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2,683,533

GRAIN SEPARATOR AND CLEANER

Filed March 10, 1950

2 Sheets-Sheet 1

Fig. 1.

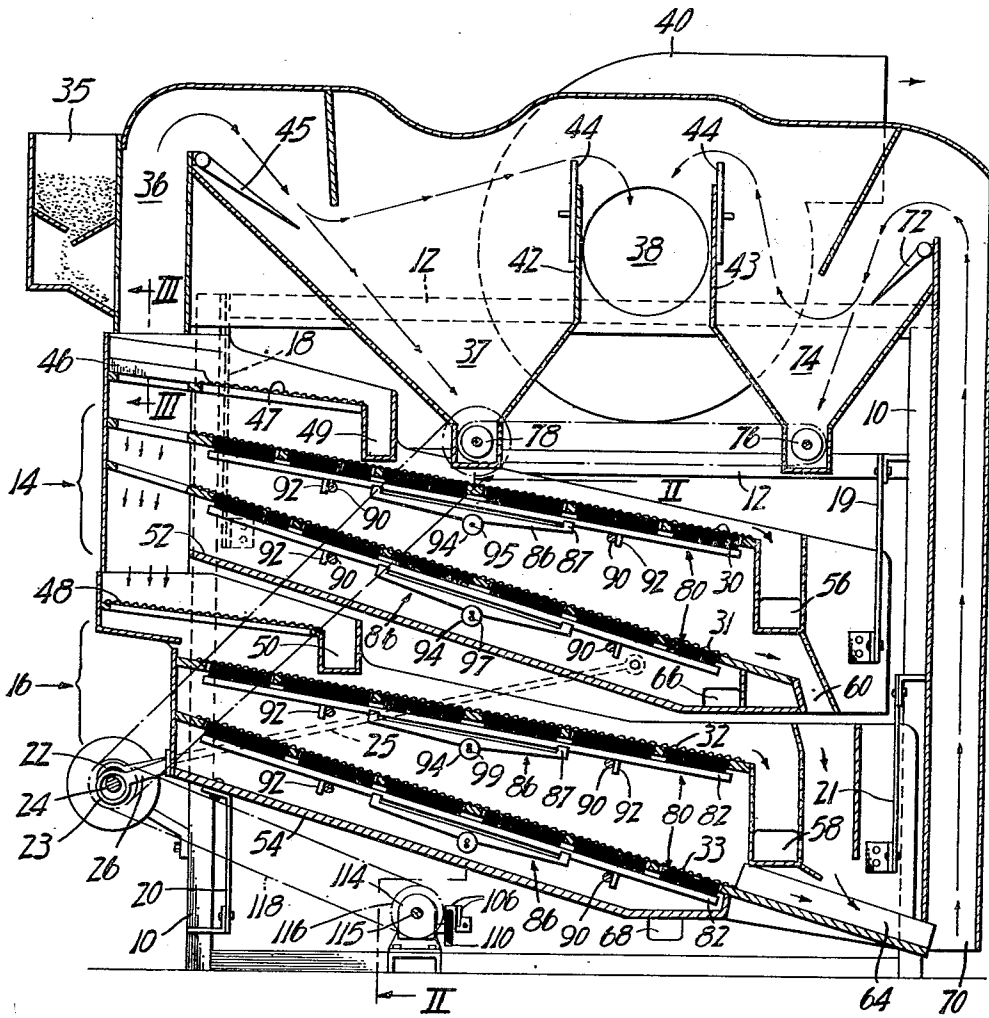
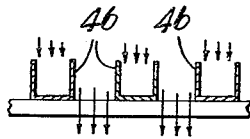


Fig. 3.



