Aug. 5, 1969 J. I. KOTTER ETAL 3,458,904

FIBER BLENDER (SRRL BALE-OPENER-BLENDER)

Filed April 21, 1967 4 Sheets-Sheet 1

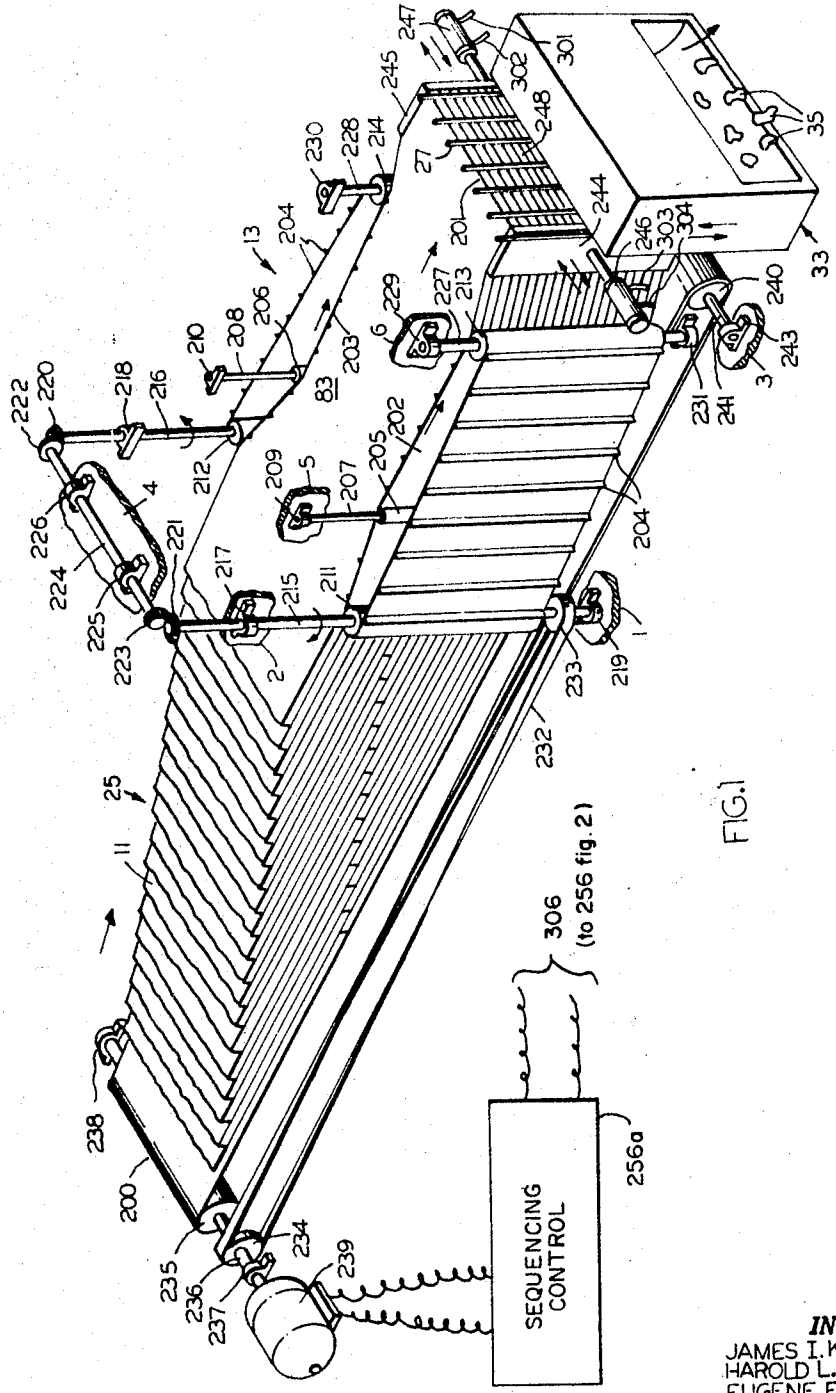


FIG. 1

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FIBER BLENDER (SRRL BALE-OPENER-BLENDER)

