United States Patent

Goodale

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[54] APPARATUS FOR SORTING AND GRADING CUT FLOWERS

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[52] **U.S. Cl.**.....**209/82,** 209/122, 214/11

[51] **Int. Cl.**.....**B07c 1/14**

[58] **Field of Search** 209/74, 82, 122, 125; 214/11

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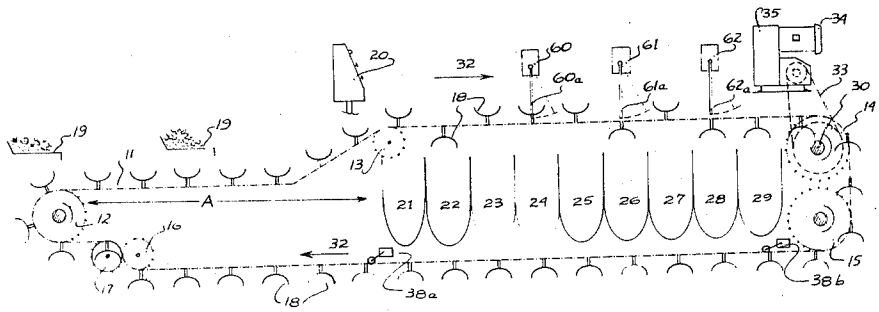
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[57] **ABSTRACT**

An apparatus for grading cut flowers according to stem length and quality of the flower buds. The cut flowers are placed on trays which are carried by a continuous conveyor past a programming station that is controlled by an operator. The trays are provided with a mechanical device that rides on a track and holds the tray upright until it arrives at the bin into which the cut flower carried by the tray is to be dumped. The quality flowers are graded into several categories depending upon the stem lengths.

