

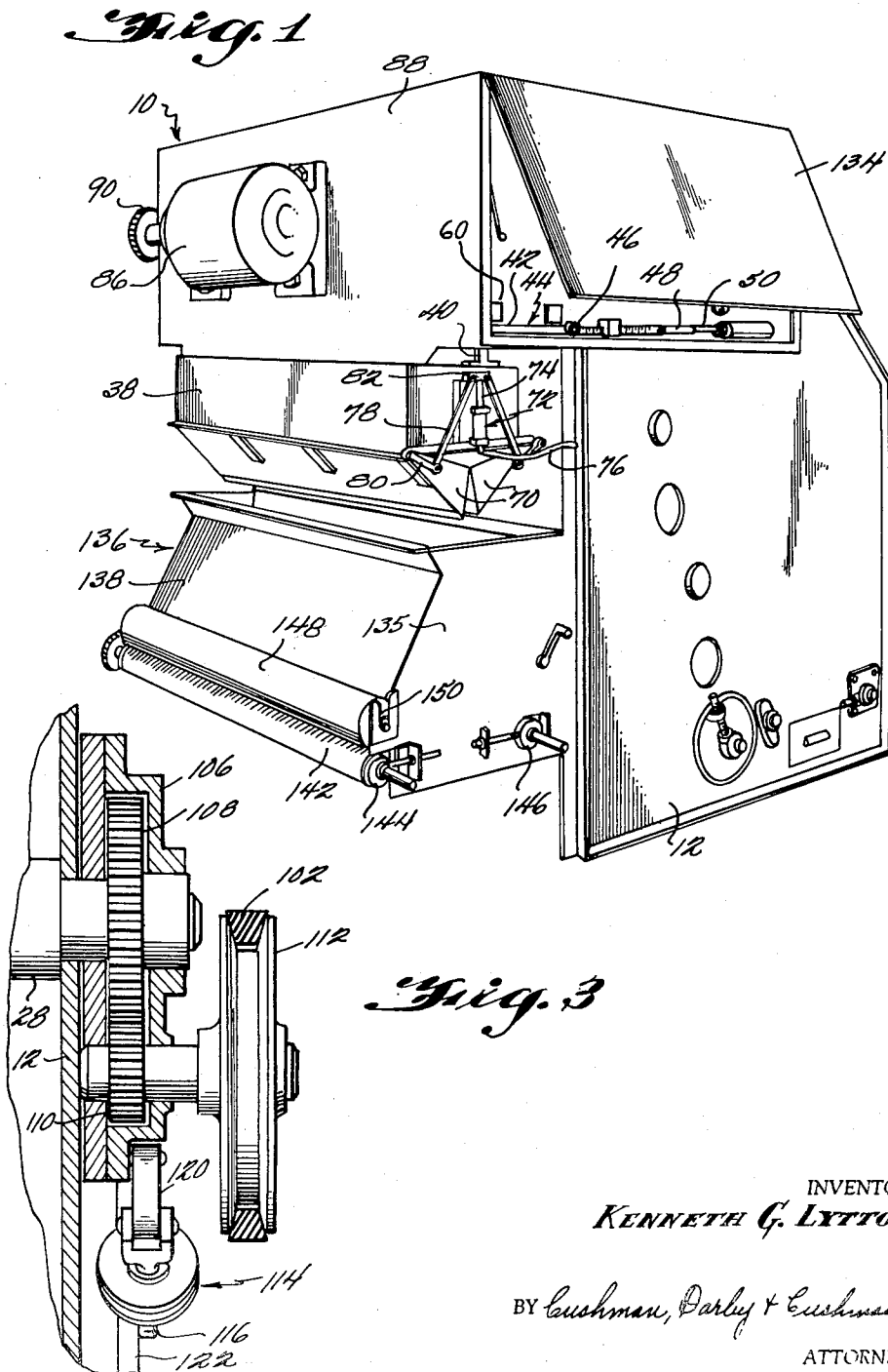
July 27, 1965

K. G. LYTTON
WEIGHING MECHANISM

3,196,967

Original Filed July 5, 1961

4 Sheets-Sheet 1



