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TOMATO SORTING APPARATUS AND METHOD

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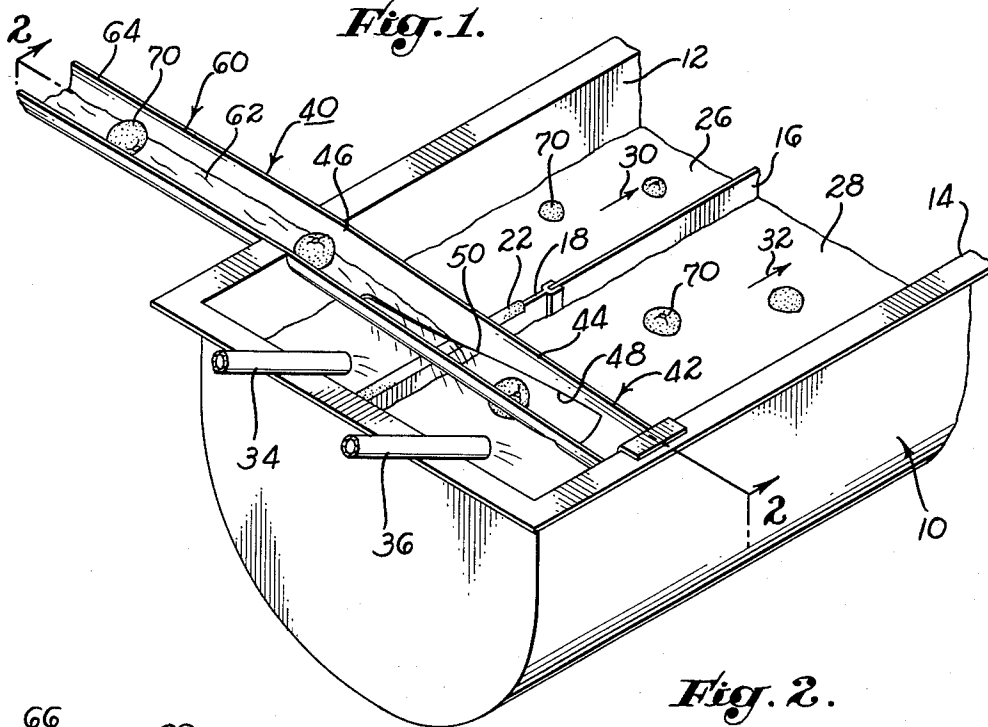


Fig. 1.

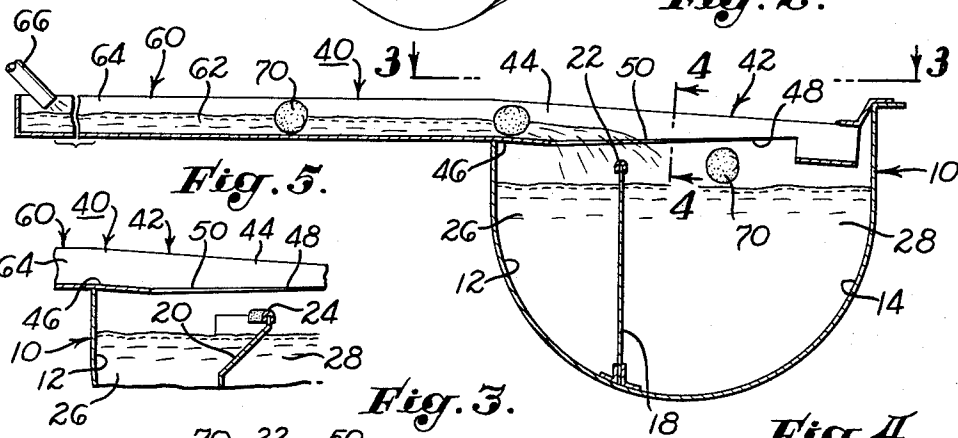


Fig. 2.

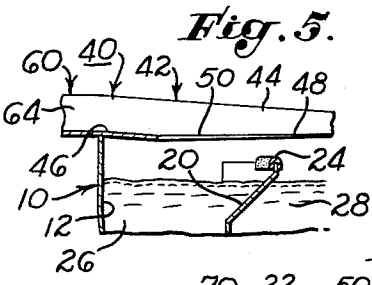


Fig. 3.

