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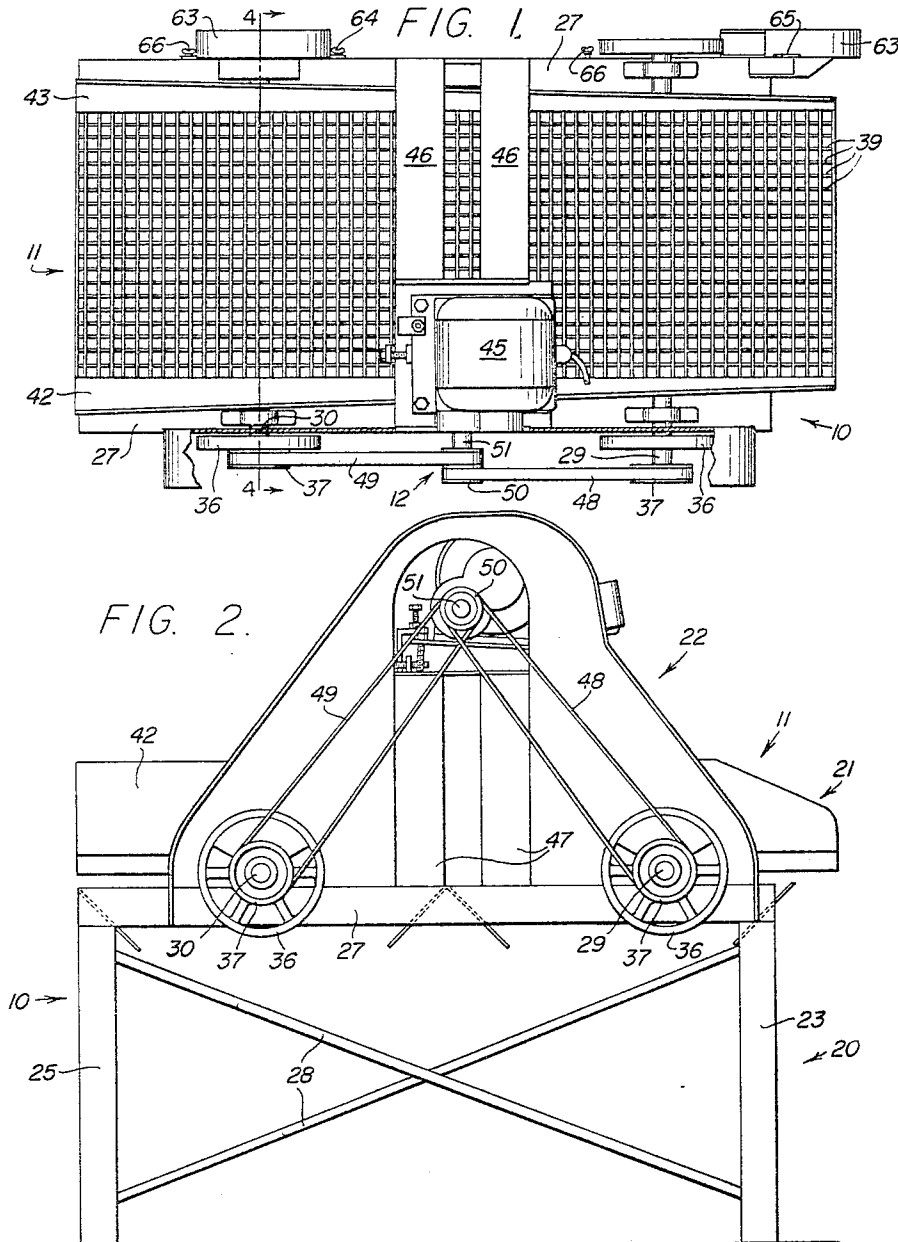
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3,483,972

