Sept. 5, 1933. E. M. WAYLAND 1,925,158

SIZING MACHINE

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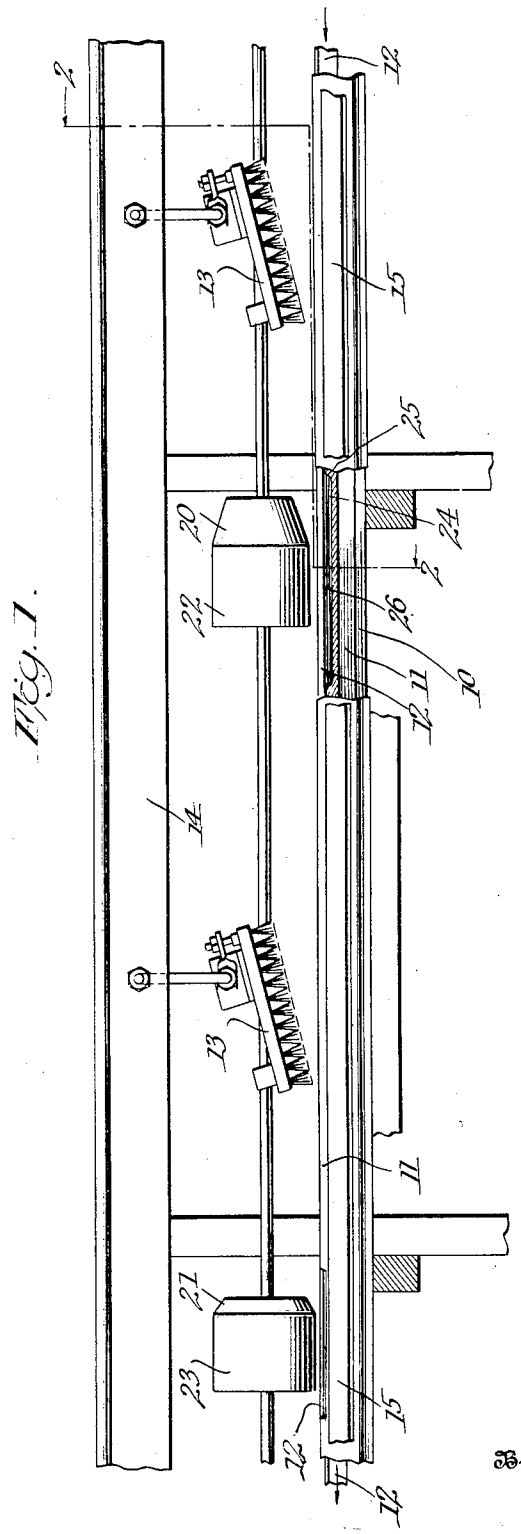


Fig. 1.

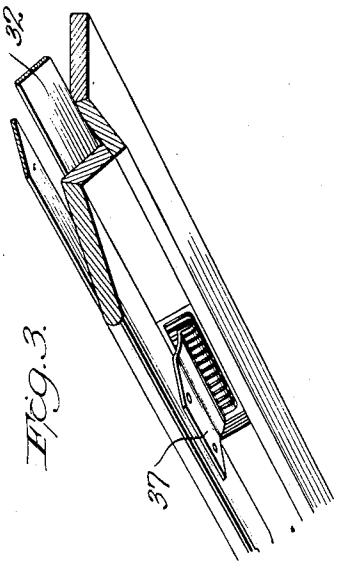


Fig. 3.

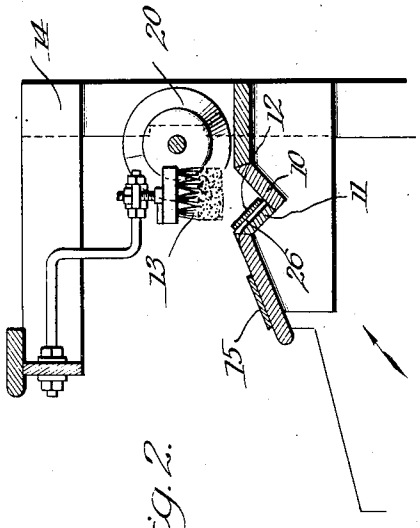


Fig. 2.

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SIZING MACHINE

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16 Claims. (Cl. 209—91)

This invention relates to fruit sizing machines and the like and aims generally to improve the classifying means of the type of sizing machine which utilizes a carrier for the articles to be classified and positive action means for ejecting articles of a given size range from the carrier.

