May 8, 1956 F. M. BURESH ET AL 2,744,294

FEEDER MECHANISM FOR TEXTILE MACHINES

Filed Jan. 13, 1950 7 Sheets-Sheet 1

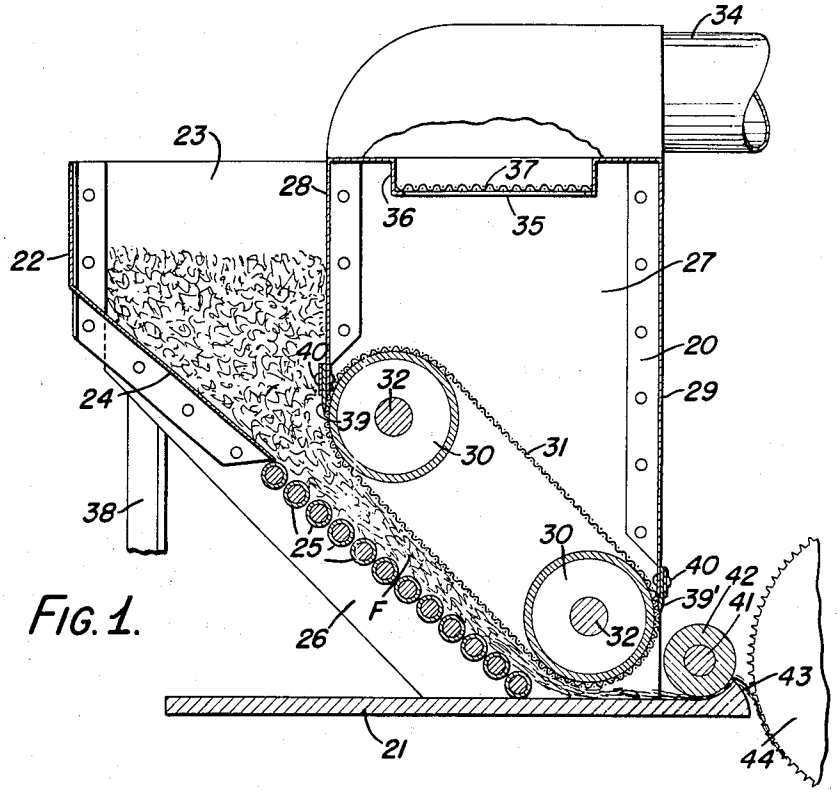


FIG. 1.

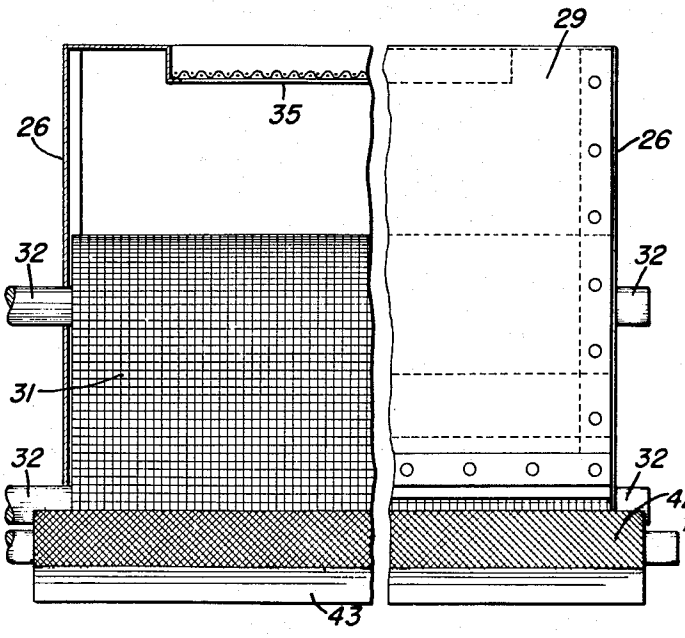


FIG. 2.

INVENTOR.
FRANCIS M. BURESH
AND HOWARD H. LANGDON
BY
ATTORNEY

May 8, 1956 F. M. BURESH ET AL 2,744,294

FEEDER MECHANISM FOR TEXTILE MACHINES

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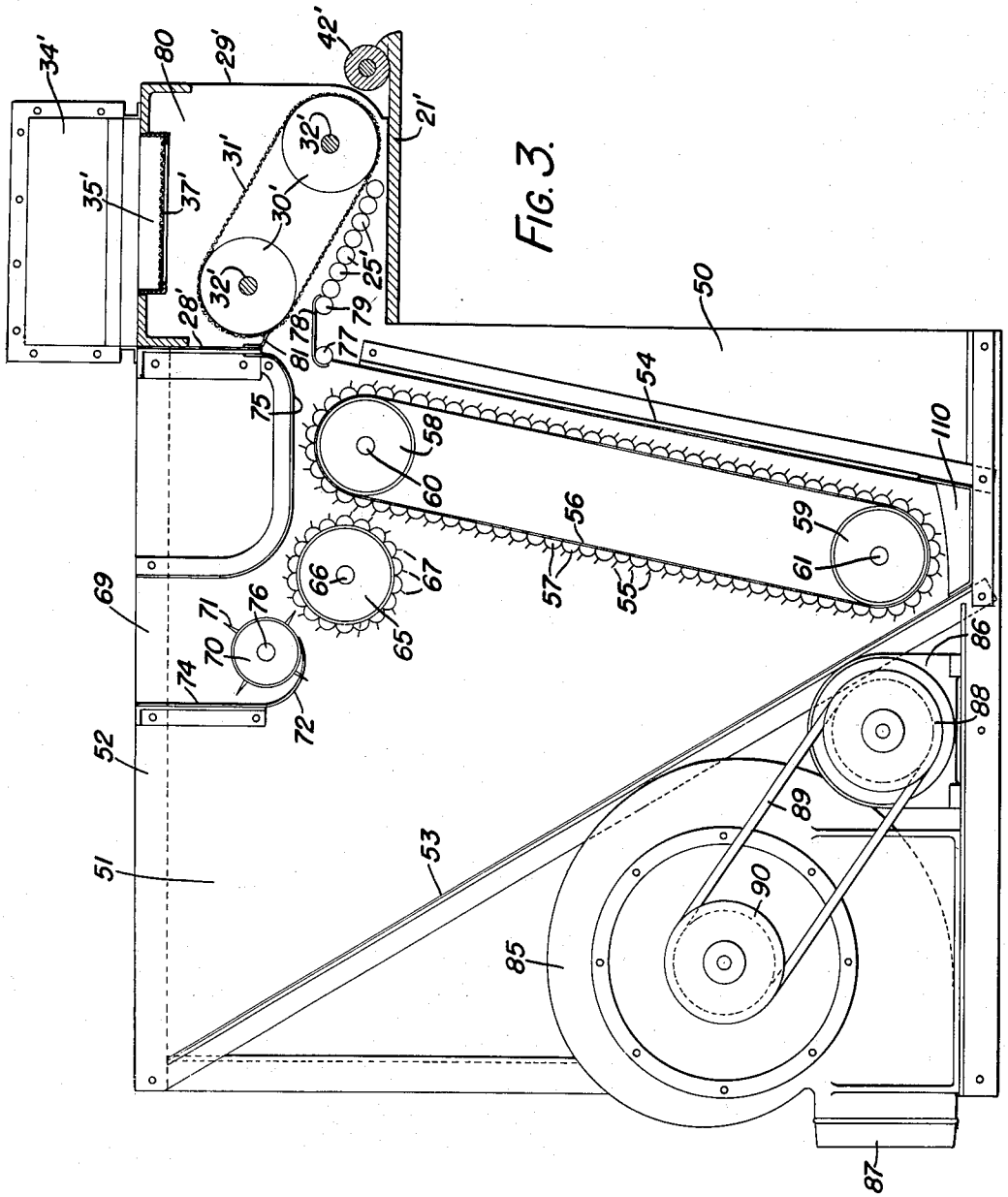


FIG. 3.