9 Claims, 8 Drawing Figures



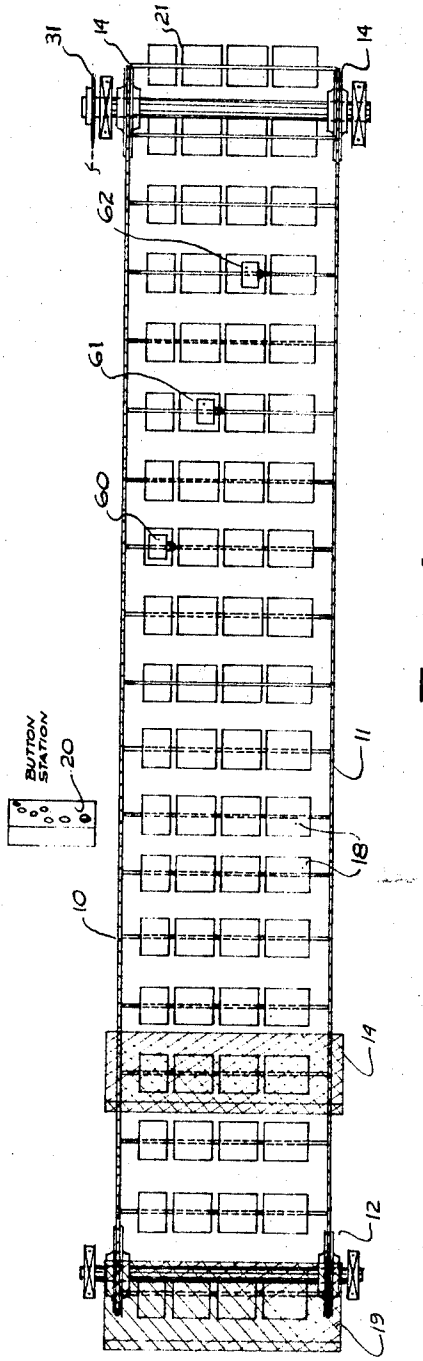


FIG. 1

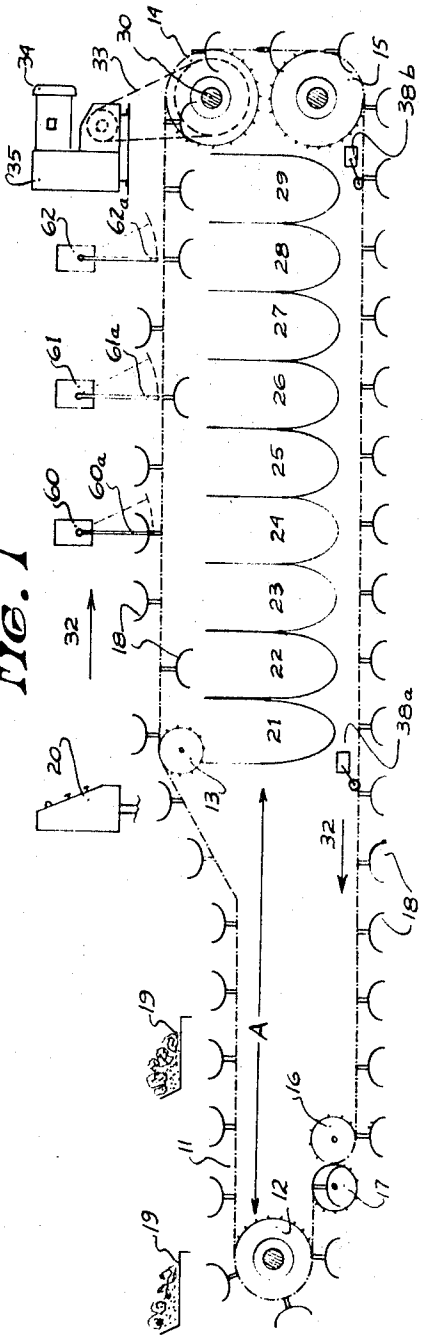


FIG. 2

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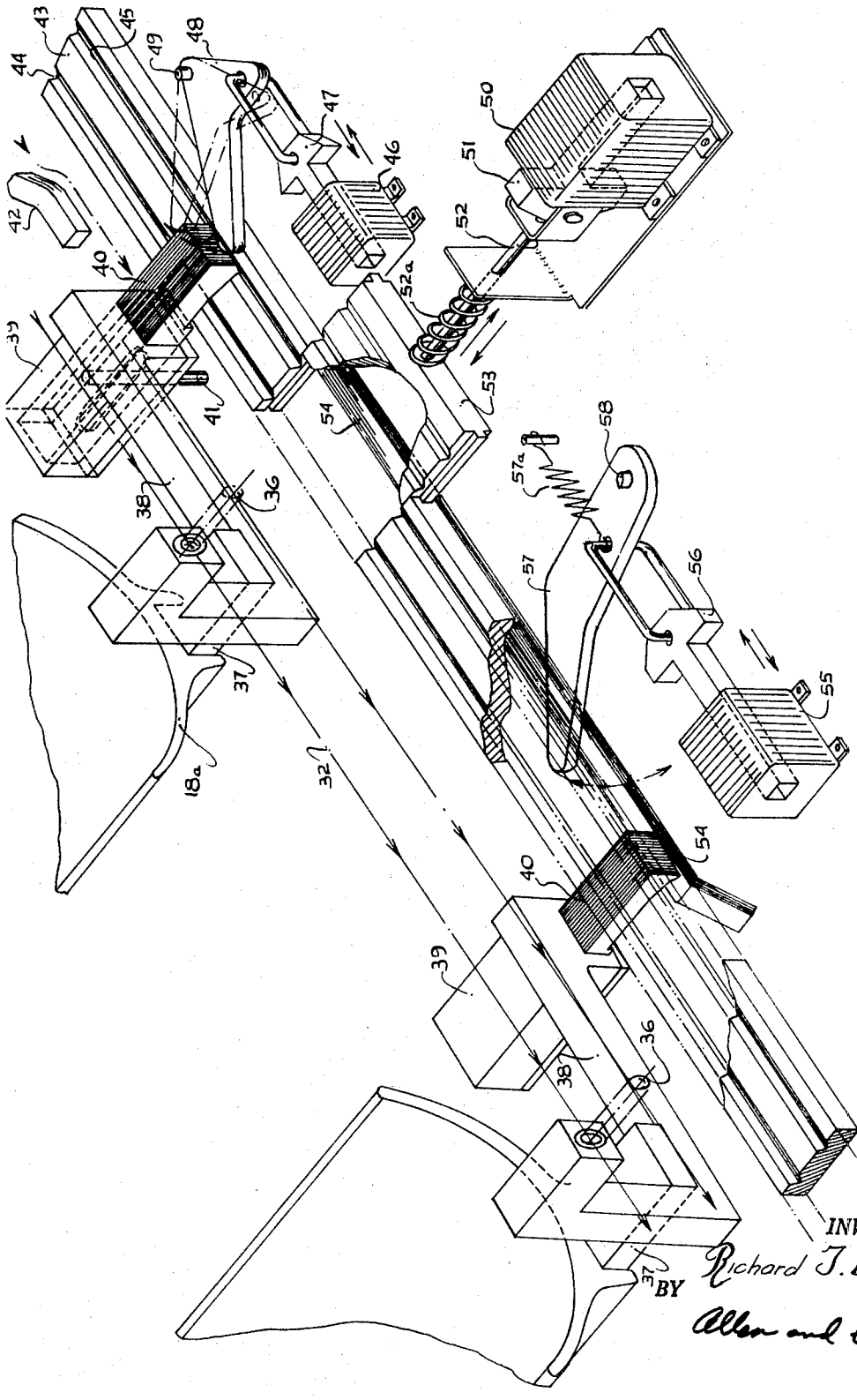


