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METHODS OF AND MACHINES FOR BLENDING TEXTILE FIBERS

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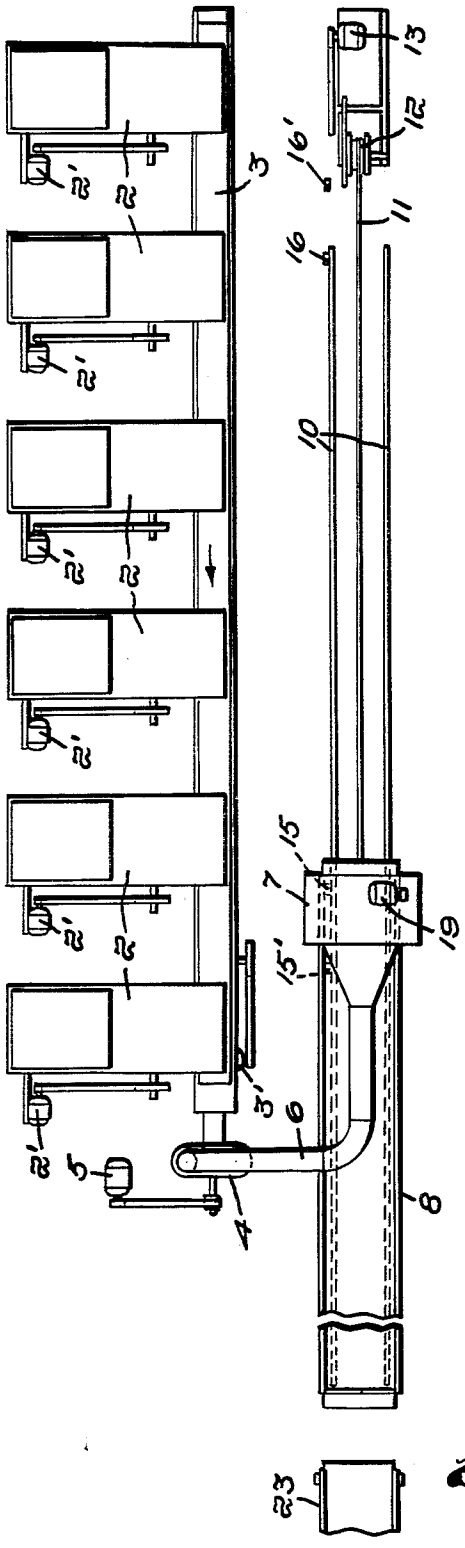


Fig. 1.

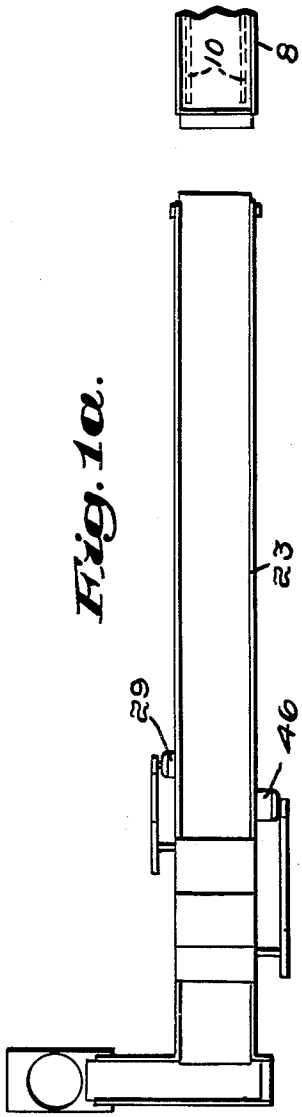


Fig. 1a.

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METHODS OF AND MACHINES FOR BLENDING TEXTILE FIBERS

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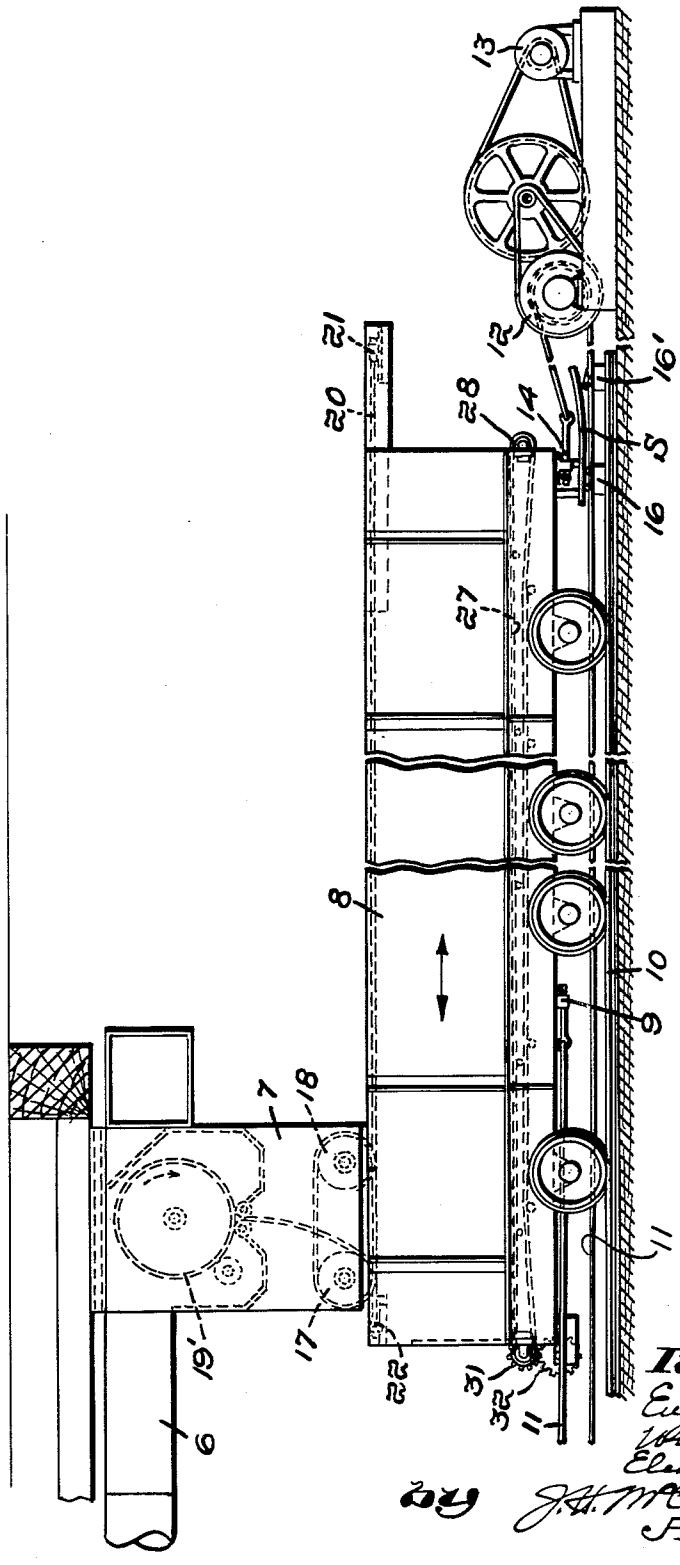


Fig. 2.