INVENTOR.
FRANCIS M. BURESH
AND HOWARD H. LANGDON
BY
ATTORNEY

May 8, 1956 F. M. BURESH ET AL 2,744,294

FEEDER MECHANISM FOR TEXTILE MACHINES

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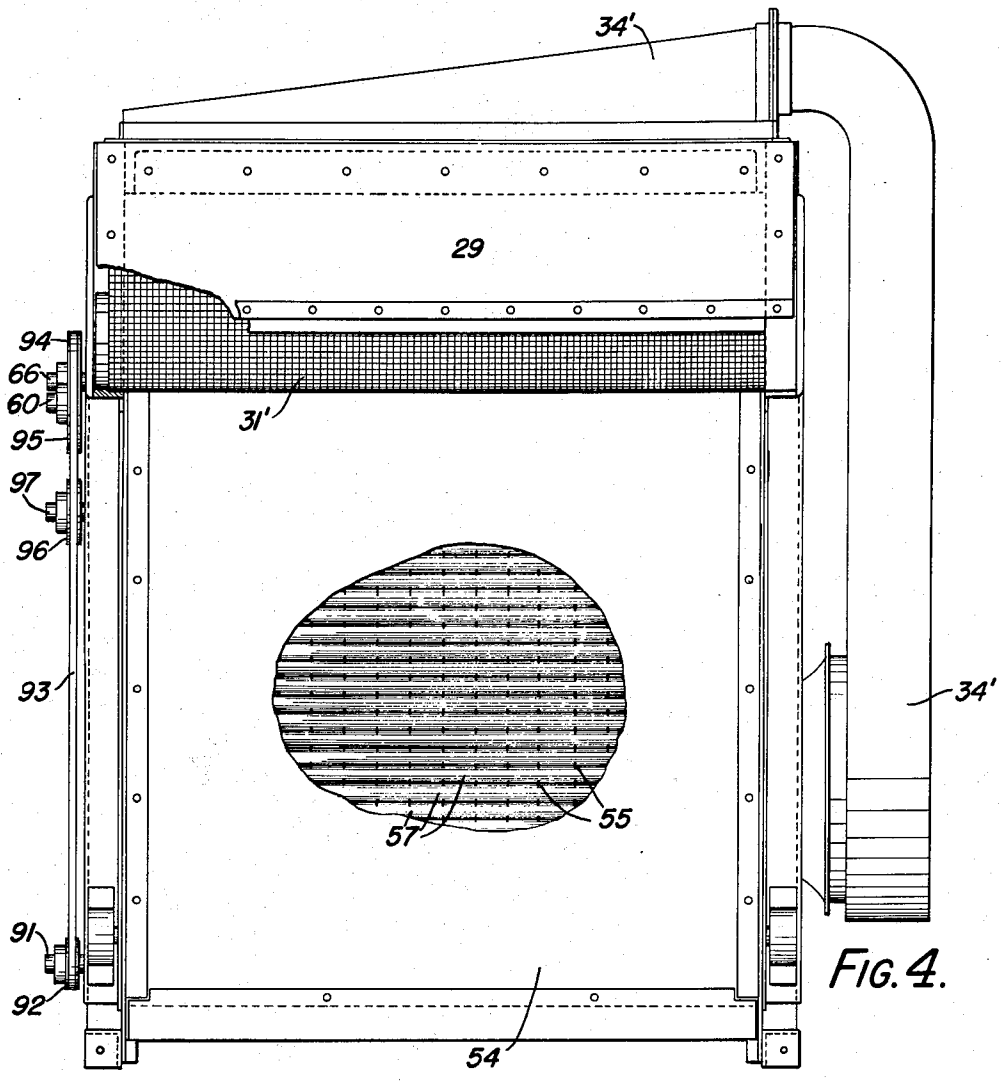


FIG. 4.

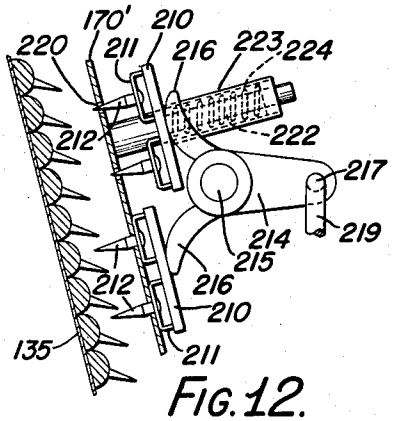


FIG. 12.

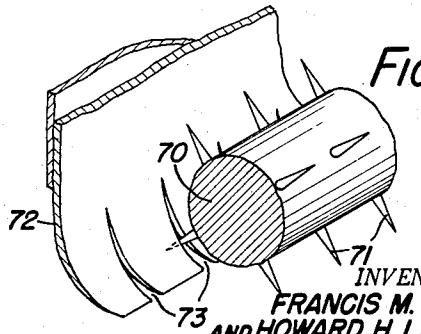


FIG. 5.

INVENTOR.
FRANCIS M. BURESH
AND HOWARD H. LANGDON
BY
ATTORNEY

May 8, 1956 F. M. BURESH ET AL 2,744,294

FEEDER MECHANISM FOR TEXTILE MACHINES

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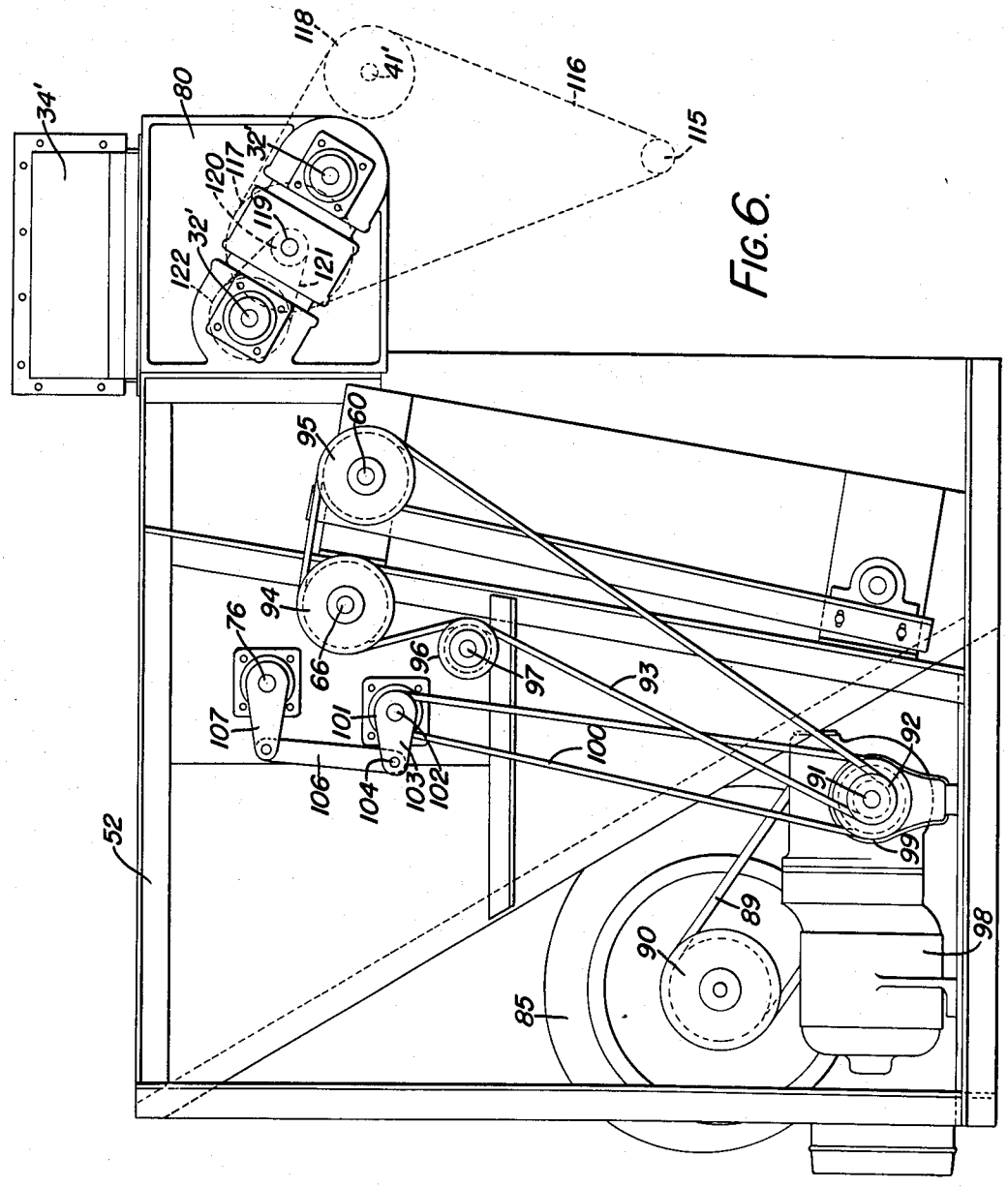


FIG. 6.

