

Jan. 14, 1969

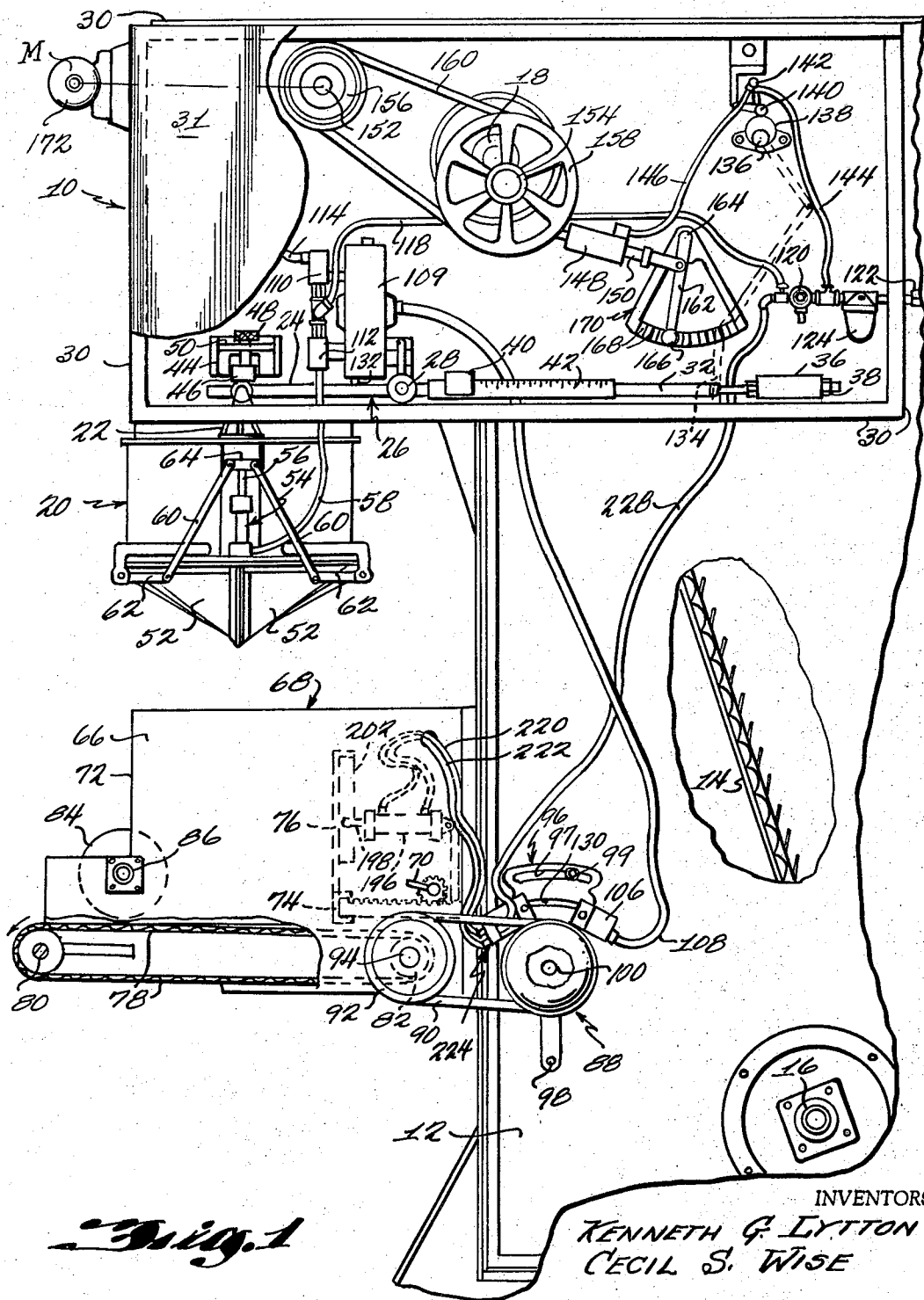
K. G. LYTTON ET AL

3,421,659

FIBER FEEDING APPARATUS

Filed Aug. 14, 1967

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INVENTORS
KENNETH G. LYTTON
CECIL S. WISE

BY
Cushman, Darby & Cushman
ATTORNEYS

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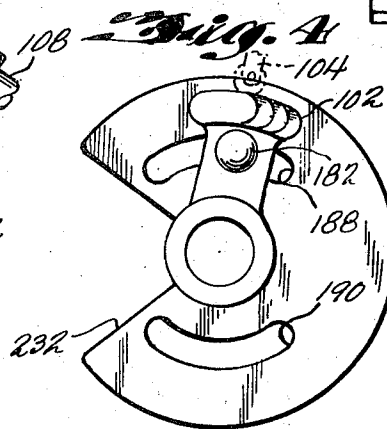
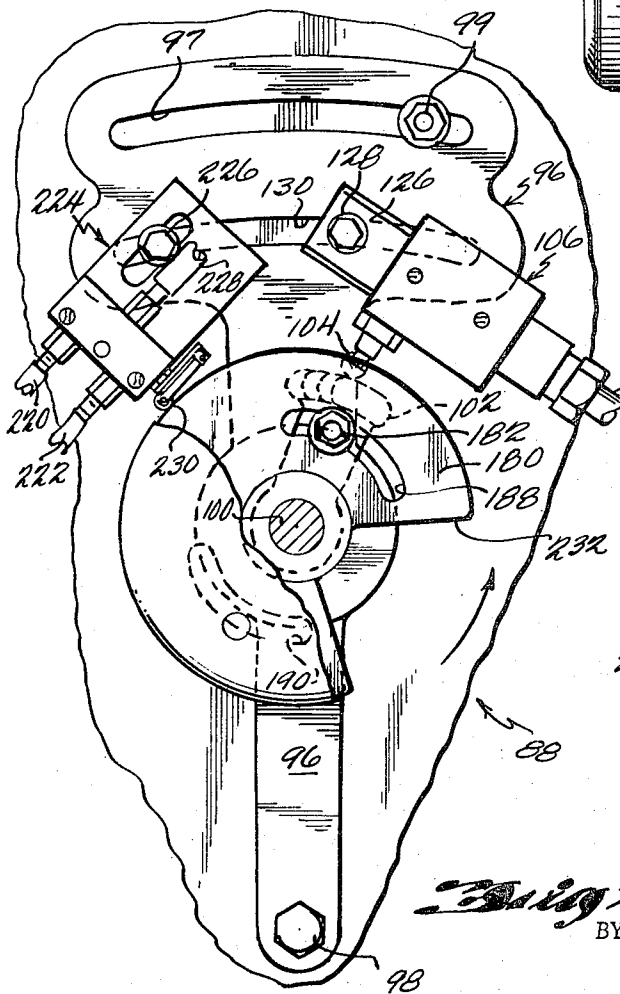
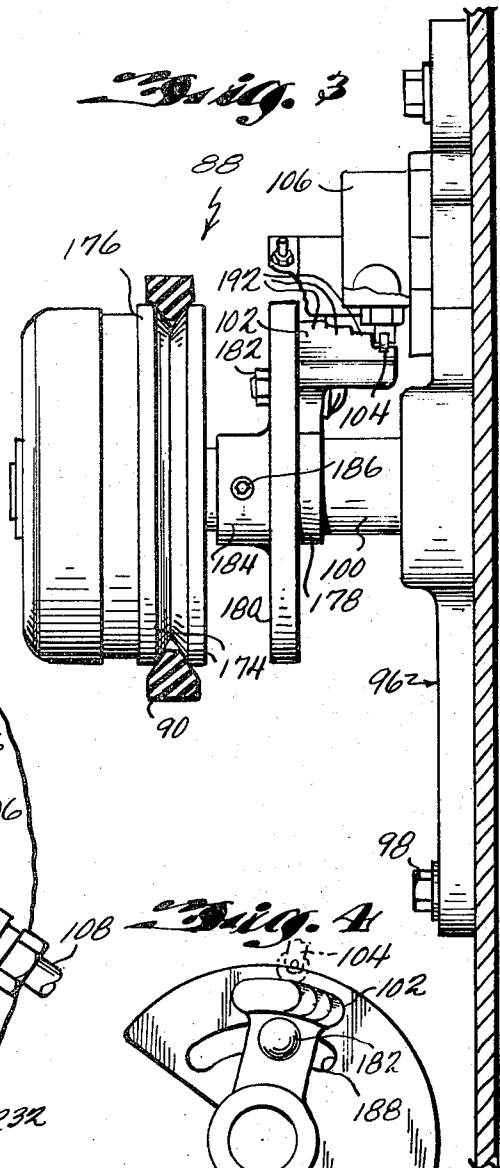
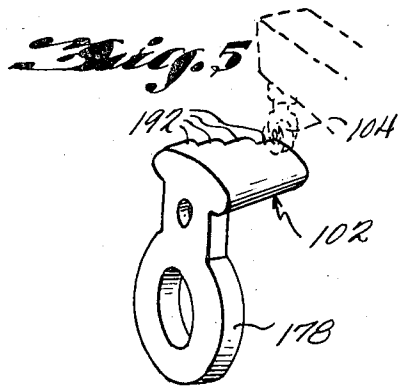
K. G. LYTTON ET AL