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METHODS OF AND MACHINES FOR BLENDING TEXTILE FIBERS

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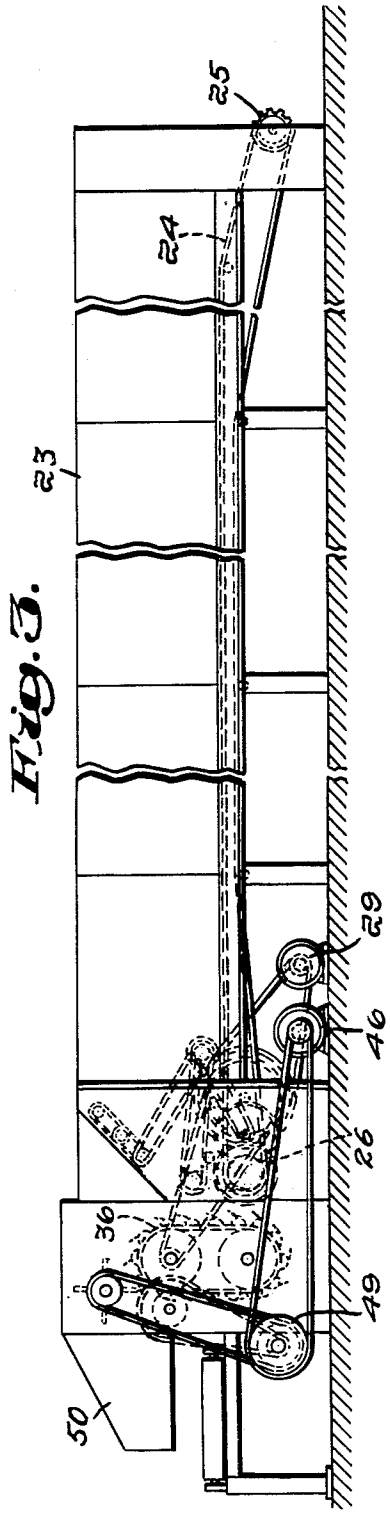


Fig. 3.

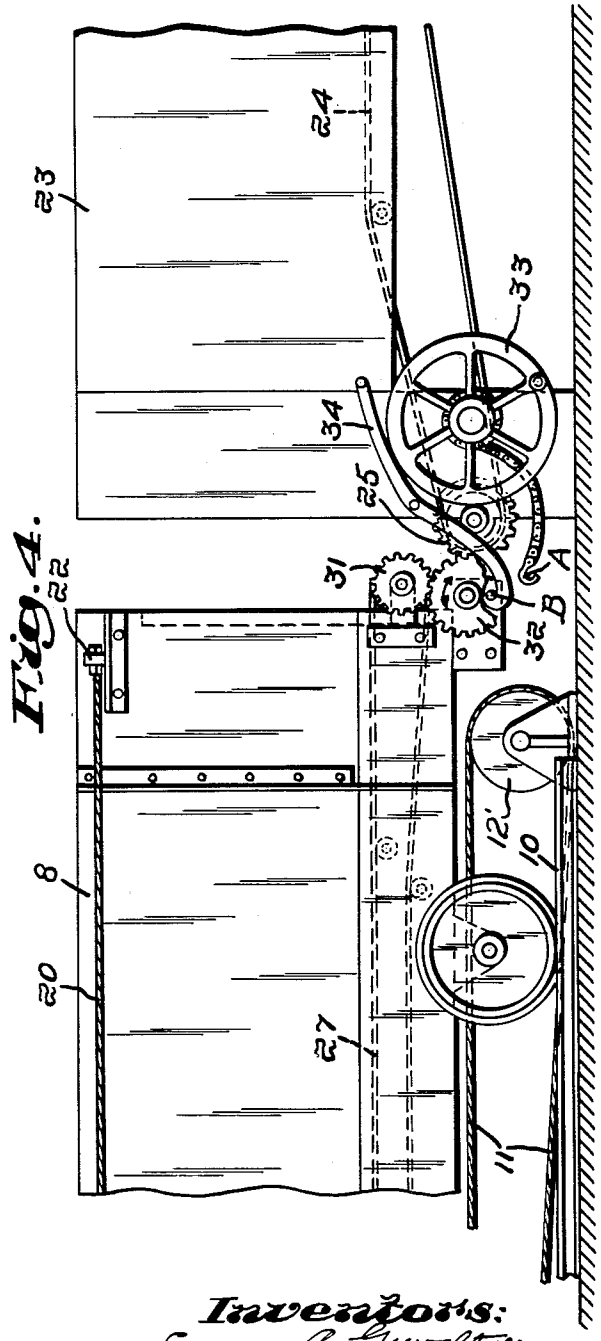


Fig. 4.

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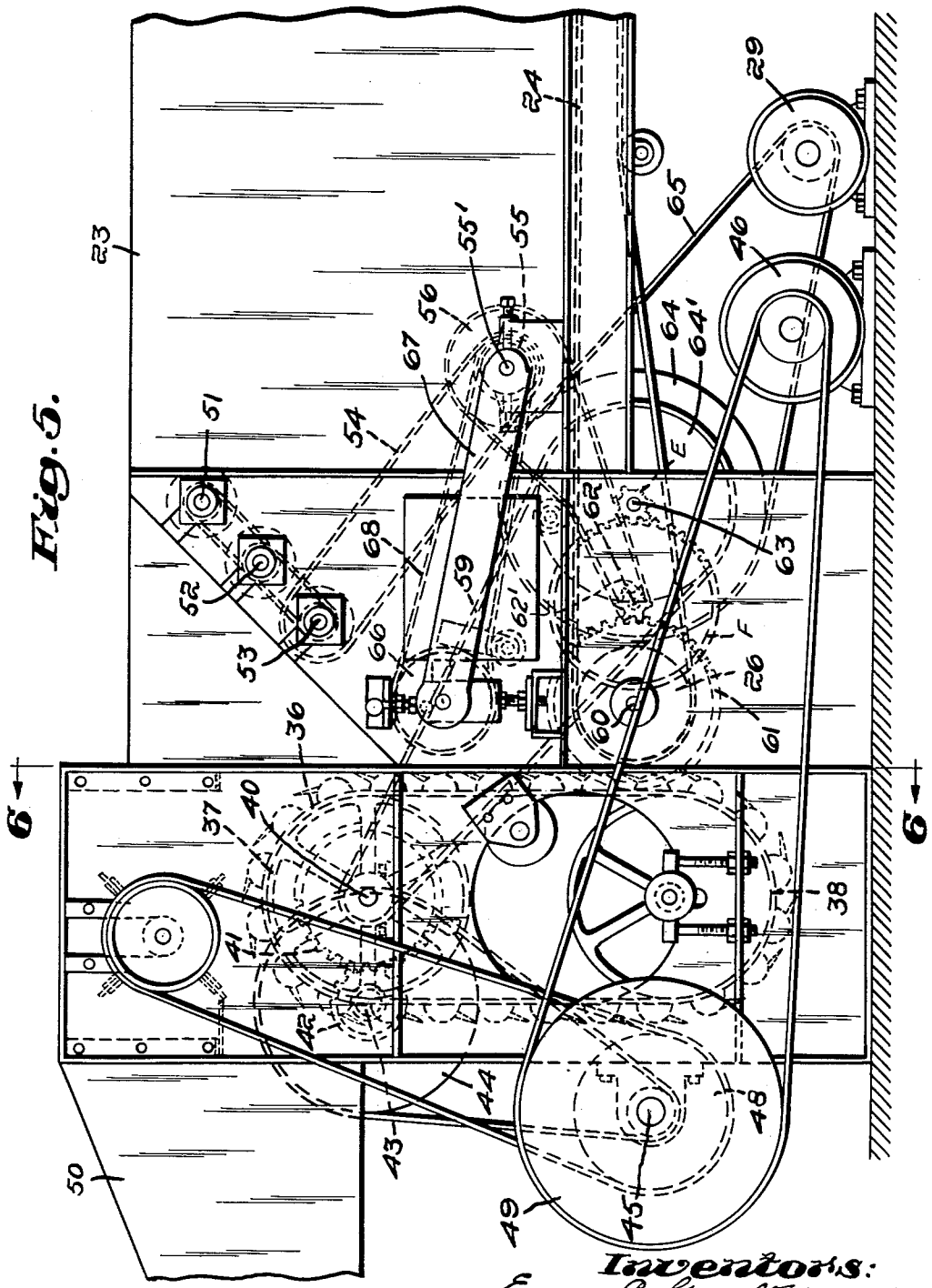
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METHODS OF AND MACHINES FOR BLENDING TEXTILE FIBERS

