United States Patent

[11] **3,580,381**

[72] Inventor **George E. Kilner**
Alameda, Calif.

[21] Appl. No. **825,005**
[22] Filed **May 15, 1969**
[45] Patented **May 25, 1971**
[73] Assignee **Filper Corporation**
San Rama, Calif.

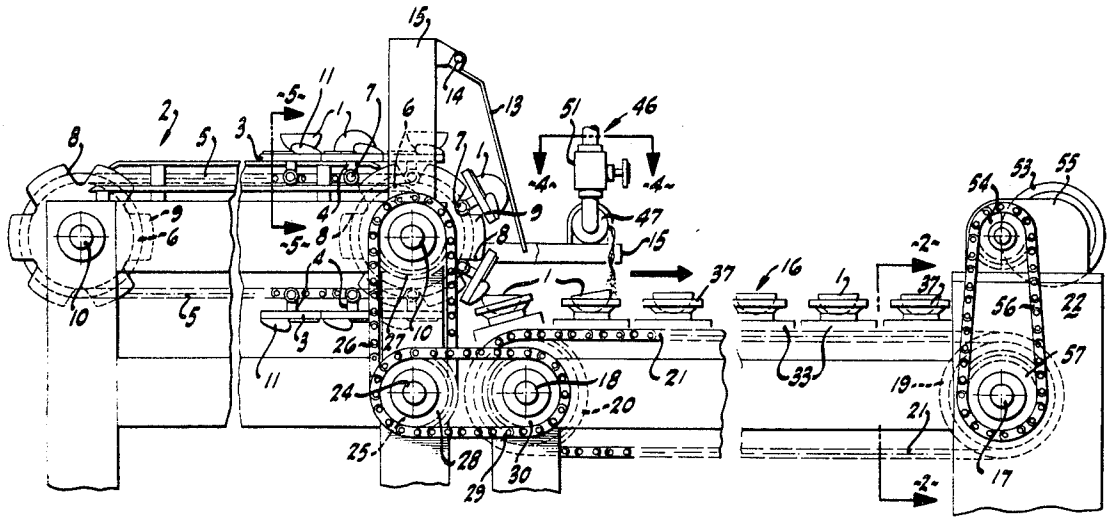
[54] **APPARATUS AND METHOD FOR LEVELLING DRUPE HALVES AND THE LIKE**
7 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **198/33**
[51] **Int. Cl.** **B65g 47/24**
[50] **Field of Search** ..... 198/33 (RI); 146/17.1, 28.1, 52, 224

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Primary Examiner—Edward A. Sroka
Attorney—Boyken, Mohler, Foster and Schwab

ABSTRACT: Apparatus and method for automatically orienting and conveying hemispherical objects each having a planar surface opposite to a hemispherical surface so said planar surfaces, when facing generally upwardly, but if slanted relative to horizontal, will automatically position themselves, while conveyed along a path of travel, so their planar surfaces are horizontal.



