

Oct. 12, 1965

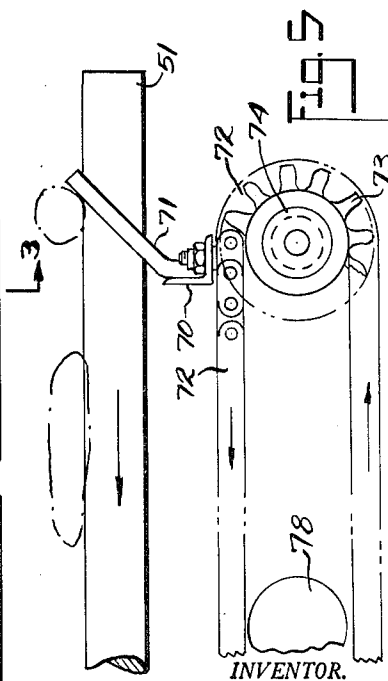
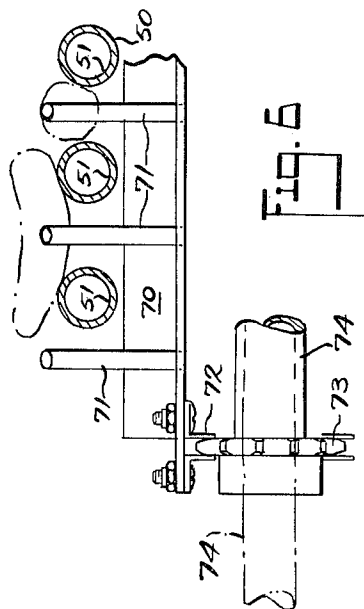
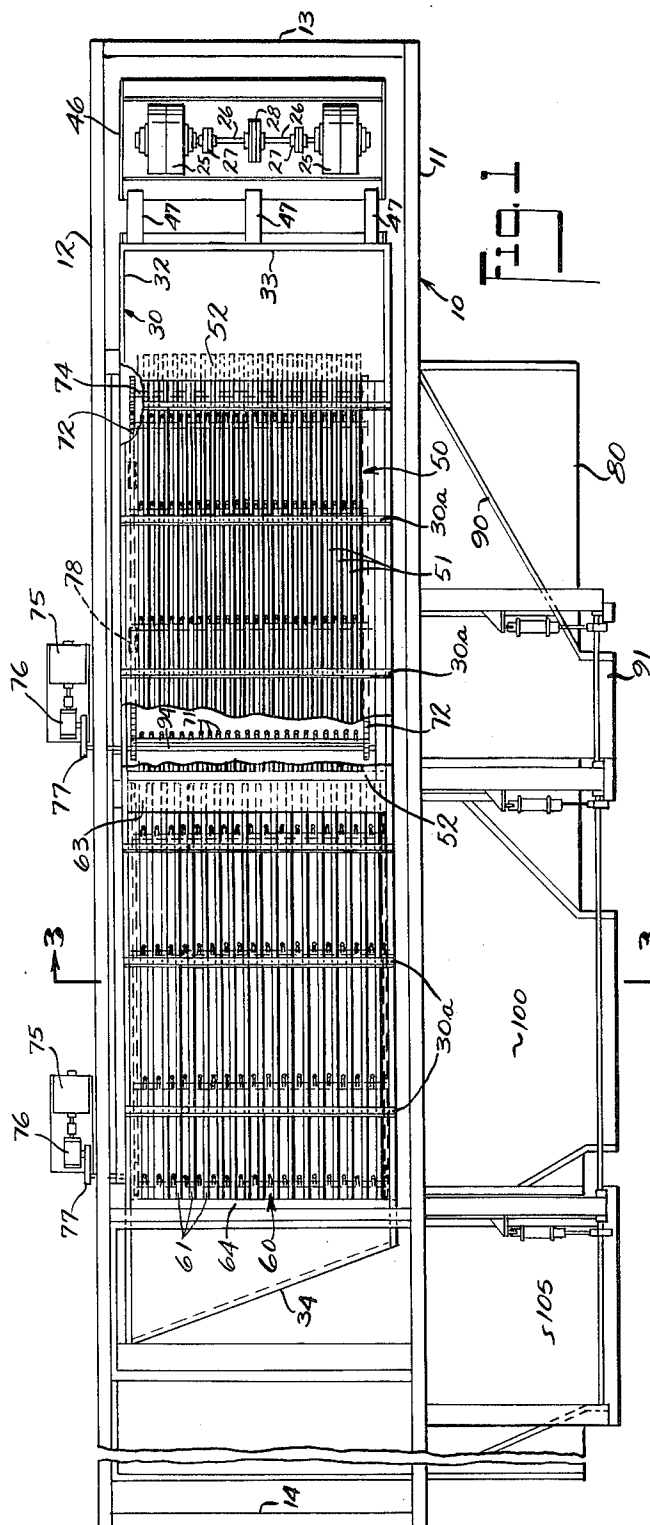
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3,211,289