Among the more important objects of my invention are, severally and interdependently, to improve the gaging and ejecting means of such machines by the provision of means for ejecting oversize articles at one or more of the classifying stations; to prevent clogging of the carrier in such machines by the provision of oversize ejecting means particularly devised for such purpose, to avoid injury to oversize articles by a particular coordination of the oversize ejecting means with the other elements constituting the classifying station, to prevent pinching of oversize articles without interfering with ejection of other articles within the size range of the station, to provide an automatically expandable gaging space for both oversize and normal size ejection at a classifying station to substantially eliminate damage of the articles being classified, and to generally improve the ejecting means and its cooperative association with the other elements of the classifying station to insure ejection of substantially all articles falling within the size range of the station.

Fruits and similar articles are generally classified according to either a given range of maximum diameters or a given range of minimum diameters. For example, apples are customarily sized according to the maximum diameter, while peaches are customariliy sized according to the minimum diameter of the fruit. Features of my invention are of utility in sizers for operating upon either of these principles, but as maximum or minimum diameter selection can be practiced with substantially the same arrangement of classifying stations (except that for sizing on the basis of the minimum diameter transverse to the core, as in peach sizing, the carrier must be modified so as to present such minimum diameter of the fruit in the gaging space) it will suffice for illustration to describe in detail my invention embodied in a machine for classifying fruits according to their maximum diameters.

Accordingly, for purposes of illustration I have shown my invention embodied in a machine of the general type disclosed in my prior Patent No. 1,696,066, granted December 18, 1928 and will consider apples as representative of any fruit to be classified thereon.

In the drawing forming a part of this specification:

Fig. 1 is a view in side elevation of a portion of a fruit sizer showing a plurality of classifying stations embodying my present invention;

Fig. 2 is a transverse sectional view taken at line 2—2 of Fig. 1, looking in the direction of the arrows; and

Fig. 3 is a detail view of a modified form of station looking in the direction indicated by the arrow 3 in Fig. 2.

The machine illustrated in Figs. 1 and 2 of the drawing, may advantageously comprise a carrier for presenting the fruit in such manner as to insure gaging and ejecting of the fruit according to the requisite standard, which carrier in the embodiment shown comprises a trough 10, the front face 11 of which supports a sizing belt 12, the trough and belt cooperating to advance the fruit and rotate the same about a predetermined axis to present all diameters thereof perpendicular to said axis to suitable gaging and ejecting means, as is well known.

In the illustrative machine in which I have embodied my invention the belt 12 and trough 10 cooperate with suitable upending means, shown as brushes 13 suspended from the frame 14 of the machine, which upend the fruit with respect to the carrier to insure rotation thereof about the axis of the core of the fruit to present all diameters of the fruit at right angles to the core in upstanding relation to the belt. This illustrative carrier and upending arrangement is suitable for the sizing of apples or other fruit sized on the maximum diameter basis, as the rotation of the fruit by the belt 12 will necessarily present the greatest transverse diameters of the fruit in upstanding relation to the said belt.

Thus this type of carrier provides for moving the fruit past a plurality of successive classifying stations, where moving ejector surfaces, spaced from the belt 12 according to the minimum length of gaging diameter desired to be ejected, frictionally engage fruit passing them, when a diameter of the fruit exceeding this minimum gaging diameter is presented by the rotation of the fruit, to eject the same. The usual distributing belt 15 for receiving and distributing the classified fruit may be provided, as is customary in the art.

As shown in my prior patent above mentioned, it has heretofore been customary to utilize ejector surfaces comprised of relatively short cylindrical rolls, or other similar means, spaced a uniform gaging distance from the belt 12 throughout their lengths, and of such length that the fruit passing

beneath the ejector, if uncontacted thereby, would normally be rotated through slightly more than 180°, for the purpose of insuring the presentation in the gaging space of a diameter of the fruit as great as the gaging diameter, if the fruit had such a diameter.

This type of gaging and ejecting means, however, has two disadvantages, which my present invention is designed to eliminate; the first being that oversize fruit is apt to arrive at the station with a diameter upstanding greater than the gaging diameter, so that the fruit will strike against the end face of the cylindrical roll or other ejector, bruising the fruit and delaying its passage under the roll, causing obstruction of the carrier and a pile-up of the fruit ahead of the roll; and the second, that because fruit which has passed under the roll continues to rotate even after the presentation of a diameter greater than the gaging diameter, it frequently occurs that in the moment during ejection, a still greater diameter of very irregular fruit may be rolled up between the belt and roll causing pinching of the fruit.

