

July 6, 1965

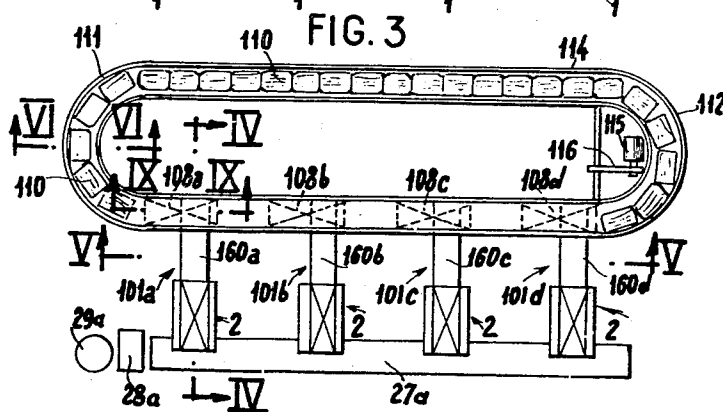
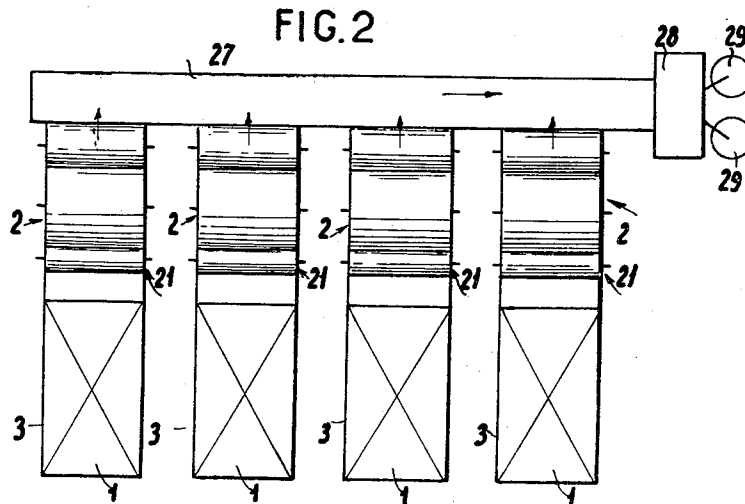
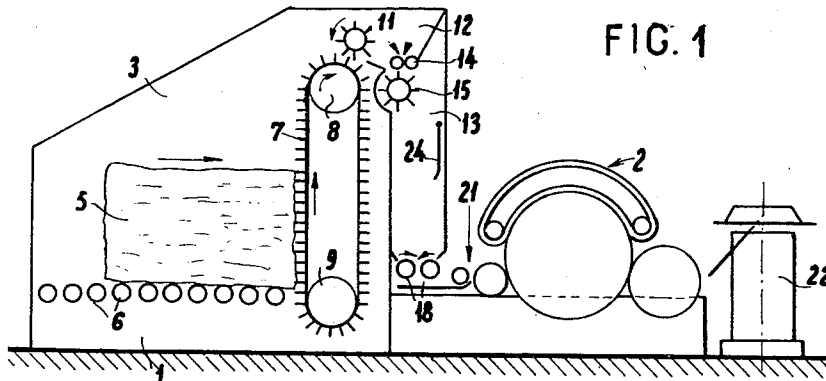
H. HALLEUX

