May 24, 1960 H. B. RIEHL ET AL 2,937,411

METHOD AND APPARATUS FOR PRODUCING YARN SLIVER

Filed Sept. 15, 1954 4 Sheets-Sheet 1

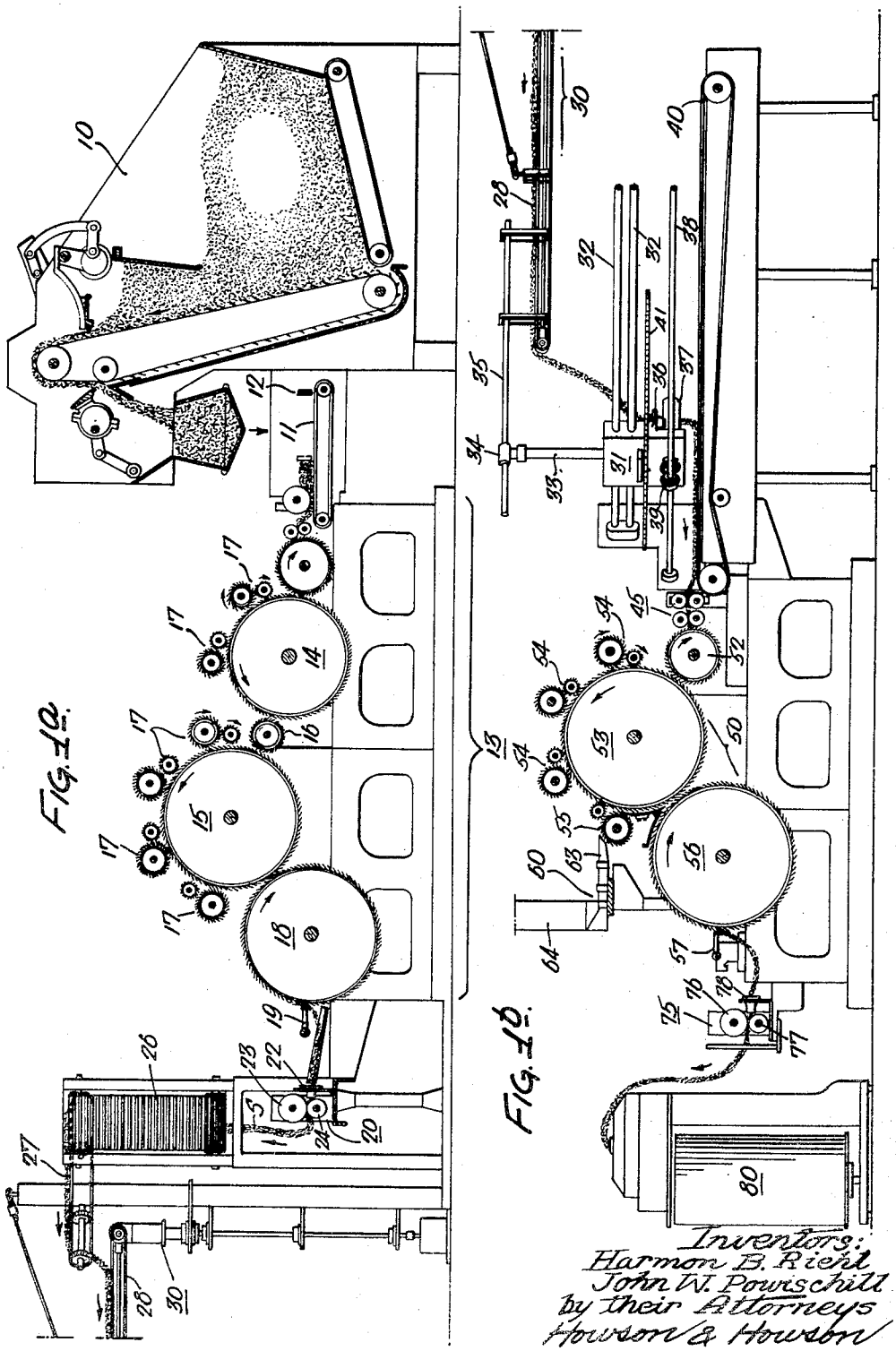


Fig. 1a.

Fig. 1b.

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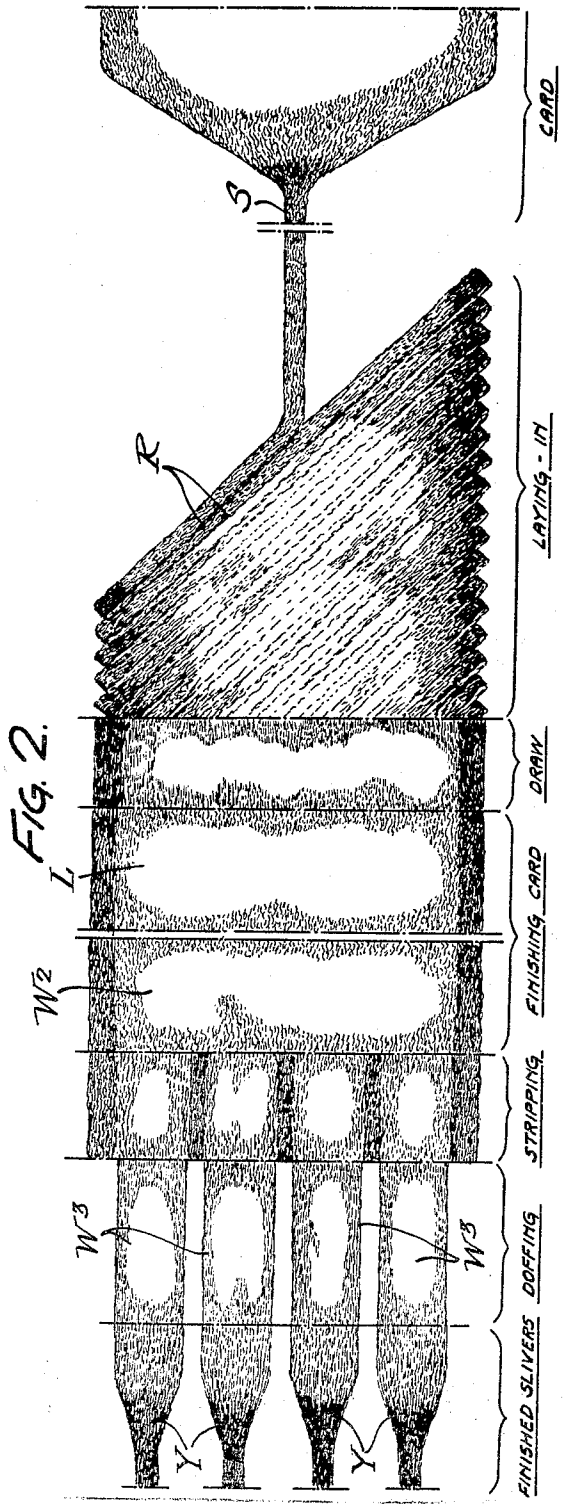


FIG. 2.