INVENTOR.
FRANCIS M. BURESH
BY AND HOWARD H. LANGDON

ATTORNEY

May 8, 1956 F. M. BURESH ET AL 2,744,294

FEEDER MECHANISM FOR TEXTILE MACHINES

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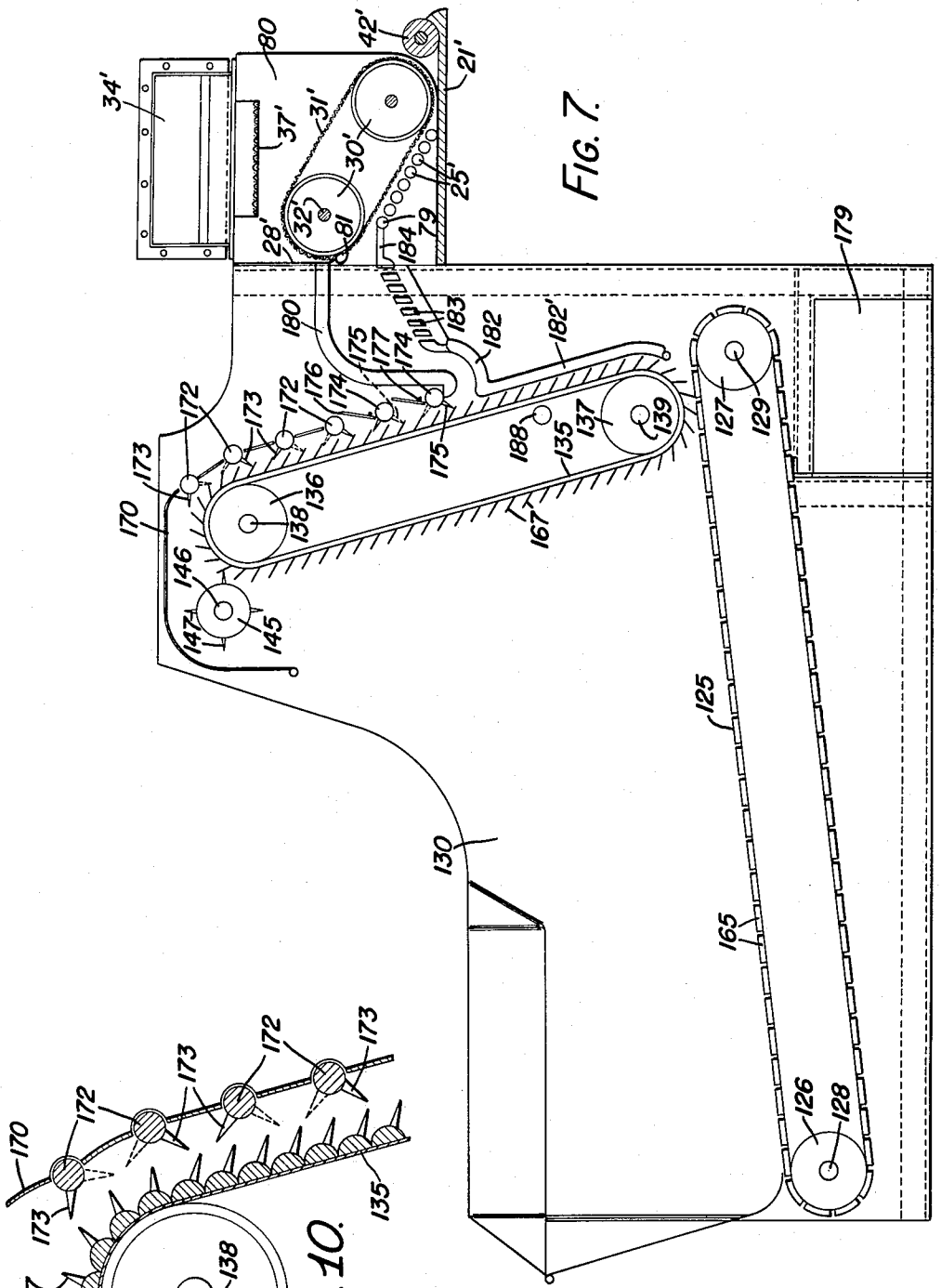


FIG. 7.

FIG. 10.

INVENTOR.
FRANCIS M. BURESH
AND HOWARD H. LANGDON
BY
ATTORNEY

May 8, 1956 F. M. BURESH ET AL 2,744,294

FEEDER MECHANISM FOR TEXTILE MACHINES

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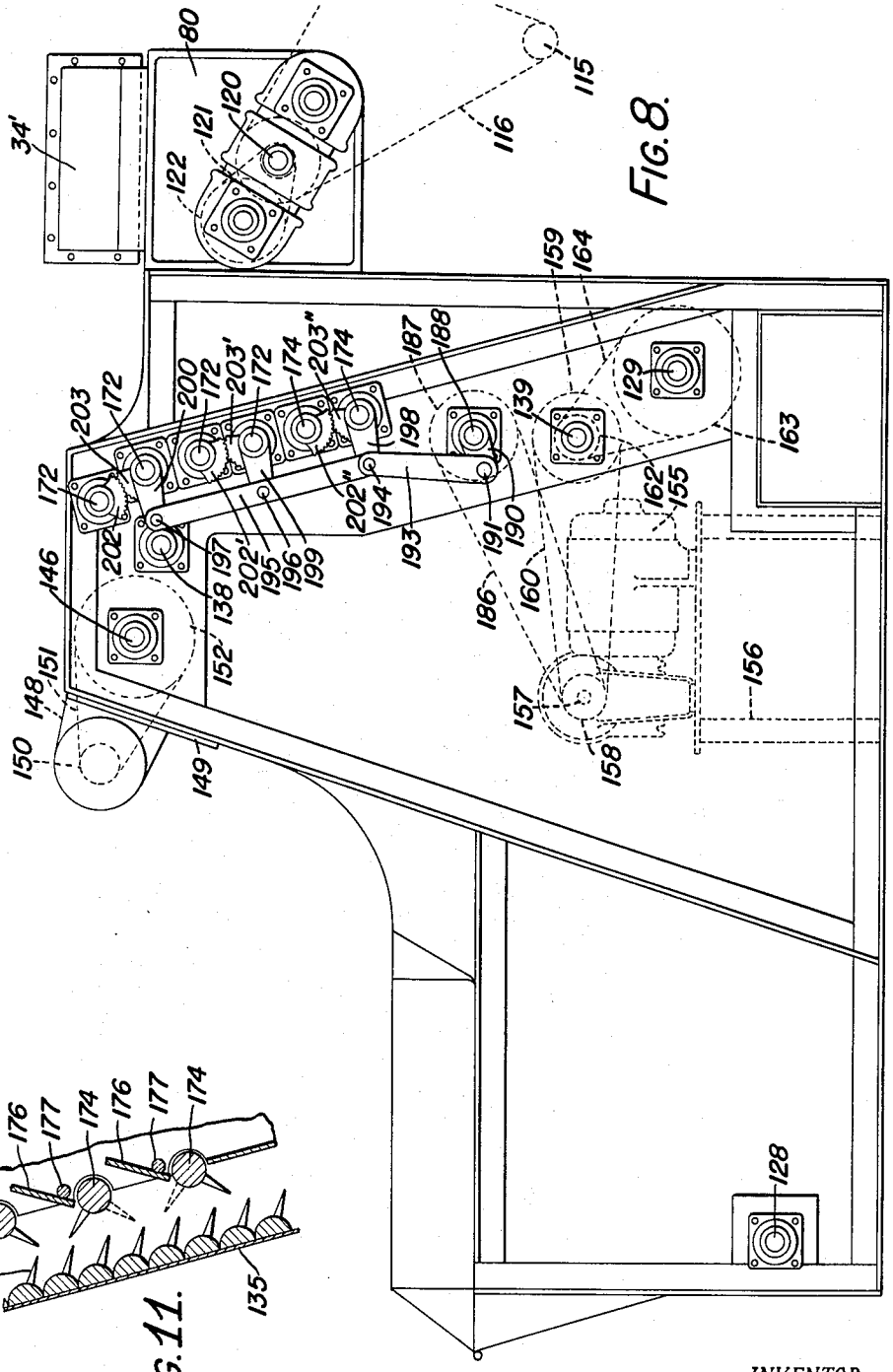


FIG. 8.

FIG. 11.

