

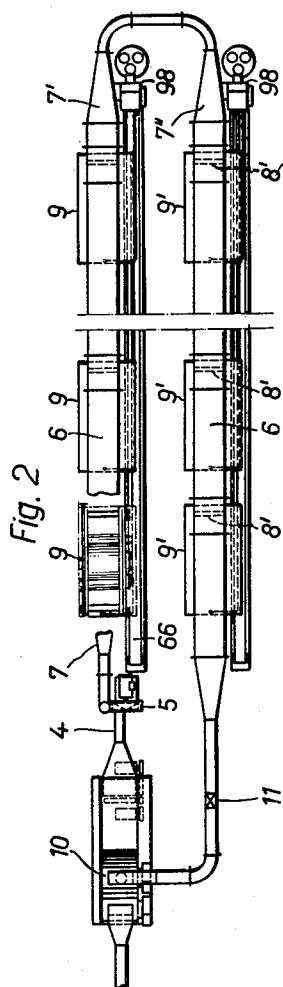
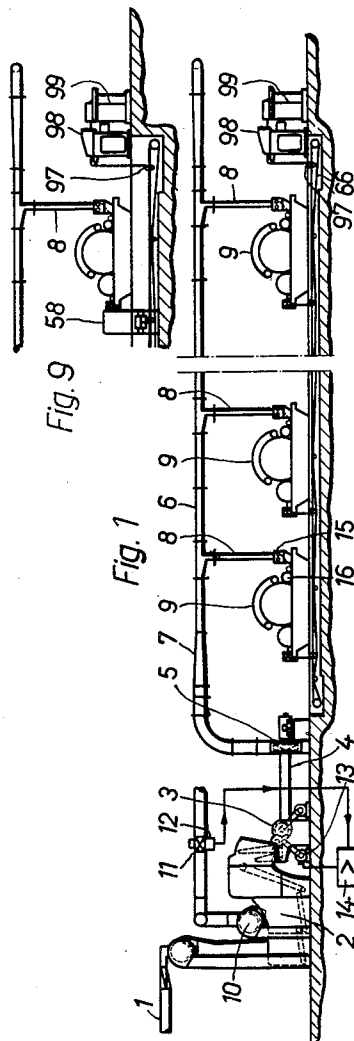
April 17, 1962

