

United States Patent [19]
Keller

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[54] MECHANICAL HOPPER FEEDER

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[52] U.S. Cl..... 214/16 R, 19/145.5, 212/127,
214/89, 294/110 R

[51] Int. Cl..... D01g 13/00

[58] Field of Search 214/16 R, 17 C, 17 CA,
214/86, 89, 658; 212/127; 294/110 R; 19/81,
145.5

[56]

References Cited

UNITED STATES PATENTS

3,577,599	5/1971	Goldammer	19/145.5
2,412,844	12/1946	Stevens	214/16 R
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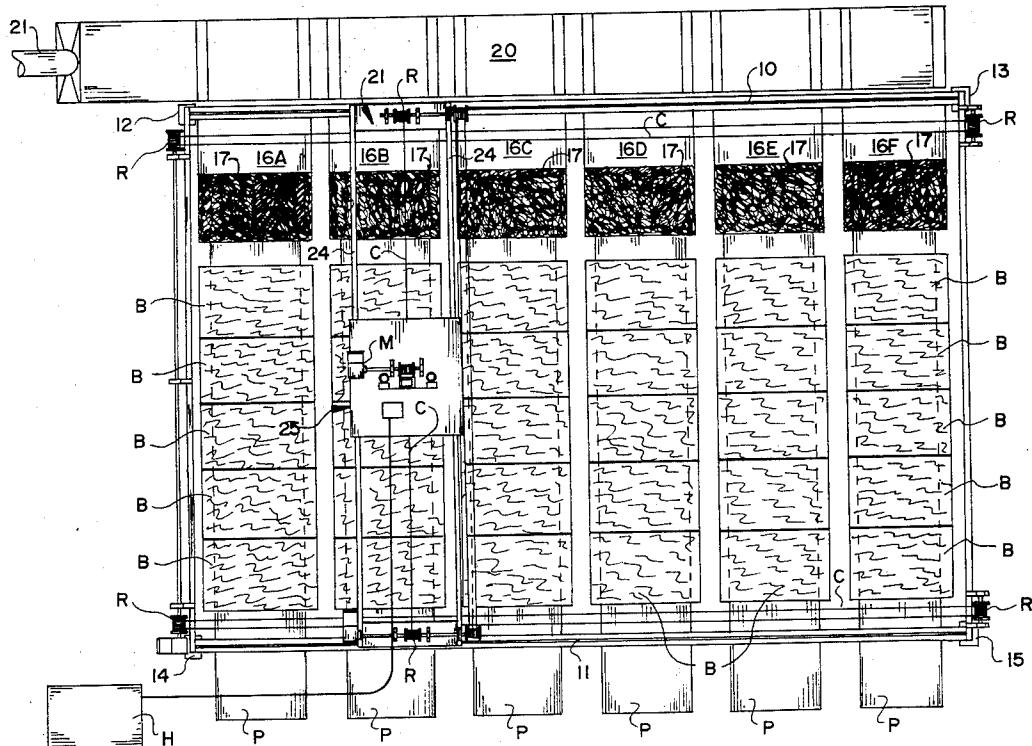
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[57]

ABSTRACT

The invention relates to an apparatus for mechanically loading fibers into the hoppers of fiber feeders.