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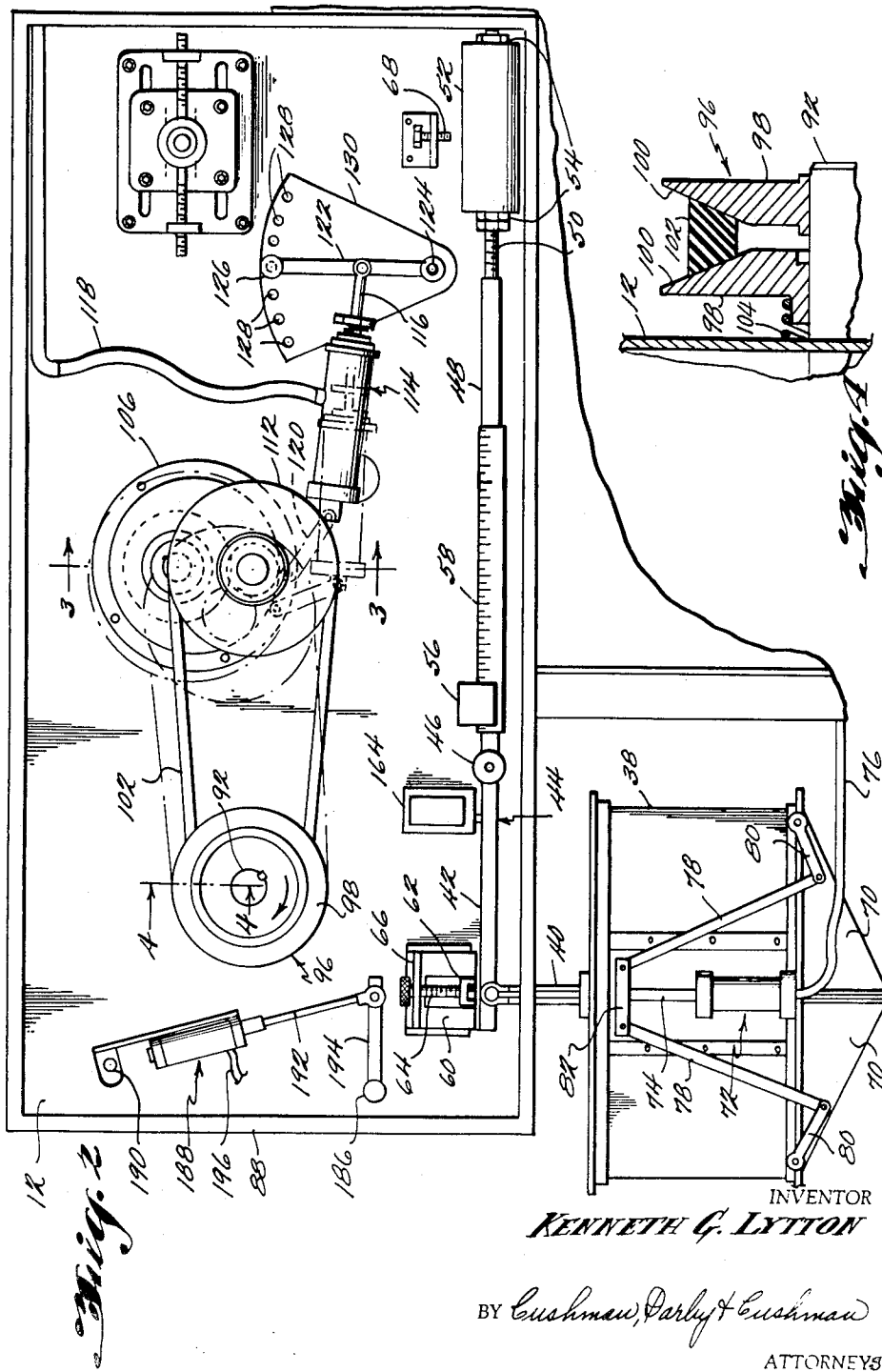
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