Filed April 21, 1967 4 Sheets-Sheet 2

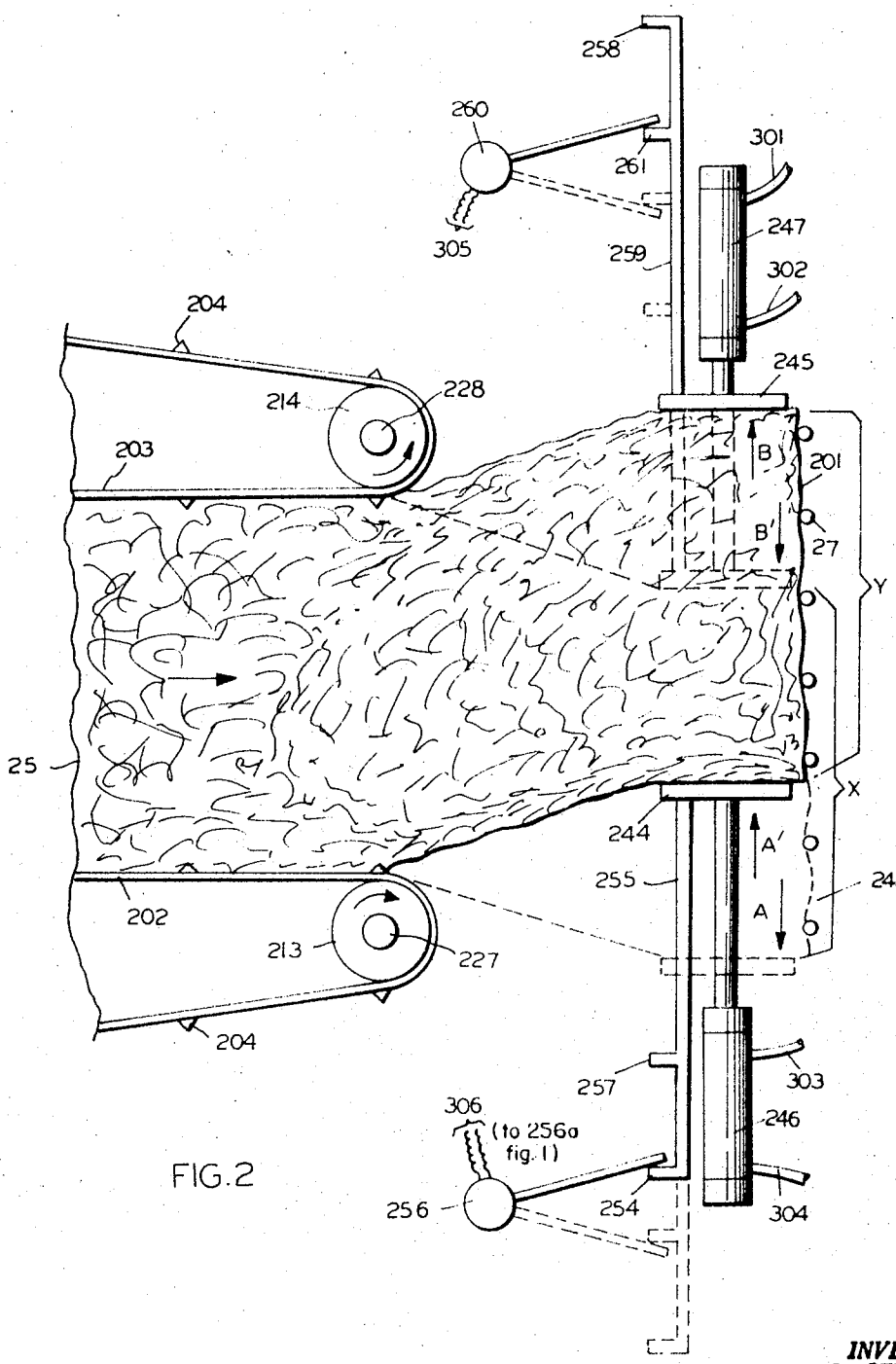


FIG. 2

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FIBER BLENDER (SRRL BALE-OPENER-BLENDER)

Filed April 21, 1967 4 Sheets-Sheet 3

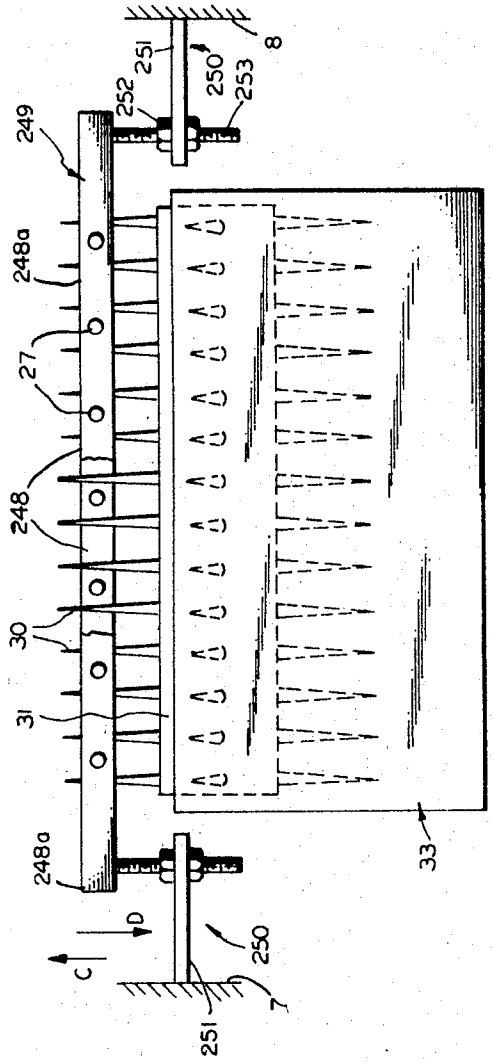


FIG.3

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FIBER BLENDER (SRRL BALE-OPENER-BLENDER)