4 Claims, 5 Drawing Figures



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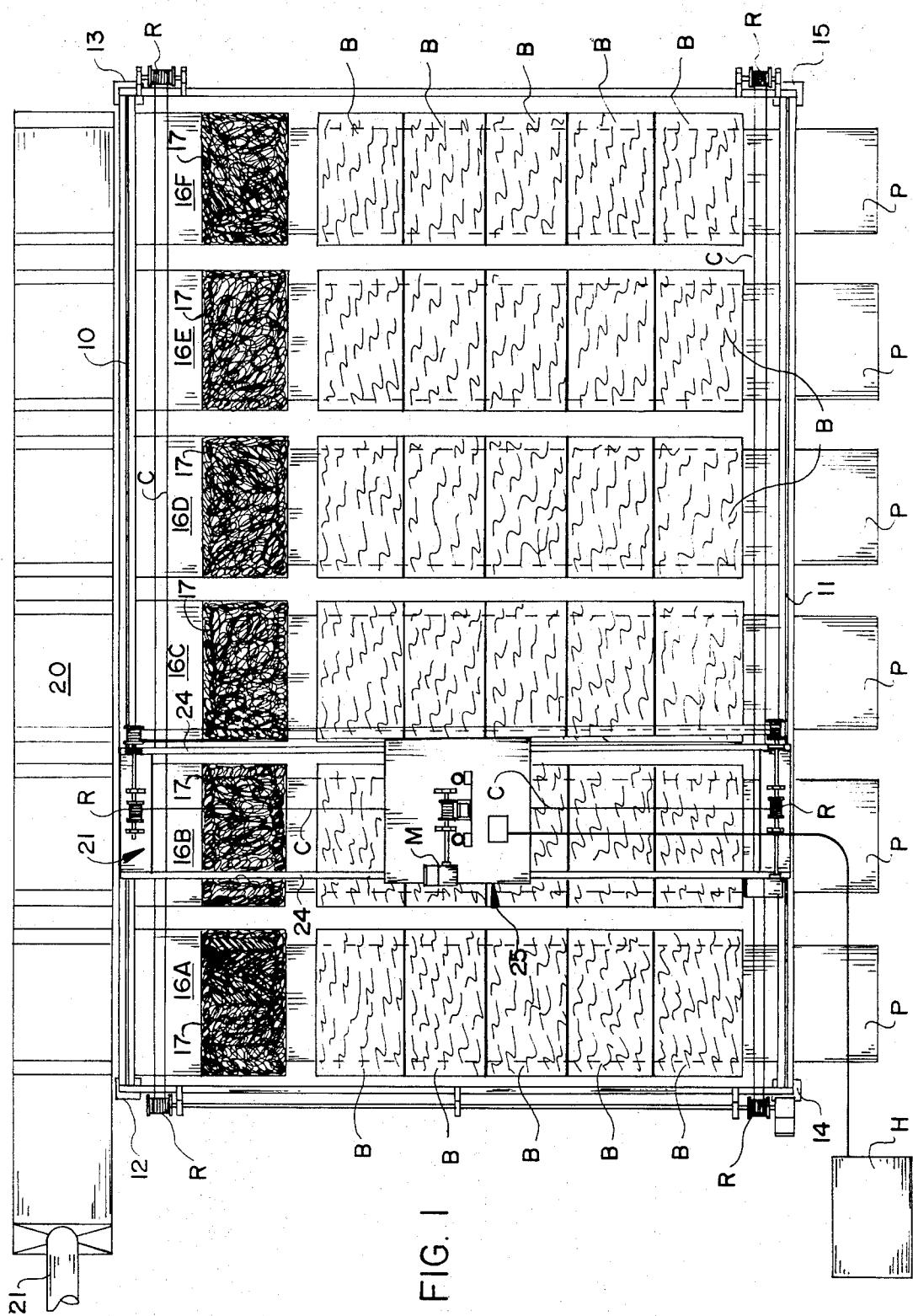


