Dec. 12, 1967 M. F. RING 3,357,537

AUTOMATIC CONTAINER SEPARATOR AND METHOD OF SEPARATING CONTAINERS

Filed Aug. 25, 1966 3 Sheets-Sheet 1

Fig. 1.

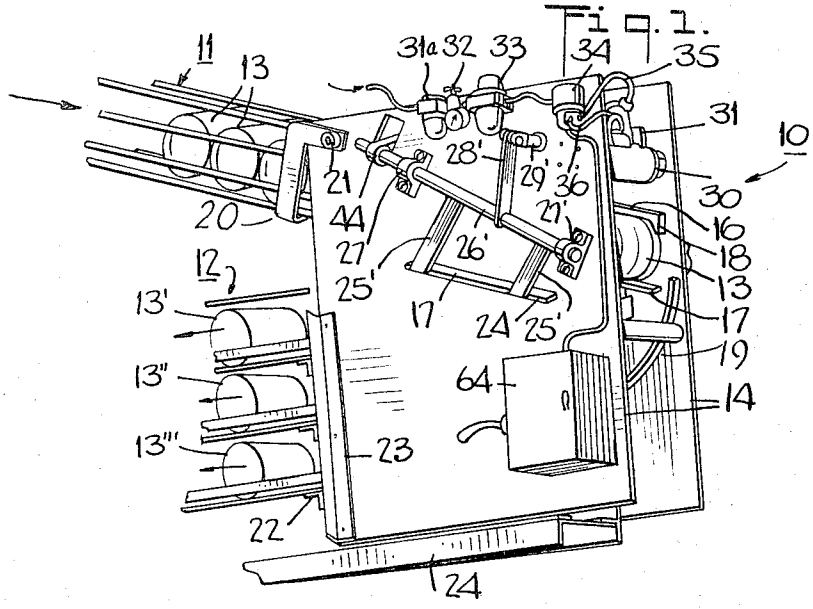
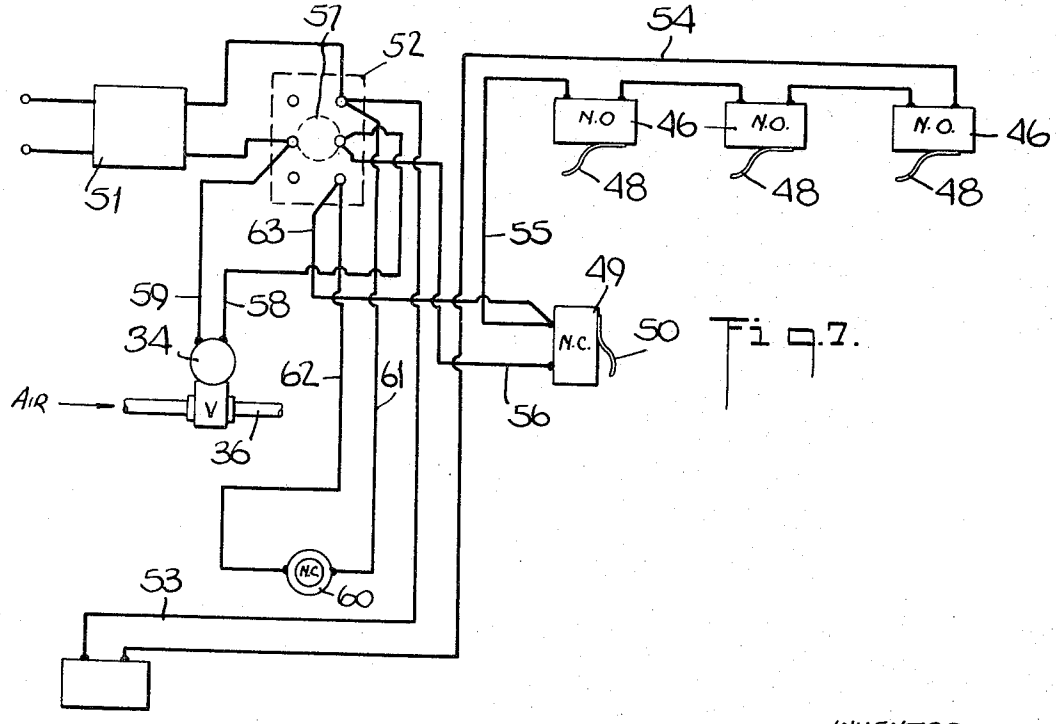


Fig. 2.



