

May 1, 1956

J. N. HIENSCH

2,743,572

TEXTILE YARN PRODUCING APPARATUS

Filed Oct. 2, 1951

5 Sheets-Sheet 1

FIG. 1

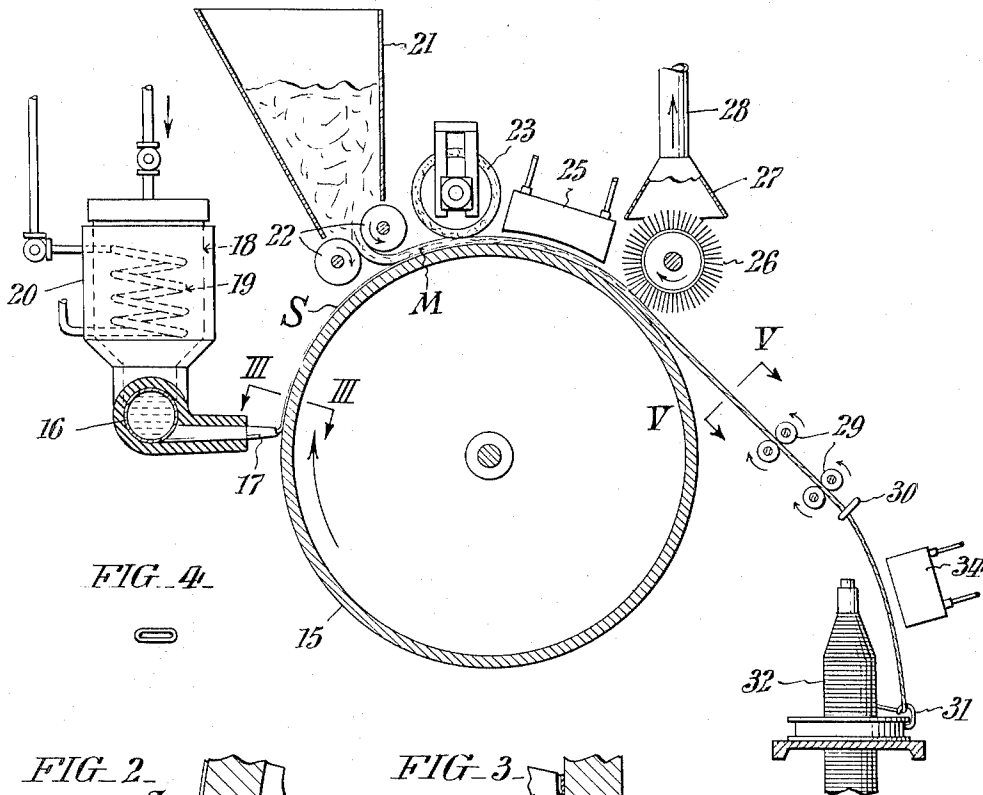


FIG. 4

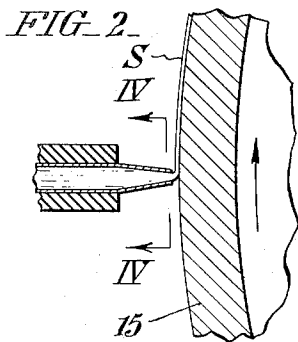


FIG. 2

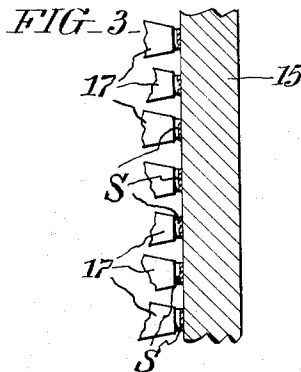


FIG. 3

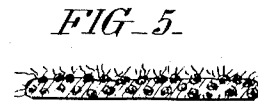


FIG. 5

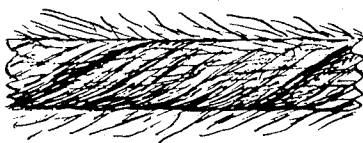


FIG. 6

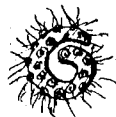


FIG. 7

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A diagram of a 1D chain, represented as a horizontal cylinder. The surface of the cylinder is covered with small black dots, representing spins. The chain is divided into three equal segments by two vertical lines. Below each segment, there is a curly bracket and the label S^2 , indicating that each segment is associated with an S^2 symmetry.