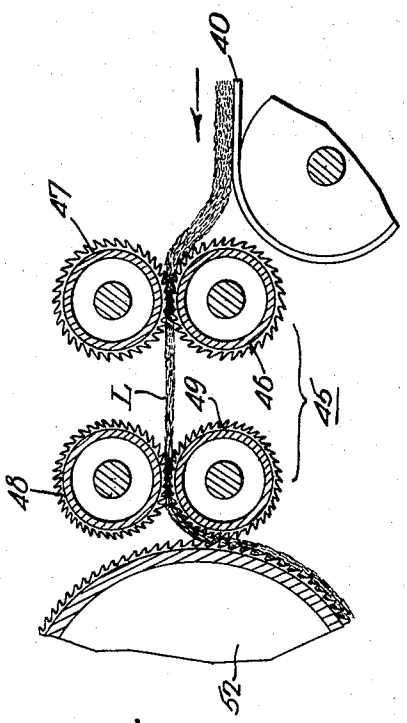


FIG. 5.

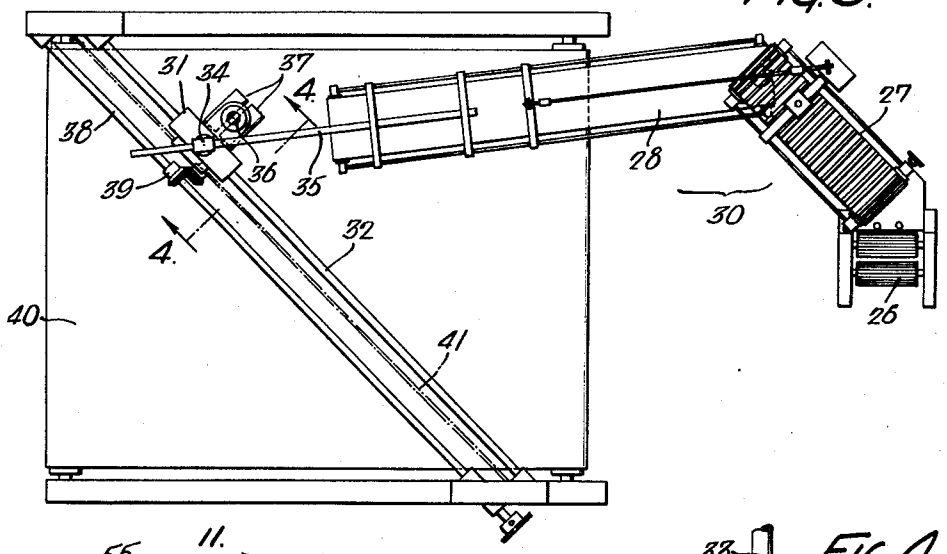
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METHOD AND APPARATUS FOR PRODUCING YARN SLIVER

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FIG. 3.



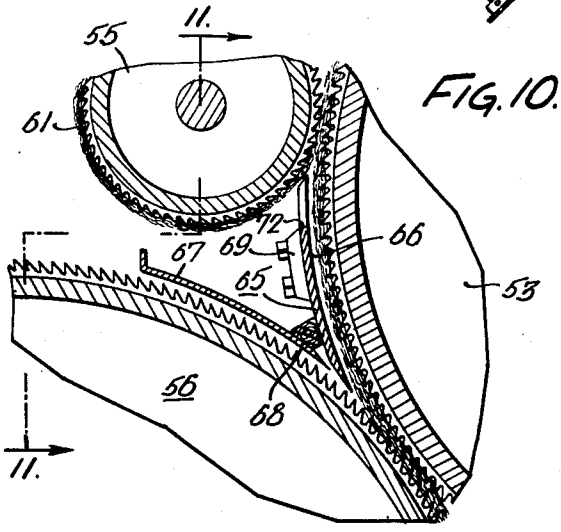


FIG. 10.

FIG. 4.

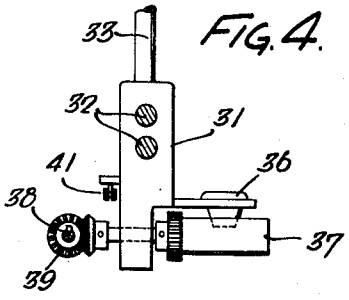
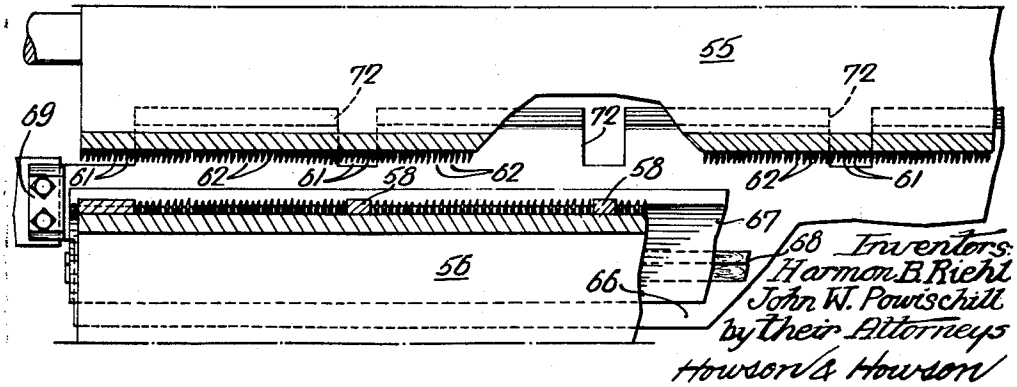


FIG. 11.



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METHOD AND APPARATUS FOR PRODUCING YARN SLIVER

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FIG. 6.