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INVENTORS
KENNETH G. LYTTON
CECIL S. WISE

Fig. 1

BY

Cushman, Darby & Cushman
ATTORNEYS

Jan. 14, 1969

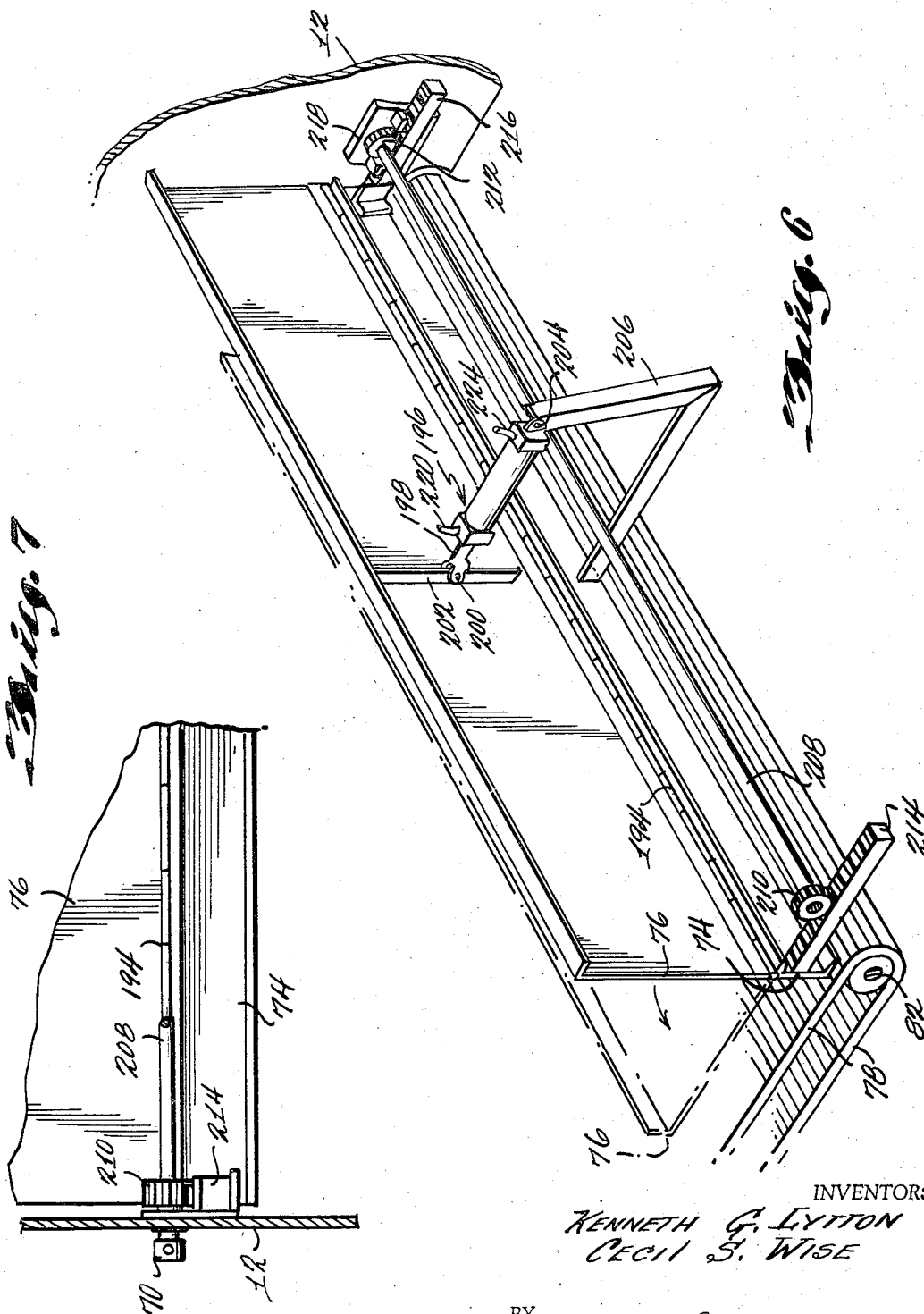
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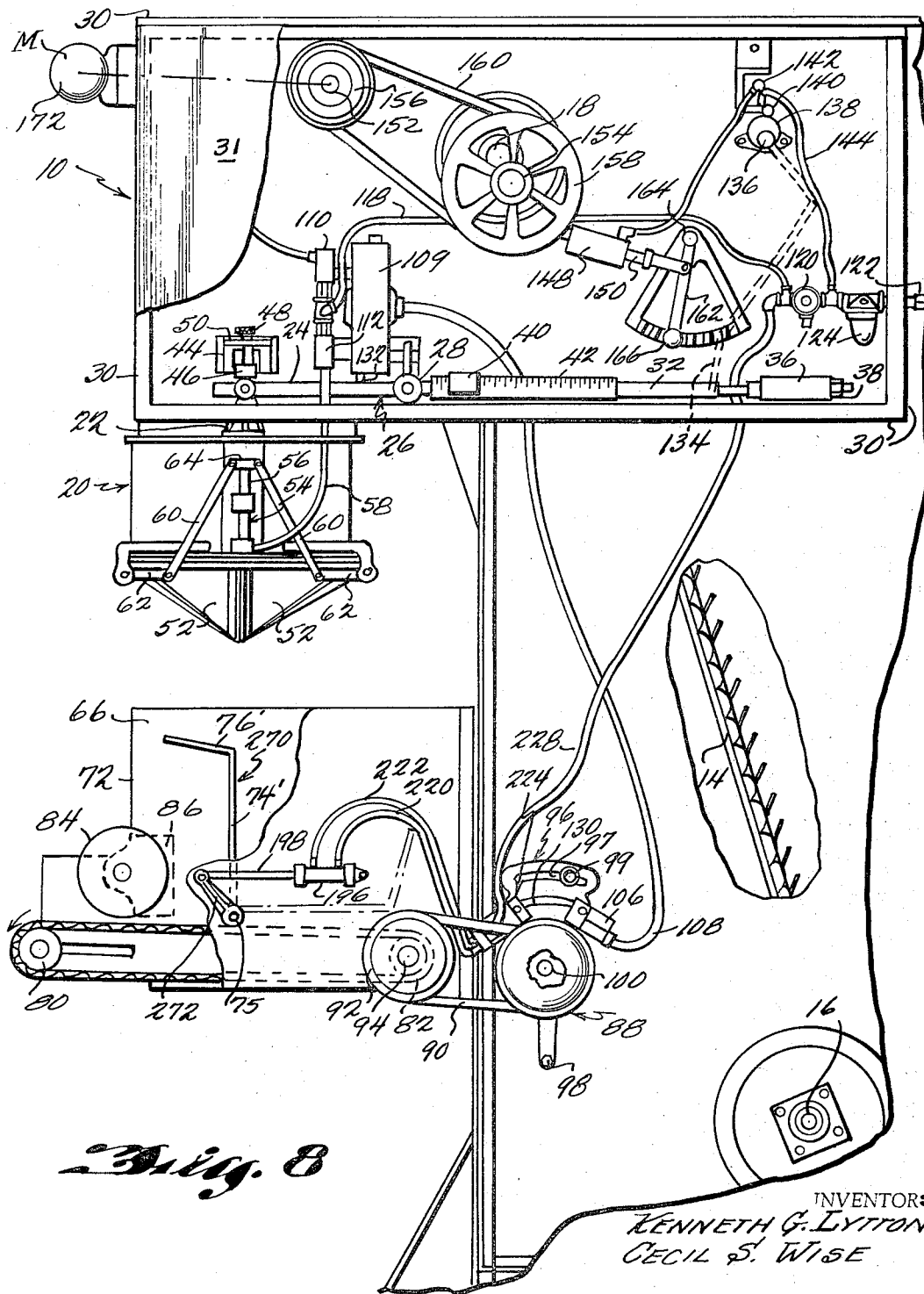