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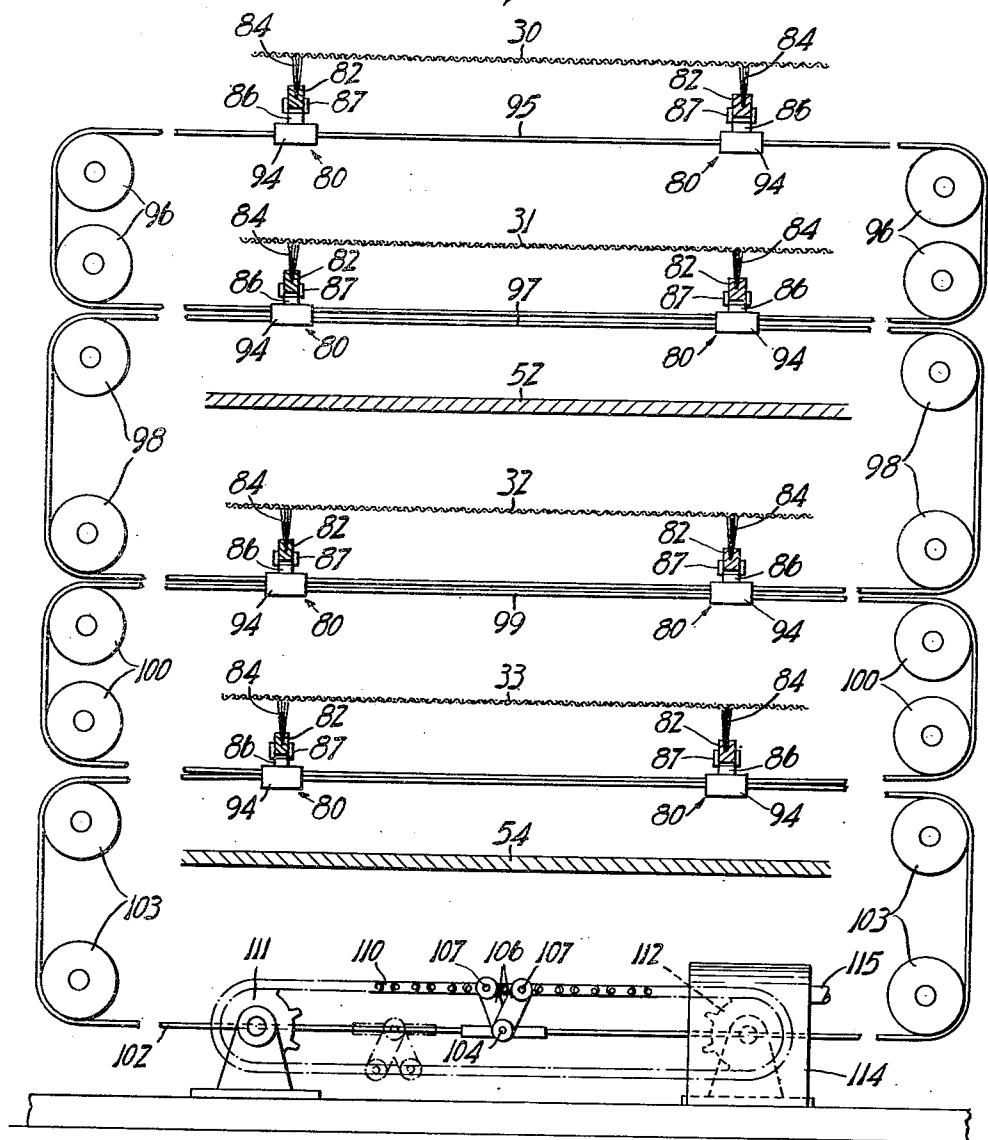
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Fig. 7.



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GRAIN SEPARATOR AND CLEANER

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2 Claims. (Cl. 209—388)

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This invention relates to grain cleaning and grading machines of the type which employ shaking screens for separating grain into several grades according to size; and air ducts for removing therefrom light weight debris, such as dust, shucks, hulls, etc.

One of the objects of this invention is to provide an improved machine of the class described which is of increased separating capacity and efficiency without corresponding increase of size of floor space requirement.

Another object of the invention is to provide in a machine of the class described an improved screen cleaning mechanism.

Other objects and advantages of the invention will appear from the specification hereinafter.

In the drawing:

Fig. 1 is a vertical sectional view through a machine of the invention;

Fig. 2 is a section, on an enlarged scale, taken along line II—II of Fig. 1; and

Fig. 3 is a fragmentary section, along line III—III of Fig. 1.

In the drawing the machine is illustrated to comprise a stationary frame which includes up-rights 10 and horizontal sills 12 supporting a pair of reciprocating shoes designated 14 and 16. The upper shoe 14 is suspended from the frame sills by means of leaf springs 18 and 19, and the lower shoe 16 is supported from the frame by leaf springs 20 and 21. Eccentrics 22 and 23 on a drive shaft 24 are connected to the shoes 14 and 16 respectively by connecting rods 25 and 26 for reciprocation of the shoes upon their spring mountings.

The shoe 14 includes coarse and fine inclined screens 30—31 formed of wire cloth or perforated sheet metal, or other suitable material; and the shoe 16 contains similar coarse and fine screens 32—33. The screens 30 and 32 are alike and the screens 31 and 33 are alike in respect to the size of their perforations or mesh, so that the corresponding screens effect the same separation of grain supplied to them into two grades, of which the smaller grade passes through the perforations while the larger grade escapes over the tail end of each screen.

