Dec. 27, 1966 L. H. SMITH 3,293,700

CHARGING, CLEANING AND METERING APPARATUS

Filed May 27, 1964 3 Sheets-Sheet 1

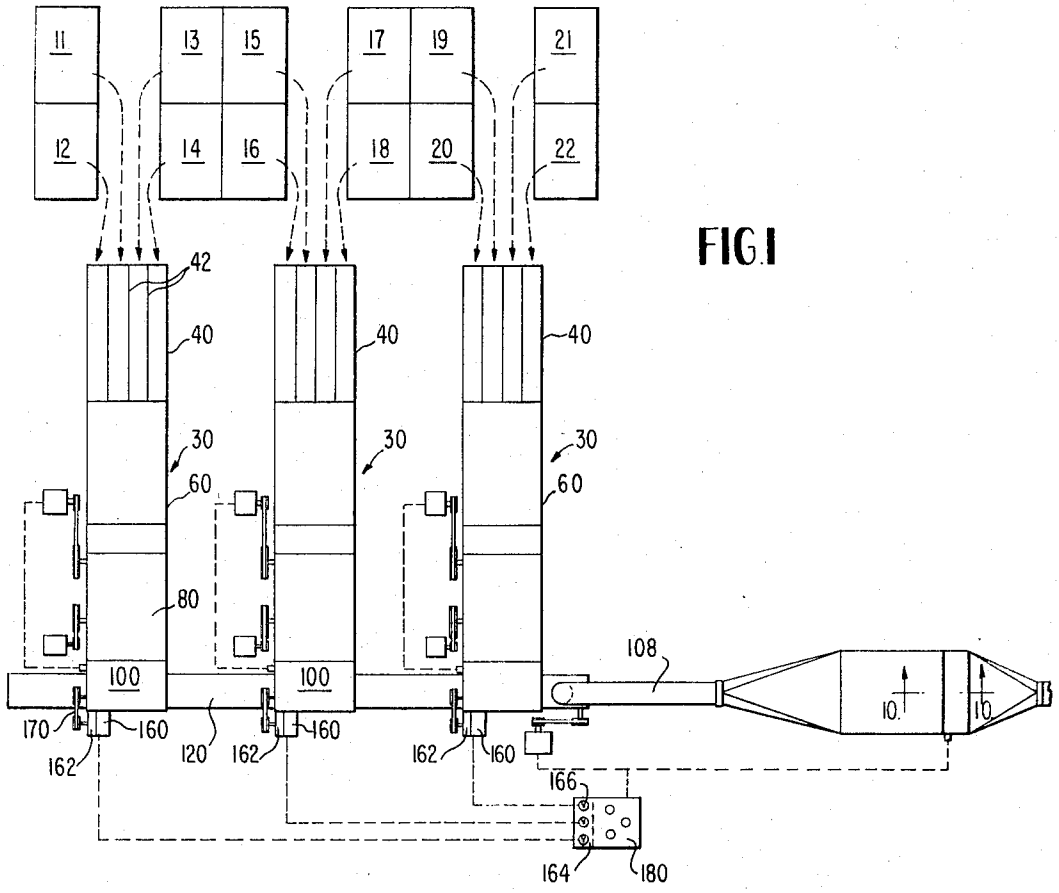


FIG. 1

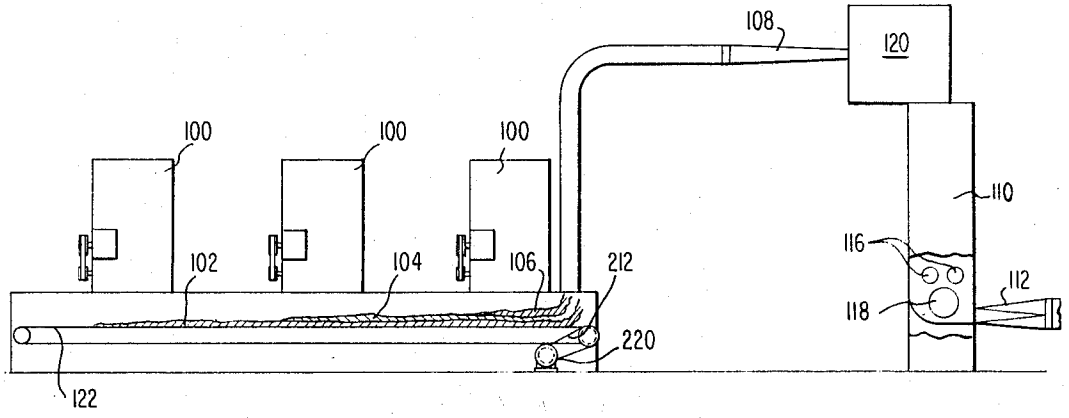


FIG. 2

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CHARGING, CLEANING AND METERING APPARATUS

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FIG. 3