In my prior Patent No. 1,672,441, granted June 5, 1928, I have disclosed a construction designed to avoid to some extent the second of these objections by the cutting away of the support of the belt immediately below the ejecting roll so that the belt can be depressed to allow ejection of the fruit without pinching when an extra large diameter rolls up between the belt and ejecting roll, which is of such length as to allow but slightly more than 180° rotation of the fruit passing therebelow, but I have found that when using this construction it occasionally happens that, either because of obstruction of the carrier or because of depression of the belt by an irregular fruit, fruit which should have been ejected at that station, will slip or "leak" past the station without being ejected, to thus pass into the next cheaper size, entailing a loss to the seller.

My present invention eliminates these disadvantages of prior constructions by improving the coordination of all the elements of a classifying station and by modifying some of the elements thereof and adding certain other elements thereto, to eliminate obstruction of the carrier by oversize fruit and to eject oversize and irregular fruit without bruising or pinching the same, while practically eliminating any chance of "leakage" past a station of fruit which should be ejected thereat.

According to my present invention I provide the ejector rolls with oversize ejector portions as shown at 20 and 21, which may be integral with the body portions of the rolls 22 and 23, or may be separate therefrom as desired. These oversize ejector portions 20 and 21 are preferably frustoconical in shape, as shown, and taper from the size of the corresponding ejector roll proper, 22, 23, to a sufficiently smaller cross-section to provide a preliminary or oversize gaging space as large as the maximum diameter of the fruit which will be presented at the classifying station by the carrier. Thus the oversize ejector 20, at the first station of the sizing machine, may be of comparatively great length and of comparatively small entering end cross-section, so as to provide a sufficiently large preliminary or oversize gaging space to take care of the maximum size of fruit expected to be encountered in the machine.

Correspondingly, the oversize ejectors at stations other than the first station, as oversize ejector 21, need provide a preliminary or oversize ejecting space only large enough to receive and eject fruit which has passed the previous stations, as larger sizes will have been removed thereby.

It will be apparent that my tapered oversize ejector will thus preliminarily eject all oversize fruit before it reaches the ejector proper, thus reducing the ejector proper to the status of a gleaning ejector for culling out all fruit presenting to it gaging diameters of approximately the minimum gaging diameter to be picked out at its station, so that the pinching problem for the gleaning ejector will be minimized, but upon close consideration it will be appreciated that the use of this oversize ejector would present a pinching problem even more marked than that encountered between the ejector proper and the belt because the carrier in presenting the fruit to the oversize ejector, tends to crowd it into the tapered gaging space defined by the oversize ejector and the belt 12.

Accordingly, I provide means for allowing expansion of the tapered preliminary or oversize gaging space whether or not such means is provided for the gleaning ejector, and in the embodiment shown in Figs. 1 and 2 this means is provided by recessing or cutting away the belt supporting element 11 of the trough 10 under the oversize ejector 20 as indicated at 24 and to a point 25 preceding the point where oversize fruit will contact the belt when it first contacts the oversize ejector, thereby to allow depression of the belt by oversize fruit being crowded into the tapered gaging space, to permit ejection of such fruit without pinching of the same.

It will thus be seen that by the above novel construction and association of elements at the classifying station I eliminate end-face contact of oversize fruit with the gaging and ejecting rolls, thus doing away with the bruising of fruit and obstruction of the carrier incident thereto, and that I provide anti-pinching means for the preliminary and positive ejection of such oversize fruit.

However, I have found that the introduction of this preliminary anti-pinching oversize-ejecting mechanism accentuates the problem of "leakage" presented in the machine disclosed in my prior Patent No. 1,672,441, and I accordingly find it advantageous to provide means for eliminating substantially all "leakage" past a given station of fruit which should be ejected at that station, particularly when, as in the preferred embodiment of my invention, I cut away the support below the ejector proper, 22, 23, as indicated at 26, in accordance with my prior Patent No. 1,672,441.

The means which I prefer to use for the elimination of practically all "leakage" is a novel proportioning of the length of the ejector proper, as shown in Fig. 1 of the drawing herewith.

As above mentioned, it has been customary to use ejector rolls of such length as to extend slightly more than the distance travelled by a fruit while being rotated approximately 180°, and it has been considered desirable to maintain this short length when using the improvement of my prior Patent No. 1,672,441 to maintain the unsupported gap of the belt 12 as short as practicable, so that sag of the belt would not increase the "leakage."