Fig. 8

INVENTORS
KENNETH G. LYTTON
CECIL S. WISE

BY
Cashman, Darling & Cashman
ATTORNEYS

Jan. 14, 1969

K. G. LYTTON ET AL

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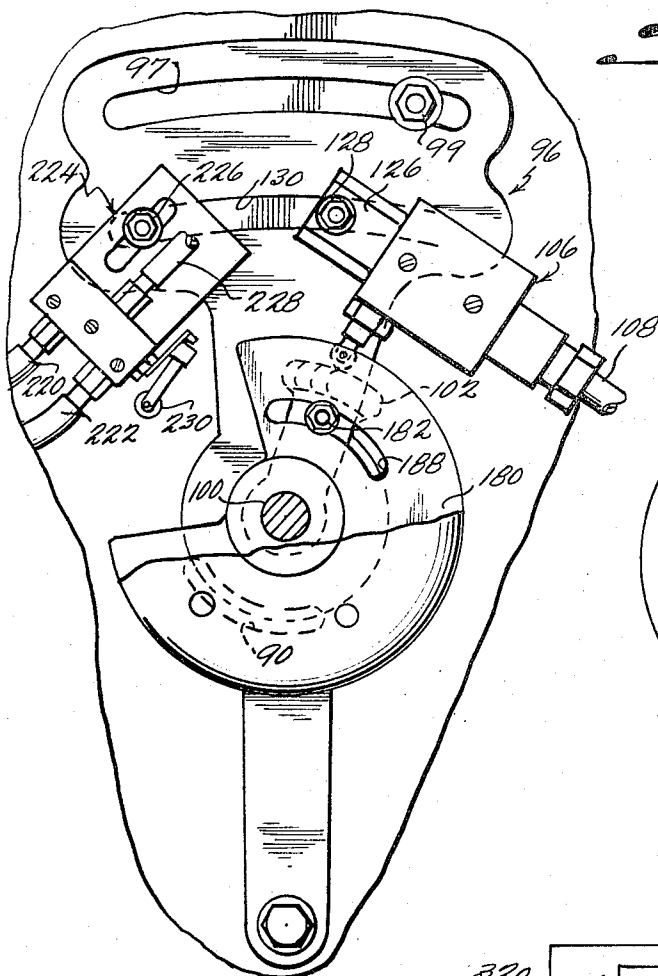


Fig. 9

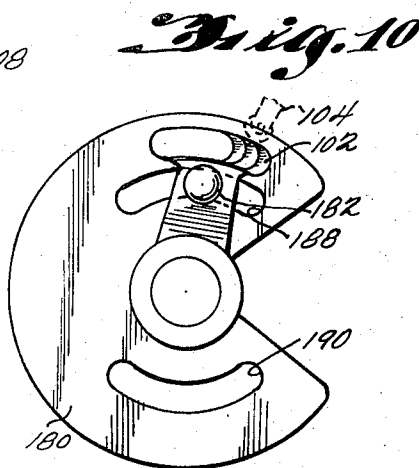


Fig. 10

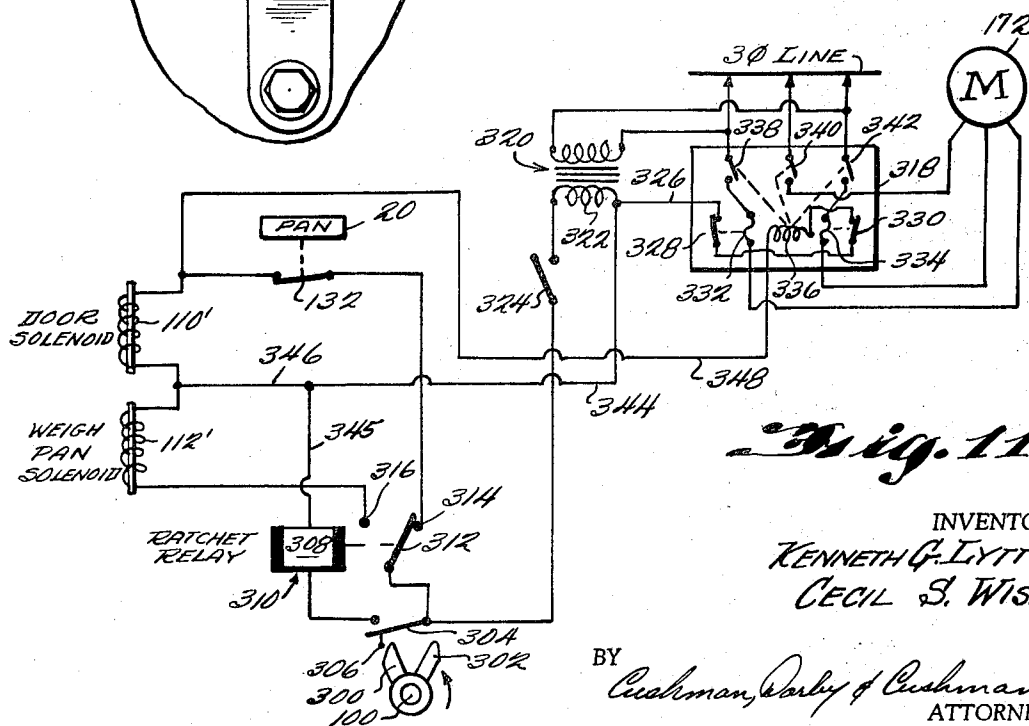


Fig. 11

INVENTORS
KENNETH G. LYTTON
CECIL S. WISE

BY
Cushman, Darby & Cushman
ATTORNEYS

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3,421,659

FIBER FEEDING APPARATUS

Kenneth G. Lytton, 106 S. Patrick St., Gastonia, N.C. 28052, and Cecil S. Wise, Rte. 1, Robinson Road, Dallas, N.C. 28034

Continuation-in-part of application Ser. No. 465,140, June 18, 1965. This application Aug. 14, 1967, Ser. No. 662,840

U.S. Cl. 222-55

20 Claims

Int. Cl. B67d 5/08

ABSTRACT OF THE DISCLOSURE

Disclosed herein is fiber feeding and weighing equipment which dumps predetermined amounts of fibers onto a conveyor which may feed a card. The cyclic rate of feeding fibers into the weigh pan and dumping the fibers is adjustable with regard to the conveyor speed, by use of an adjustable driving mechanism. In addition, the duration of the dump in each cycle and the time that the dump starts is adjustable. When the fibers are dumped onto the conveyor, they may be packed thereonto by a pusher-packer device which is adjustably timed in its operation.