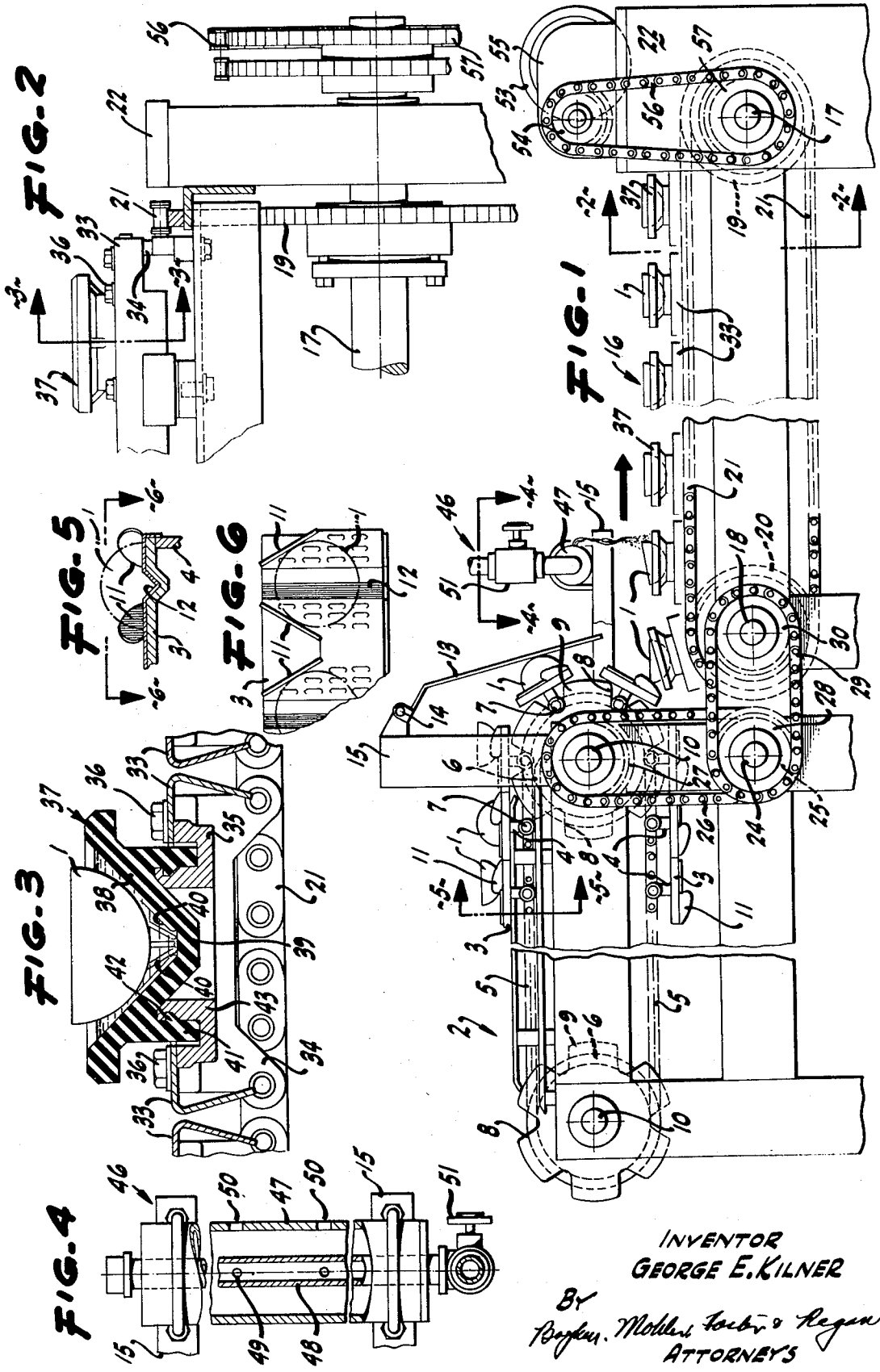


FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 5

FIG. 6

INVENTOR
GEORGE E. KILNER

By Bayless, Mobley, Fowler & Regan
ATTORNEYS

APPARATUS AND METHOD FOR LEVELLING DRUPE HALVES AND THE LIKE

SUMMARY OF THE INVENTION

In the fruit industry, the adequate inspection of drupe halves from which the pits have been removed as well as prior to such removal so as to detect and remove halves having defective pits or to remove the pitted halves having had pit cavities or pit cavities retaining fragments of pits therein has heretofore been a problem. If the drupe halves are fed, in bulk, onto conveyors, some of the halves will have their planar faces against the conveyor and must be turned over, while those having their hemispherical sides against the conveyor may have their planar faces so tilted in any one of many directions, relative to horizontal so that the pits or pit cavities cannot be inspected, or if inspected, the viewing thereof may be inadequate.

