Oct. 21, 1947. E. METZGER 2,429,560

BELT TYPE FRUIT GRADER WITH ADJUSTABLE GRADING APERTURES

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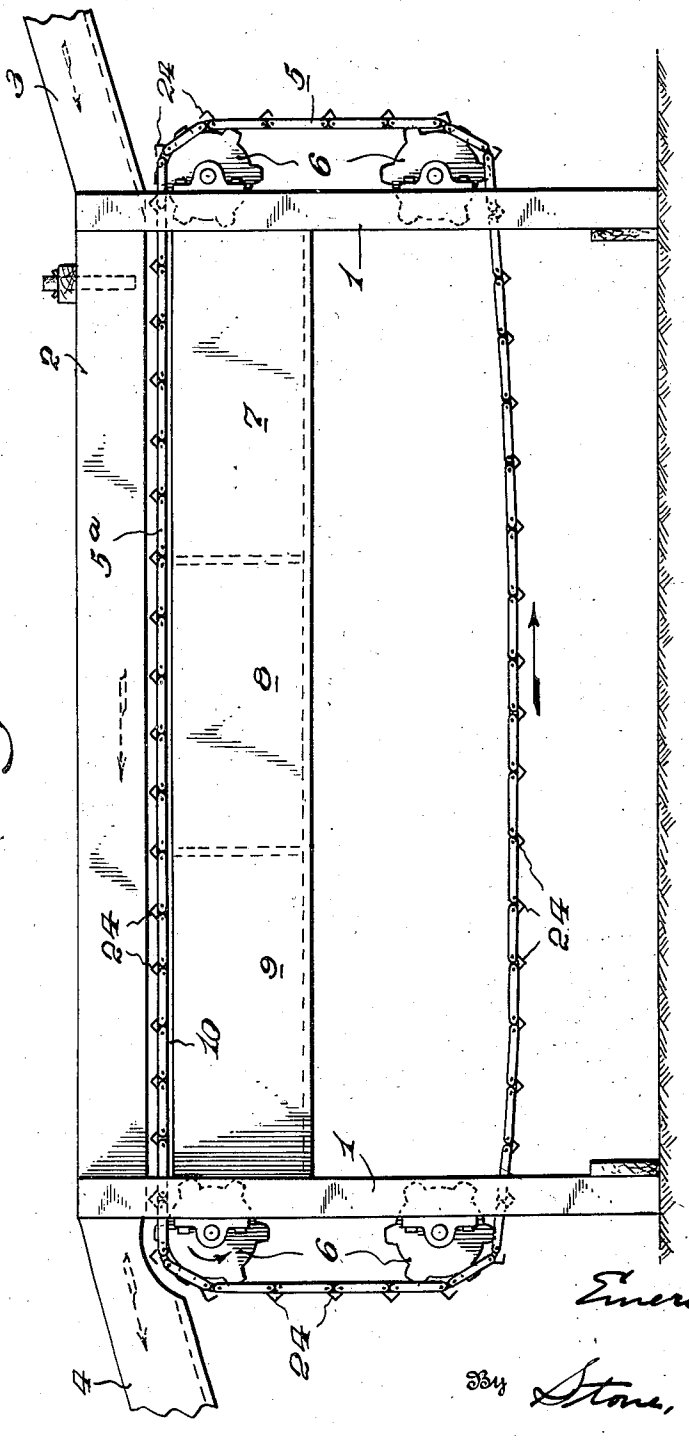