R. WILDBOLZ ET AL
AUTOMATIC CARDING PLANT

3,029,477

Filed Sept. 16, 1959

4 Sheets-Sheet 1



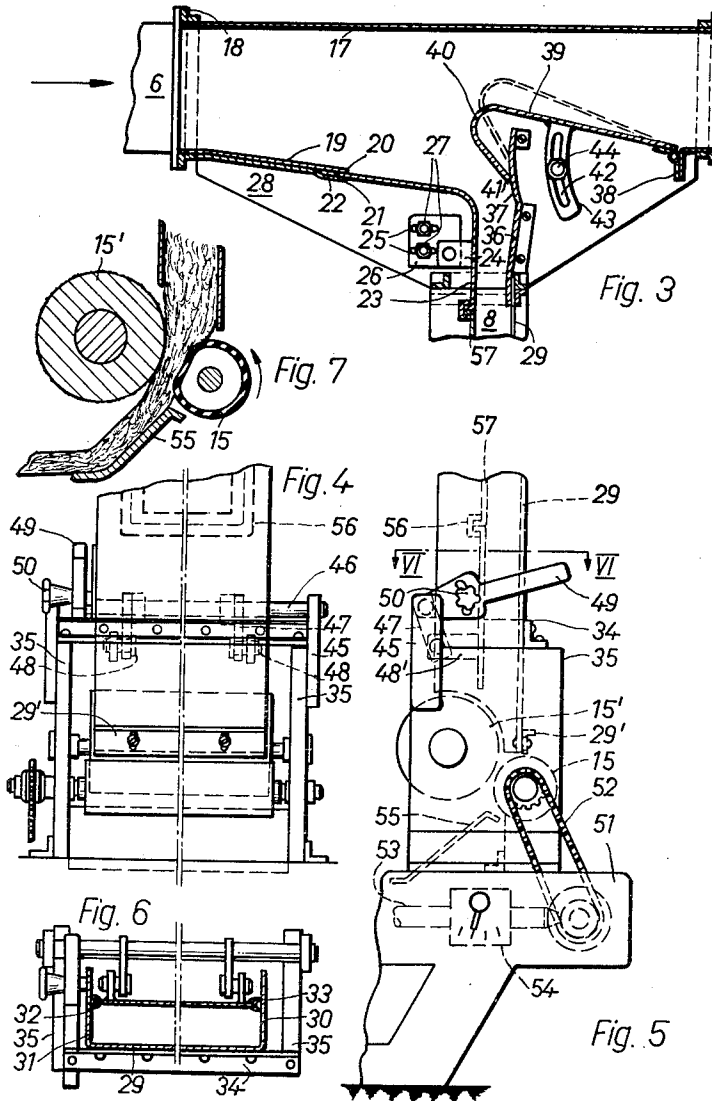
April 17, 1962

R. WILDBOLZ ET AL
AUTOMATIC CARDING PLANT

3,029,477

Filed Sept. 16, 1959

4 Sheets-Sheet 2



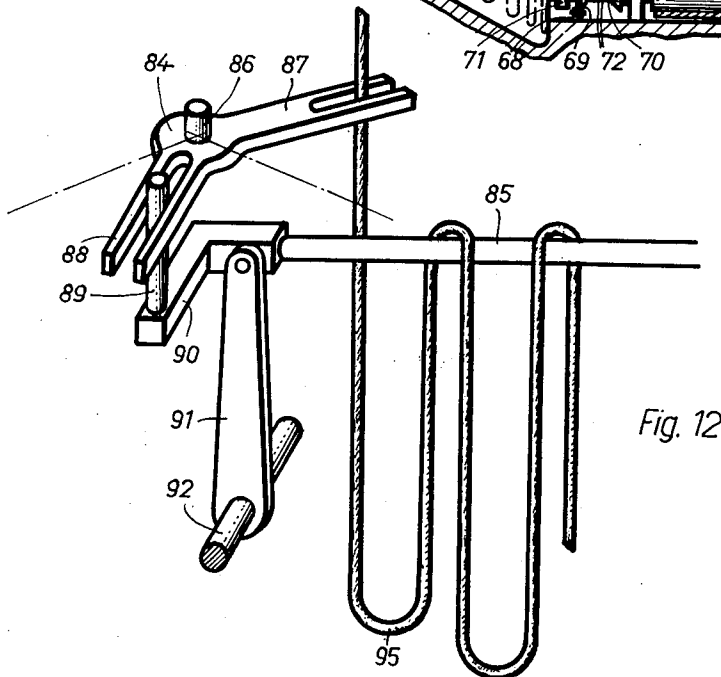
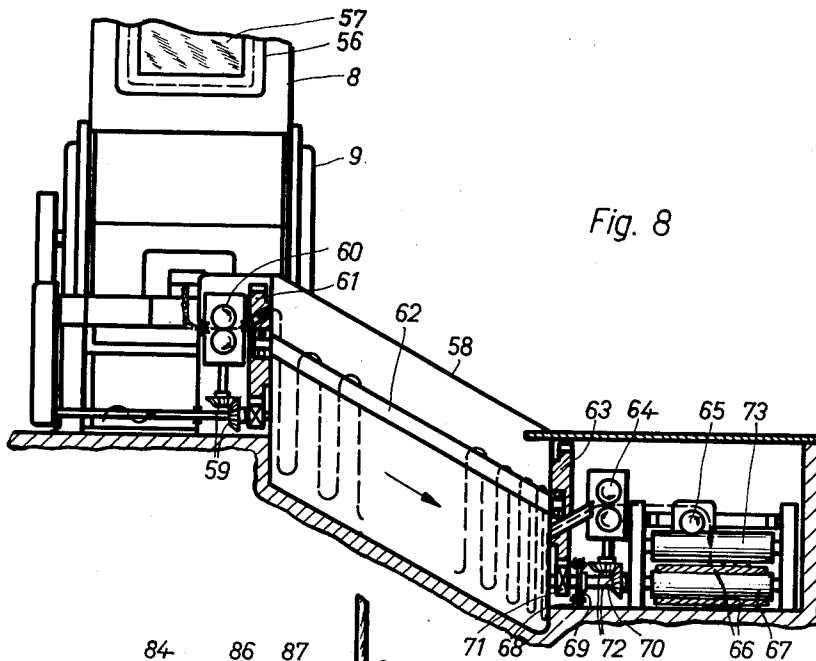
April 17, 1962