WOOL CLEANING AND SORTING METHOD AND APPARATUS

Filed Nov. 29, 1966

4 Sheets-Sheet 1



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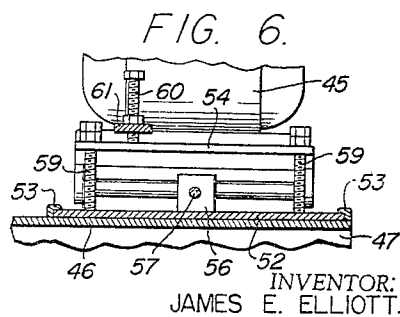
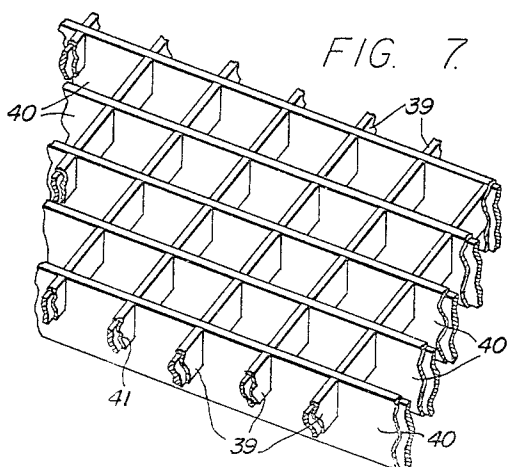
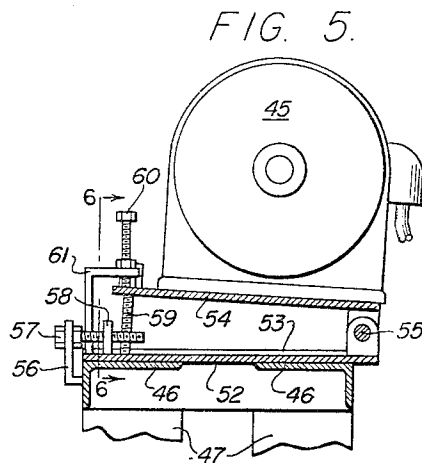
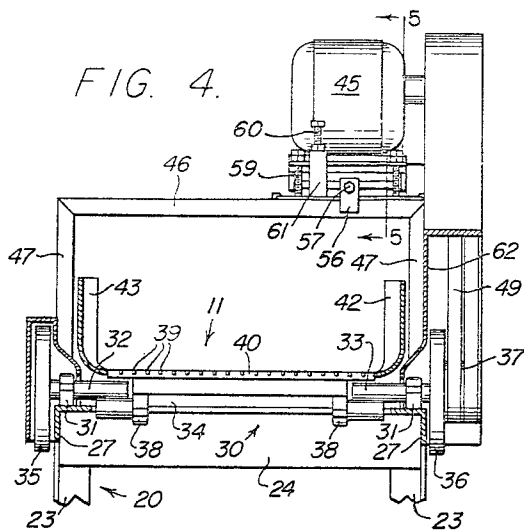
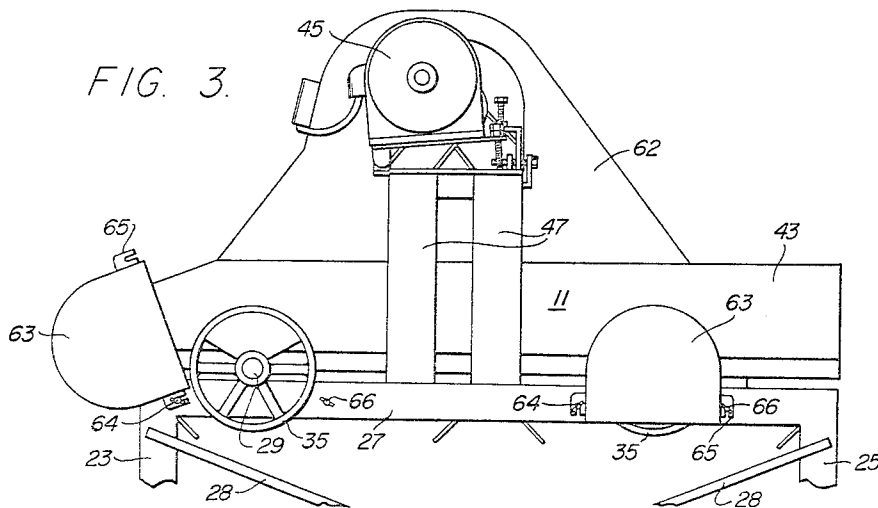
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4 Sheets-Sheet 2



