

May 7, 1968

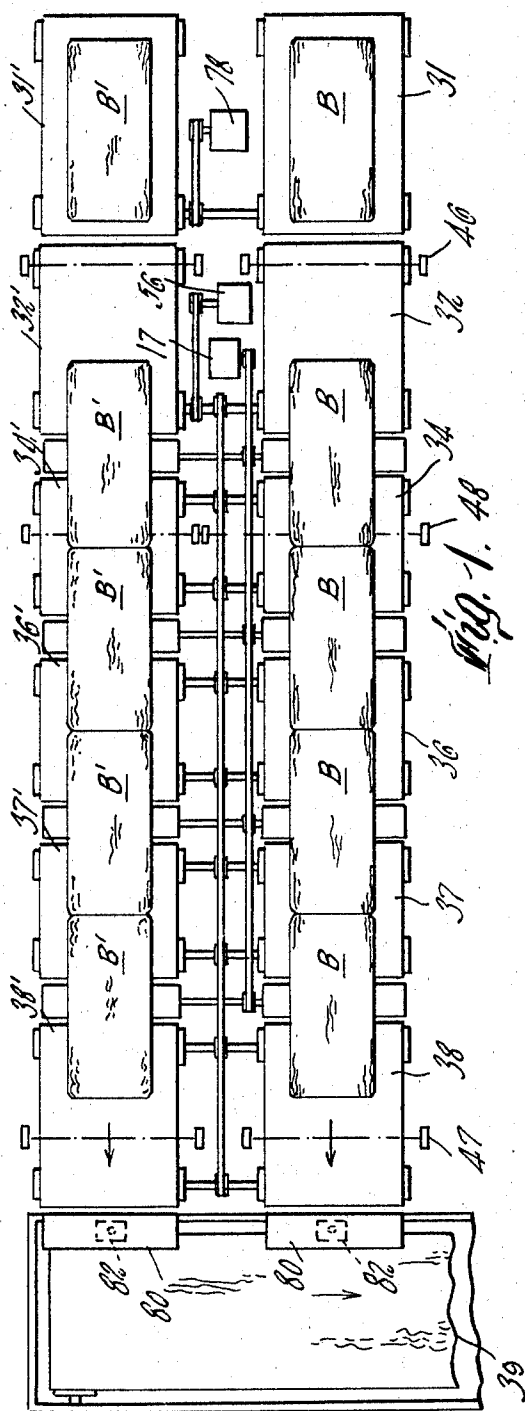
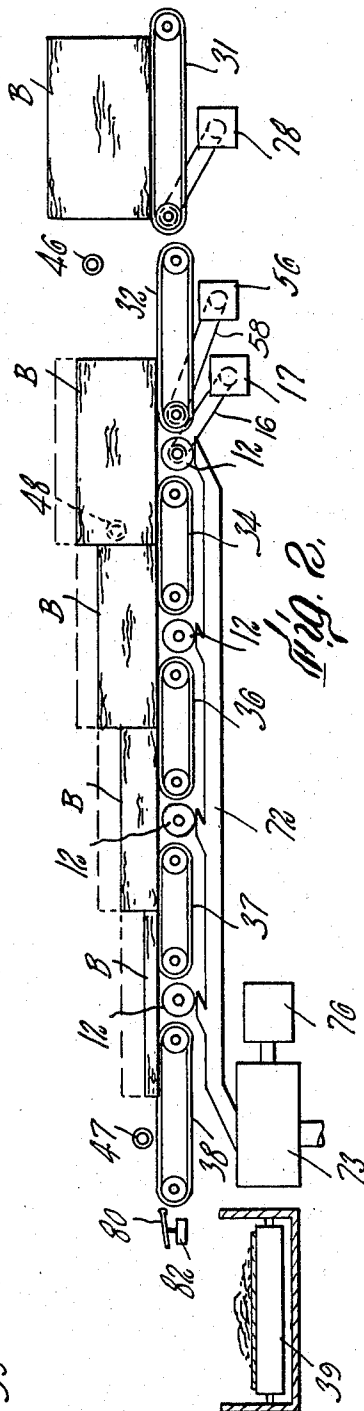
L. PLATT ET AL