INVENTOR.
FRANCIS M. BURESH
AND HOWARD H. LANGDON
BY

ATTORNEY

May 8, 1956 F. M. BURESH ET AL 2,744,294

FEEDER MECHANISM FOR TEXTILE MACHINES

Filed Jan. 13, 1950 7 Sheets-Sheet 7

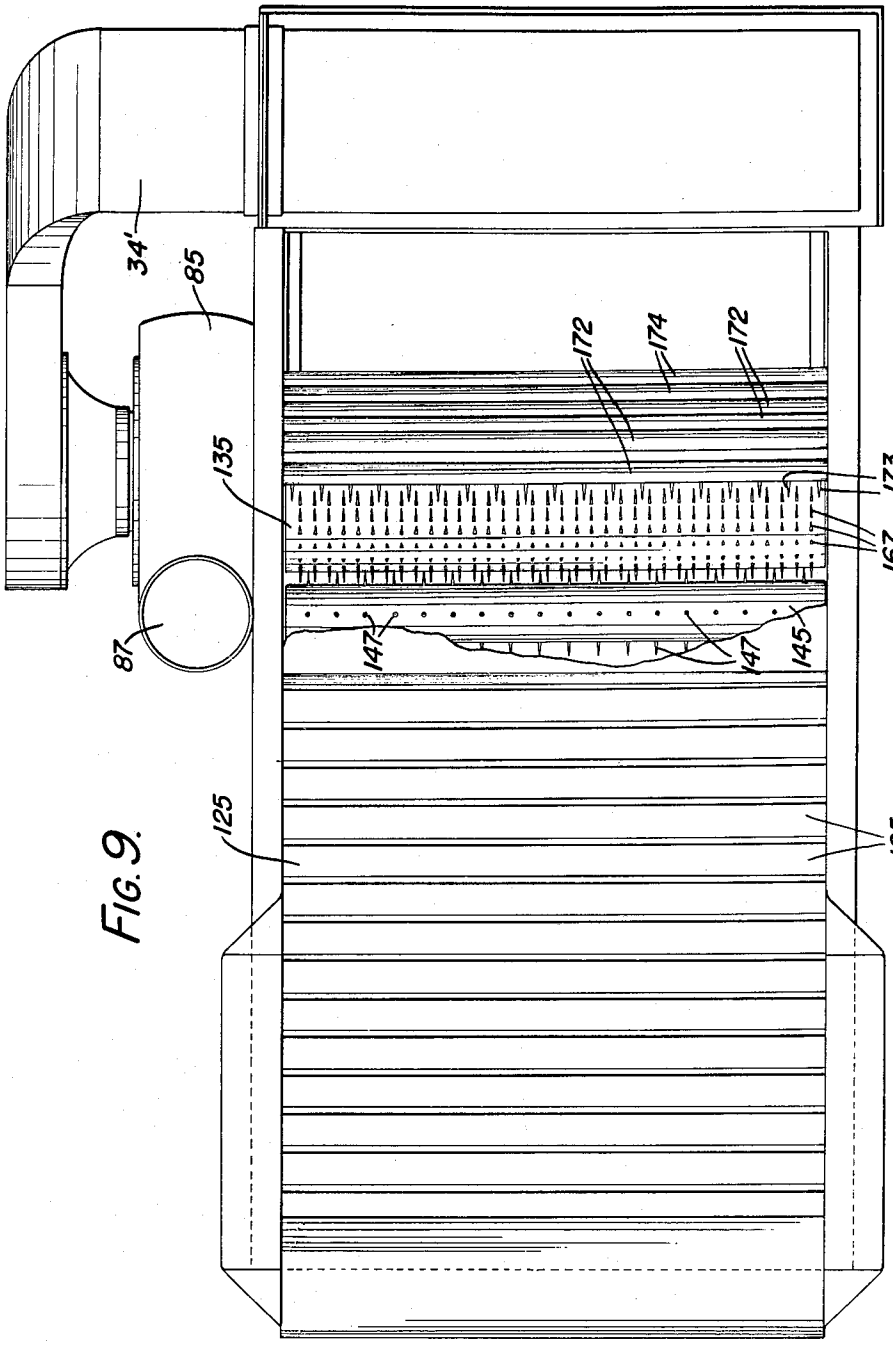


FIG. 9.

INVENTOR.
FRANCIS M. BURESH
AND HOWARD H. LANGDON
BY
ATTORNEY

United States Patent Office 2,744,294 Patented May 8, 1956

2,744,294

FEEDER MECHANISM FOR TEXTILE MACHINES

Francis M. Buresh, Blandford, Mass., and Howard H. Langdon, Rochester, N. Y.; said Langdon assignor, by mesne assignments, to Curlator Corporation, Rochester, N. Y., a corporation of New York

Application January 13, 1950, Serial No. 138,504

11 Claims. (Cl. 19—67)

The present invention relates to feeding mechanisms for handling fibrous material and particularly to a feeding mechanism suitable for use in feeding fibrous material to machines for forming random fiber webs, and to carding, picking, garnetting, and other types of textile machines. This application is a continuation-in-part of our pending U. S. patent application Serial No. 26,256 filed May 11, 1948, now Patent No. 2,700,188.

One object of the invention is to provide a hopper feed mechanism for machines of the character described which will feed fibrous material into a machine at an even rate and uniformly across the width of the operating section of the machine.

Another object of the invention is to provide a hopper feed mechanism for a machine for forming random fiber webs which will feed fibrous material to the lickerin of the machine in a lap of uniform thickness, thereby materially aiding in formation by the machine of a random web of uniform thickness.

Another object of the invention is to provide a feed mechanism for fibrous material which will operate to open up the fibers, and separate the trash therefrom.

Still another object of the invention is to provide a feed mechanism for fibrous material which will operate to insure that the fibrous material has been opened up and cleaned to a desired degree before it is fed into the machine which is to operate upon it.

Other objects of the invention will be apparent hereinafter from the specification and from the recital of the appended claims.

In the drawings:

Fig. 1 is a vertical sectional view of a combined hopper and feed box constructed according to one embodiment of this invention, parts of a machine on which the apparatus is employed being shown, also;

Fig. 2 is a fragmentary view, partly in section, partly in elevation, taken at right angles to Fig. 1, and looking at the feeding apparatus from the right hand side of Fig. 1;

Fig. 3 is a view, with the side cover plates removed, of a feeder unit constructed according to a modification of the invention;

Fig. 4 is an end elevation of this feed unit looking at it from the right of Fig. 3, parts being broken away;

Fig. 5 is a fragmentary perspective view showing the stripper plate and oscillating stripper of this feed unit;

Fig. 6 is a side elevation of this feeder unit showing the drive to the various parts of the same, the guards for the drives being removed;

Fig. 7 is a longitudinal vertical sectional view of a feeder built according to a still further embodiment of the invention;

Fig. 8 is a side elevation of this feeder unit, showing the drive to the various parts of the feeder unit, the guards for the various parts having been removed;

Fig. 9 is a plan view of this feeder unit, parts being broken away;

Fig. 10 is a fragmentary view on an enlarged scale showing details of the elevating apron of this feeder unit and cooperating, oscillating worker pins alongside the top portion of the back flight of this apron;

Fig. 11 is a fragmentary view showing a further portion of the back flight of this apron, the working pins which cooperate therewith, and the louvers which admit air to separate out trash and dirt and to strip the pins of tufts of fibers; and

Fig. 12 is a fragmentary view showing the back flight of the apron and a modified form of opening pin mechanism.

Referring now to the drawings by numerals of reference and first to Figs. 1 and 2, 20 denotes a feed unit constructed according to one embodiment of this invention. This unit is here shown as mounted upon the lap bed or feed plate 21 of a machine for forming random fiber webs such as described in our application Serial No. 26,256 above mentioned.. This feed unit has an opening 23 at its top at one side through which fibrous material, such as reclaimed tire cord, napper flocks, etc. in loose form may be dumped, or into which fibrous material may be delivered directly from the plant conveyor system.

This feed unit has at one side a downwardly inclined floor portion 24 and a plurality of freely rotatable rollers 25. The rollers 25 are journaled in the side walls 26 of the feed unit parallel to one another and are disposed successively relative to one another to extend in the same generally downwardly inclined direction as the floor plate 24 so that they constitute in effect an extension of that plate and part of the floor of the unit. These rollers 25 are slightly spaced from one another to allow passage of air between them, thereby providing in effect a perforated flooring.

A partition wall 28 extends transversely across the feed unit. Mounted within the chamber 27 formed between this partition wall 28 and the right hand wall 29 of the feed unit are a pair of rolls 30 over which runs an endless flexible screen or foraminous belt 31. The rollls are secured to shafts 32. These shafts are so journaled in the side walls of the unit that the under side of the belt 31 is inclined to a plane tangent to the tops of the rollers 25 and converges toward the lowermost right hand roller 25.

The top of the chamber 27 is closed by cover plate 36 which has a central opening 35 therein. A screen 37 fits over this opening. The opening 35 is connected by a conductor pipe 34 with a suction fan which may be mounted at any suitable point on the machine on which the feed unit is employed. The fan sucks air from between the rollers 25, through the interstices of the belt 31, the chamber 27, the opening 35 in the top plate 36, and the screen 37 which covers that opening.

One of the rolls 30 may be the driver and the other an idler. The driver may be driven from the same motor (not shown) as drives the fan, or it may be driven in any other suitable manner. The rolls 30 are driven in a counter-clockwise direction as viewed in Fig. 1 so that, as the screen 31 travels over these rolls, the fibrous material F which is in the feed unit is caught between the lower side of the screen 31 and the rollers 25 and is fed down onto the bed plate 21. The rollers 25 rotate freely and revolve simply by the friction of the fibrous material caught between them and the bottom of the screen 31.

In Figs. 1 and 2 of the drawings, the feed unit is shown as mounted upon the bed plate of a random fiber machine such as illustrated in our application above mentioned. The supports 38 serve to hold the feed unit in proper position above and on the bed plate 21 of this machine. Rubber or leather flaps 39 and 39' may be secured by bolts or rivets 40 to the partition wall 28 and outside wall 29, respectively, of the feed unit to engage closely against the screen 31 as it passes around the rollers 30 to prevent air from being drawn over the ends of the rolls, and to

insure that all air drawn into and through the chamber 27 will pass through the screen 31, thereby making the feed unit most efficient in operation.