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FIG. 11.

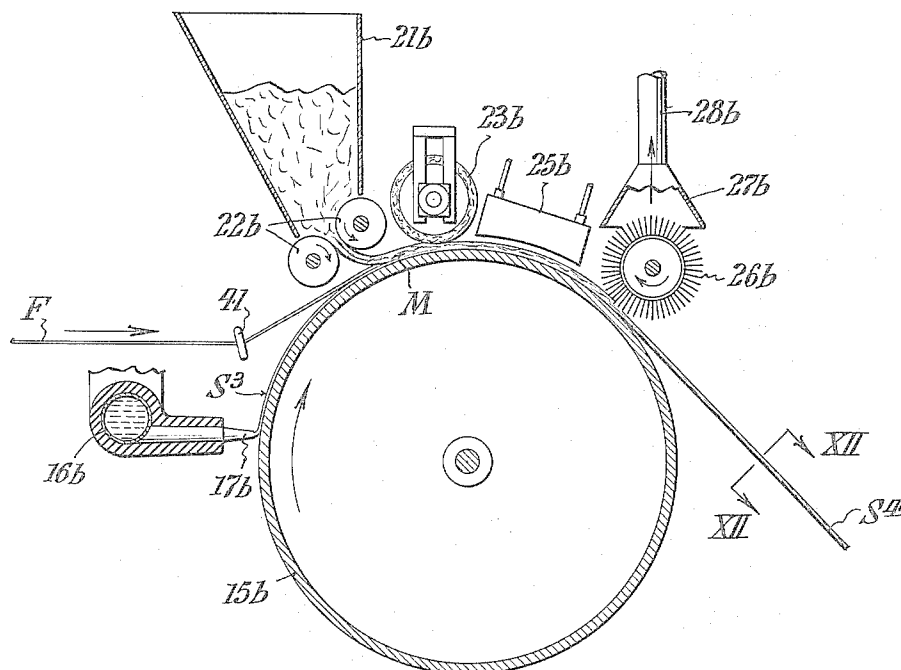
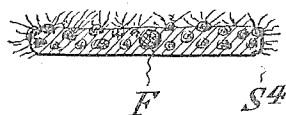


FIG. 12.