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FIBER PROCESSING SYSTEM

Filed June 29, 1964

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July 6, 1965

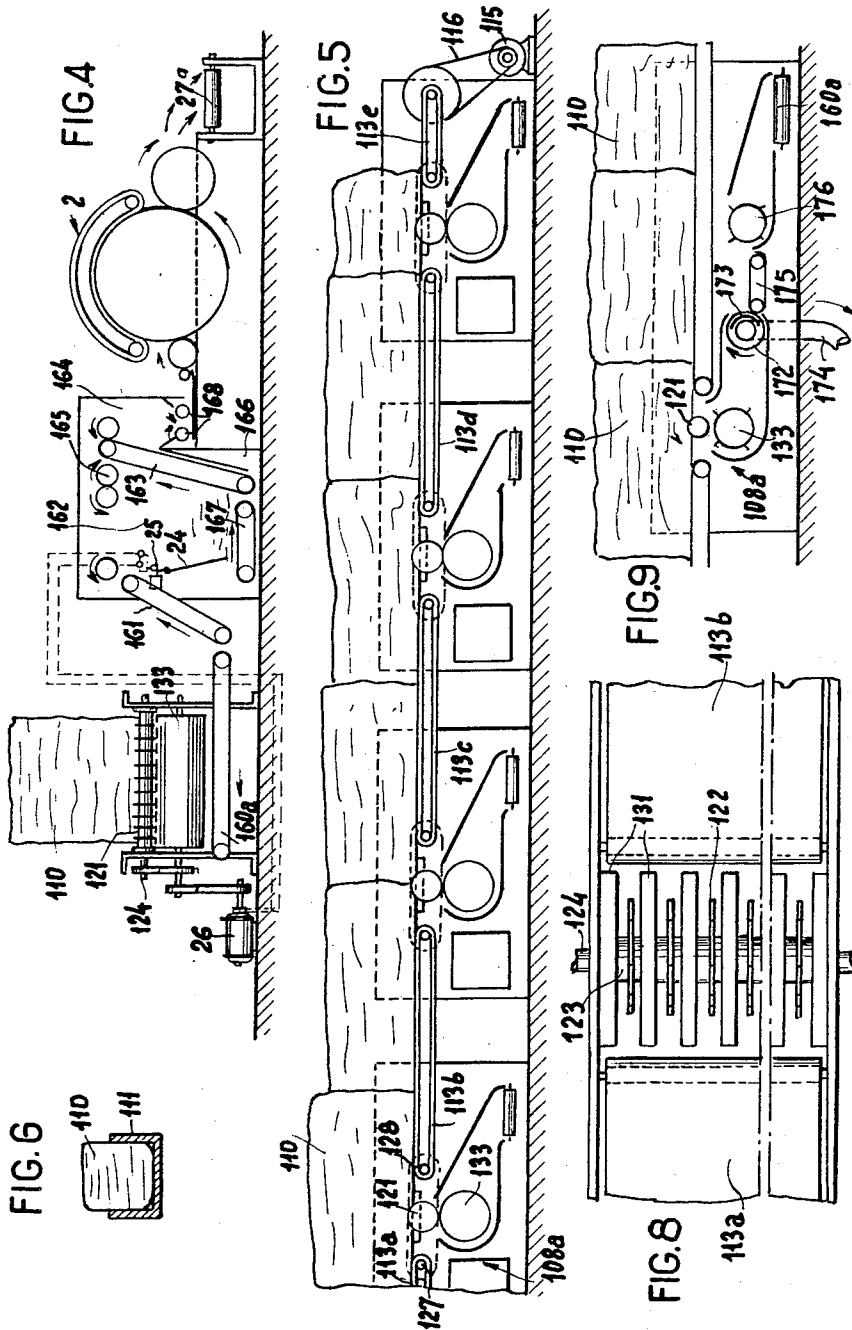
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FIBER PROCESSING SYSTEM