SORTING APPARATUS

Filed June 13, 1963

4 Sheets-Sheet 1



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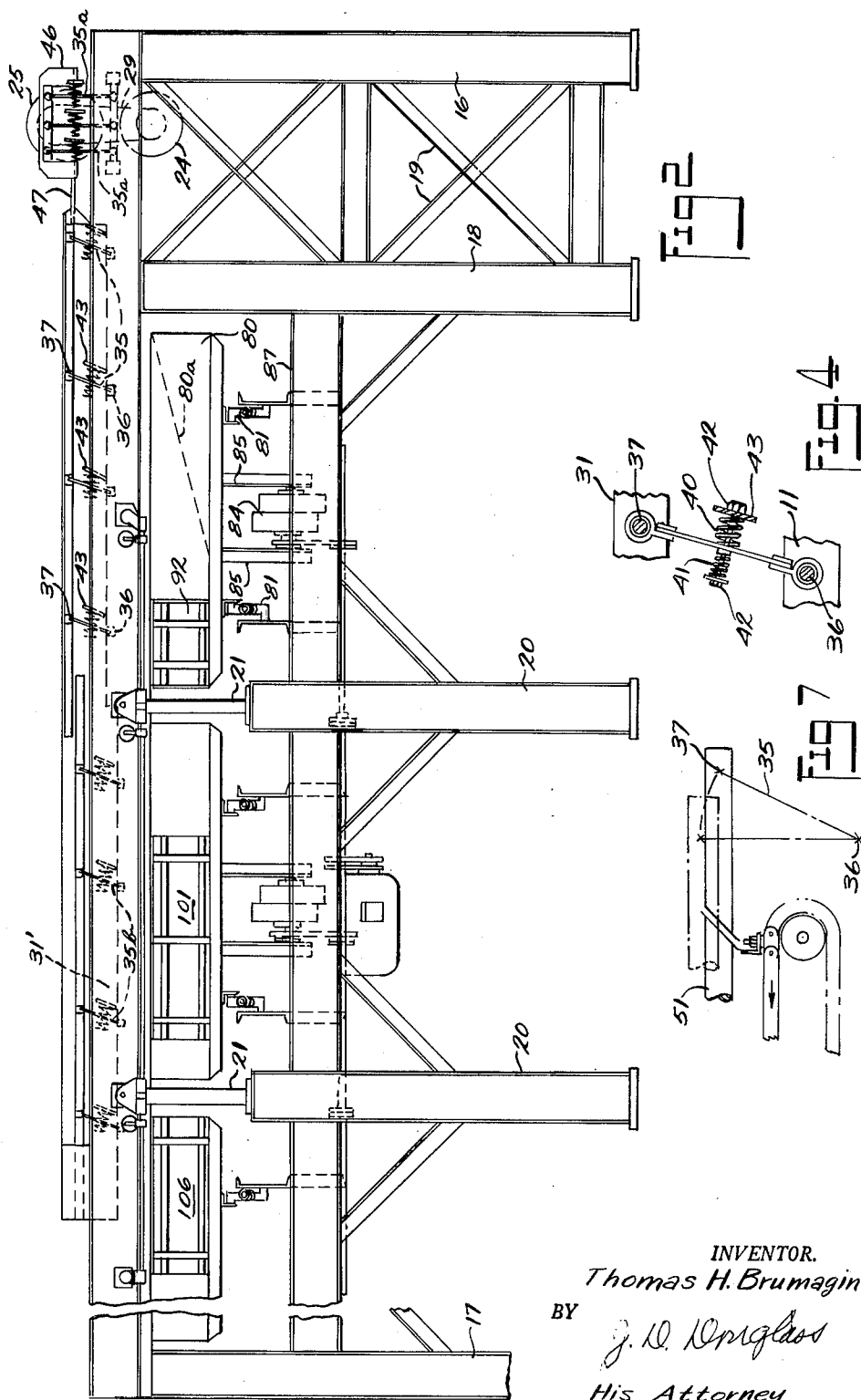
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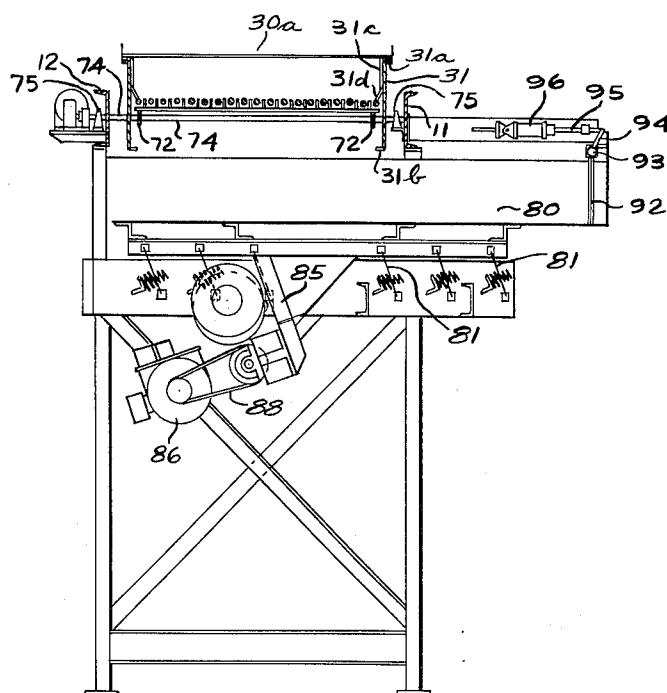