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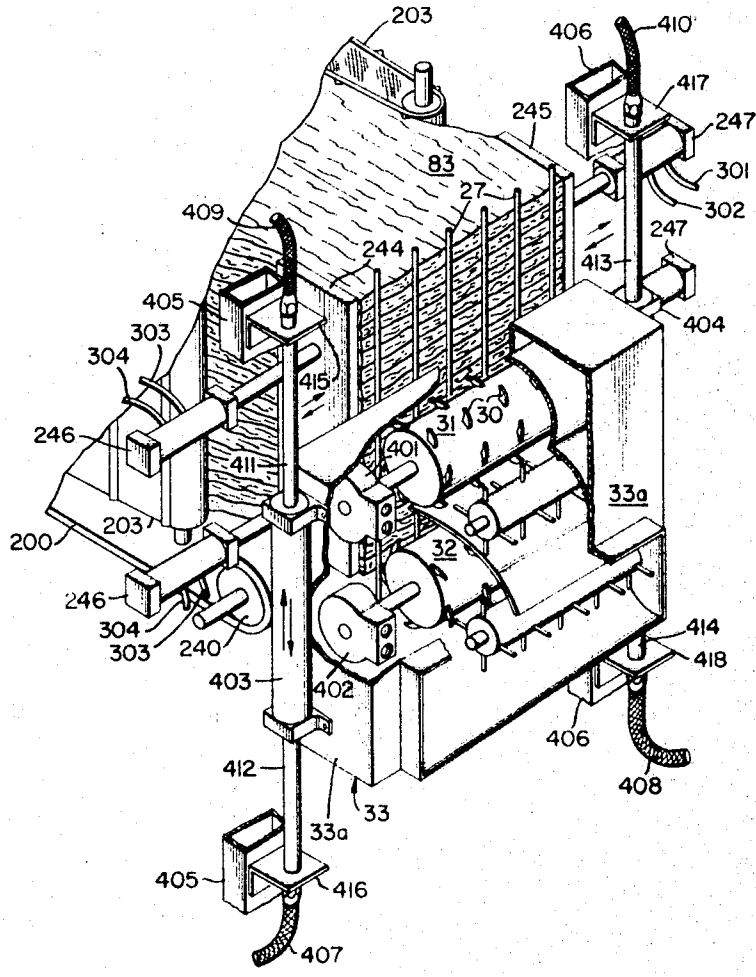


FIG. 4

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United States Patent Office 3,458,904 Patented Aug. 5, 1969

3,458,904

FIBER BLENDER (SRRL BALE-OPENER-BLENDER)

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Int. Cl. D01g 7/04, 9/16
U.S. Cl. 19—80 2 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates to an opening and blending machine designed to process and produce a homogenous blend from an endless stagger-layered package of fibers which package may incorporate as many as 20 individual bales.

An endless belt conveyor with coacting side belts support and urge the face of the stagger-layered package against the spaced vertically disposed bar components of a stationary barrier means. A processing head comprising counter rotating, cylinders with hooked teeth traverses, with a reciprocating motion, the opposite side of the barrier means and the tooth components of the said cylinders extend through the barrier means between the individual bars a sufficient distance to extract fiber tufts from the plurality of layers presented on the package face.

The machine is characterized particularly by a means for periodically shifting the face of the fiber package from side to side during the pauses between reciprocal strokes of the processing head as it traverses the barrier means.

Periodic shifting of the face of the fiber package, which shifting also coincides with a relaxing of the force urging the face of the fiber package against the barrier or alternatively coincides with complete withdrawal of the face of the fiber package from the barrier, insures uniformity of the fiber tufts plucked through the barrier means by the toothed rolls, prevents localized packing and occlusion of fiber masses behind the vertical bar components of the barrier means and attendant channeling of the package face.

A non-exclusive, irrevocable, royalty-free license in the invention herein described, throughout the world for all purposes of the United States Government, with the power to grant sublicenses for such purposes, is hereby granted to the Government of the United States of America.