FIG. 3

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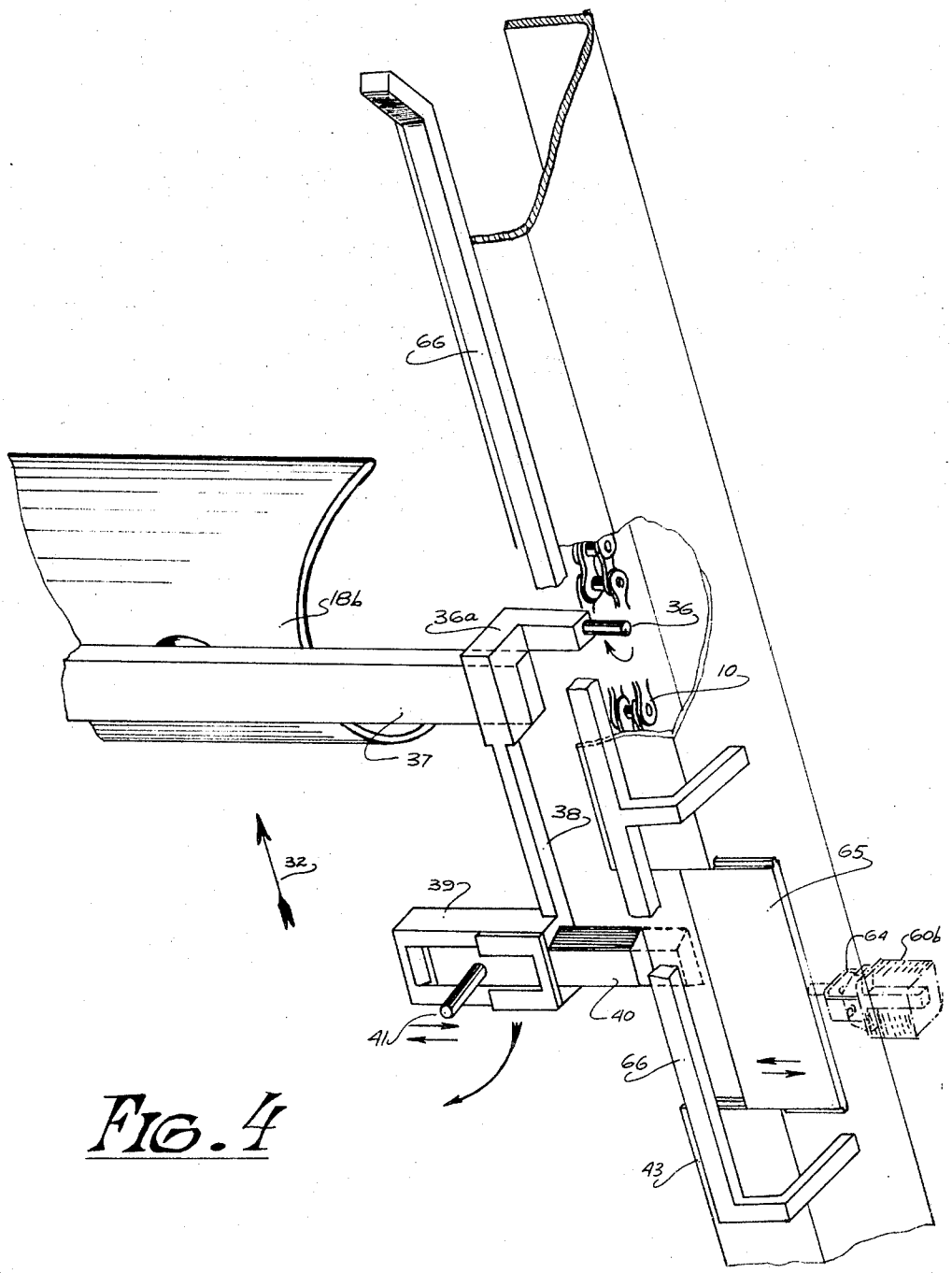


FIG. 4

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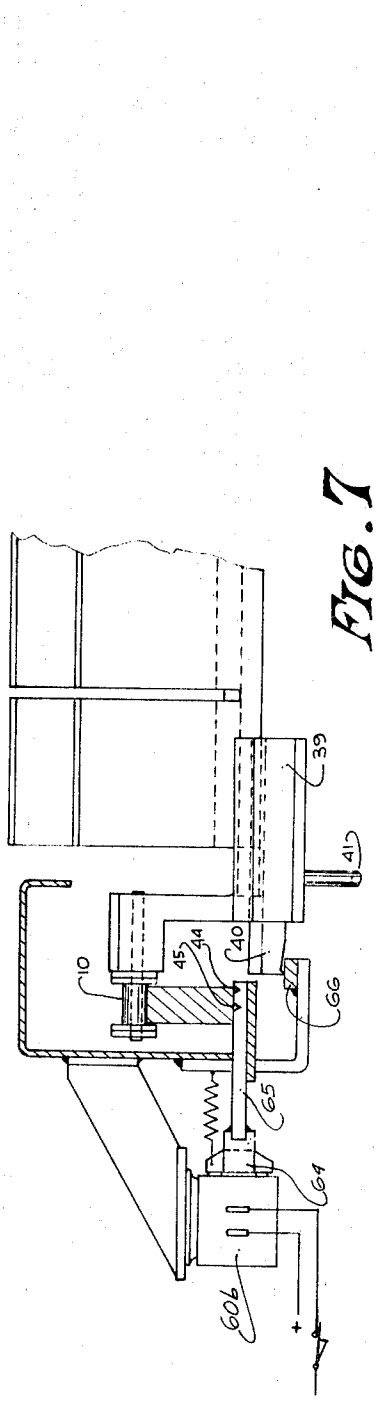