3,381,341

TEXTILE FIBER BALE OPENER UNIT AND SYSTEMS EMBODYING SAME

Filed Oct. 1, 1964

3 Sheets-Sheet 1



May 7, 1968

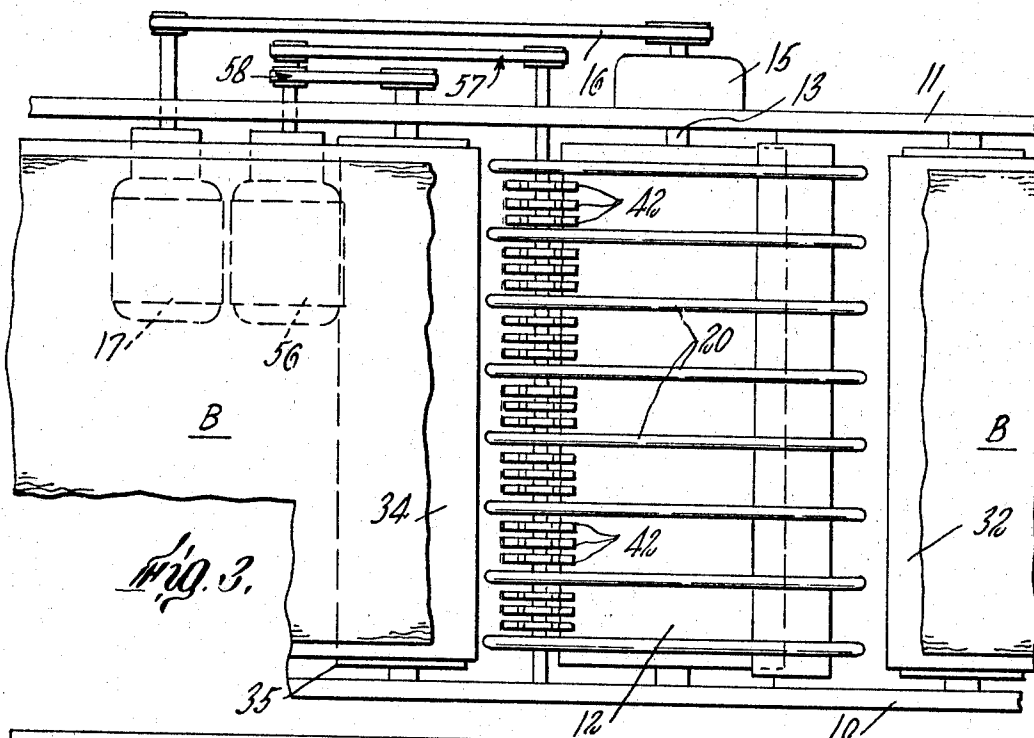
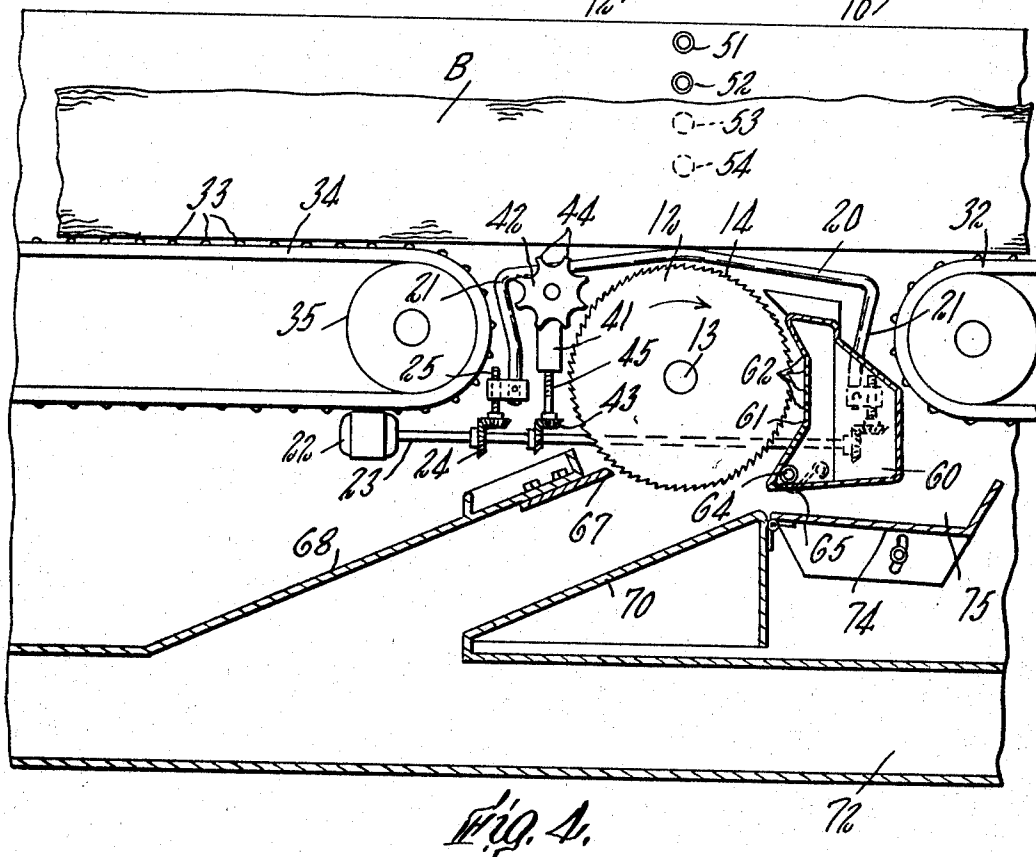
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3 Sheets-Sheet 2



