Dec. 14, 1954 E. STRNAD ET AL 2,696,909

DEFECTIVE BULB SEGREGATING APPARATUS

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Fig. 1.

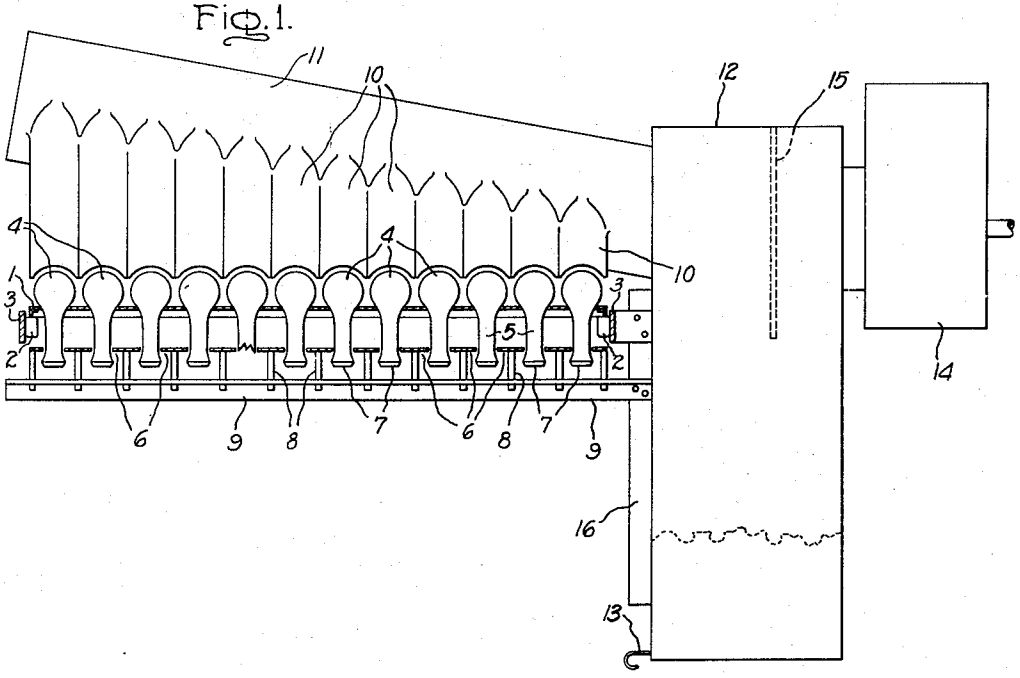


Fig. 2.

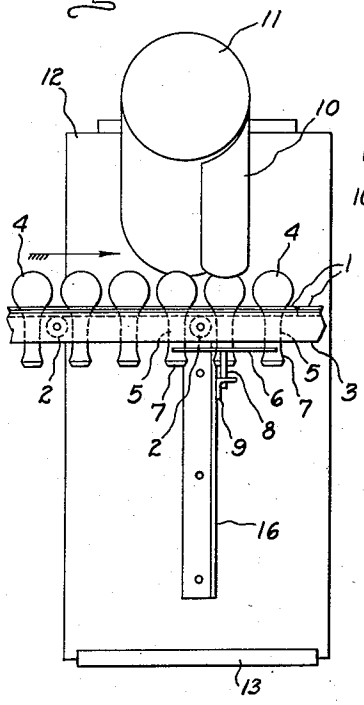
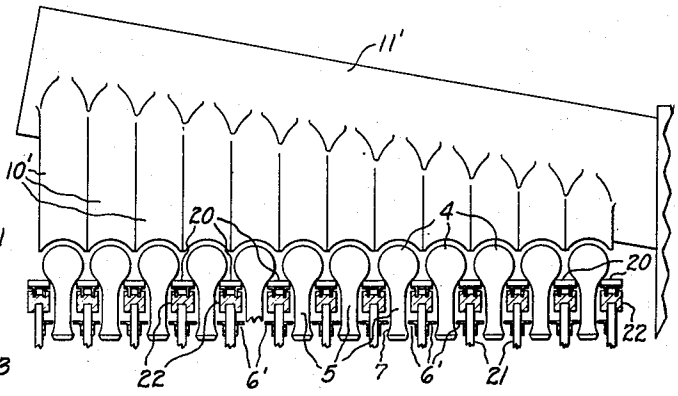


Fig. 3.



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Fig. 4.