FIG. 7

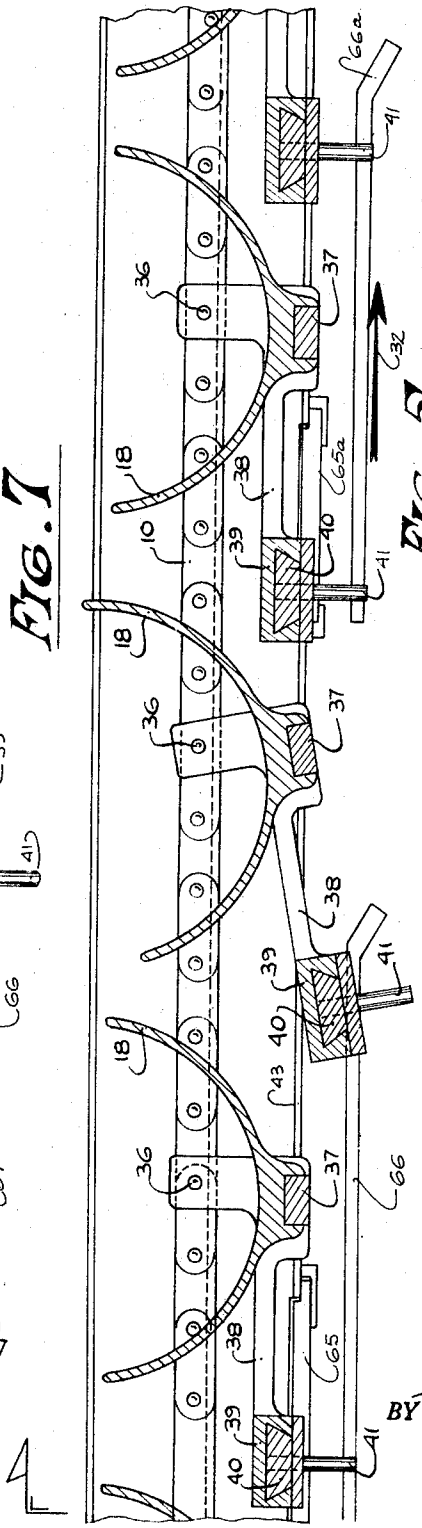


FIG. 5

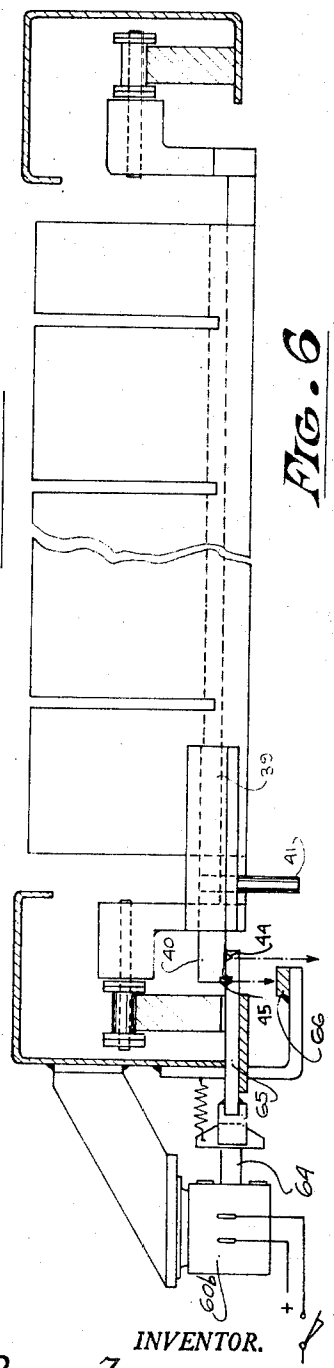


FIG. 6

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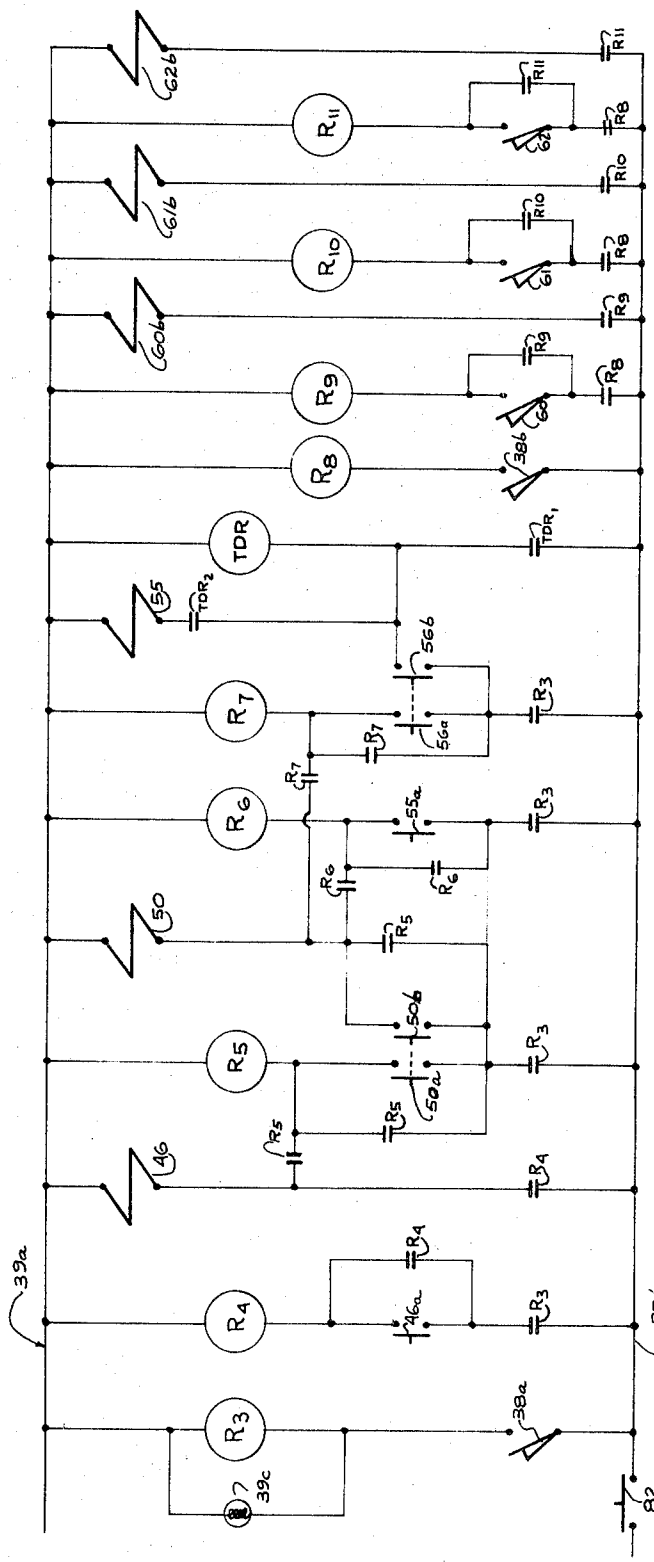