May 7, 1968

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TEXTILE FIBER BALE OPENER UNIT AND SYSTEMS EMBODYING SAME

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3 Sheets-Sheet 3

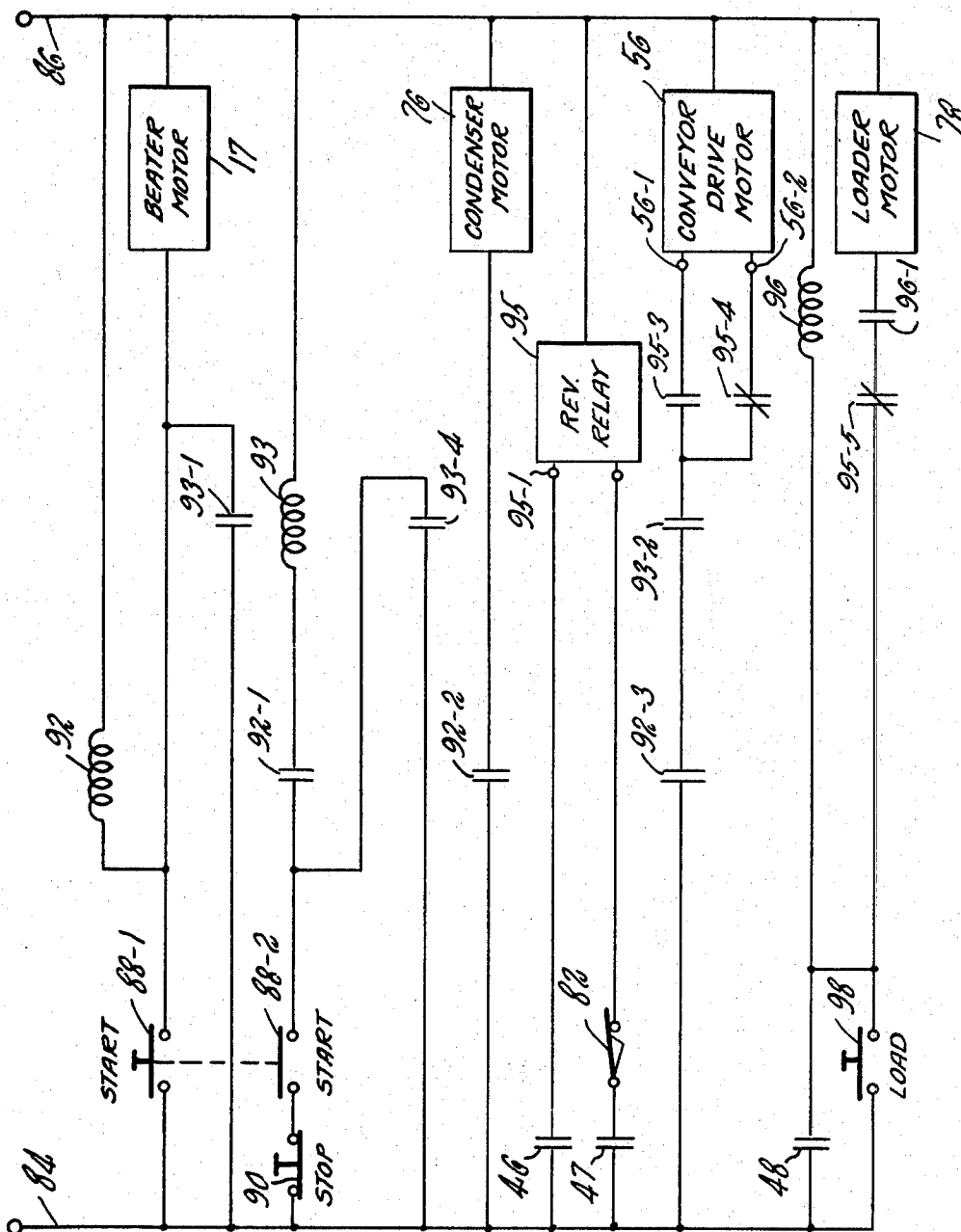


Fig. 5.

Patented May 7, 1968

2

Turning now to a more detailed description of the apparatus of the invention, each opener unit as shown in FIGS. 3 and 4 is provided with frame side members 10 and 11 supporting cylinder shaft 13 in suitable bearings. Preferably cylinder shaft 13 is driven through a slip clutch 15 by a V-belt drive 16 from a suitable motor 17 which may be common to a series of units if desired. The surface of cylinder 12 is preferably covered with so-called metallic card clothing consisting of a helically wound sheet metal with toothed projections 14 providing a multiplicity of said projections extending around the cylinder and axially for the entire length thereof. The grid bars 20 are spaced above the surface of cylinder 12 and extend generally horizontally across the top of the cylinder in a direction perpendicular to its axis. The grid bars are relatively narrow, and spaced from one another for a substantial distance, and extend for the axial length

of cylinder 12 to support the lower surface of a bale B spaced a predetermined distance above the beater cylinder surface for the individual fiber removal action characteristic of the apparatus of the invention.