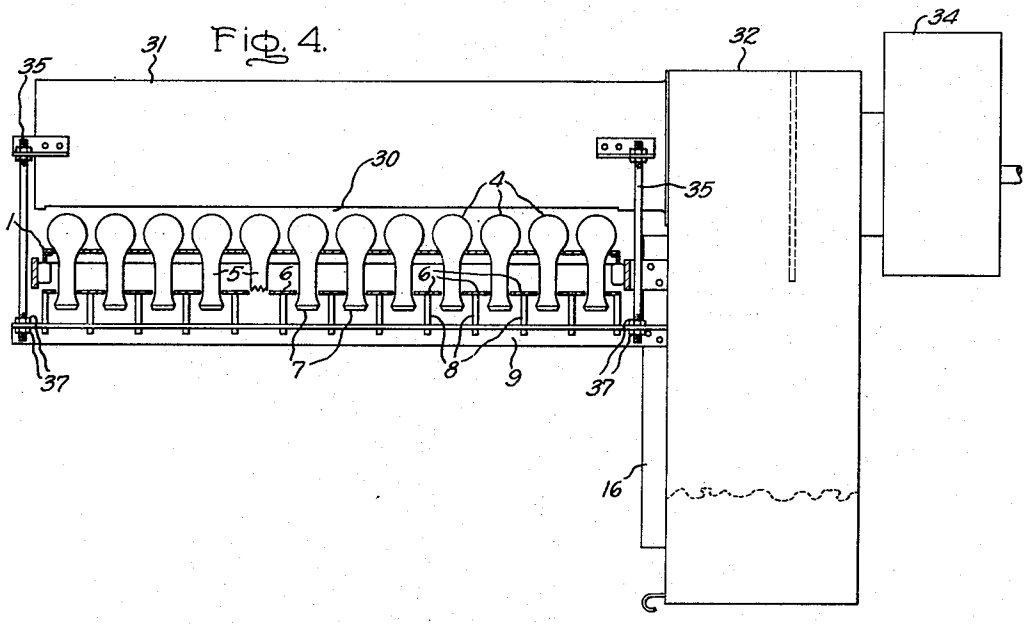


Fig. 5.

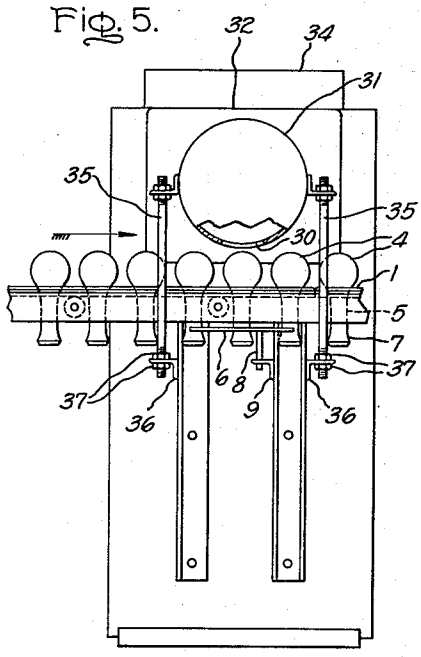
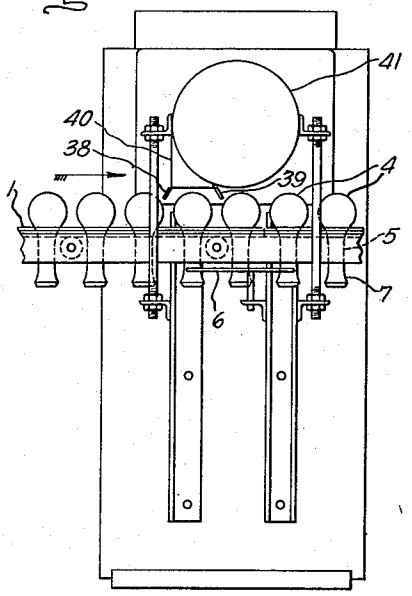


Fig. 6.



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DEFECTIVE BULB SEGREGATING APPARATUS

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Application May 28, 1953, Serial No. 358,118

9 Claims. (Cl. 209—80)

Our invention relates to apparatus for removing broken glass bulbs and like articles from conveying means, and more particularly to apparatus for selecting and discarding from a conveyor bulbs having broken neck portions.