This application is a continuation-in-part of our application of the same title, filed June 18, 1965, Ser. No. 465,140, now abandoned.

This invention relates to textiles, and more particularly, to improved equipment for feeding textile fibers uniformly into other equipment, for example into a carding machine or "card."

Apparatus for feeding textile fibers in a uniform web or stream is set forth and claimed in the Lytton Patent No. 3,132,709, which is assigned to the same assignee as the present application, and the patentee of which is one of the applicants hereto. The subject matter of that patent is incorporated herinto by reference, and is specifically set forth in part in the present application to make this application more complete within itself.

In that Lytton patent, there is described an apparatus by which successive, equal weight, loads of fibers are dumped onto an output apron or conveyor which feeds the dumped fibers into a carding machine. The dump of successive loads is cyclical and is correlated with the speed of the output conveyor. A variable speed drive for the weigh pan fiber feeding mechanism operates to insure that sufficient fibers are available to fill the weigh pan with the same weight of fibers with each cycle before the dumping time occurs. Therefore, a uniform amount of fibers is dumped at every predetermined unit of time, so as to keep the stream of fibers fed to the carding machine uniform for the particular speed of the output conveyor, which is driven in accordance with the speed of the carding machine.

Because operation by a given fiber feeding equipment is preferably variable with respect to the different types of fibers that may be fed thereby into a carding machine, it is desirable to have the feeding equipment regulatable so as to maintain the dumped fibers in a uniform output stream.

It is therefore one object of this invention to provide in fiber feeding apparatus a variable speed mechanism for regulating the cyclical rate of operation of the fiber dumping means relative to the speed of the output conveyor.

Another object of this invention is the provision of a movable packing apparatus by which dumped fibers may be packed over the conveyor means, so as to cause the output stream of fibers to be even more uniform.

Still another object of this invention is a provision for automatically operating such packing means alternately with the dumping means.

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Still a further object of this invention is the provision of adjustable means for regulating the relative operating times of dumping and packing means both with and without the aforesaid feature of regulating the cycle time of both the dumping and packing means relative to the operating speed of the output conveyor.

Still a further object of this invention is the provision of means for adjusting the duration of the dumping time per cycle independently of variations in the cyclic rate of the dumping time.

Other objects and advantages of this invention will become apparent to those of ordinary skill in the art upon reading the appended claims and the following detailed description in conjunction with the drawings, in which:

FIGURE 1 is a partial left side elevational view of feeding apparatus constructed in accordance with the present invention,

FIGURE 2 is an enlarged view of a portion of the equipment of FIGURE 1,

FIGURE 3 is a vertical cross sectional view of the equipment in FIGURE 2,

FIGURE 4 is a back elevational view of the combined cams of FIGURE 2,

FIGURE 5 is a perspective view of one of the cams of FIGURE 4,

FIGURE 6 is a perspective view of a portion of the equipment in FIGURE 1,

FIGURE 7 is a partial vertical cross sectional view of a portion of the equipment shown in FIGURE 1,

FIGURES 8-10 are the same views as FIGURES 1-3, of a modification of the invention, and

FIGURE 11 illustrates schematic circuitry for a modification of the invention using dual cams and a ratchet relay.

The apparatus shown in FIGURE 1 is a partial illustration of a fiber process feeding machine 10 of a type generally well known in the art. A similar machine is described in more detail in the Lytton Patent 3,132,709 and reference thereto may be had concerning parts and functions not specifically disclosed herein. The machine 10 in FIGURE 1 includes a housing having a left side wall 12 enclosing a compartment or hopper area in which fibers are deposited in any desirable manner, usually by hand, onto an endless conveyor or apron (not shown). That apron carries the fibers forwardly whereby they are moved into engagement with an upwardly and forwardly extending spiked apron 14, which is another endless conveyor that is trained about lower shaft 16 and upper shaft 18. As the fibers move upwardly due to the spiked apron, surplus fibers are stripped from the apron adjacent its top in conventional manner as by a Sargent comb (not shown) or the like which oscillates in close proximity to the spiked apron. Upwardly beyond the comb the apron carries a web or mat of fibers of generally uniform thickness. Normally, adjacent the top of the spiked apron 14 and on the down-turning or back side thereof, there is disposed a rotating or oscillating doffer (not shown) which strips the fibers from the apron and allows them to fall downwardly, in opened condition, into a weighing receptacle or scale pan 20 that is generally rectangular in plan view. The weigh pan 20 is suspended, as by straps 22, from the ends of parallel arms 24 of a yoke-like scale beam 26, and arms 24 straddle the discharge opening into weigh pan 20. Beam 26 is pivotally mounted on fulcrum or antifriction bearings 28 on the outer sides of the side wall 12 of the machine 10. Top, bottom, and side walls 30 extend outwardly from side wall 12 to form a compartment for the weighing mechanism, and also for other mechanisms described below. Top hinged door 31 normally covers the compartment.

Continuing with the description of the weighing mechanism, it will be noted that there is a beam counter-

balance arm 32 extending rearwardly of the beam fulcrum 28. Adjustable along the threaded extension 34 is a large tubular counterweight 36, which can be maintained in a fixed position of adjustment by stop nuts 38 engaged with the opposite ends thereof. Between the counterweight 36 and the fulcrum point 28 of the beam 26 is a smaller counterweight 40 slidable along the beam and cooperating with an indicia scale 42 thereon. The counterweight 40 constitutes a Vernier adjustment, and preferably the scale 42 is provided with indicia corresponding to ½ ounce weight adjustments.

Secured to the outer side of side wall 12 of the machine housing and over the outer end of beam arm 24 is a U-shaped permanent magnet 44 positioned to attract and pull the end of the arm 24 upwardly, such end being formed of a magnetic material or having a plate of such material secured thereto. Guided for vertical movement between the magnetic arms is a stop 46 adapted to project the lower ends of the magnet arms for varying the spacing between the scale arm 24 and magnet 44. Stop 46 is vertically adjustable by means of a screw 48, which swivelly carries the stop and threadedly engages a plate 50 secured to the side 12 of the machine housing.

From this construction, it is apparent that the nearer the beam arm 24 to magnet 44, the greater the attractive force exerted by the magnet on the beam arm. Preferably a scale (not shown) is associated with magnet 44 and stop 46, and is provided with indicia for measuring, in ounces, the attractive force between the magnet and the beam arm 24 when the latter is engaged with the stop. As an example, in actual practice stop 46 may be adjusted so that such attractive force is about four ounces. The sliding Vernier counterweight 40, and also counterweight 36, are then adjusted so that a predetermined weight in pan 20 will pull beam arms 24 away from magnet 44 and allow the pan to drop downwardly to the extent permitted by an adjustable stop (not shown) cooperating with scale beam 26, for example a stop mounted on the side of machine housing 12 in position to be engaged by counterweight 36 when it moves upwardly. By reason of magnet 44, the action of the beam arm 24 in pulling away therefrom will be very rapid, almost a snap action, so that the entire weighing mechanism is very accurate.

The bottom of scale pan 20 is formed by a pair of dumping doors 52 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 pan 20 is the cylinder of a single-acting reciprocating fluid motor 54, preferably pneumatically operated, which is arranged to extend its piston rod 56 when fluid pressure is supplied to the cylinder through a hose 58 in a manner such as that below described. A link 60 is pivotally connected to a crank arm 62 on each door and to the corresponding end of a cross bar 64 secured to the end of piston rod 56. The arrangement is such that when the piston rod is extended, the dumping doors 52 are held shut, but when the piston rod is retracted, the dumping doors open.