The left hand side of the feed unit is open between the supports 38 or has air vents therein. As the screen 31 moves forwardly, then, urging the material downwardly over the feed rolls 25, the air sucked up by the fan and passing between the rolls 25 and through the screen 31 seeks the path of least resistance. Wherever there is more or less compacted material between the rolls 25 and the screen 31 the air flow is restricted. If there is a void or thin space anywhere in the material, however, there is a pressure drop at that spot, and the air tends to rush in from the surrounding area. In doing so it moves the incoming material into the empty or thin space. This helps make the material being fed down onto the bed plate of uniform thickness across the whole width of the feed area and supplies to the bed plate a continuous lap of material of uniform thickness for the desired width.

While the floor of the hopper is preferably perforated and formed of spaced rolls 25 it might be made solid and air might be sucked instead only through the stock and the foraminous belt 31, the air being in this case drawn into the feed unit through the opening 23 in the top of the unit.

The form of machine, with which the feed unit is used, constitutes no part of the present invention. In Fig. 1 we have shown fragmentarily a part of the random fiber web machine with which the feed unit may be used. 42 is the feed roller and 44 is the lickerin of this machine. The material delivered onto the bed plate 21 is fed by the feed roller 42 over the nose portion 43 of the bed plate into the lickerin 44. The feed roll 42 is positively driven; and the upper side of the plate 21 is curved at the nose portion 43 to closely conform to the curvature of the feed roll for the purpose of disposing the stock material to the action of the lickerin in such way that the teeth of the lickerin will comb and draw out of the stock individual fibers, as described more particularly in our application above mentioned.

Another embodiment of the invention is shown in Figs. 3 to 6 inclusive. In this embodiment the hopper portion of the feed unit is enlarged and means is provided in the hopper for opening out and separating the fibers and for conveying the fibers to the screen box.

This unit comprises a frame 50 in which there is provided a hopper 51 that is formed by the side plates 52 of the frame, a rear plate 53 and a front plate 54. The plates 53 and 54 are secured to the side plates 51 and are inclined to the vertical and converge toward the bottom of the frame. The fiber which is to be fed is dumped into or delivered into this hopper. It is lifted out of the hopper by pins 55 of an apron 56 which is in the form of an endless belt and may be of conventional construction. In the instance illustrated, the apron 56 is made up of a plurality of straps 57 and the pins 55 are embedded in these straps. The apron is adapted to travel over rollers 58 and 59 that are secured to shafts 60 and 61, respectively, which are journalled in the side walls 52 of the frame.

Journalled in the side walls 52 of the frame adjacent the top of the apron and opposite the upwardly traveling portion thereof is a stripper roll 65 which is secured to a shaft 66. This stripper roll has straps around its periphery which are armed with stripper pins 67. It is mounted close to the upward flight of the apron 56 and is driven in a clockwise direction so that the bunches of fiber, which are lifted out of the hopper on the pins of the apron, are engaged by the pins of the stripper roll. Thus, the excessive fiber is drawn off of the pins 55 of the apron leaving small bunches or tufts on the individual pins of the elevating apron. This stripper roll is adapted to be rotated continuously during the operation of the machine.

The stripper roll itself also needs to be stripped of excess material. For this purpose a second stripper roll 70 may be provided. This is adapted to oscillate back and forth and is armed with stripper pins 71. Stock is stripped from this second stripper roll by the passage of pins 71 through the slots 73 (Fig. 5) of a stripper plate 72 as the roll 70 oscillates. The plate 72 is fastened to a transverse plate 74 that operates as a partition member and extends between the side walls 52 of the frame.

Mounted in the hopper above the stripper roll 65 and the conveyor roll 58 is a bridge plate 75 which extends from one side wall 52 of the frame to the other. This bridge plate has a horizontal portion close to the stripper roll 65 and to the upper reach of the conveyor belt 56; and it has a vertical portion that is parallel to the partition plate 74.

The back plate 54 of the hopper carries a rod 77 at its upper end which extends from one side plate 52 of the frame to the other. There is a bed plate 78 supported on this rod 77 and on a parallel rod 79 also carried by the side plates 52 of the frame. The bed plate 78 extends transversely across the frame from one side thereof to the other. Overlying the feed plate 21' of the machine is a screen box 80. This screen box is similar to the chamber 27 of the first described embodiment of the invention. It has a rear wall 28' and a front wall 29' extending transversely across the frame from one side thereof to the other. Extensions of the side plates 52 of the frame form the side walls of this screen box. The rear wall 28' joins the bridge plate 75 and forms a support therefor.

Mounted in the screen box are two rolls 30' which are secured to parallel shafts 32' that are suitably journalled in the side walls of the frame. The rolls 30' form a support for an endless foraminous belt or screen.

Journalled in side walls of the frame below the under reach of belt 31' and extending transversely across the feed box are rolls 25'. These rolls 25' form the bottom surface of the screen box like the rolls 25 of the box shown in Fig. 1. The lower reach of the belt 31' is inclined to a plane tangent to the rolls 25' and converges toward the rolls toward the right and lower end of the screen box so that the belt feeds the material forward over the rolls onto the feed plate 21' of the machine. There is an opening 35' in the top of the screen box in which there is mounted a screen 37'. There is a duct 34' (Figs. 3 and 4) connected with this opening 35' and leading to a fan 85 which is mounted in the base of the frame.

In this embodiment of the invention, air is drawn by fan 85 through the opening 69 between the vertical portion of bridge plate 75 and partition 74, and the stream of air is carried across the tops of oscillating stripper 70, and of rotating stripper 65, between the bridge plate 75 and the upper end of apron 56, over plate 78 through the screen 31', and screen 37' into duct 34'. Air is also drawn by the fan through the spaces between rolls 25', through screens 31' and screen 37' into duct 34'. The airstream passing over strippers 70 and 65, the upper end of apron 56 and plate 78 constitutes an air bridge and determines the weight of the tufts of material carried into the feed opening between rollers 25' and the bottom reach of screen 31', as will be described more fully hereinafter. A flap 81 provides air-tight connection between screen 31' and partition 28'.

The fan 85 is driven by a motor 86 (Fig. 3) also mounted in the base of the frame, through the pulley 88 (Fig. 3), belt 89 and pulley 90, the latter being secured to the fan shaft. The fan exhausts to the atmosphere through outlet opening 87.

The apron 56 and the stripper rolls 65 and 70 are driven from a combined motor and gear reduction unit 98 (Fig. 6) also mounted in the base of the frame. This unit drives a shaft 91. This shaft drives the stripper roll 65 and the apron drive roll 58 through a pulley 92, which is secured to the shaft, and a belt 93. The belt 93 has driving engagement with pulleys 94 and 95 that are secured to the shafts 66 and 60, respectively, to which the rolls 65 and 58 are fastened. An idler 96,

which is secured to a shaft 97, which is suitably journalled in the sides of the frame, serves to take up slack in the belt 93. The shaft 91 also drives the oscillating stripper 70, the drive being from shaft 91 through a pulley 99, which is secured to that shaft, the belt 100, and a pulley 101 which is connected to a shaft 102 that is suitably journalled in the side walls of the frame. The shaft 102 has an arm 103 secured to it which is connected by a crank pin 104 with the lower end of a link 106. This link is pivotally connected at its upper end to an arm 107 which is secured to the shaft 76 to which the oscillating stripper 70 is fastened.

The feed screen 31' is preferably driven from the machine on which the feed mechanism is used. This is in order to insure that no more stock will be fed into the machine than can be handled by the machine. The drive may be from a shaft 115 (Fig. 6) of the machine through an endless belt 116 that engages and drives two pulleys 117 and 118. The pulley 117 is secured to a stub shaft 119 that is journalled in the screen box. There is a second pulley 120 secured to this shaft. This pulley drives upper roller shaft 32' (Fig. 3) through a belt 121 (Fig. 6) and a pulley 122, which is secured to upper roller shaft 32'. The pulley 118 is secured to the shaft 41' to which the feed roller 42' of the machine is fastened.

In the operation of the feed mechanism of this embodiment of the invention, fiber is lifted out of the hopper by the pins 55 of the apron 56. The first stripper roll 65, as it rotates, pulls excessive fiber off the pins 55, leaving small bunches or tufts on the individual pins 55. The first stripper roll itself is constantly stripped of excess material by the second oscillating stripper roll 70 so as to continue to operate efficiently, and the second stripper roll cleans itself automatically as its pins 71 pass through the slots 73 of stripper plate 72. The pins of the apron and of the first stripper roll present the tufts of fiber to the air stream across the tops of stripper roll 65 and apron 56.

The screen box is constantly under suction pressure from the fan 85 through the duct 34'. To satisfy this suction pressure, atmospheric air must pass over the surface of the stripper roll 65 and over the top of the apron 56 through the constricted passage between the tops of the roll 65 and apron and the bridge plate 75. This means relatively high velocity over the stripper pins and apron pins. Obviously, small tufts or bunches of fiber held on the pins 55 and 67 will be swept up and carried to the throat the traveling screen 31' and the plate 78 and from that plate to the wedge formed between the screen 31' and the self-rotating conveyer rolls 25'. Conversely, if there is no appreciable air velocity over these rolls and pins the fiber will not be swept off and deposited in the throat of the screen wedge. By adjusting the suction produced by fan 85, then, the weight, that is, the size of tufts lifted off the pins by the air stream and carried to screen box 80 can be adjusted initially.