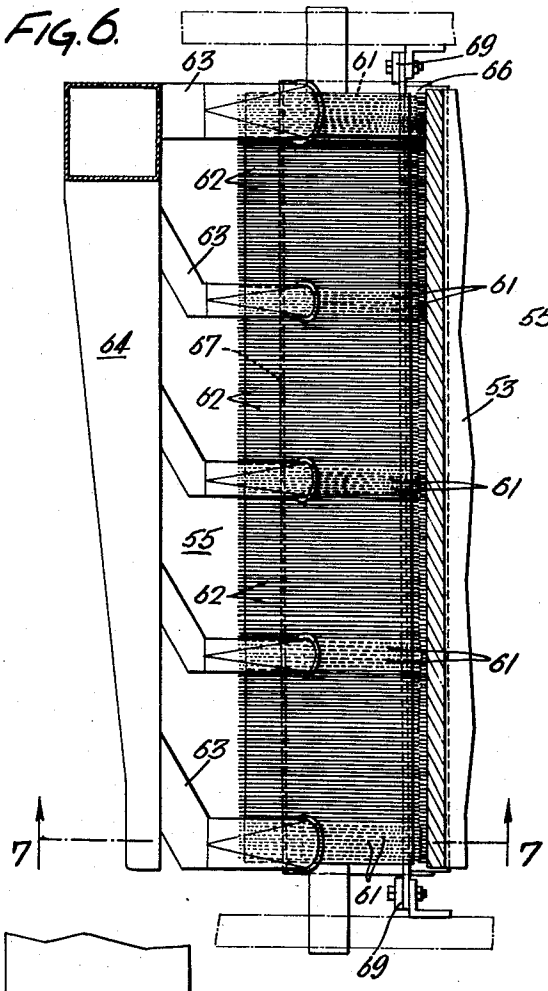


FIG. 8.

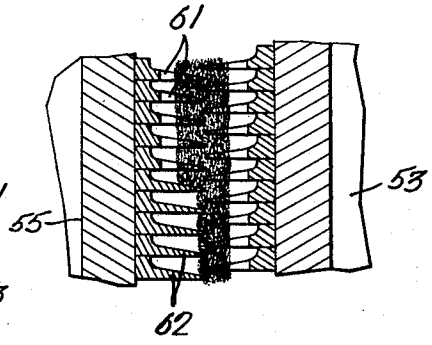
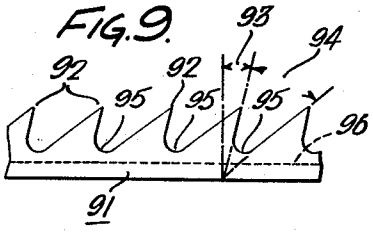


FIG. 9.



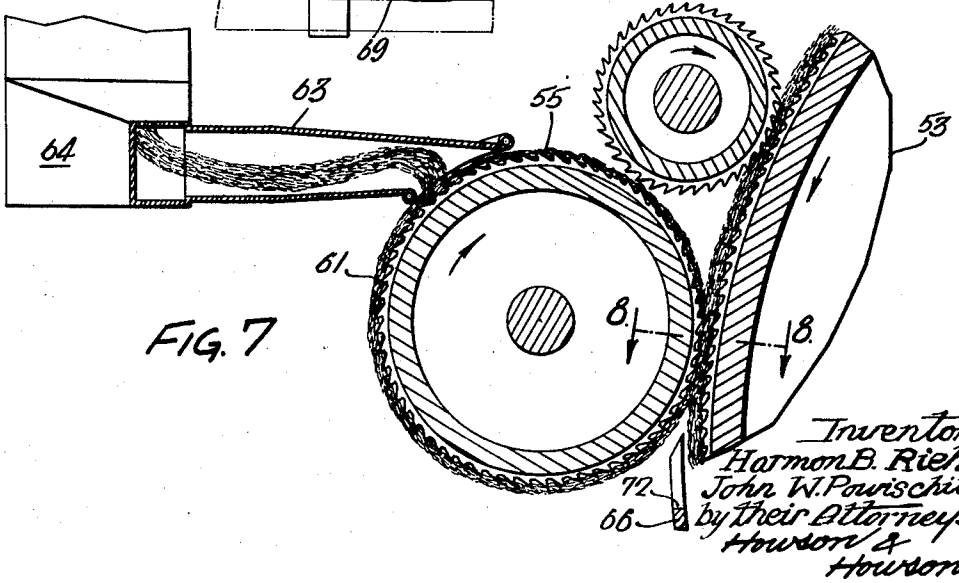


FIG. 7

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METHOD AND APPARATUS FOR PRODUCING YARN SLIVER

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Filed Sept. 15, 1954, Ser. No. 456,196

12 Claims. (Cl. 19—65)

The present invention relates to a novel method and apparatus for treating synthetic and other fibrous material and forming it into slivers. More particularly, the invention contemplates an apparatus and method for blending synthetic and other fibrous material to obtain a sliver of the material which is qualitatively suitable to be processed on the short or American system of spinning.

A conventional method of prepararing fibres for processing into yarn comprises forming the web from the finisher card into a sliver, having for example, a weight of 400 grains per lineal yard. Eighteen of these relatively thick slivers are gilled into one sliver weighing 656 grains (1.5 ounces) per lineal yard. The slivers are doubled and gilled from two to four times in order to obtain the fibre parallelization and evenness required for drawing. In addition, there are four stages of drawing, one reducing or finishing draw and one roving operation in order to produce a 1.6 grain roving from which a 15's worsted yarn is spun. It has been proposed to divide the web from the finisher card into a plurality of lesser uniform width webs, but because of the inherent characteristics of the conventional carding machine, the lesser width webs adjacent to the outer extremities of the carding cylinders are non-uniform in width. Therefore, the slivers condensed from these webs are non-uniform in weight and fibre dispersion, and thus require the excessive processing previously described, not being qualitatively suitable for use on the short or American system of spinning in which only one gilling, one stage of drawing, and one stage of roving are used prior to spinning.

More difficulties are encountered when it is desired to blend several types of fibres to produce a yarn having specific characteristics of strength, hand, and dyeing. The conventional procedure for blending differing fibres consists of processing the individual fibres on the usual carding machines and then combining the various slivers in an intersecting gill box, sometimes referred to as a melange. The gill box is supposed to blend the fibres, but frequently the fibres are not thoroughly mixed and as a result, a stripe of one color of fibre appears in the finished sliver. After repeated doublings, gillings and draftings, the material must still be processed on the old system, thereby losing the advantages of the short or American system of spinning.

With the foregoing in mind, the principal object of the present invention is to provide a method and apparatus for blending synthetic and like fibrous materials and simultaneously forming the same into slivers which are sufficiently uniform to require only one stage of gilling or pin drafting preparatory to drawing on the American or short system of spinning.

