

[54] **PECAN CLEANER**

[75] Inventor: **William D. Phelps**, Little Rock, Ark.

[73] Assignee: **Phelps-Davis, Inc.**, Baton Rouge, La.

[22] Filed: **May 5, 1972**

[21] Appl. No.: **250,629**

[52] U.S. Cl. **209/36, 209/138**

[51] Int. Cl. **B07b 9/00**

[58] Field of Search **209/34-37, 132-139 R, 209/143; 56/16.5, 328 R**

[56]

References Cited

UNITED STATES PATENTS

1,176,869	3/1916	Starnes	209/138
2,963,153	12/1960	Boesch et al.	209/143
3,107,475	10/1963	Gustafson	209/36 X
3,312,343	4/1967	Elder et al.	209/139 R
3,485,019	12/1969	Gable et al.	209/139 R X
3,618,761	11/1971	Francis et al.	209/37
3,630,355	12/1971	Christensen	209/137

Primary Examiner—Frank W. Lutter

Assistant Examiner—Ralph J. Hill

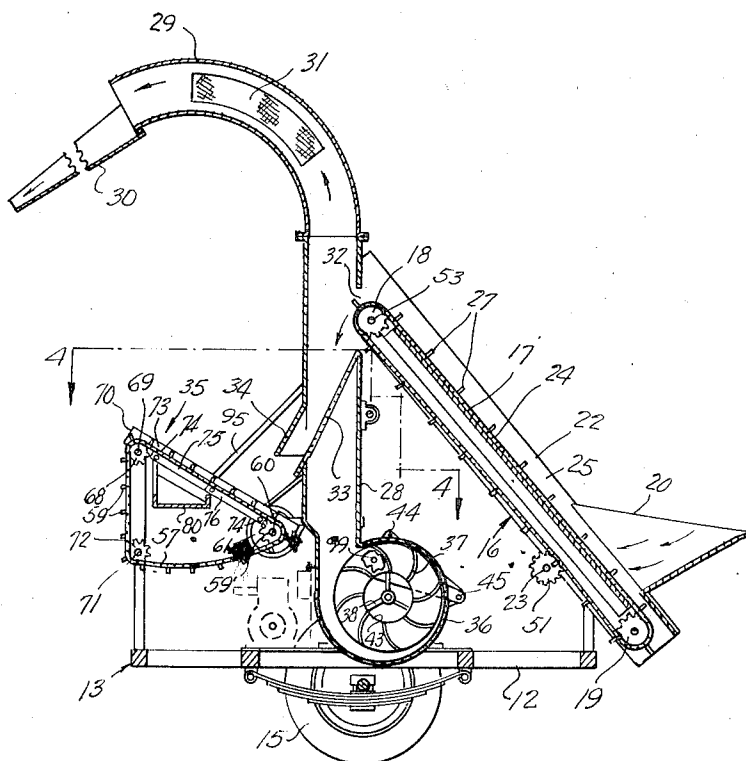
Attorney—Hyman Berman et al.

[57]

ABSTRACT

A pecan separator and cleaner consisting of an inclined infed elevator leading to a vertical air conduit supplied with upwardly moving air by a blower provided with a manually adjustable air intake port. As the harvested pecan material reaches the top of the infed elevator, the pecans and heavier debris drop down to a second inclined elevator, the lighter residue material being blown upwardly to an outwardly directed discharge chute. The second inclined elevator overlies a grating which has a first part consisting of closely spaced rods through which light trash and faulty pecans drop by gravity. Beyond the first part of the grating is a second part having widely spaced rods through which acceptable pecans drop onto an inclined lateral chute leading to an inspection table. Elongated twigs and similar debris are discharged forwardly from the top end of the second elevator. The air intake port can be adjusted so that all material lighter in weight and less streamlined than acceptable pecans is transported upwardly by the upwardly moving air.

11 Claims, 5 Drawing Figures



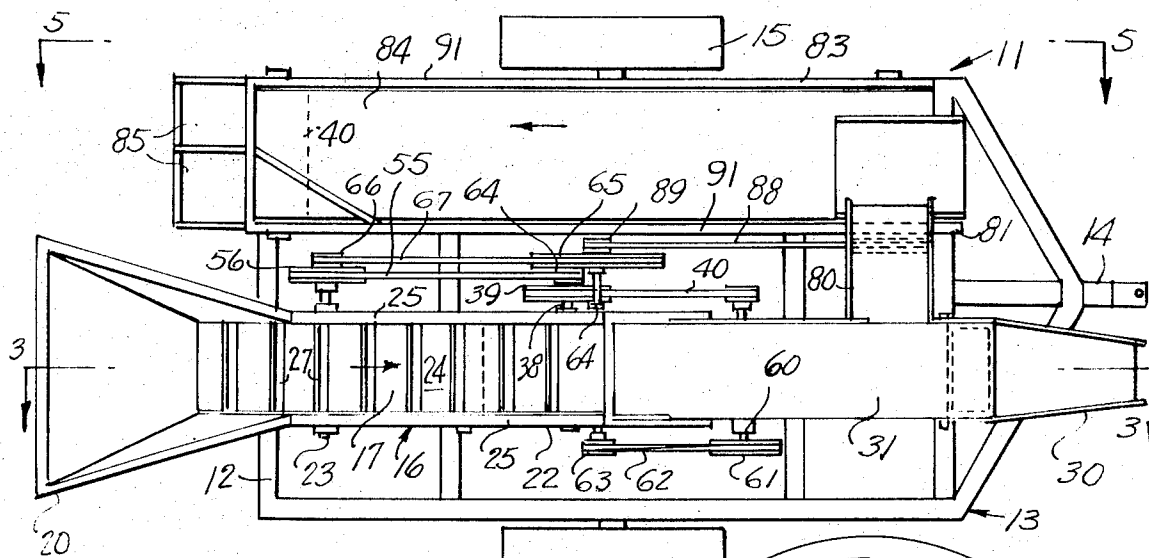


FIG. 1.

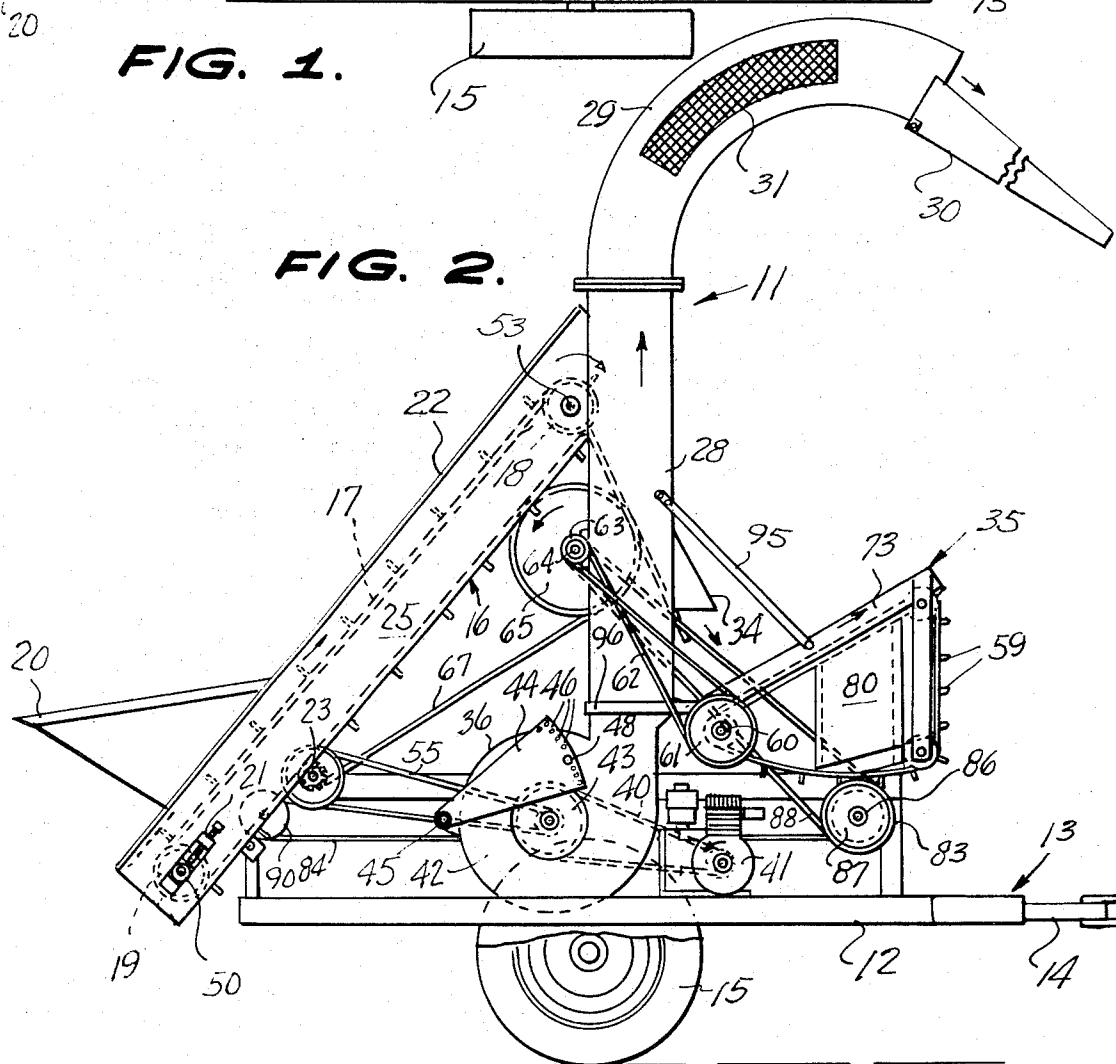
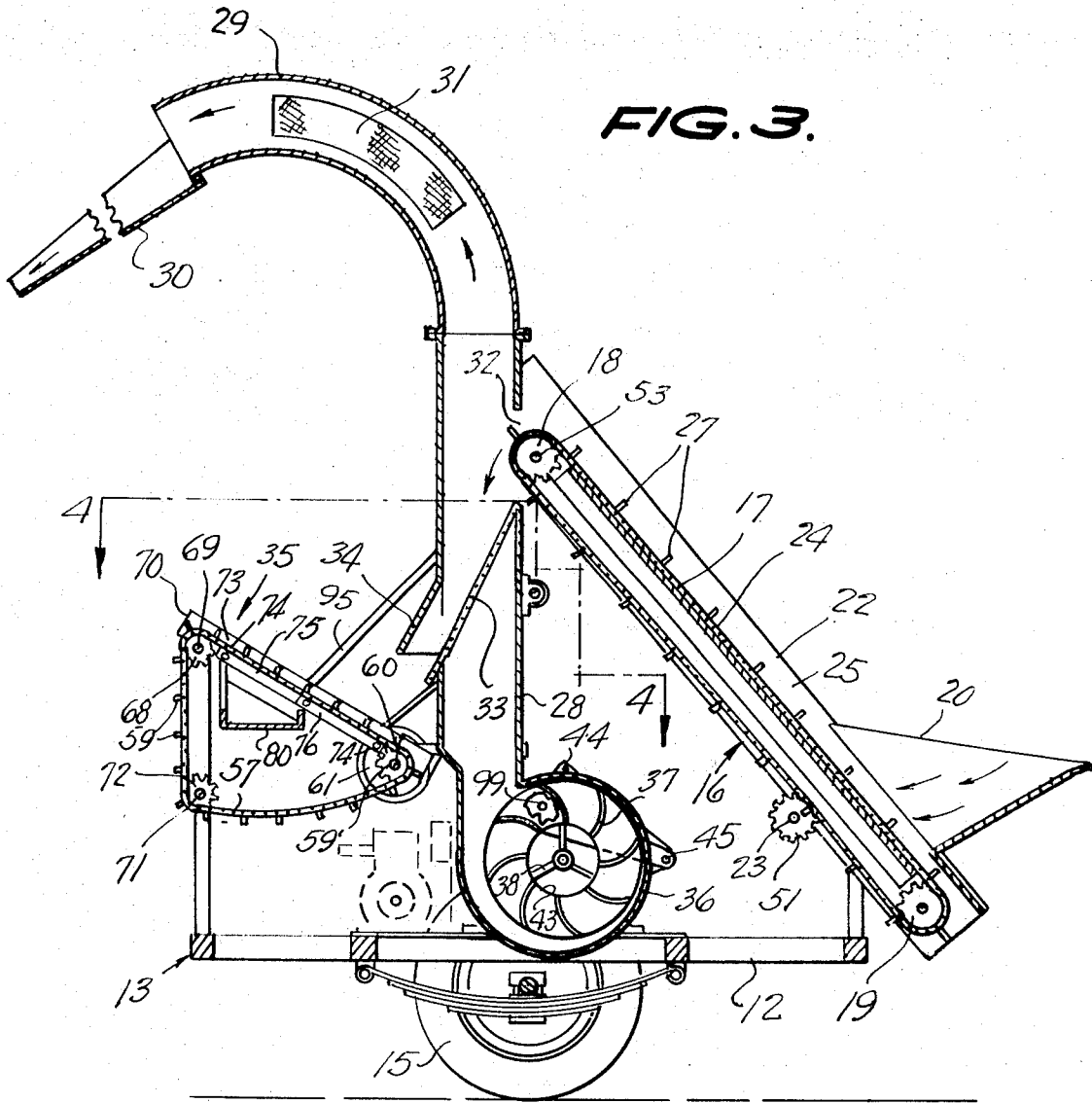


FIG. 2.

FIG. 3.



PECAN CLEANER

This invention relates to devices for cleaning harvested material, and more particularly, to an apparatus for separating pecans from undesired other material, such as twigs, sticks, light trash and faulty pecans.

A main object of the invention is to provide a novel and improved apparatus for separating pecans from accompanying undesirable harvested material, the apparatus being of relatively simple construction, being reliable in operation, and having means for adjusting the apparatus so that all material other than acceptable pecans is efficiently separated from the acceptable pecans.

A further object of the invention is to provide an improved pecan separating and cleaning apparatus which is inexpensive to construct, which is relatively compact in size, which is readily portable to a desired location of use, and which greatly facilitates the process of separating acceptable pecans from accompanying trash, debris, and faulty and unacceptable pecans.

A still further object of the invention is to provide an improved apparatus for separating pecans from undesirable accompanying harvested material, the apparatus employing an upwardly moving air column to separate out light residual undesired material from acceptable pecans and heavier material and being provided with adjustable air intake means which regulates the air flow so that all material lighter in weight and less streamlined than acceptable pecans can be transported upwardly by the upwardly moving air column, and wherein the acceptable pecans and heavier material accompanying same can drop by gravity for further separation, the apparatus providing a means for quickly, economically and conveniently separating acceptable pecans from the other accompanying harvested unacceptable material.

When pecans are mechanically harvested, poor quality pecans are nearly always present along with the good quality pecans. At the present time, special machines are employed whose only function is to separate the good pecans from the bad pecans. These machines are commonly referred to as "graders." A prime purpose of the present invention is to provide an apparatus which, along with the above-described functions, also grades. Poor quality pecans are commonly called "lights" or "pops." As will be presently explained, the poor quality pecans, being much lighter than good quality pecans, are blown out through the air discharge spout portion of the apparatus along with other light trash material.

Furthermore, the apparatus may be installed either as a permanent stationary machine in a building, or the like, or may be portable, for example, may be mounted on a trailer.

Further objects and advantages of the invention will become apparent from the following description and claims, and from the accompanying drawings, wherein:

FIG. 1 is a top plan view of an improved pecan separating and cleaning apparatus constructed in accordance with the present invention.

FIG. 2 is a side elevational view of the apparatus of FIG. 1.

FIG. 3 is a vertical cross-sectional view taken substantially on the line 3—3 of FIG. 1.

FIG. 4 is an enlarged horizontal cross-sectional view taken substantially on the line 4—4 of FIG. 3.

FIG. 5 is a side elevational view of the apparatus taken substantially on the line 5—5 of FIG. 1.

Referring to the drawings, 11 generally designates an improved pecan separating and cleaning apparatus constructed in accordance with the present invention.

The apparatus 11 is preferably mounted in a manner to allow it to be moved to a desired location for use, and, therefore, in the specific embodiment herein illustrated, the apparatus 11 is mounted on the bed 12 of a trailer 13 provided with suitable attachment means 14 for connecting the trailer to a suitable pulling vehicle, such as a tractor, or the like. The trailer 13 is provided with a pair of supporting wheels 15, 15 suitably journaled to the trailer body in a conventional manner.

Mounted on the trailer bed 12 is an upwardly and forwardly inclined infeed elevator assembly 16 employing an endless belt conveyor 17 of the sprocket-chain type supported on upper and lower pairs of sprockets 18 and 19. The lower sprockets 19 are mounted on a shaft which is provided with conventional adjusting means 21 for adjusting the position of the sprocket shaft to provide desired tension in the conveyor chains. The infeed elevator 16 is provided with a suitable material-receiving hopper 20 at its lower end for furnishing harvested material to the elevator. The upper sprocket shaft is designated at 53 and the lower sprocket shaft is designated at 50. The conveyor belt assembly is driven in a counterclockwise direction, as viewed in FIG. 3, by drive sprockets 51 engaging the lower run portions of the conveyor chains.

The infeed hopper 20 communicates with the upwardly and forwardly inclined chute 22 which contains the conveyor belt 17 and which forms part of the elevator assembly 16. The drive sprockets 51 on the elevator are mounted upon a shaft 23 which is suitably journaled beneath the elevator and is driven in a counterclockwise direction, as viewed in FIG. 3, by means presently to be described.

As shown in FIG. 3, the upper run of the conveyor belt 17 of elevator 16 is slidably supported on a downwardly facing channel bar 24 rigidly secured between and extending longitudinally of the sidewalls of the elevator chute member 22. Thus, said chute member is mainly defined by the channel member 24, which forms the bottom wall of the chute member, and the sidewalls, as shown at 25, 25, between which the channel member 24 is rigidly secured.

As is further shown in FIG. 3, the infeed hopper 20 overlies the lower end of the upper run of the infeed conveyor belt 17.

As is clearly shown in FIG. 3, the conveyor belt 17 is provided with transversely extending upstanding spaced cleats 27 which act to retain material on the belt as said material is elevated upwardly therealong, namely, upwardly and to the left, as viewed in FIG. 3.

Designated at 28 is a vertical air conduit which is suitably mounted on the trailer bed 12 and which is provided at its top end with an arcuately and forwardly curved discharge spout portion 29 provided at its forward end with a downwardly and forwardly inclined discharge chute 30. The arcuately curved top portion 29 has arcuate apertures in its sidewalls covered by screens 31. The vertical air conduit 28 is provided with an aperture 32 which receives the top end of the previously described inclined elevator assembly 16, namely, which receives the portion of the conveyor belt 17 passing around the upper belt-supporting assembly 18

carried on the rotatable transverse shaft 53, as is clearly shown in FIG. 3. Thus, material carried upwardly on the conveyor belt 17 is deposited into the upper portion of the vertical air conduit 28 through the opening 32.

Mounted in the air conduit 28 immediately below the opening 32 is a downwardly and forwardly inclined grating 33 leading to a downwardly and forwardly inclined discharge duct 34 provided in the wall of conduit 28. Grating 33 is preferably made of spaced parallel bars connected by spaced transverse rods. The parallel bars extend toward the duct 34. The duct 34 overlies the receiving end of a second elevator assembly, designated generally at 35, presently to be described, for conveying relatively heavy material separated out by gravity when delivered into the vertical air conduit 28 by the action of the infeed elevator 16.

Air is allowed to escape from discharge spout portion 29 through the screens 31, thereby relieving the pressure at aperture 32 and at discharge duct 34. The purpose of the screened apertures at 31 is to reduce leakage and "blow-out" at aperture 32 and discharge duct 34.

The lower end of the air conduit 28 is connected to the outlet of an air blower assembly 36 mounted on the trailer bed 12. The air blower assembly comprises a generally circular housing containing a conventional air impeller 37 mounted on a transversely extending shaft 38 having an external drive pulley 39 which is drivingly coupled by a belt 40 to the output shaft of a gasoline engine 41 mounted on the trailer bed 12, the blower housing being provided at a sidewall 42 thereof with an air inlet opening 43 and with a pivoted manually adjustable cover plate 44, pivoted to the blower housing 45, being adjustable to a desired position overlying a portion of the area of the opening 43 in accordance with a desired flow-rate of air through the vertical conduit 28. As will be presently explained, the cover plate 44 can be adjusted so that all material lighter in weight and less streamlined than acceptable pecans is transported upwardly from the top end of the conveyor belt 17 as the material passes through the opening 32, whereas the heavier material, including acceptable pecans, drops by gravity onto the inclined grating 33 and is guided to the downwardly and forwardly inclined duct 34. Thus, the adjustable cover plate 44 is provided with spaced retaining apertures 46 adjacent its arcuate outer edge, the apertures 46 being concentric with the pivotal connection 45 of the cover plate. The apertures 46 are selectively registrable with an aperture provided in the adjacent wall 42 of the blower housing and a retaining pin 48 may be engaged through a selected aperture 46 and the registering aperture of wall 42 to hold the plate 44 in a desired adjusted position.

An electric motor may be employed in place of the gasoline engine 41.

As shown in FIG. 2, the cover plate 44 is substantially sector-shaped and the fastening apertures 46 thereof are relatively closely spaced so that a very fine adjustment of plate 44 over the air intake aperture 43 can be obtained. The pivotal connection 45 is located outwardly adjacent the periphery of the housing of blower 36 and the length of the air intake adjustment cover plate 44 is sufficient to overlie a desired portion of the centered circular air intake aperture 43 to provide the desired degree of control over the air intake area of blower 36. In a typical embodiment of the invention,

the radial length of the control plate 44 was slightly greater than the sum of the radii of the blower housing and the circular aperture 43, and the adjustment apertures 46 were located along the arcuate edge of the cover plate 44, in the manner illustrated in FIG. 2.

The blower shaft 38 is provided with a relatively small pulley 54 adjacent the relatively large blower drive pulley 39, and the small pulley 54 is coupled by a belt 55 to a relatively larger pulley 56 mounted on the drive sprocket shaft 23 for driving the elevator belt assembly 17 simultaneously with the operation of blower 36.

The second elevator assembly 35 is mounted so as to extend upwardly and forwardly from beneath the duct 34, as above described, and comprises an endless belt assembly 57 of the sprocket-chain type comprising a pair of sprocket chains 58, 58 connected by spaced transverse outwardly projecting cleats 59 and supported on sprocket wheels in the manner illustrated in FIG. 3. Thus, the lower right portions of the chains 58, 58, as viewed in FIG. 3, engage drive sprockets 59', mounted on a transverse shaft 60 suitably journaled exteriorly to the lower portion of the vertical air conduit 28, the shaft 60 being provided with a drive pulley 61 which is coupled by a crossed endless belt 62 to a relatively small pulley 63 mounted on a transverse shaft 64 suitably journaled to the vertical conduit 28. A relatively large pulley 65 is mounted on the shaft 64, and the pulley 65 is coupled to a relatively small pulley 66 mounted on the elevator drive shaft 23 by a drive belt 67.

The upper forward portions of the second elevator belt assembly 57 are supported on sprocket wheels 68 mounted on a transverse shaft 69 journaled in the upper forward portion of the framework 70 of the second elevator 35. This framework is rigidly supported on the trailer bed 12. The sprocket chains 58, 58 likewise engage around lower front sprocket wheels 71 mounted on a transverse shaft 72 journaled in the aforesaid framework 70.

The framework 70 includes upwardly and forwardly inclined side bars 73, 73 connected by spaced transversely extending rods 74. Mounted beneath the upper run portions of the chains 58, 58 and extending therebetween is a grating structure comprising alternating relatively long and relatively short longitudinally extending grating bars 75 and 76 secured to the transverse rods 74, the short grating bars 76 being disposed between the long grating bars 75 and being located in the rightward region of the grating assembly, as viewed in FIG. 3, namely, in the area immediately subjacent the outlet of the inclined conduit 34. The grating bars are secured in any suitable manner to the transverse rods 74. It will thus be seen that the rightward portion of the grating structure, as viewed in FIGS. 3 and 4, comprises relatively closely spaced grating elements, whereas the leftward portion of the grating structure comprises relatively widely spaced grating elements. The rightward portion of the grating structure is thus adapted to allow relatively small objects, such as twigs, and undersized or defective pecans, to drop therethrough, whereas larger acceptable pecans will be carried upwardly by the cleats 59 to the leftward portion of the grating structure and will drop between the grating bars 75. Bulky trash carried along the second elevator by the cleats 59 will be discharged forwardly from the top end

of the second elevator 35 after passing beyond the region of the relatively widely spaced grating bars 75.

Suitably mounted on the framework of the apparatus beneath the leftward end of the elevator assembly 35, namely, immediately beneath the region of the widely spaced grating bars 75, is a transversely extending and downwardly inclined chute 80. The laterally and downwardly inclined chute 80 leads to an inclined longitudinal chute 81 mounted beneath the outer end of the chute 80, which is inclined downwardly and leads to a sorting belt conveyor assembly 83 mounted on the bed 12 and which includes an endless longitudinally extending conveyor belt 84 adapted to convey pecans leftwardly, as viewed in FIG. 1, toward suitable collection receptacles 85 at the left end of the conveyor assembly 83. The conveyor belt 84 is driven by a suitable drive roller carried by a transverse shaft 86 journaled to the framework of the machine and provided with a drive pulley 87 which is coupled by a drive belt 88 to a relatively small pulley 89 mounted on the shaft 64. The opposite end of conveyor belt 84 is supported by a suitable transverse idler roller 90 suitably journaled to the framework of the machine. Rigidly secured to said framework are upstanding longitudinally extending side plates 91, 91 between which the conveyor belt 84 is located.

The various drive belts and associated drive elements are so arranged that the top run portion of the first elevator assembly 16 moves rightwardly, as viewed in FIG. 1, whereas the top run portion of the conveyor belt 84 simultaneously moves leftwardly. The top run portion of the second elevator assembly 35 moves in the same direction as the top run portion of the first elevator 16. Thus, in operation, as material is furnished to the infeed hopper 20, this material is elevated by the first elevator 16 and is discharged into the upper portion of the air conduit 28. The lighter trash material, including the "lights" or "pops," is caught up by the upwardly moving air current in conduit 28 and is discharged upwardly through the curved conduit portion 29 and is deposited forwardly after leaving the inclined discharge chute 30. The heavier material drops by gravity onto the grating 33 and is guided by the duct 34 onto the lower right end portion of the second elevator 35, as viewed in FIG. 3, and the small trash material, such as twigs, other defective pecans, and the like, drops down through the relatively closely spaced grating bar elements 75, 76, as above described. The bulkier material, including acceptable pecans, is moved upwardly by the elevator cleats 59 to the region overlying the relatively widely spaced grating bars 75, in which region the acceptable pecans drop downwardly onto the chute 80, whereas the relatively bulky trash material is carried further by the elevator elements 59 and is deposited forwardly in the manner above described by the action of the elevator belt assembly. The separated acceptable pecans slide downwardly and laterally along the chute 80 and are deposited in the longitudinally extending inclined chute 81, wherein the pecans are guided onto the leftwardly moving conveyor belt top run portion of the belt 84 and are moved leftwardly at a relatively slow rate toward the collection receptacle 85. The relatively slowly moving conveyor belt 84 defines an inspection table where the pecans can be examined and can be handled for final manual cleaning and grading.

As previously mentioned, the second elevator assembly 75 is suitably connected to the vertical air conduit

28 so that it is rigidly supported thereby. Thus, the side portions of the elevator assembly 35 may be connected by inclined tie-rods 95 to opposite side portions of the vertical conduit 28 in the manner shown in FIG. 2, whereas the lower corner portion of the elevator assembly 35 may be connected to a suitable bracket 96 secured around the lower portion of conduit 28.

As previously mentioned, the flow-regulating plate 44 is adjustable to a position providing the desired flow rate through the air conduit 28. For fastening the plate 44 in a desired adjusted position, the adjacent sidewall of the blower 36 is provided with an aperture 99 registrable with a selected aperture 46 to receive the fastening pin member 48.

While a specific embodiment of an improved machine for separating and cleaning pecan nuts, or the like, has been disclosed in the foregoing description, it will be understood that various modifications within the spirit of the invention may occur to those skilled in the art. Therefore, it is intended that no limitations be placed on the invention except as defined by the scope of the appended claims.

What is claimed is:

1. A machine for separating and cleaning pecan nuts or the like comprising support means, an upstanding air conduit on said support means, an outwardly directed discharge conduit portion at the top end of said air conduit, air blower means connected to the lower end of said conduit, infeed first conveyor means connected to and communicating with the air conduit, a grating mounted in the air conduit below the connection of said first conveyor means thereto and being inclined downwardly and away from said connection, said grating allowing light trash material and relatively light defective pecans to be blown toward said discharge conduit portion by air passing therethrough from said blower means, outlet duct means on said air conduit adjacent the lower end of said grating, second conveyor means mounted below said outlet duct means and positioned to receive material from said duct means, said second conveyor means having a stationary subjacent grating to support material moved therealong by said second conveyor means, said last-named grating having relatively closely spaced aperture-defining elements in the region subjacent to said outlet duct means, defining apertures too close to allow mature pecans to drop therethrough, said last-named grating having more widely spaced aperture-defining elements in its outer region, defining apertures sufficiently wide to allow mature pecans to drop therethrough, and collection means mounted beneath said outer region to receive such mature pecans.

2. The separating and cleaning machine of claim 1, wherein said collection means comprises a downwardly and outwardly directed inclined chute.

3. The separating and cleaning machine of claim 2, and inspection table means subjacent the outer end of said outwardly directed chute.

4. The separating and cleaning machine of claim 3, and wherein said inspection table means comprises a relatively slow-moving conveyor.

5. The separating and cleaning machine of claim 1, wherein said first conveyor means comprises a belt conveyor assembly inclined upwardly toward said air conduit and provided at its lower end with an infeed hopper.

7

6. The separating and cleaning machine of claim 5, wherein said second conveyor means comprises a belt conveyor assembly inclined upwardly away from said air conduit.

7. The separating and cleaning machine of claim 1, wherein said air blower means comprises an air blower assembly having an air intake opening, and adjustable air-flow regulating means mounted so as to partially overlie said intake opening.

8. The separating and cleaning machine of claim 7, wherein said air-flow regulating means comprises a plate member pivotally connected to the air blower, and means to fasten said plate member in an adjusted position.

9. The separating and cleaning machine of claim 8, wherein said blower has a housing having opposite side-

8

walls, said plate member being pivoted to the housing for adjustment parallel to said one sidewall.

10. The separating and cleaning machine of claim 9, wherein said plate member is provided with a row of apertures arranged concentric with its pivotal connection and said one sidewall has an aperture registrable with a selected one of said first-named apertures, and wherein said means to fasten the plate member comprises a pin member insertable through said selected aperture, and said last-named aperture.

11. The separating and cleaning machine of claim 1, and wherein said outwardly directed discharge duct is provided with at least one screened aperture to relieve air pressure adjacent the infeed conveyor means connection to the air conduit and adjacent said outlet duct means.

* * * * *

20

25

30

35

40

45

50

55

60

65