Assuming that the throat between the screen 31' and the conveyer roll 25' is full of fiber which wedge of fiber extends out on the plate 21', it is apparent that the resistance to the air flow will be increased. In fact, the throat may be so filled with fiber that there is no appreciable air stream over the pins of the apron and stripper. Therefore no more fiber will be called for, and no more will be conveyed across the air bridge into the throat. Moreover, if the air stream does not exist or is feeble, the fiber stays on the pins 55 of the apron, goes down the back reach of the apron and returns to the hopper. The mechanism may continue to operate indefinitely, therefore, feeding no fiber to the screen box unless there is fiber required by the screen box to feed into the machine.

Another corollary feature of our pneumatic feeder is that the action between the stripper roll 65 and the apron 56 not only provides small bunches or tufts on the pins

but also accomplishes some opening of the bunches or tufts. This means that the material can be fed to the hopper in packed bunches of fiber as might come from a bale, plant conveyer, or bag. By the pulling or opening action of oppositely moving adjacent pins 67 and 55 these bunches are reduced to small bunches or tufts for presentation to the air stream. Heavy bunches, that have not been reduced, are not pulled off the pins of the apron or stripper roll by the air but simply go on around and are again presented to the stripping action until they are sufficiently reduced to be carried across the bridge by the air stream.

Still another feature of the pneumatic feed is the uniformity of feed. Inasmuch as the feed box is of considerable width so as to supply to the machine, with which the feed mechanism is employed, a suitable width of material, there may be slightly unequal packing across the throat between screen 31' and rollers 25'. In such case local air current flowing into the thin area or gap will be strong enough to pick fiber off the adjacent aligned pins 55 of the apron 56, which is as wide as the throat, and deliver these fibers through the air bridge into the throat. Thus, there is constant equalization cross-wise of material presented in the throat of the wedge. Not only do we have this equalization cross-wise but due to the steady movement of the screen 31', which is driven by the machine to which the feeder is attached, the packing in the throat makes the throat sensitive to variation in intensity of the air stream at any point across the tops of the stripper 65 and apron 56. Therefore there is, also, sensitive longitudinal equalization of the material; and this equalization is not dependent upon the rate at which the screen is driven in feet per minute by the machine receiving the fiber from the feeder. Thus through the air stream we control the size of the fiber tufts fed into the throat and insure that this fiber is fed uniformly both crosswise and longitudinally.

Another feature of the air bridge is the elimination of "tramp" metal. While the air bridge velocity is sufficient to pull fibers off the pins 55 and 67, it is not of sufficient intensity to lift relatively dense material and carry that material across the bridge into the throat, even though such material be entangled with the fibers. Therefore, metal, wood, burrs, etc. are not carried to the throat but must pass down the back side of the apron 56 into a trap or tray 110 at the bottom of the apron. This tray may have grid bars arranged to permit the returning fiber to pass without again picking up the metal and trash that passes through the grid bars into the tray.

Conventional feeders have mechanical weighing plates and beams that are insensitive and that do not properly equalize the web from the feeder cross-wise and that do only a fair job in equalizing the web longitudinally. Our feeder, with the sensitive air bridge and traveling air stream, the throat and wedge, has produced outstanding results in equalizing the web cross-wise and longitudinally.

A further embodiment of the invention is shown in Figs. 7, 8 and 9.

Here a relatively horizontal forward feed apron 125 is used which runs over rolls 126 and 127 that are secured to shafts 128 and 129, respectively, which are journalled in opposite side walls of the hopper 130. Cooperating with the forward feed apron is an elevating apron 135 which runs on rollers 136 and 137 that are secured to shafts 138 and 139, respectively, which are journalled in the side walls of the hopper. The elevating apron is set at an angle of less than ninety degrees to the forward feed apron 125 so as to tumble the stock back for mixing and blending. Mounted adjacent the upper end of the elevating apron 135 is a stripper roll 145. This roll is secured to a shaft 146 which is journalled in the side walls of the hopper.

In this embodiment of the invention the stripper roll is driven at high speed and cleans itself by centrifugal

action. It is driven from a motor 148 (Fig. 8) that is mounted upon a base 149 which is secured at one side of the hopper. The motor 148 drives the shaft 146 through a pulley 150, belt 151, and pulley 152. The last-named pulley is secured to the shaft 146.

The forward feed apron 125 and the elevating apron 135 are driven from a separate motor and gear reduction unit 155 which is mounted upon a support 156 alongside the hopper. This unit drives a shaft 157 through a suitable gear reduction. The shaft 157 carries a pulley 158 which drives the pulley 159 through a belt 160. The pulley 159 is secured to the shaft 139 on which the drive roller 137 for the elevating apron is mounted. Secured to the shaft 139 is another pulley 162. This pulley drives a pulley 163 through a belt 164. The pulley 163 is secured to the shaft 129 on which the drive roller 127 of the forward feed apron 125 is mounted.

The forward feed apron 125 and the elevating apron 135 may be of any suitable construction. The feed apron shown is formed of interlocking metal slats 165 (Fig. 9) which may be provided with pins or may be without pins as desired. The interlocking metal slats may be positively driven by the roller 127 according to standard practice, the roller 127 being provided with sprocket teeth for this purpose. The elevating apron 135 may also be of the interlocking slat type but is provided with pins 167.

In this embodiment of the invention an air bridge is again employed to carry the small tufts of fibers to the screen box. The screen box may be identical in construction with the screen box shown in Fig. 3 and operate in the same manner. For this reason the same reference numerals are used in Fig. 7 to designate the parts of this box as are employed to designate the corresponding parts in Fig. 3. The air bridge will be described in further detail below.

It has been observed that in some cases the stripper rolls are not fully effective in reducing the tufts of fiber on the pins to such size that they may be stripped by the air stream. In other words, in addition to tufts which are stripped by the air stream, bunches of unopened fiber go by the air stripping section and pass down the back side of the elevating apron carried all the while by the pins of the apron.

In the embodiment of the invention shown in Figs. 7 to 9 more complete opening of the fibers and better cleaning of the fibers are insured by providing two series of oscillating working pin members to coact with the downflight of the elevating apron and draw out and open the tufts of fibers, which remain on the pins 167, as the pins travel on the downflight of the apron toward the bottom of the hopper. These bunches of unopened fibers are thus opened and reduced to tufts by action on the back side or downflight of the elevating apron.

There is a plate 170 covering the stripper roll 145, the top of the elevating apron 135 and extending down substantially parallel to the back flight of the elevating apron. It is in the channel formed between this plate and the back flight of the elevating apron that the pins 167 carry down the tufts of unopened fiber. At the top of this channel there are mounted four transversely extending shafts 172 in which are mounted pins 173. These shafts are geared together in pairs and the two shafts of a pair are so positioned and oscillated that the pins 173 alternately catch and hold fibers from the pins 167 and subsequently release those fibers. This is accomplished by oscillating the two shafts of each pair in opposite directions simultaneously, each shaft oscillating through approximately ninety degrees, and by so timing or synchronizing the oscillations of consecutive shafts that at the moment of release of the fiber by any row of pins 173 the next row of pins 173 below is rising in its stroke to further retain the fiber for action by the descending pins 167 of the apron. Thus, the uppermost row of pins 173 engages the tufts of fibers carried down by the pins 167 on the back flight of the apron 135, pulls and separates the tufts; the next row of pins 173 pulls and separates any tufts of fibers caught by the first row of pins 173 and also catches and pulls fibers from descending pins 173, presents these fibers for separate action to the upper row of pins 173 and also to other descending pins 167, releases the fiber to these pins, and so on down the back flight, the tufts of fibers carried by pins 167 being successively caught, pulled apart, and again released to those pins. Thus, there is positive travel downward of the fiber along the back flight with drawing and opening of the fiber step by step down the back flight.

Below the opening pins there are two parallel shafts 174 which are also provided with pins, denoted at 175. These shafts and pins oscillate in the same manner as the shafts 172 but may be set closer to the down flight of the apron 135 and may be driven at a faster speed so as to provide a more intense action in opening and cleaning the fiber. Louvers 176 may also be pivotally mounted at 177 between the side walls of the frame. The upper louver is between the upper shaft 174 and the lower shaft 172; and the lower louver is between the two shafts 174. These louvers permit air to be drawn in over the pins 175 of the shafts 174 and the descending pins 167 of the apron 135. The suction thus produced improves the action of separation of the fibers from the screenable trash. The shafts 174 and pins 175 provide an opening and cleaning section. The air admitted through the louvers supplies the air bridge as will be described hereinafter and also filters down through the open fiber. Trash settles out and follows down along the down flight of the apron 135 to drop upon the forward feed apron 125 which in turn delivers the trash over the end of the drive roller 127 into a trash box 179 positioned in the base of the hopper frame.