Another object of the present invention is to provide a method and apparatus which produces uniformly blended slivers of constant weight per lineal length and in which the fibres are disposed substantially parallel to provide a highly satisfactory roving.

Another object of the present invention is to provide a method and apparatus for forming slivers in which the fibres are substantially parallel so as to eliminate or minimize the possibility of nep formation in subsequent processing.

Another object of the present invention is to provide a novel apparatus for doubling and drafting which affords substantial uniformity of fibre dispersion and improved ultimate fibre orientation.

Still another object of the present invention is to provide a doffing apparatus which accurately removes a predetermined width of the web formed by the card cylinder and eliminates matting of the card cylinder adjacent the edges of said predetermined width whereby the web of said predetermined width is entirely uniform across its full width.

A further object of the present invention is to provide an apparatus of the type hereinafter described having the advantages and characteristics set forth which is of comparatively simplified construction and operation and is entirely efficient and effective in operation and use.

These and other objects of the present invention and the various features and details of the construction and operation thereof are more fully set forth hereinafter with reference to the accompanying drawings in which:

Figs. 1*a* and 1*b* are left side elevational views of the front and rear ends respectively of apparatus made in accordance with the present invention;

Fig. 2 is a fragmentary diagrammatic plan view of the fibres during their passage through the apparatus;

Fig. 3 is a fragmentary plan view of an intermediate portion of the apparatus;

Fig. 4 is a sectional view taken on the line **4—4** of Fig. 3;

Fig. 5 is a fragmentary sectional view of the apparatus adjacent the entering end of the final carding machine;

Fig. 6 is a plan view of an auxiliary stripper roll adjacent the discharge end of the final carding machine;

Fig. 7 is a sectional view taken on the line **7—7** of Fig. 6;

Fig. 8 is a sectional view taken on the line **8—8** of Fig. 7;

Fig. 9 is a detached elevational view of a preferred form of metallic wire cylinder clothing employed throughout the apparatus;

Fig. 10 is a sectional view of the stripper roll and shield at the discharge end of the final carding machine; and,

Fig. 11 is a sectional view with parts broken away taken on the line **11—11** of Fig. 10.

The present invention provides apparatus for receiving fibrous material in loose bulk form in a hopper of a card feed, feeding the material from the card feed at a given weight per lineal foot, paralleling and blending the fibres by carding, condensing, doubling, drafting, carding again to form a uniformly blended web, accurately splitting the web into a plurality of narrow webs, and condensing the narrow webs into a plurality of slivers which are sufficiently uniform as to weight per lineal length and as to dispersion of the various types of fibres so that the slivers may be transferred directly or after a single gilling for finer count yarn to a draw frame.

Referring now to Figs. 1*a* and 1*b*, the fibres in loose form are deposited in the hopper of a conventional weighing feed **10** from which successive batches of a predetermined weight of fibres are deposited on a delivery apron **11** having associated therewith a conventional pusher element **12** for compacting the discharged batch of fibres to provide a layer of stock having a uniform weight per lineal measurement. The delivery apron **11** advances the layer of stock into a breaker card **13** which opens the fibres and effects partial blending thereof. As described more fully hereinafter, the breaker card delivers a web of the fibres to a condensing station **20** which drafts the

web and condenses it into a sliver S (see Fig. 2). The sliver S is carried by an intermediate traverse feed device 30 and deposited on a feed apron 40 in ribbon form as indicated at R in Fig. 2. As shown, the ribbon is laid on the feed apron 40 at an angle of approximately 45 degrees in overlapping relation. This effects a doubling of the material to provide further blending thereof.

The feed apron 40 advances the material to a drafting station 45 which forms a lap L of blended paralleled slivers. The lap L is fed into the finishing card 50 wherein further blending and paralleling of the fibres occurs, as described more fully hereinafter. At the delivery end of the finishing card 50, the web W2 formed from the lap L is split into a plurality of narrow webs W3 and means is provided at 60 to remove the excess material and convey it back to the hopper of the feed device 10. The split webs W3 are condensed into slivers at the sliver station 75 and fed into conventional can coilers 80 in the form of sliver Y suitable for single gilling and drawing.

As stated above, the weighing feed 10 operates to deposit successive batches of a given weight of fibres on the delivery apron 11. The feed device performs a minimum amount of blending but opens up the fibres for action by the breaker card 13. As shown in Fig. 1*a* the breaker card 13 is substantially conventional in design, comprising a breast roll cylinder 14 and a main cylinder 15, interconnected by a transfer roll 16. Each of the cylinders 14 and 15 has a plurality of workers and strippers 17 associated therewith. The main cylinder 15 is stripped by a doffer 18 having associated therewith a conventional doffer comb 19, which effects delivery of a uniform web of material to the condensing station 20.

The condensing station comprises the usual trumpet 22 having calender rolls 23 and 24 for drawing the web through the trumpet 22. Preferably, the calender rolls 23 and 24 are driven at a surface speed greater than that of the doffer 18 so as to impart a draft to the web as it passes from the doffer 18 to the calender rolls. This draft is greater than the normal tension draft at the delivery end of a conventional breaker card and serves to parallel the fibres in the web. The calender rolls 23 and 24 therefore form a sliver S of relatively compact parallel fibres.

The intermediate traverse feed device 30 receives the sliver from the condensing station 20 and deposits it in ribbon form on the apron 40 in a plurality of overlapping runs disposed at an angle approximating 45 degrees to the longitudinal axis of the conveyor. To this end, the intermediate feed device comprises a plurality of lattice conveyors 26, 27, and 28 which carry the sliver to an upper level overlying the feed apron 40. A carriage 31 (Fig. 1*b*) receives the sliver from the conveyor 28, forms it into a ribbon R, and deposits the ribbon transversely of the apron 40, for example, as shown in Fig. 2. The carriage 31 is mounted on a pair of rods 32, 32 which are fixedly mounted above the apron 40 at an angle approximately 45 degrees as shown in Fig. 3. The apron 28 is pivoted at its innermost end to follow the movement of the carriage as it traverses from one side of the apron 40 to the other. The apron is supported on the carriage by an upstanding strut 33 having a swivel 34 at its upper extremity for slidably supporting the arm 35 fixed to the framework of the conveyor 28.