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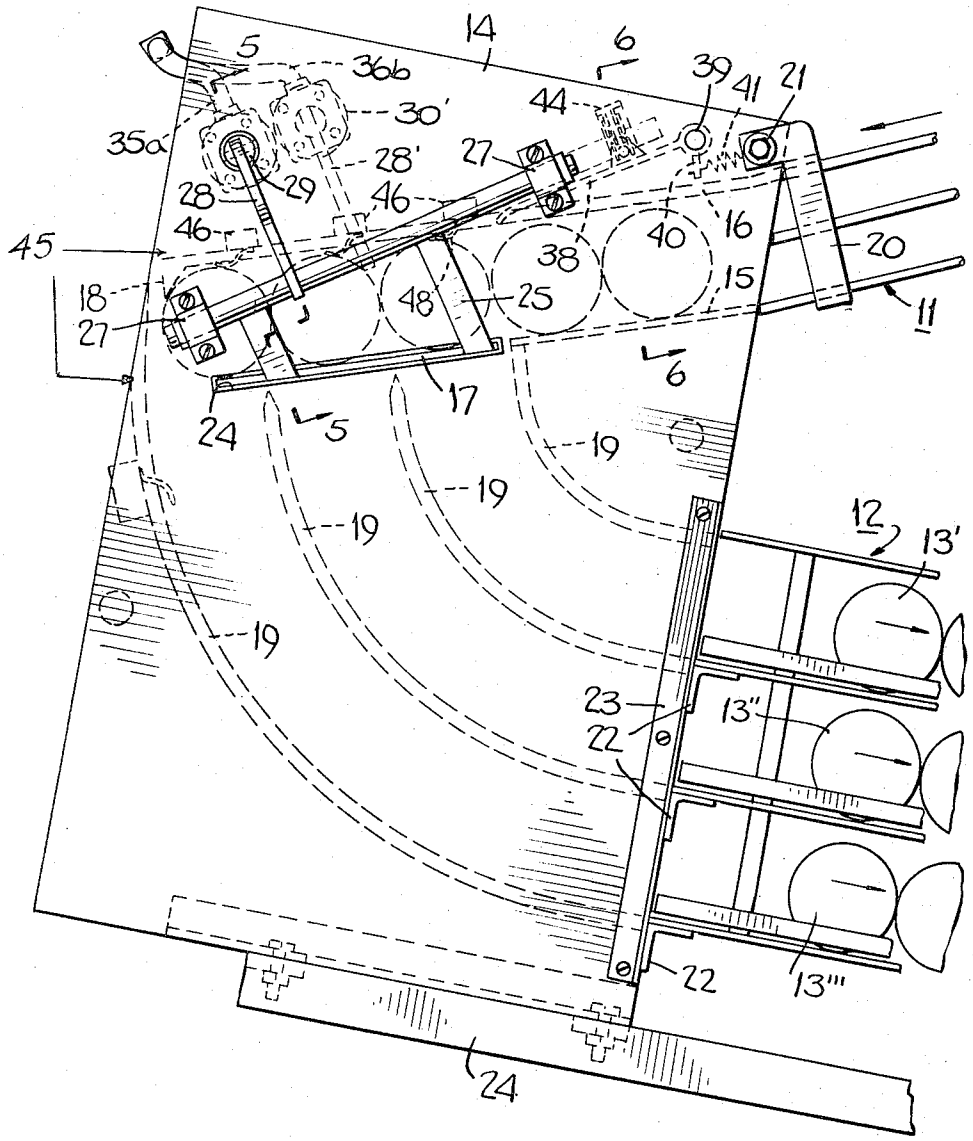
BY Kenyon & Kenyon
ATTORNEYS

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AUTOMATIC CONTAINER SEPARATOR AND METHOD OF SEPARATING CONTAINERS

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Fig. 2.



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AUTOMATIC CONTAINER SEPARATOR AND METHOD OF SEPARATING CONTAINERS

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Fig. 3.