R. WILDBOLZ ET AL
AUTOMATIC CARDING PLANT

3,029,477

Filed Sept. 16, 1959

4 Sheets-Sheet 3



April 17, 1962

R. WILDBOLZ ET AL
AUTOMATIC CARDING PLANT

3,029,477

Filed Sept. 16, 1959

4 Sheets-Sheet 4

Fig. 11

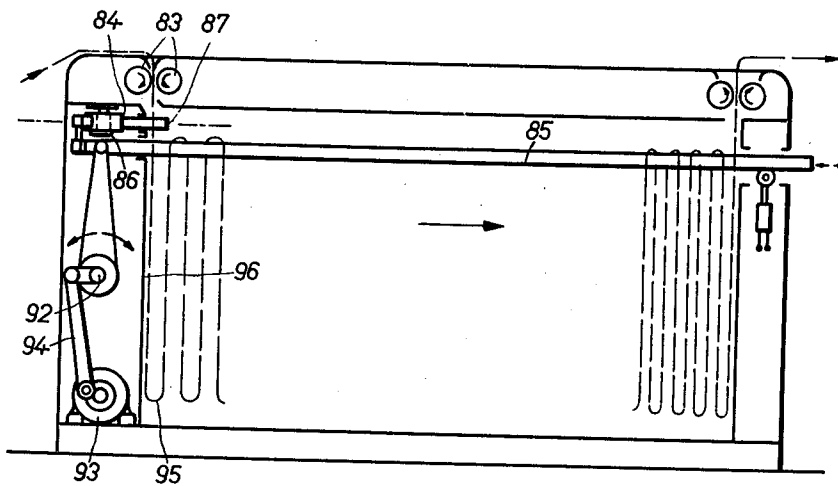
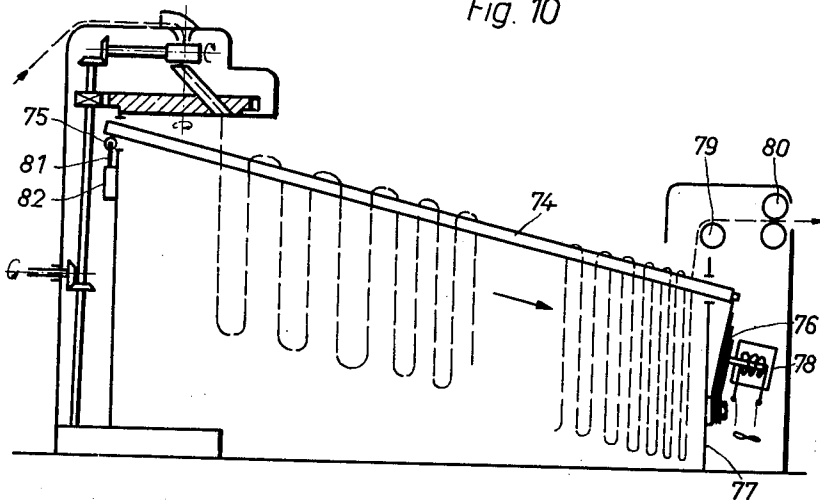


Fig. 10



1

3,029,477

AUTOMATIC CARDING PLANT

Rudolf Wildbolz and Rolf Binder, Winterthur, and Paul Stäheli, Wallisellen, Switzerland, assignors to Actiengesellschaft Joh. Jacob Rieter & Cie, Winterthur, Switzerland, a corporation of Switzerland

Filed Sept. 16, 1959, Ser. No. 840,395

Claims priority, application Switzerland Sept. 19, 1958
23 Claims. (Cl. 19—2)

The invention relates to an automatic carding plant of a spinning mill.

In conventional cotton spinning mills the carding machines are supplied by laps produced by an apparatus forming the last stage of the cleaning process. The finished lap rolls must be transported to the carding machine and placed thereon. The lap rolls must be unwound and fed into the carding machine. Though the lap can be automatically released from the lap machine, no practicable means have been found as yet to automatically place the lap on the carding machine and to automatically feed the lap to the feed rollers.

It is an object of the present invention to provide an automatic carding plant which eliminates the discontinuity and complexity of operation of conventional carders by providing a pneumatic feeding system for a plurality of carders, each of which includes a vertical cotton depositing duct forming part of a common circulating system containing a cotton transporting medium whose pressure is superatmospheric in the vicinity of the carders, the system being fed by a cotton supply machine according to the cotton consumption of the carders.

The invention eliminates the step of producing a lap roll, which step is required by the conventional systems to make it possible to transport the material, and of unwinding the lap roll at the carder. Automatic lap roll producing machines are complicated, particularly if uniformities produced by the pulling action during the formation of the lap rolls must be avoided. In the system according to the invention lap roll producing means causing ununiformity of the lap are completely eliminated.

The plant according to the invention includes an apparatus for measuring the flow of cotton downstream of the connection of the last carder to a circulating duct which apparatus controls the supply of cotton to the plant. The apparatus permits, for example, a return flow of approximately 10% of the cotton supplied to the system by an opening machine so that ample supply of cotton to all carders including the last ones is assured.

The circulating duct is preferably arranged overhead and the carders are supplied by vertical ducts or shafts from the overhead duct. The flow area of the horizontal overhead duct increases directly before each connection of a vertical duct to the overhead duct and decreases immediately downstream of each such connection. The flow area of the circulating duct is gradually increased to a suitable size downstream of the portion having a reduced flow area. Reduction of the flow area of the overhead circulating duct downstream of each connection of a vertical duct is preferably effected by a flap swingably connected to the overhead duct and forming part of the wall of the overhead duct. The flap has a free end edge portion engaging a suitably shaped portion of the upper end of the wall of the respective vertical duct and forming a closure or seal against the outside at all positions of the flap.