The carriage 31 delivers a predetermined quantity of sliver to the feed apron 40 as it traverses thereacross. The sliver S is trained through a trumpet 36 and between a pair of feed rolls 37 which compress the sliver in one direction to form the ribbon R. The feed rolls 37 are driven by a rotating shaft 38 disposed parallel to the rods 32, 32 and having a key-way for engaging the key of a gear 39 slidable on the shaft 38 as shown in Fig. 4. A yoke (not shown) is mounted on the carriage 31 and engages the gear 39 to maintain the bevel gears in engagement. A chain 41 effects traversing movement of the carriage and is operated in synchronism with the feed apron 40 to effect a uniform lapping of the ribbon R on the apron 40 as it is advanced under the carriage 31. Thus, the intermediate feed device lays a plurality of overlapping runs of ribbon onto the conveyor 40 from the sliver delivered by the condensing station 20. The depositing of the ribbon R in this manner effects a doubling of the material and provides substantial uniformity in the material across the full width of the feed apron 40.

The apron 40 advances the doubled ribbon R to the drafting station 45 where the individual fibres, which were disposed at approximately 45 degrees to the longitudinal axis of the conveyor, are drawn out into substantial parallelism with the longitudinal axis of the conveyor to form the lap L. As shown in Figs. 1*b* and 5, the drafting station 45 comprises a pair of drawing-out rolls 46, 47 and a pair of feed rolls 48, 49 for feeding the lap L into the finisher card 50. The draw rolls and feed rolls are each clothed with card teeth as shown in Fig. 5. The teeth intermesh with one another to engage the lap L and draw the fibres therein into parallelism with the longitudinal axis of the apron 40. The teeth on the rolls 46 and 49 are spirally wound thereabout in one direction whereas the teeth on the rolls 47 and 48 are spirally wound in a reverse direction, so that when the rolls are driven in opposite driections to feed the lap therethrough, there is no danger of clashing or interference between the teeth of the engaged rolls.

The feed rolls 48 and 49 are driven stubstantially faster than the draw rolls 46 and 47 so that there is a draft of at least 2:1 between the draw rolls and the feed rolls. This draft draws out the individual fibres into parallel relation from their angularly disposed relation in the ribbon form R on the feed apron 40. By providing interengaging teeth rather than a positive nip between the feed rolls and the draw rolls, the fibres are drawn out without danger of breaking the longer fibres in the lap L. Thus, the apron 40 and the drafting station 45 effect a doubling and drawing-out of the fibres as they pass from the intermediate feed device to the finisher card 50.

The finisher card 50 receives the lap L from the drafting station 45, parallels and blends the fibre in the lap and forms a web W2, splits the web into a plurality of smaller webs W3 and delivers the smaller webs to the condensing station 75. The finisher card 50, as shown in Fig. 1*b*, is substantially conventional in construction comprising a licker-in 52, a main cylinder 53, a plurality of workers and strippers 54 disposed in circumferentially spaced relation about the main cylinder, an auxiliary stripper 55, as will be described more fully hereinafter, and a doffer 56. A doffer comb 57 cooperates with the doffer to strip the plurality of webs W3 from the doffer.

To provide the web-splitting action, the doffer 56 is formed with conventional splitting devices 58 (see Fig. 11) which comprise bands disposed circumferentially about the doffer and being of a sufficient width to separate the web W2 formed from the lap L into a plurality of smaller webs W3. The portion of the main cylinder 53 which is in registry with the bands on the doffer 56 will not be stripped of the fibres thereon but the fibres will be carried around on the teeth of the main cylinder through another series of operations by the main cylinder and the workers and strippers 54.

To prevent excessive accumulation of the fibres on the main cylinder in the circumferential band portion thereof in registry with the splitting devices on the doffer, the auxiliary stripper 55 operates to remove the excess material from the main cylinder. The auxiliary stripping roll 55 is a part of the stripping device 60 which removes the excess material from the main cylinder 53 and returns it to the hopper of the feed 10. To this end, the auxiliary stripper 55 is clothed with metallic wire cylinder clothing 61 in registry with the stripping devices 58 of the doffer 56 (see Figs. 6–8). Thus, the metallic wire cylinder

clothing 61 is disposed at spaced intervals along the length of the auxiliary stripper roll 55. Intermediate the clothing 61 is disposed plain unpunched wire extending about the full circumference of the auxiliary stripper roll 55. The plain cylinder wire 62 does not remove any of the fibres from the main cylinder 53 and the auxiliary stripper roll is adjusted so that the metallic wire cylinder clothing 61 strips only the excess material from the main cylinder.

The excess material is carried by the clothing 61 and is removed therefrom by a suction device 63 positioned in registry with each of the bands of metallic wire cylinder clothing 61. The suction outlets 63 are connected to a suction header 64 which receives the loose fibrous material from the strips of metallic wire cylinder clothing 61 and conveys it back to the feed hopper of the feed 10.

By providing the pick-off device 60, the formation of neps at the edges of the webs W3 is effectively prevented. It has been found that when the dividers 58 are used on a conventional card, the fibres on the main cylinder in registry with the dividers 58, tend to build up and accumulate at the edges of the webs W3 divided by the dividers 58. The excess fibres at the edges of the webs tend to ball up and form neps in the webs at the edges thereof. When the neps are present in the finished sliver, they greatly impair the quality of the yarn. The neps make the yarn unsuitable for many purposes and reduces the quality grade under which it may be sold. The stripping device 60 prevents the formation of neps by removing the excess fibres from the main cylinder where the latter has not been stripped by the doffer. Thus, the webs W3 are uniform across their full width and may be expediently condensed and formed into slivers ultimately suitable for spinning into yarn.

Another factor which increases the non-uniformity of the sliver in conventional apparatus is the appearance of extraneous fibres on the doffer caused by the air currents at the point of junction between the main cylinder and the doffer. Means is provided to eliminate this, as shown in Figs. 10 and 11. The means comprises a shield 65 interposed between the main cylinder 53 and the doffer 56. The shield comprises a plate 66 which conforms to and is spaced from the periphery of the main cylinder 53 along its full length. A second plate 67 is mounted in spaced relation to the doffer 56 contiguous with the plate 66. A sealing strip 68 is interposed between the plates 66 and 67 to preclude the creation of air currents therebetween. The shield 65 is mounted on the frame of the finisher card as indicated at 69.

