May 12, 1959 W. F. LEINEWEBER, JR 2,885,741

METHOD AND SYSTEM OF BLENDING FIBERS

Filed March 15, 1955 2 Sheets-Sheet 1

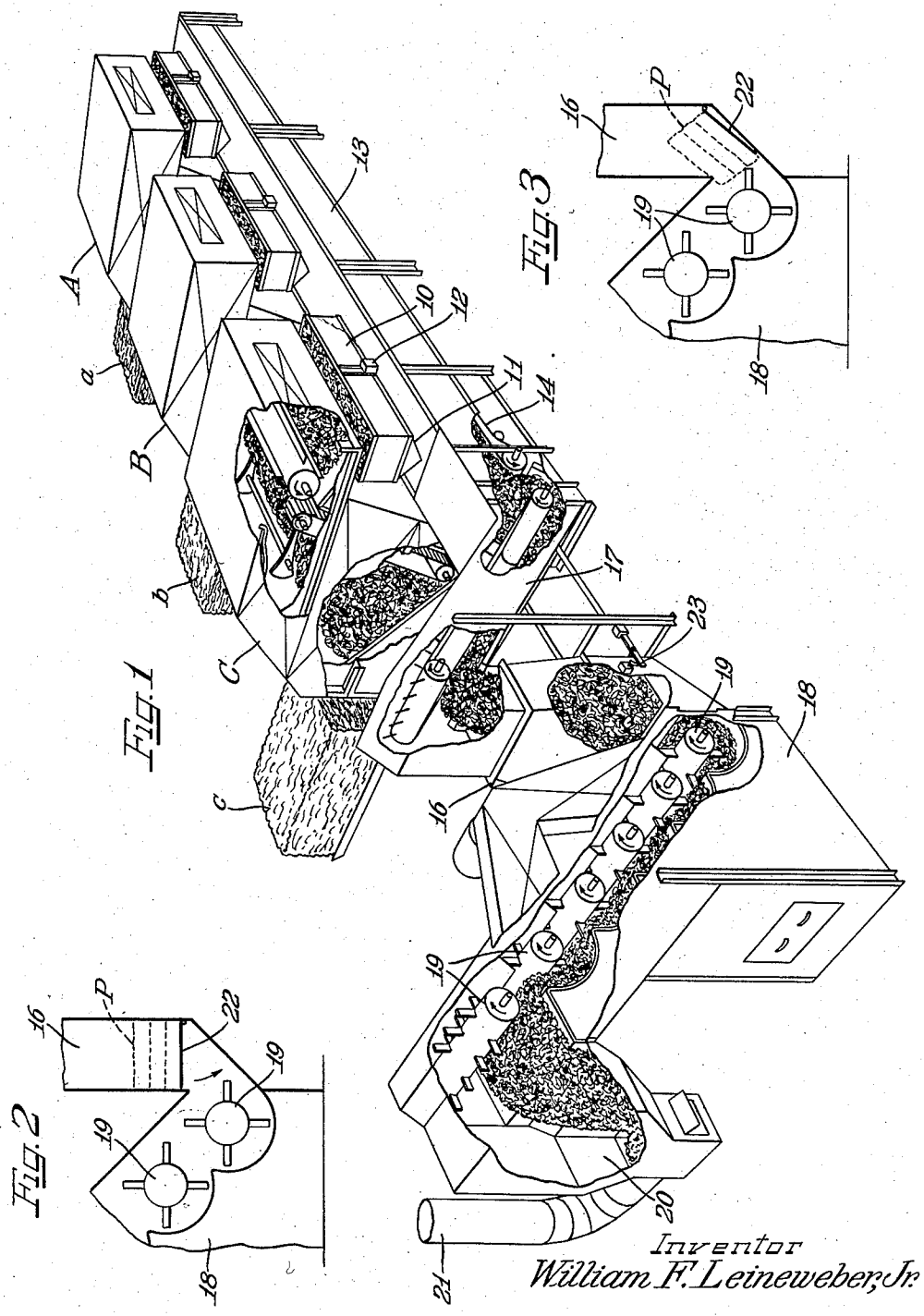



Fig. 1




Fig. 3




Fig. 2