The attempted solution heretofore most commonly adopted has been to employ a sufficient number of inspectors to turn the halves so that the planar faces can be seen, or to slow down the conveyors, both of which procedures are costly and neither of which is conclusive. The halves handled by one inspector, and passed, may still have its planar face tilted so that other inspectors are unaware that it has already been inspected. Also, halves so tilted, but still carrying pit fragments or a spoiled area on their planar faces, may be passed by inspectors under the assumption that it has been inspected.

One of the objects of the present invention is the provision of a method and apparatus whereby drupe halves, or other hemispherical bodies of similar specific gravity, will automatically position themselves on a conveyor with their planar surfaces uppermost, and horizontal so that none of the pits and pit cavities in said drupe halves will avoid detection and examination by a person positioned at either of two opposite sides of rows of said halves.

Another object of the invention is the provision of apparatus and a method by which indiscriminately positioned drupe halves and the like with respect to the upward and downward facing positions of their planar faces will be automatically positioned with their planar faces directed upwardly and horizontal, and free from obstruction for visual inspection of their planar faces and their pits and pit cavities, and for manual removal of any halves that may have defective planar surfaces, pit cavities, or that may have pits or pit fragments in their pit cavities.

Other objects and advantages will appear in the description and in the drawings.

BRIEF DESCRIPTION OF DRAWINGS

In the drawings:

FIG. **1** is a semischematic, simplified, side elevational view of the apparatus that incorporates the invention.

FIG. **2** is an enlarged, fragmentary, cross-sectional view at line **2–2** of FIG. **1**.

FIG. **3** is an enlarged, cross-sectional view of one of the supports for a hemispherical object at line **3–3** of FIG. **2** with one of such objects shown in elevation therein.

FIG. **4** is an enlarged, fragmentary view, broken in length, and partly in section, of a portion of the water supply system, as seen from line **4–4** of FIG. **1**.

FIG. **5** is an end view of one of the elements shown in FIG. **6** as seen from line **5–5** of FIG. **1**.

FIG. **6** is a fragmentary top plan view at line **6–6** of FIG. **5** showing one of the elements for discharging hemispherical objects with their planar faces directed upwardly, one of said objects being indicated in broken lines.

DETAILED DESCRIPTION

Referring to FIG. **1**, drupe halves **1** are shown supported on the upper run of an endless, horizontally extending carrier generally designated **2**, with their planar faces directed either upwardly or downwardly. Said carrier, itself, comprises a row of slats **3**, extending transversely of the direction of movement of the carrier, which slats are secured at their ends to brackets **4** that, in turn, are pivotally connected with the links of a pair of endless chains **5** that extend over sprocket wheels **6** at the opposite ends of said carrier. Pivots **7** connect brackets **4** with chains **5**, which pivots may have extensions that project into outwardly opening recesses **8** in discs **9**, the latter being secured on shafts **10**. The slats **3** span the recesses **7** and are respectively supported against the outer periphery of the discs at opposite sides of each recess **9** in a position tangential to annular outer peripheries of the latter as the slats pass around said discs.

Hereinafter the words "forwardly," and "rearwardly," "leading,"and words of similar import, are used with respect to the direction of movement of the upper run of carrier **2**, said movement being from left to right as viewed in FIG. **1**; hence, the forward end of the carrier is the right-hand end and the leading portion of the slats along the upper run of the carrier, and of any elements thereon is the right-hand edge or end as viewed in FIG. **1**.

Ears **11** of adjacent pairs thereof (FIGS. **1, 5, 6**) are rigid on each of the slats **3** and project outwardly therefrom at right angles to the flat outer surfaces of the slats. The ears of each pair thereof extend divergently rearwardly from the leading edge of each slat, at an angle of approximately 30° relative to a vertical plane bisecting the space between said ears that is perpendicular to the plane of the slat supporting the pair of ears.

The forward ends of the ears **11** of each pair thereof commence at the leading edge of each slat and at the forward or leading end of an upwardly opening V-shaped recess **12** (FIGS. **5, 6**). Recess **12** is between the ears of each pair, and extends the full width of each slat at a right angle to the latter.