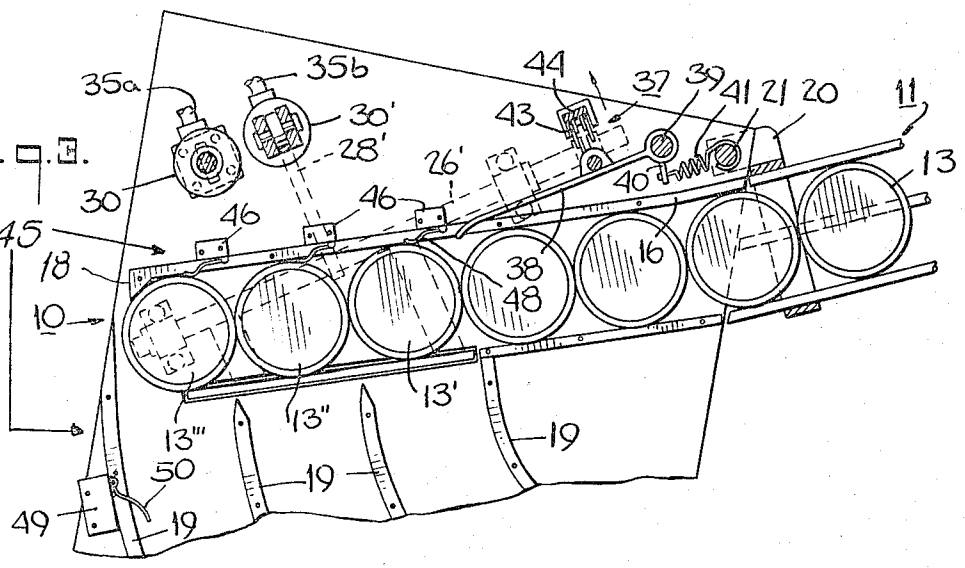


Fig. 4.

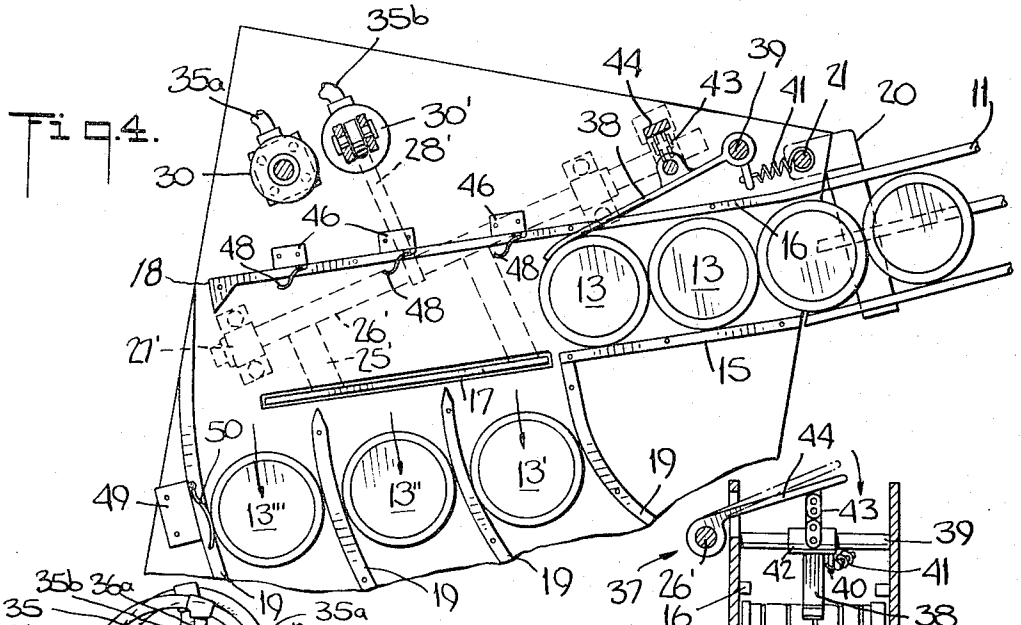


Fig. 5.

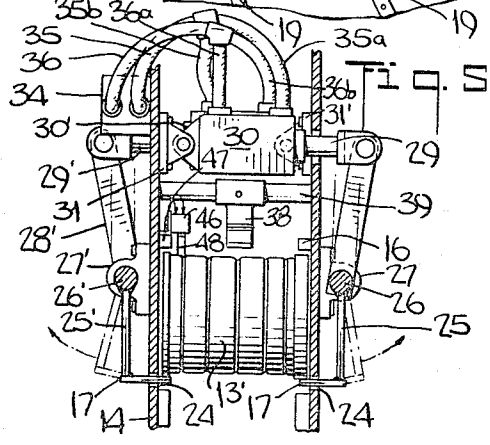


Fig. 6.

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United States Patent Office 3,357,537
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3,357,537

AUTOMATIC CONTAINER SEPARATOR AND METHOD OF SEPARATING CONTAINERS

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Filed Aug. 25, 1966, Ser. No. 575,118
13 Claims. (Cl. 198—31)

ABSTRACT OF THE DISCLOSURE

The container separator guides a predetermined number of containers from a row onto retractable rails, detects the presence of each container of the number in a respective position, and retracts the rails to dispense the number of containers simultaneously under gravity. Maintenance of the correct number of containers in successive rows is assured for proper packaging.

