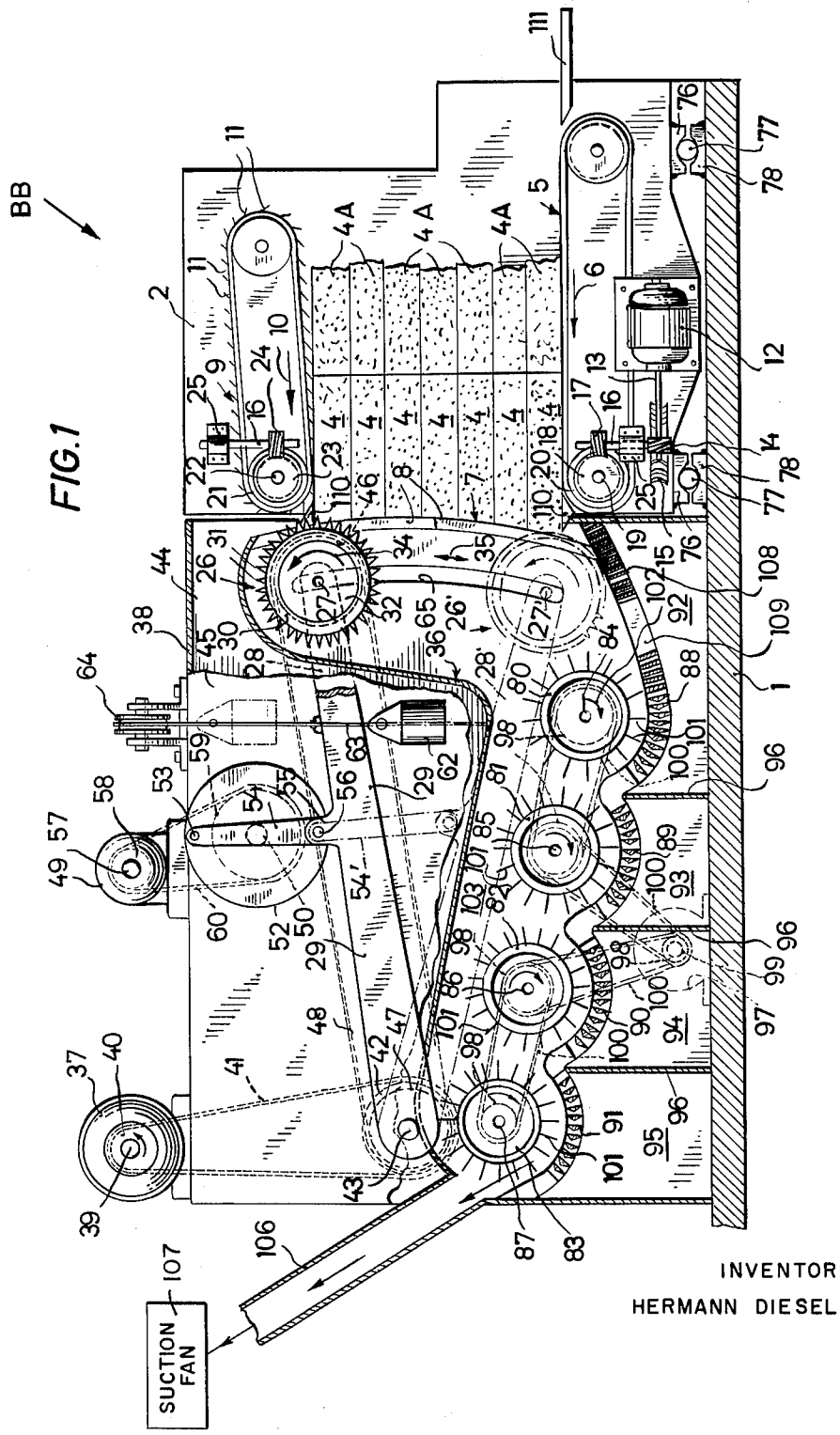
March 15, 1966 H. DIESEL 3,239,888

APPARATUS FOR BREAKING AND TEASING COMPRESSED FIBROUS MATERIAL

Original Filed March 16, 1961 2 Sheets-Sheet 1

FIG. 1



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APPARATUS FOR BREAKING AND TEASING COMPRESSED FIBROUS MATERIAL

Original Filed March 16, 1961 2 Sheets-Sheet 2

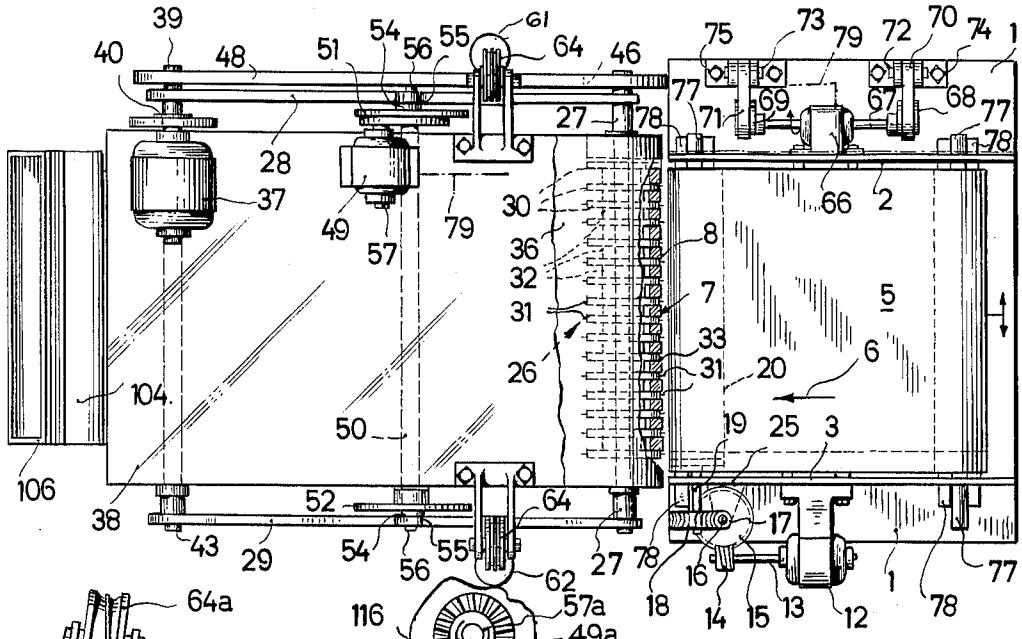


FIG. 2

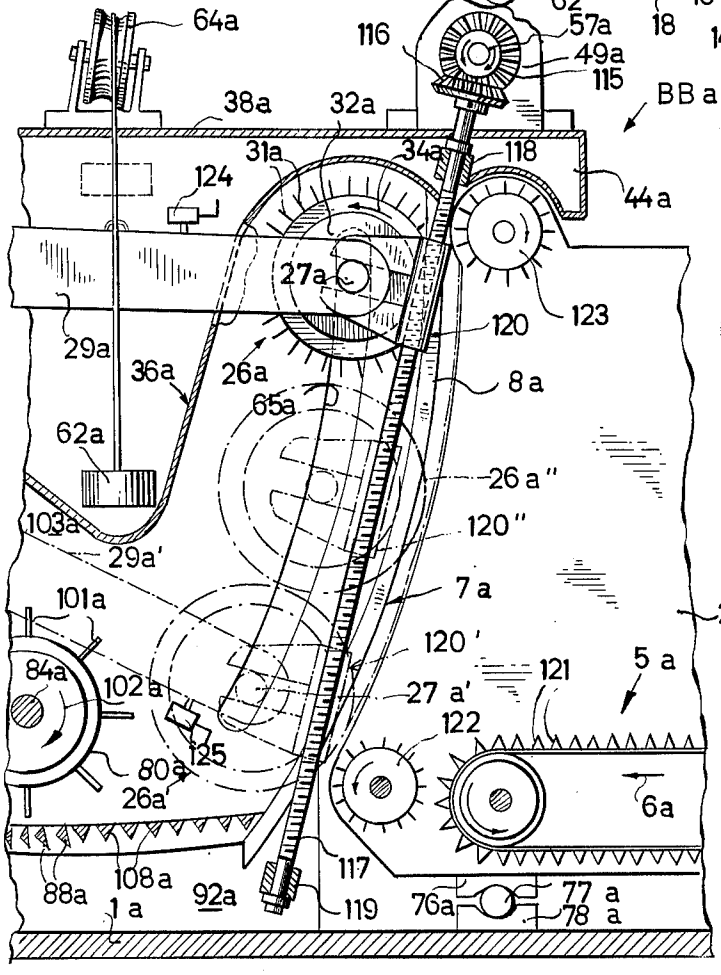


FIG. 3

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APPARATUS FOR BREAKING AND TEASING COMPRESSED FIBROUS MATERIAL

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Original application Mar. 16, 1961, Ser. No. 96,221, now Patent No. 3,139,650, dated July 7, 1964. Divided and this application Oct. 17, 1962, Ser. No. 231,253
22 Claims. (Cl. 19—80)

This application is a division of my copending application Serial No. 96,221, filed March 16, 1961, now Patent No. 3,139,650, entitled "Process and Apparatus for Breaking and Teasing Compressed Fibrous Material."

The present invention relates to an apparatus for processing fibrous materials, and more particularly to an apparatus for breaking and teasing packages in the form of stacked cotton slabs or raw cotton bales in a continuous operation. Still more particularly, the invention relates to an apparatus wherein the breaking of compressed packages occurs simultaneously with a thorough mixing of tufts prior to and during the teasing operation.

An important object of the present invention is to provide an apparatus which is capable of consecutively breaking raw cotton bales or cotton slabs in a continuous operation.

Another object of the invention is to provide a bale or slab breaker which is constructed and assembled in such a way that the compressed fibrous material is uniformly reduced to tufts and that the formation of large tufts is effectively prevented at all times.

A further object of the invention is to provide an apparatus of the above outlined characteristics wherein the tufts removed from one or more compressed packages of fibrous material may be subjected to a series of teasing, mixing and cleaning actions in a fully automatic way.

A concomitant object of the invention is to provide an apparatus of the above described type which is constructed and assembled in such a way that various impurities contained in the packages are automatically sorted and separated while the fibrous material advances from the intake to the discharge end of the apparatus.

The improved apparatus comprises a plucking roller, means for rotating and for reciprocating the roller in a predetermined path at one side of a slotted grid in such a way that the teeth of the roller extend at least slightly through the slots and to the other side of the grid, and means for advancing the package consisting of stacked slabs or one or more bales of fibrous material toward the other side of the grid and into the range of the revolving teeth so that the teeth remove tufts of fibrous material from the package and entrain the tufts through the slots of and to that side of the grid at which the plucking roller is located. The roller is preferably mounted in a suitable housing which accommodates one or more teasing rollers and defines a tuft duct wherein a current of air, produced by a suction pump or by a fan, insures that the finely divided tufts of fibrous material are continuously withdrawn from the housing.