Ears **11** are identical in contour and size and their outer edges commence at the leading edge of each slat and are progressively curved outwardly and away from the slat in a rearward direction to terminate in a relatively abrupt linearly convexly extending rear edge that extends back to the slat at points spaced from the trailing edge of the slat.

The spacing between ears **11** of each pair is such that a drupe half, for example, having a diameter of approximately 2 to 2½ inches disposed between such pair with its planar face against a slat of the upper arm, will engage the ears at points along the junctures between the ears and the slat intermediate the front and rear ends of the ears.

A drupe half having its convex hemispherical surface supported on a slat **3** between a pair of ears **11** thereon, will engage the ears at points along the curved outer edges of the latter at points intermediate the front and rear ends of the ears.

An apron **13** is pivotally suspended from a pivot **14** carried on a portion of rigid frame **15** to the carrier, the lower end portion of which apron extends across the forwardly facing sides of slats **3** as the latter move around the forward end of the carrier. This apron is suspended so as to engage the outer sides of drupe halves that are between the pairs of ears on each slat as the halves are carried down the forward end of the carrier.

The drupe halves may be fed onto each of the slats **3** between the ears **11** of the pairs thereon by any conventional or suitable means, it being immaterial which side is facing upwardly. As the slats move downwardly at the forward end of the carrier, the drupe halves may slide forwardly, by gravity, on each slate to be centered between the ears **11** and the apron **13** will engage the outwardly facing sides of the drupe halves to retain them between the pairs of ears. Preferably, the outer surface of the slats between said ears is embossed or "-pebbled" to preclude the halves having their planar surfaces against said slats from sticking to the latter when they are in a position to fall from the carrier, and recess **12** will receive pits that may project from such drupes.

The drupe halves will clear the apron **13** by the time they reach the lower portion of their arcuate downward movement at the forward end of the carrier. Those halves having their planar faces against the slats will pivot outwardly about op-

posite points on divergently extending faces of the ears to fall, by gravity, from the carrier with their hemispherical surfaces facing downwardly. In this instance it is the leading portion of each drupe half that swings outwardly from the slat.

The halves having their hemispherical surface against the slats will both pivot and slide outwardly of the slats about their points of engagement with the curved outer edges of the ears to fall, by gravity, with their hemispherical surfaces facing downwardly. In this instance it is the leading portion of the drupe half that moves outwardly from the slat.

The apron **13** is so suspended as to yieldably engage the outer surfaces of the drupe halves until they fall, which contributes to their moving to positions with their hemispherical surfaces facing downwardly when they fall.

The operation of the carrier **2**, and several modifications thereof, is described more in detail in copending application, Ser. No. 813,955, filed Apr. 7, 1969.

Forwardly of carrier **2** is an endless, horizontally extending conveyor generally designated **16**, having a pair of horizontally spaced parallel shafts **17**, **18**, each having a pair of spaced sprocket wheels **19**, **20** secured thereon. The forward shaft **17** at the forward end of the conveyor **16** carries wheels **19** while the shaft **18** at the rear end carries wheels **20**. Chains **21** extend around the wheels **19**, **20** and shafts **17**, **18** are journaled for rotation in bearings carried by the stationary frame **22**, which may be part of frame **15**.

A jack shaft **24**, parallel with and adjacent shaft **18**, is supported for rotation on frame **15** and has a sprocket wheel **25** secured thereon, which sprocket wheel is connected by a chain **26** with a sprocket wheel **27** secured on the forward shaft **10** of carrier **2**. A second sprocket wheel **28**, secured on shaft **24**, is connected by a chain **29** with a sprocket wheel **30** on shaft **18** of conveyor **16**. By this arrangement, conveyor **16** and carrier **2** are connected for simultaneous operation for movement of their upper runs from left to right as viewed in FIG. **1**.

Chains **21** of conveyor **16** have an endless row of transversely extending strips **33** secured at their ends to the links of chains **21** by lugs **34** (FIGS. **2**, **3**).