Fig. 3

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4 Sheets-Sheet 4

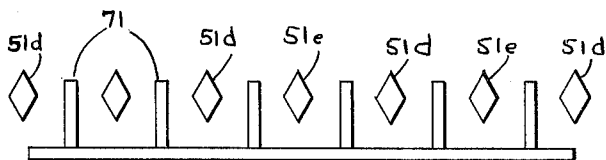


Fig. 8

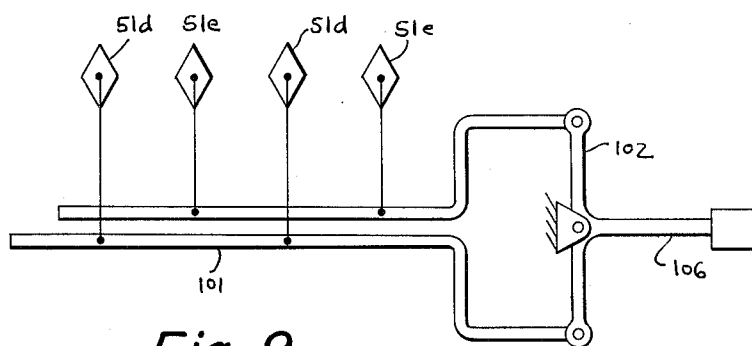


Fig. 9

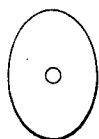


Fig. 10

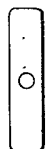


Fig. 11

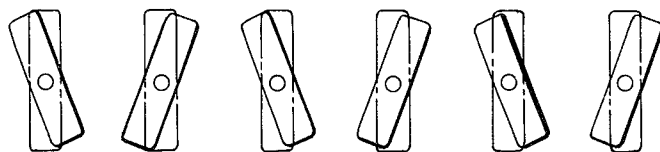


Fig. 12

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3,211,289

SORTING APPARATUS

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Filed June 13, 1963, Ser. No. 288,591
8 Claims. (Cl. 209—99)

This application is a continuation-in-part of my co-pending application Serial No. 106,745, filed May 1, 1961, and now abandoned.