The instant invention discloses a method and machine for processing a continuous composition of fibers, or more particularly an endless, stagger-layered fiber package assembled from a plurality of individual fiber packages. The continuous composition of fibers throughout this patent application will be referred to as an endless stagger-layered fiber package.

The machine herein disclosed is a fiber opening and blending machine consisting of a combination fiber package confine, support, and convey means, a fiber tuft-plucking means and means defining a rigid, fixed, discontinuous, package hold-back barrier located therebetween, said barrier being discontinuous to an extent that allows particulate tufts of fiber to be plucked from behind thereof and passed therethrough; said tuft-plucking means, with associated drive means, adapted to transverse one face of said barrier with a reciprocating motion and said tuft-plucking means comprising toothed elements the teeth of which are adapted to reach through the barrier discontinuities and to pluck particulate fiber tufts from the exposed face of an endless, stagger-layered fiber package positioned adjacent the opposite face of said barrier;

said confine and support means comprising planar, generally rectangular elements defining lateral confine and bottom support for the leading portion on an endless, stagger-layered, fiber package and said confine and support means having associated therewith drive means characterized by cyclic, variable force capability said confine and support means together with the associated drive means adapted to convey the confined and supported portion of a fiber package against the barrier means with a cyclically applied force which force is continuously variable from zero to at least that amount of force required to accommodate the maximum plucking capability of the tuft-plucking means; said barrier means comprising a plurality of uniform, fixed, rigid bars disposed in vertical, parallel, regular spaced array, transverse the fiber package pathway in the confine and support means; said opening and blending apparatus particularly characterized by opposed, rigid and substantially planar pusher plates, one each, vertically disposed, laterally adjacent either side of the face portion of an endless, stagger-layered fiber package, positioned within the package confine and support means, said pusher plates independent of and located intermediate the barrier means and the forward end of the package confine and support means, drive means for each pusher plate synchronized relative the variable force convey drive means and adapted to urge alternately, with reciprocating motion, first one plate and then the opposed plate against the leading lateral portion of the stagger-layered fiber package, only at such time as the force exerted on the fiber package by the variable force convey drive means is substantially zero, thereby to shift the forward face of the fiber package back and forth across the spaced bars of the barrier means a distance at least sufficient to overcome localized packing and occlusion of fiber masses behind the spaced bars of the barrier means and attendant channelized non-uniform plucking of the fiber package face.

This invention relates to an improvement over our Fiber Blender Patent No. 3,208,107 and our Automated Fiber Blender disclosed in application Ser. No. 531,273 filed Mar. 2, 1966, now U.S. Patent No. 3,379,324, both of which processed single packages of fibrous material.

Blending fibers is an urgent problem especially in the cotton textile industry, since research has revealed the effects of fiber properties on processing efficiency and product quality. To average out widely differing fiber properties and to obtain the stock uniformity necessary for high processing efficiency in modern mills, efficient blending of many individual fiber packages in the initial opening process is a vital function.

Among the disadvantages inherent in fiber blending machines in use today are: the incomplete mixing of fibers, the extremely limited blends obtainable within one machine, the relatively low production rates, and the large floor areas required.

One object of this invention is to provide a method and machine to open and blend fibers more efficiently.

Another object of this invention is to provide a method whereby layers from numerous individual fiber packages are placed end to end on a conveyor and stacked in stepped relationship one to the others to form a continuous stagger-layered array. The use of a continuous fiber package, which effectively has no end, eliminates all problems associated with processing the end of a single package or a single unit package. This feature alone constitutes an important advance over prior art devices.

Another object of this invention is to provide a method and machine for opening and blending fibers whereby full packages of fibers or any portion thereof, are placed on a conveyor in stepped relationship so that each layer in the stacked array is always forward of the layer im-

mediately below, thus forming a continuous composite package which package when presented to the processing means of the machine effectively has no end.

A further object of this invention is to blend cotton from numerous packages by the use of a single machine without waste, or downtime conventionally required for loading.

Another object of this invention is to provide a means for establishing consistent, nonvarying, delivery of opened and blended fibers at all desired production rates.

These and other objects which will be apparent to those skilled in the art are achieved by means of our invention.

In the machine described in U.S. Patent No. 3,208,107 and Patent No. 3,379,324, packaged cotton is fed to a reciprocating processing head assembly from manually and automatically positioned trucks.

Our present invention provides a method and an apparatus for making up, maintaining, and automatically supplying an endless stagger-layered package of fibers to the reciprocating processing head assembly of the fiber blender of U.S. Patent 3,208,107 and Patent No. 3,379,-324, as described below.

FIGURE 1 represents a three-dimensional view of the invention.

FIGURE 2 represents a plan schematic view of the invention to show movement of pusher plates and the endless stagger-layered package of fibers.