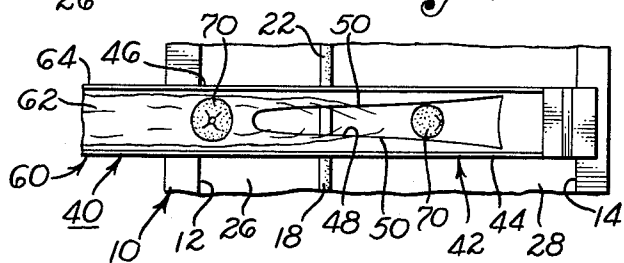


Fig. 4.

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TOMATO SORTING APPARATUS AND METHOD
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The present invention relates to a method of and apparatus for sorting according to size articles which may be described generally as oblate spheroids having their maximum transverse dimensions in their equatorial planes.

The invention is particularly applicable to those varieties of tomatoes which have their maximum transverse dimensions in planes perpendicular to their stem-blossom axes, and which thus fit the foregoing general description. Consequently, the invention will be considered herein in connection with tomatoes having this configuration as a matter of convenience, with the understanding that the invention may, without departing from the scopes of the appended claims, be used in connection with any oblate spheroids having their maximum transverse dimensions in their equatorial planes.

Automatic sorting of tomatoes according to size has not been practical heretofore because of the fact that tomatoes, when rolled, tend to tumble about axes other than axes in their equatorial planes. Consequently, any attempts to size tomatoes which involve rolling them tend to result in sorting the tomatoes into size groups according to their smallest diameters rather than their largest. In other words, sorting tends to take place with reference to the dimension along the stem-blossom axis, instead of a larger dimension perpendicular thereto.

In view of the foregoing, a primary object of the invention is to provide a method of and apparatus for automatically sizing tomatoes according to their largest diameters, rather than their smallest.

More particularly, a basic object of the invention is to: utilize a generally horizontal, elongated sizer having an inlet end and having longitudinally extending, laterally spaced supports the spacing of which increases longitudinally of the sizer away from its inlet end; and to propel tomatoes in single file to the inlet end of the sizer, and onto the supports thereof, by means of a substantially horizontally stream of water which at least partially floats the tomatoes. With this construction and procedure, the tomatoes for the most part tend to roll or spin about their largest diameters, and thus drop from the longitudinally extending, laterally spaced supports of the sizer at points where the distances between these supports are respectively substantially equal to the largest diameters of the tomatoes. Thus, sorting according to maximum diameter is achieved.

Another and important object of the invention is to drop the tomatoes from the supports of the sizer into bodies of water respectively spaced from the inlet end of the sizer distances corresponding to the desired size groups into which the tomatoes are to be sorted. By this procedure, damage to the tomatoes, as they drop between the supports of the sizer, is minimized, the respective bodies of water into which tomatoes of different sizes drop cushioning their fall to achieve this result.

Another object of the invention is to provide tomato-receiving bodies of water beneath the sizer which are streams of water moving laterally away from the sizer so as to continuously convey the different sizes of tomatoes to suitable processing stations, for example.

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Another object of the invention is to provide a sizer having the form of a generally horizontal trough provided in its bottom wall with an opening the width of which uniformly diverges longitudinally of the sizer from its inlet end, thereby providing longitudinally extending, laterally spaced supports the spacing of which uniformly increases longitudinally of the sizer from its inlet end.

The foregoing objects, advantages, features and results of the present invention, together with various other objects, advantages, features and results thereof which will be evident to those skilled in the art in the light of this disclosure, may be achieved with the exemplary embodiments of the invention described in detail hereinafter and illustrated in the accompanying drawing, in which:

FIG. 1 is a semidiagrammatic, fragmentary perspective view of a tomato sizing apparatus which embodies the invention;

FIG. 2 is a sectional view taken along the arrowed line 2-2 of FIG. 1;

FIG. 3 is a fragmentary plan view taken along the arrowed line 3-3 of FIG. 2;

FIG. 4 is a fragmentary sectional view taken along the arrowed line 4-4 of FIG. 2; and

FIG. 5 is a view similar to a portion of FIG. 2, but illustrating a modified construction.