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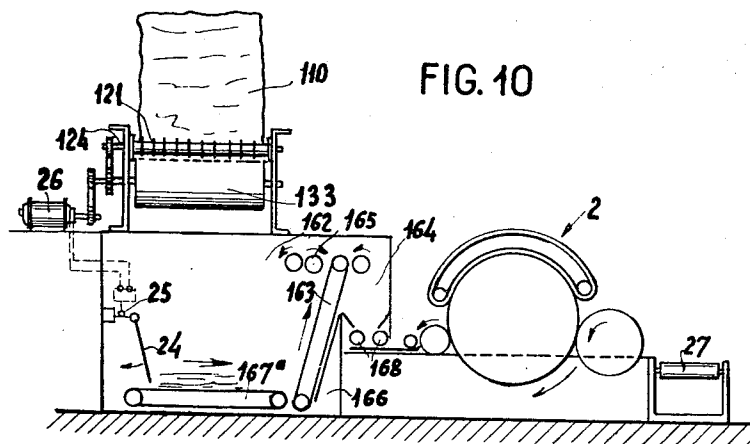
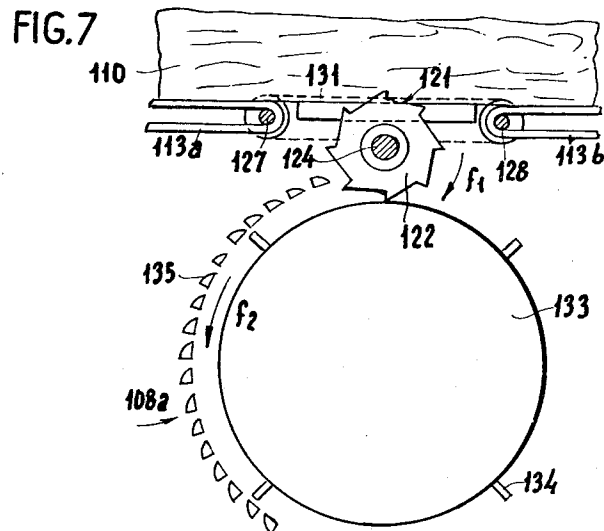
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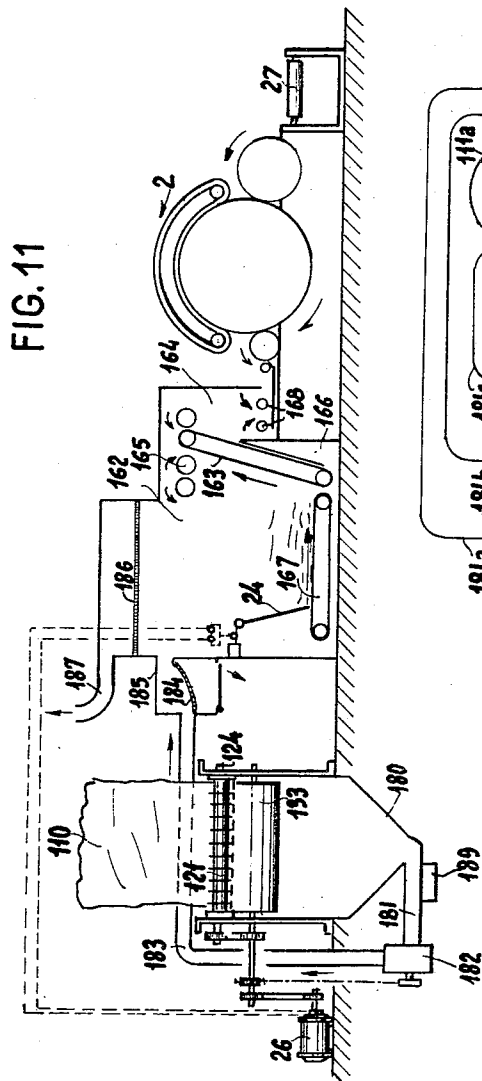


FIG. 11

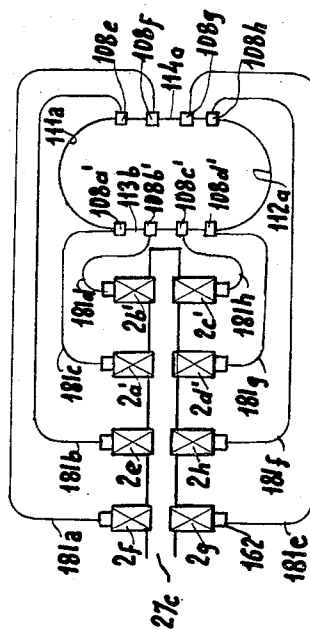


FIG. 12

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FIBER PROCESSING SYSTEM

Hubert Halleux, Clemenceau Mulhouse, Haut-Rhin, France, assignor to Societe Alsacienne de Constructions Mecaniques, Mulhouse, Haut-Rhin, France, a company of France

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3 Claims. (Cl. 19—65)

The present application is a continuation-in-part of my copending application Serial No. 69,020 filed November 14, 1960, now abandoned, and entitled "Fiber Processing System."

The invention relates to fiber processing for producing strips, webs or sheets of carded fiber material from bales of fiber.

Carding operations may be performed on various conventional machines herein referred to generally as carding machines or plants. The raw fiber stock, such as cotton, is delivered to the carding plant in the form of compact bales, and considerable relatively complex mechanisms have heretofore been required to withdraw the fiber from the bale and deliver the fiber to the carding plant in a proper condition for being processed.