This invention relates to an apparatus for sorting or classifying articles and more particularly to an apparatus for sorting articles as to sizes. It is particularly useful in sorting articles which are of an elongated shape and where the length is greater than the width such as certain types of vegetables, of which one variety is cucumbers, and the invention about to be described will be described in its application to the sorting of cucumbers for the purpose of pickling. It should be understood, however, that it is not limited to the specific purpose described and that a particular product is designated to enable a better understanding of the invention and is not intended to be by way of limitation.

It is customary, in the pickling industry, particularly that of cucumber pickles, to pick the cucumbers indiscriminately and load them onto a truck. The truck conveys them to the pickling plant and here they are first sorted as to size. The assorted pickles may then be used to provide the various types of pickles, such as "dill" which are usually relatively large, or "Gherkins" which are relatively small, etc.

The cucumbers, although of a relatively rugged nature, must be handled delicately, otherwise they become bruised, which effects the quality, particularly the crispness that is highly desirable. Heretofore the cucumbers were placed upon a vibrating grating or shaker, which consisted of longitudinally extending bars, which are vibrated in horizontal direction, and the cucumbers were moved along the bars by rakes. The bars were so arranged that at the loading end the space between the bars was relatively small and the space gradually widened toward the end remote from the loading end. The smaller cucumbers fell through the narrow space and the larger ones through the wider space, thus classifying the same as to size. The grating did little more than agitate the pickles and the actual conveying of the articles from end to end was done by rakes.

At the outset, if the cucumbers were to be properly classified, they had to be placed on the grate a few at a time and at the end nearest to the loading end. If they were not placed exactly at the end, the smallest ones would not be separated from some of the larger ones and the classification was not of the desired nature.

Furthermore if a large bulk was placed on the conveyor, before the larger ones would come to the top, which was effected by the shaking action, some of the smaller ones would be conveyed along the grate and be mixed with the larger ones when they fell through the grate. This was particularly true with cucumbers, because very often a small cucumber would extend crosswise of the grate and be conveyed along the grate without falling through. In addition, with the weight of the pickles on top of each other, the rake, which did the conveying, caused damage to the pickles because of the bulk to be moved.

The foregoing was a relatively slow process and, in order to keep up with the harvesting, several machines had to be used in order to enable a large quantity of articles to be classified. This made the investment uneconomical because it required several machines which were expensive, and these machines laid idle except during the harvest season, which was relatively short.

It should be pointed out that the cucumbers should be graded and weighed quickly, because the tally of the graded pickle determines the amount to be paid to the grower. During the season many growers may be delivering their product to the plant and it is highly desirable that the grading be effected quickly and as exactly as possible in order to conserve the time of the people delivering the product to the plant.

By the present invention it is possible for the grower to drive up to the machine and dump his product into the sorter more or less indiscriminately. The sorting starts immediately and proceeds at a high rate of speed. Furthermore the sorting is more exact and less damage is done to the product.

Briefly, the invention comprises a conveyor in the form of a grating, composed of longitudinally extending bars, which is reciprocated in an arcuate direction longitudinally and vertically, and a product dislodging means cooperating therewith in the form of a plurality of fingers which are moved on a horizontal line between the conveyor bars. It will be particularly noted that the movement of the product is solely because of the reciprocating conveyor and that the fingers mentioned are not intended to move the product along the conveyor, but to dislodge irregularly shaped articles which become lodged between the bars. These fingers may also help to align the product with the spaces between the bars.

More specifically, the conveyor includes a number of grates, the number used depending upon the number of sizes into which the product is sorted. The grates are preferably made by the use of parallel rods or tubes which may be of various cross sectional shape, designed to provide wedge shaped valleys formed by the adjacent rods. The valleys in themselves materially assist in the operation of aligning the product so that it may fall through the spaces between the rods.

The invention also contemplates the use of grate bars which may have a cross sectional configuration other than round, which bars may be rotated around their longitudinal axes and wherein the transverse dimensions of the bars are such that the spacing between the bars may be regulated to increase or decrease the spacing.

Still other advantages of the invention and the invention itself will become more apparent from the following description of some embodiments thereof and their method of application, which is illustrated in the accompanying drawings and forms a part of this specification.