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Fig. 5.



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METHODS OF AND MACHINES FOR BLENDING TEXTILE FIBERS

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Fig. 6.

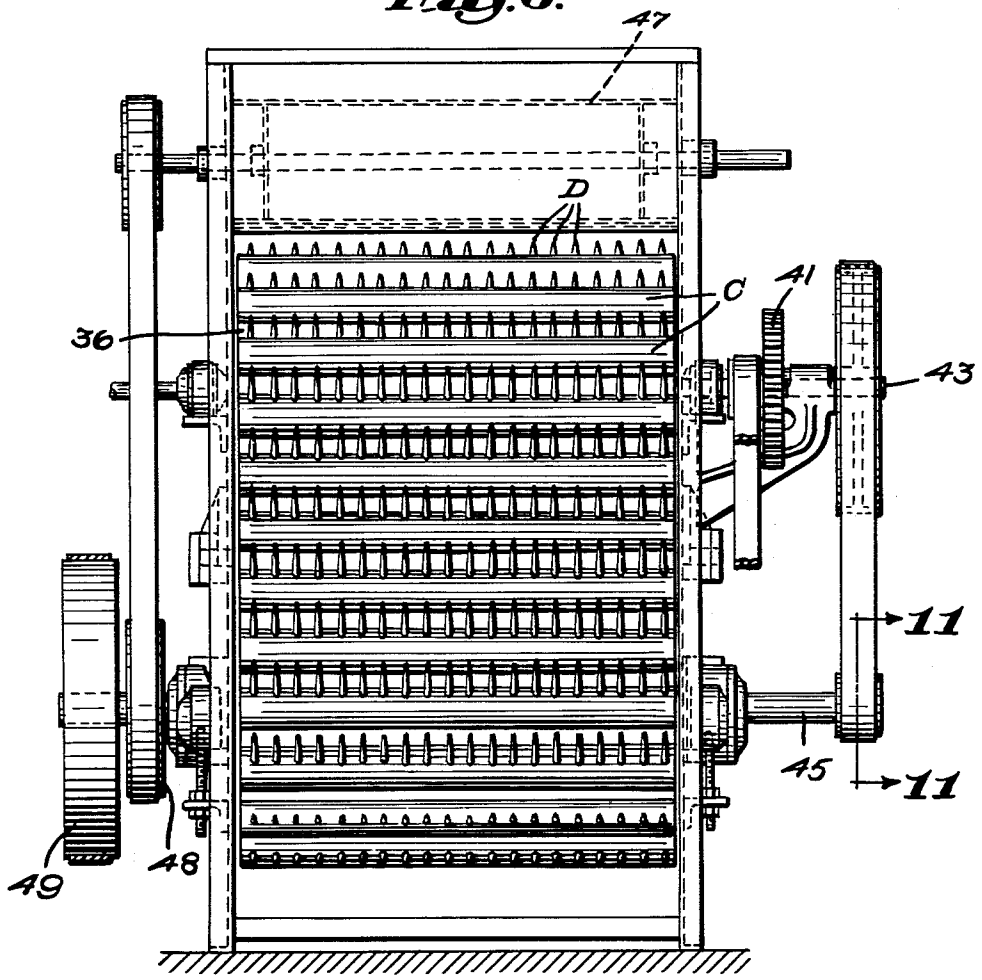


Fig. 11.

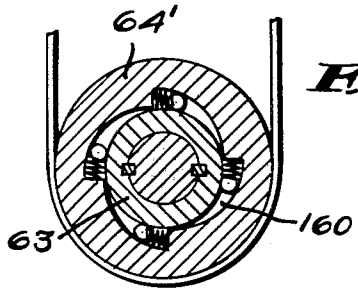


Fig. 10.

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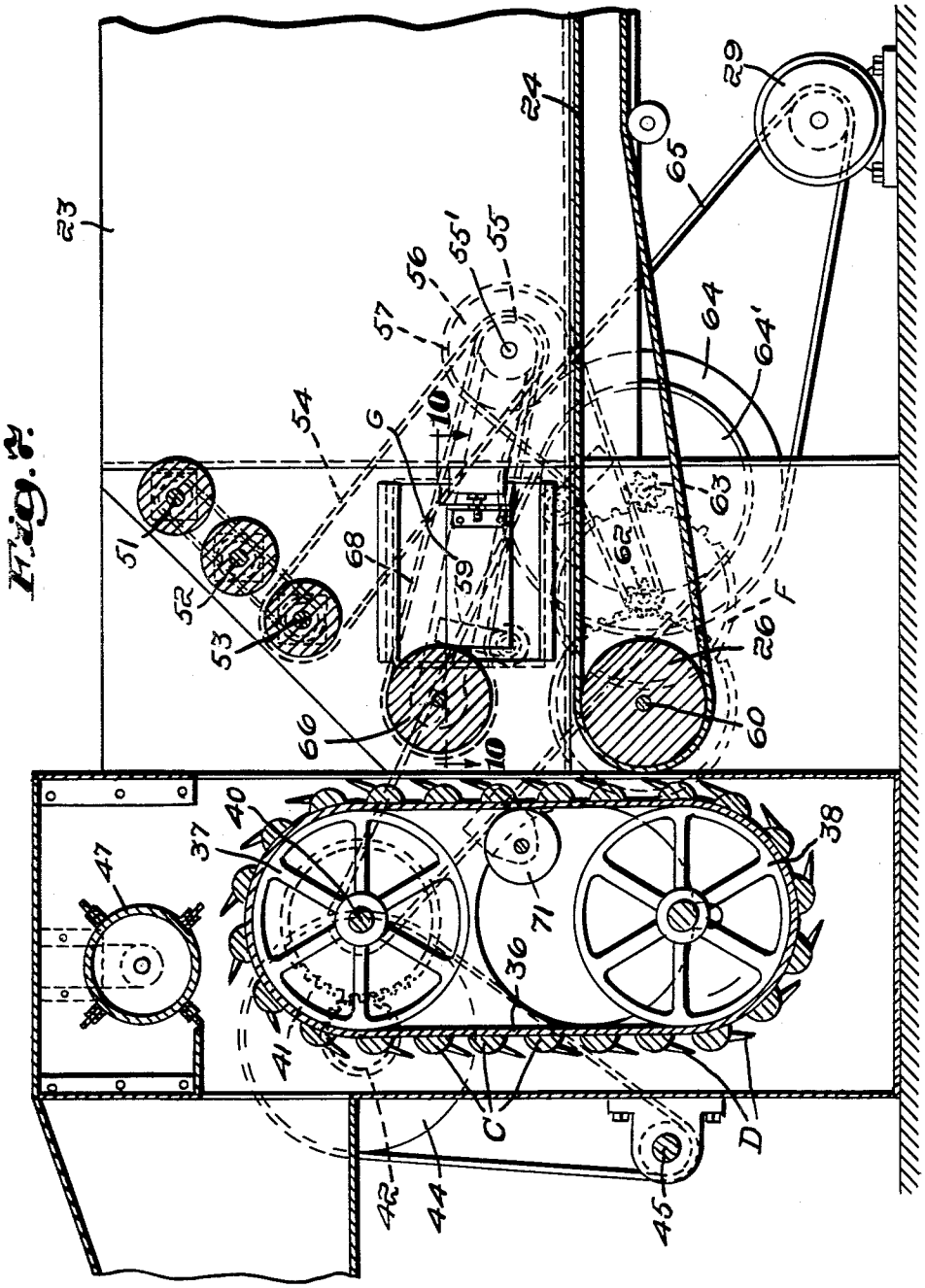
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METHODS OF AND MACHINES FOR BLENDING TEXTILE FIBERS