This invention relates to an automatic container separator. More particularly, this invention relates to an automatic container separator for separating a single row of delivered containers into a plurality of aligned rows of dispensed containers. Still more particularly, this invention relates to an automatic container separator for separating a single row of containers into a plurality of aligned rows in preparation for case packing.

Generally, in packaging content filled containers, the containers are automatically conveyed in a single continuous row into a separating device for segregating successive containers into different runways. The runways are aligned with each other to guide the segregated containers in aligned rows into case packing units wherein the aligned rows of containers are placed in suitable cases for shipment.

Heretofore, container separating devices have been used which direct each container of a delivered row of containers into a different runway from the next successive container. In some instances, these separating devices have utilized a rotary wheel provided with circumferential container receiving pockets and releasable container locks in each pocket which sequentially lock a received container in place and release the container after a predetermined rotation of the wheel for depositing successive containers into differently spaced runways. In other instances, the separating devices have utilized a pair of tangentially disposed rotors in the path of the containers which have different sized container receiving peripheral pockets. The rotors have coacted together to segregate successive containers into disparate runways having particularly shaped entrances.

However, the heretofore used separating devices have not been generally successful in that the containers have not always been delivered into the proper runways. That is, the topmost runways have had more containers than the runways below, and in some instances, the lowermost runway has been void of any containers. This has caused an uneven distribution of the containers per row to be introduced into the case packing units and thereby has caused malfunctioning of the case packing units and coincident delays in output. Further, the separating devices have had frequent malfunctions in dispensing the containers into the runways which have caused jams and production down time. Additionally, especially where spring tensioned mechanisms have been used, the general method of operating the separating devices has made adjustments very difficult.

Generally, the invention provides an automatic container separator which separates a single row of delivered containers into a plurality of runways by intermittently segregating a predetermined number of containers from

the delivered row of containers and depositing the segregated containers into the runways simultaneously. The automatic containers separator is positioned in the path of a row of moving containers at the entrance to a conveyor ramp having a plurality of runways. The separator includes a housing having a guide means for positioning a row of containers in the separator and a pair of oppositely mounted retractable rails mounted over the runways for receiving the containers, a stop for abutting the foremost container, means for detecting the presence of a predetermined number of containers on the retractable rails and means for actuating the retractable rails to retract and close. In addition, the separator has a means positioned adjacent the runways for determining the passage of a predetermined number of containers from the retractable rails in order to reset the rail actuating means and container detecting means.

When the means for detecting the presenc of a predetermined number of containers on the retractable rails over the runways is actuated, the rails are retracted to allow the containers to fall simultaneously under gravity into the respective runways. Upon passing the means adjacent the runways for determining the passage of the segregated containers, the falling containers actuate the means to close the rails and to reset the means for detecting the presence of containers thereon.

In order to prevent the movement of succeeding containers into the separator, a stop arm is provided in the path of the single row of containers which is actuated simultaneously with the retractable rails.

The invention provides a method of separating a single row of containers into a plurality of aligned rows which includes the steps of moving the row of containers in a downwardly sloped direction, arresting movement of the containers, segregating a predetermined number of the foremost containers and dispensing the segregated containers simultaneously under gravity in aligned rows. The several steps are repeated in sequential manner so that the aligned rows of dispensed containers contain an even distribution of containers.

Accordingly, it is an object of the invention to provide an automatic container separator and method of separating a row of containers which segregates a plurality of containers from the row and delivers the segregated containers simultaneously into a plurality of runways for case packaging.

It is another object of this invention to provide an automatic container separator and method of separating a single row of containers which intermittently segregates a predetermined number of containers from the row and delivers the segregated containers simultaneously into a plurality of runways for case packaging.

It is another object of the invention to provide an automatic container separator which operates in response to the presence of a predetermined number of containers therein.

It is another object of the invention to provide an automatic container separator which is cycled by the passage of a predetermined number of segregated containers therethrough.

It is another object of the invention to provide an automatic container separator which operates in an efficient consistent accurate manner to intermittently deliver a plurality of containers into respective runways for a case packing unit.

It is another object of the invention to provide an automatic container separator which is easily adjusted and repaired.

It is another object of the invention to provide an automatic container separator with a sensing means for detecting any interruption in the delivery of containers.