An object of this invention is to simplify materially the apparatus for delivering the material from the fiber bale to the carding machine for carding purposes.

Heretofore, the bales were usually first broken up by heavy rotating bale-breaker wheels. Such material was then spread, cleaned, again spread, filtered, condensed and deposited in a layer upon a conveyor belt. All of these and other intermediate steps were performed at different stations and each of which stations required considerable floor space due to the large amount of broken-up fiber material present, and the material was usually moved from one to the following relatively distant station by conveyor means. In addition to the considerable equipment and over-all space required, the installations were further complicated by the ancillary equipment associated with the conveying operations.

An object of this invention is to provide a simple and highly compact apparatus, including relatively few parts for efficiently withdrawing the fiber directly from each bale and passing the same to a carding frame in a suitable condition for the carding operation and with only a minimum distance existing between the bale and the carding frame, thereby materially simplifying the conveying operations as well as reducing floor space.

A further object of this invention is to deliver fibrous material to a carding machine without the formation of a lap.

More particularly, the fiber material is withdrawn directly from the bale by a shredder member in operative engagement with a surface of the bale. There is further provided a fiber processing means comprising means supporting a fiber bale, a moving shredder member having sharp points projecting therefrom for engagement with a surface of the bale for stripping shreds of fiber therefrom on movement of the shredder member across the surface, a carding frame, and means for transferring the shredded fiber from the shredding member to the carding frame.

A further object of the invention is to provide a fiber processing system which is of particular advantage for producing a composite carded web from a plurality of bales consisting of fiber of selected, different grades.

For this purpose, the invention provides means including conveyor means for supporting a plurality of bales of fiber of selected grades at a plurality of shredding stations, a plurality of similar processing units associated with the respective stations with each unit being con-

2

structed and arranged as above described, and a common output conveyor associated with all of the units for receiving the carded fibers from all of the units and combining the fibers into a composite web.

Further objects and advantages of the invention will become more readily apparent to a person skilled in the art by reference to the following detailed description and attached drawings, in which drawings:

FIG. 1 is a diagrammatic elevation view of a fiber processing apparatus according to the invention;

FIG. 2 is a diagrammatic plan view showing on a reduced scale a system comprising a battery of four units of the type shown in FIG. 1, associated with a common output conveyor;

FIG. 3 is a plan view illustrating a modified embodiment;

FIG. 4 is a view on line IV—IV of FIG. 3 on an enlarged scale;

FIG. 5 is a section on line V—V of FIG. 3, on an enlarged scale;

FIG. 6 is a partial section on line VI—VI of FIG. 3;

FIG. 7 is a large-scale view of a detail of FIG. 5;

FIG. 8 is a plan view corresponding to FIG. 7;

FIG. 9 is a diagrammatic view of a modification of part of the apparatus shown in FIG. 5;

FIG. 10 is a view similar to FIG. 4 of a modification thereof;

FIG. 11 is a view similar to FIG. 4 showing pneumatic conveyor means; and

FIG. 12 is a diagrammatic plan view showing a system comprising an endless conveyor of the type shown in FIG. 3, cooperating with eight plucking devices and eight carding machines interrelated by pneumatic conveyor means.

Referring to FIG. 1, the apparatus includes a common frame 1 having a generally rectangular base (FIG. 2) and a set of four similar units are shown. The unit generally comprises a carding frame 2 and mechanism for feeding fiber to the frame from a bale 5 advanced to the unit along a roller conveyor 6. This mechanism is generally supported across laterally spaced upstanding walls 3.

The bale input to the unit is provided by the roller conveyor 6 which is shown somewhat inclined to the horizontal so as to feed the bales 5 by gravity, and thus present the leading end surface of each bale to a shredding member defined by an endless belt 7 provided with sharp outwardly-projecting points or prongs, and movable about vertically spaced pulleys or the like, 8 and 9. The pulleys are rotated in the direction of the arrow (pulley 8), and it will be seen that the upwardly moving left-hand flight of the belt 7 scrapes the leading end surface of the bale 5 applied thereagainst (by gravity) so as to strip shreds of cotton or other fiber from the bale and raise the shreds towards and over the upper pulley 8.