A row of castings **35** extends longitudinally of each strip **33** with each of the castings secured to each strip by screws **36** (FIG. **2**), and each casting is apertured for holding a cup or cuplike support **37**.

Each cuplike support opens upwardly along the upper run of conveyor **16**, and has sides **38** extending convergently downwardly to a horizontal bottom wall **39**. An annular row of vertically elongated, horizontally spaced ridges **40** project inwardly from the inner sides of sidewalls **38**, said ridges having the same inclination, relative to vertical, as sidewalls **38**. It is thus seen that the cuplike supports are generally frustoconical with their larger diameter ends uppermost, and the ridges **40** provided channels between the ridges for passage of water between and past the outer hemispherical surface of drupe halves adapted to be positioned in the supports **37** of the upper run of conveyor **16**.

An annular flange **41** depends from said sidewalls **38**, and is formed with an annular radially inwardly projecting ridge **42** adapted to be received in an annular radially outwardly opening recess in the sides of a cylindrical vertically disposed boss **43** integral with each casting **35**. The inner side of this boss **43** defines the sides of the aperture in each casting into which the lower end of each cuplike support **37** extends (FIG. **3**).

The cuplike support is preferably of resilient, elastic, material, in which the side and bottom walls are imperforate. The flange **41**, being elastic, is adapted to be stretched so the ridge **42** will snap into the recess around the outer side of boss **43** to releasably hold each cup onto one of the castings **35**.

The diameter of each cuplike support **37** at its upper end and the slat of the sidewall **38** and ridges **40** are such that a drupe half **1**, when positioned in each support of the upper run of conveyor **16** with its hemispherical surface facing generally downwardly, will be supported with its upwardly facing planar face approximately at the level of the upper edges of the cuplike supports, and the lowermost portion of the downwardly facing hemispherical surface will be spaced above the bottom wall **39**. Thus, said hemispherical downwardly facing surface of each drupe will be at approximately 45° relative to horizontal and said ridges **41** will engage said surface at points intermediate the uppermost and lowermost surfaces of the support.

The space between the upper edges of said cuplike support and the upper portion of the drupe half is such that water falling from above will readily fall into said space even after a drupe half is positioned in each cuplike support, and such water will readily pass between the adjacent pairs of ridges **41** to below the cuplike support for floating a drupe half in such support.

There is the same number of drupe supports **37** on each strip **33** as the number of pairs of ears **11** on each slat **3** of corner **2**. The pairs of ears **11** on the upper run of carrier **2**, longitudinally of said run, are generally in alignment with the longitudinally extending rows of supports **37** on conveyor **16**. A vertical plane disposed longitudinally of the upper run of carrier **2** and bisecting the spaces between the ears **11** of each pair thereof on carrier **2** would bisect the cuplike supports **37** of the rows that extend longitudinally of the upper run of conveyor **16**.

The sprocket wheels on forward shaft **9**, shaft **24**, and shafts **17**, **18** are proportioned so that the drupes respectively supported between the pairs of ears **11** will fall from carrier **2** into the cuplike supports **37** as upon dropping by gravity from the forward end of carrier **2** at the moment when the supports have approximately reached the upper horizontal run of conveyor **16** (FIG. **1**). By this arrangement a transverse row of drupe halves on each slat **3** with some having their planar surfaces facing upwardly and others with their planner surfaces facing downwardly, will simultaneously fall into each row of supports **37** on each strip **33** with their hemispherical surfaces facing downwardly as the rows of slats carry the ears **11** downwardly past the upwardly moving supports on the strips **33**. By this action, orientation of the planar surfaces of the drupe halves, so they will be directed generally upwardly on conveyor **16**, is accomplished.

In dropping into the supports **11**, some of the upwardly facing planar surfaces of the drupe halves will be tilted forwardly, rearwardly, and laterally to one side or the other, relative to horizontal, in the cuplike supports **37**, and in order to obtain a clear view of the planar surfaces of the drupe halves and any defects therein or pit halves in the pit cavities of the halves from one side of the row or the other, the planar surfaces should be horizontal.