Thus, the machine includes a feed hopper 35 which receives the grain to be separated and from which the grain passes into an ascending air duct 36 which is connected at its upper end with a separating hopper 37 from which air is drawn into the intake port 38 of a fan 40. Baffle boards 42—43 control the paths of flow into the fan, and adjustable extensions 44 on the baffle

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boards and a valve 45 permit adjustment of the air separation operation.

The upper shoe 14 is provided with a feed splitting device 46 of the grizzly type which as shown in Fig. 3 comprises a series of spaced channels arranged to pass one half of the stream of grain falling thereon and to direct the other half to slide down through the channels onto a scalping screen 47 carried by the top shoe 14. The grain passing through the splitting device 46 falls upon a similar scalping screen 48 carried by the bottom shoe 16, and thus the oversize debris "scalped" from the grain passes over the screens 47—48 into chutes 49—50 for disposal. The grain supplied to the feed hopper 35 of the machine, after passing through the preliminary air duct 36 is in this manner divided into two streams which are delivered first to the scalping screens 47—48. The materials passing through the scalping screens falls upon the screens 30 and 32, and the materials passing therethrough fall upon the screens 31 and 33. Fines passing through the screens 31 and 33 then fall upon bottom boards 52 and 54 which collect the smallest grade of grain passing through the device. The large grade of grain which escapes over the tail ends of the upper screens 30 and 32 passes through spouts 56 and 58 which lead laterally from the machine to any convenient point of collection. The grade of grain which is retained by the screens 31 and 33 is directed by channel 60 in the case of screw 31, to slide down a chute 64. The finest size materials passing through the screens 31 and 33 and caught by the bottom boards 52 and 54 of the shoes are discharged therefrom through channels 66 and 68.

An ascending air duct 70 is provided to receive at its lower end the grade of grain retained by the screens 31 and 33, and air is drawn upwardly through the air duct 70 by the fan 40 as regulated by a valve 72 and the adjustable baffle board 44. The upper end of the air duct 70 communicates with a separating hopper 74 which in turn communicates with the intake of the fan 40, and material collected in the hopper is removed by a conveyor 76. Material collected in the hopper 37 is removed by a conveyor 78.

The arrangement of two like screening shoes, one below the other and both effecting similar grading of the separated feed, produces a grading and cleaning capacity approximately equal to that of a machine having twice the plan view dimensions of the machine of the invention without unduly increasing the height of the machine or the power required for running the machine.

As like grades of grain coming from both screening shoes are united before being subjected to the final air cleaning operation, the cleaning and grading machine is particularly desirable for handling grains such as rice preparatory to hulling, but may of course also be employed for grading other grains or substances.

In order to maintain the screens 30, 31, 32, 33 in efficient screening condition, a pair of brush devices as indicated generally at 80 are arranged below each of the screen devices for movement therealong in order to continuously brush away any grains which tend to lodge in the meshes of the screen devices. As shown in more detail in Fig. 2, the brush devices each comprise an elongate bar 82 having brush bristles 84 extending upwardly therefrom for brushing contact with the under surface of the corresponding screen device; the bars 82 being engaged in each case by a yoke device 86 having jaws 87 gripping the bar at spaced positions therealong. To vertically support the brush devices against the screen devices, transverse rails 90 are provided to extend from opposite sides of the shoe structures so that the brush bars 82 are supported thereon at positions spaced longitudinally of the bars while being free to slide back and forth upon the rails 90. Guide fingers 92 extend from the brush bars to engage the rails 90 so as to maintain the brush bars in proper position upon the rails.

To motivate the brush bars back and forth from side to side under the screen devices, the yoke members 86 are provided with couplings 94 which receive in connected relation therein endless flexible pull devices such as chains or cables arranged for pulling the brush bars side-wise back and forth beneath the screens. Thus, as shown in Fig. 2, the brush bars under the screen 30 are connected to an endless chain or cable 95 training around guide devices such as sprockets or pulleys 96, while the same chain also connects to the coupling devices of the brush bars positioned below the second screen 31. The couplings of the brush bars below the screen 31 also connect to a second endless chain 97 which trains around idler sprockets 98 into similar connection with the brush bars under the screen 32. The coupling devices of the brush bars under the screen 32 also connect to a third chain 99 which trains around sprockets 100 and into connection with the brush bars under the screen 33.

The couplings of the brush bars under the screen 33 also connect to a fourth chain 102 which trains around pulleys 103 into pivotal connection at 104 to the ends of a pair of links 105—106, the other ends of which pivotally connect as indicated at 107—107 at spaced positions upon an endless chain 110 which trains around sprockets 111—112. The sprocket 112 is driven by the output shaft of a gear device 114 having a power input shaft 115 extending therefrom for connection to a suitable power source, such as a pulley 116 arranged to be driven by a belt 118 (Fig. 1) coupled to the machine drive mechanism.