Fig. 1

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Fig. 2

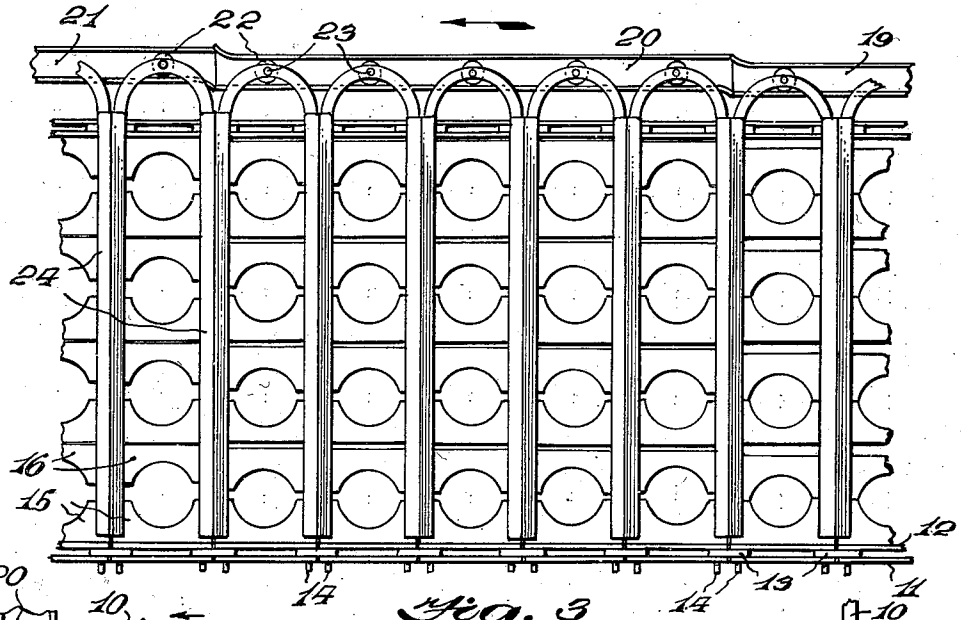


Fig. 3

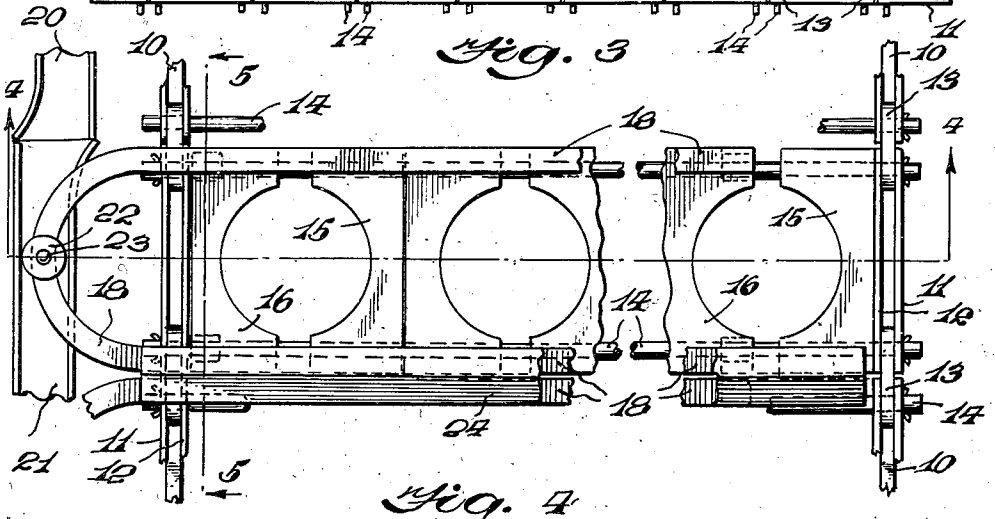


Fig. 4

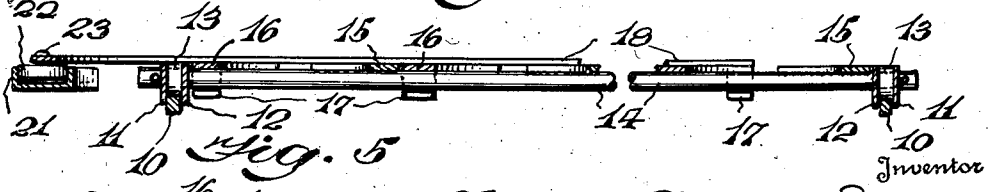
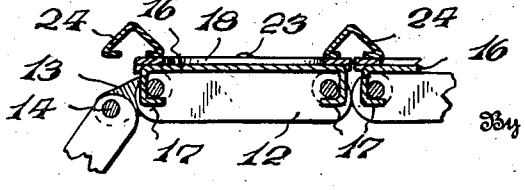


Fig. 5



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BELT TYPE FRUIT GRADER WITH ADJUSTABLE GRADING APERTURES

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5 Claims. (Cl. 209—84)

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This invention relates in general to apparatus for grading fruit, or other objects, according to size.