It is another object of the invention to provide an automatic container separator which avoids jamming of the containers with a resultant efficiency in running time.

These and other objects and advantages of the invention will become more apparent from the following detailed description and appended claims taken in conjunction with the accompanying drawings in which:

FIG. 1 illustrates a perspective view of an automatic container separator of the invention positioned between a container supply ramp and a case packer ramp;

FIG. 2 illustrates a side elevational view of the automatic container separator of FIG. 1;

FIG. 3 illustrates a fragmentary side view of the separator in an unreleased condition;

FIG. 4 illustrates a fragmentary side view similar to FIG. 3 with the separator in a released condition;

FIG. 5 illustrates a view taken on line 5—5 of FIG. 2;

FIG. 6 illustrates a view taken on line 6—6 of FIG. 2; and

FIG. 7 illustrates a schematic wiring diagram of an electrical circuit employed in the invention.

Referring to FIGS. 1 and 2, an automatic container separator **10** is positioned between a filled container supply ramp **11** and a plurality of case packer runways **12** to separate a single row of containers **13** conveyed from the supply ramp **11** into a plurality of aligned rows of dispersed containers **13'**, **13''**, **13'''** in the case packer runways **12**. The containers **13** are initially fed into the supply ramp **11** in a continuously moving manner and are generally of a cylindrical shape. The supply ramp **11** is sloped downwardly so that the containers **13** roll substantially under gravity into the container separator **10**. Similarly, the case packer runways **12** are sloped downwardly so that the containers **13'**, **13''**, **13'''** roll under gravity.

The automatic container separator **10** includes a pair of spaced opposed side walls **14** positioned astride the path of the single row of containers **13** contiguous to the respective ends of the ramps **11** and runways **12**. The side walls **14** are spaced by suitable spacer rods and are formed with guide means for positioning the containers **13** in the separator **10**. That is, each side wall **14** has a fixed lower rail **15** and a fixed upper rail **16** directed in a sloped downward direction in alignment with the supply ramp **11** for guiding the containers **13** into the separator **10** and maintaining the guided containers against upward movement relative to the rails **15**, **16**. In addition, each side wall **14** has a retractable lower rail **17** in alignment with the fixed lower rail **15** below a forward portion of the upper rail **16**. The forward end of the upper rail **16** is provided with a stop lug **18** which projects into the separator for arresting movement of the containers **13** down the rails **15**, **17**. The respective rails **15**, **16**, **17** of each side wall **14** are in horizontal alignment with each other so as to define a continuous passage with the supply ramp **11** for the single row of containers **13**.

The lower rails **15**, **17** are sized relative to each other so that a predetermined number of the containers **13** within the separator **10**, for example, three, are supported on the retractable rails **17**.

Further, the automatic container separator **10** includes a plurality of arcuate rails **19** mounted on opposed side walls **14** below the retractable rails **17** to form a plurality of arcuate chutes conforming to the number of containers positionable on the retractable rails **17**. Each pair of horizontally opposed arcuate rails **19** is positioned relative to the retractable rails **17** and the runways **12** of the case packer to define a continuous arcuate passageway for a container **13** in passing from the separator **10** into the runways **12**.

The container separator **10** is secured to the supply ramp **11** by a bracket **20** which passes under the supply ramp **11** and which is mounted on a rod **21** passing through and secured to the side walls **14**. Also, the container separator **10** is secured to the case packer runways **12** through

brackets **22** which are disposed across the undersides of the runways **12** and secured to angle irons **23** on the exterior surfaces of the side walls **14**. Additionally, a lower adjustable framework **24** which is a part of a total conveyor machine structure supports the container separator **10**.

Referring to FIGS. 1, 2 and 5, each retractable rail **17** is sized to project into the space between the side walls **14** a distance which is only sufficient to adequately support the ends of the containers **13** without interfering with the downward movement of the containers upon retraction of the rails **17**. Since the retractable rails **17** are actuated by identical assemblies only one of such assemblies will be described below in detail while the other assembly will be designated by primed reference characters in the drawings. Each retractable rail **17** passes through a slot **24** in the respective side wall **14** and is secured outside of the side wall **14** to the ends of a pair of spaced rods **25**, as by welding. The rods **25** are each fixed to a shaft **26** which is rotatably mounted within a pair of spaced bearing blocks **27**, **27'**. The shaft **26** is rotated within the bearing blocks **27**, **27'** through an arm **28** which is fixedly secured at one end to the shaft **26** intermediately of the bearing blocks and pivotally secured at the other end to a piston rod **29** which passes through an aperture in the side wall **14** into an air cylinder **30**. The air cylinder **30** is pivotally mounted on a pin support **31** secured to the side wall **14** opposite the side wall through which the piston rod **29** passes.