However, when using the anti-pinching oversize ejector of my present invention the unsupported gap must be increased in length, because the taper of the oversize ejector 20, 21, cannot

be too steep, or it would not function properly, and the ejector proper 22, 23 cannot be reduced in length, because it must be long enough to have all the greater diameters of the fruit presented in its length, as the fruit is rotated by the belt, to insure the ejection of all fruit having a maximum diameter as great as the gaging space, to avoid "leakage." Furthermore, as fruit may be ejected at any point under the oversize ejector or the ejector proper, the belt must be able to yield at all points under these parts, to prevent pinching.

In order to prevent undue "leakage" of fruit past the classifying station I preferably increase the length of the ejector and unsupported portion of the belt for the purpose of eliminating "leakage", to such length that all the greater diameters of the sizes of fruit apt to pass the preliminary oversize ejectors, will be presented in upstanding relation to the gaging space two or more times while the fruit is travelling under the ejector proper, 22, 23. Thus according to my present invention instead of using an ejector proper for apple sizing of approximately three inches in length, I use an ejector proper of approximately twice this length, say six inches in length, so that if depression of the belt by an oversize apple causes enlargement of the gaging space under the ejector proper at just the instant which will cause the ejector to miss contact with the maximum diameter of an apple which it should eject, this diameter will again be presented by the belt before the apple passes beyond the ejector, so that "leakage" of that apple is prevented.

The form of my invention which I prefer to use for apples and other similar fruits is that shown in Figs. 1 and 2 of the drawing herewith, but it will be readily apparent that for the handling of heavier fruits and fruits of different shape characteristics, it will be advantageous to modify my invention according to the circumstances of use.

As an example of one form of modification I have shown in Fig. 3, a view from below of a station in which the belt 32 is yieldingly supported below the ejecting means by suitable yielding means such as a multi-spring-finger unit 37, so that if a wide range of sizes of fruit are to be ejected at a given station, or if the fruit is a heavy or very irregular fruit, depression of the belt at a given point, as under the oversize ejector roll, will cause only local yielding of the belt, so that the gaging space will for the most part be maintained at substantially the predetermined size, to reduce the danger of "leakage." It will be appreciated that with this type of station either a relatively short ejector proper, of a length but slightly greater than the distance travelled by the fruit while rotating 180°, may be utilized, depending upon the localization of yield of the belt to eliminate "leakage"; or that the relatively long ejector proper disclosed in the embodiment of my invention suitable for apple sizing, which would enable presentation to the ejector proper of the maximum diameter of the fruit more than a single time, may be used to further insure against "leakage".

I have described in detail preferred embodiments of my invention for the purpose of clearly explaining the practice of the same, but by so doing I do not desire to be understood as limiting my invention to the particular details described, wherefore I have defined my invention broadly in the following claims.

I claim:

1. In a device of the class described, a carrier for presenting irregular articles of varying gaging diameter to a gaging and ejecting station, transversely moving preliminary oversize ejecting means at said station defining a gaging space gradually decreasing in the direction of movement of the articles and thus adapted to eject from said carrier all articles presenting thereto a gaging diameter above the minimum size to be ejected at said station, and a transversely moving ejector proper at said station adapted to eject substantially all the articles over said minimum size which reach said ejector proper after passing said oversize ejector by reason of having presented to said oversize ejector no diameter equal to the gaging diameter therefor.

2. A fruit sizer comprising a carrier for conveying fruit to a gaging and ejecting station and presenting gaging diameters of said fruit at said station, transversely moving preliminary oversize ejecting means at said station defining a gaging space gradually decreasing in the direction of movement of the fruit and thus adapted to eject from said carrier all articles of fruit presenting thereto a gaging diameter above the minimum size to be ejected at said station, and a transversely moving ejector proper at said station adapted to eject from said carrier substantially all the articles of fruit having a gaging diameter above said minimum size which pass said preliminary ejector by reason of having presented thereto no diameter equal to the gaging diameter thereof.

3. A fruit sizer comprising a carrier for conveying fruit to a gaging and ejecting station and rotating the fruit to present maximum gaging diameters of said fruit at said station, and having sizing means at said station of the type effecting positive removal of selected fruit from the carrier by contacting the same, said sizing means comprising preliminary oversize ejecting means defining with said carrier a tapering gaging space decreasing in the direction of movement of the fruit from the maximum gaging diameter normally to be encountered at said station to the minimum gaging diameter to be ejected at said station, and an ejector proper at said station beyond said preliminary ejection in the direction of movement of the fruit defining with said carrier a substantially uniform gaging space of the minimum gaging diameter of said station and of such length as to insure the presentation in said uniform gaging space of the maximum gaging diameters of the fruit being rotated and conveyed by said carrier.