Certain other features of the improved apparatus reside in the provision of specific means for reciprocating the plucking roller, in the provision of grates and one or more magnets which separate the impurities from the mixture of tufted fibrous material, in the provision of specially constructed means for reciprocating the package or packages in directions substantially at right angles to the direction of their advance into the path of the plucking roller, in the provision of means for properly guiding and supporting consecutive packages during their advance toward and into the path of the plucking roller, in the provision of a drive for rotating the teasing rollers at

different speeds, and in the provision of specially constructed and mounted supporting arms for the plucking roller which enable the latter to simultaneously perform a rotary and a reciprocatory movement with respect to the grid.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following detailed description of certain specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a somewhat schematic side elevational and partly sectional view of a bale or slab breaking, mixing and teasing apparatus embodying one form of my invention;

FIG. 2 is a smaller-scale top plan view of the apparatus with certain parts omitted and with certain parts broken away for the sake of clarity; and

FIG. 3 is an enlarged fragmentary side elevational and partly sectional view of a modified apparatus.

Referring now in greater detail to the illustrated embodiments, and first to FIGS. 1 and 2, there is shown a bale or slab breaking apparatus BB comprising a frame including a base plate 1 and two side walls 2, 3 which define between themselves a space through which a package consisting of one or more bales or several slabs 4 of compressed fibrous material may be introduced onto an endless lower belt or chain conveyor 5. As is known, such slabs are formed by cutting or slicing a compressed bale into several plate-like sections. The upper run of this conveyor 5 is driven anticlockwise to advance the compressed fibrous material in the direction indicated by the arrow 6 toward the convex side of an arcuate grid 7 consisting of spaced substantially vertically arranged arcuate bars 8. The upper side of the uppermost slab 4 is engaged by the lower run of a second endless conveyor 9 which moves in clockwise direction as is indicated by the arrow 10. The apron of the upper conveyor 9 is inclined downwardly and forwardly, as seen in the direction in which the stack of compressed fibrous material 4 is advanced, and this apron is provided with a plurality of forwardly inclined spikes 11 which penetrate into the uppermost slab 4 and help to advance the entire stack of slabs in a direction to the left, as viewed in FIG. 1. The downwardly inclined lower run of the conveyor 9 preferably at least slightly compresses the package of stacked slabs 4 as they advance endwise toward the outer or right-hand side of the grid 7.

