning machine, an elongated twist needle; means to rotate said twist needle on its longitudinal axis; means to deliver fibrous material to said twist needle; and means to assist said twist needle to twist said material and initially draw the twisted fibres off said needle, including a twist belt having an outer periphery closely adjacent the periphery of said twist needle at all times, the axis of rotation of said twist needle being non-parallel with respect to the axis of rotation of said twist belt.

4. In a spinning machine, an elongated twist needle; means to rotate said twist needle on its longitudinal axis; means to deliver fibrous material to said twist needle including a pair of spaced apart conveyor belts, with their runs in substantially the same planes; and means to assist said twist needle to twist said material and initially draw the twisted fibres off said needle, including a roller having an outer periphery closely adjacent the periphery of said twist needle at all times, the axis of rotation of said twist needle being non-parallel with respect to the axis of rotation of said roller, said roller extending into the space between said pair of conveyor belts.

5. In a spinning machine, an elongated twist needle; means to rotate said twist needle on its longitudinal axis; means to deliver fibrous material to said twist needle; means to assist said twist needle to twist said material to partly draw said material off said needle, including a rotatable member having an outer periphery closely adjacent said twist needle at all times,

the axes of rotation of said twist needle and rotatable member being non-parallel, one with respect to the other; and means to finally draw the twisted fibrous material off said twist needle, comprising a pair of delivery rolls normally in peripheral contact one with the other and the juncture of their peripheries being disposed closely adjacent the point of said needle.

6. In a spinning machine, an elongated twist needle; means to rotate said twist needle on its longitudinal axis; means to deliver fibrous material to said twist needle; means to assist said twist needle to twist said material to partly draw said material off said needle, including a rotatable member having an outer periphery closely adjacent said twist needle at all times, the axes of rotation of said twist needle and rotatable member being non-parallel, one with respect to the other; and means to finally draw the twisted fibrous material off said twist needle, comprising a pair of delivery rolls normally in peripheral contact one with the other and the juncture of their peripheries being disposed closely adjacent the point of said needle, with the axis of rotation of said needle substantially intersecting the line of contact of said rolls.

7. In a spinning machine, an elongated twist needle, means to rotate said twist needle on its longitudinal axis; means to deliver fibrous material to said twist needle; means to assist said twist needle to twist said material to partly draw said material off said needle, including a rotatable member having an outer periphery closely adjacent said twist needle at all times, the axes of rotation of said twist needle and rotatable member being non-parallel, one with respect to the other; means to finally draw the twisted fibrous material off said needle comprising a pair of delivery rolls normally in peripheral contact one with the other and with the juncture of their peripheries closely adjacent the point of said needle; means to rotate one of said rolls; and means to urge the second roll into peripheral contact with the first roll.

8. In a spinning machine, a twist needle; conveyor means to deliver plucked fibres to said needle, including a conveyor belt and a roller over which said belt is trained, said roller being disposed closely adjacent said needle and with its axis of rotation extending substantially parallel with the axis of rotation of said needle; and means to retain the fibres upon said belt during twisting comprising a second roller, above the first roller, with its periphery in contact with said belt and with its axis of rotation substantially paralleling the axis of rotation of said first roller, the axes of rotation of said rollers being in substantially the same vertical plane.

9. In a spinning machine, a twist needle; conveyor means to deliver plucked fibres to said needle, including a conveyor belt and a roller over which said belt is trained, said roller being disposed closely adjacent said needle and with its axis of rotation extending substantially parallel with the axis of rotation of said needle; means to retain the fibres upon said belt during twisting comprising a second roller, above the first roller, with its periphery in contact with said belt and with its axis of rotation substantially paralleling the axis of rotation of said first roller, the axes of rotation of said rollers being in substantially the same vertical plane, and means to press the periphery of said second roller means into line contact with said belt.

10. In a spinning machine, an elongated twist needle; means to rotate said twist needle on its longitudinal axis; means to deliver fibrous material to said twist needle; and means to assist said twist needle to twist said material and initially draw the twisted fibres off said needle, including a rotatable member having an outer periphery closely adjacent the periphery of said twist needle at all times and spaced from the end of said twist needle, the axis of rotation of said twist needle being non-parallel with respect to the axis of rotation of said rotatable member.

11. In a spinning machine, an elongated twist needle; means to rotate said twist needle on its longitudinal axis; means to deliver fibrous material to said twist needle; and means to assist said twist needle to twist said material and initially draw the twisted fibres off said needle, including a twist belt having an outer periphery closely adjacent the periphery of said twist needle at all times and spaced from the end of said twist needle, the axis of rotation of said twist needle being non-parallel with respect to the axis of rotation of said twist belt.

12. In a spinning machine, an elongated twist needle having a pointed outer end; means to rotate said twist needle on its longitudinal axis; means to deliver fibrous material to said twist needle; and means to assist said twist needle to twist said material and initially draw the twisted fibres off said needle, including a rotatable member having an outer periphery closely adjacent the periphery of said twist needle at all times and with the pointed end of said twist needle extending over the edge of said rotatable member, the axis of rotation of said twist needle being non-parallel with respect to the axis of rotation of said rotatable member.

13. In a spinning machine, an elongated twist needle; means to rotate said twist needle on its longitudinal axis; means to deliver fibrous material to said twist needle; and means to assist said twist needle to twist said material and initially draw the twisted fibres off said needle, including a twist belt having an outer periphery closely adjacent the periphery of said twist needle at all times and with the pointed end of said twist needle extending over the edge of said rotatable member, the axis of rotation of said twist needle being non-parallel with respect to the axis of rotation of said twist belt.

14. In a spinning machine, an elongated twist needle; means to rotate said twist needle on its longitudinal axis; means to deliver fibrous material to said twist needle; means to assist said twist needle to twist said material and initially draw the twisted fibres off said needle, including a rotatable member having an outer periphery closely adjacent the periphery of said twist needle at all times, the axis of rotation of said twist needle being non-parallel with respect to the axis of rotation of said rotatable member; and means to drive said twist needle and rotatable member.

15. In a spinning machine, an elongated twist needle having an inner end, a pointed outer end and an intermediate portion; means to deliver fibrous material to said twist needle; means to assist said twist needle to twist said material and initially draw the twisted fibres off said needle, including a rotatable member having an outer periphery closely adjacent the periphery of said twist needle at all times and spaced from the end of said twist needle, the axis of rotation of said twist needle being non-parallel with the axis

of rotation of said rotatable member, whereby said twist needle extends diagonally across said rotatable member, and means to rotate both said twist needle and said rotatable member, including an elongated support for said rotatable member extending toward the intermediate portion of said needle.

16. In a spinning machine, an elongated twist needle having an inner end, a pointed outer end and an intermediate portion; means to deliver fibrous material to said twist needle; means to assist said twist needle to twist said material and initially draw the twisted fibres off said needle, including a twist belt having an outer periphery

closely adjacent the periphery of said twist needle at all times and spaced from the end of said twist needle, the axis of rotation of said twist needle being non-parallel with the axis of rotation of said twist belt, whereby said twist needle extends diagonally across said twist belt, and means to rotate both said twist needle and said twist belt, including an elongated support for said twist belt extending toward the intermediate portion of said needle.

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No references cited.