It is advisable to slightly increase the flow area of the lower portions of the vertical ducts whereby the extent of this increase depends on the operating conditions. The portion of the wall of the vertical shaft opposite the flap described in the paragraph next above is preferably made

2

displaceable parallel to itself so that the flow area of the inlet of the vertical shaft and consequently the cotton supply to a pair of discharge rollers at the lower end of the vertical shaft can be adjusted. The speed of rotation of these rollers is adjustable so that the amount of cotton supplied to a carder can be accurately controlled. The driven one of the aforesaid rollers may be provided with an elastic covering which automatically regulates the feeding of the respective carder.

A considerable clearance is provided between the walls of the vertical shafts and the periphery of the rollers allowing escape of the cotton transporting medium and retaining the cotton inside the cotton depositing ducts. The size of the clearance can be controlled by manipulation of a suitable slide connected to the lower end of the vertical duct. The pressure of the gaseous cotton transporting medium in the circulating duct and in the vertical cotton depositing ducts is higher than that of the ambient atmosphere and, because of the clearance at the lower ends of the vertical ducts, a downward current develops in the vertical ducts, increasing movement of cotton to the portions of the cotton depositing ducts where the cotton is relatively less dense, and permits a greater flow of air, if air is used as transport medium.

In a plant according to the invention, the slivers produced by the carding machines are not deposited in cans which must be transported to the subsequent machines and placed thereon, as is the case in conventional plants, but are deposited side by side on a continuously operating transport means, for example a conventional conveyor, which is placed alongside a row of carders, and are supplied in parallel relation to the drafting arrangement. The purpose of the latter is not only the parallel arrangement of the fibres but also an equalization of the weight of the roving. The plant according to the invention includes a drafting arrangement which is particularly suitable for this purpose, feeding the supplied slivers either jointly or individually and regulating the drafting operation accordingly.

A sliver accumulating device may be provided between each carding machine and the sliver transport means so that a carding machine may be stopped without immediately interrupting sliver delivery. This device also equalizes the delivery of slivers, if the sliver production of the carders is not uniform, for example, due to different belt slip, and affords provision of a running on and running out of the sliver.

An object of the invention is, therefore, the provision of a sliver accumulator between two continuously operating preparatory spinning machines, whereby one machine produces the sliver and the second machine receives the sliver. In lieu of the second machine the sliver may be deposited on a conveyor.

The conventional deposition of the slivers in cans and transporting the cans to a subsequent machine is a discontinuous operation which contradicts the continuous operation of the processing machines. The invention eliminates this discontinuous operation which causes disturbances and is costly, by directly and continuously conducting the sliver from one machine, for example a carder, to a consecutive machine, for example a drafting arrangement. This kind of operation, per se, necessitates stopping of the first or second machine, if one of the machines must be stopped because of an operating irregularity, in order to prevent breaking or excess delivery of sliver.

The sliver accumulator according to the invention, which is interposed between two processing machines, overcomes the aforescribed difficulty by automatically receiving the sliver produced in the first continuously operating machine, accumulating a certain length of sliver

and delivering the sliver to the subsequent continuously operating machine at a certain time lag, defined by the length of the accumulated sliver.

The novel features which are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, and additional objects and advantages thereof will best be understood from the following description of embodiments thereof when read in connection with the accompanying drawing, in which:

FIG. 1 is a schematic side elevation of an automatic carding plant according to the invention.

FIG. 2 is a plan view of the plant shown in FIG. 1.

FIG. 3 is a vertical longitudinal section of a connection between a horizontal overhead circulating duct and a vertical cotton supply duct.

FIG. 4 is an elevation of the lower end of a vertical duct as seen from the intake side of a carder.

FIG. 5 is a side view of the vertical duct portion shown in FIG. 4.

FIG. 6 is a horizontal section of a vertical duct, the section being made along line VI—VI in FIG. 5.

FIG. 7 is a cross sectional view of a modified roller pair at the outlet of a vertical duct.

FIG. 8 is a diagrammatic part sectional illustration of a sliver transporting apparatus including a sliver accumulator.

FIG. 9 is an elevation of the part of the apparatus shown in FIG. 8, at the end of a row of carders.

FIG. 10 is a diagrammatic elevation of a sliver accumulator having an open loop deposition.

FIG. 11 is a diagrammatic elevation of a modified lap accumulator.

FIG. 12 is a perspective illustration of a part of the device shown in FIG. 11.