Spaced above the pulley 8 is a stripper or separator roller 11 provided with projecting points or the like which is rotated in a direction opposite to that of the pulley 8 with a peripheral velocity somewhat higher than the peripheral velocity of such pulley. Thus, the cotton shreds fed over the pulley 8 are stripped therefrom by the roller 11 and discharged into a hopper 12 and thereafter through a cleaner system including a pair of spaced smooth rollers 14 and a cleaner roller 15 into a vertical shaft, chimney or collecting chamber 13. The cleaner system 14-15 is optional and may in many cases be omitted.

Positioned at the bottom outlet of the chimney or shaft 13 is a pair of discharge rollers 18 serving to ensure a smooth continuous discharge of the cotton shreds from the shaft 13 and at the same time impart a controlled

degree of compression thereto. From the discharge rollers 18, the fiber shreds are passed directly to card feed rollers 21 and thereafter to the carding frame 2 which may be of conventional construction. The carded material discharged from the outlet of carding frame 2 is collected in a container 22.

The frame 2 comprises a conventional drum rotated at a predetermined velocity for achieving maximum efficiency and rate of production. The rate of rotation selected for the carding frame is the factor determining the rate of operation of all of the previously described components of the invention, including particularly the endless belt 7 and discharge rollers 18, all of which components are driven in timed relationship with the carding drum and at velocities in predetermined ratios with that of the drum and with one another. The velocity relationships are such that the amount of fiber material built up in the shaft or chimney 13 remains substantially constant and the degree of compactness of the material discharged from the bottom of the shaft is substantially uniform, as determined by the rotational speed of the discharge rollers.

To maintain a constant depth of material within the chimney or shaft 13, there is provided a conventional regulator means diagrammatically shown at 24 (FIG. 1) and comprising means responsive to the depth of material in the shaft to vary the drive velocity of the input means including endless belt 7 and stripper roller 11. It will be controlled in the system described.

FIG. 2 illustrates a battery of four units of the type above described arranged in parallel side by side relationship, and in which the carding frames 2 deliver their output to a common conveyor belt 27 extending transversely respecting the four units, so as to combine the carded webs issuing therefrom. The combined web is passed to a drafting unit 28 and thereafter to collector means 29.

It will be noted that in contrast to conventional systems in which the mixing of the fiber material derived from different bales is usually effected prior to the carding operations, whereas the mixing step in the present invention is effected on the conveyor 27 beyond the carding frames so that a much more efficient mixing with a substantially greater intimate intermingling of the fibers from the different bales is realized.

In the modifications illustrated in FIGS. 3 to 11, a different arrangement of the shredding mechanism is used. More specifically, the under or lower surface of each cotton bale, rather than the vertical end surface, is subjected to the action of a shredder member.

In more detail, the bales 110 are advanced along an endless conveyor path (FIG. 3) defined by two straight parallel spaced side conveyors interconnected at their ends by arcuate channels 111 and 112. Of the two straight side conveyors one, namely 114, may include a single full-length belt while the other comprises a series of spaced individual conveyor belts as shown at 113a to 113e (FIG. 5). In the spaces or gaps between the adjacent conveyor belts are positioned individual shredder tools 121, to be later described. All the conveyor belts are driven by a motor 115 through a belt and pulley drive 116.

As shown in FIG. 5, each shredder member or plucking device 121 is positioned between end drums 127 and 128 of the adjacent conveyor belts as at 113a and 113b, and is rotatable on a transversely mounted shaft 124. The shredder member comprises a plurality of spaced coaxial wheels 122 provided with asymmetrical teeth and mounted on the shaft 124 with intervening spacer disks 123 in such a manner that the teeth of the wheels project upwardly beyond the plane defined by the upper surfaces of the conveyor belts such as 113a and 113b for cutting into the under surfaces of the bales 110 supported by said belts. Spaced bars 131 bridge the gap between the adjacent conveyor belts to provide continuous support for the bales across such gaps.

In FIG. 3 there are provided four bale-shredding and carding units in parallel relationship, respectively designated 101a through 101d. Each unit comprises a carding machine 2, a plucking or shredding device and an upwardly opening casing between the carding machine and the shredding device. The casing includes an inner transverse wall or partition 166 for dividing the same into two upwardly opening fiber collecting compartments or chambers 162 and 164. The shredding devices are generally designated 108a through 108d and each includes a rotatable shredder member 121 of the type previously described, as well as the further mechanisms now to be described.