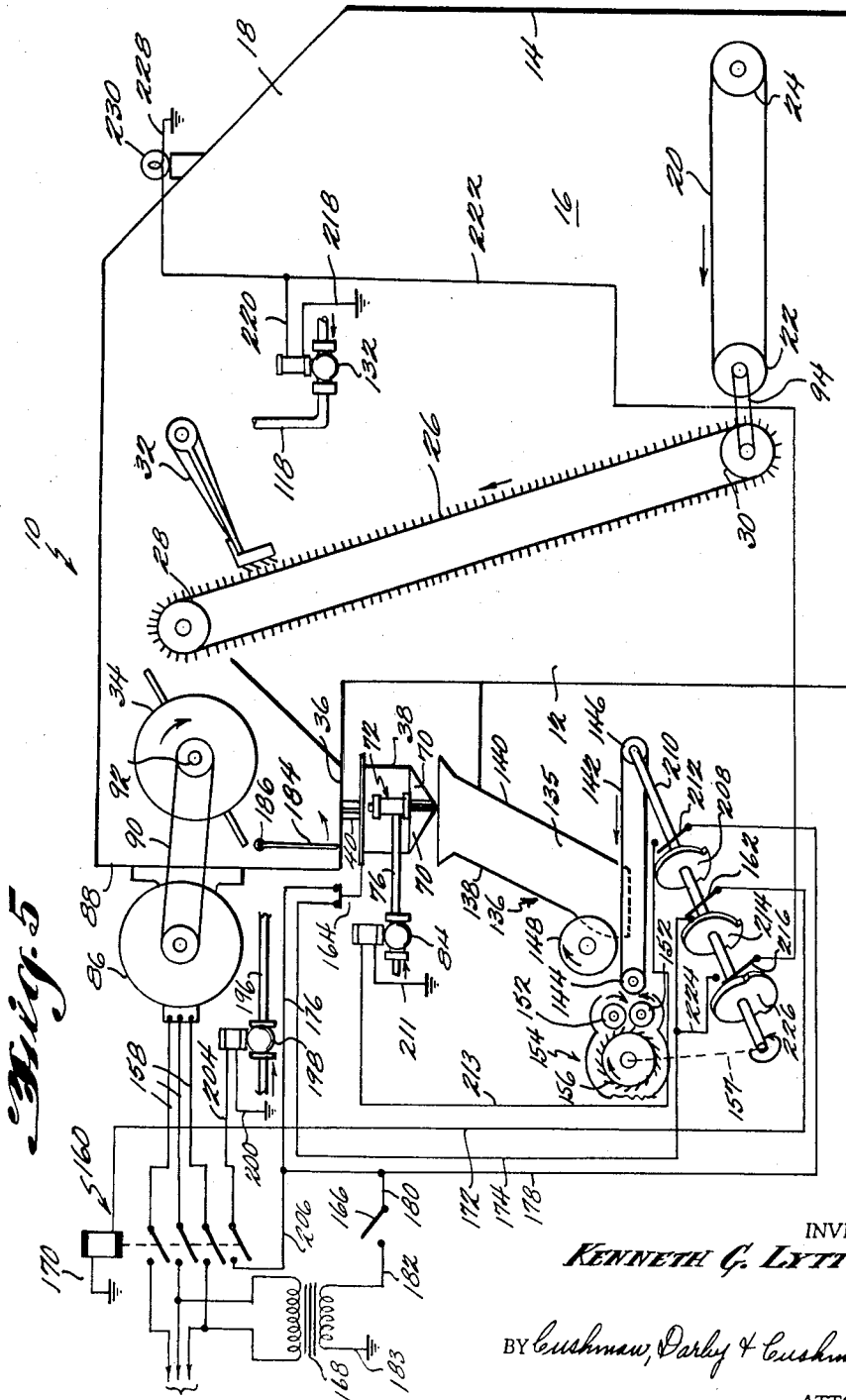
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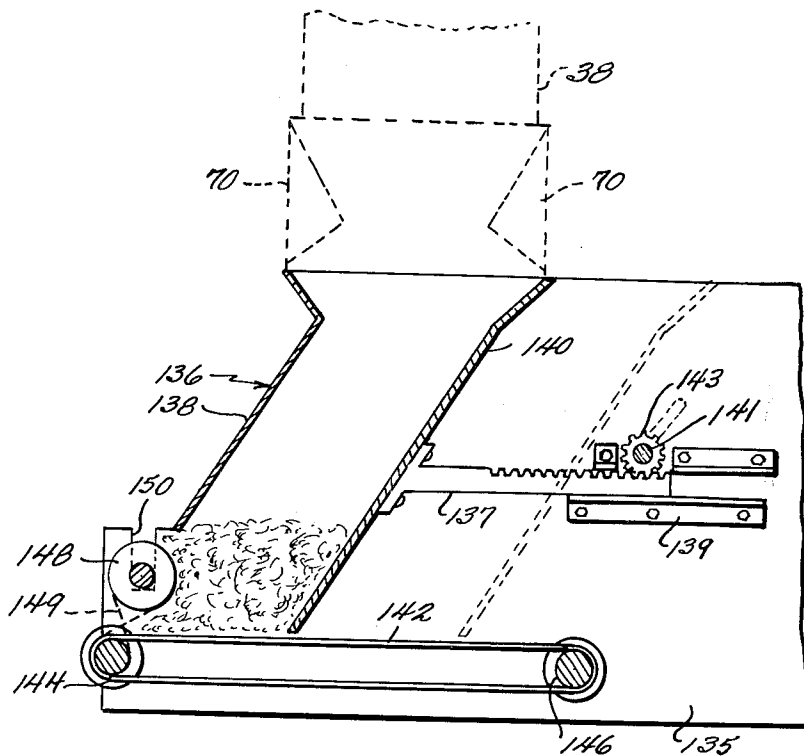