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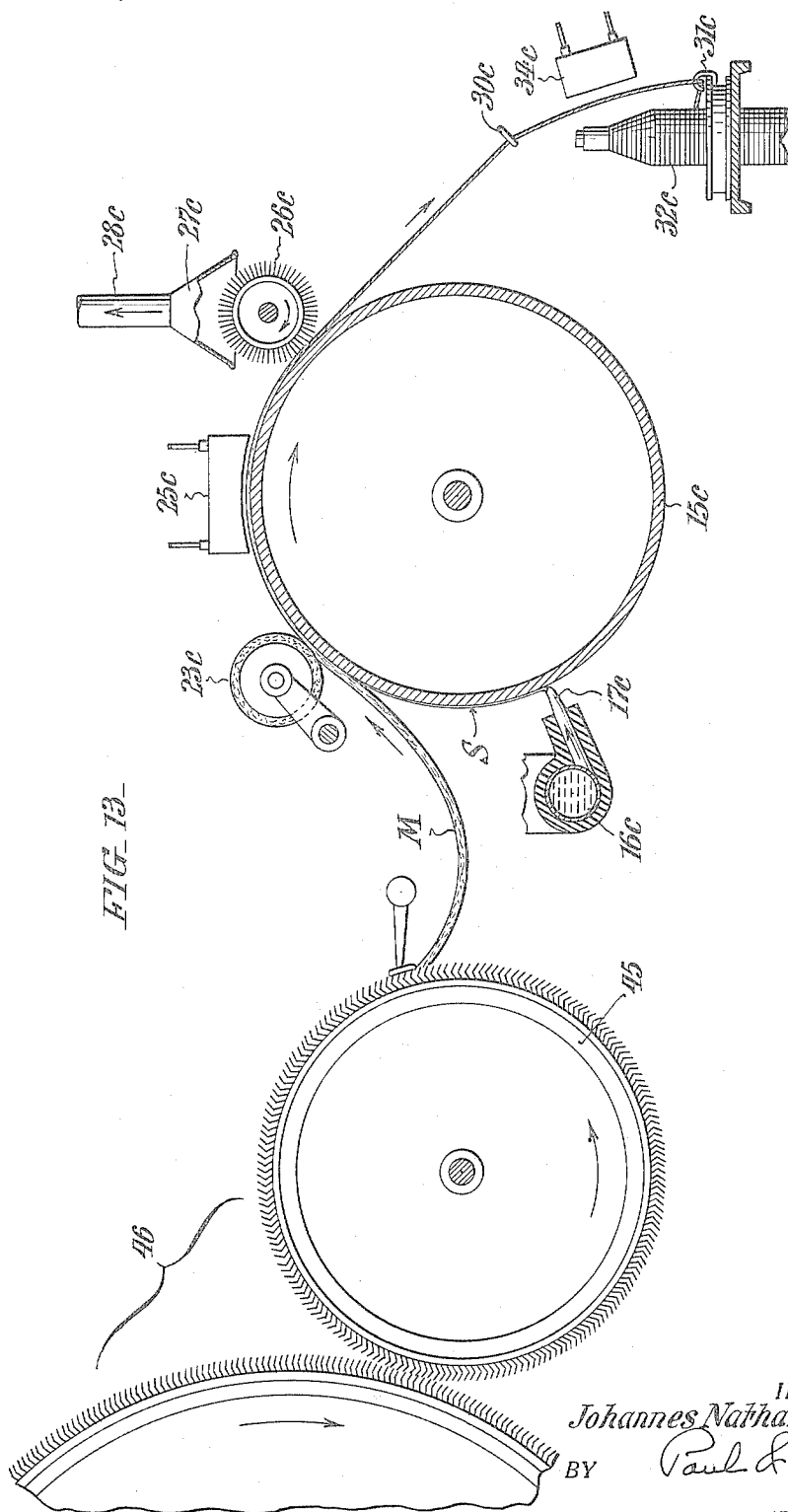
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FIG. 14.

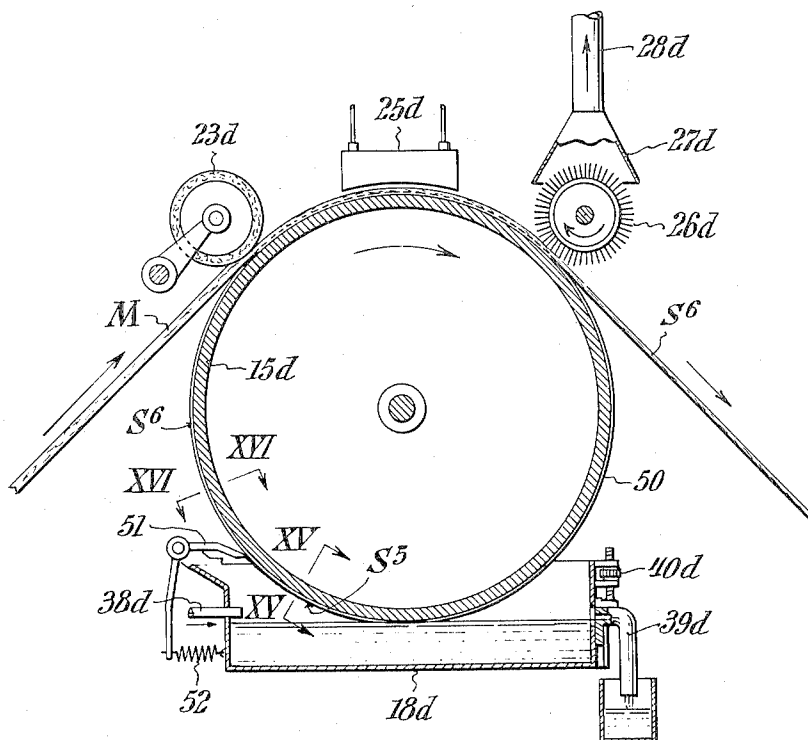


FIG. 15.