FIG 8

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APPARATUS FOR SORTING AND GRADING CUT FLOWERS

DESCRIPTION OF THE INVENTION

This invention relates to an apparatus for grading cut flowers according to bud quality and according to stem lengths.

An object of this invention is to provide an improved apparatus for grading cut flowers which is efficient in operation and economical to maintain.

Another object of this invention is to provide an improved apparatus for grading cut flowers which is provided with a series of bins for receiving different grades of culls and different grades of quality cut flowers, the quality cut flowers also being separated according to stem lengths.

Still another object of this invention is to provide an improved apparatus for sorting cut flowers, said apparatus employing a plurality of flower-receiving trays which are pivotally supported on a continuous conveyor, each of the trays being provided with a device for holding it upright until it is moved opposite a flower-receiving bin into which the flower carried by the tray is to be dumped.

Other and further objects of this invention will be apparent to those skilled in the art to which it relates from the following specification, claims and drawings.

In accordance with this invention there is provided an efficient apparatus for sorting cut flowers into a plurality of bins depending upon the quality of the flower buds and also depending upon the stem lengths thereof. This apparatus is provided with a plurality of flower-receiving trays which are pivotally supported on a continuous conveyor that is motor driven at a predetermined speed. These trays are moved in their upright position past flower-receiving stations at which cut flowers are placed upon the trays, one on each tray. The trays are then moved by the conveyor past a control station which is provided with a plurality of electrical switches operated by an operator who observes the quality of the cut flower as the trays pass this control station. The operator manipulates selected electrical switches which control the dumping of the flowers from the various trays into bins provided therefor. The culls are separated into three groups, that is the no-good cull, the cull with the too-open bud and the cull with the too-tight bud and these three categories of culls are dumped into separate bins depending upon whether the buds thereof are slightly open or tight and depending upon the lengths of the stems thereof.

Further details of this invention will be set forth in the following specification, claims and drawing, in which, briefly:

FIG. 1 is a schematic plan view of an embodiment of this invention;

FIG. 2 is a schematic side view of the embodiment of this invention shown in FIG. 1;

FIG. 3 is a perspective view partially broken away of the programming apparatus of this invention employed for separating the culls into three categories;

FIG. 4 is a bottom view partially broken away of the mechanism for separating the quality buds into predetermined categories;

FIG. 5 is a sectional view taken through the several bud-carrying trays illustrating the control mechanism for separating the quality buds;

FIG. 6 is a detail view of the track gate shown in FIG. 5 illustrating this gate in position in the track;

FIG. 7 is a detail view similar to FIG. 6 showing the track gate in withdrawn position; and

FIG. 8 is a schematic wiring diagram of the electrical connections employed in an embodiment of this invention.

Referring to the drawing in detail there is shown in FIGS. 1 and 2 an embodiment of this invention employing a conveyor that is provided with endless chains or other flexible conveyor elements 10 and 11. Each of these endless conveyor elements is supported by sprockets 12, 13, 14, 15, 16 and 17 as shown in the side view in FIG. 2 supporting the endless conveyor element 11. Flower-receiving trays 18 are pivotally attached to the conveyor elements 10 and 11 at spaced points and these trays are presented in their upright position as they are moved along the upper left-hand portion of the apparatus designated as section A so that flowers may be placed thereon from the shelves 19. As the trays are moved by the conveyor past the operator's control station 20 the operator presses certain switch buttons at this station, as will be described hereinafter, to control the dumping of the flowers from selected trays into the bins 21 to 24, 26 and 28, inclusive, depending upon certain qualities of the flowers. High-quality flowers are dumped into bins 25, 27 or 29 automatically depending on their stem lengths.

Sprockets 14 are keyed to the shaft 30 which is provided with a drive sprocket 31 so that the conveyor chains 10 and 11 may be driven, in the direction indicated by the arrow 32, by the belt or chain 33 which is driven by the motor 34 through the reduction gearing 35.