Beneath the weigh pan 20, the sides of the machine housing are extended, as at 66, to form the sides of a chute 68, or column, adapted to receive batches of fibers dumped from pan 20. The chute 68 is generally rectangular in horizontal section, having a width, transversely of machine 10, which is only slightly greater than the corresponding dimension of weigh pan 20, and a front to back dimension which can be varied by manual operation of a rotatable external handle 70. The front wall 72 of chute 68 is illustrated as vertical, but it may be downwardly inclined forwardly if desired. The effective rear wall of the chute is forwardly and rearwardly movable by handle 70 as above indicated, and is comprised of a lower portion 74 and upper portion 76, which, as is explained in greater detail below, is hinged to and pivots on the lower wall

portion 74 forwardly from its illustrated position in FIGURE 1 to a substantially horizontal position (as shown in dotted lines in FIGURE 6).

The dumped fibers fall through chute 68 onto an output apron or endless conveyor 78, which is trained about a forward roller 80 and a rearward roller 82. The shaft of the forward roller 80 is driven in any desired manner by the equipment which apron 78 is feeding, for example by a carding machine such as shown in the above mentioned Lytton Patent 3,132,709. Dumped fibers move forwardly with the driven apron 78 and pass under a press roll 84, which is adjacent and just above the front end of apron 78. Press roll 84 is maintained in a desired position by opposite end bearings 86. The lower end of front wall 72 of chute 68 depends into close adjacency with the rear side of the press roll 84, so that the roll itself essentially forms the lower portion of the front wall of the chute. It is apparent from the foregoing that as the rear reach of the conveyor belt 78 moves forwardly, it will feed fibers out of the chute in a relatively thin flat web or stream.

The dumping of fibers into chute 68 is timed in relation to the speed of the output conveyor 78. This is accomplished by use of a variable speed mechanism 88, which is driven by a belt 90 trained around a sheave 92 secured to the shaft 94 of the rear apron roller 82. Since apron 78 is synchronized in speed with the card as indicated by the mechanical coupling 81, the well known speed variations to which cards are subject such as belt slippages and change in production rate are transmitted in synchronism to apron 78 and speed change mechanism 88 which controls dumping, and packing too as is apparent below. In a manner described in more detail below, movement of the frame or mounting bracket or arm 96 about its pivot 98 to a position secured by bolt 99 in slot 97 varies the distance from apron shaft 94 to the shaft 100 of the speed changing mechanism causing the diameter of a driven sheave in mechanism 88 to vary, to thereby vary the cyclic rate of shaft 100 and consequently of the dumping relative to the driven speed of the output conveyor 78. By means of a cam 102 (FIGURES 2-5), which is secured to the speed changing shaft 100, a cam follower in the form of a roller 104 is operated to a retracted position once per cycle of cam 102. Follower 104 is connected to an electrical switch 106, of the microswitch variety for example, which connects through the electrical cable 108 to a junction box 109 in FIGURE 1. Switch 106 operates solenoid valve 112, which in turn supplies fluid, such as pressurized air, to hose line 58. Air pressure may be regulated to 20-25 p.s.i. for example, as supplied to the solenoid valves 110 and 112 via hose line 118 from a pressure regulator 120. This air in turn is obtained from a filtered supply through line 122 and an automatic air oiler 124.

The electrical switch 106 is fixed arcuately adjustable about speed change shaft 100, by virtue of being mounted by bracket 126 and bolt 128 through slot 130 in a pivoted frame 96. This switch 106 is utilized to cause dumping to occur beginning at a desired time in each cycle or revolution of the speed change shaft 100. When the switch roller 104 is retracted by being contacted by the camming surface of cam 102, solenoid valve 112 is operated so as to cause the normal supply of pressure fluid to cylinder 54 to be cut off so that piston rod 56 retracts and the dumping doors 52 fall open. An appropriate spring (not shown) may be employed to urge doors 52 constantly open, and thus hasten their opening on relief of pressure in the cylinder or motor 54.

Before solenoid valve 112 is operated as just described to cause dumping of a load of fibers, solenoid valve 110 is operated to cause a normally open cut-off door or a pair of such doors (not shown, but like door 184 in FIGURE 5 of the aforesaid Lytton Patent 3,132,709) to close and prevent any fibers doffed off the upper rear side of the inclined spike apron from being added into the weigh pan after a load of fibers has been weighed out. This is accomplished by a single-acting reciprocating fluid motor

(not shown, but like motor 188 in FIGURE 2 of that Lytton patent) which is supplied by fluid pressure via hose line 114. Such a cut-off door or doors are closed in response to the sensing by a switch arm 132 of the dropping of weigh pan 20 when it is filled to the predetermined amount set on the scale equipment, in a manner similar to that described in that Lytton patent.

In order to insure that the weigh pan is full by the time dumping switch 106 is actuated every revolution of cam 102, fiber availability sensing equipment and a variable feed drive are preferably incorporated in the machine. This may be accomplished in a manner disclosed in the aforesaid Lytton patent, or as set forth herein. In greater particular, it will be noted in FIGURE 1 hereof that there is shown in dotted line an arm 134, which is secured to a shaft 136. This arm is a pressure plate or the like which extends across the hopper in front of spiked apron 14. It is balanced so that it tends to rotate shaft 136 clockwise with the arm or plate 134 tending to move against the upper-mid portion of spiked apron 14. In this manner, plate 134 rotates clockwise or counterclockwise according to the amount of fibers that spiked apron 14 is carrying upward. As the quantity of fibers in the hopper becomes less, the amount of fibers which spiked apron 14 will carry upward becomes less, allowing plate 134 to rotate slightly more clockwise, and vice versa. Connected to shaft 136 is a cam 138 that cooperates with a cam follower 140. This follower controls an air switch 142, which in turn controls the amount of unregulated pressure air that can flow from hose line 144 to hose line 146 and thence into a fluid motor 148. This motor is of the single-acting reciprocating pneumatic type, which is adapted to retract its piston rod 150 in response to an increase in the supply of fluid pressure to its cylinder through line 146. As shown in more detail in the aforesaid Lytton Patent 3,132,709, motor 148 operates to change the distance between driving shaft 152 and driven shaft 154 on which are located respective sheaves 156 and 158 connected by belt 160. Sheave 156 is of the type which has a split pulley with the separation distance between its halves causing a variable effective diameter. Due to the presence of belt 160, sheave 156 changes its effective diameter as the distance between shafts 152 and 154 changes. Shaft 154 is geared to shaft 18, which drives the spike apron 14. The outer end of piston rod 150 is pivotally connected to a manually operated lever 162, which is pivotally connected at its end 164. The other end of lever 162 carries a spring-pressed pin or knob 166 adapted to project, when allowed therewith, into any one of an annularly-arranged series of holes or slots 168 in a quadrant-plate 170 which is fixed to the side wall 12 of the machine housing.

From the foregoing construction, it is apparent that when fluid motor 148 is exhausted by virtue of the pressure plate or arm 134 moving clockwise due to a decrease in the amount of fibers being carried upward by spiked apron 14, piston rod 150 extends because of the corresponding force exerted thereon by belt 160. This allows the separated halves of sheave 156 to move toward each other and enlarge its effective diameter. Since shaft 152 is driven at a given speed by the main motor 172 that operates the feeding equipment, the increased effective diameter of sheave 156 means that its speed increases, thereby increasing the speed of shaft 18 and consequently of spiked apron 14. This causes the amount of fibers carried upward and doffed into the weigh pan per unit of time to increase. Of course, when the supply of fibers in the hopper is sufficient to allow filling of the weigh pan properly each cycle without needing to speed up the operation of spiked apron 14, pressure plate 134 senses this condition by the larger amount of fibers that the apron 14 carries upward, and through its operation of air switch 142 applies pressurized air to cylinder 148 to effect the reverse operation of the speed change mechanism and re-

duce the speed of apron 14 back from its higher speed to a lesser rate of travel. The speed of sheave 158, and consequently of spiked apron 14, can also be adjusted, in either the pressurized or exhausted condition of motor 148, by manually changing the annular position of lever 162 and relocating it in place by engaging pin 166 in a selected one of the slots 168.