In the absence of the shield 65 the high peripheral speed of the main cylinder creates a vortex of air between the main cylinder and the doffer. The vortex of air captures and entrains the fly, i.e., short broken fibres, cast off by the rapidly rotating main cylinder. The swirling air draws the fly into the center of the vortex thereby building up a roll of fly of considerable size. After this roll has been built up and becomes sufficiently heavy, it drops into the clearance between the main cylinder and the doffer and is carried into engagement with the doffer and becomes part of the carded web. The roll thereby increases the size of the web at the point where the roll is engaged upon the doffer. This increased web is then acted upon in the usual manner and appears in the final web as an enlargement which makes the web unsuitable for forming into yarn. The enlargement may be sufficient to plug the can coiler trumpet, thereby breaking the sliver formed by the trumpet and causing a shutdown in production.

To prevent interference with the action between the cylinder 53 and the auxiliary stripper roll 55, the plate 66 is notched as indicated at 72 at the points along its length where it is in registry with the metallic wire cylinder clothing 61. Thus, the plate does not adversely affect the stripping action of the roll 55 when the latter is stripping long fibres from the main cylinder 53. As shown in Fig. 10, the long fibres are stripped from the main cylinder 53 at a point below the junction thereof with the stripper roll 55. It is noted that if the shield is not properly notched, the plate 66 will operate to strip the fibres from the stripper roll 55 and will eliminate its effectiveness in removing the excess fibres from the card cylinder.

Thus, highly uniform webs are formed on the doffer roll 56 to be stripped therefrom by the conventional doffer comb 57. The condensing station 75 receives the webs W3 from the doffer 56, condenses them into sliver Y and advances the sliver to the can coiler 80. The condensing station 75 is similar to the station 20 and comprises calender rolls 76 and 77 following the conventional trumpet 78. The fibres leaving the condensing station 75 are in the form of a condensed sliver Y which may be acted upon by the conventional can coiler 80 in the usual manner.

A preferred tooth formation for the metallic wire cylinder clothing of the various cylinders is shown in Fig. 9. The metallic wire clothing must have certain definite characteristics, namely, the ability to pluck fibres from the compact mass being presented to it by the card rolls with the minimum of fibre fracture. In addition, the clothing must be able to carry relatively large quantities of fibres, but at the same time be easily stripped by its coacting cylinder. Holding action, on the part of card clothing results in either fibre fracture or the loading of the cylinder. This is especially true of nylon, which will readily wrap around a cylinder. The tooth formation shown at 91 in Fig. 9 has been developed with these thoughts in mind, it being either groove wound on a cylinder or surface wound as the case may be.

In the present instance, the wire points 92 number approximately six to the lineal inch. The harshness of the tearing action of any wire is effected by the rake angle indicated at 93, for example, the greater the rake angle the greater the tearing action, and also the harder it becomes to strip. A relatively low rake angle has been used, in this instance a rake angle of 15 degrees was found most satisfactory to meet the varying carding conditions. The amount of openness, i.e., the punch angle 94 and the diameter of the gullet 95, also affect carding and loading conditions. Hence, these have been made as large as practicable, considering the number of teeth per lineal inch. In addition, the height of the wire above the shoulder 96 of the wire affects the loading of the cylinder. High wire, in general will load more readily than will low wire, since the fibres become deeply embedded between laterally adjacent teeth and cannot be removed readily without the use of a fancy roll, which at the best is a continual source of trouble and one of the main causes of nep formation. Therefore, the overall height of the metallic wire in the present instance is held to 0.162 inch. Thus, the present form of card wire effects proper carding action throughout the apparatus and eliminates the possibility of excessive card loading and fibre breakage.

In summation, the present invention provides an apparatus and method for producing a uniform sliver for use on the short or American system of spinning. The fibres are received in loose bulk form in the hopper of the weighing feed 10 and are deposited in the can of the can coiler 80 in the form of silver. The fibres are completely blended during the process and the uniformity which is obtained by the weighing feed, the doubling and drafting on the apron 40, and the stripping by the doffer 56 of the finisher card, is controlled within the desired limits without substantial supervision and without the necessity for intermediate devices to compensate for variations in the webs or slivers produced.

While a particular embodiment of the present invention has been herein illustrated and described, it is not intended to limit the invention to such disclosure, and changes and modifications may be made therein and thereto within the scope of the following claims.

We claim:

1. A method for processing fibrous materials and forming the same into sliver having uniform weight per lineal distance comprising the steps of forming a loose lap of the materials having a given weight per lineal distance; advancing said lap into a carding machine to parallel the fibres, open the same, and form a web of the fibrous material; drafting said web; condensing said drafted web into the form of a sliver; depositing said sliver on a movable surface transversely to the direction of movement of the surface to form overlapping runs of the sliver thereon; advancing said overlapped sliver to a drafting station; drafting said overlapping runs of sliver to form a lap; carding said lap to form at least one uniform and blended web of parallel fibres; drafting said web; and condensing the web, to form a sliver of uniformly blended parallel fibres and having a uniform weight per unit length.

2. A method for blending fibrous materials and forming the same into sliver having uniform weight per lineal distance comprising the steps of forming a loose lap of the materials having a given weight per lineal distance; advancing said lap into a carding machine to parallel the fibres, open the same, and form a web of the fibrous material; drafting said web; condensing said drafted web into the form of a sliver; compressing said sliver in one direction to form a ribbon of constant weight per lineal distance; depositing said ribbon at a given rate on a moving conveyor at an angle of substantially 45 degrees to the direction of movement of the conveyor to form overlapping runs of the ribbon thereon; advancing said overlapped ribbon to a drafting station; drafting said overlapping runs of ribbon to form a lap; carding said lap to form at least one uniformly blended web of parallel fibres; and condensing the web to form a sliver of uniformly blended parallel fibres and having a uniform weight per unit length.

3. A method for blending fibrous materials and forming the same into sliver having uniform weight per lineal distance comprising the steps of forming a loose lap of the materials having a given weight per lineal distance; advancing said lap into a carding machine to parallel the fibres, open the same, and form a web of the fibrous material; drafting said web; condensing said drafted web into the form of a sliver; compressing said sliver in one direction to form a ribbon of constant weight per lineal distance; depositing said ribbon at a given rate on a moving conveyor at an angle of substantially 45 degrees to the direction of movement thereof to form overlapping runs of the ribbon on the conveyor; advancing said overlapped ribbon to a drafting station; drafting said overlapping runs of ribbon to form a lap in which the fibres are substantially parallel to the direction of movement by discharging said lap from the drafting station at a rate twice the rate of feed into the drafting station; carding said web to form at least one uniformly blended web of parallel fibres; drafting said web; and condensing the web to form a sliver of uniformly blended parallel fibres and having a uniform weight per unit of length.