Fig. 6

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3,196,967

WEIGHING MECHANISM

Kenneth G. Lytton, P.O. Box 1358, Gastonia, N.C.
Original application July 5, 1961, Ser. No. 136,966, now
Patent No. 3,132,709, dated May 12, 1964. Divided
and this application May 11, 1964, Ser. No. 366,529
1 Claim. (Cl. 177—157)

This invention relates to textiles and, more particularly, to improved equipment for feeding textile fibers uniformly into a card. This application is a division of my copending application Serial No. 136,966, filed July 5, 1961, now Patent 3,132,709, which is a continuation-in-part of my earlier copending application Serial No. 857,140, filed December 3, 1959, now Patent 2,995,783.

Cards, as is well-known in the art, form slivers, or roving, i.e., rope-like lengths of textile fibers that are in a somewhat parallel though loose and fluffy condition. Thread and yarn are made from sliver and roving by drawing and spinning operations. In order to maintain yarn uniformly without excessive doubling operations, it is essential that sliver and roving be of substantially uniform composition and weight throughout its length, i.e. per increment of length. The formation of uniform sliver and roving is dependent, to a great extent, on the maintenance of a uniform feed of fibers into a card.

Fibers usually are fed into a cotton card in the form of a lap made by a picker. Picker laps are, however, notoriously lacking in uniformity. As a consequence, conventional cotton cards maintain sliver variation only within .15 inch, a tolerance considered excellent in the industry. Sliver variation is measured by a standard test, which involves both compression and pull-through of the sliver on a testing machine of a type well-known in the art.

Woolen cards usually are fed by so-called weighing-feeds of the Bramwell type which deposit successive batches of fibers of a desirably uniform predetermined weight on an endless card-feeding conveyor. Each deposited batch then is individually pushed and compacted, by a so-called push board, toward the delivery end of the conveyor and against the nip or card feed rolls in an effort to form a uniform mat, as shown, for example, in the patent to Willis, 2,597,831. The feeding of cards by such weighing-feeds, however, usually results in a greater variation or lack of uniformity in the roving made on the card, then in sliver made on cotton cards with picker laps. This lack of uniformity appears, to a large extent, to be caused by the action of the push board in compressing the fibers so that there are large variations in density throughout the compacted mat. In this type of feed, each batch of fibers dropped on the moving conveyor forms a pile of irregular outline. The use of the push board is, therefore, an attempt to shape the irregularly shaped pile into a mass having some degree of uniformity of configuration.

Accordingly, it is an object of this invention to provide improved apparatus for feeding a textile card.

It is another object of this invention to provide an improved method and apparatus for feeding a textile card which will result in sliver or roving variation of no more than .05 inch.

It is another object of this invention to provide an improved weighing feed type of apparatus for feeding a textile card.

Other objects and advantages of the invention will become apparent from the following description and accompanying drawings in which:

FIGURE 1 is a perspective view of apparatus embodying this invention for feeding a textile card.

FIGURE 2 is an enlarged fragmentary side view of

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a portion of the machine shown in FIGURE 1, and with a side door of the machine removed to illustrate interior parts.

FIGURE 3 is an enlarged fragmentary sectional view taken substantially on line 3—3 of FIGURE 2.

FIGURE 4 is an enlarged fragmentary sectional view taken substantially on line 4—4 of FIGURE 2.

FIGURE 5 is a diagrammatic view showing the controls of the machine shown in FIGURE 1 and illustrating the use thereof in feeding a textile card.

FIGURE 6 is an enlarged fragmentary vertical sectional view of a portion of the apparatus shown in FIGURE 1.

Referring now to FIGURES 1, 2 and 5 of the drawings, there is shown a fiber processing and feeding machine 10 of a type well-known in the art. The machine includes a housing having side and rear walls 12 and 14 partly defining a hopper 16, best shown in FIGURE 5, provided with an opening 18 adjacent its top through which fibers are deposited, usually by hand. At the bottom of the hopper 16 is an endless conveyor 20 which includes front and rear rollers 22 and 24. The conveyor 20 moves the fibers forwardly into engagement with an upwardly and forwardly extending spiked apron 26 trained over upper and lower rollers 28 and 30. The apron 26 picks up the fibers and moves them upwardly out of the hopper 16. Adjacent the top of the apron 26 is a Sargent comb 32 which oscillates in close proximity to the spiked apron to strip therefrom surplus fibers so that upwardly beyond the comb the apron carries a web or mat of fibers of generally uniform thickness. In front of the upper roller 28 of the apron 26 is a rotating doffer 34 which strips the fibers from the apron and allows them to fall downwardly, in opened condition, through a discharge opening 36 beneath the doffer.

Disposed beneath the discharge opening 36 of the machine 10 is a weighing receptacle or scale pan 38 that is generally rectangular in plan view. The pan 38 is suspended, by straps 40, from the ends of the parallel arms 42 of a yoke-like scale beam 44 which straddles the discharge opening 36. The beam 44 is pivotally mounted on fulcrums or anti-friction bearings 46 on the outer sides of the side walls 12 of the machine 10. Extending rearwardly of the beam fulcrums 46 is a beam counterbalance arm 48 having a threaded extension 50. Adjustable along the extension 50 is a large tubular counterweight 52 which can be maintained in a fixed position of adjustment by stop nuts 54 engaged with the opposite ends thereof. Between the counterweight 52 and the fulcrum point 46 of the beam 44 is a smaller counterweight 56 slidable along the beam and cooperating with an indicia scale 58 thereon. The counterweight 56 constitutes a Vernier adjustment and preferably the scale 58 is provided with indicia corresponding to ½ ounce weight adjustments.