The grid bars 20 are mounted at their ends on transverse support rods 21 which may be adjustably moved vertically by adjusting motor 22 through suitable mechanical connections including horizontal shaft 23 driving through suitable bevel gears 24, threaded vertical shafts 25 which are received in cooperating internally threaded members carried on transversal support rods 21.

Transverse scarifying roll 42 with its lugs 44 that extend upwardly through the spaces between the grid bars 20 extends along one side of cylinder 12 and is carried in suitable bearings 41 mounted for vertical movement in side frames 10 and 11, such being moved with grid bars 20 by horizontal shaft 23 driving through suitable bevel gears 43 threaded vertical shafts 45 which are received in cooperating internally threaded portions of bearings 41. Grid bars 20 and scarifying roll 42 may be arranged for movement independently of one another if desired, as by disconnecting one of their driving bevel gears. Scarifying roll 42 is driven by a reversing motor 56 by a sprocket and chain drive 57, controlled as hereinafter more fully explained.

Conveyors 32 and 34 are provided for reciprocating a bale B over grid bars 20 and for advancing said bale from an opener unit to discharge or to a succeeding unit, such conveyors having a plurality of pins 33 on their upper surface and being carried by rolls 35 driven by motor 56 by suitable chain and sprocket drives 58, controlled as hereinafter more fully explained.