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Fig. 2.



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METHODS OF AND MACHINES FOR BLENDING TEXTILE FIBERS

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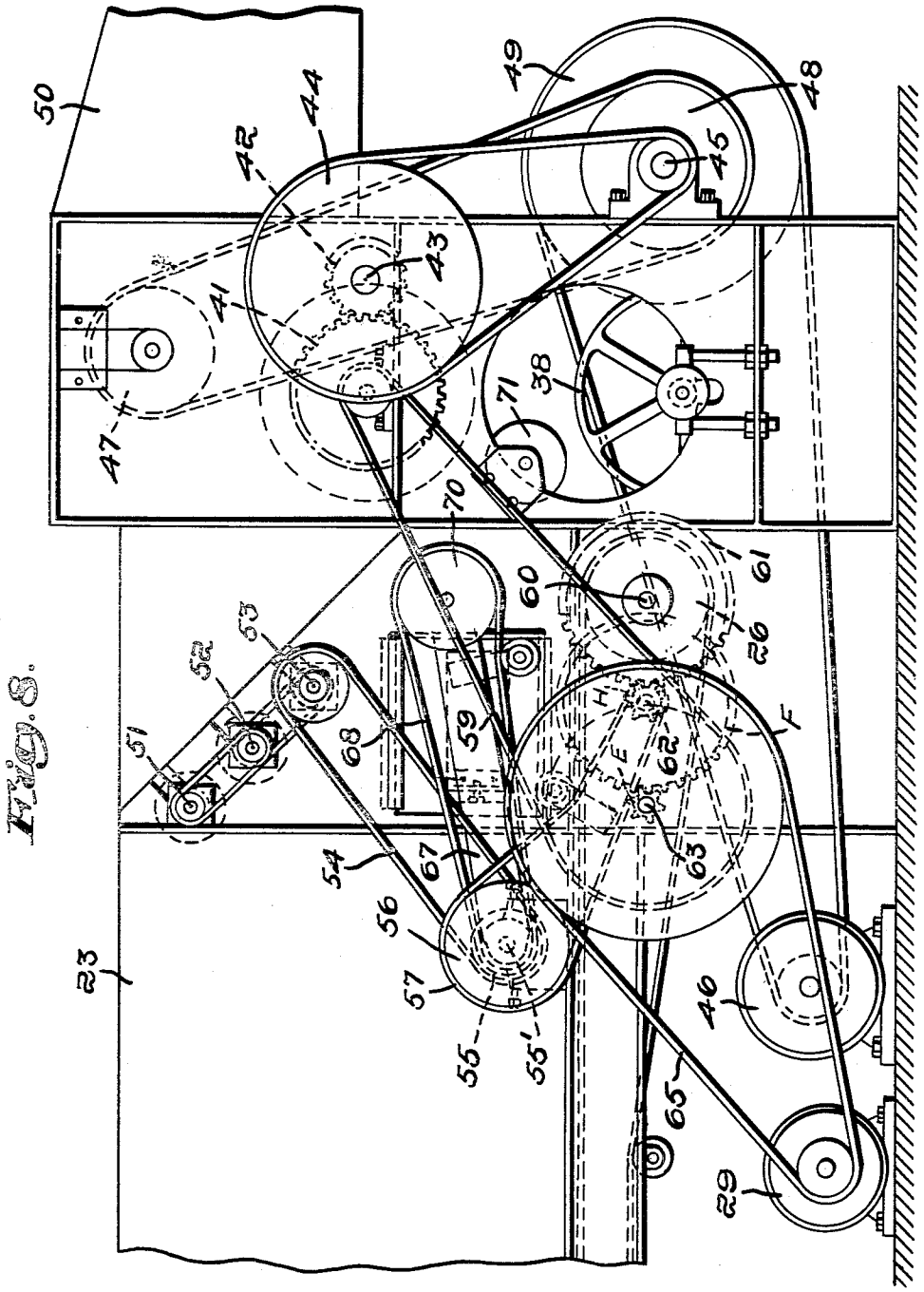


Fig. 8.

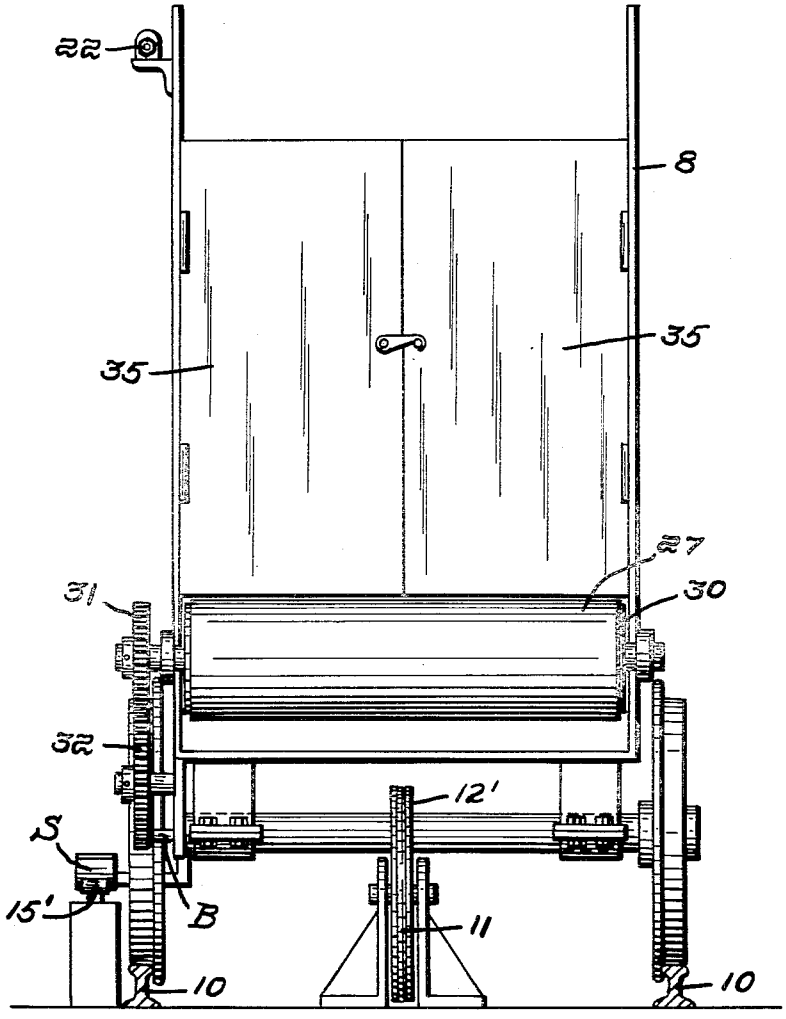
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METHODS OF AND MACHINES FOR BLENDING TEXTILE FIBERS