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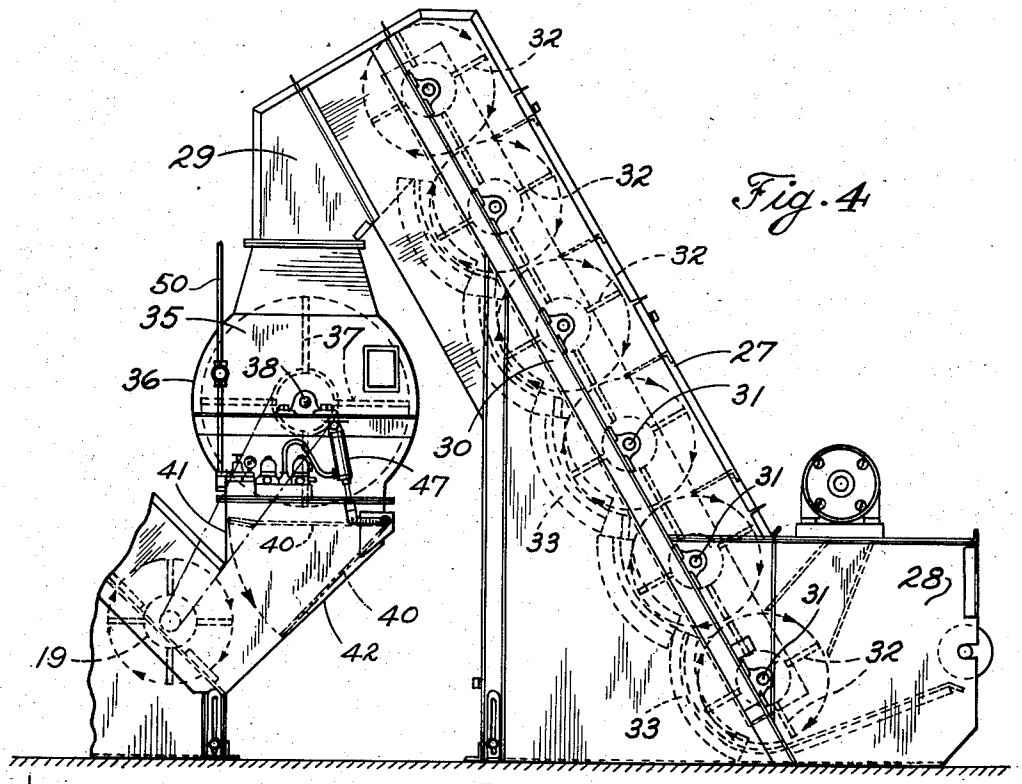



Fig. 4

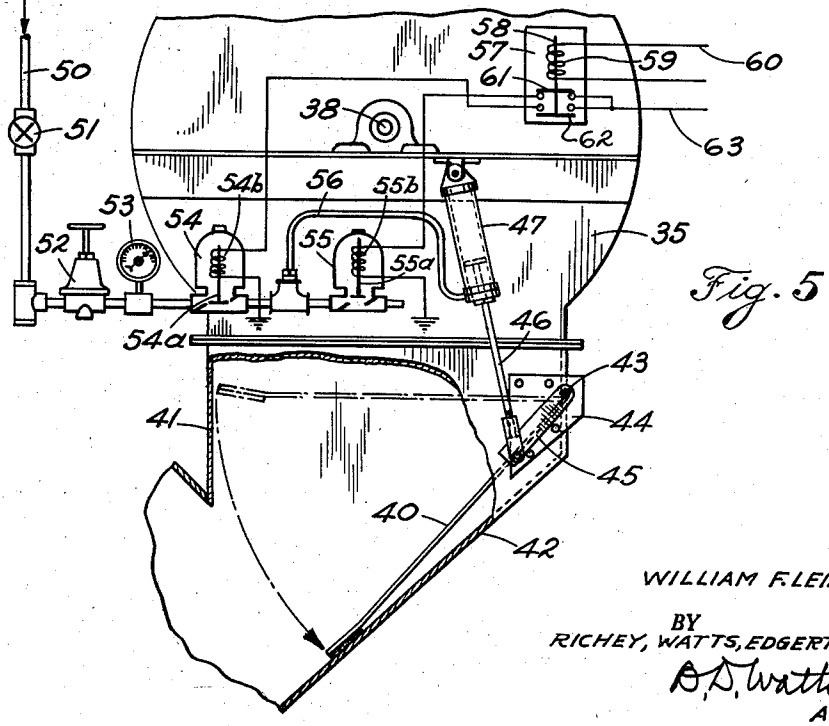



Fig. 5

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# METHOD AND SYSTEM OF BLENDING FIBERS