4. A method for processing fibrous materials and forming the same into slivers having uniform weight per lineal distance comprising the steps of forming a loose lap of the materials having a given weight per lineal distance; advancing said lap into a carding machine to parallel the fibres, open the same, and form a web of the fibrous material; drafting said web; condensing said drafted web into the form of a sliver; compressing said sliver in one direction to form a ribbon of constant weight per lineal distance; depositing said ribbon at a given rate on a moving conveyor at an angle of substantially 45 degrees to the direction of movement thereof to form overlapping runs of the ribbon on the conveyor; advancing said overlapped ribbon to a drafting station; drafting said overlapping runs of ribbon to form a lap in which the fibres are substantially parallel to the direction of movement by discharging said lap from the drafting station at a rate substantially twice the rate of feed into the drafting station; carding said lap to form a uniform web of parallel fibres; splitting the last-mentioned web into a plurality of webs of smaller width; drafting said smaller webs; and condensing the webs to form slivers of parallel fibres and having a uniform weight per unit length.

5. A method for blending fibrous materials and forming the same into a web having uniform weight per lineal distance comprising the steps of depositing the various materials in batch form in a hopper; opening said fibrous materials; weighing predetermined weights of said fibrous materials; and compacting the same into a predetermined lineal distance to form a loose lap having a given weight per lineal distance; advancing said lap into a carding machine to parallel the fibres, open the same, and form a web of the fibrous material; drafting said web; condensing said drafted web into the form of a sliver; compressing said sliver in one direction to form a ribbon of constant weight per lineal distance; depositing said ribbon at a given rate on a moving conveyor at an angle of substantially 45 degrees to the direction of movement thereof to form overlapping runs of the ribbon on the conveyor; advancing said overlapped ribbon to a drafting station, drafting said overlapping runs of ribbon to form a lap in which the fibres are substantially parallel to the direction of movement by discharging said lap from the drafting station at a rate substantially twice the rate of feed into the drafting station; and carding said lap to form a uniformly blended web of parallel fibres.

6. A method for blending fibrous materials and forming the same into webs having uniform weight per lineal distance comprising the steps of depositing the various materials in batch form in a hopper; opening said fibrous materials; weighing predetermined weights of said fibrous materials and compacting the same into a predetermined lineal distance to form a loose web having a given weight per lineal distance; advancing said web into a carding machine to parallel the fibres, open the same, and form a web of the fibrous material; drafting said web; condensing said drafted web into the form of a sliver; compressing said sliver in one direction to form a ribbon of constant weight per lineal distance; depositing said ribbon at a given rate on a moving conveyor at an angle of 45 degrees to the direction of movement thereof to form overlapping runs of the ribbon of the conveyor; advancing said overlapped ribbon to a drafting station; drafting said overlapping runs of ribbon to form a lap in which the fibres are substantially parallel to the direction of movement by discharging said lap from the drafting station at a rate substantially twice the rate of feed into the drafting station; carding said lap to form a uniformly blended web of parallel fibres; splitting the last mentioned web into a plurality of webs of smaller width; and removing the narrow webs.

7. A method for blending fibrous materials and forming the same into webs having uniform weight per lineal distance comprising the steps of depositing the various materials in batch form in a hopper; opening said fibrous materials; weighting predetermined weights of said fibrous materials and compacting the same into a predetermined lineal distance to form a loose lap having a given weight per lineal distance; advancing said lap into a carding machine to parallel the fibres, open the same, and form a web of the fibrous material; drafting said web; condensing said drafted web into the form of a sliver; compressing said sliver in one direction to form a ribbon of constant weight per lineal distance; depositing said ribbon at a given rate on a moving conveyor at an angle of 45 degrees to the direction of movement thereof to form overlapping runs of the ribbon on the conveyor; advancing said over-

lapped ribbon to a drafting station; drafting said overlapping runs of ribbon to form a lap in which the fibres are substantially parallel to the direction of movement by discharging said lap from the drafting station at a rate substantially twice the rate of feed into the drafting station; carding said lap on a machine having a main carding cylinder to form a uniform blended web of parallel fibres; splitting the last-mentioned web into a plurality of webs of smaller width; removing the narrow webs from the main carding cylinder and leaving narrow bands of excess fibres on said cylinder; removing the excess fibres from said cylinder; and conveying away the excess fibres removed from said cylinder by suction.

8. A method for processing fibrous materials and forming the same into sliver having uniform weight per lineal distance comprising the steps of depositing the various materials in batch form in a hopper; opening said fibrous materials; weighing predetermined weights of said fibrous materials and compacting the same into a predetermined lineal distance to form a loose lap having a given weight per lineal distance; advancing said lap into a carding machine to parallel the fibres, open the same, and form a web of the fibrous material; drafting said web, condensing said drafted web into the form of a sliver; compressing said sliver in one direction to form a ribbon of constant weight per lineal distance; depositing said ribbon at a given rate on a moving conveyor at an angle of substantially 45 degrees to the direction of movement thereof to form overlapping runs of the ribbon on the conveyor; advancing said overlapped ribbon to a drafting station; drafting said overlapping runs of ribbon to form a lap in which the fibres are substantially parallel to the direction of movement by discharging said lap from the drafting station at a rate substantially twice the rate of feed into the drafting station; carding said lap on a machine having a main carding cylinder to form a uniform web of parallel fibres; splitting the last-mentioned web into a plurality of webs of smaller width; removing the narrow webs from the main carding cylinder and leaving narrow bands of excess fibres on said cylinder; removing the excess fibres from said cylinder; conveying the excess fibres removed from said cylinder by suction and depositing the same in the hopper for repetition of the above-defined steps; drafting said smaller webs; and condensing the webs to form slivers of parallel fibres having a uniform weight per unit length.

9. In apparatus for processing fibrous materials and forming the same into sliver; a carding machine for blending and paralleling the fibes and forming the same into a web; means to feed said material into the carding machine; a trumpet to condense the web from said carding machine into a sliver; an apron conveyor; a carriage receiving the sliver from said trumpet; rolls on said carriage to feed the sliver onto said apron conveyor; means mounting said carriage for displacement transversely of the conveyor; means to advance said conveyor underneath said carriage to effect depositing of said sliver transversely on said conveyor in overlapping runs; draw rolls to receive the overlapping runs of the material from said conveyor; means to advance said draw rolls at a given rate; feed rolls spaced from said draw rolls to receive the material from said draw rolls; means to advance said feed rolls at a rate faster than said given rate to draft the material intermediate said draw rolls and said feed rolls; a carding machine to receive the drafted web from said feed rolls; said carding machine including a doffer and a doffer comb to strip the web from the doffer; a trumpet for forming said web into a sliver; a condenser for said sliver; and a can coiler for collecting said sliver.