FIG. 1

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FIG. 2

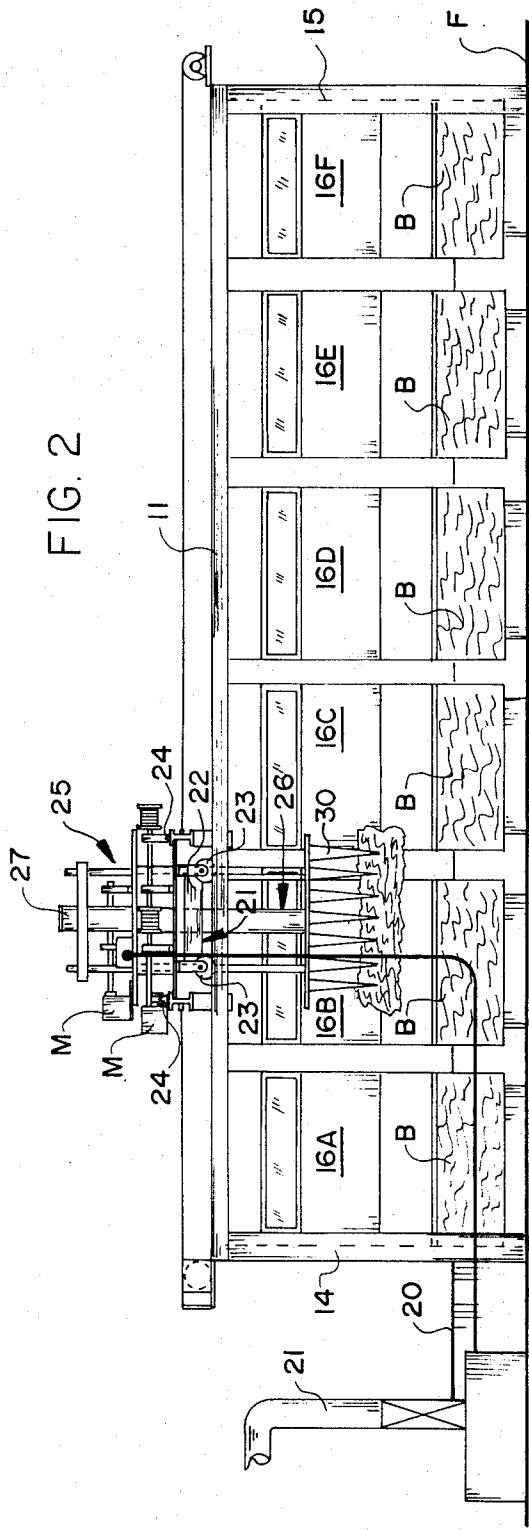
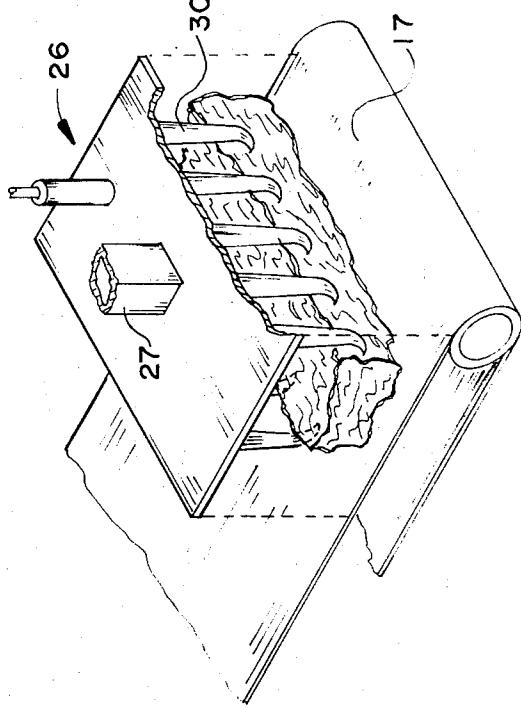