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Application March 15, 1955, Serial No. 494,319

5 Claims. (Cl. 19—146)

This invention relates generally to fiber preparation and more particularly to a method and system for obtaining a uniform homogeneous mixture of different types of textile fibers.

In order to produce cloth of different textures, various methods and means of blending fibers have been heretofore provided wherein the various elements are proportioned and thoroughly mixed to obtain a blended mixture.

In one method heretofore practiced, quantities of fibers were hand-weighed in large amounts ranging from 50–100 pounds, whereupon the various lots of weighed fibers were mixed and discharged into large storage bins for aging prior to delivery of the fibers to the picker room. It has been found that storage of large quantities of variously proportioned fibers results in a physical separation due to the different densities and characteristics of the individual types of fibers. Moreover, the proportioning operation is subject to a large factor of human error and the use of storage bins takes up valuable space and adds to overhead cost.

Another method of blending fibers heretofore practiced has consisted of the so-called "floor sandwiching" arrangement wherein a large number of workers are used to break open bales of various types of fibers and each of the workers will carry what is supposed to be a proportionate quantity of fiber to a common mixing point, for example, the center of a large floor space, whereupon the various types of fibers are subsequently mixed either by hand, or by introduction into a tumbler-type feeder machine. Because the quantities of fiber are frequently quite large, it has been found that thorough mixing is virtually impossible. Moreover, the large number of personnel engaging in the tedious labor required in the practice of this method makes the practice of the method expensive and unwieldly.

According to the principles of the present invention, a plurality of different types of fibers are automatically and accurately proportioned, delivered in small increments to a common holding station, automatically sandwiched into a single package and each package is separately blended for delivery to the picker room whereby the entire blending operation may be effected in one continuous operation and within an extremely compact space.

More specifically, the system provided in accordance with the principles of the present invention includes a plurality of fiber feeding and weighing machines arranged in battery to automatically and continuously weigh small increments of different types of fibers. A common holding chamber is provided and a conveyor means is situated between each of the machines and the common holding chamber. Control means in control of each of the machines regulate the concurrent discharge of all of the increments to the conveyor means for delivery to the common chamber whereupon a single sandwiched package is formed by the increments in the chamber. Each package is separately mixed in a blending machine and the mixed packages are continuously delivered to the picker room.



It is an object of the present invention, therefore, to provide an improved method and system of blending fibers which overcomes the deficiencies of the arrangements heretofore provided.

Another object of the present invention is to provide a method of blending fibers wherein the entire blending operation may be effected in one continuous operation and within an extremely compact space.

Yet another object of the present invention is to provide a system of blending fibers wherein fiber stock is automatically and accurately weighed in small increments, automatically sandwiched and subsequently blended in a continuous flow operation.

Many other features, advantages and additional objects of the present invention will become manifest to those versed in art upon making reference to the detailed description which follows and the accompanying sheet of drawings in which a preferred structural system incorporating the principles of the present invention and capable of practicing the methods described and claimed is shown by way of illustrative example.

In the drawings:

Fig. 1 is a schematic diagram of an automatic blending system according to the principles of the present invention;

Fig. 2 is a diagrammatic view of an automatic holding chamber with a sandwiched blend shown in dotted line deposited in the chamber;

Fig. 3 is a diagrammatic view of the automatic holding chamber shown in Fig. 2 showing the operation of the control means for releasing the sandwiched package from the holding chamber into the blending machine;

Fig. 4 is a side elevational view of a modified form of fiber opening and fiber mixing apparatus; and

Fig. 5 is a fragmentary elevational view of the mixer of Fig. 4 showing means for actuating the door thereof.