The shredder member 121 of each unit is driven by means of an electric motor 26, and below the shredder member is mounted a rotatable break-up or stripper drum 133 carrying projecting teeth 134 and rotated by motor 26 at a high speed as shown by arrow f2 (FIG. 7) so as to strip the shreds of cotton from the shredder member 121 and feed the same to a transversely disposed conveyor belt such as 160a, 160b, 160c, 160d, and it will be seen that as the plucking operation proceeds, the belts 160a-160d will each convey fibers successively removed from the successive bales. An arcuate grill 135 surrounds the downgoing side of the drum 133 in spaced relation to the periphery thereof for retaining the shreds and cooperating with the teeth 134 for further dividing the fiber.

The fibers conveyed by each belt 160a, 160b, 160c, 160d are taken up by an endless conveyor 161 provided with rakes or the like, and are dropped into the fiber collecting chamber 162 and onto a horizontal conveyor belt 167 mounted therein whereby the upper flight of belt 167 will be covered with fibers from one bale forming a layer on top of which will be deposited the fibers from another bale forming another layer, and so on. The fibers will fall, like snow, onto the left part of the conveyor 167 so that after the plucking has proceeded for a time, the conveyor 167 will support fibers from the successive bales in superposed formation (layers). As the successive fibers are caused to fall successively onto the conveyor in a spread condition, they are deposited onto the conveyor as successive layers. This does not mean that the deposited fibers are or must be retained on the conveyor to prevent each batch from rotating as the layers move into contact with the conveyor 163. The layers deposited on the conveyor 167 prior to any operation of the conveyor 163 are indicated at X. A lateral portion of the superposed layers of fibers is upwardly removed from belt 167 by means of an endless conveyor 163 mounted in chamber 162 adjacent wall 166 and having rakes or the like. From the upper end of conveyor 163 the fibers from the superposed layers are dropped into the other fiber collecting chamber 164 in which the fibers are deposited in mixed condition. The number of fibers delivered to chamber 162 is greater than is necessary to feed the conveyor 163, at least at the start thereof.

Conventional scraper means 165 are mounted in chamber 162 near the top of the conveyor 163.

The amount of fibers in chamber 162 may be kept substantially constant by means of a conventional regulating system comprising a feeler member 24 pivotally supported in chamber 162 and adapted to actuate a control switch 25 connected to the circuit of motor 26 so that upon actuation of the switch, the circuit is opened and rotation of shredder member 121 arrested. When the amount of fibers in chamber 162 is in excess, the fibers move the feeler member 24 into switch-engaging position and no further fibers will be conveyed to chamber 162. Discharge rollers 168 are provided for controlling the rate of discharge from the chamber 164.

From the bottom outlet of chamber 164, the shredded and compressed fiber stock is passed to the carding machine 2. From the outlet of carding machine 2 the carded fiber is deposited on a conveyor belt 27a common

to all four carding machines and which extends across the outlets as shown in FIG. 3 where the outputs of the four carding machines are combined, passed to a common drawing unit 28a and then to a receiver 29a.

In the operation of the system shown in FIGS. 3-8, cotton bales 110 which may include bales of different grades of cotton stock are charged on the conveyor system 111, 112, 114 at a loading station, and are advanced around the conveyor system. As each bale moves past a shredder device such as 108a the under surface is scraped by the related shredder member 121 and the shreds removed drop onto the related conveyor belt 160a, and thereafter processed in the manner described.

It will be apparent that in any one of the four units, the collecting chamber 162 at any given time contains layers of shredded material stripped in turn from all of the bales advanced along the conveyor, and if the bales of different grades are interspersed thereon in regular cyclic succession, or otherwise, a substantially intimate uniform mixture of the various grades is obtained, especially in view of the action of the conveyor 163 which, as above indicated, is provided with sharp points for picking up the fiber from within collecting chamber 162, thereby achieving a fine mixture of the various layers contained therein. The resulting web issuing from each carding machine 2 and deposited on conveyor 27a combines with the similar webs from the other carding machines, thus again improving the uniformity of the mixture. Preferably, the direction of rotation of the bales 110 on the conveyor is reversed from time to time to cause the bales to be scraped by the shredders first in one direction, then in the other, thereby improving the efficiency of the shredding operations especially near the ends or corners of the under surfaces of the bales.