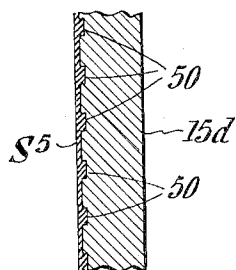
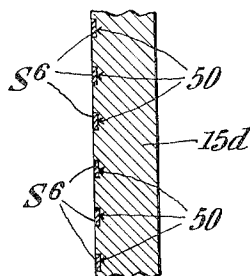


FIG. 16.



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TEXTILE YARN PRODUCING APPARATUS

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Application October 2, 1951, Serial No. 249,304

17 Claims. (Cl. 57—34)

This invention relates to apparatus useful in the commercial production of textile yarns. More specifically, it is concerned with apparatus for fabricating textile yarns in the improved manner disclosed in a copending patent application Ser. No. 246,064, filed by me on September 11, 1951, wherein textile fibers are applied in excess quantity to continuously running strands of fluent adhesive; wherein the excess non-adhering fibers are then removed and those retained aligned with the strands after setting of the adhesive; wherein in some instances, the fiber loaded strands are then drafted to the size desired in the finished yarns; and wherein, in other instances, the strands are twisted and the resulting yarns finally collected on bobbins.

The chief aim of the present invention is to provide simple and reliable apparatus capable of carrying out the above recited method economically for the commercial production of uniform yarns in quantity, continuously and more rapidly than possible with the prior art methods heretofore employed in textile yarn production.

How the foregoing and other important objects and attendant advantages are realized in practice will appear from the following detailed description of the attached drawings, wherein:

Fig. 1 is a more or less diagrammatic view in longitudinal section, of one form of textile yarn producing apparatus conveniently embodying my invention.

Fig. 2 is a fragmentary view corresponding to Fig. 1 but drawn to a larger scale so as to show, to better advantage, important structural details of the apparatus.

Fig. 3 is a fragmentary view in section taken as indicated by the angled arrows III—III in Fig. 1.

Fig. 4 shows the end view of one of a plurality of adhesive discharging nozzles embodied in the apparatus.

Fig. 5 is a cross section of one of the adhesive strands after application thereto of the textile fibers, the section being taken as indicated by the angled arrows V—V in Fig. 1.

Fig. 6 shows, on a greatly magnified scale, a fragment of twisted yarn such as may be produced with the apparatus of Fig. 1.

Fig. 7 shows the cross section of the twisted yarn.

Fig. 8 is a view like Fig. 1, showing an alternative form of my invention.

Fig. 9 is a fragmentary view showing the apparatus of Fig. 8 in top plan.

Fig. 10 is a fragmentary view in section taken as indicated by the angled arrows X—X in Fig. 9.

Fig. 11 is likewise a view similar to Fig. 1, showing another alternative form of my invention.

Fig. 12 shows the cross section of one of the yarns produced by the apparatus of Fig. 11, the section being taken as indicated by the angled arrows XII—XII in the last mentioned illustration.

Figs. 13 and 14 are views, in turn like Fig. 1, showing two other alternative forms of the apparatus.

Figs. 15 and 16 are fragmentary detail views in section taken as indicated respectively by the angled arrows XV—XV and XVI—XVI in Fig. 14.