The cleaning function of the opener unit of the invention is provided by a suction duct 60 having an arcuate surface 61 with perforations 62 which extends adjacent to the downwardly moving surface of cylinder 12 along its entire axial length, the duct 60 being connected to a suitable suction system (not shown) to remove foreign matter from the fibers while they are carried past perforations 62 on the projections 14 of cylinder 12. Preferably, duct 60 is pivoted on shaft 64 for swinging movement of its upper portion away from cylinder 14 to avoid machine damage should a mass of fiber attempt to pass through the apparatus, spring 65 being provided normally to maintain said duct in its operating position as shown. A stripper edge 67 is provided adjacent the lower side of cylinder 12, such edge forming the uppermost edge of a wall 68, which, together with a bottom wall 70, forms a branch duct connecting to a main duct 72 which may be utilized to connect the branch ducts of a number of opener units for combining and blending their outputs. Preferably, an adjustable end portion 74 swingably mounted on the upper end of lower wall 70 is provided to underlie the suction duct 60 and to provide an inlet at 75 for air flow downwardly through the branch duct defined by walls 68 and 70 to carry released and opened fibers therethrough to main duct 72 and condenser 73.

Returning to the showing of FIGS. 1 and 2, wherein are shown four opening units as above described, a common motor 17 drives all of the beater cylinders through V-belt drive 16, while all of the aprons are driven by chain and sprocket drive 58. The common ducts 72 of both series of openers are led to a conventional condenser 73 having a driving motor 76.

Photocells 46, 47 and 48 are located, respectively, adjacent the input end of conveyor 32, adjacent the output end of conveyor 33, and generally centrally of conveyor 34 with photocell 47 located at a lesser height above the level of said conveyors than are photocells 46 and 48, for reasons hereinafter described.

The first of the opener units of the series is preceded by a loading conveyor 31 driven by a motor 78; and the last of the opener units is followed by a transversely

extending sensing plate 80 having a switch 82 associated therewith.

An electrical drive and control system is provided for the opener and blender apparatus of FIGS. 1 and 2 as shown in FIG. 5 of the drawings, only those connections being shown which are believed necessary for a full understanding of the invention, with relays and their contacts being similarly numbered with further individual identifying reference numerals.

In FIG. 5, the various electrical elements are shown connected between two circuit lines 84-86.

With the apparatus in operation as controlled by the momentary starting switch contacts 88-1 and 88-2 and stop switch 90, the energizing elements which control the normal operation of the apparatus are photocells 46, 47 and 48, herein depicted as switches since such elements are well known to those skilled in the electrical control art.

As shown in FIG. 5, normally open momentary starting contacts 88-1 are connected in series therewith between lines 84 and 86 with beater motor 17 and relay operated timer 92. Normally open contacts 93-1 of relay operated timer 93 are connected in parallel with the momentary starting switch contacts 88-1 to perform a holding function. Normally open momentary starting contacts 88-2 are in series with normally closed momentary stop contacts 90, normally open contacts 92-1 of timer 92 and the relay operated timer coil 93. Holding contacts 93-4 are provided across starting contacts 88-2.

Condenser motor 76 is connected in series with contacts 92-2 of timer coil 93 across lines 84, 86.

Apron drive motor 56 has its common side connected to line 86, its forward terminal 56-1 being in series with one side of normally open contacts 95-3 of reversing relay 95 and its reverse terminal 56-2 in series with one side of normally closed contacts 95-4 of said reversing relay. The other side of contacts 95-3 and 95-4 are connected together in series with contacts 93-2 of timer and contacts 92-3 of timer 92 to line 84. Reversing relay 95 has its common terminal connected to line 86, its forward terminal 95-1 connected to line 84 in series with normally open photocell contacts 46, and its reverse terminal connected to line 84 in series with both photocell contacts 47 and pivot plate switch contacts 82.

Loader motor 78 is connected in series with photocell contacts 48 as well as with normally closed contacts 95-5 of reversing relay 95 and normally open contacts 96-1 of a relay coil 96 in parallel with loader motor 78, reversing relay coil contacts 95-5 and its own contacts 96-1. A normally open momentary manual switch 98 is provided in parallel with photocell contacts 48.

In the operation of the opener unit of the invention, fiber removal from the bale is accomplished as a result of three interdependent functions: air currents created by the beater cylinder 12 and the pneumatic stock removal system, including condenser 73; the scarifying roll 42 which disturbs the under surface of the bale, thus permitting the air currents to have greater effect in pulling the fibers into the path of the teeth on the beater cylinder which removes fibers in small increments, so that by the time the fibers are released from the beater cylinder they are essentially in individual fiber state.