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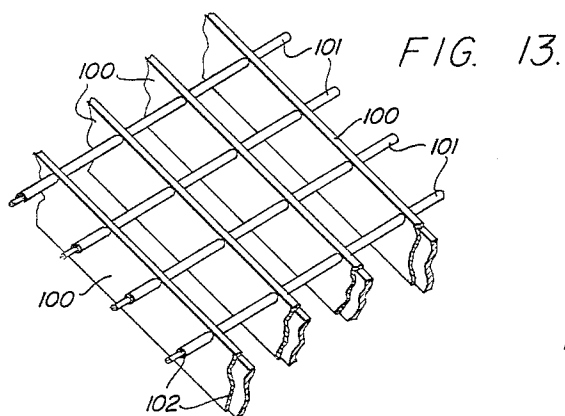
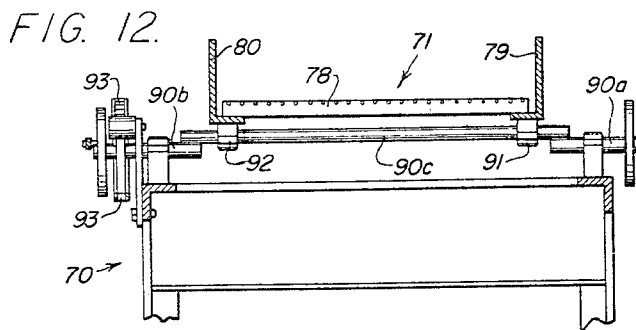
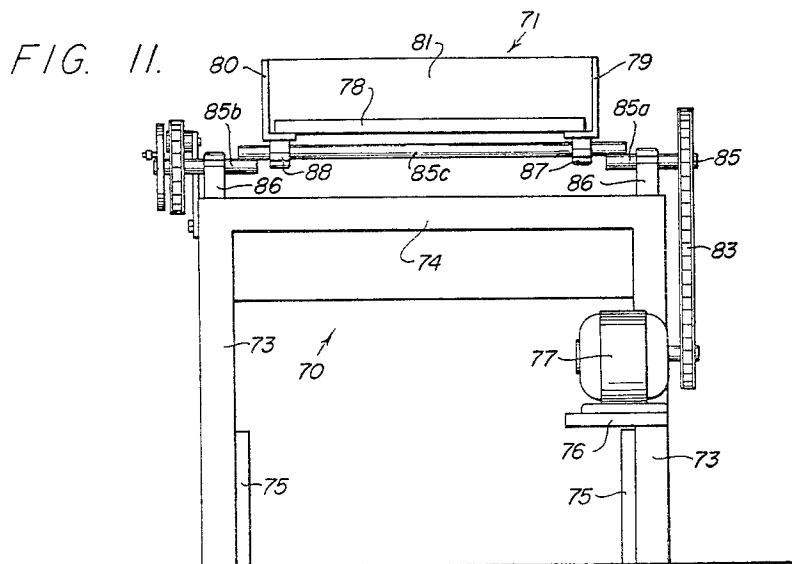
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WOOL CLEANING AND SORTING METHOD AND APPARATUS

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4 Sheets-Sheet 4



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3,483,972

WOOL CLEANING AND SORTING METHOD AND APPARATUS

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6 Claims

ABSTRACT OF THE DISCLOSURE

A method and apparatus for sorting and cleaning wool, usually raw wool in the form of sheet shearings. The wool is placed on a screen, and the screen is reciprocated in rotary strokes to impart an upward tangential movement to the wool and to impact it as it falls. The apparatus is a machine that includes a screen, having spaced longitudinal and transverse members forming substantially square openings, and crank shafts mounting the screen for rotary reciprocation. Fly wheels are mounted on the ends of the crank shafts to minimize vibration, and a belt drive arrangement from an adjustably positioned motor is provided to rotate the crank shafts. In one embodiment, a chain and sprocket drive arrangement insures absolute synchronism between the crank shafts. The transverse members of the screen have a depth that prevents fibers from being wrapped around them during operation of the screen.

This invention relates to a method and apparatus used to clean and sort wool fibers.

During the raising of sheep in the production of wool the wool becomes contaminated as it comes in contact with foreign objects native to the areas in which the sheep are grown and processed. The wool picks up and takes on the color of the dirt and other materials encountered while the sheep are grazed on the open range and also collects vegetable matter such as particles of sagebrush, cedar or similar brushes and grass and grass seeds. While sheep are in feed corrals their wool collects hay and straw chaff, as well as other general feed corral contaminants, such as dirt and manure. Even during the shearing of sheep, in accordance with usual practices, the sheared wool falls to the ground where it picks up additional vegetable matter and loose dirt.