Secured to the side 12 of the machine housing over the outer end of a beam arm 42 is a U-shaped permanent magnet 60 positioned to attract and pull the end of the arm 42 upwardly, such end being formed of a magnetic material (as shown) or having a plate of such material secured thereto. Guided for vertical movement between the magnet arms is a stop 62 adapted to project below the lower ends of the magnet arms for varying the spacing between the scale arm 42 and the magnet 60. The stop 62 is vertically adjustable by means of a screw 64 which swivelly carries the stop and threadedly engages a plate 66 secured to the side 12 of the machine housing.

From this construction it will be seen that the nearer the beam arm 42 to the magnet 60, the greater the attractive force exerted by the magnet on the beam arm, and vice versa. Preferably, a scale (not shown) is asso-

ciated with the magnet 60 and the stop 62 and provided with indicia for measuring, in ounces, the attractive force between the magnet and the beam arm 42 when the latter is engaged with the stop. In actual practice, the stop 62 is adjusted so that such attractive force is about 4 ounces. The sliding Vernier counterweight 55, and also the counterweight 52, are then adjusted so that a predetermined weight in the pan 38 will pull the arm 42 away from the magnet 60 and allow the pan to drop downwardly to the extent permitted by an adjustable stop 63 mounted on the side of the machine housing 12 in position to be engaged by the counterweight 52.

By reason of the magnet 60, the action of the beam arm 42 in pulling away therefrom will be very rapid, almost a snap action, so that the entire weighing mechanism is very accurate.

The bottom of the scale pan 38 is formed by a pair of dumping doors 70 hinged to the lower edges of the longitudinal side walls of the pan so that the doors may be swung downwardly to dump the contents of the pan. Secured in an upright position on the outer side of an end wall of the pan 38 is the cylinder of a single-acting reciprocating fluid motor 72 arranged to extend its piston rod 74 when fluid pressure is supplied to the cylinder through a hose 76 from any suitable source. A link 73 is pivotally connected to a crank arm 80 on each door and to the corresponding end of a cross bar 82 on the end of the piston rod 74 of the motor 72. The arrangement is such that when the piston rod 74 is extended the dumping doors 70 are held shut, but when the piston rod is retracted the dumping doors open. The supply and exhaust of fluid under pressure to the motor 72 may be controlled by a two-way solenoid valve 84 (FIGURE 5) connected into the hose 76, or into a supply conduit (not shown) leading thereto. The arrangement is such that when the valve 84 is deenergized the motor 72 is supplied with pressure fluid and the doors 70 are held shut, and when the valve is energized the supply is cut off and the motor is exhausted so that the doors fall open. An appropriate spring (not shown) may be employed to constantly urge the doors 70 to open, and thus hasten their opening on relief of pressure in the motor 72.

The foregoing weighing and dumping mechanisms are similar in many respects to those shown in the copending application of Lytton et al., Serial No. 348,406.

The machine 10 is driven by a conventional electric motor 86 that may be secured to the housing front wall 88 and has a belt drive 90 to one end of the doffer shaft 92. The spiked apron 26, and also the hopper bottom conveyor 20 which is driven by a belt 94 from the shaft of the lower apron roller 30, are driven by a variable speed drive between the other end of the doffer shaft 92 and an end of the shaft of the upper roller 28 of the spiked apron. This variable speed drive includes a variable effective diameter sheave 96 fixed to the end of the doffer shaft 92. The sheave 96, as is well-known in the art, includes two halves or parts 98 having inclined opposed edges 100 to form the side walls of a circumferential groove for receiving a V-belt 102, as shown in FIGURE 4. The two parts 98 of the sheave 96 are constantly urged toward each other by a spring 104 so as to increase the effective diameter of the sheave as respects the belt 102. It will be seen, however, that when a sufficient pulling force is exerted on the belt 102, it will spread the parts 98 to reduce the effective diameter of the sheave 96. When the effective diameter of the sheave 96 is so reduced the belt 102 will drive another part at a lower speed than when the effective diameter of the sheave is increased.