It is of particular importance to the operation of the apparatus of the invention that there exist a spacing of at least about 1/2 inch between the top of the grid bars 20 and the top of the beater cylinder 12 which determines the spacing between the bottom of the bale and the beater cylinder. It is also important that either such spacing or the projection of scarifying roll lugs 44 above the grid bars be adjustable. Setting may be varied by adjusting the grid and scarifying roll to the beater and such may be accomplished by direct actuation of operating motor 22 in response to signals from photocells 51-54 (FIG. 4) or by using a series of opener units and advancing a bale therealong (FIGS. 1 and 2). In the latter case, a typical

setting with variable grid bar-beater cylinder spacing the grid bars at the first station are set at about 1 inch and progressively decreased down to the last station where the setting is about ½ inch. With variable grid bar-scarifying roll setting, the projection of the scarifying roll lugs will increase at successive stations. The progressively varied setting in accordance with the teachings of the present invention compensates in a unique manner for the progressively diminishing bale thickness and makes possible fiber removal at a uniform rate as is not only highly desirable, but is essential for accurate bale blending.

Another important feature of the invention is the reversal of rotation of scarifying roll 42 as the direction of movement of the bale reverses as it is carried by the conveyors. Thus the periphery of the scarifying roll is always moving in the same direction as that of the bottom surface of the bale. The horizontal traversing movement of the bale is preferably faster than the peripheral speed of the roll by a ratio of about 1½–2½ to 1 for most desirable disturbing action for most efficient operation.

Referring to the control system for the apparatus of FIGS. 1 and 2 as shown in FIG. 5, the photocell 46 at the first opener unit of the apparatus and the photocell 47 at the last opener unit control the traversing and advancing movement of the bales as hereinafter explained in detail. The height of the photocell 47 is vertically adjustable so as to establish the maximum size of the bale to be fed onto the cross conveyor 39. As intermediate photocell 48 is positioned at the second opener unit at such a level that it is always below the level of the bales at the first and second stations for operating loader motor 78.

Assuming that bales are positioned as shown in FIGS. 1 and 2, the apparatus of the invention is put into operation by pushing the start pushbutton to momentarily close starting contacts 88–1 and 2 to energize the beater cylinder motor 17 and the relay operated timer 92, the closing of contacts 92–2 of which causes the condenser motor 76 to be energized. At the same time, with the relay operated timer 92 operated, the relay operated stop motion timer 93 will also be energized to lock in starting contacts 88–1, 88–2 and close contacts 93–2. After a predetermined time delay, the timer contact 92–3 closes and the conveyor drive motor 56 will start up. (The direction of rotation motor 56 is dependent upon the state of the reversing relay 95.) As shown in FIG. 5 the conveyor drive motor 56 will run in the reverse direction until the photo relay contacts 46 are operated. This will energize relay 95 which, in turn, will cause the conveyor drive motor to reverse direction and move all the bales carried on the conveyors in the opposite direction. The conveyor drive motor 56 will continue to run in this direction until the photo relay contacts 47 are operated, at which time reversing relay 95 will again reverse direction of the conveyor drive motor.

This reciprocating movement of each bale (except the one on the loading conveyor 31), back and forth across an opener unit for continuous removal of fiber and reduction in thickness of the bale continues until the bale at the last station is of such a reduced height that the photocell contacts 47 will not be interrupted by that bale's advance, so that it and all of the other bales as well continue to advance. When this occurs, the last bale as it passes over plate 80 will operate the plate switch 82, preventing the photocell 47 from operating conveyor motor 56 in its reverse direction.