One object of our invention is to provide automatically operated apparatus for preventing bulbs or like vitreous articles having broken neck portions from being advanced to frosting machines or other apparatus. The apparatus effects the removal of broken bulbs in the course of their movement along a conveyor and thus eliminates the need for the services of an operator. In the instance where the apparatus is used in combination with a conveyor for carrying said bulbs to a frosting machine, the removal of the broken bulb permits the substitution of a complete bulb in its place and avoids damage which would result from frosting material discharging freely through the broken bulb portion.

Another object of our invention is to provide apparatus for removing bulbs having broken neck portions from a conveyor wherein said bulbs are held in suspended neck-down positions in trays or between support rails.

In an embodiment of our invention, the apparatus is arranged along paths of movement of rows of bulbs suspended in neck-down positions in openings in trays or between support rails of a conveyor and is comprised of suction means located over said paths for lifting bulbs from said openings or from between said rails, and other means located below said trays and rails for preventing complete bulbs with undamaged necks from being lifted therefrom. This latter means may comprise pairs of stationary bars defining a restricted path of movement which is sufficiently wide to permit smaller intermediate portions of the bulb necks to pass therebetween but is narrower than the diameter of the lower flared ends of the bulb necks. Accordingly, all normal bulbs will be prevented from being drawn upward into the suction means, because the flared ends of the bulbs are too large to pass between the stationary bars, whereas bulbs with damaged or missing flared ends (so-called cullet portions) are not blocked from vertical movement by the bars and are drawn into the suction means. The suction means may, for instance, be comprised of a manifold slit along its length and arranged to extend across several parallel paths of movement of bulbs, or it may comprise individual tubes arranged to extend over each of said several paths. The broken bulbs are conducted by the manifold to a refuse container having a suction fan adjacent one end thereof, and are separated from the air flow therein so as to collect upon the bottom of the refuse container. The split type manifold has the advantage that it can be used properly with a large variety and sizes of bulbs; however, it requires a larger capacity suction fan than a manifold with individual tubes which are normally tailored to suit the bulbs being removed. A further feature effecting the economy of operation of the apparatus is the construction of the bulb holding trays or rails as the air flow has more lift upon the bulb when the trays and rails are made as solid as possible so as to restrict the flow of air to the area around the upper portion of the bulbs.

In the drawing, Fig. 1 is a side elevation of broken lamp bulb removing apparatus of our invention, which apparatus is particularly suited to remove specific sizes of bulbs from rows of openings in the trays of a conveyor shown in section.

Fig. 2 is a side elevation, at right angles to Fig. 1, of

the broken bulb removing apparatus and the adjacent portion of the tray type conveyor.

Fig. 3 is a side elevation corresponding to Fig. 1 of a portion of modified bulb removing apparatus arranged for operation with a belt type conveyor which is shown in section.

Fig. 4 is a side elevation corresponding to Fig. 1 of another modification of bulb removing apparatus comprising our invention wherein a slit manifold for use with a range of sizes of bulbs is provided.

Fig. 5 is a side elevation of the modified apparatus shown in Fig. 4.

Fig. 6 is a side elevation, corresponding to Fig. 5, of a further modification of the apparatus.

The apparatus, as shown in Figs. 1 and 2 of the drawing, is adapted to be mounted along the course of movement of the bulb holding trays of a conveyor which may be of the type shown in the disclosure of a bulb traying machine in Patent 2,439,883, C. A. Brown et al., which is assigned to the assignee of the present invention. The apparatus, as shown in Fig. 3, is adapted to be mounted along the bulb conveying belts of a feeding and storage means, as for instance, the bulb conveying belts of the bulb traying machine disclosed in said aforesaid patent.

When the broken bulb removing apparatus is arranged for use with the tray type conveyor as shown in Figs. 1 and 2, it is located at an operative position along the path of movement of bulb holding trays 1, said path being determined by rollers 2 on stationary rails 3 at opposite sides thereof. Each of the series of bulb holding trays 1 supports a relatively large number of bulbs 4 correspondingly suspended on the shoulders of a number of rows of openings therein and, in the course of movement along said path, advances a transverse row of bulbs 4 to operative relation to the broken bulb removing apparatus, which extends transversely across said path at one point therealong. As the bulbs 4 come into alignment with said apparatus the smaller intermediate portions of the necks 5 thereof pass between pairs of stationary bars 6 which are spaced apart a distance only slightly larger than the diameters of said intermediate portions of the bulb necks. The bulbs 4 are thus effectively locked in the openings in the trays 1 inasmuch as the ends 7 of the bulb necks 5, which are lowermost, flare outwardly and the bulbs therefore cannot be pulled upward between the stationary bars 6. The bars 6 are mounted upon posts 8 extending upward from a stationary cross member 9 located below the path of movement of the trays 1 and held in position by a portion of the frame (not shown) of the conveyor.