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Fig. 9.



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METHODS OF AND MACHINES FOR BLENDING TEXTILE FIBERS

Filed Aug. 12, 1949 9 Sheets-Sheet 9

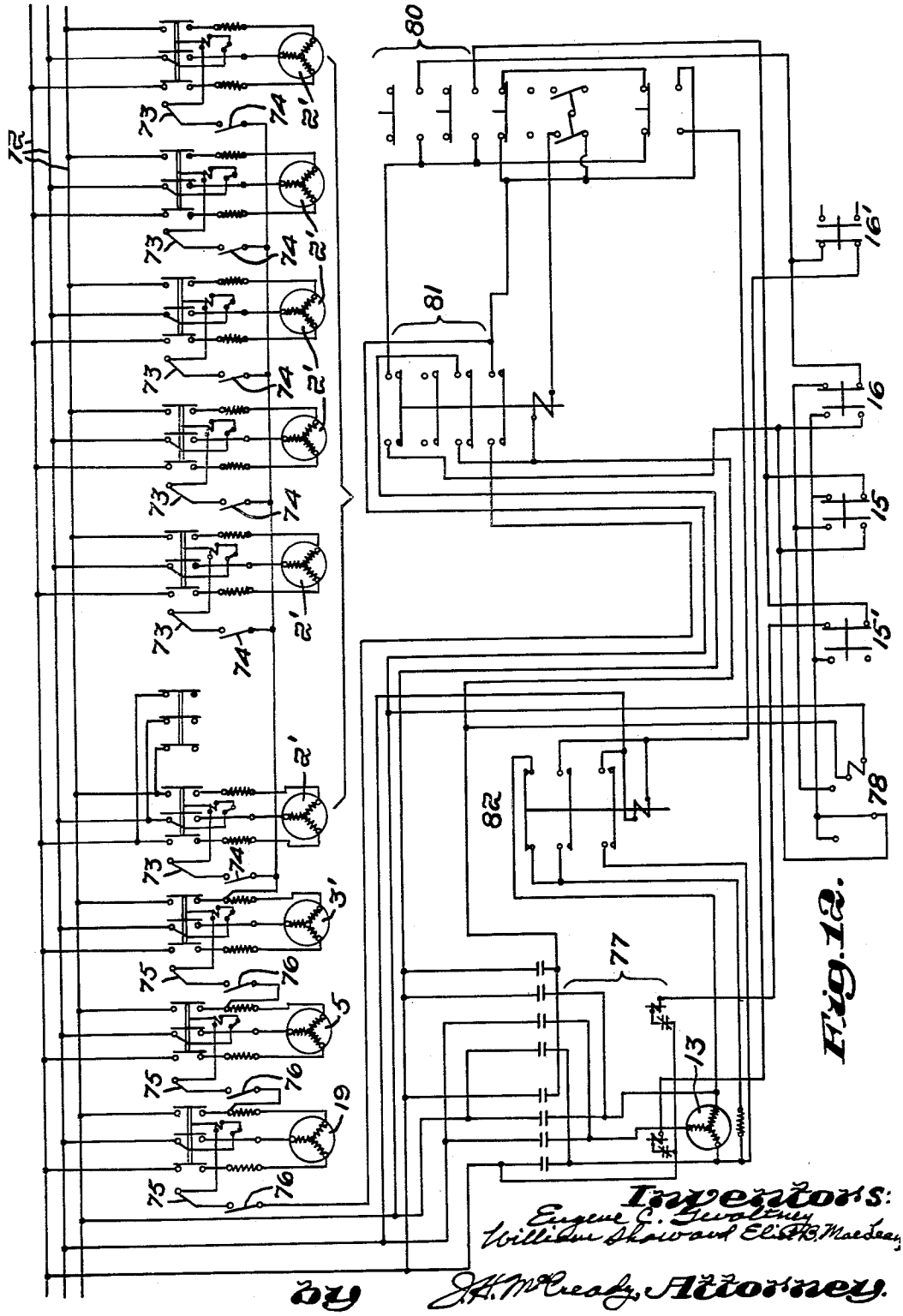


Fig. 12.

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United States Patent Office

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METHODS OF AND MACHINES FOR BLENDING TEXTILE FIBERS

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Application August 12, 1949, Serial No. 109,976

6 Claims. (Cl. 19—146)

In the manufacture of yarn or cloth it is very frequently desirable to blend two or more kinds of fibers, as well as different sizes of fibers of the same kind, and the production of a satisfactory product from these mixed fibers requires that the mixtures be highly uniform. This is particularly true when rayon, or other synthetic fibers, are mixed with cotton, wool, or other natural fibers, or are mixed together. The production of such mixtures is a very common practice, as for example, to produce a stronger fabric, or in other cases to produce blends suitable for cross-dyeing.

Trouble often arises, however, in fabrics produced from such mixtures because of the fact that when the cloth is dyed, the different fibers take the dye to very different degrees. Cotton, for example, usually absorbs the dyes very readily, whereas the synthetic fibers differ greatly in this respect. Also, even when a dyed mixture seems to the naked eye to be perfectly uniform, it is a common experience to find, after the mixture has been woven, that differences in shades or tones appear vary plainly although they could not be detected at any previous stage in the process of manufacture. This is particularly true when some such mixture forms the filling or weft of the final product. In fact, these differences in shade are commonly referred to in the trade as "filling bars."

Such a lack of uniformity in fabrics made from mixed fibers has caused so much trouble that it has been necessary to adopt measures to minimize this difficulty. It is now recognized that the variations in distribution of the fibers in a mixture including synthetics, must not be more than 1% of the synthetic component if the desired uniformity for good dyeing and, in some cases for uniform strength, is to be produced.