4. A fruit sizer comprising a carrier for conveying fruit to a gaging and ejecting station and rotating the fruit to present maximum gaging diameters of said fruit at said station, and having sizing means at said station of the type effecting positive removal of selected fruit from the carrier by contacting the same, said sizing means comprising preliminary oversize ejecting means comprising a friction surface adapted to move transversely of said carrier and defining with said carrier a tapering gaging space decreasing in the direction of movement of the fruit from the maximum gaging diameter normally to be encountered at said station to the minimum gaging diameter to be ejected at said station, and an ejector proper at said station beyond said preliminary ejector in the direction of movement of the fruit comprising a friction surface adapted to move transversely of said carrier and defining

with said carrier a uniform gaging space of the minimum gaging diameter to be ejected at said station and of such extent longitudinally of the carrier as to insure the presentation in said uniform gaging space of the maximum gaging diameters of the fruit being rotated and conveyed by said carrier.

5. A fruit sizer comprising a carrier for conveying fruit to a gaging and ejecting station and presenting gaging diameters of said fruit at said station, and having sizing means at said station of the type effecting positive removal of selected fruit from the carrier by contacting the same, said sizing means comprising preliminary oversize ejecting means at said station comprising a rotatable conical member having its axis substantially parallel to and spaced from said carrier and arranged to provide a gaging space between its surface and said carrier gradually decreasing in the direction of movement of the fruit from the maximum gaging diameter normally to be encountered at said station to the minimum gaging diameter to be ejected at said station, and an ejector proper at said station beyond said preliminary ejector in the direction of movement of the fruit comprising a rotatable cylindrical member having its axis substantially parallel to and spaced from said carrier and arranged to provide a substantially uniform gaging space between its surface and said carrier of a length longitudinally of said carrier, sufficient to insure presentation therebetween of the gaging diameters of the fruit presented by said carrier.

6. A fruit sizer comprising a carrier for conveying fruit to a gaging and ejecting station and presenting gaging diameters of said fruit at said station, transversely moving preliminary oversize ejecting means at said station adapted to eject from said carrier all articles of fruit presenting thereto a gaging diameter above the minimum size to be ejected at said station, a transversely moving ejector proper at said station adapted to eject substantially all the articles of fruit above said minimum size which reach said ejector proper by reason of having presented to said oversize ejector no diameter equal to the gaging diameter thereof, and means providing for yielding of said carrier below said preliminary ejector and below said ejector proper to prevent pinching of the fruit during ejection.

7. In a device of the class described, a carrier for presenting irregular articles of varying gaging diameter to a gaging and ejecting station, transversely moving preliminary oversize ejecting means at said station adapted to eject from said carrier all articles presenting thereto a gaging diameter above the minimum size to be ejected at said station, a transversely moving ejector proper at said station adapted to eject substantially all the articles over said minimum size which reach said ejector proper after passing said oversize ejector by reason of having presented to said oversize ejector no diameter equal to the gaging diameter therefor, said carrier comprising a sizing belt and supporting means therefor providing for yielding of said belt below said preliminary ejector and said ejector proper to prevent pinching of the fruit during ejection.

8. In a sizing machine of the class described, a carrier for conveying irregular articles to a gaging and ejecting station and presenting gaging diameters thereof at said station, transversely moving preliminary oversize ejecting means at said station defining a gaging space gradually decreasing in its direction of movement of the articles for preliminarily ejecting oversize articles to limit the range of sizes passing therebeyond to a range including maximum gaging diameters but slightly larger than the minimum to be ejected at said station, and transversely moving final gleaning ejector means at said station for culling out and ejecting substantially all sizes having a maximum gaging diameter equal to the minimum to be ejected at said station.

9. In a sizing machine of the class described, a carrier for conveying irregular articles to a gaging and ejecting station and presenting gaging diameters thereof at said station, transversely moving preliminary oversize ejecting means at said station defining a gaging space gradually decreasing in the direction of movement of the articles for preliminarily ejecting oversize articles to limit the range of sizes passing therebeyond to a range including maximum gaging diameters but slightly larger than the minimum to be ejected at said station, one of the cooperating elements of said ejecting means being yieldable with respect to the other to prevent pinching of the fruit, and transversely moving final gleaning ejector means at said station for culling out and ejecting substantially all sizes having a maximum gaging diameter equal to the minimum to be ejected at said station.