More specifically, the machine of this invention is of the endless belt or conveyor type in which are incorporated improved structural features. Fruit is discharged onto a horizontal run and is permitted to pass down through grading openings according to size.

One of the features of this improved grader is the arrangement and operation of the plates which provide and regulate the size of the grading openings.

Another feature of the invention pertains to the mechanism for preventing fruit from riding on the flat or level portions of the plates which comprise the surface of the grader.

The foregoing and additional features are described in greater detail in the following claims, and illustrated in the accompanying drawings, in which:

Fig. 1 is a side elevation of a grader embodying the general principles of this invention;

Fig. 2 is a fragmentary view in plan illustrating the surface of the grader and showing portions of the machine at three different sizes of grading openings;

Fig. 3 is an enlarged view in plan of one of the units of the conveyor element;

Fig. 4 is a sectional view taken on line 4—4 of Fig. 3; and

Fig. 5 is a fragmentary view in section taken on the line 5—5 of Fig. 3, showing the position and mounting of the baffle elements on the grading units.

Referring in detail to the several figures of the drawings, 1 is an upright post, leg or support of the frame of the apparatus, which in plan view is preferably rectangular. It will be observed that one of these posts is located at each end of the apparatus. A similar pair of such upright members 1 (not shown) are located at the opposite side of the structure shown in Fig. 1. A horizontal side frame member connecting the posts 1 is shown at 2 and serves as a side retaining wall to prevent fruit which is passing over the grader from falling sidewise from the grader. A similar board (not shown) is located on the opposite side of the grading elements of the machine.

3 indicates an inclined feeding chute from which fruit or other objects to be graded are delivered to the grading mechanism. 4 is the discharge chute which will receive any fruit which is too large to have passed through the grading apparatus.

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The grading mechanism is an endless structure having two spaced endless chains 5, one of which is shown in side elevation in Fig. 1. Four sprocket gears 6 are positioned to receive the chain which is shown in Fig. 1, two each being mounted on axles which are likewise held in suitable bearings fastened to each of the upright frame members 1. Power may be applied to whichever of these axles is selected, depending on the direction of movement of the apparatus. In the structure illustrated, power should be applied preferably to the axle next adjacent the discharge end and the sprocket gear should be fixed to turn with its respective axle. In other words, that sprocket gear serves to pull the horizontal run of the chain.

A similar chain 5 and a corresponding set of sprocket gears, similarly mounted, are located at the opposite side of the structure shown in Fig. 1. The grading mechanism is supported by and extends between the two chains, as will be described.

Fruit graded by the mechanism and passing through the mechanism is caught in suitable receptacles 7, 8 and 9, positioned immediately beneath the upper run of the grading apparatus, and as shown in Fig. 1 these receptacles are at a level below the upper run 5a of the chain 5.

To maintain substantially horizontal and support the upper run 5a of the grading chain and its associated mechanism, there is provided a rigid track or rail 10, one each of which is located at each side of the grading mechanism. Each chain 5 is adapted to rest on and be guided by a rail 10, as will be described.

The grading mechanism, which, as indicated, is in the form of an endless or belt-like structure. It is composed of a series of grading units, each of which extends across the width of the mechanism. The respective units are pivotally connected to each other, side by side, completely around the chain 5. Referring to Fig. 3, it will be noted that the rails 10 are shown substantially at opposite sides of the structure, and, in other words, at opposite ends of each of the individual grading units of which one is shown at Fig. 3. The unit shown in Fig. 3 is typical of the last complete unit shown at the left end of the structure shown at Fig. 2, the size of openings being substantially circular in contour and at their full wide open position.