The general practice of making fiber mixtures or blends, which has been in use in the textile industry from time out of mind, is to produce the mixture by hand. That is, if a six hundred pound batch of mixed fiber is to be made, and it has been decided that the composition of that batch shall consist of equal parts of cotton, wool, rayon, or any other fibers, then two hundred pounds of each kind of fibers is weighed out and placed in a pile or in a container. A space is cleared on the floor large enough to accommodate the entire batch. Then a workman scatters a thin layer of one fiber, say cotton, over this entire space. On top of it he sprinkles another kind of fiber, say wool, to produce another layer, and on top of that he makes still a third layer, using such care as he can to make the layers as nearly uniform as possible. He repeats these operations until the entire weight of six hundred pounds of fiber has been used up in this manner.

This produces what is known in the industry as a "sandwich mix." If this mixture is to be spun, and the fibers are in proper condition for picking or carding, the workman slides one hand under the edge of the entire pile, places the other hand on top of the pile and directly over the first hand, and he then picks up all of the material gripped between his two hands that he can carry. This he dumps into the hopper of the picker lapper or other machine in which the fiber is to be first operated upon. He repeats these operations until he has placed enough fiber into the hopper to warrant starting up the machine. As the picker continues to operate he keeps on feeding stock taken from his sandwich mix in the manner just described and placing it in the hopper until finally the whole batch is exhausted.

The lap so produced may or may not be picked a second, or more times, depending upon the requirements of the yarn that is to be made. Later the lap is carded and goes through the conventional operations necessary to produce a yarn of the desired character.

As above indicated, this method of producing fiber blends, crude as it is, has been used from time out of mind, and is still used, in textile mills. When an extraordinarily uniform blend is required, as in making mixtures containing a substantial percentage of synthetic fibers, the same method is followed, except that the mixing is performed in very small lots, the sandwich is built up very carefully, pains being taken to make the layers as uniform as possible, and greater care being given to the weighing of the different charges. One of the points where troublesome variations have been found to occur is in the weighing of the different quantities of fiber on different scales. In fact, there is enough difference in different weighing devices of the same type and make to produce endless trouble in making these blends. If synthetics are to be used, it is now customary for all the components of each batch to be weighed on the same scale, performing this operation with great care, and using the same high degree of care throughout the entire process. Naturally such a method is expensive, both in time and labor.

The present invention is especially concerned with this problem of making fiber blends or mixtures, and it aims to devise both a superior method and also a novel machine organization with the aid of which this mixing or blending process can be performed far more effectively and efficiently than has been possible with any prior art method.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

In the drawings,

Fig. 1 is a plan view of the right-hand end portion of a machine organization constructed in accordance with this invention;

Fig. 1*a* is a similar view of the left-hand end of the same machine organization;

Fig. 2 is a side elevation of the bat building unit of the organization shown in Fig. 1;

Fig. 3 is a side elevation of the bat feeding and picking unit of the machine shown in Fig. 1*a*;

Fig. 4 is a view similar to Fig. 2 showing the manner in which the bat building and feeding units are connected at one step in the cycle of operations of the machine;

Fig. 5 is a side elevation, on a larger scale, of the mechanism shown at the left-hand end of Fig. 3;

Fig. 6 is a vertical, sectional view taken on the line 6—6, Fig. 5;

Fig. 7 is a longitudinal, vertical, sectional view of the mechanism shown in Fig. 5;

Fig. 8 is a side elevation of the opposite side of the end portion of the machine shown in Fig. 5;

Fig. 9 is an end view of one element of the bat building mechanism;

Fig. 10 is a horizontal, sectional view of a switch arrangement used in the sandwich feeder;

Fig. 11 is a sectional view illustrating the manner in which an over-running clutch may be used with one of the gears or pulleys; and

Fig. 12 is a diagram showing the electrical connections for the various units of the machine.

Preliminary to a detailed description of the machine organization illustrated in the drawings, it may be pointed out that the method provided by this invention, as designed for practice with the particular equipment here illustrated, comprises the steps of feeding the different kinds of fiber to be blended in separate streams on to a feed table. These streams of fiber meet on the feed table and are carried by it to a blower or fan and thence are conveyed by the current of air created by the blower to a condenser which works the fibrous mass into a sheet or web. This sheeted product is folded backward and forward upon itself to build up a very thick bat composed of thin layers superposed, one upon another. When the bat has been completed it is fed endwise against a lattice equipped with pins, which rake across the end face of the bat, transversely to the layers of which it is composed, and thereby removes approximately equal increments of fiber from the respective layers or webs. These operations are continued until the bat is exhausted, or the desired quantity of fiber has been collected.

The various units of the machine shown in the drawings will be described in approximately the order in which they, or the steps which they perform, have just been mentioned.

Referring first to Fig. 1, a series of hopper feeders **2** are there shown diagrammatically, those here illustrated being of a common type known as "Saco-Lowell's F 5." Each feeder is a complete motor-driven unit and all of the feeders are arranged side by side to deliver their fiber on to the feed table **3**. The number of feeders used in producing any individual bat will depend upon the composition of that bat and the number and proportions of the different kinds of fibers of which it is to be composed. The weight of fiber delivered per minute by any individual feeder can be controlled in ways well known in this industry so that if the fibers are carefully weighed before being put into the respective hoppers, and the machines are properly adjusted, the desired proportions of the different kinds of fiber can be delivered at predetermined rates to the feed table. There they unite to form a stream of fibers of the kinds and general proportions desired in the final blend.

This stream of fiber is conveyed by the feed table **3** to its delivery end at the left of Fig. 1 where it is picked up in the intake of the blower **4** driven by the motor **5** and is conveyed in the stream of air created by the blower through the conduit **6** to the condenser **7**, better shown in Fig. 2. During its travel from the feed table to its delivery by the condenser, the fibrous constituents of the different webs produced by the respective feeders **2** become mixed and intermingled with each other so that the sheet delivered by the condenser contains a mixture of the different fibers. At this time, however, the fibers are not thoroughly blended with each other.

The condenser works this mixture into a composite web from which a bat can be built up for further treatment. This operation is performed with the aid of the bat building unit partly illustrated in Figs. 1 and 1*a* and better shown in Fig. 2. It comprises a car **8** mounted on wheels which run on a track **10**. As best shown in Fig. 2, the condenser **7** is mounted directly over the path of travel of the car **8** and mechanism is provided for reciprocating this car forward and backward under the condenser while the latter continues to deliver its web of fiber. Referring to Figs. 1 and 2, it will be seen that the car **8** has a cable **11** connected to it at **9** and running over a drum **12'** (not shown in Fig. 2) and then back around a drum **12** driven by a motor **13** through reduction belting or gearing. After running around this drum the other end of the cable is secured to the car at **14**, Fig. 2. Reciprocating motion of the car is produced by installing two limit switches **15** and **16** near opposite ends of the track **10** where they will be operated alternately by one or more shoes S, Figs. 2 and 9, mounted on the car, and these switches reverse the direction of rotation of the motor at the opposite ends of the traverse of the car. The car is simply a sheet metal box with a sturdy bottom and suitable frame but open at the top. Consequently, as it is reciprocated forward and backward, while the condenser continues to deliver its web, the latter is folded back and forth upon itself, this operation being continued until a thick bat, which may be as deep as the car body, has been built up.