In their course of movement between the bars 6, a transverse row of the bulbs 4 is carried into alignment with a series of branch ducts or suction tubes 10 arranged across the path of movement of the trays 1. The suction tubes 10 tend to pull the bulbs upward and out of the trays 1. Complete, or acceptable, bulbs 4 will be held in the tray 1 by the bars 6 and carried beyond the suction tubes 10. However, bulbs which are incomplete or defective by virtue of missing or partially broken flared ends 7 are sucked up into the tubes 10. The suction at the mouths of the tubes 10 is concentrated about the rounded tops of the bulbs 4 by virtue of the fact that the mouths of the tubes 10 are only slightly larger than the bulbs 4 and are of concave curvature to extend down along the sides of said bulbs so that a passageway conforming generally to the shape of said bulbs 4 is formed.

Broken bulks 4 sucked up the tubes or conduits 10 are carried into a connecting conduit or manifold 11 and then longitudinally through said manifold 11 to the upper end of a refuse container 12 where they fall to a collecting point on the bottom 13 thereof. The suction force by which the broken bulbs are carried into the tubes 10 and the resulting currents of air by which said bulbs are moved through the manifold 11 to the refuse container 12 are produced by the suction force of a blower 14 connected to an upper portion of the refuse container 12 at a point opposite the manifold 11.

It will, of course, be apparent that each of the twelve suction tubes 10 which span the twelve longitudinal rows of bulbs 4 across the tray 1 must receive a proportionate share of the suction force produced by the blower 14 and accordingly it may be desirable to provide less clear-

ance between the ends of bulbs 4 and the suction tubes 10 farthest from the container 12 than between the bulbs 4 and tubes 10 near the container 12 to cause the proper suction over every row of bulbs 4. The suction tubes 10 are connected to the curved sidewalls of said manifold 11 in a manner which allows pieces of the bulbs 4 to fall to the sloping bottom of said manifold 11 and to be swept down said bottom to the refuse container 12 by the combined forces of the air currents and gravity. Further control over the direction of movement of the broken glass is provided by a baffle 15 in the refuse container 12, which baffle 15 causes the air stream to pass downward along one side of the container 12 and then reverse its direction to a path upward along the opposite side thereof so that the broken bulbs 4 separate therefrom. After an appreciable mass of glass accumulates in said container 12, it is removed therefrom through an opening formed by sliding the bottom 13 to one side. The container 12 is mounted upon a frame portion 16 joining one of the conveyor support rails 3 and one end of the cross number 9.

In the modified form of apparatus for operation with the conveyor belts of the traying machine, said apparatus is located at operative relation to rows of bulbs 4 resting upon and conveyed by the moving belts 20 shown in Fig. 3. The motion of the belts 20 carry the intermediate neck portions 5 of the bulbs 4 between stationary angle bars 6' defining paths of movement only slightly wider than the necks 5 and at the same time carry the tops of said bulbs below the open ends of suction tubes 10' connected to a manifold 11'. The bars 6' which define the path of movement of the bulb necks 5 are, in the present instance, mounted upon the stationary support uprights 21 for the guide bars 22 for the belts 20. As in the previously described apparatus, the suction lifts broken bulbs 4 from the conveyor only when the flared necks or cullet portions 7 have been broken so that they are not retained by the bars 6'.

The modified broken bulb removing apparatus shown in Figs. 4 and 5 of the drawing represents one form thereof adapted to operate satisfactorily with but little adjustment for removing a considerable range of sizes and shapes of bulbs from either tray or belt-type conveyors. The rows of bulbs 4, in this specific instance, pass below the longitudinal slit 30 in a conduit or manifold 31 and if broken are pulled up into said manifold 31 and into the refuse container 32 by the suction force of a blower 34 attached thereto. Because of the large size of the opening formed by the slit 30, considerably more suction force must be used than in the previously described modification, and therefore the effectiveness of the suction about the mouth of the slit 30 is desirably made as great as possible. It is, therefore, preferred that the trays 1 be solid except for the bulb-holding openings so that air drawn into the slit 30 sweeps about the upper end of the bulbs 4 in a manner to give considerable lift thereto. It is also preferred that the manifold 31 be supported in a manner whereby it can be raised or lowered to the most effective relation to the bulbs 4 in the trays 1. To this end, the manifold 31 is mounted at opposite ends upon support rods 35 which are adjusted in the stationary frame 36 for the tray conveyor by screwing the nuts 37 thereabout.