Rotatably mounted on the end of the shaft of the upper roller 28 for the spiked apron 26 is a gear housing 106 enclosing a gear 108 fixed on the shaft, as shown in FIGURE 3. A pinion 110, meshing with the gear 108, is journaled in the side walls of the housing 106 and has a projecting stub shaft carrying a sheave 112 over

which the belt 102 is trained to drive the spiked apron 26. A single-acting reciprocating fluid motor 114, adapted to retract its piston rod 116 on the supply of fluid pressure to its cylinder through a hose 118 from a suitable source, has the closed end of its cylinder connected by a link 120 to the gear housing 106 at a location adjacent the pinion gear 110. The end of the piston rod 116 of the motor 114 is pivotally connected to a lever 122 which has one end thereof pivotally connected, at 124, to the side 12 of the machine housing for limited angular adjustment. The other end of the lever 122 carries a spring-pressed pin 126 adapted to project, when aligned therewith, into any one of an arcuately-arranged series of recesses or holes 128 in a quadrant-plate 130 fixed to the side wall 12 of the machine housing.

From the foregoing construction it will be seen that when fluid pressure is supplied to the motor 114 and the pin 126 is in a hole 128, the rod 116 will retract and swing the gear housing 106 in a direction to increase the distance between the sheaves 96 and 112, thus spreading the parts 98 of the sheave 96 and reducing the driven speed of the sheave 112. When the motor is exhausted the piston rod 116 extends, because of the extending force exerted thereon by the belt 102, and thus allows the parts 98 of the sheave 96 to move toward each other and increase the driven speed of the sheave 112 (as shown in dotted lines in FIGURE 2). The speed of the sheave 112, and consequently the spiked apron 26 and the conveyor 20, can also be adjusted, in either the pressurized or exhausted condition of the motor 114, by manually changing the angular position of the lever 122 and re-locking it in place by engaging the pin 26 in a selected one of the holes 128.

The supply and exhaust of pressure fluid to and from the motor 114 is controlled by two-way solenoid valve 132 (FIGURE 5) connected into the hose 118 or into a supply conduit (not shown) leading thereto. The valve 132 is arranged so that when it is de-energized, pressure fluid is supplied to the motor 114 thus driving the machine 10 at slow speed, and when the valve 132 is energized, the supply of fluid pressure is shut off and the motor 114 exhausted thus driving the machine at high speed. Preferably, the weighing and speed change mechanisms are enclosed in a compartment on the side of the machine 10 which is closed by a door 134.

Beneath the weigh pan 38 the sides 12 of the machine housing are extended, as at 135, to form the sides of a chute 136 adapted to receive batches of fibers dumped from the pan. The chute 136 is generally rectangular in horizontal section, having a width, transversely of machine 10, only slightly greater than the corresponding dimension of the weigh pan 38 and a front to back dimension which can be varied. The chute 136 is provided with downwardly and forwardly inclined front and rear walls, 138 and 140, which are flat and substantially parallel for the major portion of their vertical extents. Adjacent their upper ends, the front and rear walls 138 and 140 may be provided with upwardly diverging portions in order to facilitate entry into the chute of batches of fibers dumped from the weigh pan 38, even when the front to back dimension of the chute is at its minimum, as shown in FIGURE 6. The rear wall 140 preferably is adjustable toward and away from the front wall 138 in order to vary the effective front to back dimension of the chute. Thus, for example, the rear wall 140 of the chute 136, adjacent its lateral edges, may have secured thereto rearwardly extending racks 137 sliding in horizontal guideways 139 formed, for example, of channel members secured to the interior of the sides 135. A transversely extending shaft 141 journaled in the sides 135 is provided with pinions 143 which mesh with the racks 137 so that rotation of the shaft will serve to vary the spacing between the front and rear walls 138 and 140 of the chute. In this connection, such spacing can be adjusted so that it is considerably less than the

corresponding dimension of the weigh pan 38, as shown in FIGURE 6, or considerably greater than such dimension, as indicated in dotted lines. The inclination of the front and rear walls 138 and 140 may be of the order of 40° to the vertical and the proportions of the chute 136 desirably are such that when the rear wall 140 is in its forwardmost position it substantially completely underlies the horizontal outline of the weigh pan 38. On the other hand, when the rear wall is in its rearwardmost position, only the lower portion of the rear wall 140 underlies such outline.

At the bottom of the chute 136 is an endless conveyor having a horizontal belt 142 trained over front and rear rollers 144 and 146 journaled in the front extensions 135 of the sides 12 of the machine housing. The bottom or rear wall 140 of the chute 136 depends into close proximity of the conveyor belt 142, as shown in FIGURE 5, while the lower portions of the front extensions 135 depend therebelow. Adjacent and above the front roller 144 of the conveyor 142 is a press roll 148 adapted to ride on fibers being carried forwardly out of the bottom of the chute 136 on the belt 142. The press roll 148 is maintained in position by end stub shafts received in vertical guideway notches 150 in the front extensions 135 of the sides 12 of the machine housing. The upper or front wall 138 of the chute 136 depends into close adjacency with the rear side of the press roll 148, so that the latter essentially forms the lower portion of the front wall of the chute. It will be seen that as the upper reach of the conveyor belt 142 moves forwardly, it will feed fibers out of the chute in a relatively thin flat web or stream.