Referring more particularly to FIGS. 1 and 2 of the drawing, numeral 2 designates a hopper feeder receiving fibrous material from an opener, not shown, through a supply conduit 1 through which the fibrous material is pneumatically transported. The fibrous material is finely tufted by a beater 3 in the conventional manner. The fine tufts are drawn through a conduit 4 by means of a blower 5 which transports the tufts by means of a transporting medium, for example air, at superatmospheric pressure into an elevated circulating pipe line 6. An adapter 7 converts the cross section of the exhaust duct of the blower 5 to a rectangular cross section which is approximately as broad as a carder. Vertical cotton depositing ducts 8 individually connect the duct 6 to carders 9 which are placed in a row. After serving a first row of carders the duct 6 extends above a second row of carders 9' which are supplied by vertical ducts 8' (FIG. 2). The end of the elevated duct 6 is connected to a conventional suction box 10 which is connected to the hopper feeder 2 and provided with a dust cage. A conventional device 11 or a device as disclosed in the patent application of Hansruedi Lamparter, Serial No. 31,585, filed May 25, 1960, is provided in the duct 6 close to the suction box 10 for measuring the weight of the cotton returned to the box 10 and for producing an electric signal corresponding to the weight of the returned cotton. The signals produced by the device 11 actuate a control apparatus 12 which controls the amount of fibrous material supplied by the hopper feeder 2 and the beater 3 according to the amount of cotton returned to the suction box 10. This control is effected by controlling the operation of an electric motor 13 which drives the beater 3 and the feed elements of the hopper feeder 2. The control of the motor 13 is preferably effected by controlling the armature voltage, for example, through a magnetic amplifier 14 according to the signals produced by the apparatus 12.

By shaping the flow area of the overhead duct 6 at the connections of the vertical ducts 8 and 8' and providing suitable regulating devices, which will be described

later, cotton is deposited in the vertical ducts and accumulates in the lower portions thereof up to a certain elevation. The accumulated cotton is discharged from the lower ends of the vertical ducts by means of rollers 15 and 15' which form bits and feed the cotton in slightly compressed condition to a taker-in 16 of the carding machine. The plant schematically shown in FIGS. 1 and 2 comprises two rows of carding machines, each row having but a few carders. The portions of the circulating duct 6 supplying the individual rows of carding machines are connected by connecting duct pieces 7' and 7'' so that both rows are supplied with cotton from the same circulating duct. The circulating duct may be so arranged as to supply a great number of carding machines.

The connection of a vertical supply duct 8 to the overhead duct 6 includes a connecting piece 17 (FIG. 3), having a rectangular cross section and being inserted in the horizontal duct 6. The flow area of the connecting piece 17 increases downstream of a connecting flange 18, the lower wall 19 of the connecting piece being slightly slanted downward and formed by two plates 20, 21 whose end portions are slightly spaced, forming a slot 22 receiving a marginal portion of a sheet metal piece 23. This is so bent as to form a continuation of the wall 19 and the upper left wall of the vertical duct 8. A flange 24 is pivoted to a plate 26 which is horizontally slidably connected to downward extensions 28 of the connecting piece 17, slots 25 being provided in the plate 26 for receiving screws 27 extending from the extension 28. By moving the sheet metal piece 23 more or less deeply into the slot 22 the inlet area of the duct 8 can be changed. The wall portion 29 opposite the sheet metal piece 23 and the lateral walls of the vertical duct are formed by a U-shaped plate having flanges 30 and 31 (FIG. 6), the laterally movable element 23 being placed between the flanges 30 and 31 and parallel to the wall 29. The vertical edges of the element 23 are provided with elastic seals 32 and 33 for closing the vertical duct to the outside. The seals 32 and 33 are not shown in FIGS. 3, 4 and 5. A beam 34 is riveted or screwed to the wall 29 and connected to supports 35. The wall 29 continues upwardly into a slightly outwardly bent wall portion 36 having an arched top portion 37. The center of the curvature of the portion 37 coincides with the fulcrum of a hinge 38 connecting a flap 39 to the lower wall of the element 17 close to the outlet end of the latter. The free end of the flap 39 is bent downward at 40 and has an edge 41 slidably engaging the arched element 37. An arched element 43 extends downward from the flap 39 and is provided with a slot 42 receiving a bolt 44 mounted on a side wall of the element 17 for holding the flap 39 in any desired position. This position depends primarily on the position of the vertical duct 8 relative to the other ducts 8 of the same row of carding machines. The flap 39 of the connecting piece 17 for connecting the first vertical duct 8 to the circulating duct 6 is fixed in a position which is lower than the flaps 39 of the subsequent connecting pieces.

The position of not only the upper part of the vertical duct wall 23 is adjustable but also the position of the lower end portion of the wall 23 is adjustable relative to the wall 29. As seen in FIGS. 4 and 5 a shaft 46 is rotatably supported by a vertical stationary support 45. Arms 47 are rigidly connected to the shaft 46. The wall 23 is provided with flanges 48' which are pivoted at 48 to the arms 47. The angular position of the shaft 46 and, consequently, the position of the lower portion of the wall 23 is defined by the position of a lever 49 which is rigidly connected to the shaft 46 and whose position can be fixed by manipulating an arresting screw 50 extending through an arched slot in the lever 49. Delivery rollers 15 and 15' are placed adjacent to the lower end of the vertical duct 8 and are rotatably supported by elements 35 provided on both sides of a frame 51 of a carding machine. The lower roller 15 which has a rela-

5

tively small diameter is driven by a chain 52 which receives its drive from the drive shaft 53 of the carding machine via a continuous speed changing gear 54. The upper and relatively large roller 15' is freely rotatable. The roller 15' must have a larger diameter because the wall 23 located thereabove can be moved substantially parallel to itself and should always be above the roller 15'. Both rollers form a closure for the lower end of the duct 8. The cotton entering the bite formed by the rollers 15, 15' and being discharged by the rollers from the duct 8 is deposited on a guide plate 55 from which it is fed into the taker-in 16 of the carding machine 9.