As previously indicated, the relative rate of the dumping cycle compared to the speed of output conveyor 78 can be regulated by another speed changing device 88. As the frame mounting member 96 is pivoted clockwise in FIGURE 1, the separable opposite halves 174 (FIGURE 3) of a sheave 176 are spread by the pull of belt 90, thereby reducing the effective diameter of sheave 176. Since the peripheral speed of belt 90 remains the same, the smaller effective diameter of sheave 176, which is secured to shaft 100, causes that shaft to rotate at a faster angular velocity. Cam 102 has a dependent member 178 which surrounds shaft 100 but is not directly fixedly secured thereto. Instead, cam 102 is secured to a second cam 180 by bolt 182, and cam 180 has a hub 184 which secures the cams to shaft 100 adjustably along its length by any desirable means such as a set screw 186. As is apparent in FIGURES 2 and 4, cams 102 and 180 are arcuately adjustable relative to each other by virtue of arcuate slots 188 and 190 in cam 180. This adjustability along with that provided by slot 130 allowing for arcuate movement of dumping switch 106, means that the beginning of the dumping time can be accurately set for each cycle of cam 102.

Furthermore, the duration of the dumping interval is regulatable independently of variations in the cyclic rate of cam 102. As previously indicated relative to FIGURE 3, set screw 186 fixes hub 184, and consequently cams 180 and 102, at any desired longitudinal position along shaft 100. Therefore, the length of time that the cam follower 104 is actuated by cam 102 per cycle, is adjustable, in the illustrated embodiment of cam 102, to any one of four different durations, or parts of a cycle, as respectively determined by the four different length camming surfaces 192. As illustrated in FIGURE 3, the cam following roller 104 is associated with the shortest one of camming surfaces 192, but upon loosening set screw 186 and moving hub 184 and consequently cams 180 and 102 rightwardly, roller 104 may be associated with any of the other three different length camming surfaces 192. This adjustment of dump duration per cycle independently of adjustment of the cyclic rate of the dump, allows for situations where the cyclic rate is substantially increased in order to provide the desired uniform mat or web in the output stream of the feeding equipment, which in turn decreases the length of time that dumping doors 52 are open. Since dumping per se depends upon operation by gravity once the dumping doors are open, the dumping time required for a given load of fibers remains substantially constant regardless of any change in the dumping rate per cycle. Therefore, as the cycle rate increases, the duration of the dumping time decreases as long as the cam following roller 104 is retained on the same camming surface. However, if cam 102 is moved rightwardly in FIGURE 2 so that roller 104 is on one of the longer camming surfaces 192, the duration of the dumping time is increased or at least remains approximately the same as previously, notwithstanding an increase in the cyclic rate of dumping.

As previously indicated, the back of chute 68 between the weigh pan and output conveyor 78, is formed by a movable column-forming wall which has a lower portion 74 (FIGURES 1 and 6) and a pivotable upper portion 76. The upper portion 76 is connected to the lower portion by a hinge 194, and the upper portion is maintained in either a vertical position as illustrated in solid lines in FIGURE 6, or a substantially horizontal position as indicated by dash lines in FIGURE 6, by means of a fluid motor 196 of the double-acting reciprocating type. The piston

rod 198 of this motor has its outer end pivotally secured at point 200 to a backwardly extending plate 202 which is in turn secured to the upper wall portion 76. At its opposite end, motor 196 is pivotally secured at point 204 to a frame 206 the other end of which is fixedly positioned to the lower wall portion 174 in any desired manner. As previously indicated relative to FIGURE 1, externally of the machine is a handle 70 by which the back wall 74, 76 can be rearwardly and forwardly positioned. As shown in FIGURES 6 and 7, this handle 70 is secured to shaft 208, which has at its opposite ends respective pinion gears 210 and 212. These gears cooperate with respective gear racks 214 and 216, which are secured at their forward ends to the bottom wall portion 74. A casting 218 on opposite side walls 12 of the machine housing journals shaft 208 and therefore when the shaft, and pinion gears 210 and 212, are rotated by manual operation by handle 70, the lower wall portion 74 accordingly moves forwardly or rearwardly. Due to the adjustably fixed relationship between the lower wall portion 74 and the upper wall portion 76, the latter also moves forwardly and rearwardly, in a vertical position, in unison with the lower wall portion 74.

The upper wall portion 76 of the back wall column former is pivotable about hinge 194, as previously noted. The purpose of this arrangement is to pack successive loads of fiber over and onto the output conveyor, in order to make the density of the output web of fibers more uniform at a desired density. Since the packing wall 76 needs to be up out of the way while dumping doors 52 are open and a load of fibers is being dumped onto the output conveyor, the dumping and packing operations are made to occur alternatively. Fluid motor 196, which is preferably pneumatically operated, controls the movement of packing wall 76. The hose lines 220 and 224 in FIGURE 6 connect to an air switch 224, which as shown in FIGURES 1 and 2, is secured in an arcuate position adjustably relative to slot 130 in the speed changing frame member 96, by a bolt 226. Regulated pressurized air is supplied to switch 224 by a hose line 228. Determination of whether the so supplied air pressure is released to hose line 220 to cause the packing wall member 76 to retract to its vertical position, or to hose line 222 to cause packing wall 76 to pivot forwardly, is made by the cooperation of cam follower 230 and cam 180. In the operated state of cam follower 23, i.e., while follower 230 is actuated by the outer surface of cam 180, air pressure is delivered to line 220 to keep the packing wall 76 vertical before and while dumping is occurring. Then, soon after dumping stops, cam 180 moving counterclockwise presents its cut out area 232 to follower 230, which then relaxes and thereby causes switch 224 to effect a supply of air over line 222, whereby packing wall 76 pivots forwardly over onto the dumped load of fibers and causes same to be packed.

When frame member or mounting bracket 96 of the speed change mechanism 88 is pivoted about point 98 and fixed in a new position by tightening of bolt 99, not only is the cyclic rate of dumping changed as above described, but also the cyclic rate of packing is changed correspondingly, since the packing cam 180, as well as the dumping cam 102, has its angular velocity changed with the angular velocity of shaft 100. In order to adjust the period of the packing time forward or rearward in a cycle relative to the start of the dumping time, either cam 180 may be rotated relative to cam 102, or packing switch 224 may be arcuately adjusted relative to dumping switch 106. In any event, and for any dumping duration imposed by even the longest one of the camming surfaces 192 of the dump switch 102, the beginning of the cut out area 232 of packing cam 180 follows to allow packing of the dumped fibers by packing wall 76 to occur then without intervention from the dumping operation, i.e., dumping and packing always occur alternately. The length of the cut out area 232 is illustrated as about 80% of the cycle, but it may be lengthened as desired so that packing

occurs for any portion of a cycle up to approximately 330°. Generally, the longer the packing time the better as long as the fibers while they are being packed will pass forward on conveyor 78 under press roll 84.

While packing is above described as being effected by the pivotal wall 76, and while it has been indicated that wall 74 has a forward-rearward position determined by manual handle 70, it is within the purview of this invention to cause the lower wall portion 74 to move from a rearward position forwardly while the upper portion 76 pivots downwardly over a dumped load of fibers in order to both pack the fibers not only from the top but also by pressure from the rear.