In the use of the apparatus, the front roller 144 of the conveyor 142 is positioned closely adjacent the feed rolls 152 of a card 154, only a portion of which is illustrated diagrammatically in FIGURE 5. The card feed rolls 152 receive the web emerging from beneath the press roll 148 and feed it to the conventional lick-in 156 of the card. The conveyor 142 is driven by or in synchronism with the card 154 by means of an appropriate drive train 157 (not shown in detail) between the card and the stub shaft of one of the conveyor rollers 144 or 146.

Referring now to FIGURE 5 of the drawings, the motor 86 is supplied with power, from any appropriate source of three-phase power, by the conductors 158 which have three sets of normally-open contacts of a motor control relay 160 interposed therein. The relay is controlled by a circuit which includes the energizing coil of the relay 160, a normally-closed cam operated switch 162, a weight switch 164, and a manually-operable switch 166, all connected in series across an appropriate source of power, e.g., a transformer 168, by conductors 170, 172, 174, 176, 178, 180, 182 and 183. The weigh switch 164 may be in the form of a conventional microswitch mounted on the side 12 of the machine housing above the arm 42 of the scale beam 44. The arrangement is such that when the arm 42 of the beam 44 is engaged with the stop 62 associated with the magnet 60, the weigh switch 164 is closed, but when any selected predetermined weight of fibers has been received in the weigh pan 38 and pulls the arm 42 away from the stop 62, the switch 164 is open.

From the foregoing arrangement it will be seen that when the switch 166 is closed and the weigh pan 38 is empty, the circuit which includes the energizing coil of the relay 160 will be closed so that the normally-open contacts of the relay in series with the conductors 158 will close, and the motor 86 will drive the machine 10 to feed fibers into the weigh pan 38. When the latter receives its predetermined weight of fibers the weigh switch 164 will open and the relay 160 will be de-energized, thus stopping the motor 86 and further feeding the fibers into the weigh pan.

Preferably, a normally open cut-off door 184 is mount-

ed on a horizontal shaft 186 journaled in the side walls 12 of the machine housing immediately to the rear of the front wall 88 of the machine and above the discharge opening 36. The cylinder of a single-acting reciprocating fluid motor 188 is pivotally mounted, as at 190, to the side wall 12 of the machine housing, as shown in FIGURE 2. The end of the piston rod 192 of the motor 188 is pivotally connected to a crank arm 194 on the end of the door shaft 186. The arrangement is such that when the piston rod 192 is extended, the door 184 lies substantially flush against the front wall 88 of the machine housing, but when the rod 192 is retracted, as by the supply of fluid pressure to the motor 188, via a hose or conduit 196, the door 184 is swung into a position to substantially block the discharge opening 36 of the machine 10. The motor 188 is controlled by a two-way solenoid valve 198 connected into the conduit 196. When the valve 198 is energized, the supply of fluid pressure to the motor 188 is interrupted and the latter is vented to atmosphere. When the valve 198 is de-energized, the motor is supplied with fluid under pressure. The relay 160 preferably is provided with a fourth set of normally-open contacts and the energizing coil of the valve 198 is connected in a series with those contacts, the switch 166, and with the transformer source of power 168, via conductors 200, 204, 206, 178, 180, 182, and 183. From the foregoing it will be seen that when the motor 86 stops, on the opening of the weigh switch 164, the door 184 closes to thereby quickly interrupt the further feeding of any fibers into the weigh pan 38 and thus insure better weighing accuracy.

The weigh pan 38 is dumped periodically by operation of a cam 208 driven in synchronism with the conveyor 142, as by being mounted on a shaft 210 driven directly by the rear roller 146 of the conveyor. The energizing circuit of the dumping solenoid valve 84 includes a normally-open switch 212 adapted to be closed for a brief interval during every revolution of the cam 208. The switches 166 and 212 and the coil of the solenoid valve 84 are connected in series and supplied with power from the transformer 168 via conductors 211, 213, 178, 180, 182 and 183.

The feeding of fibers by the machine 10 is timed with the movement of the conveyor 142 so that a predetermined weight of fibers is periodically weighed out in the pan 38, and then the further feeding of fibers into the pan ceases because of the opening of the weigh switch 164 as aforescribed, and thereafter the conveyor driven cam 208 closes the switch 212 thus dumping the batch of fibers into the chute 136. The predetermined amount of fibers thus periodically dumped into the chute 136 is correspondingly correlated with the amount of fibers being withdrawn from the chute by the conveyor 142. In some instances, and depending to some extent upon the type of fibers being handled, it is desirable to operate the apparatus with the rear wall 140 of the chute 136 in its forwardmost position. When so adjusted, the batches of fibers dropped in succession into the chute 136 are deposited one upon another and tend to form in the chute a static column of fibers that are of rectangular configuration in plan view. It will be seen that because the fibers are maintained in such column formation, the movement thereof by the conveyor 142 beneath the press roll 148 will form a mat of fibers having a high degree of uniformity as respects weight per increment of length. With other types of fibers, this same result can be achieved by moving the rear wall 140 of the chute 136 to its rearwardmost position. When so adjusted, the successive batches of fibers dropped into the chute 136 tend to drop one behind another with only a small amount of overlap, directly onto the conveyor 142 as each batch is moved forwardly by the conveyor to form a mat on its passage beneath the press roll 148. In other words, each batch is substantially removed from the lower end of the chute 136 before a succeeding batch is dropped there-