Referring to FIGS. 1 and 5, the air cylinders **30'** for the two retractable rails **17** are operatively connected to a common air supply source (not shown) for reciprocal movement of the respective piston rods **29**. The air supply source delivers air in a conventional manner through an oiler **31***a*, a pressure regulator **32**, and air filter **33** and a solenoid valve **34**. The solenoid valve **34** (FIG. 5) is connected by a single air feed tube **35** having branches **35***a* and **35***b* to the respective forward ends of the cylinders **30**, **30'** for passing air into the cylinders **30**, **30'** to move the piston arms **29**, **29'** into the cylinders. Also, the solenoid valve **34** is connected by a single air feed tube **36** having branches **36***a* and **36***b* to the respective rear ends of the cylinders **30**, **30'** for passing air thereinto to move the piston arms **29**, **29'** out of the cylinders.

Referring to FIGS. 1, 2 and 6, a container stop assembly **37** is mounted in the container separator **10** to prevent movement of the single row of containers from the fixed lower rails **15** towards the retractable rails **17** until the retractable rails **17** are within the confines of the side walls **14** and positioned to support containers thereon. The container stop assembly **37** includes a stop arm **38** pivotally mounted on a shaft **39** mounted between the side walls **14**. The stop arm **38** is formed with a depending lug **40** at the shaft **39** which is engaged by a tension spring **41** mounted on the bracket rod **21** to constantly urge the stop arm in a downward direction into the path of the single row of containers **13**. The stop arm **38** is formed with a bracket **42** intermediately on the top surface which secures one end of a flexible connection, such as a chain **43**, therein. The opposite end of the chain is secured to a lever arm **44** transverse to the stop arm **38** which passes through one of the side walls **14** and which is fixedly mounted to shaft **26'**. The connection of the lever arm **44** to the shaft **26'** is such that the movement of the lever arm **44** is synchronized to the movement of the retractable rails so that upon rotation of the shaft **26'** in a counterclockwise direction as viewed in FIG. 6, the stop arm **38** is pivoted against the force of the spring **41** out of the plane of the single row of containers **13** and the retractable rails **17** are pivoted into the confines of the side walls **14**. This permits passage of the single row of containers onto the retractable rails **17**. Conversely, upon rotation of the shaft **26'** in a clockwise direction, the retractable rails **17** are moved out of the side walls **14** and the stop arm is moved under the force of the spring **41** into the plane

of the single row of containers to prevent further movement onto the retractable rails 17.

Referring to FIGS. 2 and 3, a container sensing assembly 45 is positioned in the container separator 10 to detect the presence of a predetermined number of segregated containers on the retractable rails 17 and to determine the passage of the segregated containers through the chutes formed by the arcuate rails 19. The container sensing assembly 45 includes a purality of microswitches 46 corresponding to the number of containers to be positioned on the retractable steps 17, for example, three, which are secured along one of the upper rails 16 (FIG. 5) as by brackets 47. Each microswitch 46 has a finger 48 which projects into the path of the containers 13. The fingers 48 are each arranged to contact a container positioned over a chute defined by the rails 19 and thus actuate the respective microswitches upon the presence of a container. Additionally, the container sensing assembly 45 includes a microswitch 49 positioned adjacent one of the outer arcuate rails 19 having a finger 50 which project into the path formed by that rail and the next arcuate rail 19. The finger 50 is sized to contact one of the segregated containers to activate the microswitch 49 upon passage of the segragated containers through the chutes formed by the arcuate rails 19.

Referring to FIGS. 3 and 4, in operation, a single row of containers 13 are fed at a substantially constant rate into and down the supply ramp 11. The containers pass into the aligned passage of the automatic container separator 10 formed by the rails 15, 16, 17. With the retractable rails in a closed position (FIG. 3), the foremost container 13' on the retractable rails 17 comes into abutting contact with the stop lugs 18 over the chute between the first pair of arcuate rails 19 and at the same time contacts the foremost microswitch finger 48 to actuate the microswitch. Subsequently, the succeeding containers on the retractable rails 17 come into mutual contact with each other over the chutes between the remaining arcuate rails 19 while simultaneously actuating the remaining microswitches 46 through contact with the finger 48. After three containers have come onto the retractable rails 17 and have actuated the three microswitches 46 simultaneously, a circuit is completed that actuates the solenoid valve 34 (FIG. 1) to introduce air through the air feed tube 35 into the air cylinders 30, 30' so as to move the piston arms 29, 29' into the cylinders. Upon movement of the piston arms 29, 29' (FIG. 5), the shafts 26, 26' rotate respectively to retract the retractable rails 17 from within the side walls 14 and to simultaneously drop the stop arm 38 into the path of the containers between the third container 13''' and the next succeeding container to segregate the forward three containers.