The positively driven relatively small roller 15 may be provided with an elastically deformable surface, somewhat like the tire of an automobile (FIG. 7) so that, if the cotton concentration increases due to a disturbance in the deposition of the cotton in the vertical duct, the density of the cotton mass increases and the elastic drive roller 15 is compressed whereby its active driving radius is reduced. This causes slowing down of the discharge of the cotton from the duct 8 and of the supply of cotton to the carding machine 9. A pair of rollers as described acts for fully automatically apportioning the cotton supply to the individual carders. At least one of the rollers may be provided with a rough surface, for example, by gluing coarse sand thereto.

A substantial clearance is provided between the rollers 15, 15' and the walls 23 and 29 and the flanges 30 and 31 which clearance permits escape of transporting medium, for example air, but not of the cotton. This is important because it creates a downward air current from the circulating duct 6, in which the air pressure is relatively high, through the duct 8. This air current acts particularly on the relatively loosely deposited cotton, compressing the cotton and making the density of the cotton mass deposited in the vertical shafts uniform.

The width of the clearance between the wall 29 and the roller 15 can be adjusted by lowering or raising a slide 29' mounted to the lower end of the wall 29. For observing the elevation of the cotton accumulation in the lower end of the shaft 8, a transparent plate 57 is inserted in a frame 56 mounted to the wall 23.

A sliver accumulating apparatus 58 is preferably provided at the outlet of each carding machine 9.

The modification of this apparatus schematically shown in FIG. 8 comprises a pair of feed rollers 60 which are supported in a conventional manner, not shown, and are driven by the drive shaft of the carding machine through bevel gears 59, a relatively slowly rotating coiling wheel 61, also driven by the drive shaft of the carding machine, and an inclined sliver supporting rod 62 whose high end receives the sliver from the coiling wheel 61 and whose low end is placed at the rotation axis of an uncoiling wheel 63 whereby the sliver loops slide on the carrier rod 62 by gravity from the high receiving end to the low delivering end. Each of the wheels 61 and 63 may be supported by three pinions as is usually done in sliver coilers whereby one of the pinions (71) may be used for driving the coiling wheel. The ends of the rod 62 are provided with pins extending into the inner race of ball bearings for the coilers 61 and 63. The latter cooperates with a pair of delivery rollers 64 for continuously feeding the sliver around a roller 65 onto an endless conveyor 66 driven by rollers 67, one roller 67 being preferably provided for each carding machine. The rollers 67 are driven by a chain 68 placed alongside the conveyor and supported by sprocket wheels 69 mounted on shafts 70. The shafts 70 also drive the uncoiling wheels 63 through pinions 71. The rotational speed of the wheels 63 must correspond to the speed of the feed rollers 60. The delivery rollers 64 are driven through bevel gears 72 by the shaft 70. The roller 65 may either be positively driven at a speed corresponding to that of the delivery rollers or may be freely rotatable. In order to guide the

6

card slivers on the conveyor 66 a roller 73 resting on the slivers may be provided above the roller 67.

FIG. 10 shows a modified system of sliver accumulating apparatus which includes a conventional device as used for depositing slivers in cans. The left end of an accumulating rod 74 is supported by a roller 75 mounted on the housing of the apparatus. The right end is connected to a plate spring 76 which is mounted on a housing portion 77. The rod 74 is oscillated in the axial direction by means of an electrically actuated vibrator 78 which acts on the plate spring 76. The longitudinal vibrations of the rod 74 induce movement of the sliver loops hanging on the rod 74 from the left end to the right end of the rod. The sliver is so hung on the rod 74 that loops alternately depend from one side of the rod and from the other side of the rod so that the loops can be pulled upward in contradistinction to the arrangement shown in FIG. 8 wherein the loops must be unwound from the rod 62. Lifting of the sliver loops from the rod 74 is effected by moving the sliver through the nip formed by positively driven calender rollers 80. The sliver is diverted from the vertical to the horizontal by means of a freely rotating roller 79. In order to prevent overloading of the rod 74 or complete removal of the sliver from the rod, the roller 75 is mounted on a piston rod 81 which extends from a piston forming part of a conventional switch 82 which is responsive to the weight acting on the roller 75, i.e. to the weight of the sliver resting on the rod 74. The switch 82 and the electric circuit controlled thereby are not illustrated in detail because this does not form part of the present invention. The switch 82 stops the current supply to the motors operating the respective card and the devices for feeding sliver onto the rod 74 when the latter is overloaded.