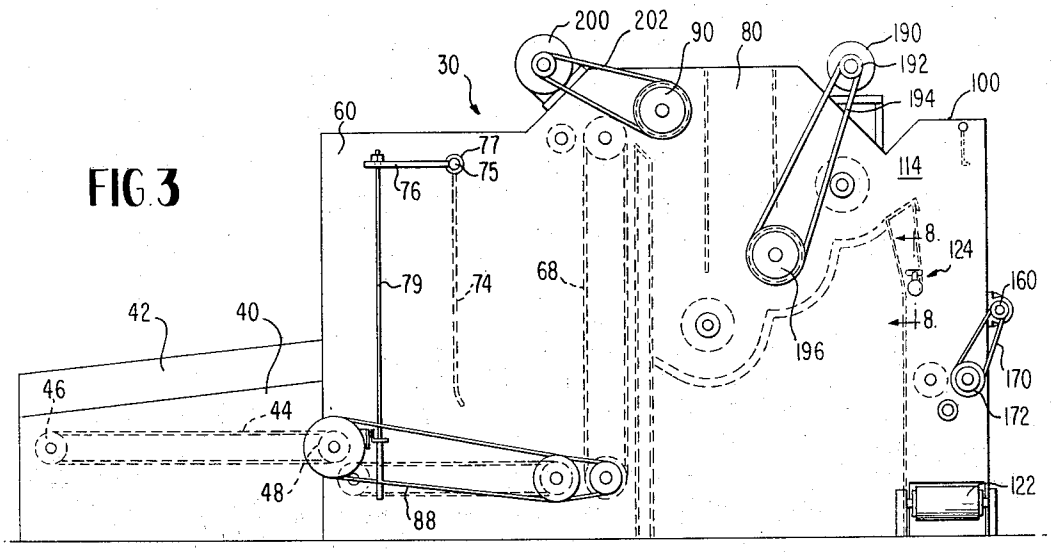
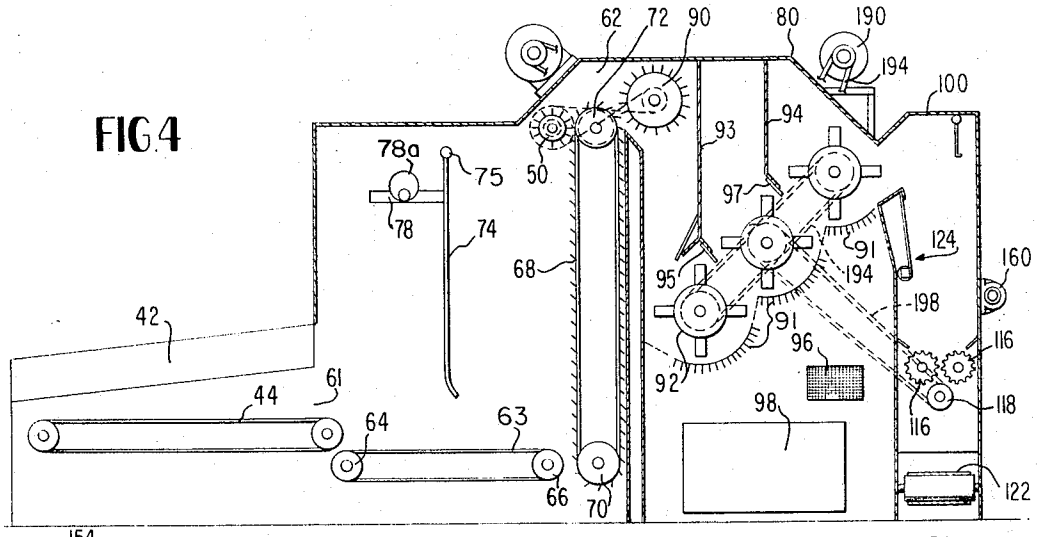


FIG. 4



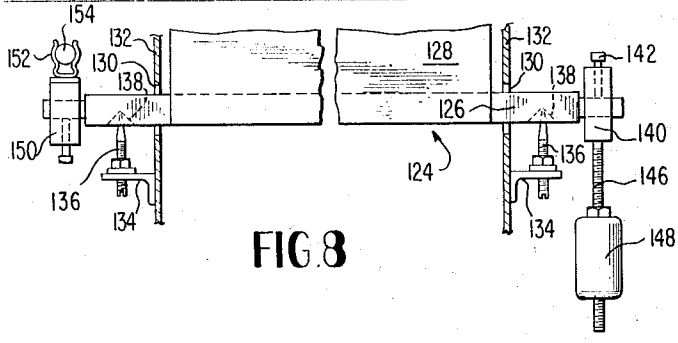


FIG. 8

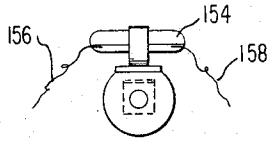


FIG. 9

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FIG. 5

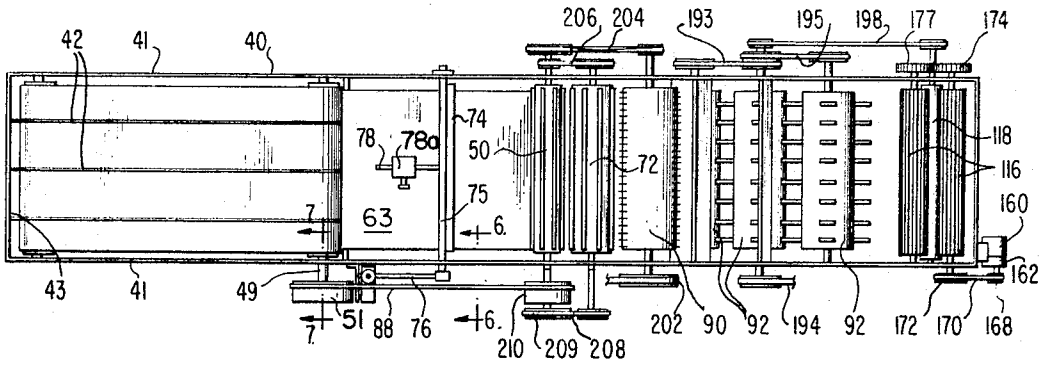


FIG. 6

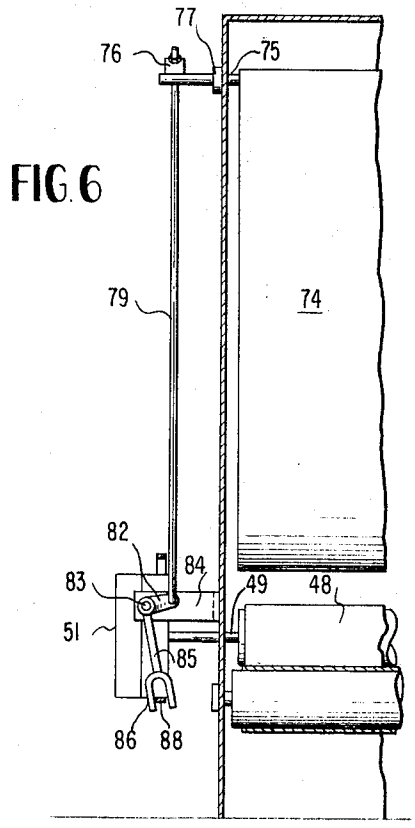
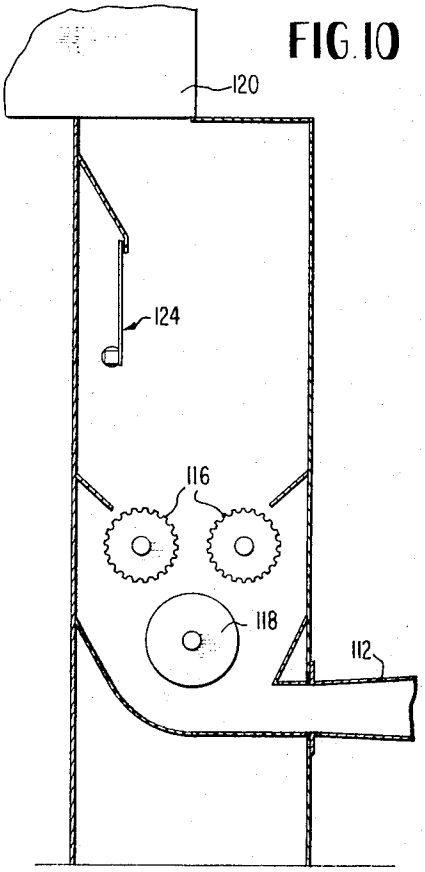