The foremost three containers 13', 13'', 13''', because the lower support rails 17 are removed, drop into the chutes between the arcuate rails 19 under gravity. Since the stop arm 38 is in abutment with the foremost container of the containers remaining in the single row, there is no further movement of the containers from the lower fixed rails 15 towards the retractable rails 17.

As the segregated containers 13', 13'', 13''' continue through the chutes formed by the rails 19, one of the containers triggers the microswitch finger 50 to actuate the microswitch 48. This completes a circuit which recycles the microswitches 47 and reverses the solenoid valve 34 so that air is introduced through the air feed tube 36 into the air cylinders 30, 30' so as to move the piston arms 29, 29' out of the cylinders. The shafts 26, 26' are thus rotated to return the retractable rails 17 inside the side walls and to simultaneously lift the stop arm 38 from the path of the single row of containers. The next succeeding three containers roll into the retractable rails 17 to repeat the above operation.

When the segregated containers 13', 13'', 13''' reach the end of the arcuate rail chutes they are dispensed into the respective separated runways 12. The segregated containers then proceed to roll down the runways 12 in substantial alignment with each other to a conventional case packer unit (not shown).

Should one or more containers fail to be positioned on the retractable rails 17 over the chutes formed by the arcuate rails 19, the microswitches 46 at those stations will not be actuated. Thus, the circuit for actuating the air cylinders to retract the rails 17 will not be completed. Accordingly, none of the containers will be allowed to drop through the arcuate rail chutes to the runways 12 of the case packer. The automatic container separator 10 operates to segregate and dispense the containers 13 only when a full complement of containers are positioned on the retractable rails 17 over the arcuate rail chutes.

Referring to FIGS. 1 and 7, an electrical circuit for coordinating the operation of the sensing assembly 45 and solenoid valve 34 includes a transformer 51 which is operatively connected to a relay 52 to transform a relatively high voltage e.g. 110 volts, to a relatively low voltage, e.g. 24 volts. The relay 52 is operatively connected through lines 53, 54 to the microswitches 46 which are normally open. The microswitches 46 are connected in series through a line 55 to the microswitches 49 which is normally closed. The microswitch 49 is connected through a line 56 to a coil 57 of the relay 52. The coil 57 is operatively connected to the solenoid valve 34 through lines 58, 59. Thus, when the microswitches close, the circuit to the solenoid valve 34 is closed to direct air into the air cylinders 30 to retract the retractable rails 17. Upon opening of the microswitch 49, the circuit to the solenoid valve 34 is opened to redirect air into the air cylinders 30' to close the rails 17 and open the microswitches 46.

In order to provide for manual operation of the container separator 10, a push button release 60 is interposed in the circuit. The push button release 60 which is normally open is connected to the relay through lines 61, 62 and to the limit switch 49 through a line 63 from the relay 52. Upon closing of the button 60, a circuit is completed to the solenoid valve 34 to direct air into the air cylinders 30 to retract the retractable rails 17.

The transformer 51 and relay 52 as well as other suitable electrical components are housed within a box 64 mounted on one of the side walls 14 of the separator 10 (FIG. 1).

It is noted that the container separator may be readily modified to dispense any suitable number of rows of dispensed containers by adding or removing microswitches 46 and rails 19 with concurrent changes in the proportions of the separator components especially the retractable rails.

It is further noted that the containers while described above as being filled and of a cylindrical shape may also be unfilled and be of any size or volume as used in the conventional canning industry. Further, the containers may be made of glass, plastic, metal or any conventional canning material.

It is also noted that while the segregated containers are dispensed in intermittent fashion from the container separator the operation of the container separator is rapid and continuous so that delivery of the constant supply of the single row of containers is not significantly disrupted.

The invention provides a simple, efficient container separator which automatically segregates a single row of moving containers into a plurality of aligned rows of containers and dispenses the segregated containers simultaneously into aligned case packer ramps. The container separator operates only upon the presence of a predetermined number of segregated containers over the respective ramps so that the containers are dispensed uniformly and evenly into the respective ramps of the case packer unit. Additionally, the container separator is constructed to be capable of rapid adjustments and repairs.