A modification of this invention is a construction of the packing equipment in a manner similar to that illustrated in FIGURES 8-10 wherein elements above described are given the same numerical designation while those of similar nature have their numbers primed. In FIGURE 8, an inverted L-shaped pusher-packer 270 is pivoted, upon rotation of shaft 75 by arm 272 when piston rod 198 extends, at the lower end of the leg member 74' of the pusher-packer so as to move from a generally horizontal position, such as shown in dash line. In this position the leg member practically lies on the output conveyor and the integral top member 76' of the L-shape extends substantially vertically while fibers are dumped partially onto the pusher-packer and partially on the output conveyor. After each dump the L-shaped member 270 is moved to a vertical pushing-packing position as shown in solid line whereby the top member 76' of the L-shape extends substantially horizontal to a point adjacent the front wall of the column former. In effect, such a pusher-packer 270 makes a vertical column of fibers as opposed to the more horizontal column formed by packing wall 76 shown in FIGURES 1 and 6. For the vertical column pusher-packer 270, as shown in FIGURES 9 and 10, cam 180 is reversed relative to cam 180 in FIGURES 2 and 3, and the hose lines 220 and 222 from switch 224 are also reversed or interchanged so that the cut out area 232 precedes cam 102 in FIGURES 9 and 10 and prevents packing for about an 80° portion of each cycle, which portion embraces the dumping time. In other words, packer 270 is pivoted back to its dash line position before the dumping starts and then up to its solid line position after the dump time has ceased.

In FIGURE 11, circuitry is shown in conjunction with a modification of this invention. The modification includes two separate finger cams 300 and 302 which are independently and adjustably secured to the adjustable speed driving shaft 100. These cams actuate a dump switch 304 by contacting its extension 306. Each time one of the cams contacts extension 306, switch 304 closes momentarily.

Upon each closure of dump switch 304, coil 308 of ratchet relay 310 is energized, thereby moving the relay contact 312 to its opposite position. As shown, relay contact 312 is in a position against terminal 314, but when coil 308 is momentarily energized, contact 312 moves against terminal 316. Then upon the next closure of switch 304 and momentary energization of coil 308, relay contact 312 moves back to terminal 314.

The main motor 172, which as previously explained operates the feeding equipment, i.e., causes spiked apron 14 (FIGURES 1 and 8) to carry fibers upward and over into weigh pan 20, is electrically connected to a three phase line through motor magnetic apparatus 318. One phase of the three phase line is connected to a transformer 320, the secondary coil 322 of which has one side connected to an on-off switch 324. The other side of the secondary coil 322 is connected by line 326 to the motor magnetic equipment 318, and in particular through two normally closed contacts 328 and 330, which are respectively operated by circuit breakers 332 and 334, to the magnetic contact coil 336. This coil operates three normally open line contacts 338, 340 and 342.

The transformer secondary coil 322 is also connected to the ratchet relay coil 308 via lines 344 and 345. The other side of coil 308 returns to the other side of the transformer secondary coil via switches 304 and 324. Therefore, when the on-off switch 324 is closed, relay coil 308 is energized each time dump switch 304 is closed.

The transformer secondary coil 322 is also connected to the door solenoid 110' and the weigh pan solenoid 112' by lines 344 and 346. Solenoids 110' and 112' are part of the previously described solenoid valves 110 and 112. When the weigh pan is empty, switch 132 is closed, thereby completing the energization of door solenoid 110' through switch 132 and ratchet relay contact 312 when in position 314. During this time, it will be noted that a circuit from secondary coil 332 to motor magnetic coil 336 is also completed via line 348 and switch 132. Consequently, the three phase contacts 338, 340 and 342 are closed and motor 172 operates. This causes fibers to be fed into weigh pan 20 via the open door operated by solenoid 110'.

As soon as weigh pan 20 is filled to its predetermined extent, the pan drops down and switch 132 opens, thereby de-energizing the door solenoid 110' and motor 172, preventing further fibers from being fed into the weigh pan. Then, when finger cam 300 rotates in its counterclockwise travel so as to cause dump switch 304 to close, relay coil 308 is energized and its contact 312 moves to position 316 to energize the weigh pan dump solenoid 112'. Since relay 310 is of the ratchet type, the reopening of dump switch 304 when finger cam 300 passes the switch extension 306, does not cause relay contact 312 to move, but instead it stays in position 316. Then, when finger cam 302 comes into contact with switch extension 306, switch 304 again closes momentarily and energizes coil 308. While this energization is only momentary, relay contact 312 nevertheless changes its position again to terminal 314, where it stays until the next cycle or revolution of finger cam 300. It is therefore apparent that ratchet relay 310 is a bistable type of switch, in that it has two stable operating conditions the instant occurring one of which is retained even when coil 308 is de-energized. Relay 310 is also of the toggle type since it always reverses its operating condition upon being triggered by a pulse effected by a momentary closing of switch 304.

When relay contact 312 moves back to position 314, and the empty pan 20 moves back to its upward position so that switch 132 recloses, a return path for both the door solenoid 110' and the motor magnetic coil 336 is re-established to cause fibers to be fed into the weigh pan again during a new cycle.

As mentioned above, the finger cams 300 and 302 are secured to shaft 100, which it will be recalled with reference to FIGURES 1 and 8, is the output shaft of the speed changing mechanism 88. These cams are angularly adjustable on shaft 100 so that their separation distance may be varied to regulate the duration of the dump, and so that their relative position in the cycle may be adjusted to determine the time when the dumping duration and starting time should begin. Cams 300 and 302 may be adjustably secured to shaft 100 in any conventional manner. The use of the dual cams 300 and 302 provides for more flexibility in that a wide range of adjustability in dump duration and starting time is available.

While the embodiment described with regard to FIGURE 11 does not show a pusher-packer arrangement such as in FIGURES 1 and 8, it is to be understood that it and the speed changing device 88 may be employed with the dual cam embodiment of FIGURE 11.

Thus it is apparent that all of the objects and advantages here and before stated have been provided for by this invention. Still other objects and advantages, and even further modifications and other embodiments of the invention, will become apparent to those of ordinary skill in the art upon reading this disclosure. However, it is intended that this disclosure be interpreted as illustrative

and not limitative, the invention being defined by the appended claims.

What is claimed is:

1. For use with fiber processing equipment of the type having drive means subject to variation in speed, improved fiber feeding apparatus comprising:

fiber output conveyor means adapted to be coupled to said drive means for operating said output conveyor means at a desired speed which varies with the said drive means speed,

means for dumping fibers onto said conveyor means, said output conveyor means being arranged to carry dumped fibers to the output of said apparatus at said desired speed, and

control means for recurrently operating said dumping means cyclically at a rate adjustably related to said desired speed of said output conveyor means,

said control means comprising an adjustable speed driving means having an input member coupled to be driven at a speed related to said desired speed in a predetermined ratio, an output member, means coupling said input member to said output member for rotating said output member at a speed related to the speed of said input member in a manner determined by the adjustment of said adjustable speed driving means,

said control means further comprising means coupled to said output member for recurrently operating said dumping means cyclically at a rate variable relative to said desired speed as said speed of said output member is varied relative to the speed of said input member.

2. Apparatus as in claim 1 and further including: means for adjusting the duration of the dumping time per cycle.

3. Apparatus as in claim 1 and further including: means for at least approximately correlating the dump duration time per cycle with the cycle rate thereof.

4. Apparatus as in claim 1 and further including: packing means operable to pack dumped fibers over said conveyor means.

5. Apparatus as in claim 4 including: means coupled to said output element for recurrently operating said packing means cyclically at the same rate as, and alternately with, said dumping means.