As the advance of bales continues, the photocell 48 operates when the rearmost bale has advanced beyond it to energize relay coil 96 to close its contact 96–1 in series with loader motor 78. When the bales have advanced sufficiently to operate photocell 47, reversing of the direction of bale movement will take place as explained above. When sufficient reverse movement has occurred to again operate photocell 46, not only will the

bales again advance but loader motor 78 will be operated, since its contacts 96–1 are closed and its contacts 95–5 have closed by reason of the action of the reversing relay 95 in the forward direction of conveyor motor 56. The bale on the loader conveyor 31 will be advanced simultaneously with the advance of the other bales to the first opening unit and the apparatus will again take up its reciprocating movement as explained above. All of the bales having been advanced and each opener unit being occupied by a bale, a new bale may then be placed on loader conveyor 31, and that conveyor advanced to ready the new bale for the next automated advance of all of the bales by means of manual loader switch 98. Bales may be varied as loaded for blending.

In stopping the machine, the stop contacts 90 are momentarily opened to deenergize the conveyor, cylinder and condenser motors.

Thus it will be seen that the invention provides both a novel textile fiber bale opener and cleaner unit and systems useful for blending embodying it. Various modifications of the invention within the spirit of the invention and the scope of the appended claims will be apparent to those skilled in the art.

What is claimed is:

1. A textile fiber bale opener comprising a rotary beater cylinder, bale support means supporting a surface of a bale at a predetermined spacing from the surface of said cylinder, reciprocating means for moving a surface of a bale back and forth past said cylinder and spaced from said cylinder to remove fibers therefrom and reduce the thickness of said bale, sensing means for sensing a predetermined thickness of a bale less than the thickness of a bale delivered to said opener as it is so moved, control means responsive to said sensing means connected to said support means for adjusting the bale support means relative to the surface of the cylinder to provide a decrease in the predetermined spacing upon a reduction in the thickness of a bale.
2. A textile fiber bale opener comprising a plurality of successively arranged bale opening stations, each station including a rotary beater cylinder and bale reciprocating means for moving a bale back and forth past said cylinder to remove fibers therefrom and reduce the thickness of said bale, sensing means at at least said one of said stations responsive to a predetermined maximum thickness of a bale less than the usual thickness of a bale as delivered to one of said stations, bale advancing means responsive to said sensing means for simultaneously advancing a bale at each of said stations from a preceding to a succeeding station upon sensing predetermined maximum thickness at said one of said stations.
3. A textile fiber bale opener as claimed in claim 2, further including conveyor means common to all of said stations for collecting fibers therefrom.
4. A textile fiber bale opener as claimed in claim 3 wherein said conveyor means is pneumatic.
5. A textile fiber bale opener as claimed in claim 2, wherein second sensing means are provided for sensing a bale being advanced from said one station, and wherein said bale advancing means is responsive thereto.
6. A textile fiber bale opener as claimed in claim 5, wherein loading means are provided for loading a bale on the first of said stations, and said loading means is responsive to said second sensing means.
7. A textile fiber bale opener comprising a plurality of successively arranged bale opening stations, each station including a rotary beater cylinder having a multiplicity of pro-

jections on its surface for removing fibers from a bale surface,  
 a plurality of transversely spaced grid bars extending longitudinally in a horizontal plane generally perpendicular to the axis of said cylinder and having a predetermined spacing above said cylinder supporting the lower surface of a bale above the projections, with successive of said stations having successively decreased predetermined spacing,  
 bale reciprocating means for moving a bale back and forth across said station in a direction longitudinally of said grid bars and in contact therewith including reciprocating conveyor means extending between each of said cylinders,  
 sensing means responsive to a predetermined maximum thickness of a bale less than the usual thickness of a bale as delivered to at least one of said stations,  
 bale advancing means responsive to said sensing means for simultaneously advancing a bale at each of said stations from a preceding to a succeeding station, and  
 bale output sensing means following the last of said conveyor means in said plurality of bale opening stations, said advancing means being responsive to said bale output sensing means to advance a bale from said last conveyor means.

8. A textile fiber bale opener as claimed in claim 7, further including loading conveyor means in advance of the first of said reciprocating conveyor means of said plurality of bale opening stations, and sensing means responsive to the bale condition at one of said stations for advancing said loading conveyor means to load a bale on said first reciprocating conveyor.