FIGURE 3 represents a plane view of the holdback tension rod assembly, with parts broken away, showing an adjustment means.

FIGURE 4 is a view of the head assembly, with parts broken away, to show the pertinent internal structure of the head assembly.

Reference is made to the drawings. As may best be seen in FIGURE 1, layers **11**, removed from individual packages of fibers are placed end to end on a conveyor of any suitable construction such as an endless belt **200** and stacked in stepped relationship to each other forming effectively an endless stagger-layer array, namely continuous composite package **25**. Layers from one fiber package occupy the bottom position on the conveyor belt **200** which is supported by rear roller **235** and forward roller **240**. As shown in FIGURE 1, roller **235** is mounted on shaft **236** which is supported by bearings **237** and **238**. Forward roller **240** is mounted on shaft **241** supported by a pair of bearings, only one of which **243**, is visible in FIGURE 1. Layers from a second fiber package are placed in the next upper position being offset forward a finite distance from the layer immediately below; (a one foot offset will cause satisfactory results) layers from a third fiber package in the next position and so on, all in stepped relationship making up the multi-layered continuous package **25**.

Although not essential to the invention, we prefer to present a vertical flat front surface **201** of the continuous package to the processing head assembly **33**. To obtain said vertical flat front surface **201**, the portions or overages of all layers **11** extending beyond the end of the forward bottom layer are removed in the initial loading only.

To maintain the continuous package **25** and to maintain uninterrupted operation of the opening and blending machine **13**, periodic stacking of layers **11** is necessary; first a layer from the first bale in bottom position then a layer from the second bale in next upper position, and so on until the desired number of layers **11** have been added to the composite package **25**.

In addition to supporting the continuous fiber package **25**, the conveyor **200** is synchronized with vertical conveyors **202** and **203**, which together form a channel and serve to confine and to convey continuous package **25**. The so-confined portion of continuous package **25** is designated as **83** in FIGURES 1 and 4. Once layers **11** enter channel **83** of fiber blender **13**, contact is maintained between continuous package **25** and vertical conveyors **202** and **203**. Said conveyors **202** and **203** may be any type common to the art, but we prefer to use endless belts, equipped with slats **204**.

Fiber contacting surfaces of feed conveyors **202** and **203** converge for a finite distance prior to becoming and remaining parallel. Convergence of contact surfaces of conveyor belts **202** and **203** is accomplished by the positioning and location of guide rollers **205** and **206**, mounted onto shafts **207** and **208**, rotatably supported by bearings **209** and **210**, and co-acting bearings not shown. These bearings are mounted on adjacent portions of the structural framework, a portion of which, **5**, is shown in FIGURE 1. Feed conveyors **202** and **203** are supported by drive rollers **211** and **212** and idler rollers **213** and **214**. Drive rollers **211** and **212** are affixed to shafts **215** and **216**, rotatably mounted in bearings **217**, **219**, **218** and co-acting bearing not shown. As before, the bearings are mounted on the structural framework, the relevant portions being indicated by **1** and **2**. Idler rollers **213** and **214** are affixed to shafts **227** and **228**, rotatably supported by upper bearings **229** and **230**, and by two lower bearings, **231** and the other not shown. The bearings are mounted on adjacent portions of the structural framework, designated as **6**, the others being omitted in the interest of clarity.

Feed belts **202** and **203** are synchronized and driven with their fiber contact surfaces traveling in the same direction by any driving means such as bevel gears **220** and **221**, on shafts **215** and **216**, meshing with bevel gears **222** and **223**, on shaft **224**, rotatably mounted in bearings **225** and **226**, the latter bearings being mounted on an upper portion **4** of the framework.

Vertical feed conveyors **202** and **203** and horizontal conveyor **200** are driven by any variable torque means such as variable torque motor **239** through twisted drive belt **232** contacting pulleys **233** and **234** on shafts **215** and **236** respectively.

Conveyor belt forward roller **240** is affixed to shaft **241** which is rotatably supported in bearing **243** and co-acting bearing not shown. The bearings supporting roller shafts **236** and **241** are also mounted on corresponding adjacent portions of the structural framework, only one of which portions **3** is shown.

The continuous package **25** is advanced to the vertically reciprocating, processing head assembly **33**, of the kind disclosed in Patent No. 3,208,107, and is held with a predetermined force against holdback tension bars **27**, as the teeth **30** (FIGURE 3), of counter-rotating processing cylinders **31** and **32**, shown in FIGURE 4, pluck tufts **35** from confined portion **83** of continuous package **25**. Said force, as applied to and subsequently exerted by continuous bale **25** on holdback tension bars **27**, originates from variable torque means, such as motor **239**. The force is transmitted through drive means to fiber contact surfaces of conveyor **200** and vertical feed conveyors **202** and **203** as previously explained. Regulation of force exerted by continuous package **25** on holdback tension bars **27** is a means for controlling production rates of the fiber blender **13**.