In the drawings:

FIG. 1 is a plan view of a machine constructed according to the invention, with certain parts broken away to more clearly show underlying structures;

FIG. 2 is a side elevational view;

FIG. 3 is a sectional view, taken from the line 3—3 of FIG. 1;

FIG. 4 is a more detailed view of a support for a vibrating table;

FIG. 5 is an enlarged fragmentary elevation of the chain driven product dislodger;

FIG. 6 is a fragmentary view at right angles to FIG. 5;

FIG. 7 is a diagrammatic view illustrating the operation;

FIG. 8 is a diagrammatic view of a modified form or grate bars and showing the position of the article dislodging fingers;

FIG. 9 is a diagram of a grate bar adjusting linkage;

FIGS. 10 and 11 are outlines of other sections of grate bars which may be used; and

FIG. 12 is a diagrammatic view of a series of rectangular bars and showing in dotted lines the alternate positions to which the bars may be adjusted.

The apparatus comprises a main stationary frame 10, which may be conveniently made of channel irons, and

is of rectangular plan formation. It comprises the near side piece 11 and the far side piece 12, the right end 13 and the left end 14. The frame is supported by pedestals 16 and 17 at the right and left ends respectively. Associated with the right end pedestal 16 is a pedestal 18, the two being rigidly interconnected by suitable cross bracing 19. Intermediate supports are provided by the pedestals 20 which have pillars 21 on their tops that are connected to the main side frames 11 and 12. The extra cross bracing and pedestals 16, 18 and 19 are provided at the position where the vibrating means is mounted.

Inwardly of the main frame and in spaced relation thereto, is an oscillatable frame, indicated generally at 30, and which likewise is of general rectangular formation. This frame acts as a combined hopper and conveyor and has a grate in the bottom by means of which the articles are sorted. It is composed of the near and far sides 31 and 32 and an end 33 at the right. The side member 31 may be slightly shorter than the member 32 and the end opposite to the end 33 provided with a slanting tie member 34. Intermediate the ends of the oscillatable frame, the frame is braced and the side members 31 and 32 held in spaced parallel relation to each other by cross beams 30a of angle iron, which are welded to the top of the side members. As best shown in FIG. 3, the frame may be of a composite construction including the side wall 31 having an outturned upper flange 31a and an inturred lower flange 31b. At the upper ends there is provided a second sheet 31c which is contiguous to the first and which at the bottom end slants inwardly at 31d. The frame 30 is supported from the frame 10 by links 35, which are indicated diagrammatically in FIG. 2, and which are pivotally connected to the main frame channels 11 and 12, at 36, and to the oscillating frame members 31 and 32, at 37, FIG. 1. The intermediate portions of the links, FIG. 4, are provided with springs 40 and 41 and a through bolt 42, which extends through an abutment 43, connected to the side of the channel member 11.

These links furnish a support for the oscillatable frame, allowing that frame, when moved by the vibrator, to oscillate in a longitudinal and upward direction along an arc defined by the upper end 37 of the link, the lower end being fixed at 36. The linkage itself and its manner of connection is more specifically shown in the Brumagin Patent No. 2,678,720, and is therefore, in connection with the drawings, merely shown in a diagrammatic manner. Reference may be had to the above-mentioned patent for the specific details of the same.

The number of supports connecting the main frame 10 to the oscillating frame 30 may be varied and their spacings also varied. In the structure shown in the drawings, eight such supports are provided, as indicated. Thus the oscillating frame, since the links 35 are of equal length, is supported in parallelism with the main frame and, when moved, partakes of the movement as previously stated, which throughout its length is in a direction defined by the points 37 of the links about their pivots 36, as illustrated in FIG. 7.

The frame 30 is oscillated by a vibrator mechanism which comprises two units 25 coupled together by shafts 26 and joints 27 and having a central sheave 28 which is connected by a belt 29 to a motor 24. The motor is rigidly supported on the main frame and the vibrating mechanism is supported on a sub-frame 46 which is of generally rectangular formation, as shown in FIG. 2, which in turn is supported from the main frame by links 35a that are the same as the links previously described. The links 35a extend vertically instead of at an angle as do the links 35 for the oscillating frame. The frame 46, which supports the vibrator, is connected to the oscillating frame 30 by straps 47. The vibrating units are preferably of the character shown in the Shaler Patent No. 1,999,213. Other types of vibrating mechanism could be used, but this type has been found to be very efficient and

effective and is highly desirable. The movement of the energizing frame 46 is also slightly arcuate but has equal components of movement in an upward and downward direction, which is transmitted through the connectors 47 to the oscillating frame, these connectors being sufficiently flexible that the oscillating frame may partake of a rising movement in an arcuate path while the vibrator frame is moving substantially horizontal.