The details relating to the structure of the chain 5 will now be described. The chain 5 includes two spaced links 11 and 12, both of which are substantially as long as the width of the grading unit. 11 identifies the link at the outside of

the structure and 12 is the link next adjacent the grading mechanism. Links 11 and 12 are spaced from each other by a third link 13, one end of which is positioned between the links 11 and 12 of the next adjacent unit. 13 thus serves as a connecting link between adjacent units. This structure is repeated completely around each chain 5.

It will be noted by reference to Figs. 3, 4 and 5, that the links 11 and 12 are deeper than the link 13 and the lower edge of the links 11 and 12 are positioned below the lower edge of the link 13. By this arrangement the links 11 and 12 extend downwardly alongside of the rail 10 and the link 13 is enabled to ride on the rail 10. Thus the rails 10 not only carry the weight of the chains and the grading mechanism, but also the rails co-operate with the chains to maintain exact alignment during the grading operation and while the respective grade units are passing along the length of the horizontal run of the chains.

Both chains 5 are held in fixed spaced relation with respect to each other by a series of rods 14 which are arranged in groups of two for each grading unit. With reference to Fig. 3, it will be observed that the ends of the rods 14 project through the respective links 11, 12 and 13. The links are preferably pivotally mounted with respect to the rods, and this is especially true with respect to the connecting link 13. Suitable securing means, such as cotter pins, are used in connection with the rods to prevent the accidental loosening of the links from the rods. This construction provides a substantially rectangular framework formed of the two parallel rods and the four links associated therewith, including two links 11 and two links 12.

The grading mechanism is mounted on the rods 14 and includes one or more fixed plates 15 which are secured to the rods, as by welding, and are not movable with respect thereto. It will be observed that the plates 15 are provided with arcuate recesses. Co-operating with each fixed plate 15 are movable plates 16 which are adapted to slide lengthwise of the rods 14, as will be described. Each plate 16 has at opposite sides thereof lugs 17 which partially encircle the rods 14 to hold the movable plate 16 against lateral dislodgment from the rods. All of the movable plates 16 are connected to a common operating element 18, carried by the traveling grading mechanism and which is subject to manipulation by a fixed gauging member while the grading mechanism is being moved along the upper run and is in position to grade fruit. The element 18 is shown as a U-shaped bar, the side arms of which extend substantially parallel to the rods 14 so as to overlie the opposite marginal portions of each of the plate members 16. The plate members 16 are secured to the arms of the members 18 by welding or by any other suitable means. Fig. 3 shows that the element 18 projects beyond the grading plates and beyond the chain at one side with a substantially U-shaped curve.

Mechanism for manipulating the member 18 is provided by the following structure which is fixed with respect to the framework 1 and 2, and extends lengthwise of the machine. When the grading mechanism and chains 5 move upward toward the horizontal run, it is desired that the plates 15 and 16 should be relatively close together so that only fruit of a relatively small size will pass therebetween. Accordingly, the elements 18 should be in their innermost position so that the plates 16 should be close to the plates 15, as at the right side of Fig. 2. As the mechanism travels to the left, the spaces are opened as many times as may be desired, according to the capacity and design of the machine. The position of the elements 18 is determined by fixed elements 19, 20 and 21, which are trough-like in cross-section, as shown at 21 in Fig. 4. It is desirable that these structures have spaced side walls for retaining a roller or wheel 22 which is pivotally mounted at 23 at the outermost end of the element 18. The parts 19, 20 and 21, with their side walls, serve as runways to guide the wheels 22. When the plates 15 and 16 are close together for the passage of small fruit only, the relative position of a specific wheel 22 will be between the walls of the part 19. In the next progressive position, that wheel 22 will be between the walls of the part 20. In the third and larger position, the same wheel 22 will be between the walls of the part 21. The juncture between the walls of the parts 19, 20 and 21 respectively are inclined to provide a gradual cam surface whereby the wheel 22 will be urged outwardly and the element 18 and the plates 16 moved thereby.

The advance end of the part 19 is flared, not shown, to provide a cam surface to bring the wheel 22, the member 18, and plates 16 from the extended and wide open position into the position shown at the right side of Fig. 2. In Fig. 2 the direction of motion of the grading mechanism, as shown by the arrow, is toward the left.