For the purposes of the air bridge, an upper bridge plate 180 is provided to extend from the lowermost shaft 174 to the wall 28' of the screen box 80. The lower boundary of the air bridge is defined by a plate 182, the transverse, spaced sifting bars 183, and a plate 184. The bed plate 184 extends from the right hand end of the sifting bars 183 to the rod 79 of the screen box. The plate 182 has a downwardly depending portion 182' which extends parallel to the lower portion of the down flight of the apron 135 and continues the channel formed at the upper end by the plate 170.

The plate 180 is preferably formed as shown in Fig. 7 so that an expansion chamber is provided above the sifting bars 183 to slow down the speed of the air stream above these bars. This permits the tufts of fiber, which are carried in the air stream and which are stripped from the apron pins 167, to slow down and drop their contained trash through the sifting bars. In fact, the velocity of the air stream may be decreased to a point that the fiber tufts will tumble over the sifting bars on their way to the plate 184 at the screen throat, thus further insuring elimination of trash from the fiber tufts before delivery of those tufts to the screen box. In this way dense or heavy objects of any kind, metal, wood, or fragments of stalks and limbs, leaf trash, etc. will be prevented from being carried over the air bridge and will settle out to fall into the trash box 179.

The fiber delivered to the screen box will, of course, be fed by the screen 31' over the rollers 25' and feed plate 21' to the machine in the manner already described.

The shafts 172 and 174 are adapted to be driven from the shaft 157 through pulley 158, belt 186, and pulley 187, the last-named pulley being secured to a shaft 188 that is suitably journalled in a side wall of the hopper 130. Secured to this shaft is a crank arm 190 which is connected by a pin 191 with a connecting link 193. This link is pivotally connected by pin 194 to a link 195 which is pivotally connected by pins 194, 196 and 197 to arms 198, 199 and 200. The arm 198 is secured to the lowermost shaft 174. The arm 199 is secured to the lower-

most shaft 172. The arm 200 is secured to the second highest shaft 172. The uppermost and second uppermost shafts 172 are connected by spur gear segments 202 and 203. The third and fourth shafts 172 are connected by similar spur gear segments 202', 203'. The two shafts 174 are connected by similar spur gear segments 202'' and 203''. Thus as the shaft 187 rotates, the shafts 172 and 174 are oscillated back and forth in pairs so as to effect the opening action through their pins 173 and 175 which is desired.

With the above described embodiment of the invention, the upper pins 173 open up and draw the fibers while the section comprising the pins 175 opens, draws, and cleans trash and other objects from the fiber.

Instead of oscillating the shafts 172 and 174 to effect the opening and drawing action, the pins may be attached to bars which are reciprocated rectilinearly toward and away from the down flight of apron 135. This arrangement is shown in Fig. 12. Here two transversely extending bars 210 are shown, each of which carries two parallel transversely extending slats 211. Pins 212 are secured in these slats. The pins 212 are alternately moved in and out by a rocker arm 214 which is mounted upon a shaft 215 and is provided with two shoes 216 that engage the backs of a pair of plates 210. This rocker arm may be oscillated by a link member 219 similar to the member 195 (Fig. 8) driven in similar fashion thereto and connected by pin 217 with the rocker member. The pins 212 are adapted to project through holes 220 in a back plate 170' which is similar to plate 170. The plates 210 have spaced tubular casings 223 (of which only one is shown) secured to their backs. Coil springs 224, one of which is mounted within each casing, serve to hold the plates 210 against the shoes 216. Each spring surrounds a rod 222 and is interposed between the bottom of the tubular casing and a shoulder formed on the rod. The rod is welded or otherwise secured to plate 170' and projects through a hole in the bottom of the casing.

With this construction the pins 212 are projected and retracted through holes in the back plate alternately and in such manner that they engage fiber which is being carried by the descending pins 167 of apron 135 and open and draw out that fiber. The pins 212 are themselves cleaned by passage through the holes 220.

The action of pins 212 is similar to the action of pins 173. The alternately projecting and retracting pins 212 operate in a cyclic manner to hold up unopened bunches of fiber that were not selected by the air stream at the point of air pick-off. The apron pins 167 move through such caught bunches after which the pins 212 withdraw, freeing the fiber caught by them. However, a few rows below, the opening pins 212 protrude again in their cycle and recatch the reduced bunches of fiber, again permitting action by the apron pins 167 and so on alternately down the back flight. Thus there is intermittent presentation of fiber caught on the pins 212 for action by the apron pins 167 followed by downward travel of the fibers, then catching of the fibers again by other pins 212, followed by downward travel, etc. Each time the bunches are acted upon they are partially opened, permitted to travel, again caught and further opened.

In connection with either the embodiment shown in Fig. 7 or that shown in Fig. 12, it is to be noted that the air bridge and the air-stripping arrangement is so adjustable and so operated that only tufts of less than a predetermined weight are stripped from the pins and carried over the bridge. Trash of greater density than the fiber will not be raised and passed through the air bridge. In certain fibers, like cotton balls, trash is intermingled with the fiber when delivered to the hopper. Through the intense opening action of the mechanism of our invention, especially in the lower section of the down flight in which the action of the pins 175 is augmented by suction, the trash will be separated from the fiber, drawn away and deposited in the trash box.

The elevating pins 167 carry upward bunches of unopened fiber, sometimes large masses. The large masses are generally stripped off by the pins 147 of the stripper roll 145 leaving small bunches or tufts on the pins 167. When the louvers 176 are open, the suction in the duct 34' causes an air stream over the down flight of apron 135 and thence into the duct between upper plate 180 and lower plate 182, sifting bars 183, and plate 184, drawing the sufficiently opened tufts off descending pins 167 and delivering them to the throat between the bottom flight of screen 31' and rolls 25'. This air stream may be augmented by the air stream produced by suction in the duct 34' and flowing under plates 170 and 170', over the stripper 146 and top of apron 135, down the back flight of apron 135, and into the duct formed between plate 180, at the top, and plate 182, sifting bars 183, and plate 184, at the bottom. When the louvers are closed the latter air stream picks off pins 167 the tufs which are light enough to be carried off by the suction. Unopened bunches of fibers are carried past the stripper roll, past the air stripping section, and down the back flight.

The pin mechanism 173, 175 (Fig. 7) or 212 (Fig. 12) described above has for its purpose the opening of such bunches and the reduction of these bunches on the back flight to tufts caught on individual pins. Pins 167, which are still loaded with tufts of fiber, after passage through the reducing section, will pass on around through the loaded hopper and will not engage new fiber. Such pins carrying their tufts are presented to the air stream for stripping on their second time around. Pins so stripped will pick up tufts of fiber down the back flight resulting from the bunches which have been carried in to the pins 173, 175, or 212 by the pins 167 which received their load from the hopper. Thus, due to the selective action of the air stream in picking off only light bunches or tufts of fiber, the excess fiber in bunches passes down the back flight, is opened, drawn and re-distributed on the pins 167, and, even though such pins 167 pass up through the loaded hopper again they do not carry up new fiber for stripping action. In other words, a pin loaded with tufts or small bunches does not pick up new fiber as it passes through the loaded hopper. Only an empty pin will bring up new fiber. The air stripping method will only pick off tufts or small bunches. All excess material goes back down the back flight for complete opening and cleaning. The tufts or small bunches of fiber are, of course, caried away from the pins by the air stream to the throat of the screen roll to be fed on to the machine on which the feed mechanism is used.

While the opening and cleaning arrangement has been described as operating on the down flight, it will be understood that it might also be so positioned as to work adjacent the upflight of the lifting apron.

While the drives to the various parts have been described as effected through belts and pulleys, it will be understood that sprockets and chains, gear drives, or other suitable drives may be used instead.

With the invention as described, the screen box makes a selective demand for fiber and equalizes the web that is formed both cross-wise and longitudinally. The uncalled-for fiber returns down the back side of the apron to the hopper. It is again presented for further opening by the stripper rolls until the bunches of fiber are reduced sufficiently to be picked up by the air stream. The ability to lift the bulk fiber from the hopper and present it to the air stream for air stripping permits dense objects, such as metal, wood, twigs, etc. to return to a trash box at the bottom of the conveyor. Through the mechanism of this invention we can control the opening of the fiber to meet any need.

As a result we have devised a feeder which is arranged to form a uniform lap of opened fiber cross-wise and lengthwise, the opening being effected along with elimination of heavy trash and its accumulation in a trashbox. A

feeder capable of accomplishing the above has widespread application in textile mills.

While several different embodiments of the invention have been described, it is to be understood that the invention is capable of further modification, and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains and as may be applied to the essential features hereinbefore set forth and as fall within the scope of the invention or the limits of the appended claims.

Having thus described our invention, what we claim is:

1. In a machine of the character described, a hopper into which the stock material may be placed, a pair of perforated members between which the material is adapted to be fed from the hopper, one of said members being movable to effect said feed and converging toward the other in the direction of feed, and means disposed at one side of one of said members in the direction of air flow for sucking air from the distal side of the other of said members successively through the perforations in both said members and in a direction transverse of the direction of feed during movement of said one member.