The means for driving the conveyors 5 and 9 comprises an electric motor 12 which is secured to the wall 3 and whose shaft 13 carries a worm 14 meshing with a worm wheel 15 mounted on a vertical drive shaft 16. This shaft 16 carries a lower worm 17 which meshes with a worm wheel 18, and the latter is coaxially mounted on the horizontal shaft 19 of the front sprocket 20 forming part of the lower conveyor 5. The front sprocket 21 of the upper conveyor 9 is mounted on a horizontal shaft 22 and is driven by a worm wheel 23 which is also mounted on the shaft 22 and which meshes with an upper worm 24 on the drive shaft 16. The shaft 16 is rotatably mounted in two or more spaced bearings 25 which are secured to the wall 3. It will be readily understood that the worm drives 17, 18 and 23, 24 may be replaced by a system of bevel gears or by a pair of V-belt drives, if desired.

The means for breaking the slats 4 into tufts comprises a plucking roller 26 whose horizontal shaft 27 is rotatably mounted in the right-hand ends of two elongated arms 28, 29. The plucking roller 26 is a composite structure consisting of uniformly spaced plucking wheels 30 which are provided with teeth 31, and of spacer elements

in the form of disks 32 which alternate with the wheels 30. The teeth 31 of each wheel 30 project through and beyond one of the substantially vertical slots 33 formed between the adjacent bars 8 of the grid 7 to engage the left-hand faces of the slabs 4 when the roller 26 rotates about the axis of the shaft 27 in the anticlockwise direction indicated by the arrow 34 and when this roller is reciprocated in a predetermined path located in a substantially vertical plane in directions indicated by the double-headed arrow 35. The roller 26 is received in a housing 36 which is supported by the base plate 1 and whose open right-hand or intake end extends to the grid 7. The width of the slots 33 preferably equals the width of the bars 8.

The means for rotating the roller 26 in the direction indicated by the arrow 34 comprises an electric motor 37 which is mounted on a platform 38 located above the housing 36 and whose shaft 39 carries a driver pulley 40 which latter, through a V-belt 41, rotates a driven pulley 42 mounted on a horizontal shaft 43 which is journalled in a pair of upright supporting walls 44, 45 for the platform 38, these walls being secured to the base plate 1 and preferably constituting the lateral walls of the housing 36. The roller shaft 27 carries a driven pulley 46 which is rotated by a V-belt 48 driven by a driver pulley 47 mounted on the shaft 43. The pulleys 40, 42, 46, 47 and the V-belts 41, 48 may be respectively replaced by sprockets and chains, if desired.

The left-hand ends of the arms 28, 29 are pivotably mounted on the shaft 43 and are rockable in directions indicated by the double-headed arrow 35 by means of a reversible electric motor 49 which is mounted on the platform 38 and which drives a horizontal shaft 50 mounted in the walls 44, 45 and drivingly connected with two crank-wheels or disks 51, 52 disposed externally of the walls 44, 45, respectively. Each disk is provided with an eccentric pin 53 for one end of a link 54 whose other end is pivoted to a bracket 55 of the respective arm by a pin 56. The driving connection between the shaft 57 of the motor. 49 and the shaft 50 comprises a driver pulley 58, a driven pulley 59 and a V-belt 60. The arms 28, 29 are respectively connected with counterweights 61, 62 whose cables 63 pass over sheaves 64 mounted on the platform 38. The arms 28, 29 are located externally of the housing 36, and the roller shaft 27 extends through arcuate slots 65 (only one shown in FIG. 1) which are provided in the supporting walls 44, 45 and whose center of curvature coincides with the axis of the arm shaft 43. When the motor 49 rotates, the arms 28, 29 reciprocate the roller 26 in its path at the left-hand side of the grid 7.

In order to insure uniform removal of fibrous material from the left-hand end faces of the slabs 4, the apparatus BB comprises means for reciprocating the slabs in a horizontal plane and in a direction enclosing right angles with the direction of the arrow 6 and with the longitudinal direction of the slots 33. The means for bringing about such transverse reciprocatory movements of the slabs 4 may assume a number of forms and, in the embodiment of FIGS. 1 and 2, includes an electric motor 66 which is mounted at the outer side of the wall 2 and whose shaft 67 carries two eccentrics 68, 69. The straps 70, 71 of these eccentrics are pivotable about a pair of coaxial journals 72, 73 mounted in bearings 74, 75 which are fixed to the base plate 1. The undersides of the walls 2, 3 are provided with bearings 76 which are movable along transversely extending guide rails 77 mounted on bearings 78 carried by the base plate 1. The stroke of the eccentrics 68, 69 is selected in such a way that, when the shaft 67 is turned through 180 degrees, the slabs 4 are shifted transversely of the grid 7 through a distance equal to the width of the slots 33 so that the roller 26 will remove a complete layer of fibrous material from the left-hand end face of each slab during each complete revolution of the shaft 67. The motor 66 is operated intermittently, i.e., it is arrested during the movement of the roller 26 in directions indicated by the arrow 35 and is set in motion when the roller 26 reaches the upper or the lower end of its stroke. It is preferred to provide an operative connection between the motors 49 and 66 to insure that the reciprocatory movements of the roller 26 and the intermittent rotary movements of the shaft 67 are synchronized. The exact construction of this operative connection (indicated by the phantom line 79 in FIG. 2) forms no part of the present invention.

It will be seen that the walls 2, 3 and the conveyors 5, 9 form a transversely reciprocable unit which causes a preferably intermittent forward movement of the slabs 4 in the direction of the arrow 6 and preferably intermittent transverse movements of the slabs with respect to the stationary grid 7 to insure uniform breaking of the slabs by the teeth of the revolving and reciprocating roller 26 when the apparatus is in actual use. Of course, it is equally possible to fix the side walls 2, 3 to the base plate 1 and to provide means for reciprocating the conveyors 5 and 9 with respect to the fixed side walls. The unit may be further simplified by omitting the upper conveyor 9 in its entirely or by replacing this conveyor by a forwardly and downwardly inclined baffle plate which then performs the function of the lower run of the conveyor 9 and which may be biased into requisite compressive engagement with the uppermost slab 4.

The tufts of fibrous material removed from the slabs 4 and entrained through the slots 33 by the teeth 31 of the roller 26 are hurled against the adjacent transversely extending wall portion of the housing 36 and descend in this housing to be engaged by the first of a series of teasing rollers or pin wheels 80–83 which are mounted on transversely extending parallel shafts 84–87, the latter rotatably supported by the walls, 44, 45. These teasing rollers are respectively located above the grates 88–91 which form slotted covers for four receptacles or waste boxes 92–95 formed between the base plate 1 and the walls 44, 45 and separated from each other by partitions 96. The means for driving the teasing rollers 80–83 comprises an electric motor 97 mounted on the base plate 1, suitable pulleys or sprockets 98 on the motor shaft 99 and on the shafts 84–87, and a plurality of V-belts 100 which drivingly connect the pulleys 98 with each other in a manner plainly illustrated in FIG. 1. This illustration also shows that the rollers 80–83 are driven at different speeds, i.e., that the r.p.m. of the roller 81 is less than the r.p.m. of the roller 82 but more than the r.p.m. of the roller 80, and that the r.p.m. of the roller 83 is more than the r.p.m. of the other rollers. Furthermore, the number and density of substantially radial teasing pins 101 on the roller 81 is preferably more than the number of pins on the roller 80 but less than the number of pins on the roller 82, and the number and density of pins on the roller 83 is preferably more than the number of pins on each of the other rollers. All teasing rollers are assumed to rotate continuously in clockwise direction as is indicated by the arrows 102. The grates 88–91 and the top wall of the housing 36 define between themselves a tuft duct 103 which accommodates the rollers 80–83 and which extends from the enlarged compartment for the plucking roller 26 (i.e. from the grate 7) to the discharge end 104 of the housing 36. This discharge end is connected to a suction duct 106. The negative pressure in this suction duct 106 is produced by a suction fan 107 in known manner and prevents the escape of fly dust and impurities from the housing 36 into the surrounding atmosphere. As shown in FIG. 1, the tuft duct 103 is preferably inclined upwardly in a direction from the grid 7 toward the suction duct 106.