No coiling wheels are found in the embodiment of the invention shown in FIGS. 11 and 12. The sliver is supplied by a calender roller pair 83 to a fork at one of the free ends of a two-arm lever 84 horizontally swinging between two end positions at either side of a sliver hanging rod 85 and is positively advanced by suitable longitudinal movement of the rod 85.

As seen in FIG. 12 the lever 84 swings on a pin 86 and has two arms whose free ends form forks 87 and 88. A slot between the prongs of the fork 87 guides the sliver 95. The slot between the prongs of the fork 88 receives a vertical pin 89 which is rigidly connected to the left end of the rod 85 by an angle member 90. The latter is supported by an arm 91 mounted on an oscillating shaft 92 which is mounted on the apparatus frame. The oscillation of the shaft 92 is effected by a motor 93 (FIG. 11), having a crank actuating a connecting rod 94 whose free end is pivoted to an arm extending from the shaft 92. Upon oscillation of the arm 91 the rod 85 is axially oscillated and the lever 84 is swung in a horizontal plane, hanging a new loop of sliver 95 on the rod 85 at every oscillation of the member 84 and at every movement of the rod 85 to the left. This newly hung sliver loop is between the wall 96 and the previously hung loop and pushes all sliver loops hanging on the rod 85 towards the right end of the rod 85 when the latter moves to the left so that the left end of the rod extending to the left of the wall 96 is empty and remains empty when the rod moves to the right, carrying all loops hanging on the rod to the right. The rightmost loop is now taken off the rod. During the subsequent movement of the rod to the left a new loop is hung on the empty left end of the rod. This last hung loop is between the previously hung loop and the wall 96 and pushes all loops on the rod to the right, relative to the rod, upon continued movement of the rod to the left so that the device is ready for the subsequent operating cycle.

The slivers resting on the conveyor 66 are removed from the end of the conveyor (FIGS. 1 and 9). They pass around a roller 97 (FIG. 9) and are supplied to a

drawing arrangement 98 located at the end of each row of carding machines. Thereupon they are deposited in cans 99.

We claim:

1. An automatic carding plant including cotton supply means, a closed cotton circulating duct having an inlet portion and an outlet portion, both portions being connected to said supply means, said duct forming a single closed loop between said portions and receiving cotton from said supply means and returning unused cotton to said supply means, a plurality of cotton depositing ducts consecutively branching from said circulating duct, a carding machine connected to each of said depositing ducts for receiving cotton therefrom, and means connected to said cotton circulating duct for circulating a gas therethrough to flow from said inlet portion to said outlet portion and to maintain a superatmospheric pressure in said duct at least at the locations where said depositing ducts branch from said circulating duct.

2. An automatic carding plant as defined in claim 1 including a continuously operating transport means connected to at least a plurality of said carding machines for receiving the slivers produced in said machines, and a drawing frame connected to and receiving the slivers from said transport means.

3. An automatic carding plant as defined in claim 1 wherein said cotton depositing ducts are substantially vertical and said carding machines are placed adjacent to the lower ends of said depositing ducts, discharge means being provided at the lower ends of said depositing ducts for withdrawing cotton accumulated therein from said depositing ducts and feeding the cotton into the respective carding machines, said discharge means being formed by rollers creating a bite, rough sand being glued to the surface of said rollers for increasing friction.

4. An automatic carding plant as defined in claim 1 wherein said cotton depositing ducts are substantially vertical and said carding machines are placed adjacent to the lower ends of said depositing ducts, discharge means being provided at the lower ends of said depositing ducts for withdrawing cotton accumulated therein from said depositing ducts and feeding the cotton into the respective carding machines, said discharge means being formed by two rollers arranged to create a bite, one of said rollers rotating freely and having a relatively hard surface, the other of said rollers being positively driven and having an elastically deformable surface allowing a substantial reduction of the active driving radius of the roller surface for slowing down the cotton discharge by said rollers upon increasing density of the cotton entering the bite formed by the rollers.

5. An automatic carding plant as defined in claim 1 wherein the flow area of said circulating duct increases at the approach and upstream of each connection of a cotton depositing duct to the circulating duct.

6. An automatic carding plant as defined in claim 1, each of said carding machines having a cotton intake, the flow area of said circulating duct adjacent to the connections of said depositing ducts being substantially rectangular and of the same width as the intake of said carding machines, the width of said depositing ducts being substantially equal to the width of said flow area of said circulating duct.

7. An automatic carding plant as defined in claim 1 comprising measuring means connected to said circulating duct, and control means connected to said measuring means and to said supply means for controlling the amount of cotton supplied to said circulating duct to maintain the amount of cotton returned by said circulating duct at a predetermined value.