Referring to FIGURE 3, tuft size is controllable by regulating the depth of penetration of processing cylinder teeth **30**, through the interstices **248** of holdback tension bars **27** into the leading face of continuous package **25**. Processing head assembly **33**, and holdback bar unit assembly **249**, Patent No. 3,208,107. However, to the extent pertinent here, the processing head assembly, as shown in FIGURE 4, comprises a pair of rollers **31** and **32** on which are mounted teeth **30**. These rollers are driven by hydraulic motors **401** and **402**, respectively, which are connected by means of conventional hydraulic lines (not shown) to conventional pumping means (also not shown).

Vertical reciprocating motion of head assembly **33** is obtained by means of reciprocating hydraulic cylinders **403** and **404**, secured to the outer casing **33***a* of the head assembly. Cylinder **403** moves on tubular stationary

pistons 411 and 412, which also serve to deliver hydraulic fluid through pipes 409 and 407, respectfully, from any conventional hydraulic pump. Control of direction of flow is by valve means (not shown) familiar to those skilled in the art. Similarly, cylinder 404 moves on tubular stationary pistons 413 and 414 which, in like manner are supplied with hydraulic fluid through pipes 410 and 408, respectively. The four tubular pistons are mainted stationary by being secured to brackets 415, 416, 417, and 418, which, in turn are secured to adjacent structural members 405 and 406 (shown in part) of the framewark of the apparatus. Adjustment of the holdback tension bars 27, as a unit assembly 249, in the direction indicated by arrows, C & D, regulates the depth of penetration of processing cylinder teeth 30, into the leading face of continuous package 25. Holdback bar unit assembly 249 is positioned and adjusted by any means common to the art such as four co-acting adjustment units 250 (only the upper two being shown), consisting of rigidly fixed blocks 251, nuts 252, and stud bolt 253 attached to assembly 249. Assemblies 249 are secured to portions 7 and 8 of the adjacent framework structure of the apparatus. By loosening and tightening appropriate nuts 252 on stud bolt 253 which freely passes through block 251, tension bar assembly 249 is moved and locked in desired position for processing.

Referring to FIGURES 1 and 2: as the processing head assembly 33 reciprocates vertically by means described in U.S. Patent No. 3,208,107, extracting tufts 35 from continuous package 25, pusher plates 244 and 245 attached to and actuated by any means common to the art such as hydraulic cylinders 246 and 247 (supplied with hydraulic fluid from conventional pumping means, not shown, through lines 301, 302, 303, and 304), shifts the vertical surface 201 of the leading face of continuous package 25, in cyclic horizontally transverse movement as indicated in FIGURES 1 and 2. Transverse movement of the forward portion 83 of package 25 during processing is a means for establishing consistent production at any desired production rate.

Referring to FIGURE 2: in normal operation, the fiber blender's feed cycle functions as follows.

STEP I

As the processing head 33 reciprocates vertically, the continuous package 25 is "advanced" and held with a predetermined force against holdback parallel tension bars 27, for a timed interval by means of any conventional sequencing means, such as timed electrical ratchet relay switch 256*a*, shown schematically in FIGURE 1.

STEP II

When "advance" timed interval is completed, the force exerted by synchronized conveyor belt 200 and feed conveyors, 202 and 203 is removed. As this occurs, pusher plate 244 moves the forward vertical surface 201, of package 25 a predetermined distance from position X to position Y by the action of hydraulic cylinder 246.

STEP III

When pusher plate 244 travels a prescribed distance, terminating at A', hydraulic cylinder 246 is actuated by any conventional control means, such as electric switch 256 (connected to known control circuits by wires 306), which returns pusher plate 244 to its original position, A. Switch 256 is contacted by protuberance 254 on rod 255 attached to pusher plate 244.

STEP IV

As pusher plate 244 reaches its original position A, Step I is repeated, by switch 256 actuating the feed, (feed motor 239), to which it is connected through timed switch 256*a* by wires 306. Switch 256 is contacted by protuberance 257 on rod 255 attached to pusher plate 244.

STEP V

When "advance" timed interval is completed, (by any conventional sequencing means such as an electrical rachet relay, not shown) hydraulic cylinder 247 is actuated and pusher plate 245 moves the forward surface 201, of continuous package 25, a predetermined distance from position Y to position X.

STEP VI

When pusher plate 245 travels a prescribed distance, terminating at B', hydraulic cylinder 247 is actuated by a conventional control means, such as switch 260, connected to known control circuits by wires 305, returning pusher plate 245 to its original position B. Switch 260 is contacted by protuberance 258 on rod 259 attached to pusher plate 245.