FIG. 5



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FIG. 3

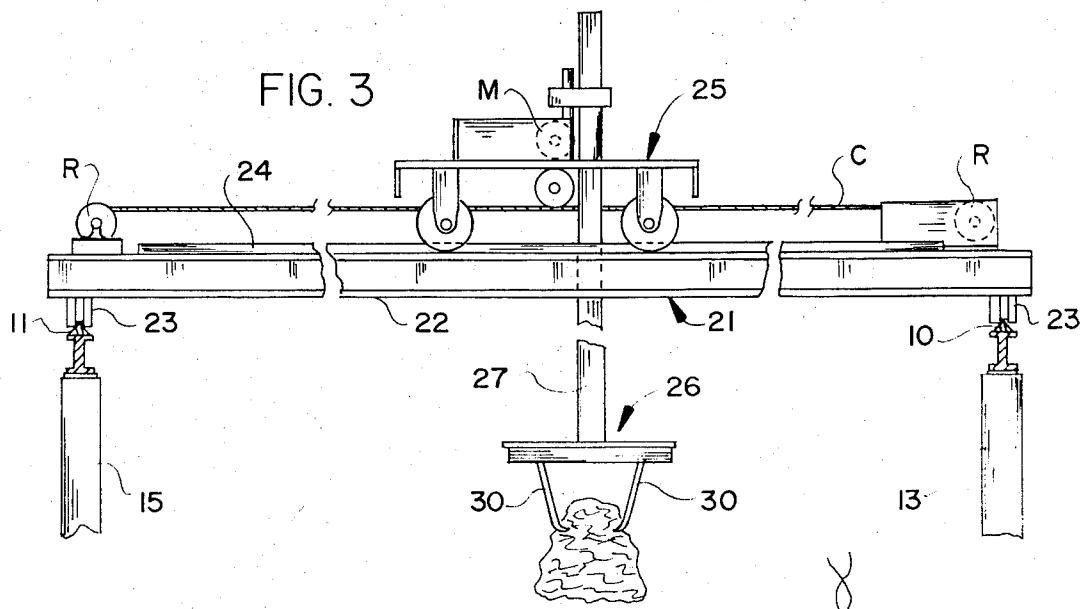
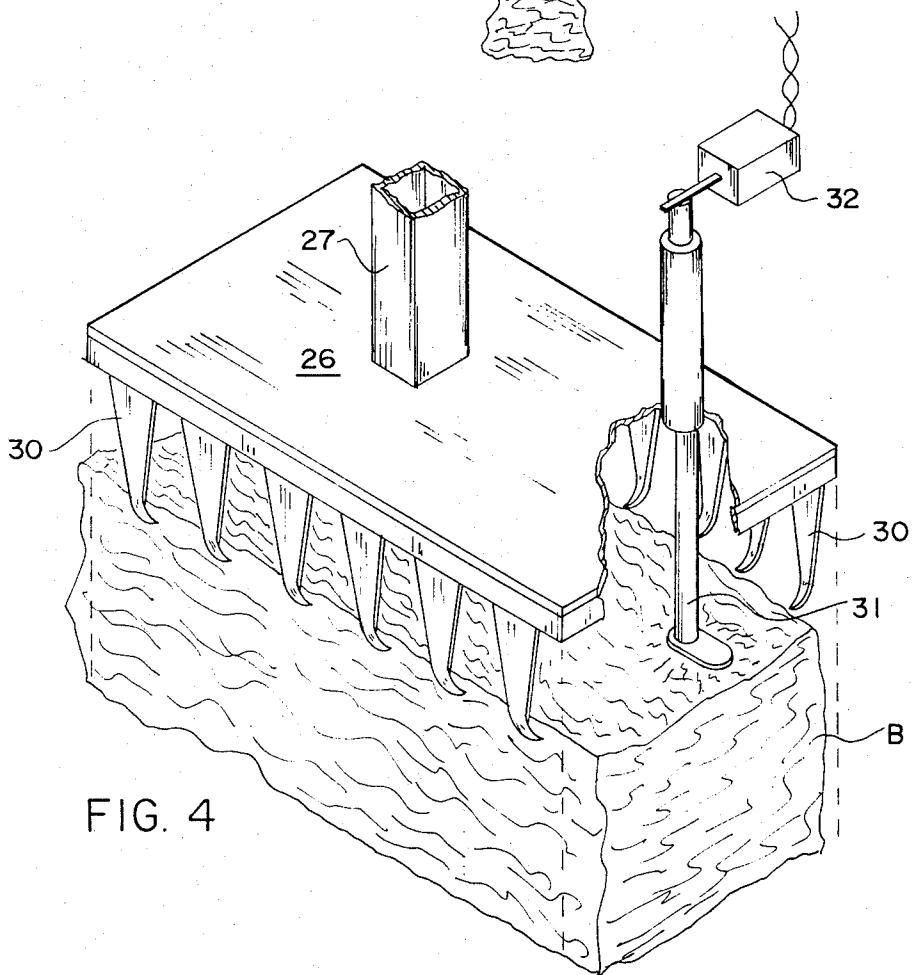


FIG. 4



MECHANICAL HOPPER FEEDER

BACKGROUND OF THE INVENTION

This invention comprises a mechanical device for feeding fibers on to a hopper or apron of a fiber processing and feeding machine sometimes known in the art as a bale opener. The invention has particular application to the utilization of a group of such bale openers arranged adjacent each other. Groups of bale openers are utilized in the art to facilitate the mixing of different kinds of fibers. The desired kinds of fibers of a planned mixture are arranged in bales behind selected bale openers, the bales behind a given bale opener being of one kind of fiber while the bales behind other openers in the group are of different kinds of fiber.

To permit the maintenance of a certain ratio between the components of the mixture of fibers from different sources, the prior art provides for each fiber component a bale opener equipped with an automatic weighing system. See, for example, U. S. Pat. No. 3,132,709 issued May 12, 1964 entitled "Apparatus for Feeding Textile Fibers in a Uniform Stream" and issued to Fibers Controls Corporation upon application of Kenneth G. Lytton. The Lytton patent discloses a system of weighing fibers preliminarily to the mixing of such fibers with other fibers and their subsequent delivery to a carding machine. It is with a group of fiber weighing machines of the type disclosed in the Lytton patent with which this invention is particularly intended to be used. The fiber processing and feeding machine of the type shown in the Lytton patent includes a hopper into which is loaded a supply of fibers. The loading of the hopper is generally done by hand, as explained in the Lytton patent at Col. 2, line 19.