2. In a machine of the character described, a hopper into which the stock material may be placed, a plurality of closely spaced parallel rollers forming a surface over which the material is adapted to be fed from the hopper, an endless foraminous belt adapted on movement to effect said feed, said belt being mounted to converge toward the rollers in the direction of feed, and means disposed at the side of said belt remote from said rollers for sucking air from the distal side of said rollers successively both through the spaces between said rollers and through the holes in said belt and in a direction transverse of the direction of said feed movement during said feed movement.

3. A feeder mechanism for a textile machine comprising a hopper for fibrous material, an endless conveyor mounted to travel through the material in the hopper and having pins thereon to pick up bunches of the material from the hopper, a stripper member having pins thereon mounted to engage and pull out the bunches of material carried by the pins of the conveyor, a feed box having an entry port at one end communicating with the hopper and an exit port at its opposite end and having a flow extending between said ports, an endless foraminous belt mounted in said feed box with its lower reach inclined to the floor of the feed box and converging toward the floor from entry to exit port, means disposed beyond said foraminous belt in the direction of air flow for sucking air over both the stripper member and the conveyor through the entry port and through said foraminous belt to pick material off the pins and deliver it between the belt and the floor of the feed box, and means for moving the belt to feed such material on to the exit port.

4. A feeder mechanism for a textile machine comprising a box having a floor, an endless foraminous belt mounted in said box in spaced relation to said floor but with its lower reach in position to feed fibrous material over said floor, an inlet port at one end of said box communicating with the space between said floor and said belt, an outlet port at the opposite end of said box communicating with the opposite end of said space, means for supplying fibrous material to said inlet port, means for sucking air through said inlet port and up through the lower and upper reaches of said belt successively, the quantity of fibrous material delivered into said inlet port by said supplying means being controlled by the suction demand for fibrous material across the width of the lower reach of said belt, whereby said material is supplied across said width to maintain uniform thickness of material across said width as said belt feeds said material over said floor to said outlet port.

5. A feeder mechanism for a textile machine comprising a hopper for fibrous material, an endless conveyor mounted to travel through the material in the hopper and having pins thereon to pick up bunches of the material from the lower part of said hopper and carry said bunches to the upper part of said hopper, a feed box spaced from said hopper and having an entry port and a delivery opening and having a foraminous floor extending between said port and said opening, an endless foraminous belt mounted in said feed box with its lower reach inclined to said floor to converge toward the same in the direction of the delivery opening, means comprising an air duct bridging the space between said conveyor and said feed box, means disposed beyond the upper reach of said belt for sucking air over said conveyor through said duct and through said foraminous belt to pick material of the proper weight off said pins and deliver said material between the belt and floor, said last-named means also operating to suck air through said floor and said belt, and means for moving said belt to feed the material over said floor on to the delivery opening.

6. A feeder mechanism for a textile machine comprising a hopper for fibrous material, an endless conveyor mounted to travel through the material in the hopper and having pins thereon to pick up bunches of the material from the hopper, a feed box having an entry port and a delivery opening and having a foraminous floor extending between said port and said opening, an endless foraminous belt mounted in said feed box with its lower reach inclined to said floor to converge toward the same in the direction of the delivery opening, means forming an air duct between said conveyor and said feed box, means disposed beyond the upper reach of said belt for sucking air over said conveyor through said duct and through said foraminous belt to pick material off said pins and deliver said material between the belt and floor, said last-named means also operating to suck air through said floor and said belt, and means for moving said belt to feed the material over said floor on to the delivery opening, and there being openings in the lower side of said air duct through which foreign material can drop out of the fibrous material as it is drawn through said air duct.

7. A feeder mechanism for a textile machine comprising a hopper for receiving fibrous material, a member having pins thereon movable in said hopper to cause said pins to pick up bunches of the material out of the hopper and to carry said bunches to the upper portion of said hopper, a feed box spaced from said hopper and having a floor, a foraminous member disposed in operative relation to said floor but spaced therefrom and movable with reference thereto to feed fibrous material over said floor, said feed box also having an inlet port at one end and an outlet port at its opposite end, said ports communicating with the space between said floor and said movable member at opposite ends, respectively, of said space, means comprising an air duct bridging the space between the upper portion of said hopper and the inlet port of said feed box, and means disposed beyond said foraminous member in the direction of air flow for sucking air over said pins as they move through the upper portion of said hopper, through said duct, through said inlet port and through the full width of said foraminous member, whereby bunches of fiber of proper weight are sucked off said pins, carried through said duct, and delivered uniformly across the width of said foraminous member to be fed by said foraminous member to said outlet port.

8. A feeder mechanism for a textile machine comprising a hopper for receiving fibrous material, an endless conveyor mounted to travel through the material in said hopper and having pins thereon to pick up bunches of said material from said hopper and to carry said bunches to the upper portion of said hopper, a feed box spaced from said hopper and having a foraminous floor, a movable foraminous member, an inlet port at one end, and an outlet port at its opposite end, said movable foraminous

member being spaced from said floor but being disposed in operative relation to said floor to converge relative to said floor in the direction of said outlet port and to feed fibrous material over said floor as it moves relative to said floor, said ports communicating with the space between said movable foraminous member and said floor at opposite ends, respectively, of said space, means comprising an air duct bridging the space between the upper portion of said hopper and said inlet port, and means disposed at one side of said movable foraminous member in the direction of air flow for sucking air over said pins as they move through the upper portion of said hopper, through said duct, through said inlet port, and through the full width of said movable foraminous member, and also from the distal side of said floor through said floor and through said movable foraminous member, whereby bunches of fibers of proper weight are sucked off said pins, carried through said duct, and delivered uniformly across the width of said movable foraminous member to be compacted between said foraminous member and said floor and to be fed by said foraminous member over said floor to said outlet port.

9. A feeder mechanism for a textile machine comprising a hopper for receiving fibrous material, a conveyor movable in said hopper and having pins thereon to pick up bunches of material from the lower part of said hopper and carry said bunches to the upper part of said hopper as it moves in said hopper, a feed box spaced from said hopper and having an entry port and a delivery opening and having a floor extending between said ports and said opening, a movable foraminous member mounted in said feed box and positioned to converge toward said floor in the direction of said delivery opening, means comprising an air duct bridging the space between the upper portion of said hopper and said inlet port, means disposed beyond said foraminous member in the direction of air flow for sucking air over said pins as they move through the upper portion of said hopper, through said duct, through said inlet port, and through the full width of said foraminous member, whereby bunches of fiber of proper weight are sucked off said pins, carried through said duct, and delivered across the width of said foraminous member to be fed by said foraminous member to said outlet port, and means in said hopper to engage and pull out bunches of material left on said pins to reduce the bunches carried by said pins to said proper weight.

10. A feeder mechanism for a textile machine comprising a hopper for receiving fibrous material, a conveyor movable in said hopper and having pins thereon to pick up bunches of material from the lower part of said hopper and carry said bunches to the upper part of said hopper as it moves in said hopper, a feed box spaced from said hopper and having an entry port and a delivery opening and having a floor extending between said ports and said opening, a movable foraminous member mounted in said feed box and positioned to converge toward said floor in the direction of said delivery opening, means comprising an air duct bridging the space between the upper portion of said hopper and said inlet port, means disposed beyond said foraminous member in the direction of air flow for sucking air over said pins as they move through the upper portion of said hopper, through said duct, through said inlet port, and through the full width of said foraminous member, whereby bunches of fiber of proper weight are sucked off said pins, carried through said duct, and delivered across the width of said foraminous member to be fed by said foraminous member to said outlet port, and means in said hopper to engage and pull out bunches of material left on said pins to reduce the bunches carried by said pins to said proper weight, there being openings in the lower side of said air duct through which foreign material can drop out of the fibrous material as it is drawn through said air duct.

11. A feeder mechanism for a textile machine comprising a hopper for receiving fibrous material, a conveyor movable in said hopper and having pins thereon to pick up bunches of said material from the lower part of said hopper and carry said bunches to the upper part of said hopper as the conveyor moves in said hopper, a feed box spaced from said hopper and having an entry port and a delivery opening and having a floor extending between said port and said opening, an endless foraminous belt movably mounted in said feed box with its lower reach inclined to said floor to converge toward said floor in the direction of the delivery opening, means comprising an air duct bridging the space between the upper portion of said hopper and said inlet port, means disposed at the side of said hopper remote from said floor for sucking air over said pins as they move through the upper part of said hopper, through said duct, through said inlet port, and through the full width of said foraminous member, whereby bunches of fiber of proper weight are sucked off said pins, carried through said duct, and delivered across the width of said foraminous member, means for moving said belt to feed such material in the form of a mat over said floor on to the delivery opening, and means in said hopper to engage and pull out bunches of material left on said pins to reduce said bunches carried by said pins to said proper weight.

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