Referring to the drawing, the numeral 10 designates a flume divided into two compartments 12 and 14 by a longitudinally extending partition 16. The latter includes a removable section 18 which may be replaced by a different partition section 20, FIG. 5, having its upper edge laterally offset to vary the effective relative widths of the compartments 12 and 14 for a purpose which will become apparent. The removable sections 18 and 20 are respectively provided with elastomeric upper edges 22 and 24 to minimize the possibility of damage to tomatoes dropping thereon, as will also become apparent.

The flume compartments 12 and 14 respectively contain bodies of water which are preferably streams 26 and 28 flowing in the directions of the arrows 30 and 32. The streams 26 and 28 may be caused to flow longitudinally of the compartments 12 and 14 by introducing water into these compartments through pipes 34 and 36, for example. Additional water enters the flume 10, and particularly the compartment 12 thereof, from a sizing means 40 to be described hereinafter, and, in view of this, the water source represented by the pipe 34 may be omitted in some instances. Also, by utilizing a partition 16 having openings, not shown, therein, the water source represented by the sizing means 40 may be relied on to produce the desired flows in both of the compartments 12 and 14, in which case the water sources represented by both of the pipes 34 and 36 may be omitted.

Considering the sizing means 40, it includes a generally horizontal, elongated sizer 42 shown as having the form of a substantially semicircular trough having an inlet end 46 adjacent the side wall of the flume 10 which forms one side wall of the compartment 12 therein. The sizer trough 44 extends transversely of the flume 10 and is provided in its bottom wall with a discharge opening 48 the width of which increases longitudinally of the sizer trough in a direction away from its inlet end 46. Importantly, the width of the discharge opening 48 increases uniformly from the inlet end 46 of the trough 44 toward the opposite end thereof, rather than stepwise. The edges of the discharge opening form supports 50 which extend longitudinally of the sizer 42 and which are

spaced apart laterally thereof, the spacing of the supports 50 uniformly increasing longitudinally of the sizer from its inlet end 46 toward its opposite end.

As will be clear from FIG. 2 of the drawing, while the sizer 42 has been described as generally horizontal, it preferably slopes downwardly from its inlet end slightly, and sufficiently to make the supports 50 substantially horizontal, or to provide them with a very slight downward slope from the narrow end of the discharge opening 48 toward the wide end thereof.

The sizing means 40 further includes water conveying means 60 for flowing a substantially horizontal stream 62 of water into the inlet end of the sizer 42, the volume of water being sufficient to carry the stream 62 at least as far as the partition 16. The water conveying means 60 is shown as comprising a generally semicircular trough 64 matching and forming a continuation of the trough 44. Water is introduced into the trough 64 to form the stream 62 in any suitable manner, as by means of a supply pipe 66, FIG. 2.

Operation

Considering the operation of the invention, tomatoes 70 are placed in the stream 62 in single file in any desired manner, preferably by means of suitable automatic feeding equipment, not shown. The water stream 62 then floats the tomatoes 70 into the sizer 42 one at a time.

The tomatoes 70 inherently tend to float in the water stream 62 with their stem-blossom axes vertical. Not all of the tomatoes 70 float completely free of the bottom of the trough 64, with the result that these tomatoes roll or spin about axes in their equatorial planes which inherently coincide with their longest diameters. When such tomatoes encounter the discharge opening 48, they continue to roll, about their largest diameters, along the supports 50 provided by the edges of the discharge opening. Ultimately, each drops from the supports 50, into one or the other of the water streams 26 and 28, at a point where the diameter about which it is rolling substantially equals the lateral spacing of the supports 50.