In order to reduce the fluffiness of the bat, a pair of rolls **17** and **18**, Fig. 2, are supported in the delivery chute of the condenser **7** where they can rotate in contact with the bat after it has been built up to a sufficient height to touch the rolls. Preferably the very simple arrangement shown in Fig. 2 is utilized to operate these rolls, this arrangement consisting of a cable **20** fastened to one end of an overhung portion of the car at **21**, and running clockwise around a pulley fast on the shaft of the roll **17**; then clockwise around the pulley for the other roll **18**; and back to the left-hand end of the car where it is secured at **22**. Thus, as the car moves toward the left, Fig. 2, the rolls **17** and **18**, bearing on the top of the bat in the car **8**, will roll in contact with that material in a direction to press it down, and when the motion of the car is reversed, the rotation of the rolls **17** and **18** also will be reversed automatically. Since the motion of the rolls is created by the movement of the car itself, they can readily be so designed that their contact with the bat will be simply a rolling contact without any rubbing action.

Because the ordinary condenser is relatively narrow and not as wide as it is desired to have the bat, the particular condenser shown in Fig. 2 consists of a casing, a filter cylinder **19'** driven by the motor **19**, and the doffing rolls associated with it of the Saco-Lowell No. 6 Air Filter. This produces a condenser of the desired width for bat building purposes.

When the bat has been completed it is then transferred bodily to a bat feeding unit or sandwich feeder, indicated at **23** in Fig. 1*a*, and also shown in Figs. 3 and 4. It comprises a box with sheet metal sides and suitable structural elements to support them, having about the same cross-sectional dimensions as the car **8**, and equipped with a conveyor **24** supported in the bottom thereof and including a pulley provided with a gear **25**, Figs. 3 and 4, at its rearward end, while at its forward end the conveyor belt runs over a pulley **26**, Fig. 3, which is driven through intermediate connections from a motor **29**. It should also be observed that the immediate support for the bat built up in the car **8** consists of the upper reach of a conveyor belt **27** guided at its rearward end by the pulley or roll **28**, Fig. 2, and at its opposite end by a roll **30**, Fig. 9, equipped with a gear **31**, Figs. 2, 4 and 9.

During the bat-forming operation the conveyor **27** remains stationary or inactive, but when the bat has been completed it is, as above indicated, transferred to the bat feeder or sandwich feeder **23**. For this purpose the car is moved toward the left, Fig. 2, preferably by the use of a jogging switch **78**, Fig. 12, connected into the circuit of the motor **13**, until it comes into the position shown in Fig. 4. Here an intermediate gear **32**, Figs. 4 and 9, which is always in mesh with the gear **31**, is moved into mesh with the driven gear **25** of the feeder. A chain wound on the drum of a hand wheel **33**, Fig. 4, has a hook A at one end which may be engaged with a pin B to pull the car **8** up into its final position where the hook is taken off and the hook-shaped end of a lever **34**, Fig. 4, is engaged with the pin and locks the car to the feeder. The pin B is anchored in a part of the frame of

the car, as best shown in Figs. 4 and 9. Preferably the opposite ends of the car are equipped with doors 35 which can be swung back, completely out of the way, prior to the transferring operation.

With the car secured to the feeder, as just described, the motor 29 is started up, thus bringing the feeding conveyor 24 into operation and through the intermediate gear 32 operating the conveyor 27 in the car. The result is to move the entire bat in the car bodily forward into the feeder 23.

After this transfer has been completed, the car 8 is disconnected from the feeder; is moved back into its normal relationship to the condenser 7; and the building of another bat is begun.

Before the forward end of the bat reaches the front end of the sandwich feeder, the lifting apron or picking apron 36, best shown in Figs. 6 and 7, is started up. This apron is of the lattice type and has a series of bars C bearing spikes or sharp pointed pins D. Its function is to rake across the entire forward end face of the bat and thus to remove from each of the layers of the bat small increments of stock which are collected at some suitable point or transferred to any desired piece of equipment. As best shown in Fig. 7, this apron 36 is supported on upper and lower pulleys 37 and 38. The upper of these pulleys is mounted on the shaft 40, Fig. 7, carrying a gear 41 which is driven by a pinion 42, Figs. 7 and 8, fast on the shaft 43. A pulley 44 also fast on this shaft is belt-connected to another shaft 45 that is belt-driven by the motor 46.

During the transfer of the bat from the car 8 to the sandwich feeder 23 it is desirable to operate the conveyor 24 at a rate which will effect this transfer quickly. However, once the transfer is completed and the picker unit begins to operate on the bat, it is then necessary to reduce the movement of the conveyor to a very slow value suited to the speed of operation of the picker. For this purpose means (presently to be described in detail) is provided for automatically shutting down the motor 29 when the transferring operation has been completed and for driving the conveyor from the other motor 46 throughout the feeding period.

Referring to Fig. 5, it will be observed that the transfer drive from the motor 29 is produced through the belt 65 driving a pulley 64 supported on the shaft 63. A pinion E on this shaft drives a gear F on the shaft 62 of the pinion 62', and this pinion drives the gear 61 which is fast on the shaft 60. This is the shaft on which the pulley 26 for driving the conveyor 24 is fastened.

Another drive for this shaft 63 comes through from the motor 46 to the shaft 40 which drives a belt 59 which, in turn, drives the smaller pulley 64' on the shaft 63. Both of these pulleys 64 and 64' are connected to the shaft 63 through over-running clutches, one of which is shown in Fig. 11 at 160, connecting the shaft 63 with the pulley 64'.

Consequently, with this arrangement the motor 29 drives the shaft 63 so long as the speed at which it revolves the shaft is greater than that at which the connections from the motor 46 tend to drive it through the pulley 64'. However, as soon as the motor 29 is stopped, the pulley 64' then takes over and drives the shaft 63 at a slower speed suitable for feeding the bat to the picking apron 36.

In order to stop the motor 29 a switch assembly, indicated in general at G, Figs. 7 and 10, is mounted on the side of the feeder 23, as illustrated in Fig. 10. It comprises a bell crank lever 84 having a long, flat, plate-like blade or arm lying inside the feeder casing, this lever being fulcrumed at 85 and including another arm 84' which projects through an aperture in the casing and acts on a switch element housed in the box 86. This switch may be of any common commercial form, such as one of the Microswitches. The lever is spring-biased so that the switch is normally closed and the arm 84 is normally held inwardly away from the side of the casing 23 where it remains inactive until the forward end of the bat arrives approximately at the forward end of the feeder. Then the lateral pressure of the bat on the arm 84 swings it into the position shown in Fig. 10 where it opens the switch and cuts off the flow of current to the motor 29. As indicated in Fig. 10, the side wall of the casing 23 is recessed somewhat to receive the arm 84.

Associated with the apron 36 is a doffer 47, Fig. 7, driven from a pulley 48 fast on the shaft 45, the doffer directing the fiber into a chute 50 where it is guided to some collecting point, such as a bin, or it may be delivered to any machine which is to operate next on the fiber.