8. An automatic carding plant as defined in claim 5 wherein the flow area of said circulating duct is restricted immediately downstream of each connection of

said circulating duct to one of said cotton depositing ducts.

9. An automatic carding plant as defined in claim 5 including regulating means movably connected to said circulating duct downstream of each connection of said circulating duct to one of said cotton depositing ducts for adjustably restricting the flow area of said circulating duct immediately downstream of said connections.

10. An automatic carding plant according to claim 9 wherein each of said regulating means includes a flow diverting flap having one end hinged to said circulating duct and having a free end engaging an upper wall portion of the respective cotton depositing duct for sealing the latter against the outside at all operating positions of said flap.

11. An automatic carding plant including cotton supply means, a closed circulating duct connected to said supply means for receiving cotton therefrom and for returning unused cotton thereto, a plurality of substantially vertical cotton depositing ducts consecutively branching from said circulating duct, a gaseous transporting medium circulating through said circulating duct and flowing into said depositing ducts, said medium having a superatmospheric pressure in said depositing ducts, a carding machine placed adjacent to the lower end of each of said depositing ducts, and cotton discharge means located at the lower end of each of said depositing ducts for withdrawing cotton accumulated therein and feeding the cotton into the respective carding machines, said discharge means forming a closure for the lower ends of the depositing ducts, a clearance being provided between said discharge means and said depositing ducts for allowing escape of the transporting medium while retaining the cotton inside the depositing ducts and discharge means.

12. An automatic carding plant according to claim 11 including slides individually connected to the lower ends of said cotton depositing ducts for controlling the size of said clearance.

13. An automatic carding plant including cotton supply means, continuous conveyor means having an inlet end connected to said supply means for receiving cotton therefrom and having an outlet end connected to said supply means for returning unused cotton thereto, a plurality of cotton depositing ducts consecutively branching from said conveyor means, a carding machine connected to each of said cotton depositing ducts for receiving cotton therefrom, a continuously operating conveyor, and a sliver accumulating apparatus interposed between each of said carding machines and said continuously operating conveyor for receiving sliver from said carding machines and delivering the sliver to said last mentioned conveyor.

14. In combination with two continuously operating machines, one of which delivers sliver and the second receives sliver delivered by the first machine, a sliver accumulating apparatus interposed between said two machines and receiving sliver from the first machine and delivering sliver to the second machine, said accumulating apparatus including an oblong sliver carrier having a sliver receiving end and a sliver delivering end, loading means placed at said receiving end of said carrier and adapted to form sliver loops and place same on said carrier, and unloading means located at said delivering end of said carrier for removing the sliver loops from said carrier, said carrier slidably supporting the sliver loops and permitting sliding of the loops from said receiving to said delivering end of the carrier.

15. The combination set forth in claim 14 wherein said carrier is formed by a rod having a smooth surface.

16. The combination according to claim 15 including a weight responsive means connected to and supporting at least one end of said rod, said weight responsive means being operatively connected to said loading means for stopping the latter when said rod is overloaded.

17. The combination set forth in claim 14 wherein the receiving end of said carrier is at a higher elevation than

the delivering end and said carrier has an inclined surface supporting the sliver loops whereby the sliver loops slide on said carrier by gravity from the receiving end to the delivering end of said carrier.

18. The combination set forth in claim 14 including oscillating means connected to said carrier for longitudinally oscillating said carrier and promoting travel of the sliver loops from the receiving to the delivering end of the carrier.

19. The combination set forth in claim 14 wherein said loading means include coiling means for hanging the sliver in open loops on said carrier.

20. The combination set forth in claim 14 wherein said loading means include coiling means for laying the sliver in closed loops around said carrier.

21. The combination according to claim 20 wherein said coiling means is in the form of a coiling wheel and said carrier is formed by a rod having an end placed in the rotation axis of said coiling wheel.

22. The combination according to claim 14 wherein said loading means includes an oscillating shaft, a lever operatively connected to said shaft for swinging in a horizontal plane above the receiving end of said carrier, the free end of said lever including means vertically slid-

ably engaging the sliver and swinging from one side of said carrier to the other side thereof for hanging the sliver in loops on said carrier.

23. The combination according to claim 22 including means interposed between said oscillating shaft and said carrier for longitudinally oscillating said carrier.

References Cited in the file of this patent

UNITED STATES PATENTS

556,180	Gardner	Mar. 10, 1896
1,694,950	Penney et al.	Dec. 11, 1928
1,875,356	Shaw	Sept. 6, 1932
1,899,791	Brennen	Feb. 28, 1933
2,156,893	Gaus et al.	May 2, 1939
2,442,333	Bacon	June 1, 1948
2,759,225	Hunter et al.	Aug. 21, 1956

FOREIGN PATENTS

428	Great Britain	of 1867
-----	---------------	---------

OTHER REFERENCES

Leonard: Drawing Frame for Spinning Machine September 16, 1833. (Copy in Division 21.)