FIG. 10



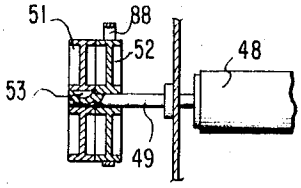


FIG. 7

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Patented Dec. 27, 1966

3,293,700

CHARGING, CLEANING AND METERING APPARATUS

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Filed May 27, 1964, Ser. No. 370,500
20 Claims. (Cl. 19—204)

This invention relates generally to equipment for processing textiles and more particularly to improvements in equipment for charging, cleaning, metering and feeding fibers to provide a uniform blend.

The grade of yarn and cloth in a textile operation is determined by the ability of a mill to successfully clean, and blend together in a consistent manner a predetermined number of different fibers. Any variation in the blend at the outset of the operation will become apparent, and be exaggerated in the finished cloth product. Also, a variation at an early stage will cause improper operation of machines used in subsequent stages as the fiber is processed through the mill. Yarn breakage in the operation is increased due to too much or too little of a certain type fiber being in the wrong place and such inconsistent or nonuniform yarn must be graded according to its lowest or weakest point. Therefore, consistency is very important in the manufacture of textiles.

A conventional line of machinery to open, clean and blend textile fiber usually consists of a battery of three to six feeders, each delivering to a single belt conveyor apron. The apron delivers the accumulation to two or three cleaning and mixing machines, from which the fiber is moved to pickers or carding machines and then to other machines for making the cloth. From four to six bales of fiber are opened up behind each of the feeders. An operator attempts to keep each of the feeders loaded with a portion of each bale of fiber laid out behind the feeder. It is next to impossible for the operator to keep a representative amount from each bale in the feeder at all times. Even if the operator is able to keep the amounts fairly accurate, the feeder will tend to draw from one batch at a time, due to the inadequacy of the feeder. The action of a conventional feeder is to form a roll or cylinder of fiber in the reservoir section and since the elevator apron picks only from the outside of the roll it is apparent that a consistent feed of all types of fibers represented cannot be accomplished. The portion from each bale fed by the operator is in slab form and since the slab will be on the outer surface of the reservoir roll it can be seen that actually, at a given moment, the elevator apron will pick from only one of the slabs in the reservoir. Thus, the feeder is providing a nonuniform mix that can never be overcome in later operations.

It is a primary object of the present invention to provide equipment which will uniformly blend different fibers and which will overcome the disadvantages stated above of conventional feeding and blending equipment.

It is another object of the invention to provide equipment which will feed and blend fibers in any desired proportion and at any desired rate.

It is still another object of the invention to provide apparatus which is capable of mixing fibers in any desired proportions to make a yarn and which will open, clean and feed, in any selected uniform proportions, the blended fibers to subsequent processing machines.

It is a further object of the invention to provide in an equipment of the above described characteristics, a feeder having a reservoir chamber including a control gate assembly for maintaining mixed fibers at a given level.

It is a still further object of the invention to provide a feeder of the above described characteristics in which

the control gate assembly starts and stops the charger which feeds said reservoir with the fibers to be blended.

Yet another object of the invention is to provide in a charger, of the above described characteristics the provision of vertical baffles defining lateral chambers for separating the different fibers fed to the charger apron.

Still another object of the invention is to provide equipment which will ensure uniformity of blend and make possible as much as a 20% betterment of the break strength of finished yarn made from the blended fibers, and which will further reduce breakage by up to 21% in spinning, thus enabling production of higher grade yarn and cloth from lower grades of fiber.

Yet another object of the invention is to provide in a feeder of the above described characteristics means for precleaning the fibers.

A still further object of the invention is to provide in charging, feeding, cleaning and metering equipment, of the described characteristics, a feeler level operated assembly in the metering unit for controlling stop and start of the charging and feeding units.

The novel features that are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment when read in connection with the accompanying drawings, wherein like reference characters indicate like parts throughout the several figures and in which:

FIG. 1 is a diagrammatic plan view of equipment for blending fibers according to the invention;

FIG. 2 is a diagrammatic elevational view of the equipment shown in FIG. 1;

FIG. 3 is an elevational view of one of the charger, feeder, cleaner and metering machines;

FIG. 4 is a central vertical section of the machine shown in FIG. 3;

FIG. 5 is a plan view of the equipment shown in FIG. 3 with the top wall removed;

FIG. 6 is an enlarged sectional, fragmentary view taken on line 6—6 of FIG. 5;

FIG. 7 is an enlarged sectional, fragmentary view taken on line 7—7 of FIG. 5;

FIG. 8 is an enlarged, fragmentary view taken on line 8—8 of FIG. 3;

FIG. 9 is an elevational view of a detail of the metering level control assembly; and

FIG. 10 is a vertical sectional view taken on line 10—10 of FIG. 1.

Overall equipment

Referring now to FIGS. 1 and 2 in which are diagrammatically portrayed the improved equipment for automatically feeding and metering fibers to provide a uniform blend, the blocks 11–22 represent 12 different bales of cotton, or other fiber, opened and arranged in pairs, each pair being aligned with the other pairs in a manner such that it will be easy for an operator to feed the three machines 30 shown aligned transversely to the bales of fiber. To this end, the bale pairs 11 and 12 are spaced from bale pairs 13 and 14 to permit the operator to load the charger section 40 of the first machine in a manner denoted by the broken line arrows so that fiber from the same bale is always loaded into the same compartment of the charger 40. Similarly, bale pairs 15 and 16 are spaced from bales 17 and 18 for loading of the second machine and bale pairs 19 and 20 are spaced from the bale pairs 21 and 22.