Vegetable matter in the wool has for a long time presented a major problem to the wool-processing industry. Heretofore, attempts have been made to hand-pick the vegetable matter from the wool at the time the wool is graded or sorted, and before it is scoured. This has involved many hours of expensive manual labor, and at best results in removal of only a small portion of the vegetable matter content.

Loose dirt, sand, manure, etc. are partially removed as the wool is handled during conventional processing, but must be more thoroughly removed by a scouring or washing process. The volume of these contaminants present in the wool when it is scoured determines the amount of washing agents required for their removal and the amount of sludge that must be later removed from the scouring equipment.

Principal objects of the present invention, therefore, are to provide a method of and apparatus for effectively and gently removing vegetable matter and other contaminants from wool before it is scoured, without the time-consuming, expensive hand-picking heretofore required. Using the method and apparatus of the invention, a higher valued processed wool can be obtained. Also, because

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smaller amounts of washing agents are required and because there is less sludge accumulation in and on the apparatus of the scouring system that must be subsequently cleaned, processing costs can be reduced. In addition, a smaller labor force is required.

In modern shearing operations short fibers or "second cuts" are made by overlapping passes of the shearing machines and from shearing of the more inaccessible portions of the sheep. These are very difficult to remove in the wool combing process and play an important part in the grading of the wool since its valuation is based, in part, on the average fiber lengths. If some or all of them can be removed before processing and prior to the combing, the overall value of the wool may be increased.

Thus, it is another object of the invention to provide a method and apparatus for removing at least some of the short fibers at the same time vegetable matter and other debris is removed from the wool. A generally inferior wool having mixed long and short fibers and containing large amounts of vegetable matter, etc. after being treated in accordance with the invention will be separated into one portion containing the longer wool, which is relatively free from contamination, and another portion containing shorter fibers and a high percentage of the vegetable matter, etc.

In accordance with the method, the wool can also be treated after washing to gently remove vegetable matter and short fibers from the scoured wool, even though they may have become somewhat intermingled in the wool during the washing process.

To accomplish the above objects, I have utilized, as a principal feature of my invention, a special screen box, over which the wool will travel without the wool fibers wrapping themselves around the screen components to plug or cover the screen openings. Other features include special mounting means that drive the screen in rotary strokes such that wool is bounced continuously therealong, with the wool fibers being somewhat separated as the wool travels. On each bounce, as the wool falls freely after being thrown into the air, it is contacted by the upwardly travelling screen. This impacting is repeated many times as the wool travels along the screen, and the repeated impacting causes vegetable matter, dirt, and short fibers to fall through the screen openings.

The mounting means includes a plurality of spaced eccentric shafts that support the screen, and the motor means includes power transmitting structure for driving the eccentric shafts in unison.

There are shown in the accompanying drawings specific embodiments of the invention representing what are presently regarded as the best modes of carrying out the generic concepts in actual practice. From the detailed description of these presently preferred forms of the invention, other more specific objects and features will become apparent.

In the drawings:

FIG. 1 is a top plan view of the wool sorting machine of the invention;

FIG. 2, is a side elevational view;

FIG. 3, a similar view of the other side;

FIG. 4, a vertical section taken on the line 4—4 of FIG. 1;

FIG. 5, an enlarged vertical section taken on the line 5—5 of FIG. 4;

FIG. 6, another fragmentary vertical section taken on the line 6—6 of FIG. 5;

FIG. 7, an enlarged fragmentary, perspective view of the screen shown in FIGS. 1—5;

FIG. 8, a top plan of another embodiment of the invention;

FIG. 9, a side elevational view of the wool sorting machine of FIG. 8;

FIG. 10, a similar view of the other side;

FIG. 11, an end elevational view, taken on the line 11—11 of FIG. 9;

FIG. 12, a vertical section taken on the line 12—12 of FIG. 10; and

FIG. 13, a view like that of FIG. 7 but showing the screen of the wool sorting machine disclosed in FIGS. 8—12.

Referring now to the drawings:

In the embodiment illustrated in FIGS. 1—8, the wool sorting machine includes a frame, shown generally at 10, a screen-box, shown generally at 11, and a drive unit, shown generally at 12, carried by the frame and adapted to drive the screen-box.