The oscillating frame 30 is provided with grates. In this instance, two grates are shown, there being a first grate, indicated at 50, which is comprised of circular cross-section longitudinally extending parallel spaced bars 51 connected to cross members 52 at opposite ends. The first set of bars 50 is disposed spaced from the top of the side members 31-32, and will be noted that the channels 31-32 which support the bars 50, as best shown in FIG. 1, are slightly narrower than the channels 31' from the mid section of the machine towards the end. This is to allow the second grate to be disposed at a lower level. It will also be noted that the links 35b are displaced downwardly slightly from the links 35 at the forward end of the machine. The spacing between the bars 51 of a predetermined width, depends upon the maximum size of articles to be sorted. The bars of the first grate 50 extend along to the bars of a second grate 60, which is at a lower level. The second grate 60 is formed of bars 61 which are fastened to the member 63 at one end and member 64 at the other end. The spacing between these bars is wider than the spacing between the bars 50, it being such as to pass articles of a size between the size held back by those of the grate 50 and a predetermined size to be passed beyond the grate 60. At the end of the grate 60, articles which are of a size larger than those that may pass through the grate 60, are discharged from the end of the vibrating frame.

It should be clearly understood that the articles which, in this instance may be cucumbers of various sizes, are loaded onto the oscillating frame close to the vibrating mechanism end of the frame and that the action of the oscillating frame is such that the articles are conveyed from one end to the other. The movement of this frame is best shown diagrammatically in FIG. 7, where the grate is moved from the position shown in full lines upward and to the left as shown by the dotted lines and then downward and backward to the full line position. This furnishes a momentum to the product upward and to the left which is thus conveyed from the loading end longitudinally of the grate 50 until it reaches the end of the grate, after which the articles that have not fallen through between the bars discharges onto the second grate 60.

During the travel, the cucumbers of a certain size pass through the gaps between the rods and drop onto a second conveyor below. Similarly the cucumbers which reach the grate 60 allow those of a certain size to pass between the bars of the grate and drop onto another conveyor below that grate. Those of a size sufficiently large to fail to pass between the bars of the grates 50 and 60 are discharged at the end onto a third conveyor. It will be appreciated that any number of these grates could be used and thus the cucumbers graded into more than three grades if desired. The number required depends upon the type of packing operation. In this instance, if the grates 50 are closely spaced, the smaller cucumbers, which may be made into so-called Gherkins, of one size, would be sorted at this station and ordinary sweet pickles at the next station, and the larger ones used for dill, depending upon the wishes of the packer.

It should be pointed out that bars of circular cross-section provides a series of parallel longitudinal troughs which assist in the alignment of the cucumbers, with the openings in the grates such that the cucumbers of a certain size may fall through.

As will later be pointed out, bars of other cross-sectional shape provide additional advantages over that of the circular cross section.

It should also be borne in mind that the conveying action which also causes considerable turbulence of the product, also causes the larger cucumbers to rise to the top as they proceed along the grate and the smaller ones to go to the bottom, which facilitates the sorting considerably over that of prior devices which were merely shakers rather than conveyors, and where the conveying was effected by rakes.

It will be appreciated that the shape of the cucumbers, particularly the smaller ones, is not necessarily straight, but that they are slightly curved. This has an undesirable effect upon the sorting operation in that some of them may be rotated crosswise of the rods, as illustrated in the dotted lines of FIGS. 5 and 6, and therefore could be carried beyond the grate 50 and discharged onto the grate 60, thus causing a loss of sorting action. It is highly desirable that all of the cucumbers of a certain size pass through the grate 50 and not be passed onto the grate 60, or even beyond and discharged at the further end.

Means is therefore provided which cooperates with the reciprocating action of the grates to cause dislodging of the articles which become wedged in the gaps between the grates. The means also assist in turning them around so that they are more apt to fall through and will not be carried beyond the end.