10. In apparatus for processing fibrous materials and forming the same into a web; means to feed said material into a carding machine; a carding machine for opening and paralleling the fibres and forming the same into a web; a trumpet to condense the web from said carding machine into a sliver; an apron conveyor; a carriage receiving the sliver from said trumpet; squeeze rolls on said carriage to compress the sliver into ribbon form and feed it onto said apron conveyor; means to advance said squeeze rolls at a predetermined rate; means mounting said carriage for displacement transversely of the conveyor at an angle substantially 45 degrees to the line of movement of said conveyor; means to advance said conveyor underneath said carriage at a rate to effect depositing of said ribbon on said conveyor in overlapping runs substantially 45 degrees to the line of travel of said conveyor; a pair of draw rolls to receive the overlapping runs of the material from said conveyor; means to advance said draw rolls at a given rate; a pair of feed rolls spaced from said draw rolls to receive the material from said draw rolls; means to advance said feed rolls at a rate substantially twice the given rate to effect a 2:1 draft of the material intermediate said draw rolls and said feed rolls, said draw rolls and feed rolls being clothed with metallic wire cylinder clothing and the rolls of each pair being spaced apart a distance sufficient that the clothings intermesh; a carding machine to receive the drafted lap from said feed rolls and form a web; and means to strip the web of material from said carding machine.

11. In apparatus for processing fibrous materials and forming the same into sliver, means to feed said material into a carding machine; a carding machine for opening and paralleling the fibres and forming the same into a web; a trumpet to condense the web from said carding machine into a sliver; an apron conveyor; a carriage receiving the sliver from said trumpet; squeeze rolls on said carriage to compress the sliver into ribbon form and feed it onto said apron conveyor; means to advance said squeeze rolls at a predetermined rate; means mounting said carriage for displacement transversely of the conveyor at an angle substantially 45 degrees to the line of movement of said conveyor; means to advance said conveyor underneath said carriage at a rate to effect depositing of said ribbon on said conveyor in overlapping runs substantially 45 degrees to the line of travel of said conveyor; a pair of draw rolls to receive the overlapping runs of the material from said conveyor; means to rotate said draw rolls at a given rate; a pair of feed rolls spaced from said draw rolls to receive the material from said draw rolls; means to rotate said feed rolls at a rate substantially twice the given rate to effect a 2:1 draft of the material intermediate said draw rolls and said feed rolls; said draw rolls and feed rolls being clothed with metallic wire cylinder clothing and the rolls of each pair being spaced apart a distance sufficient that the clothings intermesh; a carding machine to receive the drafted lap from said feed rolls to form a web and having a main cylinder and a doffer; a plate conforming to the circumference of said main cylinder and spaced closely adjacent thereto in advance of said doffer; a second plate conforming to the circumference of said doffer and spaced closely adjacent thereto; a doffer comb to strip the web from the doffer; a trumpet for forming said web into a sliver, a condenser for said sliver, and a can coiler for collecting said sliver.

12. Apparatus for processing fibrous material and forming the same into sliver, a weighing feed device to discharge weighed quantities of the material; a conveyor to receive the material discharged from said feed device; a pusher element to compact the weighed material on said conveyor into a given lineal distance; a carding machine for opening and paralleling the fibres and forming the same into a web; means to feed said material from the conveyer into the carding machine; drafting rolls for withdrawing the material from said carding machine at a rate faster than the normal rate of discharge; a trumpet to condense the web from said carding machine into a sliver; a lattice conveyor to carry the sliver to a point above the level of said drafting rolls; an apron conveyor;

a carriage receiving the sliver from said elevated position; squeeze rolls on said carriage to compress the sliver into ribbon form and feed it onto said apron conveyor; means to rotate said squeeze rolls at a predetermined rate; means mounting said carriage for displacement transversely of the conveyor at an angle substantially 45 degrees to the line of movement of said conveyor; means to advance said conveyor underneath said carriage at a rate to effect depositing of ribbon on said conveyor in overlapping runs substantially 45 degrees to the line of travel of said conveyor a pair of draw rolls to engage and receive the overlapping runs of the material from said conveyor; means to advance said draw rolls at a given rate; a pair of feed rolls spaced from said draw rolls to engage and receive the material from said draw rolls; means to advance said feed rolls at a rate substantially twice the given rate to effect a 2:1 draft of the material intermediate said draw rolls and said feed rolls and form a lap thereof, said draw rolls and feed rolls being clothed with metallic wire cylinder clothing and the rolls of each pair being spaced apart a distance sufficient that the clothings intermesh; a carding machine to receive the drafted lap from said feed rolls and form a web, said carding machine including a main cylinder, a doffer having circumferential web-splitting rings disposed at predeterminedly spaced intervals longitudinally of the doffer, and an auxiliary stripping roll confronting the main cylinder of the last-mentioned carding machine having card teeth in circumferential registry with the web-splitting means of said doffer, and having blank wire in registry with the normally clothed portions of the doffer, the card teeth of said auxiliary stripper being operable to remove the excess fibres not removed by the doffer; suction means to strip the card teeth of said auxiliary stripper and convey the excess fibres back to the feed device; a plate conforming to the circumference of said main cylinder, and spaced closely adjacent thereto in advance of said doffer and terminating adjacent said auxiliary stripper; a second plate conforming to the circumference of said doffer and spaced closely adjacent thereto; means defining slots in said first plate along the edge thereof adjacent said stripper; said slots being in registry with the card teeth of said auxiliary stripper; a doffer comb to strip the webs from the doffer formed by the web-dividing devices thereon; trumpets for forming said narrow webs into slivers; and a can coiler for collecting said slivers.

References Cited in the file of this patent

UNITED STATES PATENTS

61,219	Lewis	Jan. 15, 1867
267,513	Gessner	Nov. 14, 1882
363,732	Dobson et al.	May 24, 1887
406,985	Ashworth	July 16, 1889
467,888	Craggy	Jan. 26, 1892
534,418	Bates	Feb. 19, 1895
864,515	Collins	Aug. 27, 1907
978,998	Geb	Apr. 23, 1910
2,486,217	Slack et al.	Oct. 25, 1949

FOREIGN PATENTS

4,938	Great Britain	of 1888
664,817	Great Britain	Jan. 16, 1952