Attempts have been made to mechanically handle the fibers preparatory to their mixing, but all such known prior devices have objections which are overcome by the present invention. One such mechanical contrivance is shown in U. S. Pat. No. 3,577,599 issued May 14, 1971 to Shubert and Salzer Maschinen Fabrik upon application of Georg Goldammer and entitled "Apparatus for Mixing Fibrous Components." The Goldammer patent discloses a wheeled fiber plucking mechanism movable between rows of bales arranged behind bale openers. The fiber plucking mechanism in the Goldammer patent is selectively engageable with successive bales for the purpose of plucking a quantity of fibers therefrom. According to the Goldammer invention, the plucked fibers are weighed on a scale carried by the fiber plucking mechanism and the fibers are dumped only after the weigh pan carried by the fiber plucker has assembled a predetermined weight of fibers. Movement of the Goldammer fiber plucker and its weigh pan is limited by the track layout to travel in the space between rows of bales and behind the group of openers. This arrangement has proven unsatisfactory because of the difficulty in obtaining a predetermined mix by weight of different fibers and efficiently delivering the mix.

Another attempt to mechanically handle fibers preparatory to mixing them is known in the art as the carousel. It comprises a turn-table on which bales of fibers are mounted for rotation past a toothed roller extending through an annular opening in the bed of the carousel and across which the bales of fibers are positioned. The toothed roller tears away fibers from the bale and delivers them to a fiber weighing mechanism such as

shown in Lytton Pat. No. 3,132,709 or directly to a large storage and mixing chamber or another type of blending machine. One difficulty with the carousel type arrangement is that the fibers are plucked from the bottom of the bales. This is objectionable because the weight of the bales compresses the fibers into a tangled mass which makes it difficult to weigh the fibers as accurately as desired for good blending. The difficulty of taking tangled fibers from the bottoms of the bales is compounded by the practice of putting plates or weights on top of the bales in an effort to obtain uniform density of the bales on a carousel. Uniform density of bales is considered desirable when each bale on a carousel is of a different grade or kind of fiber and it is desired to take a given amount from each bale. Without uniform density the toothed roll at the bottom would remove different amounts of bales of different densities rather than the same amounts as desired. Any increase in the density of the bale necessarily increases the matting or tangling of the fibers at the bottom of the bale. An economical disadvantage of the carousel is that it can handle only six bales of fibers per unit of machinery.

In contrast, the practice of loading the hoppers of the fiber feeding machines by hand has the advantage that the fibers are removed from the tops of the bales rather than from the bottoms. Fibers are tightly compressed in a bale when it is formed and strapped under compression. When the straps are removed after the bale is positioned behind the fiber feeding machine the volume of the bale increases as the bale "blossoms." When this occurs, the fibers relax and become loosened from entanglement about themselves and from entanglement with other fibers. This is advantageous in that the loosened fibers enable more accurate weighing and thereby better blending and better yarn. The loading of fibers by hand into the hopper of a fiber feeding machine is, however, not without difficulty. It is extremely laborious, hot and dirty work. It is also expensive, compared to the long term costs of machinery.

SUMMARY OF THE INVENTION

The invention comprises a mechanical fiber plucker operably supported above a plurality of bales of fiber associated with a group of fiber feeding machines sometimes called bale openers or openers. In practice, there may be six such openers arranged side-by-side or otherwise in a group with the discharge ends of the openers overlying once or more conveyors extending along the discharge ends of the openers and away therefrom to convey fibers discharged from the openers to another fiber processing machine, such as a cleaning, opening, picking or a carding machine. An elevated trackway has one leg or track extending transversely of the said group of fiber feeding machines or bale openers or breakers and is suitably suspended or supported thereabove. A second track extends in spaced parallel relation to said one track and is suitably supported in the same horizontal plane about 20 feet rearwardly of said one track. These tracks are spaced about 8 or 10 feet above the floor supporting the group of breakers. A second set of tracks extends between the first and second trackways, said second set of tracks being journaled on wheels movable along the said first and second trackways transversely of the group of openers. A fiber plucker including a set of tongs is journaled on the second set of trackways for movement

therealong in a direction longitudinally of a selected breaker in said group of breakers.