Each of the machines, generally indicated by the refer-

ence numeral 30, comprises a charger section 40, feeder section 60, an opener and cleaner section 80 and a metering section 100. Each machine 30 is adapted to uniformly mix the fibers from the four bales shown, or any other suitable number if so desired, and to deliver the mixed fibers at any desired rate to the transverse conveyor 120. The output from the first machine forming a blanket 102 of fiber tufts covered, or lapped, by the output 104 from the second machine, and in turn covered by a layer 106 which is the output from the third machine. The three layers of partially mixed fibers are then sucked upwardly in conduit 108 by means of a fan 120 and deposited in the reservoir of another metering device 110 similar to the metering units 100, from which the completely mixed fibers of all twelve bales may be dispensed at any desired speed to an outlet 112 for feeding subsequent machine operations in the making of textiles.

Each machine 30, which is a combination charger, feeder, preopener cleaner, and metering equipment is shown in a preferred embodiment in FIGS. 3–9.

Charger unit

The charger section 40, shown best in FIGS. 3–5, comprises sidewalls 41 and end wall 43 mounted on a frame (not shown) and enclosing a substantially horizontal conveyor belt 44 trained over the drums 46 and 48. This section is open at the top and is provided with a plurality of vertical spacers 42 which divide the charger into four, or more, equal, or unequal, compartments. Each partition 42 is positioned above the conveyor 44 at an upwardly inclined angle toward the feeder section and is preferably spaced above the conveyor so as to reduce the friction between the partitions 42 and the fiber being moved by the conveyor.

Feeder unit

The feeder section 60, as best illustrated in FIGS. 3–7, is entirely enclosed by walls except for the inlet opening 61 and the outlet opening 62. Within the chamber and below the charger apron 44 is a substantially horizontal apron 63 trained over drums 64 and 66. An elevator apron 68 having conventional pins thereon is substantially vertically disposed adjacent the output end of conveyor 63 and trained over the drums 70 and 72. A conventional kick back roll cylinder 50, also having needle-like appendages projecting from its surface, is arranged to rotate near the upper end of the elevator apron 68 so as to feed tufts of fiber to the opening 62, a certain amount of the fiber being carried around by the kick back roll to fall back into the chamber of feeder 60 to form the usual roll therein.

Within the chamber of feeder 60 is a vertically mounted gate 74 rigidly attached to the horizontal shaft 75 which is mounted to turn in bearing openings in the side walls of the feeder. Near the upper end of the gate 74 is mounted a horizontally extended shaft-like member 78 on which is movably mounted a weight 78*a* which may be adjusted in any position along the member 78 and fixed by means of a screw, or like. Parts 78 and 78*a* constitute a counterbalance for the gate 74. Outside the chamber of feeder 60 is a horizontally disposed rod 76 fixed at one end by a collar 77 angularly adjustable on the shaft 75. The other end of rod 76 is coupled by means of an enlarged hole, or slot, and a nut to the upper end of a vertical rod 79. The lower end of rod 79 is pivotally secured to a bell crank arm 82 fixed to a shaft 83 (see FIG. 6) which rotates in a bearing opening in the bracket 84. A second arm 85 of the bell crank terminates in a fork 86 at its lower end which embraces a belt 88. The charger conveyor drum 48 is fixed to shaft 49 which in turn is keyed to an outer pulley 51 at 53 (see FIG. 7). An inner pulley 52 is freely rotatable on shaft 49 and belt 88 may be shifted from the free pulley 52 to the pulley 51 or vice versa, by movements of the gate 74 through the above described linkage.

Operation of charger and feeder

It will be apparent that when an adequate supply roll of fiber is present in the chamber of feeder 60, as moved thereinto by the conveyors 44 and 63 and kicked back by the roll 50, that gate 74 will be moved to the left and the shaft 75 turned clockwise as viewed in FIG. 3. When this occurs rod 79 will be lifted, and through bell crank 82, 85, will shift the belt 88 to the free pulley thus stopping the drive to shaft 49 and the conveyor 44. When the supply of fibers in the feeder drops below a desirable level, which is adjustable to any selected value by shifting the counterweight 78*a* the gate 74 will move to the right in FIG. 3, lowering the rod 79 and shifting the fork and belt 88 to the keyed pulley 51 to start conveyor 44 once again so as to feed additional fiber into the feeder 60.

It should be noted that in the feeder of the present invention, due to the four laterally aligned compartments in the charger defined by the partitions 42 and the side walls of the charger, that four rolls of fibers are formed on the bottom conveyor 63 as a result of the lifting action of the elevator 68. These four rolls turn and bear against the gate 74 to operate the belt shifting fork 86, as previously described, and thereby maintain a suitable amount of fiber in the chamber of the feeder at all times. Because there are four laterally aligned rolls of fiber, one from each of the bales 11, 12, 13 and 14, the elevator will continuously lift equal amounts of fiber from each of the four rolls, or bales, and pass the fiber in proportion through the opening 62 to the cleaner 80. Thus a uniform mixture of fibers from the four bales is fed to the cleaner whereas in conventional charging and feeding apparatus the material from four bales for example is laid onto the charger belt one on top of the other rather than laterally displaced. Therefore, in such equipment only a single roll is formed on the bottom conveyor of the feeder, which single roll has layers from each of the four bales but the layers are radially displaced. As a result the elevator belt tends to lift a greater quantity of fiber from one bale into the cleaner rather than equal amounts from the four bales. Thus in conventional apparatus not only is it difficult to place equal amounts from different bales in the charger but the feeder tends to feed unequal amounts of the different fibers and these two sources of error are compounded to yield a still worse result insofar as obtaining proportionate amounts of different fibers out of the feeder.

Cleaner and opener unit and its operation

Cleaner section 80 comprises a rectangular housing having an opening adjacent to the outlet 62 of the feeder and in which is placed a conventional doffer roll 90 which delivers fibers from the feeder downwardly to the first of a series of beater cylinders 92. Three such beater cylinders are shown arranged along an upwardly inclined axis, the cylinders being rotated about horizontally disposed, parallel axes. Below each cylinder is an adjustable grid bar section 91 through the openings of which dirt and refuse may fall into the lower part of the cleaner chamber. The beater cylinders and grid bar sections may be formed as disclosed in my co-pending application Ser. No. 54,445, filed September 7, 1960 now Patent No. 3,136,004 in which the grid bar sections are adjustable to change the inclination and size of the refuse openings with portions of each grid in the form of fixed screens. In the lower, refuse receiving portion of the cleaner an outer wall is provided with one, or more, air outlets 96 which prevent the build up of air pressure in the refuse chamber. A refuse outlet, or clean out door, 98 is also provided in at least one wall. Centrally above each of the first two beater cylinders are vertical, or substantially vertical, partitions 93, 94 extending from downwardly the ceiling nearly to the radial pins on the cylinders.