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Referring first to the form of apparatus illustrated in Figs. 1–4 of these drawings, the numeral 15 designates a horizontally arranged cylinder which, in practice, is provided with a smooth polished metallic surface of chrome or the like wherefrom the adhesive used in the processing will readily separate after setting. It is to be understood that the cylinder 15 is driven at a constant speed in the direction of the arrow by suitable means not shown. Disposed along one side of cylinder 15 is a manifold pipe 16 having, at lengthwise intervals thereof, closely-spaced nozzles such as the one indicated at 17, which reach into close proximity to the revolving surface of said cylinder. At one end, the manifold pipe 16 is connected to a gravity-discharge receptacle 18 containing a supply of adhesive of a kind which requires to be heated for conversion into a fluent state, said receptacle being accordingly provided with a heating coil 19. For the purpose of heat conservation, the manifold pipe 16 and the receptacle 18 are surrounded by jacketing 20 of insulation. The outlets of the nozzles 17 may be of narrow flat configuration as shown in Fig. 4 or they may be circular in configuration so that continuous thin flat narrow ribbon-like adhesive foundation strands S, uniform in cross section, are deposited on the revolving surface of cylinder 15 as best shown in Figs. 2 and 3. As the strands S pass up the rising side of cylinder 15, a dense layer or mat M containing an excess quantity of textile fibers is continuously discharged upon them. In this instance, the mat M is delivered from a hopper 21 by action of a pair of cooperative feed rolls 22 within said hopper. Somewhat further along in the travel of the strands, the fiber mat M is compacted by a press roll 23 having a covering of rubber or felt, whereby some of the fibers are pressed into said strands. At the very top of cylinder 15 is a cooling or other suitable means 25 by which the adhesive of the foundation strands S is set. After traversing the setting means 25, the excess non-adhering textile fibers are removed from the strands by a revolving brush 26 within a hood 27 which latter is connected, by a conduit 28, to a suitable source of suction, not shown. By the action of brush 26, the adhering fibers are aligned more or less in the direction of the strands S. Due to setting of the adhesive by the means at 25, the strands S, now having the cross section shown in Fig. 5, readily leave the surface of cylinder 15 under the pull of the draft rolls indicated at 29, by which latter the strands are reduced to the diameter desired in the finished yarns. Upon leaving draft rolls 29, the strands are twisted, in this instance, by passage through guide eyes 30 enroute to the travellers 31 of a spinning machine, and there incidentally collected on the revolving bobbins 32 of said machine, the resulting yarns then appearing as shown in Figs. 6 and 7. The thickness of the foundation strands S is predetermined by adjustment of the discharge ends of the nozzles 17 relative to the surface of cylinder 15. By maintaining a constant rate of rotation of cylinder 15 and a constant rate of deposit of liquid adhesive at 17, foundation strands of uniform cross section are obtained. The number of fibers retained by the individual strands is directly related to the cross sectional dimensions of the strands and the thicknesses involved, and therefore a uniformity of fiber retention is had which makes possible the production of finished uniform yarns.

At 34 in Fig. 1, is shown a means which is utilized to soften the adhesive by heat action or otherwise to render the strands pliable for mergence and permanentization of the coils resulting from the twisting, when such finishing of the yarns is desired. When solvent liquified adhesives are employed in the process, the use of the heating coils 19 associated with reservoir 18 is of course dispensed with, a heating device substituted at 25, and a softening means substituted at 34.

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In the modified embodiment illustrated in Figs. 8 and 9, a trough 18a is provided for fluent adhesive below revolving cylinder 15a. As shown, cylinder 15a dips to a small extent into the adhesive in trough 18a, as a consequence of which a thin sheet or film S' is carried up on the surface of the cylinder at the rising side to meet with the layer or mat M of textile fibers. The press roll 23a, the setting element 25a, and the rotary brush 26 all function in exactly the same way and for the same purposes as described in connection with the first embodiment, and the excess fibers removed from the adhesive sheet S' by the brush are drawn off through the hood 27a and tube 28a by suction. The apparatus of Figs. 8 and 9 is further provided with means for longitudinally slitting the sheet S', after application of the fibers and brushing, into plural yarn strands S² having the cross section shown in Fig. 10. This slitting means includes a series of cutting disks 35 which are mounted in laterally-spaced relation upon a constantly rotated shaft 36 and by which the sheet is severed as it overtravels an underlying supporting roll 37. Fluent adhesive is constantly delivered to trough 18a at one end through a feed pipe 38, and the overflow passes off from the other end of the trough by way of spout 39. In order that the thickness of the film S' carried up on cylinder 15a may be accurately controlled, the level of the fluent adhesive in trough 18a can be raised or lowered through adjustment of the overflow spout 39 by the screw means indicated at 40. If desired, draft means, supplemental softening means and twisting means like those described in connection with Fig. 1 may be used in the modified apparatus of Fig. 8 for drawing the severed individual strands, twisting them and permanentizing the coils of the twists.