As shown on the drawings, the system provided in accordance with the principles of the present invention contemplates the provision of a plurality of fiber feeding and weighing machines indicated on Fig. 1 by the reference characters A, B and C, respectively, there being one fiber feeding and weighing machine for each type of fiber to be blended in order to obtain a given mix of fibers to produce cloth of a desired texture.

Behind each of the machines A, B and C is shown a bale of fibers indicated by the reference characters *a*, *b* and *c*. It will be understood that portions of each of the bales *a*, *b* and *c* are loaded into the machines A, B and C for opening and fluffing the fibers.

Each of the machines A, B and C is provided with an automatically controlled weighing system including a weigh box **10** located subjacent a discharge opening controlled by a motor actuated valve so that predetermined increments of fiber stock may be automatically and accurately weighed. Each weigh box is further provided with a hopper door construction indicated at **11** controlled by a suitable motor indicated at **12** so that each individual machine A, B and C may be set to a predetermined weight setting in accordance with a desired proportioning percentage of the particular fiber to be employed in the blend and the entire group of machines operated in battery through an interlocking arrangement so that all of the machines in the battery line will dump their respective increments of fiber stock simultaneously as soon as each of the machines has properly proportioned the particular type of fiber being handled.

Contemporary fiber feeding and weighing machines of the type shown at A, B and C are capable of accurately weighing very minute quantities of fiber stock. This is a highly advantageous feature insofar as the practice of the methods herein disclosed are concerned since it is possible by the use of such equipment to automatically and

accurately weigh very small increments of stock, the weight range for each increment preferably being less than 32 ounces in terms of weight measure.

For additional details of the wiring circuits used in a control system for a blending line similar to that herein disclosed, reference may be made to my copending application Serial No. 262,154, filed December 17, 1951, now Patent Number 2,727,279.

A continuously fast moving conveyor mechanism **13** is provided to receive fibers discharged from each of machines A, B, and C and to convey them to and discharge them into the automatic holding chamber **16**. This conveyor mechanism **13** includes an endless belt **14** arranged to receive the fibers discharged from each of the machines A, B and C; and also includes a separate inclined device **17** which serves to transport fibers discharged from belt **14** to the top of holding chamber **16**. The device **17** includes a fixed, inclined housing into the lower end of which the fibers are discharged from belt **14** and fiber propelling means in the housing provided with projections which engage the fibers and propel them upwardly in the housing into the holding chamber **16**. The fiber propelling means shown is an endless belt and the projections are spikes which not only engage and propel the fibers but tend to open them.

Each individual increment drops on top of the preceding increment within the automatic holding chamber to form a sandwich. The sandwiching action produces a layered package indicated diagrammatically in Fig. 2 and Fig. 3 at P. For most reliable results in obtaining proper blending, it has been found that the size of the sandwich should be effectively limited to a relatively small amount and should be preferably limited to a package of less than 10 pounds in weight measure.

A blending machine **18** is provided to receive the package P from the automatic holding chamber **16** and includes a plurality of beaters **19** to separately mix each package P, the mixed blend being discharged to a common outlet **20** for delivery through the discharge pipe **21** to the picker room wherein the loose blended stock is received and subsequently formed into a lap, or rolled blanket of uniform width and length.

Control means are provided between the automatic holding chamber **16** and the blending machine **18** to regulate the passage of the package P from the automatic holding chamber **16** into the blending machine **18**. The control means are shown diagrammatically in Figs. 2 and 3 as including a hinged door **22** operated by an electric motor **23** as shown in Fig. 1. The motor **23** may be electrically interlocked with the control means, provided in connection with the fiber feeding and weighing machines A, B and C, for example, the motors **12**, so that the package P will be delivered from the holding chamber **16** into the blending machine **18** simultaneously with the concurrent discharge of all of the various increments of fiber stock onto the belt **14** of the conveyor **13**. By interlocking control of the various parts of the system, separate mixing of each package P is insured, thereby contributing to the uniformity of blend.