The modified form of apparatus shown in Fig. 6 is featured by flexible curtains 38 and 39 on the opposite lower edges of an open branch duct 40 extending along the length of a conduit or manifold 41. The curtains 38 and 39, which may be made from asbestos cloth, permit the suction within the manifold 41 to lift the bulbs 4 more effectively in that they block off the flow of air around the top and between the bulbs 4 as much as possible. The vertical front of the duct 40 also promotes more satisfactory use of the apparatus in that it prevents a loose bulb resting on top of the properly arranged bulbs 4 in the tray 1 from wedging below the manifold 41.

While we have described several embodiments of the invention, we do not wish to be limited to the particular structure shown as it will be understood that many modifications of the apparatus may be made without departing from the scope of the appended claims.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In apparatus for segregating bulbs having bowl portions with depending constricted neck portions terminating in enlarged end portions, the combination of conveyor means adapted to support and convey a horizontal succession of bulbs by their bowl portions so they hang neck down, means including suction conduit means terminating at a point above said conveyor means in a position to draw the bulbs upward out of the conveyor means and leading away therefrom, restraining means below the terminus of said conduit and below said conveyor and defining a horizontal constricted passageway located to receive the constricted neck portions of said bulbs and having a width intermediate the diameters of said neck portions and the enlarged end portions of said bulbs whereby to restrain removal of complete bulbs from the conveyor means by said suction conduit and whereby broken bulbs with partly or completely missing enlarged end portions are free to be pulled up into the conduit.

2. In apparatus for segregating bulbs having bowl portions with depending constricted neck portions terminating in enlarged end portions, the combination of conveyor means adapted to support and convey a horizontal succession of bulbs by their bowl portions so they hang neck down, means including suction conduit means terminating at a point above the conveyor means in a position to draw the bulbs upward out of the conveyor means and leading away therefrom, means mounting the conduit means for vertical adjustment to permit the terminus thereof to be arranged as close as possible to the tops of the bulbs advanced by the conveyor means, restraining means below the terminus of said conduit and below said conveyor means and defining a horizontal constricted passageway located to receive the constricted neck portions of said bulbs and having a width intermediate the diameters of said neck portions and the enlarged end portions of said bulbs whereby to restrain removal of complete bulbs from the conveyor means by said suction conduit and whereby broken bulbs with partly or completely missing enlarged end portions are free to be pulled up into the conduit.

3. In apparatus for segregating bulbs having bowl portions with depending constricted neck portions terminating in enlarged end portions, the combination of conveyor means adapted to support a horizontal succession of a plurality of rows of bulbs by their bowl portions so they hang neck down, means including suction producing means and a relatively large interconnected manifold extending transversely across and above the path of said conveyor means and having smaller branch ducts only slightly larger than the bowl portions of the bulbs extending downwardly from said manifold to positions above the respective rows of bulbs in said conveyor means to draw the bulbs upward out of the conveyor means and away therefrom, means below the several branch ducts and below said conveyor means and defining horizontal constricted passageways located to receive the constricted neck portions of said bulbs and each having a width intermediate the diameters of said neck portions and the enlarged end portions of said bulbs whereby to restrain removal of complete bulbs from the conveyor means into said ducts and whereby broken bulbs with partly or completely missing enlarged end portions are free to be pulled up into the ducts.

4. In apparatus for segregating bulbs having bowl portions with depending constricted neck portions terminating in enlarged end portions, the combination of conveyor means adapted to support a horizontal succession of bulbs by their bowl portions so they hang neck down, means including suction conduit means terminating at a point above said conveyor means at a position to draw the bulbs upward out of the conveyor means and away therefrom and having flexible skirts hanging down from the terminus thereof into the path of movement of the bulbs to restrict the passage of air thereabout, restraining means below the terminus of said conduit and below said conveyor means and defining a horizontal constricted passageway located to receive the constricted neck portions of said bulbs and having a width intermediate the diameters of said neck portions and the enlarged end portions of said bulbs whereby to restrain removal of complete bulbs from the conveyor means by said conduit means and whereby broken bulbs with partly or completely missing enlarged end portions are free to be pulled up into the conduit means.