9. A textile fiber bale opener comprising  
 a rotary beater cylinder,  
 bale support means supporting a surface of a bale spaced from the surface of said cylinder,  
 scarifying roll means mounted beneath said bale support means having a plurality of scarifying lugs extending upwardly between said bale support means and projecting therebeyond a predetermined distance into scarifying contact with the surface of a bale supported on said bale support means,  
 reciprocating means for moving a surface of a bale back and forth past said cylinder and spaced from said cylinder to remove fibers therefrom and reduce the thickness of said bale,  
 sensing means for sensing a predetermined thickness of a bale less than the thickness of a bale delivered to said opener as it is so moved,  
 control means responsive to said sensing means providing an increased predetermined distance between said bale support means and said scarifying roll means upon a reduction in the thickness of a bale.

10. A textile fiber bale opener as claimed in claim 9, in which said control means includes  
 means responsive to said sensing means for adjusting said predetermined distance.

11. A textile fiber bale opener as claimed in claim 9, further including  
 a plurality of opening stations each having a rotary beater cylinder, bale supporting means supporting a surface of a bale spaced from the surface of said cylinder, scarifying roll means mounted beneath said bale support means having a plurality of scarifying lugs extending upwardly between said bale support

means and projecting therebeyond a predetermined distance and reciprocating means for moving a surface of a bale back and forth past said cylinder and spaced from said cylinder to remove fibers therefrom and reduce the thickness of said bale, with successive of said stations having successively increased predetermined distances, and advancing means for advancing a bale from a preceding to a succeeding station, wherein said control means is operatively connected to said advancing means.

12. A textile fiber bale opener comprising  
 a plurality of successively arranged bale opening stations, each station including  
 a rotary beater cylinder having a multiplicity of projections on its surface for removing fibers from a bale surface,  
 a plurality of transversely spaced grid bars extending longitudinally in a horizontal plane generally perpendicular to the axis of said cylinder and spaced above said cylinder supporting the lower surface of a bale above the projections,  
 scarifying roll means mounted beneath said grid bars having a plurality of scarifying lugs extending upwardly between said grid bars and projecting therebeyond a predetermined distance with successive of said stations having an increased predetermined distance,  
 bale reciprocating means for moving a bale back and forth across said station in a direction longitudinally of said grid bars and in contact therewith,  
 sensing means responsive to a predetermined maximum thickness of a bale less than the usual thickness of a bale as delivered to at least one of said stations,  
 bale advancing means responsive to said sensing means for simultaneously advancing a bale at each of said stations from a preceding to a succeeding station.

13. A textile fiber bale opener as claimed in claim 12, wherein said bale reciprocating means includes reciprocating conveyor means extending between each of said cylinders, and wherein bale output sensing means are provided following the last of said conveyor means in said plurality of bale opening stations, said advancing means being responsive to said bale output sensing means to advance a bale from said last conveyor means.

14. A textile fiber bale opener as claimed in claim 13, further including loading conveyor means in advance of the first of said reciprocating conveyor means of said plurality of bale opening stations, and sensing means responsive to the bale condition at one of said stations for advancing said loading conveyor means to load a bale on said first reciprocating conveyor.

## References Cited

## UNITED STATES PATENTS

|           |        |                   |          |
|-----------|--------|-------------------|----------|
| 2,938,239 | 5/1960 | Leineweber et al. | 19—80    |
| 3,141,199 | 7/1964 | Hilt et al.       | 19—145.5 |
| 3,208,106 | 5/1965 | Leineweber et al. | 19—80    |
| 3,251,096 | 5/1966 | Rapp              | 19—80    |

## FOREIGN PATENTS

|           |        |                |
|-----------|--------|----------------|
| 1,334,207 | 6/1963 | France.        |
| 121,365   | 4/1958 | U.S.S.R.       |
| 838,793   | 6/1960 | Great Britain. |

DORSEY NEWTON, *Primary Examiner.*

UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,381,341

May 7, 1968

Louis Platt et al.

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

Column 2, line 23, cancel "a plurality of horizontal spaced grid bars" and insert -- and a pair of conveyor belts 32, 34 positioned. Column 6, line 49, cancel "said", first occurrence; line 52, before "one" insert -- said --.

Signed and sealed this 30th day of September 1969.

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

WILLIAM E. SCHUYLER, JR.

Commissioner of Patents