In practicing the method of the present invention with the apparatus of Figs. 1 to 3, a plurality of separate types of fibers are automatically and continuously proportioned by incremental quantities in individual lots of less than 32 ounces apiece whereupon the lots are concurrently delivered to a common sandwiching station and sandwiched into a single package of less than 10 pounds. The single package is separately mixed, thereby blending the fibers for delivery to a common outlet from where a supply of blended fibers may be furnished to the picker room for subsequent picking, carding and spinning operations.

In Fig. 4 is shown an opening device and a mixer which may be substituted for the conveyor **17** and hopper **16** of the embodiment shown in Fig. 1.

Fig. 4 shows the opener **27** positioned to receive increments of fibers delivered by the several feeders A, B and C to the endless belt **14**. This opener comprising a sheet metal housing **27** has a fiber receiving hopper **28** at its lower end and an outlet conduit **29** at its upper end, a pair of upwardly inclined beams **30**, a plurality of beaters including shafts **31** rotatably supported on beams **30** and rods **32** projecting at right angles from said shafts, and curved walls **33** disposed below the beaters and close to the arc of the ends of the beater rods.

The mixer **35** is generally rectangular in horizontal cross section but with its opposite sides bulged outwardly, as at **36**, to accommodate a beater which comprises rods **37** carried by a shaft **38** which is mounted for rotation in bearings attached to the mixer housing. The lower end of the chamber in which this beater is disposed is provided with an opening controlled by a door **40**. When this door is in the opened position shown in Fig. 5, the fibers in mixer **35** may move out under the force of gravity and thereby be discharged into the blending machine **18** of Fig. 1 or into any other suitable fiber handling apparatus.

The door **40** of the mixer **35**, as shown, is opened by the force of gravity acting on it and on the fiber contents of the mixer; and is moved to and held in position closing the bottom of the mixer chamber by fluid pressure which is electrically controlled in timed relation with the discharge of fibers from the feeders A, B and C.

The door **40**, as shown, is positioned within the housing which extends downwardly from the mixer **35** and is defined by vertical side walls **41** and bottom wall **42**. This door is secured to a rod **43** which is rotatably mounted in brackets **44** on the outside of walls **41**; and this rod is provided with an arm **45** to which is pivotally connected a piston rod **46** having a piston at its upper end movably mounted in the cylinder **47** which is pivotally connected at its other end to the outside of mixer **35**.

A source of fluid under pressure (not shown) is connected to a pipe line **50** which has a shut-off valve **51** and which leads through a pressure regulating valve **52**, a pressure indicator **53** and thence through two solenoid controlled valves **54** and **55**. The end of pipe **50** leading from valve **55** is open to the atmosphere. Between valves **54** and **55** a conduit **56** leads from line **50** to the lower end of cylinder **47**. It will be understood that when fluid under pressure in line **50** flows through conduit **56**, it will move the piston on rod **46** upwardly in cylinder **47** with resultant closing of the door **40**.

Valves **54** and **55** are quite similar in construction. In each the valve body is provided with inlet and outlet openings for flow of the fluid under pressure therethrough and with a valve seat between those openings on which a solenoid controlled valve may rest to shut-off the flow of fluid through the valve body. Each of these valves has a valve stem which is movably positioned within the coil of a solenoid. In valve **54** this stem is indicated at **54*a*** and the corresponding stem in valve **55** is indicated at **55*a***. The windings of the solenoids are indicated respectively at **54*b*** and **55*b***. A solenoid controlled switch **57** serves to control energization of solenoid windings **54*b*** and **55*b***. This switch includes a plunger **58** movable endwise in solenoid coil **59** which is connected to circuit **60** and carries two switches **61** and **62**. As is indicated in Fig. 5, current flow in conductor **60** and coil **59** will move plunger **58** up thereby breaking the circuit from line **63** through switch **61** to winding **55*b*** and making a circuit through switch **62** and winding **54*b***. Thus when current flows in conductor **60**, valve **54** will be opened and valve **55** will be closed with resultant flow of fluid under pressure through valve **54** and conduit **56** to cylinder **47** whereupon door **40** will be closed. When the flow of current in line **60** is interrupted, switch **61** will be closed and switch **62** will be opened with the result that valve **54** will close and valve **55** will open, permitting air to escape from cylinder **47** and allowing door **40** to open.