These partitions define, between them and the walls of the cleaner, three vertically disposed chambers, one above each cylinder **92** which retain some of the fiber and prevent its being carried backwardly in the cleaner. At the lower ends of partitions **93**, **94** are angular baffle sections **95** and **97**, made adjustable so as to extend more or less down between the cylinders. This adjustability may be achieved by any satisfactory means such as by bolts and slots. The baffles serve to change the area of the openings between the cylinders and thus change the rate of feed of fiber through the cleaner section **80**. Shortening the partitions **93**, **94** by lifting sections **95** and **97** will allow some backward feed thus permitting some of the fiber to pass two, three or more times over one or more of grids **91**. This results in additional cleaning and opening of the fibers and is useful in handling low grade fiber high in dirt content or high density fibers. The open chambers on each side of baffle **94** will allow fiber and especially lumps of fiber to be released from the cylinders, by centrifugal force to travel upwardly and then fall by gravity on to the cylinders, where the lumps are again struck by the cylinder pins and further opened. Each time fiber is subjected to the action of a cylinder the lumps are opened and cleaned further. Thus the presence of the chambers above the cylinders increases the efficiency of the cleaner and opener unit. The air outlet **96** in the refuse compartment below the grids allows excess air pressure to escape causing increased air flow through the grids. With this flow of air an increased amount of dust and other refuse will travel into the refuse compartment. Were it not for the air outlet, a build up of pressure in the refuse compartment would result and cause a greater percentage of dust and refuse to travel completely through the cleaner carried by the fiber. Desirably the air outlet **96** should be adjustable to provide different and proper rates of air flow. It will be apparent from the above description that the cleaner section **80** of each machine **30** provides at least three improvements over normal cleaners, i.e., one, the use of an air outlet in the refuse compartment which prevents build up of air pressure therein, two, the adjustable baffles **95** and **97** which permit regulation of the cleaner section to provide different rates of cleaning and additional cleaning of the same fiber batches, and three, the vertical compartments above the cylinders surrounding the baffles **93** and **94** which provide space for returned or retained fibers so that they may be subjected to further cleaning by further passes around each of the cylinders **92**.

Metering unit and level control

The metering section **100** comprises a chamber enclosed by walls having an inlet opening **114**, FIG. 3, for the cleaned and opened fiber coming from the cleaner **80**. Near the bottom of the chamber are horizontally spaced, parallel, wooden fluted cylinders **116**, FIG. 4, which are feed, or delivery, rolls for the fiber. These rolls may be operated at any desired speed by means to be described hereinafter. Below the rolls **116** is a roll **118** which serves to break the lap formed by the pressure of the rolls **116** so that fiber is fed in tufts to the conveyor belt **122** which is disposed transversely of all three machines **30** to receive tufts from each machine. The incoming fiber to the chamber of metering section **100** is fairly open and lightweight and requires a very sensitive level control assembly generally designated by the reference numeral **124**. As best seen in FIGS. 4 and 8, the level control assembly **124** comprises a horizontally disposed teeter bar **126** to which is attached a substantially vertical but slightly inclined pressure plate **128**. The bar **126** passes through openings **130** in the side walls **132** of the metering chamber. A pair of brackets **134** are affixed to the outside surfaces of walls **132** and each bracket has threaded therein a vertically extending and adjustable screw **136** terminating in an upper conically shaped point. At each side of the lower surface of bar **126** is a downwardly tapering, conical opening **138** for pivotally seating the bar on the screws **136**. At one end of the bar **126** is a collar **140** fastened to the bar by screw **142**, said collar having a dependent threaded rod **146** upon which is adjustably held a tubular weight **148** which acts as a counterbalance for the pressure plate **128**. A second collar **150**, similar to collar **140**, is fastened to the opposite ends of the teeter bar and has secured thereto on its upper side a forked spring clip **152** in which is retained the tilt actuated mercury switch **154**. Leads **156** and **158** connect the contacts of the mercury switch to the feeder motor **200** as will be fully explained hereinafter.

Metering level control operation

Fiber delivered into the chamber of the metering unit is in a very opened and light condition and therefore a conventional level control assembly is not adequate. The special level control assembly **124**, by utilizing a preferably upwardly extending and balanced pressure plate **128** delicately supported by teeter bar **126** permits operation with very little pressure. The cone point balance screws **136** supported in the downwardly tapered, cone openings of the teeter bar provide very delicate pivotal support without danger of the pivots becoming clogged with lint or grease which would cause friction and make the assembly hard to move. The described construction also prevents maladjustment which would tend to bind the teeter bar. If for any reason refuse clogs the pivot openings a slight bump by the operator will jar the teeter bar and tend to remove the refuse without disengaging the bar from its support screws. Because of the cone shaped bores in the bar, the bar will simply slide back to its proper location on the screws and remain in balanced condition. Desirably the brackets **134** are provided with slots, not shown, which enable proper alignment of the screws **136** with the teeter bar **126**.

Drives for various units

Referring particularly to FIGS. 1 and 5 each automatic machine **30** is provided with a metering, drive motor **160** directly connected to a gear reducer **162**, which for example may reduce the speed by 100 to 1. The motor **160** is preferably a variable speed motor such as a D.C. motor having a potentiometer **164** connected in the field circuit and a potentiometer adjusting knob **166**. The potentiometer control **166** may be turned to result in a motor speed of 1000 r.p.m. The output speed of the gear reducer is therefore 10 r.p.m. A sprocket **168**, having twelve teeth for example, is affixed to the output shaft of the gear reducer and drives through chain **170** a thirty six tooth sprocket **172** affixed to the shaft of one delivery roll **116** and drives this roll at 3⅓ r.p.m. At the other end of its shaft this roll is connected, through meshing equal gears **174** and **177**, the other delivery roll **116** so that the two delivery rolls are caused to turn at the same speed. If for example the delivery rolls **116** are of such diameter as to feed one pound of fiber per each revolution, the resultant fiber output from the metering chamber will be approximately 200 pounds of fiber per hour (1 x 3.33 x 60). By varying the rheostat position any desired delivery rate for a given machine **30** can be obtained. The delivery rates of the other machines may be set at the same value by the respective control knobs **166** mounted on control panel **180**, FIG. 1, or may be set at different values as may be desired to vary the proportions of different fibers from bales **11–22** appearing in the final mix.