Briefly, the means comprises a plurality of fingers extending up into the spaces between the bars at spaced intervals along the bars and which fingers are drawn longitudinally of the frame in the spaces between the bars. It should be clearly understood that the fingers are article dislodging means and not a product-conveying means, although they may also assist in aligning the product with the openings. As a matter of fact, they can be operated longitudinally of the bars in the opposite direction to the travel of the cucumbers by the conveyor action of the grates and, in some instances, this may be desirable because the straightening action is more effective.

The lodging means, FIGS. 5 and 6, comprises angle bars 70 to which are secured slanting fingers 71. The spacing between the fingers depends upon the particular grate where they are to be used and in the case of the grate 50 would be such that they were opposite to the center space between the bars 51. One set of fingers is provided for each space between the bars. The beams are connected at their ends to link chains 72, there being a pair of said link chains one of which is disposed on each side of the frame, on sprockets 73 carried by a shaft 74 which is journaled in bearings mounted on the main frame members 11 and 12. The shafts 74 are driven by motors 75 through a reduction gearing 76, which may be belted to the shaft by belts 77. Throughout the run of the chains, they are supported at spaced intervals by rollers 78, the number depending on the length of the run, so that the chains with their fingers supporting bars are maintained at a predetermined level.

The fingers are thus drawn along between the grate bars and at the same time the grate bars are being oscillated as described. Preferably the fingers, when the bars are at the lowest level, project but slightly above the top sides of the bars, and when the bars are at their uppermost position they are at approximately the midline of the bars.

As stated, the action of the grates is such that the cucumbers which are loaded onto the grate 50 at the vibrator end, are jumped along the grates, which action causes the larger ones to come to the top and the smaller ones to settle to the bottom against the grate bars. Those that happen to be aligned with the grate bars and are of the smaller size immediately pass through into the conveyor beneath the grate. Those that become lodged or stuck between the grate bars are immediately brought into contact with the fingers 71 which dislodge them and prevent them from clogging the grate. Those that are turned crosswise are immediately turned around. It will therefore be seen that there is a conjoint action between

the grate bars and the fingers, which is also assisted by the shape of the bars which provides wedge-shaped openings therebetween, so that the product is rapidly and efficiently sorted.

As was stated, the cucumbers that drop through the grate 50 fall into a second conveyor below that grate, which is indicated at 80. This conveyor is disposed transversely to the grate 50 on vibrator links 81 which are the same as the links 35. The conveyor 80 is oscillated in the same manner as the grate frame by the vibrator units 84, which are connected to the conveyor by a frame 85 and are driven by a motor 86 supported on the main stationary frame beams 87 below the members 11, through a belt 88. The oscillator causes the cucumbers to be moved toward the viewer, as seen in FIG. 2, or to the right, as viewed in FIG. 3.

The conveyors are as wide as the grates are long and the cucumbers move along the conveyors and are guided by slanting walls 90 toward a gate 91 which is controlled by a door 92. The bottom wall of the conveyor may also be slanting, as indicated at 80a, FIG. 2, to assist in causing the product to move toward the gate.

The gates are hinged at their upper ends 93 and a lever 94 connected rigidly to the gate and to the piston rod 95 of a pneumatic cylinder 96 enables the gate to be opened and closed at will.

Likewise the grate 60 is provided with a conveyor 105 having a gate 106.

Suitable receptacles, not shown, for receiving the graded cucumbers are placed beneath the discharge ends of the conveyors 80, 100 and 105, for receiving the product.

During the time when the filled receptacles are being exchanged for empty ones, the gates may be closed and the sorting operation continues, the lower conveyors gradually accumulating the product while the gates are closed.

This enables a producer to bring in a load and discharge it onto the sorter and the product is quickly sorted and conveyed by the conveyors to the receptacles. When the particular load is sorted, and the receptacles are being weighed to determine the tally, the gates may be closed and the sorting continued. Thus there is no idle time between loads, even when the loads are from different growers, because while the sorted articles are being tallied the newly deposited articles are being sorted. This enables the operation to proceed efficiently without loss of time.