Upon pusher plate 245 reaching its original position B, protuberance 261 on rod 259 contacts switch 260, which actuates the feed. Continuous package 25 is again "advanced" and beginning with Step I, the entire cycle repeats itself throughout continuous operation of fiber blender 13.

When the fiber blender's mode of operation is "on demand," the next machine in the processing line, following the blender, controls the output of fiber blender 13, on an "on-off" production basis. The feed cycle follows the same schedule as outlined; however, when blender 13 meets the demand requirement of the following machine in the processing line, continuous package 25 is retracted or withdrawn from the tension bars 27, by reversal of synchronized, conveyor belt 200, and feed belts 202 and 203 for a timed interval. When the timed interval is completed and continuous package 25 has been retracted the prescribed distance from tension bars 27, the feed system is de-energized and remains "off" until the following machine in the processing line requires more fibrous stock for processing.

In response to an electrical demand signal from the following machine requiring stock, the blender's feed system is energized and package 25 is moved forward to tension bars 27 and processing head 33, and produetion is resumed.

When package 25 is being fed forward or retracted from processing head 33, pusher plates 244 and 245 are inoperative and remain in their original retracted positions, A and B respectively.

For higher production operation, the feed cycle of fiber blender 13 functions as follows:

STEP I

As the processing head 13 reciprocates vertically, the continuous package 25 is advanced and held with a predetermined force against holdback parallel tension bars 27 for a timed interval. The force is determined by the production rate desired.

STEP II

When "advance" timed interval is completed, continuous package 25 is retracted or withdrawn from the processing head 33 by reversal of feed motor 239, driving synchronized, conveyors 200, 202, and 203 for a timed interval.

STEP III

When timed interval is completed and continuous package 25 is retracted any desired distance, (a satisfactory distance is 1" to 4") from the holdback tension bars 27, pusher plate 244 moves front vertical surface 201 of bale 25 a predetermined distance from position X to position Y by the action of hydraulic cylinder 246.

STEP IV

When pusher plate 244 travels a prescribed distance, terminating at A', hydraulic cylinder 246 is actuated by a

conventional control means, such as switch **256**, which returns pusher plate **244** to its original position, A. Switch **256** is contacted by protuberance **254**, on rod **255**, attached to pusher plate **244**.

STEP V

As pusher plate **244** reaches it original position A, Step I is repeated. Feed motor **239** is actuated by a conventional control means, such as switch **256**, and continuous package **25** is "advanced." Switch **256** is contacted by protuberance **257** on rod **255** as pusher plate **245** reaches its original position A.

STEP VI

When "advance" timed interval of Step I is completed, Step II is repeated. Continuous package **25** is "retracted" by reversal of feed motor **239** driving synchronized conveyors **200**, **202**, and **203**, for a timed interval.

STEP VII

When timed interval is completed and continuous package **25** is retracted the desired distance, (1" to 4") from the holdback tension bars **27**, pusher plate **245** moves front vertical surface **201** of package **25** a predetermined distance from position Y to position X by the action of hydraulic cylinder **247**.

STEP VIII

When pusher plate **245** travels a prescribed distance, terminating at B', hydraulic cylinder **247** is actuated by a conventional control means, such as switch **260**, which returns pusher plate **245** to its original position, A. Switch **260** is contacted by protuberance **258** on rod **259** attached to pusher plate **245**.

Upon reaching original position B, protuberance **261** on rod **259** contacts switch **260**, which actuates feed motor **239**. Continuous bale **25** is again "advanced" and beginning with Step I, the entire cycle repeats itself throughout continuous operation of fiber blender **13**.

The invention is not limited to the use of hydraulics as a means for performing the various functions throughout its operation, for example, mechanical, pneumatic, or electrical means could be employed.

We claim:

1. A fiber opening and blending machine for opening a continuous, stagger-layered fiber package and for blending fibers therefrom by plucking tufts from a face of said fiber package, said machine comprising:

(a) first endless conveyor means for conveying a continous, stagger-layered package of fibers from a loading point to a forward end of said conveyor means where tufts are plucked from said package;

(b) variable force drive means connected to said first conveyor means;

(c) time-control means connected to the drive means for alternatively activating and stopping said drive means;

(d) confine and support means on both sides of a leading portion of the first conveyor means, said confine and support means comprising separate movable endless conveying means disposed in planes perpendicular to said first conveyor means, said confine and support means presenting generally rectangular surfaces to the fiber package on the first conveyor means to provide lateral support for said fiber package;