Mounted on and above each machine **30** is a drive motor **190** for the cleaner, see FIG. 3, which is also preferably a variable speed drive motor controlled on and off from the panel **180**. The output shaft of the motor **190** is fixed to a drive pulley **192**, which by means of belt **194** trained over pulley **196** on the adjacent end of the shaft of the center cylinder **92** drives said cylinder. A pair of belts **193**, **195** is trained over adjacent pairs

of pulleys on the ends of the three shafts of the cylinders **92**, see FIG. 5, causing the center cylinder to drive the remaining two cylinders. Additionally, a belt **198** is trained over pulleys on the ends of the shafts fixed to the center cleaner cylinder and the lap breaking roll **118** of the metering unit so that the lap breaking roll **118** is driven with the cylinders **92** by the motor **190**.

A variable speed motor **209**, controlled manually on and off from the panel **180** and automatically by the metering level control assembly **124**, is normally set to run at a speed which feeds fiber at a faster rate than the rolls driven by the motor **160**, and is mounted on top of machine **30**, see FIG. 3. Belt **202** trained over pulleys on the motor shaft and the shaft to the doffer roll drives the latter at a constant speed. A transmission belt **204**, FIG. 5, is trained over a pulley fixed to the other end of the doffer roll and over a second pulley keyed on the shaft of the kick back roll **50** to drive the kick back roll. Through pulleys respectively keyed to the shafts of the kick back roll and the upper drum **72** of the elevator apron a transmission belt **206** drives the elevator apron. The lower roll **70** of the elevator apron is driven by the apron **68**. Roll **70**, through a pulley affixed to the same shaft, drives the transmission belt **208** which in turn drives pulley **209** keyed to the shaft of drum **66** to move the bottom conveyor **62** of the feeder. Another drum **210** is fixed on the shaft of drum **66** and has trained over it the transmission belt **88** which drives the charger conveyor **44** in the manner previously described through the gate **74** and linkage **79** including fork **86** to stop or start the charger apron **44** depending upon whether the feeder is fully charged or the level of fiber has dropped below an acceptable minimum therein.

The mercury switch **154** is connected in the circuit of motor **200** so that when level control assembly **124** and its pressure plate **128** are pushed counterclockwise as viewed in FIG. 4, by a sufficient stock of fiber in the chamber of the metering unit **100**, the motor **200** is cut off from the source of electric power, not shown, and the feeder aprons are stopped. When, however, the supply of fiber in the metering unit drops below an adequate level, the pressure plate carried by the counterbalance **148** returns to its rest position against the flange stop at the upper part of the chamber and the mercury switch **154** is tilted back to horizontal to close its contacts and start motor **200** so as to feed more fiber through the cleaner to the metering chamber. In this way an appropriate level of cleaned fiber is always maintained in the metering unit so that the output from the delivery rolls **116** remains constant.

The electric circuits for powering and controlling the various motors from control panel **180** will be obvious to a skilled electrician and therefor no circuit diagrams are included herein, only some of the connections from panel **180** being diagrammatically indicated by broken lines in FIG. 1.

Output mechanism

The horizontal conveyor **122**, FIG. 2, which receives the output from each of the machines **30**, is trained over a drum at each end, one of said drums being driven by a transmission belt **212** by direct current, variable speed motor **220** which may be tied into the same electric circuit as the last in line metering motor **160** to operate at the same speed as said last motor. The output fibers in tufts forming layers **102**, **104**, **106** are moved toward the right end of conveyor **122**, where they are sucked into the pneumatic pipe **108** evacuated by a fan condenser housed in chamber **120**. The blended fibers are dropped from **120** into a metering reservoir **110** containing delivery rolls **116** and which is in all respects similar to the metering chambers **100**, see FIG. 10, except that the mixed output of fibers from all machines **30** is delivered to a second pneumatic pipe **112** and from thence to subsequent machines for processing the fibers, such as for further opening, further cleaning, spinning and the like. A control assembly **124** in metering reservoir **110** is connected to switch on and off the conveyor **122** by controlling motor **220** and simultaneously start and stop all of the metering motors **160**.

Operation

A predetermined slab of fiber from bale **11** is folded lengthwise by an operator and placed into the first charger slot defined by partitions **42** at the left of FIG. 1. Similarly, slabs of fiber from the other bales are placed in order in each of the other charger slots as indicated by the broken line arrows. Motors **190** are started by the operator to revolve cleaner cylinders **92** continuously. These motors do not stop and start automatically. Motors **200** are then started which revolve all aprons of the feeders and chargers, and at proper time an adequate supply roll of fiber in feeders **60** will move the gates **74** to automatically stop the respective charger aprons **44**. Since at the start, no fiber is present in the reservoirs of feeders **60**, the swing gates **74** are pivoted, due to counterbalance **78***a*, to positions causing the belt shifter linkage to actuate the belt shifters **86** to move the transmission belts **88** to the keyed pulleys **51**. This causes rotation of pulleys **51** which moves the charger aprons **44** clockwise as viewed in FIG. 3, carrying the four different fibers in the charger compartments of each machine toward the right to be deposited on aprons **63**. These aprons move all the fiber batches, side by side to the elevator aprons **68** which lift them in upward direction by picking small amounts from each type of fiber since all types have contacted pins of the elevator aprons at the same time. The relative movements of aprons **63** and **68** cause the remainder of the mass of fibers to fall back in the feeder chamber and form rolls, or cylinders, therein. These rolls of fiber being laterally aligned contain portions from all of the bales, each roll containing fiber from a given bale. Each batch or roll of fiber exerts some pressure on a gate **74** and since excess fiber will fall by gravity from the elevator aprons the excess drops vertically to the proper location or roll aligned with its respective charger slot. Small amounts of fiber are stripped from the elevator aprons **68** by action of kick rolls **50**. These also fall by gravity and will return to approximately proper locations. Fiber remaining in the feeders will be forced against the swing gates **74** ultimately causing reverse action of belt shifters **86** shifting the transmission belts **88** to loose pulleys **52** and the respective charger aprons **44** stop. While any given apron **44** remains stopped, the operator reloads all four slots in the same manner as before, being careful to place a proper portion into the proper slot. When a feeder **60** is again sufficiently low in supply, swing gate **74** will move in the opposite sense and cause its associated charger apron **44** to again deliver fiber properly disposed in side by side relation into the feeder. This process is repeated automatically. Hence the feeders are kept at approximately proper level at all times, each with given types of fiber always in the same relative position laterally against the elevator apron.