To accomplish this result quickly, and without injury to the halves, a water supply means **46** (FIG. **1**) is stationarily positioned above the transverse rows of supports **37** at the rear end of conveyor **16**, adjacent to the point where the halves **1** fall into said support.

This water supply means comprises a horizontally elongated tubular manifold **47** supported on frame **15** in a position adjacent to the forward end of carrier **2**, parallel with and spaced above the first transverse row of cuplike supports that reaches a horizontal position in the upper run conveyor **16**.

Each manifold has closed ends with a central, horizontal water supply pipe **48** extending through one closed end of the manifold to the other and spaced within the manifold. This pipe **48** is connected with a source of water under pressure, and is formed with a plurality of discharge openings **49** (FIG. **4**) in its lower side for discharge of water into the manifold. Manifold **47**, in turn, is formed with a horizontal row of openings **50** in its forward side at least one of which openings is disposed above one of each of the cuplike supports **11** at the rear end of conveyor **16** on the strip **33** that initially reaches a horizontal position.

A valve **51** in the pressure line connected with pipe **48** controls the flow of water into the manifold, and the rate of such flow is preferably such that the water level in said manifold will remain approximately at the level of the row of openings

so that the amount of water discharged into each of the supports **37** will be adequate to sufficiently float each drupe half **1** to enable it to overcome any resistance to automatic levelling its planar surface due to engagement of the half with the ridges **40**, thus floating each half so said levelling may occur. This levelling is under the influence of gravity, and water falling from the manifold, being solely under the influence of gravity, will not injure the drupe halves, and it readily passes between the ridges **40** into each cuplike support. Irrespective of the direction of tilt of the upper surface of the drupe halves, the drupe halves will quickly automatically adjust themselves in the support once floated to the extend necessary for them to do so.

The conveyor **16** and carrier **2** may be driven by means of a motor **53** which, in turn, may drive a sprocket wheel **54** through any suitable transmission or gear box **55**. A chain **56** connects wheel **54** with a sprocket wheel **57** secured on shaft **17** of conveyor **16**.

The movement of the carrier **2** and conveyor **16** may be continuous or intermittent, as desired, according to the character of the transmission **55**.

It is not intended that the use of the invention should be restricted to handling of drupe halves, inasmuch as it is adapted to function with any hemispherical bodies having approximately the same specific gravity as drupe halves, and has been used where it is desirable that the planar surfaces of the halves be level and facing upwardly, as shown in copending application, Ser. No. 814,118, filed Apr. 7, 1969.

I claim:

1. A method of orienting and supporting objects floatable in water and having approximately the specific gravity of drupe halves, each of which objects has a planar surface on one side and a substantially hemispherical surface on the opposite side extending to the edges of said planar surface so that said planar surfaces are substantially in a horizontal plane, comprising the steps of:

a. supporting separate bodies of water having free, exposed, upper surfaces for movement of said bodies in one direction,

b. automatically positioning the object in each body of water with its planar surface horizontal during said movement by substantially floatingly supporting one of said objects in each of said bodies with its hemispherical surface facing generally downwardly,

c. moving said bodies of water in said one direction,

d. slightly agitating said bodies of water during said movement to contribute to the movement of said objects to said positions in which their planar surfaces are horizontal,

e. said movement of said bodies of water in said one direction being intermittent to effect said agitation.

2. In the method as defined in claim **1**;

f. engaging the hemispherical surfaces of said objects below said water level at equally spaced points in a horizontal plane around a vertical axis while said objects are substantially floatingly supported, and during said movement to substantially center each object in the body of water in which it is supported.

3. In the method as defined in claim **1**;

g. said row of bodies being at a level adapted to support said objects therein in positions in which the upper planar surface of said objects are exposed at both of the lateral sides of said row and from above for inspection of said planar surfaces by one operator at either side of said row during said movement of said bodies.