I also contemplate that for some purposes the fingers could be stationarily supported below the grate bars on racks. This would be particularly feasible where the articles to be sorted were of a smaller size. Actually such an arrangement would depend upon not only the size but also upon the length of the arcuate oscillatory movement, since the purpose of the fingers is to straighten and dislodge articles jammed in the grate and to prevent clogging.

It is also apparent that instead of a single frame supporting two sets of grate bars, each set of grate bars could be supported by a single frame and also that each could be independently oscillated relative to the other. This might be particularly desirable where the articles ran a large range of sizes and it was desirable to convey the smaller sizes at a different rate than the others.

Although I have indicated that grate bars of round section have certain desirable attributes, it is apparent that similar results could be obtained with bars of triangular cross section or even with rectangular bars which could be mounted with their faces slanting transversely. In some instances, it may even be desirable to provide grate bars having a plain flat upper surface.

FIG. 8 is a diagram of a set of bars 51d and 51e of diamond shaped cross section. These bars may be tilted about their axes, as shown in FIG. 9, by links 100 which are rigidly connected to the bars 51d and connected by

a rod **101**, whereby they may be moved in unison by a suitable handle or by being attached near the outer edge of a lever **102**. Likewise the intermediate bars **51e** have similar links **103** connected by a rod **104** and which in turn may have a handle or be connected to a lever **102**. The lever **102** may be operated by any suitable means, one of which includes a handle **106** and when so rotated the rods **101** and **104**, being connected to opposite sides of the lever, are moved in opposite directions and thus the bars **51d** are rotated in one direction and the bars **51e** simultaneously in the opposite direction. This causes the grate bars to be tilted to vary the slant of the sides defined by the upper side of the bars and to increase or decrease the clearance space between the bars.

It will be appreciated that the bars **101** and **103** could also be moved independently and thus moved to rotate the bars through different degrees of tilt, should it be desired.

It is contemplated that the bars could be oval as shown in FIG. 10, or generally rectangular as shown in FIG. 11, or square in cross section.

FIG. 12 shows a set of rectangular bars and in dotted lines alternate extreme positions to which the bars may be adjusted.

Having thus described my invention, I am aware that numerous and extensive departures therefrom may be made without departing from the spirit or scope of the invention as defined by the appended claims.

I claim:

1. An apparatus for grading articles as to size comprising a conveying means formed of longitudinally extending spaced bars for supporting the articles, support means for supporting said conveyor and to limit the oscillating movement for the conveyor in a substantially straight direction upwardly and forwardly and in a reverse direction thereto downwardly and backwardly to cause agitation and conveying of the articles along the conveyor, means connected to said conveyor to oscillate the same in a manner provided for by the support means, means for engaging said articles on said conveyor, said engaging means passing between said spaces to dislodge articles that become wedged in said spaces comprising projections supported for movement by an endless means between said spaces when the conveyor is oscillated in a downward and backward direction.

2. An apparatus as described in claim 1, wherein said projections are supported for movement in a longitudinal plane parallel to and along the conveyor.

3. An apparatus as described in claim 2, wherein means is provided for moving said projections in a direction opposite to that of the articles on the conveyor.

4. An apparatus as described in claim 2, wherein means is provided for moving said projections in the same direction as the movement of the articles.

5. An apparatus for sorting articles as to size comprising a conveyor, said conveyor being formed with a grating comprised of parallel spaced longitudinally extending bars pivotally mounted for rotational movement about their longitudinal axes and having a greater cross-sectional height than their width and means to rotate adjacent bars in opposite directions to increase and decrease the space between the bars, means to support said conveyor for rapid oscillatory movement in an upward and forward direction and reversely thereto, means connected to the conveyor for oscillating the conveyor, means for engaging the bottommost articles on the conveyor when it is at its lowest position to disengage articles that become wedged between the bars comprising at least one endless means disposed below the conveyor and means driven by said endless means for supporting a plurality of projections which extend into the spaces between said bars and to move said projections longitudinally of said bars.

6. A device as described in claim 5, wherein said projections are moved in a fixed plane parallel to said bars.

7. A device as described in claim 6, wherein the direction of movement of the projections is the same as that of the articles on the conveyor.

8. A device as described in claim 6, wherein the direction of movement of the projections is opposite to that of the articles on the conveyor.

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