Frame 10 includes a supporting stand 20 which comprises front legs 23, interconnected by a cross-member 24, FIG. 4, and rear legs 25 that are similarly interconnected. Side rails 27, at opposite sides of the frame interconnect the front and rear legs on each side of the frame and diagonal members 28 provide reinforcement bracing for the legs.

A pair of eccentric shafts 29 and 30 i.e. crank shafts, are journaled in opposed bearings 31, FIG. 4, that are mounted on the side rails 27, and each eccentric shaft includes aligned end stubs 32 and 33 interconnected by an offset central portion 34.

A flywheel 35, FIG. 3, is fixed to each end stub 32, outside supporting stand 20, and a similar flywheel 36, FIG. 2, is fastened to the other end stub 33 between the frame 20 and a pulley 37. Variable weights carried by the flywheels balance movement of the screen-box to prevent vibration of the machine.

Screen-box 11 is carried by the eccentric shafts 29 and 30, with the offset central portion 34 of each shaft being journaled through bearings 38 on the bottom of the screen-box. The bottom of the screen-box is made up of longitudinal bars 39 and intercepting transverse bars 40, rigidly interconnected to form a screen. The longitudinal and transverse bars are arranged to provide screen openings of desired size, preferably openings that are substantially square in horizontal cross-section and whose depths transversely of the screen are approximately equal to the length of a side of the square, as illustrated. Thus, the openings will be large enough to allow short fibers of up to a predetermined length, i.e. three-fourths of an inch, to pass through, while longer fibers are retained. The transverse bars are selected in accordance with the size of the screen openings to have a depth such that the fibers will not wrap around them to plug or close the screen openings. A coating of tetrafluoroethylene resin 41, or similar material may be applied to the bars 39 and 40 to reduce the tendency of dirt to stick to the screen surface.

The screen-box also includes a pair of curved sideboards 42 and 43 that extend above the outer side edges of the screen and that are fixed thereto. The bearings 38 are mounted on the bottoms of the sideboards, and, as the offset central portions 34 are rotated about the axes of the end stubs 32 and 33, the screen is raised and lowered in a rotary motion, while at all times being held in a fixed angle of discharge, which may be horizontal or may vary somewhat from the horizontal.

The screen box is driven by a motor 45 that is mounted on a pair of cross supports 46 supported by upright posts 47 that stand on the side rails 27.

Drive belts 48 and 49 respectively interconnect a double pulley 50 on the shaft 51 of motor 45 and the pulleys 37 on the shafts 29 and 30. Thus, rotation of the pulley 50 simultaneously rotates the eccentric shafts to drive the screen-box in a circular path.

In order to maintain constant tension on the drive belts so that the shafts 29 and 30 are driven in unison and the angle of discharge of the screen is maintained as it is driven, adjustment means are provided for positioning of

the motor. As illustrated, see especially FIG. 5, the adjustment means includes a platform 52 that rests on the cross supports 46 between a pair of guides 53, and another platform 54 hinged at 55 to one edge of the platform 52. The motor 45 is fixed to platform 54.

A bracket 56 extends outwardly and upwardly from a cross member 46 past the end of platform 52 opposite hinge 55. A bolt 57 is passed through the bracket 56, and is threaded into an upstanding ear 58 on the edge of platform 52 opposite the hinge. Rotation of bolt 57 will cause the ear 58 to be threaded onto or off of the bolt, thus sliding the platform 52 inside guides 53 and moving the platform 54 horizontally and longitudinally of the machine.

Bolts 59 are threaded downwardly through platform 54 to abut platform 52, so that as the bolts are turned the platform 54 and motor 45 are pivoted in a vertical plane about hinge 55.

By turning bolts 57 and 59 the motor 45 can be moved both horizontally and vertically to set the desired tension in the drive belts 48 and 49.

Another bolt 60, threaded downwardly through a bracket 61 that extends upwardly from platform 52 and that overhangs the edge of platform 54 holds bolt 59 tight against platform 52 and prevents vibration of platform 54 and motor 45.

A shield 62 extends upwardly from the side rail 27 adjacent the pulleys 37 and between the screen-box and the drive belts. This prevents wool being bounced off the screen and into the drive unit.