10. In a sizing machine of the class described, a carrier for conveying irregular articles to a gaging and ejecting station and presenting gaging diameters thereof at said station, transversely moving preliminary oversize ejecting means at said station defining a gaging space gradually decreasing in the direction of movement of the articles for preliminarily ejecting oversize articles to limit the range of sizes passing therebeyond to a range including maximum gaging diameters but slightly larger than the minimum to be ejected at said station, one of the cooperating elements of said ejecting means being yieldable with respect to the other to prevent pinching of the fruit, and transversely moving anti-pinching final gleaning ejector means at said station for culling out and ejecting substantially all sizes having a maximum gaging diameter equal to the minimum to be ejected at said station.

11. In a sizing machine of the class described, a trough, a sizing belt at one side of said trough adapted to move longitudinally of said trough to move fruit to be sized therealong while rotating the same about its inner axis to present the maximum gaging diameter of the fruit in upstanding relation to said belt, a sizing station past which said belt travels, and ejecting means at said sizing station comprising a transversely movable friction surface spaced progressively closer to said belt in the direction of movement of fruit therealong and having a minimum spacing therefrom approximately but not less than that corresponding to the minimum gaging diameter of fruit to be ejected at said station, and an additional transversely movable friction surface extending parallel to said belt and spaced therefrom by an amount substantially corresponding to the minimum gaging diameter of fruit to be ejected at said station.

12. In a sizing machine of the class described, a trough, a sizing belt at one side of said trough adapted to move longitudinally of said trough to move fruit to be sized therealong while rotating the same about its inner axis to present the maximum gaging diameter of the fruit in upstanding relation to said belt, a sizing station past which said belt travels, and ejecting means at said

sizing station comprising a transversely movable friction surface spaced progressively closer to said belt in the direction of movement of fruit therealong and having a minimum spacing therefrom approximately but not less than that corresponding to the minimum gaging diameter of fruit to be ejected at said station, and an additional transversely movable friction surface extending parallel to said belt and spaced therefrom by an amount substantially corresponding to the minimum gaging diameter of fruit to be ejected at said station, said belt and said friction surfaces constituting opposed means for gaging said fruit, one of said opposed gaging means being yieldable to avoid pinching of fruit being ejected.

13. In a sizing machine of the class described, a trough, a sizing belt at one side of said trough adapted to move longitudinally of said trough to move fruit to be sized therealong while rotating the same about its inner axis to present the maximum gaging diameter of the fruit in upstanding relation to said belt, a sizing station past which said belt travels, and ejecting means at said sizing station comprising a transversely movable friction surface spaced progressively closer to said belt in the direction of movement of fruit therealong and having a minimum spacing therefrom approximately but not less than that corresponding to the minimum gaging diameter of fruit to be ejected at said station, and an additional transversely movable friction surface extending parallel to said belt and spaced therefrom by an amount substantially corresponding to the minimum gaging diameter of fruit to be ejected at said station, said belt being yieldable at said station below said transversely movable friction surfaces to avoid pinching of fruit being ejected.

14. In a sizing machine, a sizing station, a belt for moving fruit past said station, said belt being yieldably arranged throughout the extent of said station, and ejecting means within the extent of said station of the type effecting positive removal of selected fruit from said carrier by contacting the same, and comprising a roll rotatable about an axis spaced from and substantially parallel to said belt, said roll comprising a preliminary conical section with its smaller end directed toward the direction from which the fruit is brought for preliminarily ejecting oversize fruit, and a cylindrical section abutting the larger end of said conical section of sufficient length to insure ejection of substantially all fruit presenting gaging diameters as large as the minimum diameter to be ejected at said station.

15. In a sizing machine, a sizing station, a belt for moving fruit past said station, and ejecting means at said station comprising a friction surface adapted to move transversely of said belt and defining therewith a tapering gaging space decreasing from the maximum gaging diameter normally to be encountered at said station to the minimum gaging diameter to be ejected at said station, said belt being yieldably arranged below said friction surface to avoid injury to fruit moved into said tapered space and forced against the converging sides thereof to be ejected therefrom.

16. The combination defined in claim 12, further characterized in that said additional transversely movable friction surface extending parallel to said belt is of such length longitudinally thereof as to insure a second presentation, in said uniform gaging space, of the maximum gaging diameter of the fruit being rotated and conveyed by said belt to avoid "leakage" of the fruit, if one of the opposed gaging means should yield or recede concurrently with the first presentation of said maximum gaging diameter.

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