If desired, conventional cleaning and spreading apparatus may be interposed at the output from each shredder mechanism such as 108a. In FIG. 9, such added apparatus is diagrammatically illustrated at 172 as being interposed between stripper drum 133 and the conveyor belt 160a of unit 108a. The conveyor and elevator means shown for passing the fiber stock from each unit to the next are not restricted to the endless belts shown. The rotary cylinder 172 is provided with a perforated cylindrical wall and a stationary arcuate inner wall member 173 arranged to cover the perforations along a portion of the circumference of the cylinder, the interior of which communicates through a pipe 174 with a vacuum source. The vacuum will draw the fibers toward cylinder 172 and cause such fibers to adhere to the outer wall of the cylinder and move therewith until the same reach the zone opposite the arcuate inner wall member 173. Such wall member covers the perforations of the cylinder in such zone and hence the fibers are no longer subjected to the vacuum effect and are free to fall onto a conveyor belt 175 which delivers the detached fibers to an additional beater cylinder 176.

In FIG. 10, there is shown a modified structure in which the plucking device 121 is arranged in a different manner relative to the collecting chamber 162. More specifically, the plucking device 121 is arranged above the chamber 162 thereby eliminating the conveyor means 160a and 161 with fibers being deposited onto the conveyor 167a.

As a modification of the embodiment disclosed in FIGS. 3 and 4, it is contemplated to substitute for the conveyor belts 160a through 160d and 161 a pneumatic conveyor system as disclosed in FIG. 11 comprising a fiber receiving chamber 180 disposed below the shredding device such as 121-133 and communicating with an air pipe section 181 which has an exhaust fan 182 at its end remote from chamber 180. The fan is driven from motor 26 and blows the fiber carrying air sucked from chamber 180 along an air pipe section 183 leading to the fiber collecting chamber 162. The air current in pipe section 183 may be conducted over a perforated concave plate member 184 mounted within a casing 185 to deflect the

air current traversing the casing so that heavier impurities will be discharged by inertia through the perforations of plate member 184 and accumulate on the removable bottom wall of casing 185. The chamber 162 is provided with an air outlet 187 positioned above the air inlet, and between such air inlet and outlet extends a gauze partition 186 which prevents the fibers from passing into the air outlet 187, but allows dust or other fine impurities to be discharged from chamber 162 with the outflowing air current. A permanent magnet 189 may be disposed on air pipe section 181 to extract from the fibers any metallic particles which might be contained therein.

A pneumatic conveyor system such as shown in FIG. 11 facilitates the disposition of a plurality of carding machines with respect to the endless bale conveyor path disclosed in FIG. 3. The fiber preparing system shown in FIG. 12 is contemplated for continuous delivery of fibers removed from a plurality of bales to eight carding machines, and comprises essentially four shredding devices 108a', 108b', 108c', 108d' disposed along the straight side 113b of the endless bale conveyor path, four shredding devices 108e, 108f, 108g, 108h disposed along the straight side 114a of said path, and separate pneumatic feed lines 181a through 181h connecting the fiber collecting chamber 162 which precedes each carding machine to a related shredding device. By reason of the separate pneumatic feed lines, it becomes convenient to dispose four carding machines 2g, 2h, 2d', 2c' in parallel side by side relationship along one side of a common conveyor belt 27c extending at right angles to the straight side 113b of the endless bale conveyor path, and to dispose the other four carding machines 2f, 2e, 2a', 2b' along the other side of the common conveyor belt 27c so that the latter will receive the output from all the carding machines.

It will be apparent from the foregoing description that the present fiber processing system achieves a number of notable advantages over conventional systems. The number of mechanical components required is greatly reduced, thus reducing floor space requirements and cost of installation, operation and maintenance. The conveyor means required to pass the stock from each unit of apparatus to the next are substantially less in number and extent than are required in conventional plants where extensive and complicated conveyor installations are usually required in view of the considerable lengths of the path over which the stock travels. Furthermore, most of the operations involved in the delivery of fibrous material to a carding machine in the form of a lap are to a very great extent eliminated, due to the direct shredding of the fiber from a surface of the bales.