Individual covers 63 are provided for each of the fly wheels 35, and each cover is pivotally connected to the adjacent side rail 27 by a bolt 64 passed through a hole in the cover and threaded into the side rail. Each has a slot 65 adapted to slide onto a locking bolt 66 also threaded into the side rail. The covers, while providing protection to the flywheels, are easily pivoted away from locked position to afford easy access to such flywheels.

In operation, as motor 45 rotates the eccentric shafts 29 and 30 the screen-box 11 is carried through a circular, clockwise path, as viewed in FIG. 2. As the screen moves upwardly in its travel the wool is carried with the screen and is given an upward tangential impetus toward the discharge end 21 of the screen. As the screen passes over the highest part of its path and starts down it moves away from the relatively low density wool and actually is on its way up again before it again hits the falling wool. The eccentric shafts are designed to give a high throw to the wool, and this, coupled with the design speed of their rotation, insures the rising screen hitting the falling wool. As the wool is repeatedly hit by the rising screen, during its travel over the screen, the repeated impacts separate the wool fibers somewhat at the same time that dirt and vegetable matter is knocked loose to fall through the openings in the screen.

Another embodiment of the invention is shown in FIGS. 8—13. In this embodiment the wool sorting and cleaning machine includes a frame, indicated generally at 70, that supports a screen-box 71 in an elevated position. The frame is supported by front legs 72 and rear legs 73. Cross-members 74 interconnect the front and rear legs as required. A weight 75 is fixed to the bottom of each leg to serve as stabilizers for the machine and prevent its being vibrated away from the feeder machine, not shown, that discharges wool onto the receiving end of the screen-box.

Frame 70 also carries a platform 76 on which a motor 77 is positioned such that it will drive the screen-box, in a circular pattern, to bounce wool placed thereon toward the discharge end of the box in the same manner as does the machine previously described.

Screen-box 71 comprises a special screen 78 that forms a bottom, and a pair of angled side boards 79 and 80, each of which has one inturned leg to which the screen is fixed and an upstanding leg that prevents wool falling

from sides of the machine as it is operated. A member 81 extends between the upstanding legs to close the receiving end of the screen-box and the screen-box is open at its discharge end.

Wool is discharged from a feeder machine (not shown) onto screen 78, adjacent to the closed, receiving end of the screen-box 71. Motor 77, is then operated to drive a sprocket 82 on its output shaft and this drives a chain 83 that passes around the sprocket 82 and a sprocket 84 fixed on an eccentric shaft 85.

Eccentric shaft 85 has axially aligned ends 85a and 85b, FIG. 11, that are respectively journaled through upright brackets 86 carried by longitudinal rails 74 at opposite sides of the frame 70, and an offset intermediate section 85c that is journaled through bearings in housings 87 and 88 which depend from the bottom of the screen-box. As shaft 85 is turned in its upright brackets 86 the offset-section 85c moves the end of the screen-box mounted thereabove in a clockwise, circular pattern, as viewed in FIG. 9.

The screen preferably slants slightly down towards its discharge end and is maintained in this angular position by another shaft 90, similar to the shaft 85, that has its axially-aligned ends 90a and 90b journaled through upright brackets 91 carried by the longitudinal rails 74 at opposite sides of frame 70 and at a level below the axially aligned ends of shaft 85. The offset intermediate portion 90c, of shaft 90, is journaled through bearings in spaced housings 91 and 92 that depend from the bottom of the screen-box.

Shafts 85 and 90 are parallel and their motions are synchronized by a chain 93.

Chain 93 passes around a sprocket 94, fixed on the end of shaft 85 opposite sprocket 84, and a sprocket 95 fixed on the corresponding end of shaft 90. Chain 93 also passes beneath a sprocket 96 carried by a slide 97 that is adjustably mounted on the frame by a bolt 98 which has its shank threaded into frame 70. By reason of a slot 99, the slide 97 can be moved to position sprocket 96 to provide desired tension on chain 93. The bolt is tightened into the frame to secure the slide and to maintain the desired tension.

As motor 77 drives shaft 85, sprocket 94 is turned to drive chain 93, and this drives sprocket 95 and the shaft 90. As the shafts 85 and 90 are turned in a counter-clockwise direction, as viewed in FIG. 10, the screen-box is rapidly raised and moved forwardly, and then lowered and carried rearwardly so that wool placed thereon is repeatedly thrown tangentially up and forward as it travels toward the discharge end of the screen-box. The short fibers, i.e. those less than $\frac{3}{4}$ inch in length, vegetable matter, dirt, etc. fall through the screen 78, while longer fibers are retained thereon to be bounced toward the discharge end. As with the previously disclosed embodiment, the falling, relatively light-weight wool fibers are impacted by the rising screen to separate the fibers somewhat and to loosen the vegetable matter, etc. The motor speed, sprocket sizes, and eccentric shafts are designed and operated to insure such repeated impacting.