The trays 18 are pivotally attached to the conveyor chains 10 and 11 by pivots such as the pins 36 shown in FIGS. 4 and 5. These pivots are attached by members 36*a* to one end of each of the bars 37 which in turn are attached to the bottom portions of the trays 18 as shown in FIG. 4. Each of the bars 37 is provided with an arm 38 at one end thereof and the outer end of each arm 38 is attached to a socket member 39 which is provided with a slidable dovetail member 40 movable in the socket to engage selected rails positioned alongside of the conveyor chain 10. Each of the members 40 is provided with a pin 41 that engages the bar 42 shown in FIG. 3 which is positioned parallel to the upper part of the conveyor chain 10 throughout the loading zone A. Thus, the pins 41 pushes the bars 40 associated with the flower trays 18 toward and upon the track 43 which also extends along the loading zone A, so that the flower trays 18 are held in their upright position oriented to receive the flowers to be placed thereon by the operators from shelves 19.

This apparatus may be employed to sort flowers such as roses into selected bins 21 to 29 depending upon the quality of the rosebuds. For example, the cull roses may be placed into bins 21, 22 and 23 while the quality roses may be placed in bins 24 to 29 depending upon the stem length thereof. The culls are graded according to whether their buds are no good, too open, or too tight, whereas the quality roses are graded according to whether their buds are tight or normal, slightly open.

Suitable rails (not shown) are provided on the bottom part of the structure shown in FIG. 2 for supporting the conveyors 10 and 11 during their travel through the bottom part of this apparatus. One of the purposes of these supports is to maintain the flower trays 18 in their level position as shown in this figure. Two electrical clock switches 38*a* and 38*b* which are connected as shown in the wiring diagram FIG. 8 are supported by the frame of this apparatus in the positions shown in FIG. 2. These clock switches are provided with actuators having rollers which engage the members 37 of the flower trays in sequence. The purpose of these clock switches is to activate the electrical circuit in timed relation with respect to the positions of the flower-carrying trays. Clock switch 38*a* controls the timing of the cull selection and separation and clock switch 38*b* controls the portion of the electrical circuit connected to the separation of the quality buds. Clock switch 38*a* is closed when the flower-carrying trays 18 are aligned with bins 21, 22 and 23 and clock switch 38*b* is closed when flower-carrying trays are aligned with bins 24 to 29, inclusive. Thus, if a bud is to be dumped from a tray into any one of the bins 21, 22 or 23, clock switch 38*a* is closed when there is alignment between the flower-carrying trays and these bins. Likewise, the clock switch 38*b* is closed when there if alignment between the flower-carrying trays and the bins 24 to 29, respectively.

Clock switch 38*a* is connected in series with the relay R_3 between the lines 39*a* and 39*b* which are connected to a suitable source of electric current supply. A manually operable

switch **82** is provided in line **39***b* for connecting this apparatus to such a source of current supply. A lamp **39***c* is connected across relay R_3 and this lamp lights each time this relay is energized by a closing of clock switch **38***a*. Relay R_3 is provided with four sets of contacts which are also designated by the legend R_3. One side of each of these sets of contacts is connected to the line **39***b* and the other sides of these four sets of contacts are connected to the bottom terminals of pushbutton switches **46***a*, **50***a*–**50***b*, **55***a* and **56***a*–**56***b*, respectively. Thus, when the relay R_3 is energized, these pushbutton switches are conditioned for operation. When pushbutton switch **46***a* is manually closed relay R_4 is energized and this relay in turn closes two sets of contacts controlled thereby. One of the contacts of relay R_4 closes a holding circuit around pushbutton **46***a* and the other contact R_4 is connected in series with the solenoid **46**. Thus, closing pushbutton **46***a* energizes the solenoid **46**. Relay R_5 is provided with three sets of contacts which are also designated as R_5 and one of these contacts is connected across the pushbutton switch section **50***a*. Another is connected across the pushbutton switch contacts **50***b* and in series with the solenoid **50**, and the third is connected between the bottom terminals of relay R_5 and solenoid **46**.

Pushbutton switch **50***a* may be designated the no-good cull switch as it is used to dump the no-good culls into bin **21**, as will be described hereinafter. Switch **55***a* which is connected in series with the relay R_6 may be designated as the too-open cull switch and pushbutton switch **56***a*–*56b* which is connected to relay R_7 and to time-delay relay TDR may be designated as the too-tight cull switch and the operation of these switches will be described hereinafter. Switch **55***a* is connected in series with the relay R_6 and when it is closed the winding of this relay is energized so that the two sets of contacts R_6 are also closed and a solenoid **50** is energized. Pushbutton **56***a* is provided with two sets of contacts, one of which is connected in series with the winding of relay R_7 and the other of which is connected in series with the time delay relay TDR and also to the solenoid **55** through the contacts TDR_2 which are controlled by the relay TDR. Thus, when the pushbutton switch **56***a* is closed the relay winding R_7 is energized thereby closing its contacts R_7 and energizing the solenoid **50**. Relay TDR is energized through contacts **56***b* of the pushbutton switch **56***a* and this relay in turn causes a solenoid **55** to be energized.