It will be understood that the switch **57** also includes a timing device (not shown). When current flows through

conductor 60 and energizes the coil 59, the timer coil (not shown) is energized and acts to hold switch 62 in closed position for a predetermined length of time after the flow of current through circuit 60 is interrupted. At the end of this timed interval the core 59 drops, breaking the circuit through 62 and making it through switch 61 as above described. The duration of this delay cycle is predetermined and is set by a dial indicator (not shown). If, for example, the feeders A, B and C are set to dump every 15 seconds, and 7 seconds are required for one batch of fibers to travel from the feeder A through opener 27, the timer should be set to hold switch 62 closed for about 10 seconds. Thus the fibers will be mixed for about 3 seconds in mixer 36 before switch 61 is closed and the fibers are discharged from the mixer. The mixer door will remain open for about 5 seconds before switch 62 would be closed.

It will be understood that conductor 60 is in circuit with the electrical means which is connected with motors 12 of feeders A, B and C, so that current will flow through coil 59 when these motors are actuated to discharge weighed increments of fibers from the feeders. A source of current of sufficient strength to actuate the valves 54 and 55 is connected to conductor 63 and the conductors leading therefrom to the coils 54*b* and 55*b* are grounded on the mixer housing as indicated.

The operation of the apparatus of Figs. 4 and 5 will be understood by those skilled in the art from the foregoing description of Figs. 4 and 5 but, succinctly stated, it is as follows: When each of the feeders A, B and C is running and feeding fibers into the weighboxes 10, no current flows in circuit 60, valve 54 is closed and valve 55 and door 40 are open. When the weigh boxes have received their predetermined weighs of fibers, all the motors 12 are energized and cause the weighed fibers to be discharged onto endless belt 14. Simultaneously with the energization of motors 12, current flows through conductor 60 with resultant opening of valve 54 and closing of valve 55 and door 40. The motors 12 are promptly de-energized but due to the timer, current continues to flow through conductor 60 and door 40 remains closed for a predetermined time, such as the 10 second interval above mentioned. At the expiration of that time period, the timer de-energizes coil 59 which permits valve 54 to close and valve 55 and door 40 to open. Fibers discharged from feeders A, B and C onto the belt 14 are thus opened by opener 27, mixed by mixer 36 and discharged therefrom while the next increments of fibers are being fed into the scale pans of feeders A, B and C.

This application is a continuation-in-part of my copending application Serial No. 222,233, filed April 21, 1951, which application is now abandoned.

Although various modifications might be suggested by those versed in the art, it should be understood that I wish to embrace within the scope of this patent all such modifications as reasonably and properly come within the scope of my contribution to the art.

What is claimed is:

1. A fiber blending system comprising a plurality of machines arranged in battery and serving simultaneously to feed and proportion separate increments of different types of fibers, there being one machine for each type of fiber, fiber discharge means to discharge the said several increments simultaneously to form a first batch of fibers, a chamber having a movable bottom wall, means to move said wall into open and closed position, an endless belt disposed to receive the said first batch of fibers, means to propel the increments of said first batch of fibers from the discharge end of the endless belt into the upper end of said chamber while a second batch of fibers is being fed and proportioned by said machines, said propelling means including an inclined housing having its lower end disposed to receive the said increments as they are dischrged one at a time from the endless belt and having its upper end disposed to discharge said increments into said chamber, and fiber propelling means in said housing separate and distinct from said endless belt and provided with projections to engage said increments and propel them in succession upwardly in the housing and into said chamber, and control means to actuate said wall moving means in timed relation to the actuation of said fiber discharge means.

2. The combination of elements set forth in claim 1 in which the said fiber propelling means is an endless belt provided with spikes projecting therefrom.

3. The combination of elements set forth in claim 1 in which the said fiber propelling means is a plurality of horizontal shafts provided with rods projecting radially therefrom.

4. The combination of elements set forth in claim 1 in which the said chamber is provided with a beater for mixing fibers in the chamber.

5. The combination of elements set forth in claim 1 in which said control means serves to move said bottom wall of the chamber to closed position simultaneously with the discharge of said increments of fibers and includes a timer which serves to maintain said wall in closed position during only part of the time the fibers are being fed and proportioned for a second batch of fibers.

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