Because the layers or webs of which the bat is composed consist of loosely associated fibers, and the further fact that the pins D of the apron 36 exert considerable lift on the parts of the bat adjacent to their points of contact with it, several hold-down rolls are provided to act on the bat and compress it adjacent to the area of operation of the apron 36. Three of these rolls are shown in Figs. 7 and 8 at 51, 52 and 53. They are chain-connected together so that one is driven from another, and the lowermost roll 53 is driven by a chain 54 from a sprocket 55, the shaft 55' of which carries a second sprocket 56 driven by the chain 57 from the sprocket H, Fig. 8, fast on the shaft 62. Another presser roll 66, Figs. 5, 7 and 8, is mounted on the forward end of a pair of pivoted arms, one of which is shown at 67 in Fig. 5, so that it can swing toward and from the conveyor roll 26 and this roll 66 is also driven from the shaft 55' through a chain 68 running over a sprocket 70 fast on the shaft which carries the roll 66. Immediately behind the apron 36 in the region of maximum pressure applied to it during operation, is a steady roll or supporting roll 71, Figs. 5 and 7, running on a stationary shaft, where it aids the pulleys 37 and 38 in supporting the working stretch of the apron in approximately a vertical plane.

As the fiber mixture is discharged into the chute 50, Fig. 5, a water-soluble tinting liquid may be sprayed on it, if desired, different tints being used for successive batches, so that any particular batch of blended stock can be identified as it goes through the mill.

As the blended stock accumulates in the chute 50 and flows through it, it may be delivered to any desired machine or to a storage bin, the particular disposition made of the blended stock depending upon the requirements of individual installations.

Fig. 12 shows a typical wiring diagram for supplying current to, and controlling the various motors of, the system shown in the other figures of the drawings. In this diagram the motors directly connected with, and serving to drive, the aprons of the hopper feeders 2 are indicated, respectively, at 2'. They receive their current from a three-phase supply line 72 and they are respectively controlled by switching apparatus of the conventional forms including magnetic switches, indicated at 73, and run-and-stop switches 74. The motor 3' for driving the feed table is likewise connected with the supply line through a magnetic switch 75 and a snap switch 76. In a similar manner the motor 5 for driving the blower 4 and the motor 19 for driving the drum 19', Fig. 2, of the condenser 7 are connected to said supply line through switches 75 and 76.

The reversing motor 13 which operates through mechanism above described to reciprocate the car 8 is connected to the supply line through a reversing control indicated, in general, at 77, this arrangement including solenoid brake relays cooperating with the limit switches 15 and 16 and 15' and 16' so that the motor is ordinarily stopped at the opposite ends of its traverse by the operation of the switches 15 and 16, the other two switches 15' and 16' being positioned at the opposite sides of the first two to operate in the event that, for some reason, the car is not stopped by either the switches

15 or 16. The solenoid control of these switches is such that any one of them cuts power off the motor and applies the brake when it is operated, but the brake is released by the reversing switch when it again reverses the current through the motor.

For the purpose of moving the car 8 into position to unload into the sandwich feeder, as above described, the manually operated jogging switch 78 is provided, as above described. The control system also includes a push button station 80 operating through the relays 81 and 82 to selectively control the release of the brakes. The control system used, however, may take many forms and will be designed to suit the requirements of individual installations, and, as to some features, will be selected to satisfy the desires of the customer.

It has been found in the actual use of this invention in mill production that it not only yields far more uniform blends than have been possible by hand, but that it does so with a very substantial saving in labor. One man can do the weighing and delivering of the fiber initially to the hopper feeders 2, and from that point on the blending operations are entirely automatic.

The improvement in quality is partly due to the fact that a sandwich bat of more uniform character is produced because the layers of which it is composed are thin and of more even composition and, more importantly, because the step of raking across the layers of which the bat is composed removes, in each revolution of the spiked lattice 36, an approximately uniform slice composed of increments taken from every layer in the bat.

As above indicated, it has been found in actual practice that this invention effectually eliminates filling bars which have been so troublesome in producing blends by the hand method. And the saving in labor is an important practical item.

While the method above described and the machine for practicing that method embody the present invention in its preferred form, it will be evident that variations may be made in non-essential particulars in the method and that the method may be practiced with the aid of other forms of equipment without departing from the spirit or scope of the invention.

Having thus described our invention, what we desire to claim as new is:

1. In a machine for blending fibers, the combination of a support for a sandwich bat composed of layers of loosely associated fibers, mechanism for raking across an edge face of said bat transversely to said layers and thereby removing increments of fiber from all of said layers, said support including a conveyor mechanism on which said bat rests and which is operable to feed said bat to said raking mechanism at a substantially predetermined speed, means for delivering a bat to said conveying mechanism, comprising another support for the latter bat, a track on which the second support is mounted for movement into and out of cooperative relationship to the first support, said second support being equipped with a conveyor on which the bat is mounted, said conveyors including gear elements adapted to be releasably coupled together to drive one from the other, and means for holding said supports in cooperative relationship to each other while the conveyor on the second support is operated by power supplied from the conveyor of the first support to transfer the bat carried by the second support completely on to the conveyor of the first support.

2. In a machine organization for blending textile fibers of different kinds, the combination of a series of hopper feeders, a feed table on to which all of said hopper feeders deliver the streams of fiber produced, respectively, by them, a bat building mechanism, means for mixing the fiber constituents of said streams and conveying the mixture to said bat building mechanism, a support for the completed bat, means operable to transfer the bat produced by said building mechanism to said support, means cooperating with said support for raking across the edge face of the bat mounted on said support transversely to the layers of which the bat is composed and thereby removing increments of fiber from all of said layers, and means cooperating with said support for feeding said bat to said raking mechanism at substantially a predetermined speed.

3. In a machine organization for blending textile fibers of different kinds, the combination of a series of hopper feeders, a feed table on to which all of said hopper feeders deliver the streams of fiber produced, respectively, by them, a condenser, means for mixing the fiber constituents of said stream and conveying them pneumatically to said condenser, whereby the condenser will work said fibrous material into the form of a web and deliver said web, a car, a track on which said car is mounted for reciprocating movement on said track in a path such that the web produced by said condenser is folded backward and forward upon itself in said car and builds up a bat, and mechanism for reciprocating said car.

4. In a machine for blending fibers, the combination of a support for a sandwich bat composed of layers of loosely associated fibers, mechanism for raking across an edge face of said bat transversely to said layers and thereby removing increments of fiber from all of said layers, said support including a conveyor mechanism on which said bat rests, and mechanism for operating said conveyor mechanism at a high rate of speed in delivering the bat initially to said raking mechanism and shifting automatically to a low feeding speed after such delivery.

5. In a machine for blending fibers, the combination of a support for a sandwich bat composed of layers of loosely associated fibers, mechanism for raking across an edge face of said bat transversely to said layers and thereby removing increments of fiber from all of said layers, said support including a conveyor mechanism on which said bat rests, mechanism for driving said conveyor at high and low speeds, and means controlled by the arrival of the bat in its operative relationship to said raking mechanism for shifting the drive from the high to the low speed.

6. In a machine for blending fibers, the combination of a support for a sandwich bat composed of layers of loosely associated fibers, mechanism for raking across an edge face of said bat transversely to said layers and thereby removing increments of fiber from all of said layers, said support including a conveyor mechanism on which said bat rests, mechanism driven by a motor for operating said conveyor at a high speed in delivery the bat initially to said raking mechanism, additional means cooperating with said motor driven mechanism and including a second motor for driving the conveyor at a slow speed for feeding the bat to said raking mechanism, and means for automatically shifting the drive from one of said motors to the other, including overrunning clutch means in the driving connections.

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