The invention is not to be confined to any strict conformity to the showings in the drawings, but changes or modifications may be made therein so long as such changes or modifications mark no material departure from the spirit and scope of the appended claims.

What is claimed is:

1. A system for preparing and mixing the fibers from a plurality of consecutive bales of fibers for continuous delivery to a plurality of carding machines, comprising conveyor means for moving said bales continuously in a same direction along the same path, a plurality of plucking devices disposed in said path to remove fibers from said bales as they move past the plucking devices, a rotatable stripper roller arranged to strip off the fibers from each plucking device, an arcuate grill partly surrounding each roller and cooperating therewith for further dividing the fibers, each of said plucking devices being associated with one of said carding machines, a casing disposed between each carding machine and its associated plucking device, a wall in said casing extending from the bottom thereof towards the upper space of the casing to divide the latter into two upwardly opening fiber collecting chambers, means to deposit the fibers from the associated rotatable stripper roller in one of said chambers so as to form therein a plurality of superposed horizontal

layers composed by the fibers removed by the associated plucking device from each of said plurality of bales, an endless rake conveyor means in said one chamber extending adjacent said wall from the bottom of said one chamber to a point above said wall, said rake conveyor means being adapted to continuously remove approximately the same amount of fibers from each of said superposed layers and to discharge the fibers from the different layers in mixed condition through said upper space into the other fiber collecting chamber, and means to deliver the mixed fibers deposited in said other chamber to the corresponding carding machine.

2. A system for preparing and mixing the fibers from a plurality of consecutive bales of fibers for continuous delivery to a plurality of carding machines, comprising conveyor means for moving said bales continuously in a same direction along the same path, a plurality of plucking devices disposed in said path to remove fibers from said bales as they move past the plucking devices, each of said plucking devices being associated with one of said carding machines, a casing disposed between each carding machine and its associated plucking device, a wall in said casing extending from the bottom thereof towards the upper space of the casing to divide the latter into two upwardly opening fiber collecting chambers, means to deposit the fibers from the associated plucking device in one of said chambers so as to form therein a plurality of superposed horizontal layers composed by the fibers removed by the associated plucking device from each of said plurality of bales, an endless rake conveyor means in said one chamber extending adjacent said wall from the bottom of said one chamber to a point above said wall, said rake conveyor means being adapted to continuously remove approximately the same amount of fibers from each of said superposed layers and to discharge the fibers from the different layers in mixed condition through said upper space into the other fiber collecting chamber, means to deliver the mixed fibers deposited in said other chamber to the corresponding carding machine, and automatically actuated means within said one chamber operative for inactivating said plucking device when the fibers have attained a predetermined level in said one fiber collecting chamber thereby stopping the delivery of fibers to such chamber.

3. A system for preparing and mixing the fibers from

a plurality of consecutive bales of fibers for continuous delivery to a plurality of carding machines, comprising conveyor means for moving said bales continuously in the same direction along the same path and separate feed lines, one for each carding machine, each feed line including a plucking means located in said path for removing a predetermined amount of fibers from each of said consecutive bales as they move past the plucking means, means defining two upwardly opening fiber collecting chambers, a horizontal endless conveyor belt disposed on the bottom of one of said two chambers, second conveyor means for successively conveying said predetermined amount of fibers from said plucking means to the top of said one chamber for forming therein a plurality of superposed horizontal layers deposited on said conveyor belt and composed by said predetermined amount of fibers removed from each one of said consecutive bales respectively, third conveyor means mounted in said one chamber to remove upwardly the fibers from one end of said layers and discharge the same into the other chamber wherein the fibers will deposit in mixed condition, means for delivering the mixed fibers from said other chamber to its respective carding machine, and automatically actuated means within said one chamber operative for inactivating said plucking means for stopping the delivery of fibers to one of the fiber collecting chambers when the fibers have attained a predetermined level in said one chamber thereby arresting the delivery of fibers to said one chamber.

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DONALD W. PARKER, *Primary Examiner.*

RUSSELL C. MADER, *Examiner.*