5. In apparatus for segregating bulbs having bowl portions with depending constricted neck portions terminating in enlarged end portions, the combination of conveyor means adapted to support a horizontal succession of bulbs by their bowl portions so they hang neck down,

means including suction conduit means terminating in a mouth portion only slightly larger than and curved in conformity closely with the bowl portions of the bulbs and located above said conveyor means at a position to draw the bulbs upward out of the conveyor means and away therefrom, means below the conduit means and below said conveyor means and defining a horizontal constricted passageway located to receive the constricted neck portions of said bulbs and having a width intermediate the diameters of said neck portions and the enlarged end portions of said bulbs whereby to restrain removal of complete bulbs from the conveyor means by said conduit means and whereby broken bulbs with partly or completely missing enlarged end portions are free to be pulled up into the conduit means.

6. In apparatus for segregating bulbs having bowl portions with depending constricted neck portions terminating in enlarged end portions, the combination of conveyor means comprising horizontal trays presenting a solid surface pierced by longitudinal rows of openings adapted to hold bulbs in a neck down position with their bowl portions resting on the rims of said openings, means including a suction manifold extending transversely across and above said conveyor means and having a longitudinal slit along the bottom thereof to draw the bulbs upward out of the conveyor means and away therefrom, restraining means below the manifold and below said conveyor means and defining horizontal constricted passageways located to receive the constricted neck portions of said bulbs and each having a width intermediate the diameters of said neck portions and the enlarged end portions of said bulbs whereby to restrain removal of complete bulbs from the conveyor means by said manifold and whereby broken bulbs with partly or completely missing enlarged end portions are free to be pulled up into the manifold.

7. In apparatus for segregating bulbs having bowl portions with depending constricted neck portions terminating in enlarged end portions, the combination of conveyor means adapted to support a plurality of horizontal rows of bulbs by their bowl portions so they hang neck down, means for drawing the bulbs upward out of the conveyor means and away therefrom including suction producing means and an interconnected manifold extending transversely across said conveyor means and having flexible skirts hanging down into the path of movement of the bowl portions of the bulbs from the edges of a longitudinal opening along the bottom thereof to restrict the passage of air into said opening from between the rows of bulbs, retaining means below the manifold and below the conveyor means and defining horizontal constricted passageways located to receive the constricted neck portions of said bulbs and each having a width intermediate the diameters of said neck portions and the enlarged end portions of said bulbs whereby to restrain removal of complete bulbs from the conveyor means by said manifold and whereby broken bulbs with partly or completely missing enlarged end portions are free to be pulled up into the manifold.

8. In apparatus for segregating bulbs having bowl portions with depending constricted neck portions terminating in enlarged end portions, the combination of conveyor means adapted to support a plurality of horizontal rows of bulbs by their bowl portions so they hang neck down, means including suction producing means and a manifold extending transversely across the conveyor means and a plurality of tubes extending downward from said manifold toward said conveyor means with each tube having its mouth arranged above a row of bulbs in a position to draw the bulbs upward out of the conveyor means and into the manifold, retaining means below the manifold and below the conveyor means and defining horizontal constricted passageways located to receive the constricted neck portions of said bulbs and each having a width intermediate the diameters of said neck portions and the enlarged end portions of said bulbs whereby to restrain removal of complete bulbs from the conveyor means by said suction tubes and whereby broken bulbs with partly or completely missing enlarged end portions are free to be pulled up into the tubes.

9. In apparatus for segregating bulbs having bowl portions with depending constricted neck portions terminating in enlarged end portions, the combination of conveyor means adapted to support a plurality of horizontal rows of bulbs by their bowl portions so they hang neck down, suction means including a manifold inclined to the horizontal and extending transversely across the conveyor means with branch ducts extending downwardly from a side of the manifold to positions over rows of bulbs to draw said bulbs upward out of the conveyor means and into the manifold, retaining means below the manifold and below the conveyor means and defining horizontal constricted passageways located to receive the constricted neck portions of said bulbs and each having a width intermediate the diameters of said neck portions and the enlarged end portions of said bulbs whereby to restrain removal of complete bulbs from the conveyor means by said suction means and whereby broken bulbs with partly or completely missing enlarged end portions are free to be pulled up into the suction means.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,960,151	Gray	May 22, 1934