In Fig. 3 an intermediate portion of the grading unit is broken away. The direction of motion is indicated by the arrow on the part 21.

Means for preventing fruit or other objects which are being graded from riding on the flat surfaces of the plates 15 and 16 and on the surfaces of adjacent units, is provided by a series of so-called baffle members 24 which extend across the width of the grading mechanism and lengthwise of each of the grading units. By reference to Figs. 2, 3 and 5, it will be noted that these baffle members overlap adjacent units. One such baffle 24 is mounted on each unit and as shown in Fig. 5 the baffle is secured to the left marginal edge portion of each unit. More specifically, the baffle 24 is mounted on and carried by the arms of the member 18 and the baffle is thus moved with the member 18. A satisfactory and advantageous shape for the baffle is as shown in Fig. 5 in which the baffle has a central longitudinal ridge and inclined walls sloping therefrom down toward the adjacent surface of the plates 15 and 16. A convenient means for attachment is provided by shaping the lower edge portions of the baffle to extend inwardly toward each other as shown in Fig. 5. One such inturned edge provides a convenient attaching surface to be secured to the arms of the element 18. Securing may be by welding if the baffle is of metal. However, the type of material and the method of securement may be determined as expediency requires. It will be noted that this manner of attachment of the baffle makes it possible for the mechanism to move around curves as illustrated where the chain and the baffles are shown making the turns around the sprocket gears, as shown in Fig. 1.

This grading machine may be of a size and capacity best adapted to meet the owner's requirements. A satisfactory length for the horizontal run, that is, the distance between the upright 1 is six feet. The mechanism can be as wide as desired. That is, each unit may be as long as desired and provide as many grading openings as needed, depending on the preferred capacity of

the machine. In addition to the side boards 2 mentioned in the foregoing, it is also desirable that one side board, not illustrated, be located substantially over or closely adjacent to the chain or rail on the side of the machine next to the fixed elements or guides 19, 20 and 21, so as to prevent fruit from falling from the grading units on that side of the machine.

Means for preventing fruit from riding lengthwise of the conveyor or the plates 15 and 16 may be provided by depending rubber fingers which may be positioned in a row across the width of the traveling portion of the grader and preferably hang downward from a suitable support above the adjacent edges of the plates 15 and 16 at sides thereof which do not contain the recesses. Such fingers or baffles are conventional.

It will be understood that the shape of the recesses in the plates 15 and 16 and the corresponding contour of the measuring openings may be varied as desired. They may be round, rectangular or some other shape, according to that best adapted to the fruit or articles being graded.

The positioning of the plates 15 and 16 in a row and in a common plane provides a highly satisfactory mechanism. It will be noted also that the upper surface of the plates 15 and 16 in each of the rows and that all of the rows in the upper horizontal run are in a common plane. It will also be noted that the upper surface of each plate all the way to the edge of the measuring opening is free from any obstruction which could prevent the free movement of fruit or other elements being graded from being moved across the surface of the plates and into the grading openings. The assembly demonstrates simplicity of construction and operation and is believed to be less prone to damage fruit than apparatus having moving cooperating parts in two separate planes. The arrangement in which alternate plates are fixed and the intermediate plates are movable provides a desired simplicity of construction and operation.

From the foregoing it will be clear that this machine provides a continuous type of grading mechanism in which one horizontal run is capable of operating to grade a plurality of sizes of fruit or other objects. It will also be clear that the width or dimension of the grading openings may be varied as desired, depending on the position at which parts 19, 20 and 21 are set.

I claim:

1. In a grader, an endless belt type of measuring member having two rows of chains spaced apart, each formed of an endless series of links, said measuring member being composed of a series of measuring units arranged side by side, each unit including a pair of parallel rods extending from a link in one chain to a corresponding link in the opposite chain, and adjustable measuring means carried by said pair of rods and including a plurality of plates in a common plane positioned in a row across the width of the measuring member between said chains, each plate having a measuring recess, every second plate being fixed with respect to said rods and with respect to each other, said plates including a series of movable plates one each being associated with one of each said fixed plates and slidably mounted with respect to said rods, and each movable plate having a measuring recess associated with the measuring recess of an adjacent fixed plate, and said movable plates being adapted to be moved toward and from said fixed plates to vary the size of the measuring recesses, and connecting means between said movable plates for moving them concurrently crosswise of said measuring member.