The right-hand receptacle 92 is covered in part by the grate 88 and in part by a grate 108 which preferably extends all the way to and eventually beyond the grid 7 and which accommodates between its parallel bars one or more magnets 109 adapted to collect particles of ferrous material which might be contained in the tufts separated by the teeth 31.

Externally adjacent to the grid **7**, there is provided a pair of guide members in the form of wedges **110** which are secured to the walls **44**, **45** and extend transversely across the space for the slabs **4**. These wedges guide the front ends of the slabs and prevent the slabs from becoming displaced by the teeth **31** when the apparatus BB is in actual use. A fixed supporting plate **111** may be provided at the intake end of the apparatus to facilitate the movement of slabs **4** onto the lower conveyor **5**.

The apparatus of FIGS. 1 and 2 is operated as follows:

In the first step, layers or slabs **4** of requisite thickness are cut from different bales whose material is to be mixed, and the slabs **4** are stacked on the supporting plate **111** to build up a stack preferably assuming the shape of a parallelepiped block or a cube. Though it is preferred to arrange the slabs **4** in horizontal planes, the apparatus will operate with equal effectiveness if the slabs are disposed in vertical planes. The lowermost slab **4** is then engaged by the conveyor **5** and is advanced in the direction of the arrow **6** toward the convex outer side of the grid **7**. Once the front faces of the slabs **4** are advanced into the range of the teeth **31**, the operation of the conveyors **5**, **9** may become intermittent so that they advance the stack to the left, as viewed in FIG. 1, after the plucking roller **26** completes a stroke in upward and a subsequent stroke in downward direction, or vice versa, i.e., after the roller **26** removes a complete layer from the front faces of the slabs **4**. In order to synchronize the operation of the motor **12** with the operation of the reversible motor **49**, there may be provided an operative connection between these motors so that the movements of the slabs **4** in forward direction and the reciprocatory movements of the plucking roller **26** take place in a predetermined rhythm, e.g., simultaneously.

Before the stack of slabs **4** is consumed, the operator or operators may move a second stack of slabs **4A** into abutment with the rear end faces of the slabs **4** so that the operation of the apparatus BB need not be interrupted when the slabs **4** are consumed, and also that the remnants of the slabs **4** are completely broken up by the teeth **31** before the roller **26** engages the front end faces of the slabs **4A**. In other words, the provision of the conveyors **5**, **9** and of the wedges **110** renders it possible to completely break a stack or package and also to immediately advance a next stack of slabs **4A** into position to be engaged by the teeth **31** so that the feeding of stacks may be continued for any desired length of time. Furthermore, the guide means **111**, **5**, **9** and **110** for the stacks of cotton slabs render it possible to change the mixture of cotton tufts at will merely by cutting slabs from different types of bales and by stacking the slabs onto the plate **11** prior to the introduction into the space between the conveyors **5** and **9**.

The purpose of the grid **7** is to prevent breaking of large tufts from the stack of slabs **4** or **4A**. Even if a large batch is torn from a stack supported on the conveyor **5**, the bars **8** of the grid prevent the transfer of such large batches from the right-hand side, through the slots **33** and to the left-hand side of the grid **7**, so that each batch must be comminuted prior to its entry into the housing **36**. It is usually preferred to arrange the roller **26** in such a way that the length of the teeth **31** projecting through and beyond the slots **33** equals between one-sixth and one-third of the total tooth length. In fact, it is not necessary to advance the front end faces of the slabs **4** all the way into abutment with the grid **7** as long as the length of the teeth **31** is sufficient to engage the slabs even if they are somewhat spaced from the grid, In such instances, the grid again constitutes a barrier for large batches of fibrous material though it is not in actual abutment with the slabs. For example, the length of the teeth **31** may be selected in such a way that only about one-third to one-sixth of their portions projecting beyond the grate **7** comes into actual engagement with the slabs **4** so that there develops a gap between the slabs and the grid whose width may equal a multiple of the thickness of a layer removed from the stack during two successive strokes of the roller **26**.

As stated before, the motor **66** reciprocates the conveyors **5**, **9** in a predetermined rhythm so that, provided the plucking roller **26** has just reached its uppermost position which is shown in full lines in FIG. 1, the motor **66** is started to rapidly turn the eccentrics **68**, **69** through 180 degrees with respect the position of FIG. 2 whereby the stack of slabs **4** is moved downwardly, as viewed in FIG. 2, through a distance equal to the width of the slots **33**. Thus, during the subsequent stroke of the roller **26** to its phantom-line position **26'** of FIG. 1, the teeth **31** engage such portions of the slabs **4** which were aligned with the bars **8** during the preceding (upward) stroke of the roller **26**. To bring about a downward stroke of the roller **26** to the position **26'**, the motor **49** turns the shaft **50** and the disks **51**, **52** through 180 degrees in order to move the links **54** to the phantom-line position **54'** whereby the roller shaft **27** assumes the position **27'** which corresponds to the phantom-line position **28'** of the arm **28**. The operation of the motor **37** which rotates the roller **26** need not be interrupted when the roller reaches the upper or the lower end of its stroke.

The impurities including non-ferrous and/or ferrous particles which might have been contained in the slabs **4** or **4A** drop onto and through the grate **108** to be collected in the receptacle **92**. Any ferrous particles which are too light or too bulky so that they do not or cannot pass through the spaces between the bars of the comparatively coarse grate **108** are collected by the magnet or magnets **109** before advancing into the range of the first teasing roller **80**. This roller further comminutes and further mixes the tufts removed from the slabs by the roller **26**, and any impurities contained in the tufts are free to pass through the grate **88** to be collected in the left-hand portion of the receptacle **92**. It will be readily understood that the receptacle **92** may be subdivided into two chambers, one for particles passing through the grate **108** and the other for particles separated from the tufts by the pins **101** of the roller **80**. The teasing and mixing of the tufts is then continued as the tufts pass through the duct **103** toward the suction duct **106**, i.e., the tufts are consecutively engaged by the pins of the continuously revolving rollers **81**, **82**, **83** and any impurities exposed by the pins **101** are free to pass through the grates **89**, **90** and **91** to be respectively collected in the receptacles **93**, **94** and **95**. The intensity of the current of air produced by the suction fan **107** connected to the upper end of the suction duct **106** depends on the configuration of the housing **36** and on the number of apertures (including the arcuate slots **65**) in its walls. It is desirable that the vacuum produced in the housing **36** be sufficient to prevent escape of tufts, dust and/or impurities from the duct **103** and to insure that the current of air flowing toward the suction duct **106** is sufficient for proper intake, dust extraction and further advance of the tuft material.