The alternative apparatus of Fig. 11 is identical with that of Fig. 1, except that in this instance, guides like the one designated 41, are provided for directing individual filaments F of rayon, nylon or the like to meet with the strands S³ of the adhesive carried up on the rising side of the cylinder 15b before application of the fibers. With this arrangement, the filaments F become embedded in the adhesive, with the result that, after the setting and brushing, the untwisted yarn strands S⁴ will appear in cross section as shown in Fig. 12. In order to obviate the necessity for repetitive description, all other elements not specifically referred to in Fig. 11, but having their counterparts in Fig. 1, are identified by the same reference numerals previously employed with addition however in each instance, of the letter "b" for convenience of more ready distinction.

The alternate embodiment of apparatus shown in Fig. 13 differs from that of Fig. 1 in that the fiber mat M is delivered to the cylinder 15c directly from the doffing roll 45 of a carding machine or a combing machine which may be of any well known type, and which is only partly illustrated and generally designated by the numeral 46. Here again, in order to dispense with duplicate description, the same reference numerals previously employed are used to designate the elements having their counterparts in Fig. 1, with addition, in each instance, of the letter c for convenience of more ready distinction.

In the modified apparatus delineated in Figs. 14-16, the cylinder 15d is provided with laterally-spaced shallow grooves 50, and the trough 18d is provided with a pivotally mounted scraper blade 51 which is maintained in pressure contact with the surface of the cylinder by the action of the spring means at 52. In this instance, a continuous film S⁵ (Fig. 15) of the adhesive is taken up on the rising side of cylinder 15d from trough 18d. However, by the action of the scraper blade 51, the excess adhesive is removed to drain back into trough 18d, leaving only strand deposits S⁶ of the adhesive in the grooves 50 of cylinder 15d as shown in Fig. 16. As cylinder 15d rotates, the strands S⁶ meet with the mat M of fibers which is thereupon subjected to the action of press roll 23d. Here, as in the previous instances, the adhesive is next set by the

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means 25d, whereupon the excess fibers are removed by rotary brush 26d and carried off through hood 27d and suction tube 28d. Also, as in the previous instances, the apparatus of Fig. 14 may be provided with draft means, supplemental adhesive softening means, and twisting means like those shown in Fig. 1.

Having thus described my invention, I claim:

1. In apparatus for producing textile yarns, a continuously-moving surface; a group of laterally-spaced nozzles for depositing strands of fluent tacky foundation material upon the moving surface; means beyond the group of nozzles in the direction of movement of the surface, for applying a relatively deep layer of textile fibers over the strands formed on the surface; means beyond the fiber-applying means for setting the material of the strands; means beyond the setting means for removing the excess non-adhering fibers from the strands; and means beyond the excess fiber-removing means for detaching the strands from the moving surface and collecting them as individual yarns.

2. Apparatus according to claim 1, for producing textile yarns, wherein the excess fiber-removing means includes a rotary brush, and a hood for the brush connected to a suction duct.

3. Apparatus according to claim 1, associated with a combing machine to receive a layer of fibers continuously delivered as a mat by said combing machine.

4. Apparatus according to claim 1, wherein the moving surface is in the form of an endless belt.

5. Apparatus according to claim 1, further including means interposed between the fiber applying means and the setting means for pressing the fiber layer.

6. In apparatus for producing textile yarns, a continuously-rotating cylinder; a group of laterally-spaced nozzles for depositing fluent adhesive upon the revolving surface of the cylinder; means beyond the nozzle group in the direction of cylinder rotation, for applying a relatively deep layer of textile fibers over the strands of adhesive formed on the cylinder; means beyond the fiber-applying means for setting the adhesive in the strands; means beyond the setting means for removing the excess non-adhering fibers from the strands; and means beyond the excess fiber-removing means for detaching the strands from the cylinder and collecting them as individual yarns.

7. Apparatus according to claim 6, for producing textile yarns, wherein the excess fiber-removing means includes a rotary brush, and a hood for the brush connected to a suction duct.

8. Apparatus according to claim 6, associated with a carding or combing machine to receive a layer of fibers continuously delivered as a mat by said carding or combing machine.