4. The method of orienting drupe halves and the like, each having a planar surface on one side and a substantially hemispherical surface on the opposite side extending to the edges of said planar surface, comprising the steps of;

a. conducting a plurality of said halves in a row in one direction longitudinally thereof for discharge at the end of said row, said halves being indiscriminately positioned in said row with respect to whether their planar faces are directed upwardly or downwardly,

b. moving a row of upwardly opening receptacles past and below said outer end of said row in a position successively to receive in each receptacle one of the drupe halves discharged from said outer end of the row of drupe halves,

c. discharging the drupe halves in the row thereof from said end of said row thereof and at the same time guiding each of the halves so discharged to a position for falling of each discharged half into a receptacle therebelow with the planar faces of said drupe halves indiscriminately positioned with respect to whether their planar faces are tilted relative to horizontal or horizontal,

d. moving the receptacles of said row longitudinally thereof away from said end of the row of drupe halves, and effecting automatic turning of the drupe halves having tilted upwardly directed surfaces so their said planar surfaces will be horizontal, while maintaining the horizontal positions of the drupe halves in said receptacles having their planar surfaces horizontal, by floatingly supporting each drupe half positioned in each of said receptacles free from frictional resistance to said turning of each drupe half under the influence of gravity, whereby said planar surfaces of the drupe halves in said receptacles will be horizontal and readily inspected from either of two opposite sides of said row of receptacles.

5. Apparatus for orienting drupe halves and the like, each of which has a planar surface on one side in which a pit or pit cavity is exposed, and a substantially hemispherical surface on the opposite side extending to the edges of said planar surface, for positioning said planar surfaces horizontal and facing upwardly to enable a person at one side or the other of said halves to visually inspect said planar surfaces and the pits or pit cavities therein, comprising;

a. a plurality of parallel, horizontally extending longitudinal rows of imperforate, upwardly opening, cuplike supports in side-by-side relation with the supports in said rows in alignment transversely of said rows to thereby provide transverse rows of said supports at right angles to said longitudinal rows,

b. each of said supports being adapted to support therein a drupe half with its planar surface facing generally upwardly at a level adjacent to the uppermost portion of each support,

c. means supporting said longitudinal rows of supports for movement as a unit in one direction, and means connected with said rows for so moving them,

d. feed means over said longitudinal rows for simultaneously depositing a drupe half in each of the supports of said transverse rows at a point along said longitudinal rows,

e. means adjacent to said feed means for simultaneously discharging a sufficient amount of water into each of said supports to substantially float each of said drupes deposited in said supports, whereby drupe halves in said supports that may have their planar surfaces tilted relative to horizontal will automatically position themselves, when so floated, under the influence of gravity so their planar surfaces are horizontal to enable inspection of said planar surfaces and the pits or pit cavities therein by one person at either one or the other of the two opposite sides of said rows.

6. In apparatus as defined in claim **5**;

f. said means for discharging said water into said supports including a horizontally extending outer tubular manifold formed with a horizontal row of spaced discharge openings on one lateral side thereof respectively positioned over each of the supports of each transverse row adapted to pass therebelow for discharge of water in said manifold reaching said level, and

g. a pipe spaced within and parallel with said manifold formed with discharge openings for discharging water into said manifold,

h. means for controlling the rate of flow of water discharged into said manifold to maintain the level of water within the latter at row of discharge openings in the latter for

falling therefrom by gravity into said supports free from pressure thereagainst.

7. In apparatus as defined in claim 5;

f. said feed means including means for supporting a plurality of parallel rows of drupe halves in indiscriminate arrangement with respect to the upwardly and downwardly facing positions of their planar surface for movement longitudinally of said rows thereof to a discharge position for said simultaneous depositing of said halves into said transverse rows of said cups, and

g. means at said discharge position for guiding each of said drupe halves to a position for falling by gravity into each of said supports with its hemispherical surface facing downwardly.