FIG. 3 illustrates a slightly modified apparatus BB*a* wherein all parts identical with or analogous to those described in connection with FIGS. 1 and 2 are denoted by the same reference numerals followed by the letter *a*. Such parts will be described only insofar as is necessary for better understanding of the manner in which the modified apparatus performs its functions. The means for rotating the plucking roller **26***a* has been omitted for the sake of clarity and, while the front wall of the housing **36***a* is broken away, the front arm **29***a* is shown to facilitate the understanding of the modified arrangement which reciprocates the roller **26***a* between its full-line position at the upper end of its stroke and its phantom-line position **26***a'*, the latter corresponding to the phantom-line positions **27***a'*, **29***a'* of the roller shaft **27***a* and of the arm **29***a*, respectively. FIG. 3 further shows an intermediate

position of the roller **26***a* which is identified by the reference numeral **26***a''*.

The shaft **57***a* of the reversible motor **49***a* is rigid with a bevel gear **115** which meshes with a second bevel gear **116** mounted at the upper end of an inclined spindle **117** which is rotatable in two bearings **118, 119** carried by the front upright wall (not shown) of the housing **36***a*. The threads of the spindle **117** mesh with the internal threads of a forked motion transmitting element **120** whose prongs define an open recess for the end portion of the shaft **27***a* whereby, when the spindle **117** is driven in a direction to move the element **120** toward and beyond its intermediate position **120''** to the end position **120'**, the roller **26***a* is also moved to its lower end position **26***a'*. The movement of the roller **26***a* is reversed when the spindle **117** is rotated in the opposite direction. The arm **29***a* and its companion arm (not shown) merely serve as a means for properly supporting the shaft **27***a* in the slots **65***a* and for insuring smooth operation of the motor **49***a*, such smooth operating being enhanced by the provision of the counterweights (only the counterweight **62***a* shown) which compensate for the weight of the arms. It is preferred to provide two spindles **117** and two motion transmitting elements **120**, one at each end of the roller shaft **27***a*.

The modified apparatus BB*a* comprises a single endless belt or chain conveyor **5***a* whose apron is provided with spikes **121** to engage the lowermost slab of a package (not shown) and to advance the slabs toward the grid **7***a*. Adjacent to the outer side of this grid, there is provided a pair of spiked guide rollers **122, 123** which replace the wedges **110** and which properly retain the package during the reciprocation of the plucking roller **26***a*. The means for driving the spiked rollers **122, 123** at predetermined intervals may be coupled with the motor of the conveyor **5***a*.

The grates **88***a*, **108***a* may consist of a magnetic material so that the magnet or magnets **109** may be dispensed with. The grates of the apparatus BB or BB*a* are preferably adjustable, i.e. they may be formed with removable bars in order that an operator may readily change the spacing between the adjacent grate bars by inserting differently dimensioned and/or configurated bars, or the individual bars of each grate may be movable toward and away from each other to change the spacing therebetween and to insure that impurities up to a given size may drop into the respective receptacles.

The arm **29***a* operates an upper limit switch **124** when the roller **26***a* reaches the upper end of its stroke, and this switch is operatively connected with and reverses the motor **49***a* in order to start the motion transmitting element **120** in downward direction. A suitable time-lag relay may be installed in the connection between the switch **124** and the motor **49***a*. A second limit switch **125** is adjacent to and is operated by the arm **29***a* when the latter reaches the lowermost position **29***a'*; the switch **125** reverses the motor **49***a* to start the element **120** and the roller **26***a* in upward direction.

The plucking roller **26** or **26***a* is driven in anti-clockwise direction (i.e. in a direction to loosen and to mix the tufts in the right-hand compartment of the housing **36** or **36***a* before the tufts reach the first teasing roller **80** or **80***a*) in order to prevent a clogging of the housing at a point adjacent to the grid **7** or **7***a* and eventual interference with the reciprocatory movements of the plucking roller. The motor **49** or **49***a* which reciprocates the roller **26** or **26***a* may be arrested in a fully automatic way in response to impulses produced by a control element (not shown).

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic and specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. An apparatus for breaking packages of compressed fibrous material which comprises, in combination, a toothed plucking roller; means for rotating said roller; means for reciprocating said roller in a predetermined direction along a predetermined path; means for consecutively advancing packages of fibrous material endwise into said path whereby the teeth of said roller remove tufts of fibrous material from the front end faces of the packages and for reciprocating said packages during advancing thereof in a direction different from said predetermined direction of reciprocation of said roller; and retaining means located adjacent said path and defining at least one opening through which the teeth of said plucking roller project into plucking contact with said front end faces of said packages.

2. An apparatus for consecutively breaking stacked slabs of compressed fibrous material which comprises, in combination, a toothed plucking roller having a substantially horizontal axis of rotation; means for continuously rotating said roller about said axis; means for reciprocating said roller in a substantially vertical path; elongated stationary supporting means leading to said vertical path in a direction substantially normal thereto for supporting the stacked slabs to be broken up; and transporting means engaging the supported slabs and positively moving them on said elongated supporting means into said path whereby the teeth of said roller remove tufts of fibrous material from the slabs.

3. An apparatus for consecutively breaking stacked slabs of compressed fibrous material which comprises, in combination, a plucking roller comprising a plurality of toothed wheels and spacer elements between said wheels; means for rotating said roller; means for reciprocating said roller in a predetermined direction along a predetermined path; means for advancing stacked slabs into the range of said teeth whereby the teeth remove tufts of fibrous material from the slabs and for reciprocating said stacked slabs during advancing thereof in a direction different from said predetermined path of reciprocation of said roller; and retaining means located adjacent said path and defining at least one opening through which the teeth of said plucking roller project into plucking contact with said front end faces of said packages.

4. An apparatus for consecutively breaking stacked slabs of compressed fibrous material which comprises, in combination, retaining means defining at least one opening; a plucking roller having teeth projecting through said opening; means for rotating said roller; means for reciprocating said roller in a predetermined direction along a predetermined path, said retaining means being located adjacent said path and the teeth of said plucking roller projecting into plucking contact with the front end faces of said slabs; elongated stationary supporting means leading to said predetermined path in a direction substantially normal thereto for supporting the stacked slabs to be broken up; and transporting means engaging the supported slabs and positively moving them on said elongated supporting means toward said predetermined path and into the range of said teeth whereby the teeth remove tufts of fibrous material and entrain the tufts through said opening and to the one side of said grid.