9. In apparatus for producing textile yarns, a continuously-rotating cylinder; a group of laterally-spaced means for depositing strands of fluent tacky foundation material upon the revolving surface of the cylinder; means beyond the depositing means in the direction of cylinder rotation, for applying a relatively deep layer of textile fibers over the foundation strands formed on the cylinder; means beyond the fiber-applying means for setting the material of the strands; means beyond the setting means for removing the excess non-adhering fibers from the strands; means beyond the excess fiber-removing means for detaching the strands from the cylinder; drafting means beyond the detaching means for drawing the fiber coated strands; and means beyond the drafting means for collecting the drawn fiber coated strands as individual yarns.

10. Apparatus according to claim 9, further including means interposed between the fiber applying means and the setting means for pressing the fibers.

11. In apparatus for producing textile yarns, a continuously-rotating cylinder; a group of laterally-spaced means for depositing fluent tacky foundation material upon the revolving surface of the cylinder; means beyond the depositing means in the direction of cylinder rota-

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tion, for applying a relatively deep layer of textile fibers over the foundation strands formed on the cylinder; means beyond the fiber-applying means for setting the material of the strands; means beyond the setting means for removing the excess non-adhering fibers from the strands; means beyond the excess fiber-removing means for detaching the strands from the cylinder; drafting means beyond the detaching means for drawing the strands; means beyond the drafting means for softening the foundation material of the strands; and means beyond the softening means for twisting the strands and collecting them as individual yarns.

12. In apparatus for producing textile yarns, a continuously-moving surface with laterally-spaced grooves; means for continuously applying fluent adhesive to the moving surface; scraper means acting upon the moving surface to remove the adhesive except that held in the grooves; means beyond the scraper means in the direction of movement of the surface for applying textile fibers in excess quantity over the adhesive strands in the grooves; means beyond the fiber-applying means for setting the adhesive of the strands; means beyond the setting means for removing the excess non-adhering fibers from the strands and means beyond the excess fiber removing means for detaching the strands from the moving surface and collecting them as yarns.

13. Apparatus according to claim 12, for producing textile yarns, wherein the continuously-moving surface is provided by a rotating cylinder having laterally-spaced circumferential grooves; and wherein the adhesive-applying means, the fiber-applying means, the setting means, and the excess fiber-removing means are all arranged in spaced relation about the cylinder in the order named and in the direction of cylinder rotation.

14. Apparatus according to claim 13, for producing textile yarns, wherein the adhesive-applying means includes an underlying trough containing a quantity of the fluent adhesive into which the cylinder dips; and wherein the scraper means acts upon the rotating surface of the cylinder.

15. Apparatus according to claim 13, for producing textile yarns, wherein the adhesive-applying means includes an underlying trough containing a quantity of the fluent adhesive into which the cylinder dips; said trough having an inlet through which fluent adhesive is fed thereinto, and an overflow which is regulatable for adjustment of the fluid level to predetermine the amount of adhesive carried up by the cylinder.

16. In apparatus for producing textile yarns, a continu-

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ously-moving surface with laterally-spaced grooves; means for continuously applying fluent tacky foundation material to the moving surface; scraper means acting upon the moving surface to remove the foundation material except that held in the grooves; means beyond the scraper means in the direction of movement of the surface for applying textile fibers in excess quantity over the strands in the grooves; means beyond the fiber-applying means for setting the material of the strands; means beyond the setting means for removing the excess non-adhering fibers from the strands; and means beyond the excess fiber removing means for detaching the strands from the moving surface; and drafting means beyond the detaching means for drawing the strands and collecting them as individual yarns.

17. In apparatus for producing textile yarns, a continuously-moving surface with laterally spaced grooves; means for continuously applying fluent tacky foundation material to the moving surface; scraper means acting upon the moving surface to remove the foundation material except that held in the grooves; means beyond the scraper means in the direction of movement of the surface for applying textile fibers in excess quantity over the strands in the grooves; means beyond the fiber-applying means for setting the material of the strands; means beyond the setting means for removing the excess non-adhering fibers from the strands; means beyond the excess fiber removing means for detaching the strands from the moving surface; drafting means beyond the detaching means for drawing the strands; means beyond the drafting means for softening the material of the strands; and means beyond the softening means for twisting the strands and collecting them as individual yarns.

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