According to the illustrated embodiment, 30 or 36 bales of fibers are deposited in the area traversed by said second set of trackways as it moves between the ends of said first and second tracks, five or six bales being arranged behind each of the six bale breakers.

The fiber plucker is selectively movable to any one of the 30 bales, which may comprise different kinds of fibers according to plan. When the fiber plucker is located above a desired bale, the tongs are lowered about the bale and closed to pick up a quantity of fibers from the bale. With the tongs closed about the quantity of fibers, they are raised and the fiber plucker is moved along said second set of trackways into overlying relation with the hopper of a breaker and the quantity of fibers is deposited therein by opening the tongs. Thereafter the fibers within the breaker are conveyed to a weighing mechanism such as shown, for example, in Lytton U. S. Pat. No. 3,132,709, after which the fibers are fed to a carding machine or the like. The process is repeated as required to keep the six hoppers filled to a minimum level with fibers by repeatedly moving the fiber plucker between selected bales and selected hoppers. In practice, each hopper may receive only a given kind of fiber. The fibers are dropped directly into the hopper or on the extended apron of the bale breaker after being plucked from the bale. They are not weighed or mixed with other fibers before being dropped in the hopper.

One object of the invention is to provide a single mechanism capable of processing a large number of bales of fibers. This is advantageous because it enables a more diverse blending of fibers than is possible with a smaller number of bales. It is also advantageous for one mechanism to handle a large number of bales from the standpoint of economics.

Another object of the invention is to provide a highly mobile mechanism which can be quickly moved in a non-circuitous path from any given bale to any given hopper and thence return to the same or another bale with a minimum of lost motion.

It is another object of the invention to obtain the foregoing objects with a mechanism capable of removing fibers from the tops of bales after they have "blossomed" and the fibers have thereby become loosened and unentangled.

It is a still further object of this invention to provide a mechanism of the type described wherein means are provided for sensing the presence of a bale between the opened tongs and second means are provided responsive to said sensing means for closing the tongs.

A still further object of the invention is to provide a control system for sensing the quantity of fibers within the hoppers and moving the fiber plucker to an appropriate bale, removing a quantity of fiber from said appropriate bale and directing it to the corresponding hopper to replenish the same, and thereby maintain a minimum quantity in all the hoppers.

The invention also contemplates the use of endless conveyors for transporting fresh bales to the processing area beneath the trackways. A separate endless belt can be provided for delivering bales to each breaker. Each conveyor may have a conveying surface adequate to simultaneously support a sufficient quantity of bales, such as 30 bales, to satisfy the requirements of its breaker for one day. The control system is programmed

to sense the exhaustion of the bale closest to the hopper on each conveyor and to respond by actuating the conveyor to move the bales thereon toward its respective hopper and thereby present another bale to the processing area beneath the trackways.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of the trackways overlying a group of openers and their respective bales aligned behind;

FIG. 2 is a transverse elevation looking toward the hoppers of the breakers;

FIG. 3 is a side elevation, with parts broken away, looking at the right hand side of FIG. 2;

FIG. 4 is a perspective view of the tongs positioned about a bale and illustrating the function of the probe or sencer; and

FIG. 5 is a perspective view, with parts broken away, showing the fiber plucker positioned over one of the hoppers for delivery of a quantity of fibers.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A first set of trackways comprising a track 10 and a track 11 are suitably supported or suspended about 8 or 12 feet above the floor F of a fiber processing plant. In the illustrated embodiment, the tracks 10 and 11 are supported by posts 12 and 13 at the ends of track 10 and by posts 14 and 15 at the ends of track 11. Track 10 is supported above and extends across a group of fiber feeding machines sometimes called bale breakers and identified by the reference numerals 16a, 16b, 16c, 16d, 16e and 16f. Each of the openers may be like that shown and described in the Lytton U. S. Pat. No. 3,132,709 or of any other suitable construction. Each opener includes a hopper 17 within which fibers are deposited for processing within the opener and thereafter delivered to a conveyor 20 extending transversely along the row of openers. The conveyor 20 comprises an endless belt which transports fibers from the openers to a pneumatic conveyor 21 which transports the fibers to a carding machine or the like.