6. For use with fiber processing equipment of the type having drive means, the improvement in fiber feeding apparatus comprising:

fiber output conveyor means adapted to be synchronized in speed with said drive means for operating said conveyor means at a desired speed,

means for dumping fibers onto said conveyor means, said output conveyor means being arranged to carry dumped fibers to the output of said apparatus at said desired speed,

control means for recurrently operating said dumping means cyclically at a rate adjustably related to said desired speed of said output conveyor means,

said control means comprising an adjustable speed driving means having an input member coupled to be driven at a speed related to said desired speed in a predetermined ratio an output member, means coupling said input member to said output member for rotating said output member at a speed related to the speed of said input member in a manner determined by the adjustment of said adjustable speed driving means,

said control means further comprising means coupled to said output member for recurrently operating said dumping means cyclically at a rate variable relative to said desired speed as said speed of said output member is varied relative to the speed of said input member,

means for feeding fibers to said dumping means,

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means for energizing said feeding and dumping means alternately,
 means including said recurrent operating means for actuating said energizing means to cause alternate feeding and dumping each cycle,
 said actuating means being adjustable to vary the duration and starting time of the dump each cycle.

7. In fiber feeding apparatus of the type having means for dumping fibers and having output conveyor means arranged to carry dumped fibers to the output of said apparatus at a desired speed, the improvement comprising:
 adjustable speed driving means having an input element coupled to be driven at an input speed related in a predetermined manner to said desired speed and having an output element rotatable relative to said input speed at an output speed determined by the adjustment of said driving means,
 means coupled to said output element for recurrently operating said dumping means cyclically at a rate variable relative to said desired speed as said output speed is varied relative to said input speed,
 means for feeding fibers to said dumping means,
 means for energizing said feeding and dumping means alternately,
 means including said recurrent operating means for actuating said energizing means to cause alternate feeding and dumping each cycle,
 said actuating means being adjustable to vary the duration and starting time of the dump each cycle,
 wherein said energizing means includes switch means having two stable conditions for respectively energizing said feeding and dump means, and an input switch for alternating said switch means between said two conditions by successive closures, and
 said actuating means includes two fingers rotatable around a common axis at a desired angle and azimuth relative to said axis to determine said dump starting time and duration during rotation.

8. In fiber feeding apparatus of the type having means for dumping fibers and having output conveyor means arranged to carry dumped fibers to the output of said apparatus at a desired speed, the improvement comprising:
 adjustable speed driving means having an input element coupled to be driven at an input speed related in a predetermined manner to said desired speed and having an output element rotatable relative to said input speed at an output speed determined by the adjustment of said driving means,
 means coupled to said output element for recurrently operating said dumping means cyclically at a rate variable relative to said desired speed as said output speed is varied relative to said input speed,
 means for feeding fibers to said dumping means,
 means for energizing said feeding and dumping means alternately,
 means including said recurrent operating means for actuating said energizing means to cause alternate feeding and dumping each cycle,
 said actuating means being adjustable to vary the duration and starting time of the dump each cycle,
 packing means operable to pack dumped fibers over said conveyor means,
 means coupled to said output element for recurrently operating said packing means cyclically at the same rate as, and alternately with, said dumping means,
 wherein said means for cyclically operating said dumping and packing means includes:
 cam means secured to said output element, and
 two angularly spaced cam followers operative with said cam means and respectively coupled to said dumping and packing means.

9. In fiber feeding apparatus of the type having means for dumping fibers and having output conveyor means arranged to carry dumped fibers to the output of said apparatus at a desired speed, the improvement comprising:

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adjustable speed driving means having an input element coupled to be driven at an input speed related in a predetermined manner to said desired speed and having an output element rotatable relative to said input speed at an output speed determined by the adjustment of said driving means,
 means coupled to said output element for recurrently operating said dumping means cyclically at a rate variable relative to said desired speed as said output speed is varied relative to said input speed wherein:
 said adjustable speed driving means includes a shaft as said output element and connected thereto, as said input element, a variable effective diameter sheave having a belt driven off of said conveyor means and a pivoted arm journaling said shaft for fixedly adjusting the distance between said conveyor means and sheave so as to vary the effective sheave diameter and accordingly the angular speed of said shaft, and
 said means for cyclically operating the dumping means includes a cam secured to said shaft and a cam follower arrangement connected to said arm.

10. Apparatus as in claim 9 wherein said cam includes: a plurality of different length cam surfaces, and said cam and follower are relatively adjustable so that said follower cooperates with a desired one of said cam surfaces to regulate the duration of the dumping time.

11. Apparatus as in claim 9 wherein:
 said cam and follower arrangement are fixedly adjustable angularly for regulating the beginning of the dumping cycle.

12. Apparatus as in claim 9 and further including:
 packing means operable to pack dumped fibers over said conveyor means,
 a second cam secured to said shaft, and
 a second cam follower arrangement connected to said arm for cooperating with said second cam to operate said packing means cyclically at the same rate as, and alternately with, said dumping means.

13. Apparatus as in claim 12 wherein:
 said second cam and its follower arrangement are fixedly adjustable angularly for determining the part of the cycle in which packing may occur, and
 the first mentioned cam and its follower arrangement are fixedly adjustable angularly for determining the part of the cycle in which dumping may occur.

14. In fiber feeding apparatus:
 means for dumping loads of fibers,
 output conveyor means beneath said dumping means for carrying dumped fibers to the output of said apparatus at a desired speed,
 means adjustably correlated to the speed of said conveyor means for cyclically operating said dumping means, and
 packing means automatically operable alternately with said dumping means to move against a dumped load of fibers for packing same over said conveyor means, and
 adjustable means for regulating the cycle time of both the dumping and packing means relative to the said desired speed of said output conveyor means.

15. For use with fiber processing equipment of the type having drive means, the improvement in fiber feeding apparatus comprising:
 fiber output conveyor means adapted to be synchronized in speed with said drive means for operating said conveyor means at a desired speed,
 means for dumping fibers onto said conveyor means,
 said output conveyor means being arranged to carry dumped fibers to the output of said apparatus at said desired speed,
 control means for recurrently operating said dumping means cyclically at a rate adjustably related to said desired speed of said output conveyor means,
 said control means comprising an adjustable speed

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driving means having an input member coupled to be driven at a speed related to said desired speed in a predetermined ratio, an output member, means coupling said input member to said output member for rotating said output member at a speed related to the speed of said input member in a manner determined by the adjustment of said adjustable speed driving means,

said control means further comprising means coupled to said output member for recurrently operating said dumping means cyclically at a rate variable relative to said desired speed as said speed of said output member is varied relative to the speed of said input member,

said last mentioned operating means including cam means, including a plurality of different length cam surfaces, secured to said output element and a relatively adjustable cam follower cooperating with a desired one of said cam surfaces to regulate the duration of the dumping time.

16. Apparatus as in claim 15 including:
means for controlling the relative operating times of the dumping and packing operations.

17. Apparatus as in claim 15 including:
means for adjusting the duration of the dumping time per cycle independently of the aforesaid cycle regulating means.

18. Apparatus as in claim 15 wherein:
said cam and follower are fixedly adjustable angularly for regulating the beginning of the dumping cycle.

19. Apparatus as in claim 18 wherein:

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packing means operable to pack dumped fibers over said conveyor means,
a second cam secured to said shaft, and
a second cam follower connected to said arm for cooperating with said second cam to operate said packing means cyclically at the same rate as, and alternately with, said dumping means.

20. Apparatus as in claim 19 wherein:
said second cam and its follower are fixedly adjustable angularly for determining the part of the cycle in which packing may occur, and
the first mentioned cam and its follower are fixedly adjustable angularly for determining the part of the cycle in which dumping may occur.

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ROBERT B. REEVES, *Primary Examiner*.
H. S. LANE, *Assistant Examiner*.

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