The partitions **42** are inclined above the charger aprons **44** so that they serve to hold batches of fiber laterally separated. The inclination of the partitions **42** relieves some of the side pressure against the fiber and when a charger apron starts moving, the fiber will have little tendency to adhere to the partitions and will move readily with the apron. The fiber lifted by the elevator apron **68** past a kick roll **50** will travel to a doffer roll **90** where it is stripped from the elevator apron and deposited in a cleaner **80**. The fiber output from a feeder falls by gravity to contact the first cleaner cylinder **92** whose action partially opens, cleans and moves the fiber to the second cylinder. Here the cleaning process is repeated. The third cylinder also cleans and delivers the fiber to a metering chamber **100**. As the level of fiber reaches high enough in a metering chamber, pressure is exerted on the level control assembly **124** to tilt the associated mercury switch **154** and stop the respective motor **200**

which drives the associated feeder components. As long as levels of fiber in metering chambers **100** are adequate, motors **200** will remain stopped. When fibers are needed for subsequent processes, motors **160** and motor **220** driving apron **122** will be actuated through the level control assembly in metering unit **110** and the delivery rolls **116** of each machine **30** will start drawing fiber from the metering chambers, depositing it on conveyor **122**. As fiber in the metering chambers **100** is lowered, level controls **124** will return to on positions, moved by the counterbalances **148**, and the mercury switches **154** again start the motors **200** to drive the feeders so that the supply of cleaned fiber in the metering chambers will be replenished. Each feeder drive is preferably set to deliver more fiber than rolls **116** so that the level controls **124** will soon cause motors **200** to be stopped again. This process is repeated as long as the system is in operation.

Ordinarily the delivery rolls **116** are checked by experiments or test to determine exactly what quantity of any given type of fiber is delivered at a given speed for a unit of time. By adjusting the speed of delivery rolls **116**, any desired amounts of particular fibers may be delivered in a unit of time. Since the conveyor **122** can be arranged to receive from any number of machines **30**, almost any desired variation of proportions of different fiber types may be sandwiched on conveyor **122**. All delivery rolls **116** and conveyor **122** may be controlled from control panel **180** to have the same synchronized speed if equal proportions are desired to be blended from all the bales. But if different proportions are desired, each machine **30** can be set to deliver at a different rate.

Tests performed have shown that the described equipment, using a standard mill mix of fibers, will increase the break strength of the finished yarn as much as 20%. The spinning room ends down, or breakage, was reduced up to 21% on the sample runs. These tests have proven that lower grades of fiber may be used to make high grade yarn and cloth.

Although certain specific embodiments of the invention have been shown and described, it is obvious that many modifications thereof are possible. The invention, therefore is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

What is claimed is:

1. A charging, cleaning and metering equipment for feeding and blending fibers, comprising a laterally compartmented charger defined by vertical partitions and having a substantially horizontal, belt driven conveyor below the partitions, a feeder disposed at the output end of said conveyor, a substantially horizontal second conveyor and a substantially vertical elevator apron in said feeder, a vertically disposed and pivoted level gate in said feeder, linkage connecting said gate to a belt shifter for stopping and starting said first conveyor at predetermined levels of fiber in the feeder, a plurality of cleaner grates of semicylindrical shape arranged in an upwardly inclined direction, each grate having a rotatable cleaner cylinder disposed coaxially with the axis of the grate, a vertically disposed cleaning chamber above each cylinder, said chambers communicating with each other at the inclined plane of said cylinders, a refuse chamber below said grates having an air exhaust opening, said elevator apron being arranged to feed a mixture of fibers from the compartments of said charger to the first of said vertically disposed cleaning chambers, first means for simultaneously driving said elevator apron and horizontal conveyors, second means for driving said cleaner cylinders, the last of said vertical cleaning chambers feeding into the upper part of a metering chamber, a pair of fluted delivery rolls in the bottom of the metering chamber, third means for driving said delivery rolls, manually controllable potentiometer means for varying the speed of said delivery roll drive means, a level control assembly in said metering chamber above the delivery rolls, switch means operated by tilting of said level control assembly to start and stop said first drive means at predetermined levels of cleaned fiber in the metering chamber, a delivery conveyor below said metering chamber to receive fiber from said delivery rolls, and fourth drive means for moving said delivery conveyor at a selected speed.

2. A charging, cleaning and metering equipment for feeding and blending fibers, comprising a laterally compartmented charger defined by vertical partitions and having a substantially horizontal conveyor below the partitions, a feeder disposed at the output end of said conveyor, a substantially vertical elevator apron in said feeder, a pivoted level gate in said feeder, means operated by said gate for stopping and starting said conveyor at predetermined levels of fiber in the feeder, a plurality of cleaner grates arranged in an upwardly inclined direction, each grate cooperating with a rotatable cleaner cylinder, a vertically disposed cleaning chamber above each cylinder, said chambers communicating with each other at the inclined plane of said cylinders, a refuse chamber below said grates, said elevator apron being arranged to feed a mixture of fibers from the compartments of said charger to the first of said vertically disposed cleaning chambers, first means for simultaneously driving said elevator apron and conveyor, second means for driving said cleaner cylinders, the last of said vertical cleaning chambers feeding into the upper part of a metering chamber, a pair of delivery rolls in the metering chamber, third means for driving said delivery rolls, means for varying the speed of said delivery roll drive means, a level control assembly in said metering chamber above the delivery rolls, means operated by said level control assembly to start and stop said first means at predetermined levels of cleaned fiber in the metering chamber, a delivery conveyor arranged to receive fiber from said delivery rolls, and fourth drive means for moving said delivery conveyor at a selected speed.