into. Nevertheless, because even when the rear wall 140 is in its rearward position it still confines a dropped batch of fibers, the latter will not form a pile of irregular outline which would cause a lack of uniformity in the mat or thick web emerging from beneath the press roll 148.

Depending upon the type of fibers being handled, it sometimes is desirable to drive the press roll 148 at the same peripheral speed as the conveyor 142, as for example, by a belt drive 149 between appropriate pulleys on the shaft of the forward conveyor roller 144 and on the shaft of the press roll. In the event that the fibers being handled are long and somewhat wiry, as, for example, so-called carpet yarns, it may even be desirable to replace the driven press roll 148 with a short downwardly and forwardly inclined driven conveyor of the so-called nip type (not shown) in order to facilitate removal of such wiry fibers from the chute 136 in the form of an endless mat having a high degree of uniformity of weight per increment of length.

A second cam 214 on the shaft 210 is adapted to periodically open the switch 162 in the energizing circuit for the relay 160. The cam 214 opens the switch 162 at the same moment that the cam 208 closes the dumping switch 212, but maintains the switch 162 open for a short time after the weigh pan 38 has been dumped before allowing the switch 162 to close. This interval of time during which the switch 162 is open is long enough to permit the weigh pan 38 to rise, the beam arm 42 to come to rest against the stop 62, and the dumping doors 70 to close before the motor 86 restarts to drive the machine 10 to again feed fibers into the weigh pan.

The energizing circuit for the solenoid valve 132 which controls the speed change mechanism of the machine 10 includes the switch 166, the weight switch 164 and the normally-open contacts of a cam-operated switch 216, all connected in series with the transformer source of power 168 by conductors 218, 220, 222, 224, 174, 176, 178, 180, 182 and 183. A third cam 226 on the shaft 210 is adapted to periodically close the switch 216 during a last fractional part, e.g., one-fourth, of the time interval between dumping cycles, i.e., between the time when the cam 208 closes the dump switch 212. From this arrangement it will be seen that if the weigh pan 38 has not received its predetermined weight of fibers, so that the weight switch 164 is still closed, at the time that the cam 226 closes the switch 216, the valve 132 will be energized and thus shift the machine 10 into high speed drive. Connected in parallel with the solenoid valve 132, via conductors 220, 222, and 228 is a lamp 230. Thus, when the machine 10 is shifted into high speed drive the lamp 230 is lighted and signals the operator that such has occurred. If, on the other hand, the machine 10 feeds the predetermined weight of fibers into the weigh pan 38 before the cam 226 closes the switch 216, the machine 10 will not be

shifted into high speed drive because the energizing circuit for the solenoid valve 132 will have been interrupted by the opening of the weight switch 164.

The foregoing speed changing arrangement serves the purpose of assuring that the selected predetermined weight of fibers has been received in the weight pan 38 when the latter is dumped by the cam-operated switch 212. When the supply of fibers in the hopper 16 of the machine 10 is low, the machine feeds fibers at a somewhat slower rate than when such supply is high. Consequently, the foregoing speed change and signalling arrangement not only serves to assure that the machine 10 feeds the predetermined weight of fibers into the weight pan 38 before the latter is dumped, but also serves as a signal to the operator that additional fibers are needed in the hopper 16.

It thus will be seen that the objects of this invention have been fully and effectively accomplished. It will be realized, however, that the foregoing specific embodiment has been shown and described only for the purpose of illustrating the principles of this invention and is subject to extensive change without departure from such principles. Therefore, this invention includes all modifications encompassed within the spirit and scope of the following claim.

I claim:

Weighing mechanism comprising: a scale beam; a load holder therefor and movable therewith from an upper position to a lower position on the receipt of a predetermined weight of material in said holder; a counterweight mounted for adjustment along said beam; magnetic means exerting a predetermined uni-directional substantially constant attractive force on said beam when said load holder is in said upper position for urging said beam to move in the same direction in which it is urged by said counterweight, said magnetic means including a magnet and a member of magnetic material, one fixed and one mounted on said beam; and an adjustable stop engageable by said beam for defining said upper position and for varying the permissible spacing between said magnet and said member to adjust said attractive force when said load holder is in said upper position.

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