2. In a grader, an endless belt type of measuring member having two chains at the opposite sides thereof and each chain formed of an endless series of links, adjustable measuring means carried by said chains, said measuring member having a run thereof extending substantially horizontally, parallel rods extending between said two chains and having their opposite end portions extended through the links of said two chains, said measuring means including a plurality of plates in a common plane positioned across the width of said measuring member between said chains, each plate having a measuring recess, every second plate being fixed with respect to said rods and with respect to each other, said plates including a series of movable plates one each being associated with one of each said fixed plates and slidably mounted with respect to said rods, and each movable plate having a measuring recess associated with the measuring recess of an adjacent fixed plate, and said slidable plates being adapted to be moved toward and from said fixed plates to vary the size of the measuring recesses, connecting means between said movable plates for moving them concurrently crosswise of said measuring member, gauging means fixedly mounted alongside of said measuring member and adapted to determine the position of said connecting means crosswise of said measuring member, and a traveling contact member movable with said connecting means and adapted to coact with said gauging means during the movement of said measuring member whereby the size of the recess openings is adjusted.

3. In a grader, an endless belt type of measuring member having two endless chains, each of an endless series of links, and a pair of spaced horizontal parallel rails supporting said chains in a horizontal run of said measuring member, said measuring member including a series of grading units, each extending crosswise of the path of travel of said measuring member and pivotally associated with the next adjacent unit of the series, each unit including parallel spaced links of said chains extending lengthwise of the path of travel and pivotally associated with the corresponding link of the next adjacent unit, each unit having a pair of spaced rods between and carried by opposite links of the two spaced chains, a series of grading plates in a common plane and having grading openings therebetween, said plates extending between said chains and carried by said pair of rods, certain plates being fixed and others being movable with respect to said rods, and a separate baffle member carried by each of said grading units and secured to the unit along one margin thereof and extending lengthwise of said unit and crosswise of the path of travel of said measuring member, each baffle member overlapping adjacent edges of adjacent grading units in the horizontal run and having inclined surfaces whereby fruit is diverted toward said grading openings.

4. In a grader, and endless belt type of measuring member having a series of grading units, each extending crosswise of the path of travel of said measuring member, said grading units being pivotally associated together and the assembly of said units substantially comprising the surface of said measuring member, each of said units including a series of fixed and movable plates arranged in alternate relation and all in a common plane and providing grading openings therebe-

tween, and a separate baffle member carried by each of said grading units and extending crosswise of said measuring member and secured at one margin of said grading units and overlapping the adjacent edge of the next adjacent unit and having inclined surfaces whereby fruit is directed toward said grading openings.

5. In a grader, an endless belt type of measuring member having a run thereof extending substantially horizontally, said measuring member having a series of grading units each extending crosswise of the path of travel of said measuring member, said grading units being pivotally associated together and the assembly of said units substantially comprising the surface of said measuring member, each of said units including a series of fixed and a series of movable plates having flat upper surfaces throughout their area in said horizontal run arranged in alternate relation and all in a common plane and providing adjustable grading openings therebetween, the upper surface of each plate in said horizontal run lying in a single plane which terminates at the marginal edge of the grading opening, means to feed elements to be graded to the upper surface of said plates in said horizontal run, said fixed plates having a straight path of travel parallel to the path of travel of said measuring member during a grading operation and said movable plates being adjustably mounted with respect to said fixed plates to be spaced therefrom progressively at specified distances and when so spaced being adapted to move in a path of travel parallel to said fixed plates for a prescribed part of the path of travel of said measuring member, said grading units being so closely positioned with respect to each other that elements resting on said plates awaiting grading cannot pass downward between adjacent units, said surface of said measuring member being closed except for grading openings in its direction of travel and substantially coextensive with the units transversely to the path of travel.

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