3. A charging, cleaning and metering equipment according to claim **2** wherein said vertical partitions of said charger slope upwardly toward the feeder.

4. A charging, cleaning and metering equipment according to claim **3** wherein said vertical partitions are spaced above said conveyor.

5. A charging, cleaning and metering equipment according to claim **2** wherein said charger conveyor is belt driven and said means operated by said feeder gate for stopping and starting said conveyor comprises a drive shaft having a drive pulley fixed thereto and a free pulley rotatable thereon, a belt shifter operable to move the conveyor belt from said drive pulley to said free pulley and back to the drive pulley, and linkage connecting said belt shifter to said feeder level gate whereby movements of the gate move the belt shifter.

6. A charging, cleaning and metering equipment according to claim **2** wherein each of said first, second, third and fourth drive means are independently variable in speed.

7. A charging, cleaning and metering equipment according to claim **2** wherein said vertically disposed cleaning chambers are partially defined by a pair of spaced vertical partitions each having an angularly disposed, adjustable baffle section at its lower end movable to extend at various heights between said cleaner cylinders whereby to vary the rate of feed through and amount of cleaning in said cleaning chambers.

8. A charging, cleaning and metering equipment according to claim **2** wherein said refuse chamber is provided with an air exhaust opening of adjustable size.

9. A charging, cleaning and metering equipment according to claim **2** wherein said level control assembly comprises a substantially horizontal bar pivotally mounted and extending across said metering chamber, an upwardly extending plate fixed at its lower end to the bar,

and a downwardly dependent adjustable counter weight secured to said bar.

10. A charging, cleaning and metering equipment according to claim 9 wherein said bar is provided with a pair of spaced, downwardly opening conical sockets in its lower side, each socket seating on a fixed pin having an upwardly directed point.

11. A charging, cleaning and metering equipment according to claim 9 wherein said bar extends outside of said metering chamber though openings in the walls thereof, said sockets and pins being located outside the metering chamber.

12. A charging, cleaning and metering equipment according to claim 11 wherein a mercury switch is mounted on said pivoted bar outside the metering chamber and forms part of said means operated by the level control assembly to start and stop the first means.

13. Charging, cleaning and metering apparatus for feeding and blending fibers, comprising a laterally compartmented charger defined by vertical partitions and having a substantially horizontal conveyor below the partitions, a feeder disposed at the output end of said conveyor, a substantially vertical elevator apron in said feeder, a pivoted level gate in said feeder, means operated by said gate for stopping and starting said conveyor at predetermined levels of fiber in the feeder, a cleaner grate cooperating with a rotatable cleaner cylinder, a vertically disposed cleaning chamber above said cylinder, said elevator apron being arranged to feed a mixture of fibers from the compartments of said charger to said vertically disposed cleaning chamber, first means for simultaneously driving said elevator apron and conveyor, second means for driving said cleaner cylinder, said vertical cleaning chamber feeding cleaned fiber into the upper part of a metering chamber, a delivery roll in the metering chamber, third means for driving said delivery roll, a level control assembly in said metering chamber above the delivery roll, means operated by said level control assembly to start and stop said first means at predetermined levels of cleaned fiber in the metering chamber, a delivery conveyor arranged to receive fiber from said delivery roll, and fourth drive means for moving said delivery conveyor at a selected speed.

14. In a charging, cleaning and metering apparatus, a cleaning unit having variable cleaning and feed rates comprising an enclosure having an inlet opening near the top at one side and an outlet opening near the top at the opposite side, a plurality of cleaner grates of semicylindrical shape arranged in an upwardly inclined direction toward said outlet opening, each grate having a rotatable cylinder disposed coaxially with the axis of the grate, a pair of spaced vertical partitions each having an angularly disposed, adjustable baffle section at its lower end movable to extend at various heights between said cleaner cylinders, and means for rotatably driving said cylinder.

15. In a charging, cleaning and metering apparatus, a cleaning unit according to claim 14 wherein is additionally provided a refuse chamber below said grates having an air exhaust opening.

16. In a charging, cleaning and metering equipment for feeding and blending fibers, a metering unit comprising an enclosure having an inlet opening near its top and a delivery outlet near its bottom, a pair of fluted delivery rolls in the bottom of the enclosure above said delivery outlet, means for driving said delivery rolls, manually controllable potentiometer means for varying the speed of said delivery roll drive means, a level control assembly in said metering chamber above the delivery rolls, means for feeding fiber to said inlet opening, switch means operated by tilting of said level control assembly to start and stop said feed means at predetermined levels of fiber in the enclosure, a delivery conveyor below said metering enclosure to receive fiber delivered by said delivery rolls, and drive means for driving said delivery conveyor at a selected speed.

17. In a charging, cleaning and metering apparatus, a metering unit according to claim 16 wherein said level control assembly comprises a substantially horizontal bar pivotally mounted and extending across said metering enclosure, an upwardly extending plate fixed at its lower end to the bar, and a downwardly dependent adjustable counterweight secured to said bar, said bar being provided with a pair of spaced, downwardly opening conical sockets in its lower side, each socket seating on a fixed pin having an upwardly directed point.

18. In a charging, cleaning and metering apparatus, a metering unit according to claim 17 wherein said bar extends outside of said metering enclosure through openings in the walls thereof, said sockets and pins being located outside the enclosure, and a mercury switch mounted on said pivoted bar outside the metering enclosure and forming said switch means to start and stop said feed means.

19. A charging and metering equipment for feeding and blending fibers, comprising an elevator feeder, a charger spaced from and preceding said feeder having lateral compartments for charging from different bales and a conveyor leading to the feeder, means for driving said feeder and said charger conveyor, level operated means in said feeder for stopping and starting said drive means, a metering unit connected to receive fiber from said feeder and including metering drive means, and level operated means in said metering unit for stopping and starting said feeder and charger drive means.

20. A charging, cleaning and metering equipment for feeding and blending fibers, comprising an elevator feeder, a charger spaced from and preceding said feeder having lateral compartments for charging from different bales and a conveyor leading to the feeder, means for driving the feeder and charger conveyor, level operated means in said feeder for stopping and starting said drive means, a cleaner and opener connected to receive fibers from said feeder and including cleaner drive means, a metering unit connected to receive fiber from said cleaner and opener and including metering drive means, and level operated means in said metering unit for stopping and starting said feeder and charger and said cleaner and opener drive means.

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