The track 10 is supported above the group of breakers and extends transversely of the path of the fibers through the breakers. Track 11 is supported in the same horizontal plane as track 10 but spaced rearwardly therefrom a sufficient distance to define a processing area wherein fibers are delivered to the hoppers of the breakers. A distance of about 25 feet has been found sufficient for this purpose. Each of the breakers is about 3 feet in width and the track 10 overlies six breakers in the illustrated embodiment. The tracks 10 and 11 may, therefore, be conveniently about 40 feet long.

A plurality of bales B of fibers, such as cotton, are arranged in the processing area behind the breakers and between the tracks 10 and 11. As illustrated, the bales are of rectangular configuration and may be arranged on the floor in any desired pattern, but as illustrated are arranged in longitudinal rows behind respective breakers with the longest dimension of the bales extending transversely of the row behind each breaker. This arrangement has been found advantageous in conserving floor space and thereby permitting a larger number of bales to be assembled within the processing area between and beneath the tracks 10 and 11.

If desired, all of the bales in a row behind a given breaker, such as the breaker 16a, may contain a fiber of a given kind which is different from the fibers in the remaining bales in the processing area. Similarly, the bales behind another breaker, such as 16b, may contain fibers different from the fibers in the rest of the bales in the processing area. Alternatively, the bales furthest from the hoppers and beneath the track 11 may all contain the same kind of fiber which is different from the fiber in the rest of the bales within the processing area. Still another alternative would be for all of the bales in the processing area to contain the same kind of fiber. The point is that the bales within the processing area may or may not contain different fibers and bales with fibers different from the fibers in other bales may be arranged in any desired pattern. The invention is equally applicable to all arrangements of bales containing the same or different kinds of fibers. Any desired mixing of fibers is accomplished after the fibers are deposited in the hoppers, the only function of the hopper feeder being to deliver fibers to the hoppers — not to mix them.

Extending between the tracks 10 and 11 is a wheeled frame broadly indicated at 21 and including a rectangularly shaped longitudinally extending carriage 22 having wheels 23 journalled at the ends thereof and rotatably mounted for reciprocal movement along the tracks 10 and 11. The frame 21 supports a pair of transversely spaced longitudinally extending tracks 24, upon which is mounted for reciprocal movement therealong a wheeled carriage broadly indicated at 25.

The carriage 25 supports a fiber plucker or tongs broadly indicated at 26 and comprising a vertically reciprocable support shaft 27 and a pair of cooperating tongs or prongs 30 operatively connected to the lower end of the support shaft 27. The prongs 30 are selectively movable toward and away from each other to close upon a quantity of fibers in a bale within the processing area and to release the fibers plucked from the bale into one of the hoppers 17.

Extending axially adjacent the support shaft 27 and between the cooperating prongs 30 is a downwardly extending probe 31. When the prongs 30 are opened to the position of FIG. 4, the probe or senser 31 is enabled to contact and thereby sense the proximity of a bale to the prongs 30. The vertical distance between the lowest end of the probe 31 and the prongs 30 when in the closed position of FIG. 5 is predetermined as desired to cause the tongs to pluck a desired approximate quantity of fibers from successive bales. The probe 31 is electrically connected to a limit switch, schematically shown at 32 in FIG. 4, which may be of conventional construction and which is operatively arranged to trigger the inward movement of the prongs 30 toward each other to close about a quantity of fibers in the bale over which the fiber plucker is positioned.

Suitable controls comprising appropriately arranged and powered electric motors M, cables C, and reels R are suitably arranged to propel the carriage 22 along the transversely extending tracks 10 and 11 and to propel the carriage 25 along the longitudinal tracks 24. The fiber plucker 26 is thereby enabled to be moved directly from any bale within the processing area to any hopper in a non-circuitous path. Thus, obviously the carriage 25 and its fiber plucker 26 may be moved directly from the position shown in FIG. 1 to the hopper 17 of the breaker 16b in a non-circuitous path by sim-

ply propelling the carriage 25 along the longitudinally extending tracks 24. Assuming it is desired to deposit the kind of fiber in the bale behind the breaker 16b over which the carriage 25 is positioned in FIG. 1 to the hopper of the breaker 16f, the fiber plucker with the fibers from the bale behind breaker 16b may be transported directly to the hopper of the breaker 16f by simultaneously moving the carriage 22 transversely along the tracks 10 and 11 and moving the carriage 25 longitudinally along the tracks 24 until the tongs are positioned over the hopper 17 of the breaker 16f. Thereupon, the tongs may be opened and the fibers deposited in the hopper 17 of the breaker 16f. By means of the present invention the fibers are conveyed above and across the bales within the processing area instead of having to be transported circuitously through the spaces between rows of bales, as in the prior art.