Clock switch **38***b* is connected in series with the winding of relay R_8 and this relay is provided with three sets of contacts which are also designated as R_8 and which are connected in series with the limit switches **60**, **61** and **62**, respectively. Thus, energizing the relay R_8 conditions these limit switches for operation. Limit switch **60** is connected in series with the winding of relay R_9 and the contacts controlled by this relay are connected in series with the gate solenoid **60***b*. An additional set of contacts R_9 is connected across the limit switch **60**. Similarly, limit switch **61** is connected in series with winding of relay R_{10} and limit switch **62** is connected in series with the winding of relay R_{11}. One set of contacts of relay R_{10} is connected in series with the gate solenoid **61***b* and one set of contacts R_{11} is connected in series with the gate solenoid **62***b*. The other set of contacts R_{10} is connected across limit switch **61** and the other set of contacts R_{11} is connected across limit switch **62**.

If it is assumed that the ray **18***a* shown in FIG. **3** has arrived at the control station **20** and that it is carrying a no-good cull, then the operator at this control station closes pushbutton **50***a* shown in FIG. **8**. Switch **50***a* controls the energization of solenoid **46** and the magnetic field setup by this solenoid attracts the armature **47** thereof. This causes the lever **48** to be turned on its pivot **49** from its position shown in solid lines to that shown in broken outline so that the member **40** is moved from the slot **45** of track **43** to slot **44**. It will be noted that when the tray **18***a* arrived at the control station **20** the member **40** associated with this tray was shifted by the rail **42** from slot **44** to slot **45** of the track **43**. The purpose of this shift will be described hereinafter. However, in the case of the no-good culls the member **40** is shifted from slot **45** to slot **44**. At the same time as solenoid **46** is energized solenoid **50** is energized through contacts **50***b*. Solenoid **50** is provided with an armature **51** which is connected by the rod **52** to gate **53** which is a section of track **43** that is adapted to be displaced therefrom. Thus, as the member **40** is moved along the track **43** it arrives at the gap in this track caused by shifting the gate **53** so that the member **40** drops from groove **44** downward and in doing so misses the track **54** which is supported directly below the groove **45** of track **43**. As a result, the tray **18***a* is caused to dump the rose carried thereby into bin **21** which is the bin for the no-good culls.

Track gate **53** is shifted back into its position in the track **43** by the spring **52***a* after the no-good cull is dropped from the tray **18***a*.

If it is assumed that the rose positioned on the tray **18***a* is a too-open cull and is to be dumped into bin **22** then the operator closes the switch **55***a* to energize the solenoid **50** as previously described and shift the gate **53** out of the track **43**. Since the gate **50** is open the member **40** which is riding in groove **45** will drop down to the lower rail **54** and continue on this rail until it is deflected by the cam lever **57** so that the too-open cull is dumped from the tray into bin **22**. Cam lever **57** is normally in position across the rail **54** and it may be shifted off of rail **54** by energizing solenoid **55**.

Bin **23** is provided for collecting the too-tight culls. In sorting the culls with too-tight buds the operator closes the pushbutton switch **56***a*. Closing this pushbutton energizes solenoid **50** as previously described, and gate **53** is shifted out of the track **43** so that member **40**, supporting the tray **18***a* which is now carrying the cull with the too-tight bud, for example, is caused to drop down to track **54**.

It will be noted that when the pushbutton switch **56***a* is closed the additional contacts **56***b* thereof are also closed as previously described and the time-delay relay TDR is energized. Relay TDR closes its two sets of contacts TDR_1 and TDR_2 so that the solenoid **55** is energized, through the operation of this time-delay relay for a predetermined time interval. Solenoid **55** is provided with an armature **56** which is connected to the cam lever **57**. Energizing this solenoid causes it to attract its armature **56** and shift cam lever **57** on its pivot **58** away from track **54** for a predetermined length of time required for the member **40** to travel on the track **54** and clear the location of this cam lever. Since lever **57** is swung out of the way of track **54** member **40** continues down this track to the end thereof which is opposite bin **23**. After lapse of the predetermined time delay the lever **57** is swung back over track **54** by the spring **57***a*. Member **40** after leaving track **54** allows the tray **18***a* to dump the cull carried thereby into bin **23**.

The roses of desired quality are collected in bins **24**, **25**, **26**, **27**, **28** and **29**. High-quality roses are placed into bins **25**, **27** and **29**, depending upon the lengths of the stems thereof. The rosebuds with the longer stems are placed in bin **25**; those with medium length stems are placed in bin **27**, and those with the short stems are placed in bin **29**. The stem length selections are made by limit switches **60**, **61** and **62** which are provided with actuating arms **60***a*, *61a* and **62***a*, respectively. It will be noted that the trays **18** are provided with slots as shown in FIG. **1** and the limit switch actuators are adapted to pass through different ones of these slots as the trays are moved by the conveyor. Thus, the rose with the long stem extends practically over the length of the tray and reaches all the way to the limit switch actuator **60***a*. The rose with the medium length stem will bridge the slot through which the limit switch actuator **61***a* is adapted to pass and the short stem rose will bridge the slot through which the limit switch actuator **62***a* is adapted to pass. The roses with these different stem lengths will deflect these different limit switch actuators and thus control the respective switches associated therewith.