The container separator automatically segregates and dispenses containers at a high output rate with a substantial reduction in production down time.

Having thus described the invention, it is not intended that it be so limited as changes may be readily made therein without departing from the scope of the invention. Accordingly, it is intended that the subject matter described above and shown in the drawings be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A container separator for separating a single row of containers into a plurality of aligned rows of containers comprising

guide means for positioning a plurality of containers of a single row of containers therein, said guide means including a pair of oppositely disposed retractable rails for supporting the ends of a predetermined number of said plurality of containers thereon,

means for detecting the presence of a predetermined number of containers on said retractable rails, and

means operatively connected to said detecting means for actuating said retractable rails in response to the detection of the presence of said predetermined number of containers on said rail means whereby said retractable rail means is retracted to dispense said predetermined number of containers simultaneously under gravity from the container separator.

2. A container separator as set forth in claim 1 wherein said guide means further includes a pair of fixed upper rails for preventing upward movement of said plurality of containers, each said upper rail having a stop lug projecting into the path of the containers for arresting movement of the containers through said guide means.

3. A container separator as set forth in claim 1 wherein said means for actuating said retractable rail means includes a pair of assemblies for actuating said rails, each assembly having a rotatably mounted shaft, means for rotating said shaft in response to the detection of the presence of said predetermined number of containers on said rail means and a pair of rods securing one of said rails to said shaft.

4. A container separator as set forth in claim 3 wherein said means for rotating said shaft includes an air cylinder and a piston arm in said air cylinder connected to said shaft, each shaft of said assemblies being connected to a common solenoid valve having means for reciprocating each said piston arm in each said air cylinder.

5. A container separator as set forth in claim 3 which further comprises a container stop assembly operatively connected to said shaft of one of said assemblies for preventing movement of the remaining containers of said plurality of containers towards said retractable rails whereby movement of said remaining containers is prevented during movement of said predetermined number of containers past said retractable rails.

6. A container separator as set forth in claim 1 which further includes a plurality of arcuate chutes positioned below said retractable rails for receiving said predetermined number of containers therein, each of said chutes being disposed in the path of a respective one of said predetermined number of containers whereby a plurality of aligned rows of containers are dispensed from the container separator.

7. A container separator as set forth in claim 1 which further comprises a container stop assembly for preventing movement of the single row of containers towards said retractable rails whereby movement of the single rows of containers is prevented during movement of said predetermined number of containers past said retractable rails.

8. A container separator as set forth in claim 7 wherein said container stop assembly is in synchronism with said means for actuating said retractable rails.

9. A container separator for separating a row of containers into a plurality of aligned rows of containers comprising

guide means for positioning a plurality of containers of a single row of containers therein, said guide means including a retractable rail means for supporting a predetermined number of said plurality of containers thereon,

means for detecting the presence of a predetermined number of containers on said retractable rail means,

actuating means operatively connected to said detecting means for actuating said retractable rail means in response to the detection of the presence of said predetermined number of containers on said rail means whereby said retractable rail means is retracted to dispense said predetermined number of containers simultaneously under gravity from the container separator, and

switch means disposed below said retractable rail means in spaced relation to said actuating means, said switch means being operatively connected to said actuating means for determining the passage of said predetermined number of containers past said retractable rail means, said switch means activating said actuating means to close said retractable rail means in response to the passage of said predetermined number of containers therefrom whereby a successive predetermined number of containers can be supported on said retractable rail means.

10. A container separator as set forth in claim 9 wherein said means for detecting the presence and said means for determining the passage of said predetermined number of containers are microswitches, each of said microswitches having a finger projecting into the path of a container.

11. A method of separating a single row of containers into a plurality of aligned rows of containers comprising the steps of

moving the row of containers in a downwardly sloped direction, arresting movement of the foremost containers in the row of containers, segregating a predetermined number of foremost containers from the single row of containers, each of said segregated containers having an axis disposed in a first plane, and

dispensing the segregated containers simultaneously under gravity from the remaining containers in the row of containers in aligned rows while maintaining the axis of each dispensed container parallel to said first plane.

12. A method as set forth in claim 11 wherein said steps of arresting, segregating and dispensing are repeated in sequential manner whereby the aligned rows of dispensed containers contain an even distribution of containers.

13. A method as set forth in claim 11 which further includes the step of preventing movement of the remaining containers of the single row of containers during dispensing of the segregated containers.

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