5. An apparatus for consecutively breaking packages of compressed fibrous material which comprises, in combination, a grid formed with a plurality of parallel slots; a plucking roller disposed at one side of said grid and having teeth projecting through said slots and at least slightly to the other side of said grid; means for rotating said roller; means for reciprocating said roller in a predetermined path adjacent to said one side in such a way that the teeth of said roller continuously project to said

other side; and means for consecutively advancing packages of fibrous material toward said other side and into the range of said teeth whereby the teeth remove tufts of fibrous material and entrain the tufts through said slots and to said one side of the grid and for reciprocating the packages transversely of said path through distances substantially equal to the spacing between said slots.

6. An apparatus for consecutively breaking stacked slabs of compressed fibrous material which comprises, in combination, a housing having an open end; a grid provided at said open end and formed with a plurality of parallel slots; a plucking roller disposed in said housing adjacent to said grid and having teeth projecting through and at least slightly beyond said slots; means for rotating said roller; means for reciprocating said roller in said housing in a predetermined path adjacent to said grid in such a way that the teeth of said roller continuously project through said slots; and means located externally of said housing for advancing stacked slabs toward said grid and into the range of said teeth whereby said teeth remove tufts of fibrous material from the portions of slabs adjacent to said slots and for reciprocating the slabs transversely of said path through distances substantially equal to the width of said slots to move different portions of the slabs into the range of said teeth.

7. An apparatus for consecutively breaking packages consisting of compressed fibrous material which comprises, in combination, a housing having an open intake end and a discharge end; a grid mounted in said intake end and comprising a plurality of spaced bars defining a plurality of parallel slots; a plucking roller disposed in said housing adjacent to said grid, said roller comprising a plurality of teeth projecting through and at least slightly beyond said slots; means drivingly connected with said roller for rotating the same; means for reciprocating said roller in the longitudinal direction of said slots in such a way that the teeth of said roller project through the respective slots during the reciprocatory movements of said roller; means located externally of said housing for consecutively advancing packages of compressed fibrous material toward said grid and into the range of said teeth whereby the teeth remove tufts of said fibrous material from the foremost package and entrain the tufts through said slots and into said housing and for reciprocating said packages in directions at right angles to the longitudinal direction of said slots; a plurality of teasing rollers in said housing for comminuting and mixing the tufts removed by the teeth of said plucking roller; and means for producing a current of air in said housing in a direction toward said discharge end for withdrawing the tufts from said housing.

8. An apparatus for consecutively breaking packages consisting of compressed fibrous material which comprises, in combination, a housing having an open intake end and a discharge end and defining a tuft duct extending from said intake end toward said discharge end; a grid mounted in said intake end and comprising a plurality of spaced bars defining a plurality of parallel slots; a plucking roller disposed in said housing adjacent to said grid, said roller comprising a plurality of teeth projecting through and at least slightly beyond said slots; means drivingly connected with said roller for rotating the same; means for reciprocating said roller in the longitudinal direction of said slots in such a way that the teeth of said roller project through the respective slots during the reciprocatory movements of said roller; means located externally of said housing for consecutively advancing packages of compressed fibrous material toward said grid and into the range of said teeth whereby the teeth remove tufts of said fibrous material from the foremost package and entrain the tufts through said slots and into said housing and for reciprocating said packages in directions at right angles to the longitudinal direction of said slots; a plurality of parallel teasing rollers in said housing for comminuting and mixing the tufts removed by the teeth of said plucking roller, said teasing rollers extending transversely of said duct and each comprising a plurality of pins for engaging the tufts, the number of pins on each teasing roller closer to said discharge end exceeding the number of pins on each teasing roller closer to said intake end; means for rotating said teasing rollers; and means for producing a current of air in said housing in a direction toward said discharge end for withdrawing the tufts from said housing.

9. An apparatus for consecutively breaking packages consisting of compressed fibrous material which comprises, in combination, a housing having an open intake end and a discharge end and defining a tuft duct extending from said intake end toward said discharge end; a grid mounted in said intake end and comprising a plurality of spaced bars defining a plurality of parallel slots; a plucking roller disposed in said housing adjacent to said grid, said roller comprising a plurality of teeth projecting through and at least slightly beyond said slots; means drivingly connected with said roller for rotating the same; means for reciprocating said roller in the longitudinal direction of said slots in such a way that the teeth of said roller project through the respective slots during the reciprocatory movements of said roller; means located externally of said housing for consecutively advancing packages of compressed fibrous material toward said grid and into the range of said teeth whereby the teeth remove tufts of said fibrous material from the foremost package and entrain the tufts through said slots and into said housing and for reciprocating said packages in directions at right angles to the longitudinal direction of said slots; a plurality of parallel teasing rollers in said housing for comminuting and mixing the tufts removed by the teeth of said plucking roller, said teasing rollers extending transversely of said duct; means for rotating said teasing rollers at different speeds so that the speed of each teasing roller closer to said discharge end exceeds the speed of each teasing roller closer to said intake end; and means for producing a current of air in said housing in a direction toward said discharge end for withdrawing the tufts from said housing.

10. An apparatus for consecutively breaking packages consisting of compressed fibrous material which comprises, in combination, a housing having an open intake end and a discharge end; a grid mounted in said intake end and comprising a plurailty of spaced bars defining a plurality of parallel slots, the width of said slots at least approximating the width of said bars; a plucking roller disposed in said housing adjacent to said grid, said roller comprising a plurality of teeth projecting through and at least slightly beyond said slots; means drivingly connected with said roller for rotating the same; means for reciprocating said roller in the longitudinal direction of said slots in such a way that the teeth of said roller project through the respective slots during the reciprocatory movements of said roller; means located externally of said housing for consecutively advancing packages of compressed fibrous material toward said grid and into the range of said teeth whereby the teeth remove tufts of said fibrous material from the foremost package and entrain the tufts through said slots and into said housing and for reciprocating said packages in directions at right angles to the longitudinal direction of said slots and through distances at least approximating the width of said bars; a plurality of teasing rollers in said housing for comminuting and mixing the tufts removed by the teeth of said plucking roller; and means for producing a current of air in said housing in a direction toward said discharge end for withdrawing the tufts from said housing.