As shown in Fig. 2, the links 105—106 are of such dimension and arranged so as to dispose the pull device connection point 104 thereof along the center line of the sprockets 111—112, and thus it will be appreciated that as the sprocket 112 operates to drive the chain 110 to run continuously in one direction, the link devices 105—106 will thereby be carried to travel

around an orbit defined by the positions of the upper and lower strands of the chain and the outer peripheral portions of the sprockets 111—112; and that throughout such operation of the chain the connection point 104 of the link device will thereby describe a simple straight-line reciprocatory movement from right to left and back again as viewed in Fig. 2. Thus, the pull member 102 is pulled upon by the connection point 104 to oscillate back and forth upon its idler pulley system, thereby pulling upon the brush bars below the screen 33 so as to move them sidewise back and forth below the screen, thereby applying thereto a vigorous brushing action throughout the entire bottom surface thereof. Inasmuch as the pull devices 99—97—95 are all interconnected with the pull member 102, they are simultaneously motivated by operation of the mechanism so as to provide similar brushing actions against the bottom surfaces of the screens 30, 31, 32.

By mounting a pair of brushes under each of the screen devices as shown in Fig. 2, the parts may be conveniently arranged so that the range of brushing action of one brush overlaps the range of brushing action of its companion brush, thereby insuring complete coverage of the screen device. Also, this shortens the required stroke of the brushing action and thereby substantially contributes to the compactness of the machine and the operating mechanism. It is a particular feature of the driving link mechanism 105—106 that this linkage system avoids interference with free movement of the endless chain 110 around its mounting sprockets while at all times maintaining the connection point 104 with the driven pull member 102 to move undeflected in a straight line between the centers of the sprockets 111—112; thereby eliminating variable speed or load effects and strains upon the mechanism such as might otherwise be encountered, and thereby providing a uniformly smooth transmission of power from the continuously running chain 110 to the reciprocating brush actuation system.

Although only one form of the invention has been shown and described in detail, it will be apparent to those skilled in the art that the invention is not so limited but that various changes may be made therein without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. In a grain cleaning and grading machine, the combination of a plurality of first shaking screens of like mesh arranged one beneath the other, means for directing feed material in the form of divided streams to the head ends of said first screens, a second screen of different mesh arranged beneath each of said first screens in operative alignment therewith, and screen brush means disposed beneath each of said screens comprising a brush member mounted below each of said screens for reciprocating movements therebelow, a first endless pull member coupled to each of the brush means associated with the uppermost first and second screens and training around first guide devices, a second endless pull member training around second guide devices and connected at one strand portion thereof to one strand portion of said first pull member and at another strand portion thereof to the brush means associated with the lowermost first screen, a third endless pull member training around third guide devices and coupled to each of the

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brush means of the lowermost first and second screens, a fourth endless pull member training around fourth guide devices and connected at one strand portion thereof to one strand portion of said third pull member, and a drive mechanism for said pull members comprising an endless chain training around sprockets having their centers in alignment with a strand portion of said fourth pull member and arranged to be driven continuously in one direction, and a coupling device interconnecting one strand of said chain and said aligned pull member strand portion comprising a pair of links pivotally connected to said chain at spaced positions therealong and extending therefrom in convergent relation into a point of single pivotal connection with said aligned strand portion of said fourth pull member, said links being so dimensioned as to thereby dispose the point of pivotal connection with said fourth pull member to lie in a plane intersecting the center line between said chain sprockets.

2. In a grain cleaning and grading machine, the combination of a plurality of shaking screens arranged one beneath the other, and screen brush means disposed beneath each of said screens, said screen brush means comprising a brush member mounted below each of said screens for reciprocating movements therebelow, a first endless pull member coupled to each of said brush means and training around first guide devices, a second endless pull member training around second guide devices and connected at one strand portion thereof to one strand portion

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of said first pull member, said first and second pull members lying in substantially vertical planes, and a drive mechanism for said first and second pull members comprising an endless chain training around sprockets having their centers in alignment with a strand portion of said second pull member and arranged to be driven continuously in one direction, and a coupling device interconnecting one strand of said chain and said aligned pull member strand portion comprising a bipod device pivotally connected to said chain at two spaced positions therealong and extending therefrom in convergent relation into a point of apex pivotal connection with said aligned strand portion of said second pull member, said bipod device being so dimensioned as to thereby dispose the point of apex pivotal connection with said second pull member to lie in a plane intersecting the center line between said chain sprockets.

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