In sorting quality roses the procedure is as follows:

It is assumed that tray **18***b* shown in FIG. **4** is carrying a high-quality rose with a tight bud and a long stem. This tray

18*b* is moved by the conveyor with its supporting member 40 on the track 43 in groove 45. The long stem rose carried by this tray actuates the member 60*a* of limit switch 60. Switch 60 is connected to control the energization of solenoid 60*b*. This solenoid is provided with an armature 64 which is connected to the track gate 65, as shown in FIGS. 6 and 7, and when this solenoid is energized it functions to withdraw the gate 60*b* from the track 43, thereby leaving a gap in the track. When the member 40 of tray 18*b* is moved by the conveyor to this gap the member 40 is dropped to the lower track 66 as shown in FIG. 7 and rides along on this track to the end thereof which is opposite the bin 25. When the member 40 of tray 18*b* comes to the end of the track 66 and the tray is caused to dump the rose carried thereby into the bin 25.

If the tray 18*b* had been carrying a second-quality rose then the member 40 associated with this tray would have been shifted from track groove 45 to track groove 44. To accomplish this the operator closes the switch 46*a* to energize solenoid 46 and shift lever 48 (FIG. 3) over groove 45 of track 43 thereby causing the member 40 of tray 18*b* to move into groove 44 of the track 43. Thus, when the tray 18*b* carrying the rose with the normal slightly open bud is moved by the conveyor so that the member 40 of this tray comes to the gap in the track 43 caused by the shifting of the gate 65, member 40 is caused to drop through this gap. In this case, member 40 is clear of the lower track 66 which is directly under groove 45 as shown in FIG. 6 so that the rose in tray 18*b* is dumped into bin 24 which is provided for the second-quality roses with long stems. Six bins 24 to 29, inclusive, are provided for the quality roses as previously mentioned and three gates such as gate 65 are provided in track 43. These gates are controlled by solenoids 60*b*, 61*b* and 62*b*, respectively, and they are opposite bins 24, 26 and 28 so that the second-quality roses are dumped into these bins if they are long stem, medium stem or short stem, respectively. Also three sections of lower track such as track 66 shown in FIGS. 5, 6 and 7 are provided opposite bins 24–25, 26–27 and 28–29, respectively, so that the first-quality roses may be dumped into bins 25, 27 or 29 if they are long stem, medium stem or short stem, respectively.

While I have shown and described a certain preferred embodiment of the invention, it will be understood that the invention is capable of variation and modification from the form shown so that the scope thereof should be limited only by the proper scope of the claims appended hereto.

What I claim is:

1. In apparatus for sorting cut flowers such as roses according to the quality and stem lengths, the combination comprising a conveyor having a plurality of spaced trays attached thereto, means supporting said trays upright for receiving the cut flowers, sprocket means driving said conveyor, said supporting means including track means positioned adjacent to a predetermined part of said conveyor, flower-receiving bins also positioned adjacent said predetermined part of said conveyor, different ones of said bins receiving flowers of different qualities and stem lengths, manually controlled means releasing said supporting means to dump cull cut flowers into selected ones of said bins and means actuated by the quality cut flowers of different stem lengths for dumping such cut flowers into different selected ones of said bins.

2. In apparatus for sorting cut flowers such as roses according to the quality and stem lengths, the combination as set forth in claim 1, further characterized in that said tray-supporting means includes means pivotally attaching said trays to said conveyor.

3. In apparatus for sorting cut flowers such as roses according to the quality and stem lengths, the combination as set forth in claim 2, further characterized in that said tray-supporting means includes a lever attached to each tray, said lever having means slidably engaging said track means.

4. In apparatus for sorting cut flowers such as roses according to the quality and stem lengths, the combinations as set forth in claim 3, further characterized in that said track means comprises an upper track and a lower track and means shifting said lever from said upper track to dump a predetermined type of cull cut flower into a selected bin for culls, said means shifting said lever from said upper track to said lower track to dump another predetermined type of cull cut flower into another selected bin for culls.

5. In apparatus for sorting cut flowers such as roses according to the quality and stem lengths, the combination as set forth in claim 4, further characterized in that said upper track is provided with a gate that is adapted to be shifted out of said upper track to provide a gap therein through which said lever is shifted.

6. In apparatus for sorting cut flowers such as roses according to the quality and stem lengths, the combination as set forth in claim 5, further comprising a solenoid having an armature coupled to said gate and means energizing said solenoid when said gate is to be shifted out of said

7. In apparatus for sorting cut flowers such as roses according to the quality and stem lengths, the combination as set forth in claim 3, further characterized in that said track means includes an upper track and a lower track positioned adjacent to said different selected bins, said different selected bins for each stem length comprising at least two bins for each stem length, gate means in said upper track, means opening said gate means to permit said lever to drop through said upper track and dump the cut flower into one of said two bins.

8. In apparatus for sorting cut flowers such as roses according to the quality and stem lengths, the combination as set forth in claim 7, further characterized in that said upper track means is provided with two grooves that are substantially parallel, means selecting which of said grooves is engaged by said lever, both of said grooves being interrupted by said gate means, one of said grooves being above said lower track and the other of said grooves being laterally displaced to one side of said lower track so that when said lever is shifted from said one groove it is dropped to said lower track and the cut flower is dumped into one of said two bins and when said lever is shifted from said other of said grooves said lever clears said lower track and the cut flower is dumped into the other of said two bins.

9. In apparatus for sorting cut flowers such as roses according to the quality and stem lengths, the combination as set forth in claim 1, further comprising a plurality of limit switches, said limit switches being positioned so that different ones thereof are actuated by cut flowers of different stem lengths and means activated when different ones of said limit switches are closed to dump the cut flowers of different stem lengths into different selected bins.

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