The sequence of operations may be controlled through a control circuit including a manually operated or computer operated console H operatively connected by a line L to the electric, hydraulic, or air motors energizing the movement of the carriage 22 along tracks 10 and 11, carriage 25 along tracks 24, and the raising and lowering of the support shaft 27 and the opening and closing of the tongs 30. The console H may also include appropriate programming for sensing the volume of fibers within each of the hoppers 17, and be responsive to a volume less than a predetermined minimum to cause the fiber plucker to move an appropriate kind of fiber from one of the bales in the processing area to the hopper requiring replenishment.

The bales B may be deposited and arranged within the processing area by hand or they may be delivered into the processing area by means of endless conveyors extending from each of the breakers and beyond the track 11 a sufficient distance to support a desired number of bales for delivery to the processing area within a predetermined length of time, such as one shift or 1 day's operation.

The control circuit terminating in the console H may also include means for sensing the depletion or exhaustion of a bale in the transverse row closest to the hoppers 17 and be responsive to that condition to actuate the appropriate conveyor to move forward an increment of distance sufficient to deliver the next succeeding bale to the hopper and to bring another bale within the processing area under the track 11.

There is thus provided a mechanical hopper feeder which is capable of supplying fibers to the hoppers of fiber processing machines according to the kind and quantity required by moving them directly from one of a plurality of bales to the hopper in a direct non-circuitous path.

What is claimed is:

1. In combination with a fiber feeding machine having a hopper, a mechanical hopper feeder for delivering fibers to said hopper from a plurality of bales positioned within a fiber processing area, said mechanical hopper feeder comprising a first pair of spaced parallel tracks extending transversely to the path of fibers through said fiber feeding machine, means supporting the tracks in a common horizontal plane above the fiber feeding machine, one of said tracks extending transversely across the fiber feeding machine and the other of said tracks being horizontally spaced therefrom to define said fiber processing area between and beneath said tracks and adjacent said hopper, a first

carriage extending between said first pair of tracks and mounted for reciprocable movement thereon, a second set of tracks carried by said first carriage and extending between said first pair of tracks, a second carriage on said second set of tracks, a fiber plucker carried by said second carriage, means for propelling said first carriage along said first tracks, means for propelling said second carriage along said second tracks, means for vertically reciprocating said fiber plucker, whereby said fiber plucker may be positioned over a bale in said processing area to pluck fibers therefrom and moved directly to said hopper in a non-circitous path.

2. An apparatus according to claim 1 wherein said fiber plucker includes a vertically reciprocable support shaft, a pair of tongs depending from said support shaft, means for opening and closing said tongs, and a probe positioned between said tongs and engageable with a bale of fibers when said tongs are lowered in opened position above a bale, and means operatively connecting said probe to said means for opening and closing said tongs to actuate the tongs to pluck fibers from said bale when engaged by said probe.

3. In combination with a group of aligned fiber feeding

machines, each including a hopper for the reception of fibers from a plurality of bales arranged in a processing area directly to any one of said hoppers in said group of fiber feeding machines, said means comprising a fiber plucker selectively engageable with each of said bales in said processing area, said fiber plucker including a vertically reciprocable support shaft and a pair of tongs depending from said support shaft, means for moving said fiber plucker across said processing area in a direction extending transversely to the path of fibers through said fiber feeding machine, and means for moving said fiber plucker across said processing area in a direction extending parallel to the path of fibers through said fiber feeding machine, whereby said fiber plucker may be positioned over a bale at any location in said fiber processing area and moved directly to said hopper in a non-circitous path.

4. A structure according to claim 3 wherein a conveyor extends from adjacent each of said hoppers through said processing area and there beyond, and means for activating the conveyors to move successive bales into said processing area.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,777,908 Dated December 11, 1973

Inventor(s) Alex J. Keller

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

At column 8, line 3, after the word "area," insert the following:

--behind the fiber feeding machines, means for feeding fibers from any one of said bales within said processing area--

Signed and Sealed this
twenty-third Day of December 1975

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks