



US 20070006564A1

(19) **United States**(12) **Patent Application Publication****Barr**(10) **Pub. No.: US 2007/0006564 A1**(43) **Pub. Date: Jan. 11, 2007**(54) **OSCILLATING SORTING DEVICE FOR GRAPE BERRIES****Publication Classification**(51) **Int. Cl.****A01D 46/00** (2006.01)(52) **U.S. Cl.** **56/330**(76) **Inventor: Edwin L. Barr, Santa Rosa, CA (US)**

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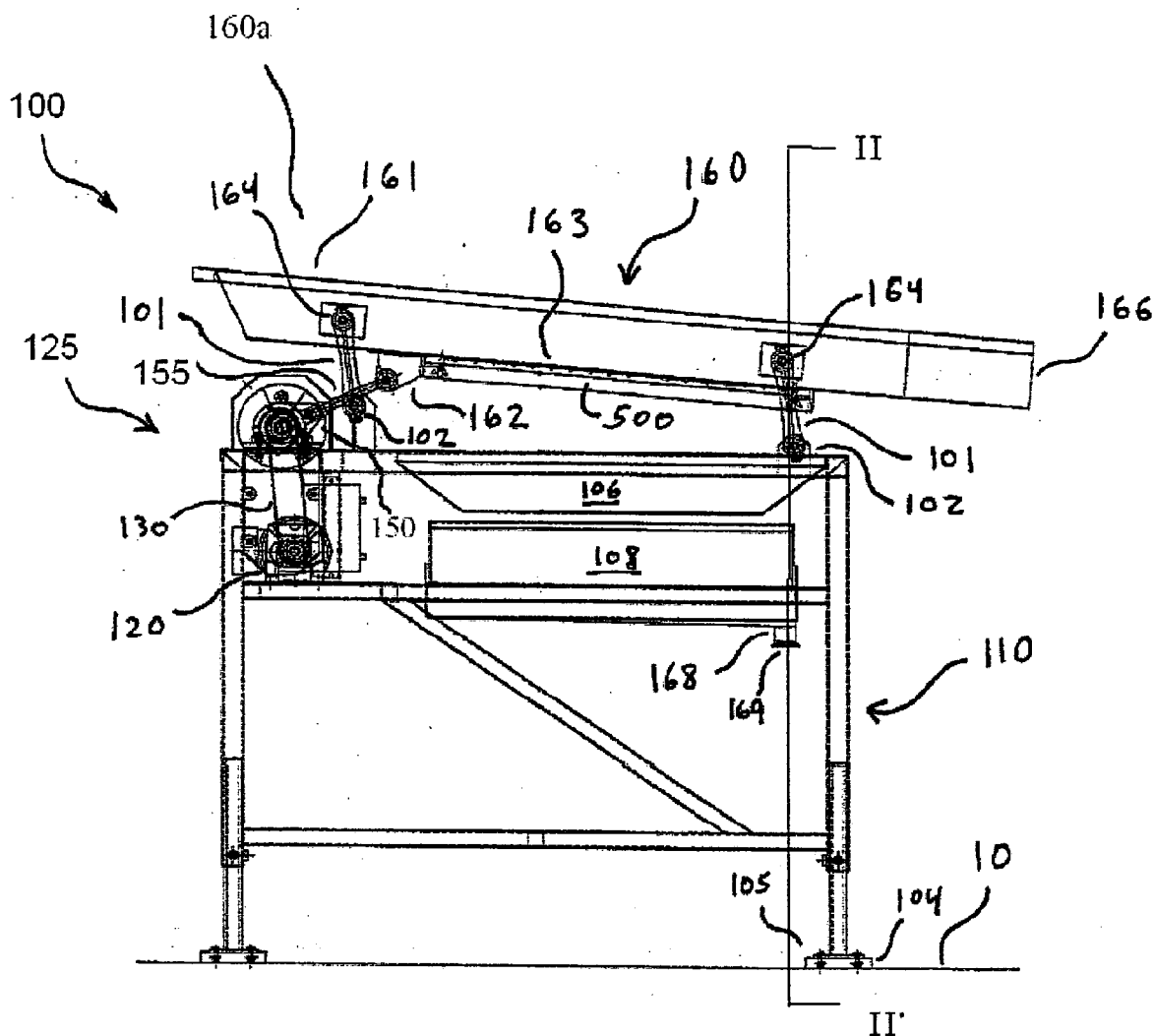
(21) **Appl. No.: 11/394,509**(22) **Filed: Mar. 31, 2006****Related U.S. Application Data**

(63) Continuation of application No. 11/176,431, filed on Jul. 6, 2005.

(57)

ABSTRACT

An oscillating sorting conveyor is adapted for separating whole berries of wine grapes from undesirable components such as "shot berries" (immature grapes), stems, raisins, leaf material, bugs, pebbles and the like. The sorter deploys a downward tilting trough that is driven to oscillate. A screen is disposed at the bottom of the trough such that whole berries are conveyed over the screen while the undesirable components pass through the screen. The preferred embodiment of the screen has a non-uniform cross-section to improve the efficiency of removal the undesirable components without clogging or requiring constant maintenance.



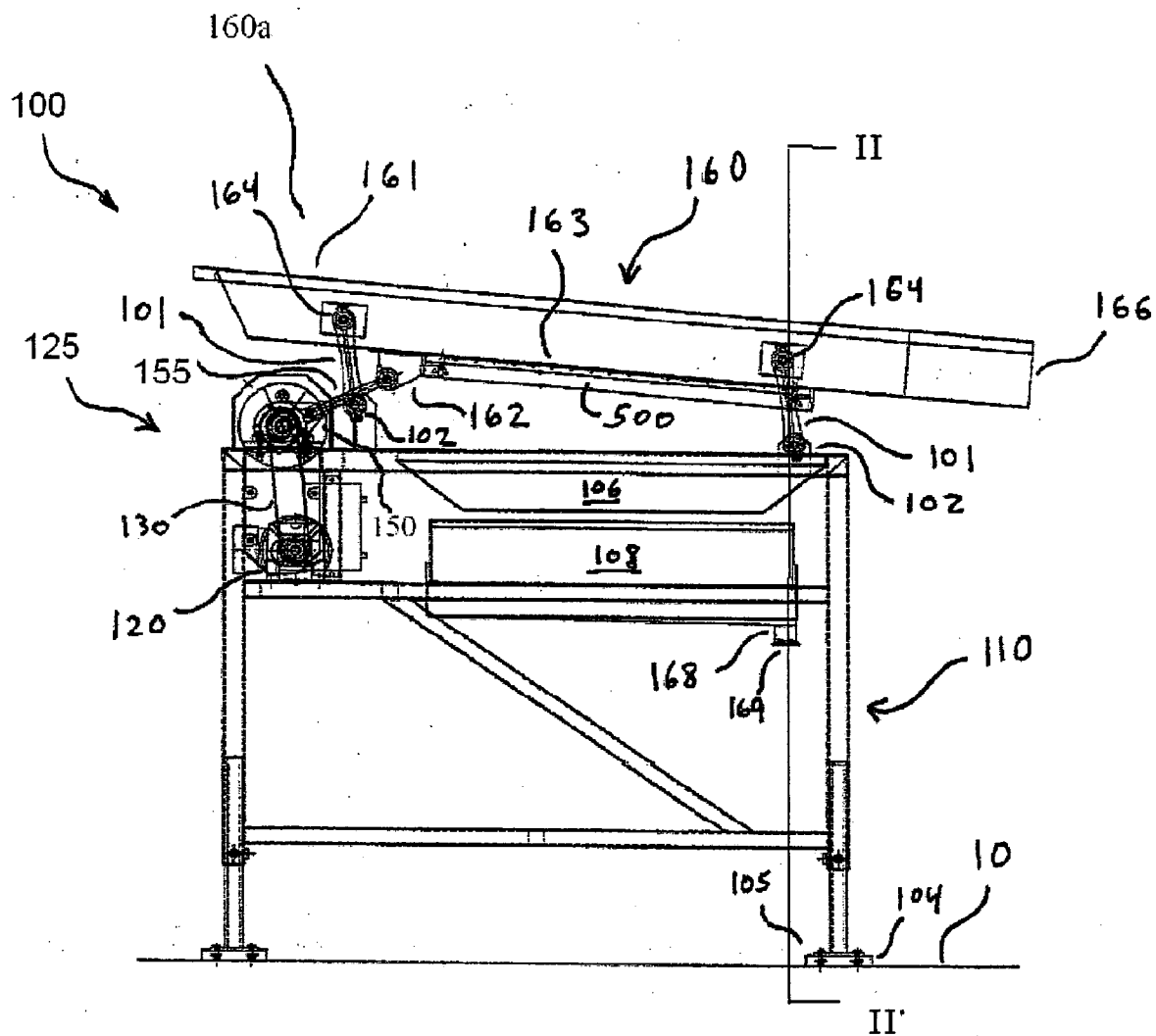


FIG. 1

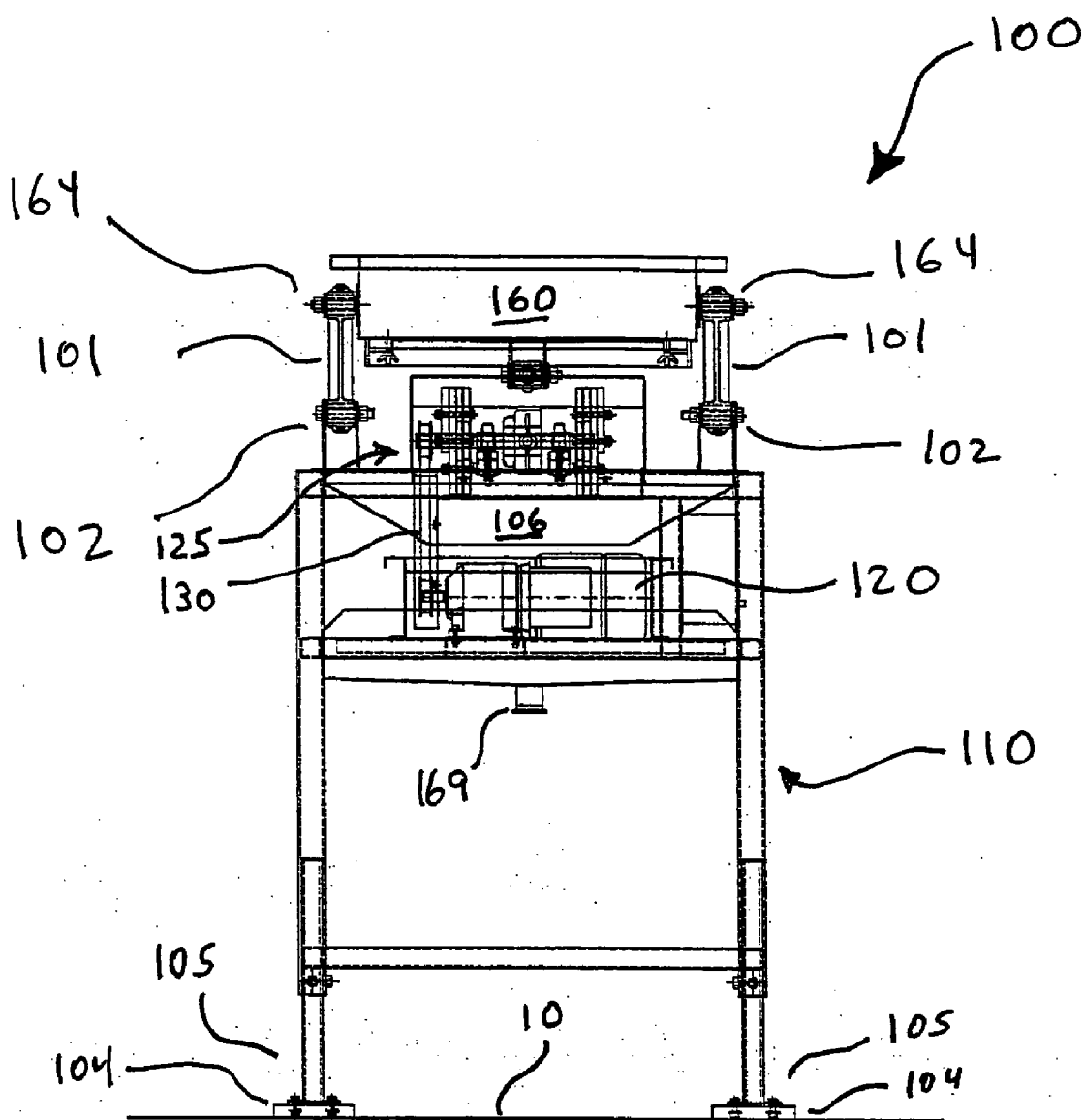


FIG. 2 A

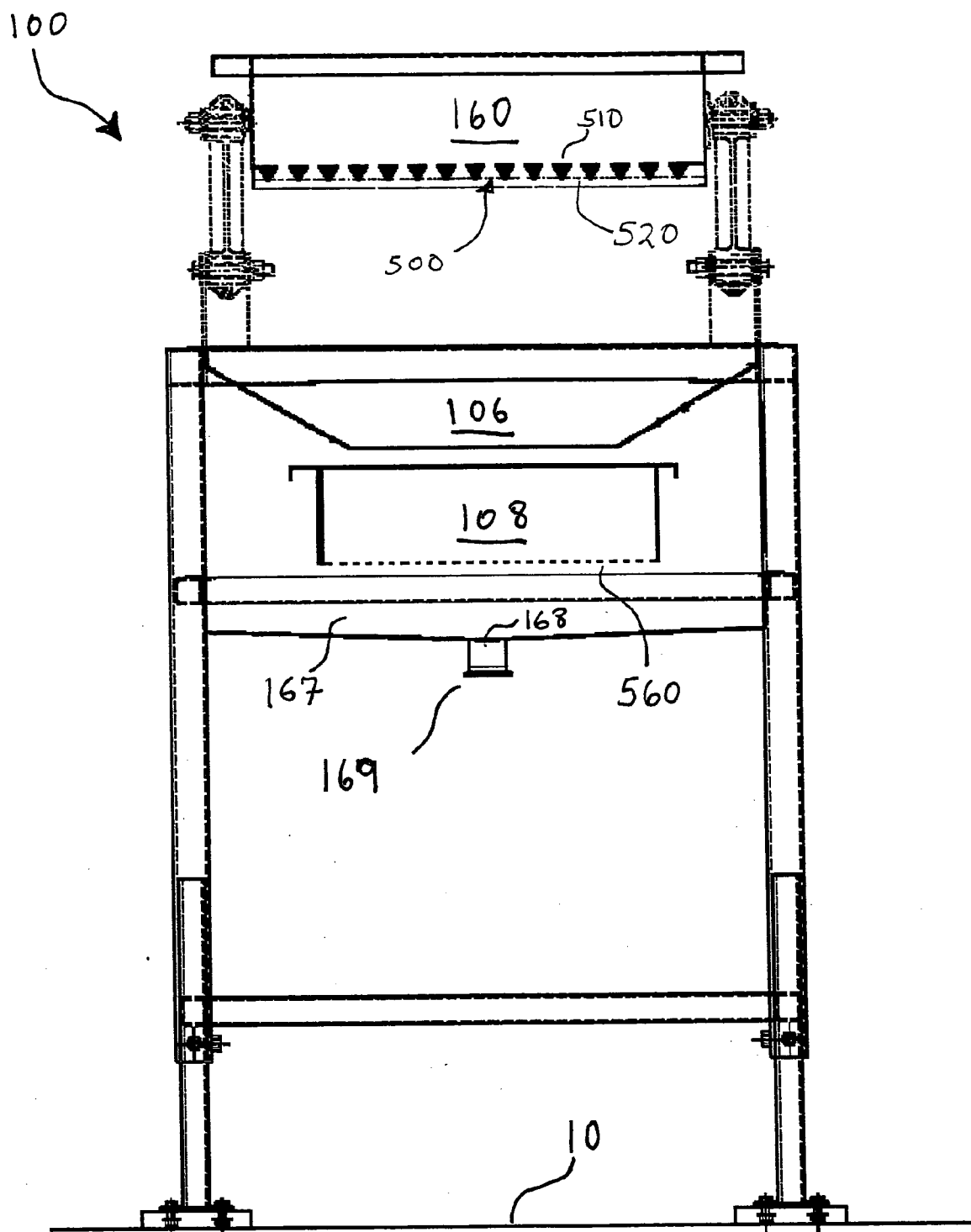


FIG. 2B

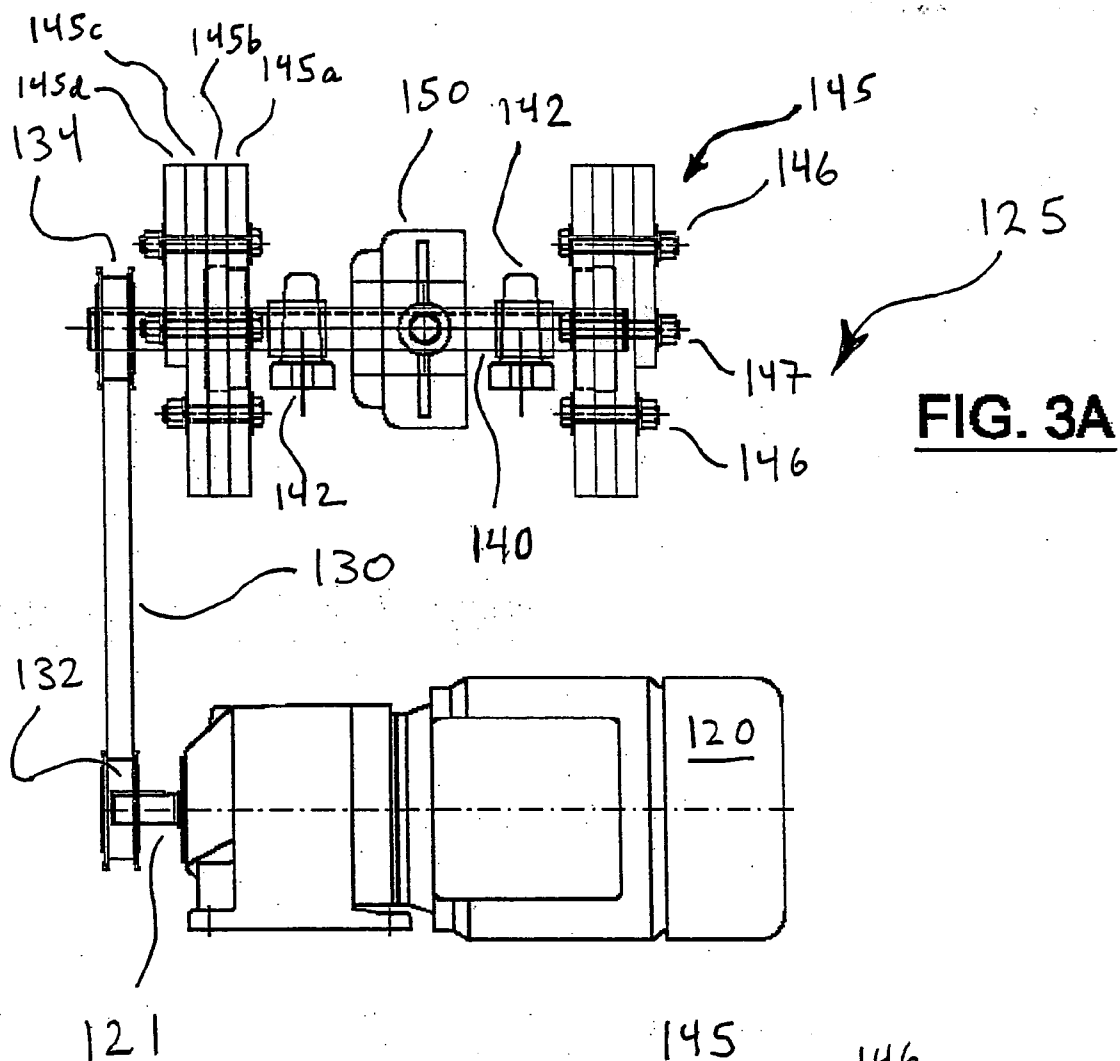
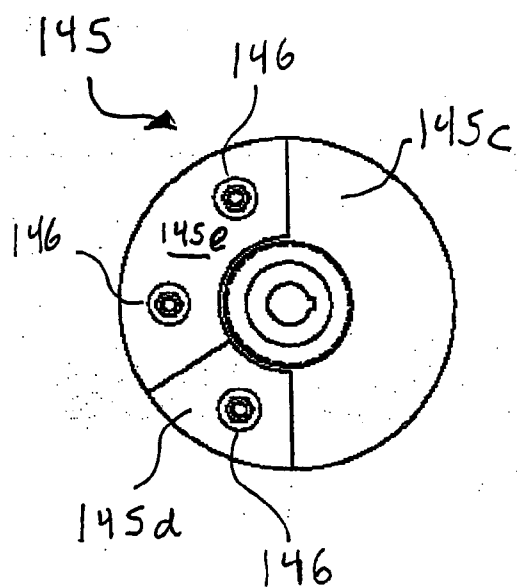


FIG. 3B



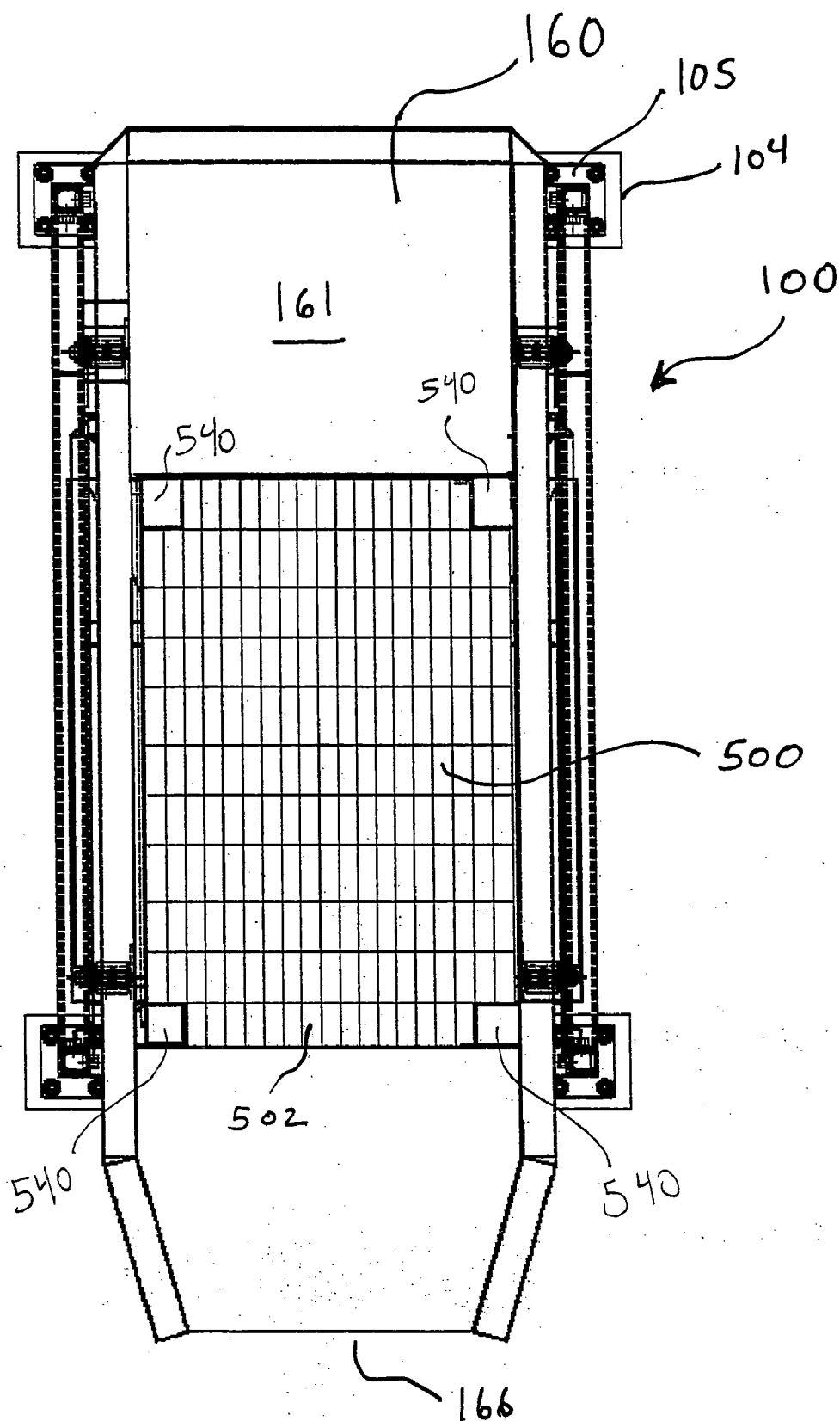
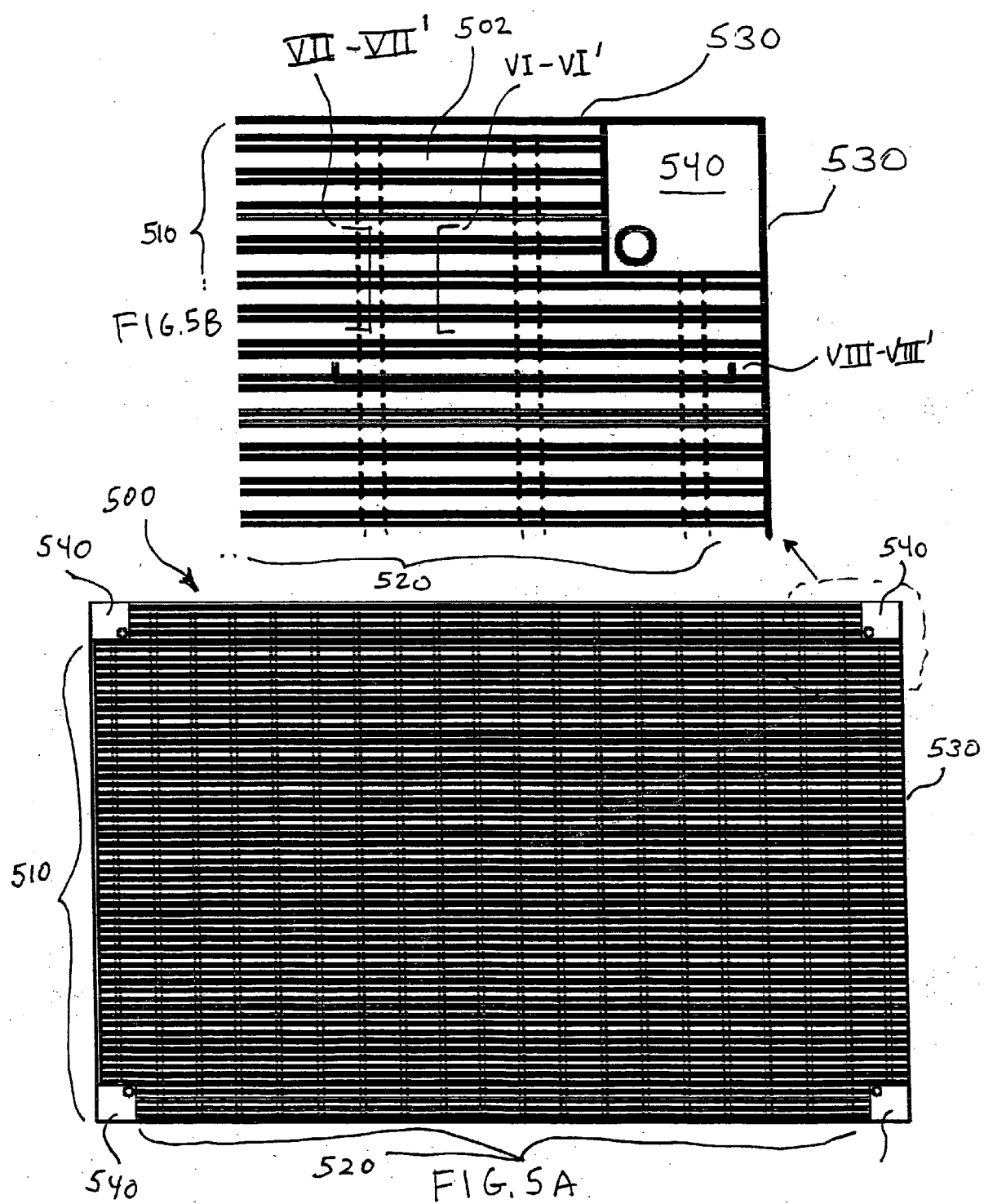
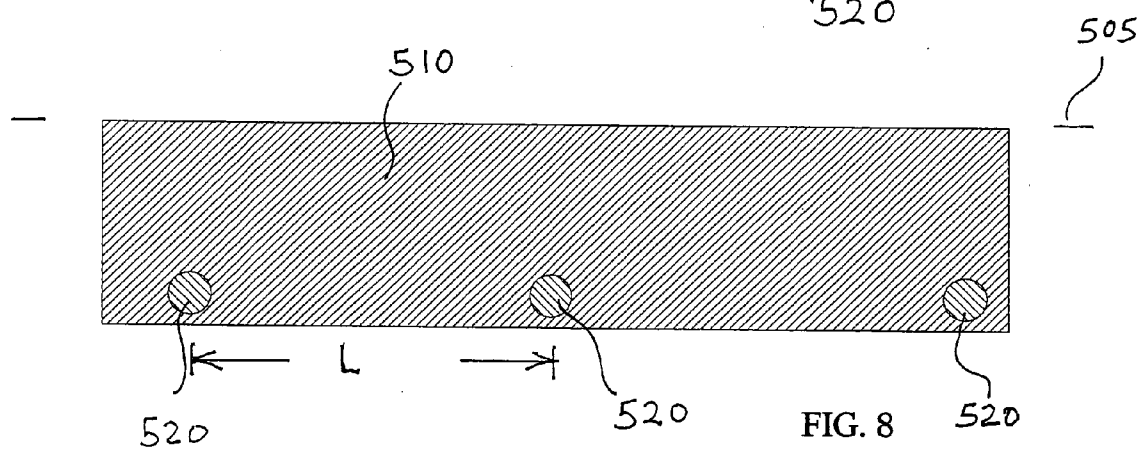
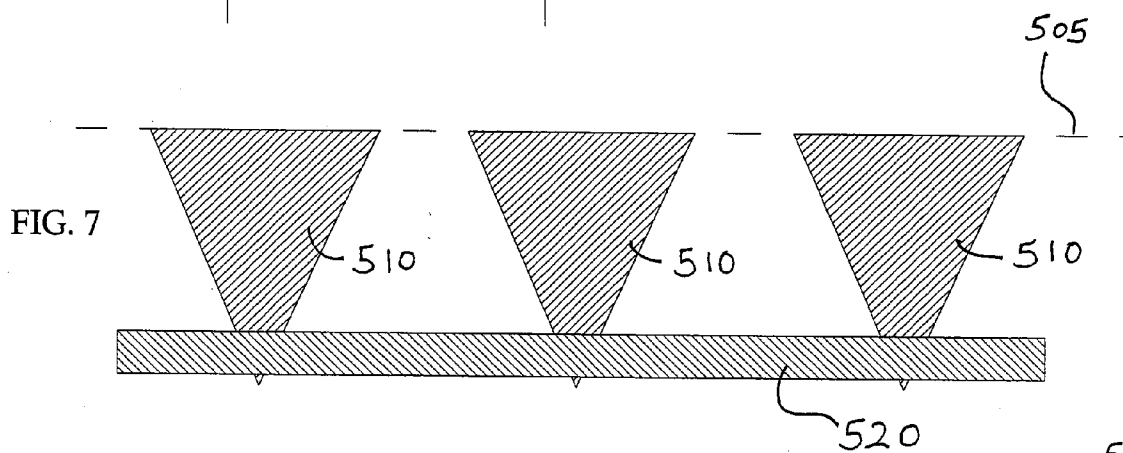
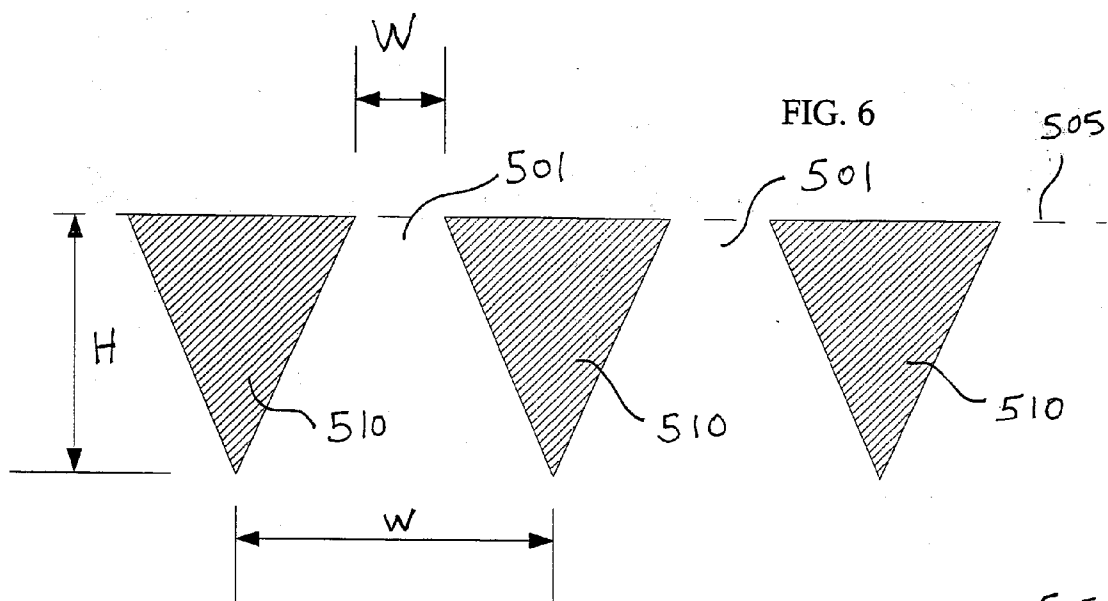


FIG. 4





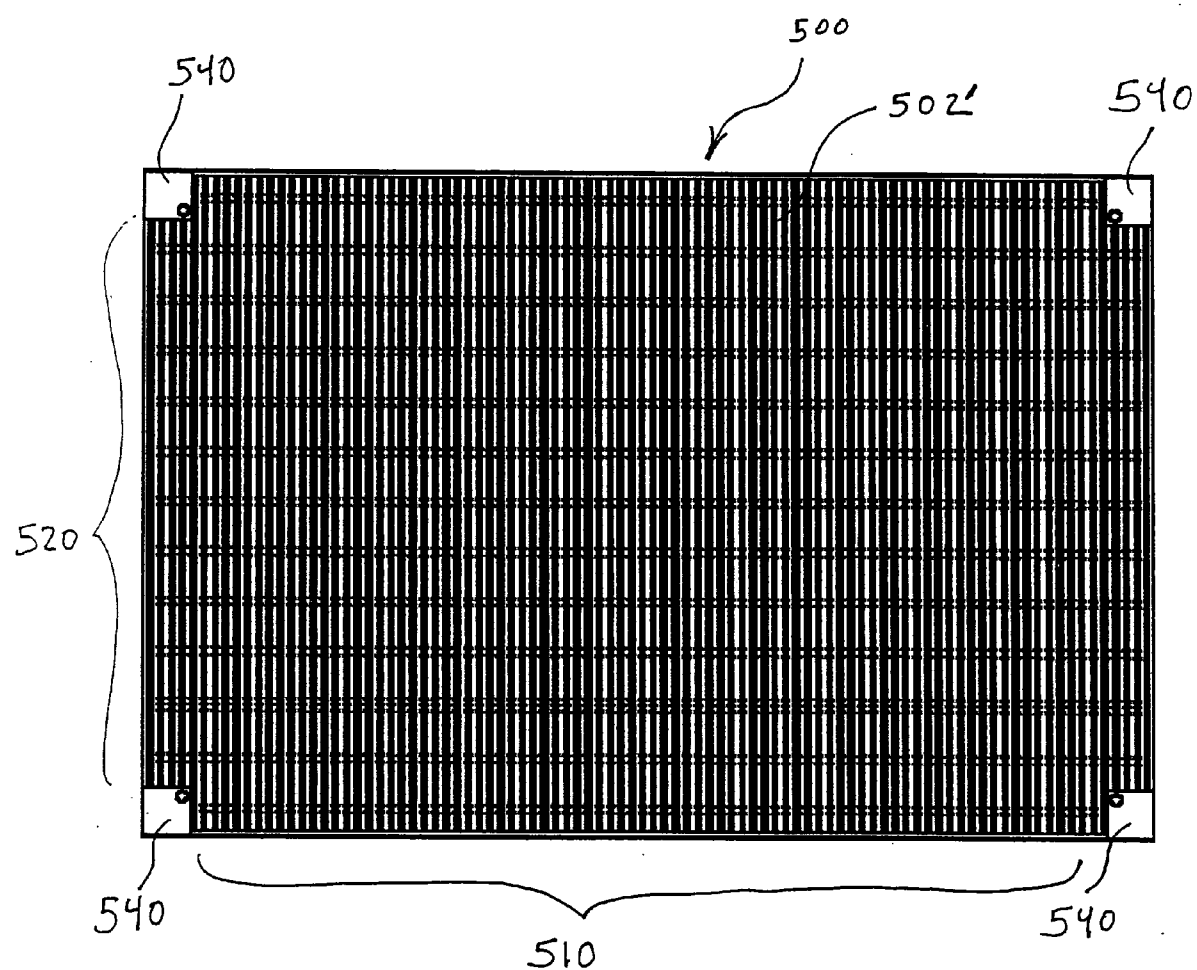


FIG. 9

OSCILLATING SORTING DEVICE FOR GRAPE BERRIES

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The current application is a Continuation of and claims priority to the application for an "Oscillating Sorting Device for Grape Berries", filed on Jul. 6, 2005, having Ser. No. 11,176,431.

BACKGROUND OF INVENTION

[0002] The present invention relates to the processing of wine grapes, and more specifically to an apparatus, process and related equipment for separating wine grape berries prior to conversion into must and juice for wine making

[0003] The manufacture of the highest quality wines requires the use of nearly perfect wines grapes, which are of perfect ripeness and free from foreign and extraneous matter that would lead to off flavors and/or hinder or degrade the fermentation process.

[0004] Wine grapes, being a natural agriculture product that is harvested in large commercial quantities for commercial wine making, inevitably contains some quantity of foreign or otherwise undesirable matter, be it from field contamination, so-called MOG (an acronym for "material other than grapes") or natural variation in fruit ripeness and quality as caused by weather, pestilence, genetic variation and the like. MOG may include stems or portions thereof (such as sheared stem material produced by the action of the destemming machine), leaf material, bugs, pebbles and the like.

[0005] Current industrial practice at premium commercial wineries is to employ crews that visually inspect grapes, either before or after de-stemming, in order to manually cull and remove the undesirable matter. However, hand sorting is limited in efficiency, completeness and in particular, is not practical to remove some undesirable components. Indeed it is difficult to remove by hand sorting "shot berries" (immature grapes) as well as overripe grapes or raisins, both of which although technically grape matter, adversely effect wine taste, flavor and aroma.

[0006] Accordingly, there is a need for automated equipment and processes to remove undesirable matter from wine grape berries after de-stemming.

[0007] It is therefore a first object of the present invention to provide such equipment and a process that has the general attributes of removing MOG from de-stemmed grape berries.

[0008] It is another objective of the invention to provide such equipment and a process that removes "shot berries" as well as raisins without damaging or crushing whole ripe grapes.

[0009] It is a further objective of the invention to provide the above automated process that is highly efficient at removing undesirable components, yet does so at a high throughput of grape berries.

[0010] Still yet another object of the invention is to provide such a process and equipment which is relatively

easy to maintain, with minimum and infrequent downtime for cleaning or refreshing by removing the separated undesirable materials.

SUMMARY OF INVENTION

[0011] In the present invention, the above and other objects of the invention are achieved by providing an oscillating flow platform that receives the de-stemmed grapes at one end directly from a grape de-stemming machine, and then separates out the undesirable matter through a screen as the grapes are conveyed via a trough to holding tank, press or crusher.

[0012] The oscillating flow platform includes a support stand on which a trough having a screen at its bottom surface is oscillated back and forth by a motor driven cam mechanism. The screen in the preferred embodiments has a mesh pattern that facilitates removal of the undesirable MOG other matter without damaging whole grape berries.

[0013] Use of the above apparatus, with a preferred screen results in the removal of MOG, "shot berries" (immature grapes), raisins, stems, leaf material, bugs, pebbles and the like from de-stemmed grape berries, while largely maintaining the integrity of the ripe grape berries. Further, the device and method provide a high efficiency of removal at a high throughput of grape berries, yet with a minimal of maintenance downtime for cleaning or refreshing the screen.

[0014] The above and other objects, effects, features, and advantages of the present invention will become more apparent from the following description of the embodiments thereof taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF DRAWINGS

[0015] FIG. 1 is a side elevation of the oscillating flow platform;

[0016] FIG. 2A is rear elevation of the oscillating flow platform;

[0017] FIG. 2B is a cross-sectional elevation of the oscillating flow platform at section line II-II' in FIG. 1;

[0018] FIG. 3A is a detailed view of a portion of the rear elevation in FIG. 2 to illustrate the powered drive mechanism of the oscillating flow platform;

[0019] FIG. 3B is a side elevation of a portion of the power drive mechanism of FIG. 3A;

[0020] FIG. 4 is a plan view of the oscillating flow platform in FIG. 1;

[0021] FIG. 5A is a plan view of the screen portion of the oscillating flow platform in FIG. 1;

[0022] FIG. 5B is a detailed view of a portion of the plan view of FIG. 5A;

[0023] FIG. 6 is a first cross sectional elevation of section VI-VI' of the screen in FIG. 5B;

[0024] FIG. 7 is a second cross sectional elevation of section VII-VII' of the screen in FIG. 5B;

[0025] FIG. 8 is a side cross-sectional elevation of section VIII-VIII' of the screen in FIG. 5B; and

[0026] FIG. 9 is a plan view of an alternative embodiment of the screen portion of the oscillating flow platform in FIG. 1.

DETAILED DESCRIPTION

[0027] Referring to FIGS. 1 through 9, wherein like reference numerals refer to like components in the various views, there is illustrated therein a new and improved oscillating flow platform, generally denominated 100 herein.

[0028] In accordance with the present invention, FIG. 1 is an exterior side elevation of oscillating flow platform 100. The platform comprises a support frame or stand 110 to which trough 160 is mounted by four pivot legs 101. The trough is tilted downward from grape receiving end 160a toward an open mouth 166. The trough has an aperture 163 that spans the midsection of the bottom surface for receiving a screen 500. Thus, in a winemaking operation oscillating flow platform 100 receives grape berries at end 160a after de-stemming. As trough 160 oscillates in the plane of FIG. 1, about the four pivot legs 101, the de-stemmed grape berries and MOG arriving from the de-stemmer are agitated as they flow downward with gravity toward open mouth 166. Open mouth 166 is preferably tapered inward, as shown in FIG. 4, so that the still oscillating berries are directed into the next conveyor, storage or process vessel in the wine-making process.

[0029] The agitation induced by the oscillating trough 160 results in multiple opportunities for the MOG, raisons and shot berries to contact and pass through screen 500. In contrast, the larger whole berries, being bigger than the slots in the screen 500, pass over it and exit the trough 160 at open mouth 166. As will be further described with respect to FIGS. 5-8, the screen 500 is configured such that whole berries pass over the screen while the majority of the undesirable mater falls through the screen. As a preferred embodiment, the trough has a solid area 161 for receiving de-stemmed grapes before entry to screen area. Initially dispensing grape berries on the solid area 161 has been discovered to result in a lower yield of juice being produced by the rupture of berries during the separation process. While the percentages of berries that rupture during the separation process is small, it can be significant for winemakers that plan to use a carbonic maceration process during the initial stages of fermentation, wherein fermentation initially occurs within the whole, un-ruptured berries. Further, avoiding the rupture of berries also minimizes the possibility that a portion of the grape juice will become oxidized before the start of fermentation.

[0030] The matter passing through screen 500 is directed by funnel trough 106, placed there under, into a removable open box-like catch basin 108. Catch basin 108 has a secondary screen 560 its bottom surface. Secondary screen 560 has a finer mesh pattern than screen 500 so that solid MOG is now retained, but grape juice generated from broken berries passes through, to be collected in the underlying secondary trough 167. Secondary trough 167 has a solid bottom surface that tapers toward a drain hole 168 and connected drain pipe 169. Thus, any juice produced by rupturing the grape berries, either during the de-stemming process or separation of MOG in oscillating flow platform 100, is readily removed and collected via a hose line or bucket placed under drain 168. Catch basin 108 rests on

secondary trough 167 so that it is readily removed therefrom to periodically disposed of the solid materials separated from the grape berries by screen 500. It should be appreciated that catch basin 108 need not be limited to a discrete fixed member as illustrated, but in other embodiments may take the form of a screen conveyer belt so that that MOG, raisons and shot berries are continuously removed from the apparatus, before they have a chance to accumulate as they would in the discrete catch basin 108 illustrated herein.

[0031] Trough 160 is oscillated about the four pivot legs 101 via motor 120 and drive assembly 125. The upper ends of the pivot legs 101 are connected to trough 160 via upper bearings 164, whereas the lower ends of the pivot legs 101 are connected to trough 160 via lower bearings 102. The upper 164 and lower 102 bearing structures are preferably bushings, but are alternatively a roller bearing, a ball bearing and the like.

[0032] The motor 120 and drive assembly 125 are mounted to support frame 110 just below the upper end 160a of the trough 160. The oscillation frequency of trough 160 is readily varied to suit the characteristics of the grape variety being treated by modulating the speed of motor 120 via frequency drive controller 125. Frequency drive controller 125 allows the user to control the speed of electric motor 120 by modulating the applied current.

[0033] As shown in further detail in FIGS. 3A and 3B, drive assembly 125 also comprises a drive shaft 140 supported for free rotary motion within a pair of block bearing 142, which are mounted to frame 110. A drive belt 130 is mounted at one end to surround the belt sheeve 132 attached to the motor drive shaft 121. The opposite end of drive belt 130 is wrapped to surround drive shaft belt sheeve 134. Thus, the rotation of motor 120 rotates drive shaft 140 via drive belt 130. Laterally disposed about the center of drive shaft 140 is a cam 150. The cam 150 has a cam follower 155 attached, which extends perpendicular to drive shaft 140. The cam follower 155 is coupled to the cam 150 to oscillate back and forth along its principle axis as the cam surface is displaced in the same direction with every rotation of drive shaft 140. The other end of the cam follower 155 is attached via the rotary coupling of central bearing block 162 (shown in FIG. 1) to the bottom of trough 160, just forward of screen aperture 163. Thus, as the cam 150 rotates eccentrically with respect to drive shaft 140, the cam follower 155 is driven to oscillate in the plane of FIG. 1 and likewise drives trough 160 to oscillate in the same plane via pivoting legs 101.

[0034] Still referring now to FIGS. 3A and 3B, further details of the preferred embodiment of the drive system 125 will now be described. Drive shaft 140 has at each end, outward of cam 150 and block bearings 142, a pair of drive shaft counterweight assemblies 145. An external side elevation of the drive shaft counter weight assembly 145 is shown in FIG. 3B.

[0035] It should be appreciated that support stand 110 is attached to or rests on the ground via stand feet 105. The stand support feet terminate in rubber damping pads 104 which contact the supporting floor or ground surface 10 to minimize vibration transmitted from the oscillatory motion of the trough 160. However, it has been discovered that the counterweight assembly 145 vastly minimizes such vibration. In the most preferred embodiment, the counter weight is configured to provide a non-uniform radial distribution of

weight with respect to the axis of drive shaft **140**. The weight is distributed such that the center of gravity of each counterweight assembly **145** is directly on the opposite side of drive shaft **140** from cam **150** and cam follower **155**.

[0036] In FIG. 3B the drive shaft counterweight assembly **145** is shown as composed of two disks segments (**145a** and **145b**) and two annular segments (**145c** and **145d**) secured together by common bolts **146** bolted together. However, each counterweight assembly can also be constructed as a monolithic component. Each counterweight assembly **145** is preferably secured to the end of drive shaft **140** as shown by end bolt **147**. The non-uniform radial distribution of counterweight **145** is provided in this embodiment by the stacking two wedge shaped segments **145d** and **145e**. The two wedge shaped segments **145d** and **145e** affixed to the other portions of counterweight assembly on the end of drive shaft **140** such that center of gravity of the counterweight assembly **145** with respect to drive shaft **140** is opposed to the center of gravity of cam **150**. The preferred masses of counterweights **145a-e** are 6, 3, 3 and 1.5 pound respectively, for a total mass of 13.5 pounds on each side of drive shaft **140**.

[0037] Reducing vibration of oscillating flow platform **100** not only reduces noise to nearby workers, but also greatly reduces the tendency for the unit to move during use, and is expected to generally extend the useful product life. Without wishing to rely on theory, it is believed that as vibration is reduced with counterweight assembly **145** there is also a more efficient coupling of the rotary motion of motor **120**, into the oscillatory motion of trough **160**, increasing the potential throughput of whole berries in trough **160** while maintaining the high separation yield of undesirable material through screen **500**.

[0038] The optimum construction and function of screen **500** is more fully described below with respect to FIGS. 5-9. However, it should be appreciated that one method of mounting screen **500** in aperture **163** is with the long axis of the slots **502** parallel with the principle axis of the trough **160**; oriented to incline downward with the trough **160**. An alternative method of mounting a different screen, shown in FIG. 9, results in the long axis of the slots **502'** oriented perpendicular to the principle axis of the trough **160**. Referring now to the first embodiment shown in FIG. 5, screen **500** has a rectangular frame **530**. Inset and connected to each interior corner of frame **530** are four solid rectangular mounting corners **540**. Each mounting corner **540** has a stud **541** for receiving a wing nut assembly (not shown) for secure attachment to the trough **160** to fill aperture **163**. The remainder of the screen **500** within frame **530** is formed from an interconnected array of triangular shafts and wires. The spacing between the shafts is less than that between the wires to define the array of rectangular slots **502**. Thus, connected to opposing sides of the frame **530** is a parallel array of triangular shafts **510**, each shaft being oriented so that sides of equal width define a common plane **505** at the entrance side of screen **500**, as shown in section VI-VI', in FIG. 6. The wires within parallel array **520** are connected at the ends to other pair of opposing sides of frame **530**. Each wire in the parallel **520** is connected to each of the triangular shafts in array **510** that it traverses so as to stabilize the entire parallel ray of shafts. As shown in FIG. 7, corresponding to section line VII-VII' in FIG. 5, it can be seen that each wire connects to the traversing triangular shaft at the apex thereof, opposite the side that defines a portion of plane **505**.

[0039] In the embodiment of screen **500** in FIGS. 5-9, it is preferable that the edge to edge spacing of the triangular shafts at the upper surface, W , within screen **500** is about 0.25 inches, with the orthogonal wires separated by a distance, L , of about 1.75 inches. The sides of each triangular shaft preferably has a width of about 0.25 inches wide. The wire preferably have a diameter of about 0.25 inches. Thus, in this preferred embodiment screen **500** consists of slots **502** having an aspect ratio of L/W . L/W is preferably greater than about 3, and more preferably greater than about 4, and most preferably at least about 6.

[0040] In the preferred embodiment of the oscillating flow platform **100** screen **500** is mounted with the leading edge (that is the side closer to grape receiving end **160a**) depressed or at least level with the bottom of the trough and the trailing edge (the side closer to open mouth **166**) above or at least level with the interior bottom of the trough **160**.

[0041] The screen construction shown in FIGS. 5-9 has several surprising advantages for separating grapes. From the interior of the trough **160**, plane **505**, the screen appears to the arriving grape matter as a series of slots. The slot spacing W is narrow enough to return ripe whole berries, yet let smaller raisins, shot berries and most forms of MOG pass through. It should be noted that as the wires **520** are connected to the triangular shafts **510** near the lower and downward facing apex, this adjacent area is wider, having a width, w , as shown in FIG. 7.

[0042] Not wishing to be bound by theory, it is currently believed that one reason for the higher throughput of screen **500** is that once MOG particles passes through aperture **501**, they are unlikely to re-enter in the opposite direction. Further, the size and spacing of the triangular rods and wires is such that high aspect ratio MOG, (such as stems, twigs and insects and the like) will not collect on these members, but rather fall downward toward secondary screen **560** for catching separated MOG. Likewise, it is believed that the inverted shape of the triangular shafts **510**, with the narrow opening W at the upper or entry surface at plane **505** makes it unlikely that matter vibrating free or hitting wires **520** will reverse direction and pass back up above plane **505** into trough **160**. Although the wires **520** are a locus for the potential buildup of matter that passes through the gap W (between triangular shafts in plane **505**), the tendency toward build-up is reduced as the inverted triangular shape of the shafts **510** provides a wider gap, w , and hence more space for such matter to tumble free of the wires **520** due to the oscillation induced vibration of the matter as it enters and then traverses screen **500**.

[0043] It should be appreciated that for some varieties of grapes it has been discovered that the orientation of the rectangular slots **502'** in screen **500**, as shown in FIG. 9, may be preferable for removing MOG and other undesirable components. Screen **500** has a rectangular frame **530**. Inset and connected to each interior corner of frame **530** are four solid rectangular mounting corners **540**. The remainder of the screen **500** within frame **530** is formed from an interconnected array of triangular shafts and wires that as in the embodiment of FIG. 5, to define the slots **502'**. However, the array of triangular shafts and wires are now reversed in orientation with respect to the long and short sides of screen **500**. That is the parallel array of shafts **510** is now oriented parallel to the short axis of screen **500** and the parallel array

of wires is oriented in the transverse direction or parallel to the long axis of screen **500**. The spacing between the shafts is less than that between the wires to orient the rectangular slots **502'** with their longer axis parallel to the shorter side of screen **500**.

[0044] While the invention has been described in connection with a preferred embodiment, it is not intended to limit the scope of the invention to the particular form set forth, but on the contrary, it is intended to cover such alternatives, modifications, and equivalents as may be within the spirit and scope of the invention as defined by the appended claims.

1. An oscillating flow separator comprising:

- a) a substantially rectangular trough open at the top and enclosed by three substantially upright sides, said trough being open on one of the shorter sides of the rectangle for dispensing purified solid matter,
 - b) a screen disposed on the bottom of said trough,
 - c) a catch basin disposed below the screen of said substantially rectangular trough that comprises a secondary screen disposed at the bottom thereof,
 - d) a secondary trough disposed below said catch basin for collected liquid separated by said secondary screen.
2. An oscillating flow separator according to claim 2 further comprising a funnel trough disposed below the screen of said substantially rectangular trough for directing matter separated by the screen into said catch basin.
3. An oscillating flow separator according to claim 1 wherein said secondary trough has a substantially solid bottom surface that tapers toward a drain hole.
4. An oscillating flow separator according to claim 2 wherein said secondary trough has a substantially solid bottom surface that tapers toward a drain hole.
5. An oscillating flow separator according to claim 1 wherein the oscillating trough is tilted such that the open side is lower than the opposite and surrounding side.
6. An oscillating flow separator according to claim 1 wherein said screen is a series of apertures formed in the bottom of the trough.
7. An oscillating flow separator according to claim 1 wherein said screen has a substantially rectangular frame

and is removed from a matching rectangular apertures formed in the bottom of the trough.

8. An oscillating flow separator according to claim 7 wherein the top side of the screen disposed parallel and distal to the open end of the trough is disposed slightly above the bottom of the trough.

9. An oscillating flow separator according to claim 7 wherein the top side of the screen disposed parallel and proximal to the open end of the trough is disposed slightly below the bottom of the trough.

10. An oscillating flow separator according to claim 7 wherein said screen comprises

- a) a first parallel array of triangular shafts, each shaft oriented so that the sides define an upper plane,
- b) a second parallel array of wires cross-connecting and stabilizing said array of triangular shafts,
- c) wherein said second parallel array of wires is connected to each of the triangular shafts of said first parallel array near the apex thereof, opposite the side that defines a portion of the upper plane.

11. An oscillating flow separator according to claim 10 wherein the spacing between the triangular shafts of the screen at the upper plane is less than about 0.5 inches

12. An oscillating flow separator according to claim 11 wherein the spacing between the triangular shafts at the upper plane is less than about 0.35 inches

13. An oscillating flow separator according to claim 12 wherein the spacing between the triangular shafts at the upper plane is less than about 0.25 inches

14. An oscillating flow separator according to claim 10 wherein the spacing between wires is about 3 times the spacing between the triangular shafts at the upper plane.

15. An oscillating flow separator according to claim 10 wherein the spacing between wires is about 4 times the spacing between the triangular shafts at the upper plane.

16. An oscillating flow separator according to claim 10 wherein the spacing between wires is about 6 times the spacing between the triangular shafts at the upper plane.

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