The foregoing tendency of the tomatoes 70 to roll or spin about their largest diameters as they traverse the troughs 64 and 44 is primarily true of the larger sizes, i.e., the sizes large enough to be classifiable in the group represented by the water stream 28 farthest from the inlet end 46 of the sizer 42. Many of the tomatoes of the smaller sizes may not roll or spin at all and may negotiate the trough 64 and the portion of the trough 44 upstream from the discharge opening 48 merely by floating with their stem-blossom axes vertical. Consequently, some of them may not be sized according to their largest diameters consistently, although they will still be sized according to diameters in their equatorial planes which do not differ greatly from their largest diameters. Thus, such smaller tomatoes 70 may fall into the first water stream 26 at points slightly closer to the upstream end of the discharge opening 48 than they would if sized strictly according to their largest diameters. However, this is immaterial since such smaller tomatoes would fall into the first stream 26 even if sized according to their largest diameters. The important thing is that all of the tomatoes 70 are consistently sized according to diameters in their equatorial planes, so that virtually all of the larger sizes reach the second stream 28 where they belong. Tests have shown that none of the tomatoes 70 belonging in the first stream 26 reach the second stream 28, and only an insignificantly small number of the tomatoes belonging in the second stream 28 drop into the first one.

As previously pointed out, the streams 26 and 28 convey the two size groups of tomatoes away, laterally of the sizer 42, to any suitable handling or processing stations. For example, the two streams 26 and 28 may lead to canning stations, not shown.

If it is desired to include more of the tomatoes 70 in the smaller size group represented by the stream 26, the

partition section 20 may be substituted for the partition section 18. Additionally, it will be apparent that the tomatoes may be sorted into more than two size groups by installing an additional partition or partitions in the flume 10.

Although exemplary embodiments of the invention have been disclosed herein for purposes of illustration, it will be understood that various changes, modifications and substitutions may be incorporated in such embodiments without departing from the spirit of the invention as defined by the claims which follow.

I claim:

1. A method of sorting tomatoes according to size, characterized by the use of an elongated sizer having an inlet end and having longitudinally extending, laterally spaced supports the spacing of which increases longitudinally of said sizer from its inlet end, and including the steps of:

- (a) flowing a stream of water to said inlet end of said sizer;
- (b) placing tomatoes in said stream of water in single file so that said stream propels the tomatoes one at a time onto said laterally spaced supports, the tomatoes dropping from said supports, at varying distances from said inlet end of said sizer, according to size;
- (c) separating the tomatoes into different size groups in accordance with the respective distances from said inlet end of said sizer that they drop from said supports; and
- (d) respectively intercepting the different size groups in streams of water located beneath said supports and flowing transversely of said sizer.

2. In an apparatus for sorting tomatoes according to size, the combination of:

- (a) a generally horizontal, elongated sizer having an inlet end and having longitudinally extending, laterally spaced supports the spacing of which uniformly increases longitudinally of said sizer from its inlet end;
- (b) substantially horizontal trough means communicating with said inlet end of said sizer for flowing a stream of water thereto;
- (c) whereby tomatoes placed in the stream of water in single file are propelled thereby onto said supports in single file;
- (d) the tomatoes dropping between said supports different distances from said inlet end of said sizer, in accordance with the respective sizes thereof;
- (e) means beneath said sizer for separating the tomatoes into different size groups in accordance with the respective distances from said inlet end of said sizer that they drop from said supports;
- (f) means forming tomato-receiving bodies of water beneath said sizer for respectively receiving tomatoes in said different size groups; and
- (g) means for producing flow in said bodies of water away from said sizer in directions transversely thereof to carry away tomatoes in said different size groups.

3. In an apparatus for sorting tomatoes according to size, the combination of:

- (a) a generally horizontal, elongated, trough-like sizer having an inlet end and having in its bottom wall an opening providing longitudinally extending, laterally spaced supports the spacing of which uniformly increases longitudinally of said sizer from its inlet end;
- (b) substantially horizontal trough means communicating with said inlet end of said sizer for flowing a stream of water thereto;
- (c) whereby tomatoes placed in the stream of water in single file are propelled thereby onto said supports in single file;
- (d) the tomatoes dropping between said supports dif-

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- ferent distances from said inlet end of said sizer, in accordance with the respective sizes thereof;
- (e) means beneath said sizer for separating the tomatoes into different size groups in accordance with the respective distances from said inlet end of said sizer 5 that they drop from said supports;
- (f) means forming tomato-receiving bodies of water beneath said sizer for respectively receiving tomatoes in said different size groups; and
- (g) means for producing flow in said bodies of water 10 away from said sizer in directions transversely there-

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of to carry away tomatoes in said different size groups.

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