11. An apparatus for consecutively breaking packages consisting of compressed fibrous material which comprises, in combination, a housing having a forward open intake end and a rearward discharge end; a grid mounted in said intake end and comprising a plurality of spaced bars defining a plurality of parallel slots; a plucking roller disposed in said housing adjacent to said grid, said roller

comprising a plurality of teeth projecting through and at least slightly beyond said slots; means drivingly connected with said roller for rotating the same; means for reciprocating said roller in the longitudinal direction of said slots in such a way that the teeth of said roller project through the respective slots during the reciprocatory movements of said roller; means located forwardly of said intake end for consecutively advancing packages of compressed fibrous material toward said grid and into the range of said teeth whereby the teeth remove tufts of said fibrous material from the foremost package and entrain the tufts through said slots and for reciprocating said packages in directions at right angles to the longitudinal direction of said slots said means comprising a pair of toothed rotary guide rollers adjacent said grid for consecutively guiding the packages toward the teeth of said plucking roller and conveyer for advancing the packages toward said guide rollers; a plurality of teasing rollers in said housing for comminuting and mixing the tufts removed by the teeth of said plucking roller; and means for producing a current of air in said housing in a direction toward said discharge end for withdrawing the tufts from said housing.

12. An apparatus for consecutively breaking packages consisting of compressed fibrous material which comprises, in combination, a housing having a forward open intake end and a rearward discharge end; a grid mounted in said intake end and comprising a plurality of spaced bars defining a plurality of parallel slots; a plucking roller disposed in said housing adjacent to said grid, said roller comprising a plurality of teeth projecting through and at least slightly beyond said slots; means drivingly connected with said roller for rotating the same; means for reciprocating said roller in the longitudinal direction of said slots in such a way that the teeth of said roller project through the respective slots during the reciprocatory movements of said roller; means located forwardly of said intake end for consecutively advancing packages of compressed fibrous material toward said grid and into the range of said teeth whereby the teeth remove tufts of said fibrous material from the foremost package and entrain the tufts through said slots, and for reciprocating said packages in directions at right angles to the longitudinal direction of said slots said means comprising a pair of toothed rotary rollers adjacent to said grid for consecutively guiding the packages toward the teeth of said plucking roller, and endless conveyer means comprising toothed apron means for advancing the packages toward said guide rollers; a plurality of teasing rollers in said housing for comminuting and mixing the tufts removed by the teeth of said plucking roller; and means for producing a current of air in said housing in a direction toward said discharge end for withdrawing the tufts from said housing.

13. An apparatus for consecutively breaking packages consisting of compressed fibrous material which comprises, in combination, a housing having an open intake end and a discharge end; a grid mounted in said intake end and comprising a plurality of spaced bars defining a plurality of parallel slots; a plucking roller disposed in said housing adjacent to said grid, said roller comprising a plurality of teeth projecting through and at least slightly beyond said slots; means drivingly connected with said roller for rotating the same; means for reciprocating said roller in the longitudinal direction of said slots in such a way that the teeth of said roller project through the respective slots during the reciprocatory movements of said roller; means located externally of said housing for consecutively advancing packages of compressed fibrous material toward said grid and into the range of said teeth whereby the teeth remove tufts of said fibrous material from the foremost package and entrain the tufts through said slots and into said housing, and for reciprocating said packages in directions at right angles to the longitudinal direction of said slots, said advancing means comprising a pair of spaced endless conveyors defining between themselves a space for consecutive packages, at least one of said conveyors having a run inclined with respect to the direction in which the packages advance for compressing the foremost package located in the range of the teeth of said plucking roller; means for reciprocating said advancing means and the packages in directions at right angles to the longitudinal direction of said slots; a plurality of teasing rollers in said housing for comminuting and mixing the tufts removed by the teeth of said plucking roller; and means for producing a current of air in said housing in a direction toward said discharge end for withdrawing the tufts from said housing.

14. An apparatus for consecutively breaking packages consisting of compressed fibrous material which comprises, in combination, a housing having an open intake end and a discharge end; a grid mounted in said intake end and comprising a plurality of spaced bars defining a plurality of parallel slots; a plucking roller disposed in said housing adjacent to said grid, said roller comprising a plurality of teeth projecting through and at least slightly beyond said slots; means drivingly connected with said roller for rotating the same; means for reciprocating said roller in the longitudinal direction of said slots in such a way that the teeth of said roller project through the respective slots during the reciprocatory movements of said roller; means located externally of said housing for consecutively advancing packages of compressed fibrous material toward said grid and into the range of said teeth whereby the teeth remove tufts of said fibrous material from the foremost package and entrain the tufts through said slots and into said housing, and for reciprocating said packages in directions at right angles to the longitudinal direction of said slots, said advancing means comprising a pair of spaced endless conveyors defining between themselves a space for consecutive packages, at least one of said conveyors having an apron formed with spikes for engaging and entraining the packages, and means for driving said conveyors in a direction to advance each package located in said space toward said grid; means for reciprocating said advancing means and the packages in directions at right angles to the longitudinal direction of said slots; a plurality of teasing rollers in said housing for comminuting and mixing the tufts removed by the teeth of said plucking roller; and means for producing a current of air in said housing in a direction toward said discharge end for withdrawing the tufts from said housing.

15. An apparatus for consecutively breaking packages consisting of compressed fibrous material which comprises, in combination, a housing having an open intake end and a discharge end; a grid mounted in said intake end and comprising a plurality of spaced bars defining a plurality of parallel slots; a plucking roller disposed in said housing adjacent to said grid, said roller comprising a shaft and a plurality of teeth projecting through and at least slightly beyond said slots; means drivingly connected with said roller for rotating the same; means for reciprocating said roller in the longitudinal direction of said slots in such a way that the teeth of said roller project through the respective slots during the reciprocatory movements of said roller, said reciprocating means comprising at least one threaded spindle, reversible motor means for alternately rotating said spindle in opposite directions, and motion transmitting means comprising an internally threaded element meshing with said spindle and engaging said shaft for alternately moving the roller in opposite directions in response to rotary movements of said spindle; means located externally of said housing for consecutively advancing packages of compressed fibrous material toward said grid and into the range of said teeth whereby the teeth remove tufts of said fibrous material from the foremost package and entrain the tufts through said slots and into said housing and for reciprocating said packages in directions at right angles to the longitudinal direction of said slots; a plurality of teasing

rollers in said housing for comminuting and mixing the tufts removed by the teeth of said plucking roller; and means for producing a current of air in said housing in a direction toward said discharge end for withdrawing the tufts from said housing.

16. An apparatus as set forth in claim 15, further comprising supporting arm means connected with said shaft, and limit switch means in the circuit of said reversing motor means, said switch means being located in the path of said arm means for reversing said motor means in response to predetermined strokes of said roller.