Obviously, gears or other drive means could also be used to drive the shafts 85 and 90 in unison.

Screen 78 allows trash and short fibers to fall through, while retaining long fibers thereon. As in the previously disclosed embodiment the construction of the screen prevents the wool fibers winding around the cross members making up the screen and prevents an accumulation of dirt on the cross members that will effectively plug the screen openings. This embodiment of the screen preferably includes bars 100 (FIG. 13), of rectangular cross section extending transverse to the axis of the screen-box and rods 101 of circular cross section that extend longitudinally with respect to the axis of the screen-box and that pass through the bars. The top edge of the rods is made substantially flush with the top edge of the bars and the size of the openings between the bars and rods will

determine the length of fibers to be removed and of those to be retained on the screen.

The bars 100 have a depth of such dimension that wool fibers will not wrap themselves therearound. As in the previously disclosed embodiment, it is sometimes desirable that the screen members be coated with a suitable tetrafluoroethylene resin 102 that will tend to prevent the adherence of dirt.

Whereas this invention is here described and illustrated with respect to certain forms thereof, it is to be understood that many variations are possible.

I claim:

1. A wool sorting machine comprising

a frame;

a screen-box having a base of spaced longitudinal and transverse members;

crank means eccentrically mounting said screen-box on the frame for rotary reciprocation, said crank means including

a first eccentric shaft having its ends journaled through the frame and having a central offset portion journaled through the lowermost portion of the screen-box, and

a second eccentric shaft having its ends journaled through the frame and having a central offset portion journaled through the lowermost portion of the screen-box and spaced from the first eccentric shaft; and

drive means for rotating said crank means to eccentrically bounce the screen-box in rotary strokes.

2. A wool sorting machine according to claim 1, where-

in the crank means includes flywheels on the opposite ends, respectively, of the eccentric shafts so that the screen-box imparts a tangential upward movement to the wool and impacts the wool as it falls to thereby release short fibers and vegetable matter from the wool substantially without vibration.

3. A wool sorting machine according to claim 1, where-

in the drive means includes

a motor having a drive pulley on the output shaft thereof;

a pulley on each of the eccentric shafts;

drive belts passed around the pulleys on the eccentric shafts and the drive pulley; and

means for moving the rotor to set the tension on the belts.

4. A wool sorting machine according to claim 3, where-

in the means for moving the motor comprises

a base slidably mounted on the frame;

a horizontal adjustment bolt arranged to reciprocate said base longitudinally of the screen-box;

a plate pivotally connected to the base;

set vertical adjustment bolt threaded through said plate

and abutting said base;

an extension member extending upwardly from the base and overhanging the plate;

and a vertical stop bolt threaded downwardly through said extension member into abutting engagement with the plate.

5. A wool sorting machine according to claim 1, where-

in the drive means includes

a motor carried by the frame and having a drive sprocket on its output shaft;

a sprocket fixed to one end of one eccentric shaft;

a chain passed around the drive sprocket and the sprocket fixed to said one eccentric shaft, whereby the motor drives the said one eccentric shaft;

another sprocket on the said one eccentric shaft;

a sprocket on the other eccentric shaft; and

a chain passed around the said another sprocket on the one eccentric shaft and the said sprocket on the other eccentric shaft, whereby the said other eccentric shaft is driven in unison with the said one eccentric shaft.

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6. A wool sorting machine, comprising
a screen-box having a bottom of spaced longitudinal
and transverse members forming a screen with square
openings, the depths of which transversely of the
screen are approximately equal to the length of a side
of the square, so as to prevent wool fibers being
wrapped therearound during wool sorting operations;
and
means for eccentrically bouncing the screen-box in ro-
tary strokes to impart a tangential upward movement
to the wool and impact the wool as it falls to thereby
release short fibers and vegetable matter from the
wool, substantially without vibration.

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U.S. Cl. X.R.

19—65; 209—326, 366