(e) means connecting the confine and support means to each other and to said variable-force drive means, whereby said confine and support means, in synchronism with the first conveyor means urge the fiber package in the direction of travel of said conveyor means with a cyclically applied force which is continuously variable from zero to a maximum;

(f) reciprocating tuft-plucking means at the forward end of the first conveyor means adapted to traverse the exposed forward face of the fiber package and pluck tufts of fiber from said exposed forward face, said tuft-plucking means comprising a housing in which are mounted rotatable toothed elements, means for rotating said toothed elements, and means connected to said housing for causing the latter to traverse the face of the fiber package with a reciprocating movement;

(g) a grid-like hold-back barrier interposed between the forward end of the fiber package and the tuft-plucking means, the grids of said hold-back barrier being adapted to admit the teeth of the rotatable toothed elements therebetween for plucking tufts of fiber from the exposed face of the fiber package during such period as the cyclically applied force varies from zero to a maximum;

(h) a pair of opposed, rigid, generally rectangular, vertically disposed planar pusher plates, one each, laterally adjacent either side of the face portion of the fiber package, said pusher plates being independent of and located between the hold-back barrier and the forward end of the package confine and support means;

(i) separate drive means connected to each pusher plate for alternately, with reciprocating extend and retreat motion, urging first one plate and then the opposed plate against the leading lateral portion of the fiber package; and

(j) switching means and accompanying circuitry connected to and position responsive to the pusher plates and period responsive to the cyclically applied force output of the confine and support drive means, said switching means adapted to start the confine and support drive means at completion of a pusher plate extend and retract motion sequence and said switching means additionally adapted to initiate a pusher plate extend and retract motion sequence only at such time as the cyclically applied force urging the fiber package face against the barrier means is in a relaxed period of the cycle, thereby to shift the forward face of the fiber package back and forth across the grid-like barrier a distance at least sufficient to overcome localized packing and occlusion of fiber masses behind the barrier and attendant channelized, nonuniform plucking of the fiber package face.

2. A fiber opening and blending machine for opening a continuous, stagger-layered fiber package and for blending fibers therefrom by plucking tufts from a face of said fiber package, said machine comprising:

(a) first endless conveyor means for conveying a continuous, stagger-layered package of fibers from a loading point to a forward end of said conveyor means where tufts are plucked from said package;

(b) variable force reversible drive means connected to said first conveyor means;

(c) time-control means connected to the variable force reversible drive means for cyclically starting, stopping, and reversing said drive means;

(d) confine and support means on both sides of a leading portion of the first conveyor means, said confine and support means comprising separate movable endless conveying means disposed in planes perpendicular to said first conveyor means, said confine and support means presenting generally rectangular surfaces to the fiber package on the first conveyor means to provide lateral support for said fiber package;

(e) means connecting the confine and support means to each other and to said variable force, reversible drive means, whereby said confine and support means, in synchronism with the first conveyor means sequentially and cyclically urge the fiber package through a forward movement, zero movement, and reverse movement with a cyclically applied force which is continuously variable from zero to a maximum;

(f) reciprocating tuft-pucking means at the forward end of the first conveyor means adapted to traverse

the exposed forward face of the fiber package and pluck tufts of fiber from said exposed forward face, said tuft-plucking means comprising a housing in which are mounted rotatable toothed elements, means for rotating said toothed elements, and means connected to said housing for causing the latter to traverse the face of the fiber package with a reciprocating movement;

(g) a grid-like hold-back barrier interposed between the forward end of the fiber package and the tuft-plucking means, the grids of said hold-back barrier being adapted to admit the teeth of the rotatable toothed elements therebetween for plucking tufts of fiber from the exposed face of the fiber package during such period as the cyclically applied force varies from zero to a maximum;

(h) a pair of opposed, rigid, generally rectangular, vertically disposed planar pusher plates, one each, laterally adjacent either side of the face portion of the fiber package, said pusher plates being independent of and located between the hold-back barrier and the forward end of the package confine and support means;

(i) separate drive means connected to each pusher plate for alternately, with reciprocating extend and retreat motion, urging first one plate and then the opposed plate against the leading lateral portion of the fiber package; and

(j) switching means and accompanying circuitry connected to and position responsive to the pusher plates

and period responsive to the reversible drive means of the confine and support means, said switching means adapted to start the confine and support drive means at completion of a pusher plate extend and retract motion sequence and said switching means additionally adapted to initiate a pusher plate extend and retract motion sequence only at that period the reversible drive means has drawn the face of the fiber package back out of contact with the barrier means, thereby to shift the forward face of the fiber package back and forth across the grid-like barrier a distance at least sufficient to overcome localized packing and occlusion of fiber masses behind the barrier and attendant channelized, nonuniform plucking of the fiber package face.

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U.S. Cl. X.R.

19—145