17. An apparatus for consecutively breaking packages consisting of compressed fibrous material which comprises, in combination, a housing having an open intake end and a discharge end; a grid mounted in said intake end and comprising a plurality of spaced bars defining a plurality of parallel slots; a plucking roller disposed in said housing adjacent to said grid, said roller comprising a shaft and a plurality of teeth projecting through and at least slightly beyond said slots; means for reciprocating said roller in the longitudinal direction of said slots in such a way that the teeth of said roller project through the respective slots during the reciprocatory movements of said roller, said reciprocating means comprising a pair of rockable arms having ends connected with said shaft, a motor, crankwheels driven by said motor, and links eccentrically connected with said crankwheels and articulately connected with said arms for rocking the same and for thereby reciprocating said shaft and said roller; means for rotating said roller; means located externally of said housing for consecutively advancing packages of compressed fibrous material toward said grid and into the range of said teeth whereby the teeth remove tufts from the foremost package and entrain the tufts through said slots and into said housing and for reciprocating the packages in directions at right angles to the longitudinal directions of said slots; a plurality of teasing rollers in said housing for comminuting and mixing the tufts removed by the teeth of said plucking roller; and means for producing a current of air in said housing in a direction toward said discharge end for withdrawing the tufts from said housing.

18. An apparatus for consecutively breaking packages consisting of compressed fibrous material which comprises, in combination, a housing having an open intake end and a discharge end; a grid mounted in said intake end and comprising a plurality of spaced bars defining a plurality of parallel slots; a plucking roller disposed in said housing adjacent to said grid, said roller comprising a shaft and a plurality of teeth projecting through and at least slightly beyond said slots; means for reciprocating said roller in the longitudinal direction of said slots in such a way that the teeth of said roller project through the respective slots during the reciprocatory movements of said roller, said reciprocating means comprising a second shaft mounted in said housing and parallel with said first mentioned shaft, a pair of supporting arms each rockably mounted on said second shaft and each having an end connected with said first mentioned shaft, a motor, crankwheels driven by said motor, and links eccentrically connected with said crankwheels and articulately connected with said arms for rocking the same about said second shaft and for thereby reciprocating said first mentioned shaft and said roller; means for rotating said roller, said rotating means comprising driver pulley means mounted on said second shaft, driven pulley means mounted on and connected with said first mentioned shaft, belt means drivingly connecting said driven pulley means with said driver pulley means, and a motor for rotating said driver pulley means; means located externally of said housing for consecutively advancing packages of compressed fibrous material toward said grid and into the range of said teeth whereby the teeth remove tufts from the foremost package and entrain the tufts through said slots and into said housing and for reciprocating the packages in directions at right angles to the longitudinal directions of said slots; a plurality of teasing rollers in said housing for comminuting and mixing the tufts removed by the teeth of said plucking roller; and means for producing a current of air in said housing in a direction toward said discharge end for withdrawing the tufts from said housing.

19. An apparatus for consecutively breaking packages consisting of compressed fibrous material which comprises, in combination, a housing having an open intake end and a discharge end; a grid mounted in said intake end and comprising a plurality of spaced bars defining a plurality of parallel slots; a plucking roller disposed in said housing adjacent to said grid, said roller comprising a plurality of teeth projecting through and at least slightly beyond said slots; means for reciprocating said roller in the longitudinal direction of said slots in such a way that the teeth of said roller project through the respective slots during the reciprocatory movements of said roller; means for rotating said roller; means located externally of said housing for consecutively advancing packages of compressed fibrous material toward said grid and into the range of said teeth whereby the teeth remove tufts from the foremost package and entrain the tufts through said slots and into said housing and for reciprocating the packages in directions at right angles to the longitudinal directions of said slots; a plurality of teasing rollers in said housing for comminuting and mixing the tufts removed by the teeth of said plucking roller; a receptacle in said housing provided beneath each of said teasing rollers for collecting impurities separated by the teasing rollers from the tufts of fibrous material; a grate provided between each of said receptacles and the respective teasing roller; and means for producing a current of air in said housing in a direction toward said discharge end for withdrawing the tufts from said housing.

20. An apparatus for consecutively breaking packages consisting of compressed fibrous material which comprises, in combination, a housing having an open intake end and a discharge end; a grid mounted in said intake end and comprising a plurality of spaced bars defining a plurality of parallel slots; a plucking roller disposed in said housing adjacent to said grid, said roller comprising a plurality of teeth projecting through and at least slightly beyond said slots; means for reciprocating said roller in the longitudinal direction of said slots in such a way that the teeth of said roller project through the respective slots during the reciprocatory movements of said roller; means for rotating said roller; means located externally of said housing for consecutively advancing packages of compressed fibrous material toward said grid and into the range of said teeth whereby the teeth remove tufts from the foremost package and entrain the tufts through said slots and into said housing and for reciprocating the packages in directions at right angles to the longitudinal directions of said slots; a plurality of teasing rollers in said housing for comminuting and mixing the tufts removed by the teeth of said plucking roller; a receptacle in said housing provided beneath each of said teasing rollers for collecting impurities separated by the teasing rollers from the tufts of fibrous material; a grate provided between each of said receptacles and the respective teasing roller; magnet means provided in said housing for collecting ferrous particles entrained by the teeth of said plucking roller; and means for producing a current of air in said housing in a direction toward said discharge end for withdrawing the tufts from said housing.

21. An apparatus for consecutively breaking packages consisting of compressed fibrous material which comprises, in combination, a housing defining a tuft duct having an open intake end and a discharge end; a grid mounted in said intake end and comprising a plurality of spaced bars defining a plurality of parallel slots; a plucking

roller disposed in said housing adjacent to said grid, said roller comprising a plurality of teeth projecting through and at least slightly beyond said slots; means for reciprocating said roller in the longitudinal direction of said slots in such a way that the teeth of said roller project through the respective slots during the reciprocatory movements of said rollers; means for rotating said roller; means located externally of said housing for consecutively advancing packages of compressed fibrous material toward said grid and into the range of said teeth whereby the teeth remove tufts from the foremost package and entrain the tufts through said slots and into said housing and for reciprocating the packages in directions at right angles to the longitudinal directions of said slots; a plurality of teasing rollers provided in said tuft duct for comminuting and mixing the tufts removed by the teeth of said plucking roller, said tuft duct extending from said intake end toward and sloping upwardly toward said discharge end; and means for producing a current of air in said housing in a direction toward said discharge end for withdrawing the tufts from said housing.

22. An apparatus for consecutively breaking packages consisting of compressed fibrous material which comprises, in combination, a housing having an open intake end and a discharge end; a grid mounted in said intake end and comprising a plurality of spaced bars defining a plurality of parallel slots; a plucking roller disposed in said housing adjacent to said grid, said roller comprising a plurality of teeth projecting through and at least slightly beyond said slots; means for reciprocating said roller in the longitudinal direction of said slots in such a way that the teeth of said roller project through the respective slots during the reciprocatory movements of said roller; means for rotating said roller; means located externally of said housing for consecutively advancing packages of compressed fibrous material toward said grid and into the range of said teeth whereby the teeth remove tufts from the foremost package and entrain the tufts through said slots and into said housing and for reciprocating the packages in directions at right angles to the longitudinal directions of said slots; a plurality of teasing rollers in said housing for comminuting and mixing the tufts removed by the teeth of said plucking roller; and means comprising a suction fan for producing a current of air in said housing in a direction toward said discharge end for withdrawing the tufts from said housing.

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