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[54] CARTON FILLING APPARATUS
10 Claims, 4 Drawing Figs.

[52] U.S. Cl. 53/159, 53/244, 53/249
[51] Int. Cl. B65b 35/32
[50] Field of Search 53/78, 147, 159, 235, 244, 249, 245

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ABSTRACT: An apparatus is disclosed for the end loading of filled cans of products into a carton by gravity. It is especially adapted for use with large diameter cans. The cans roll down an inclined track in which there are two spaced movable barriers which function to divide the progression of cans into case lots and restrain each successive lot in loading position. A carton is placed upright in a carton holder which is then tilted backward so that the open top of the carton is underneath the lower end of the trackway. With the release of the first restraining barrier, the case lot falls into the carton while the second barrier holds back the procession of cans behind it. The tilt of the carton is such that the cans will arrange themselves in layers. The holder returns the filled carton to upright position and the carton rolls from the holder onto a receiving conveyor. Upon return of the filled carton to upright position, the first barrier is raised while the second barrier is released until another case lot has rolled onto the lower terminal portion of the track, being blocked on the terminal portion by the first barrier. Foot pedals and pneumatic operators sequence the operations.

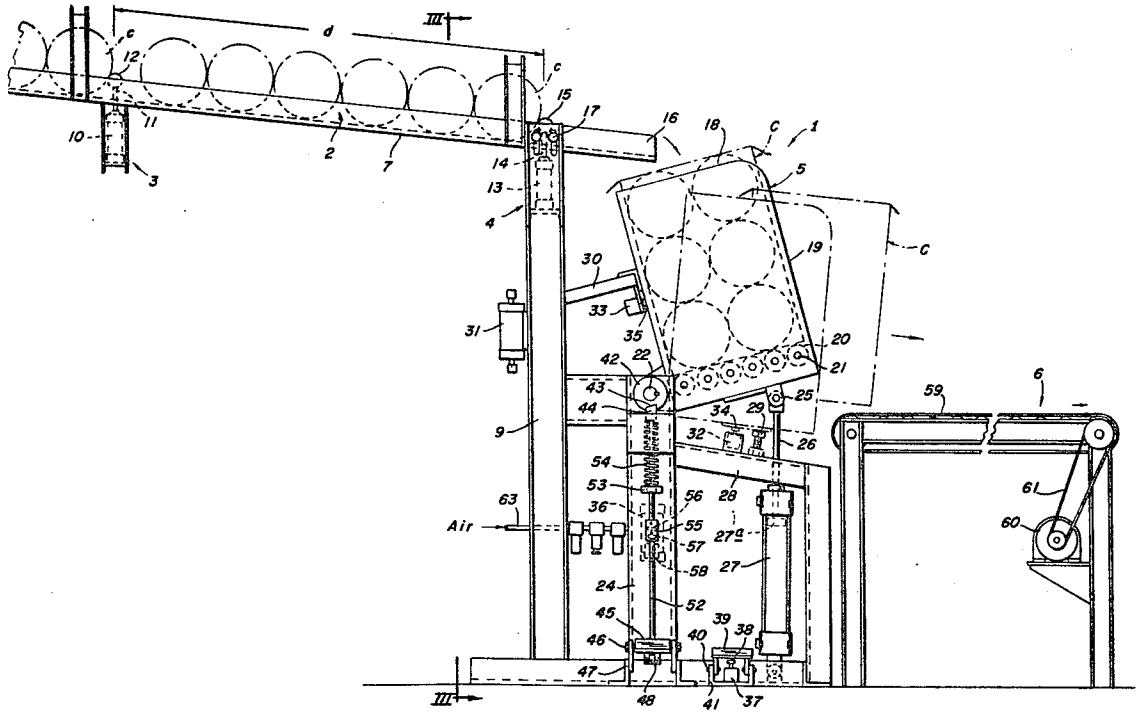
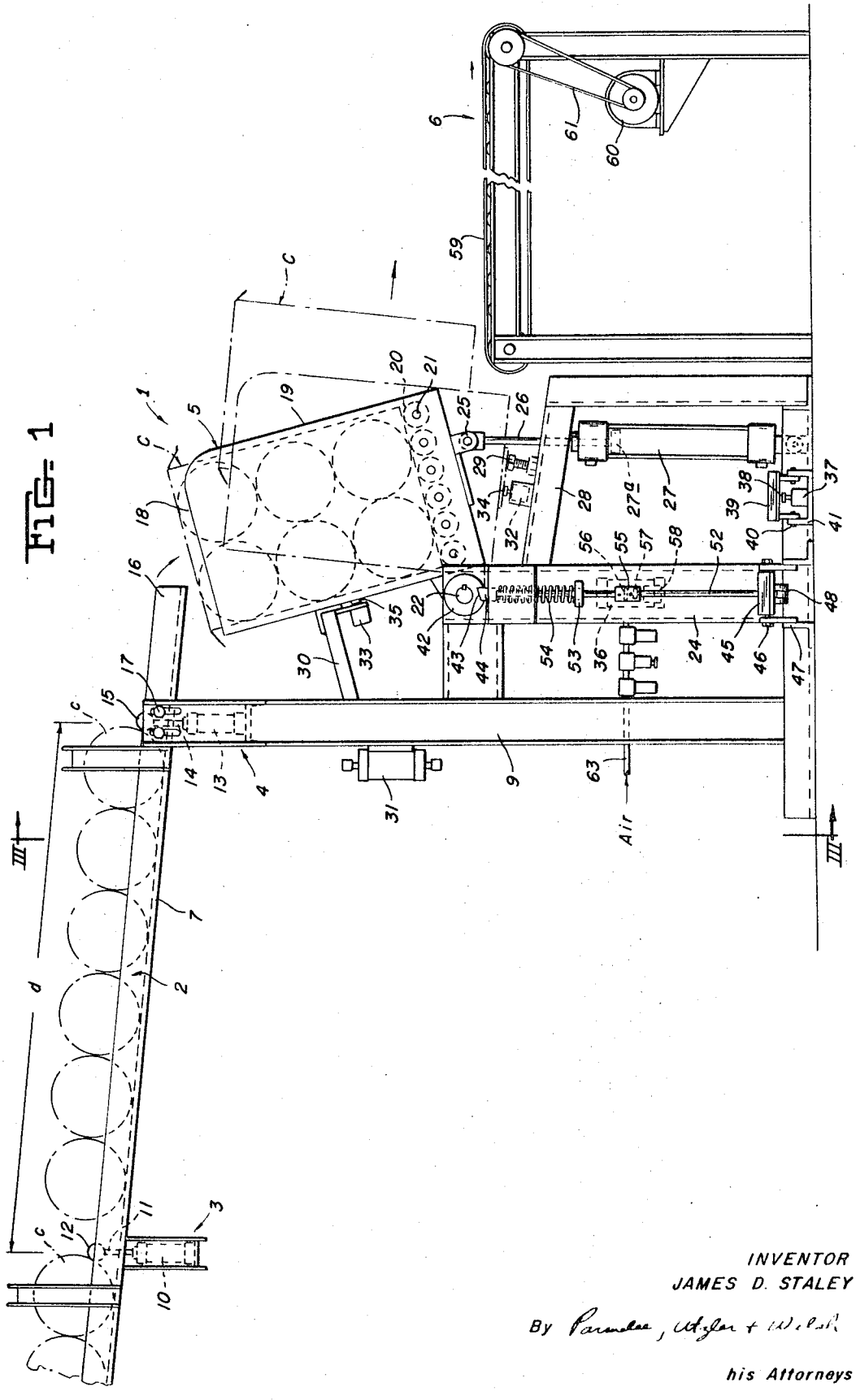


FIG. 1



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FIG. 2

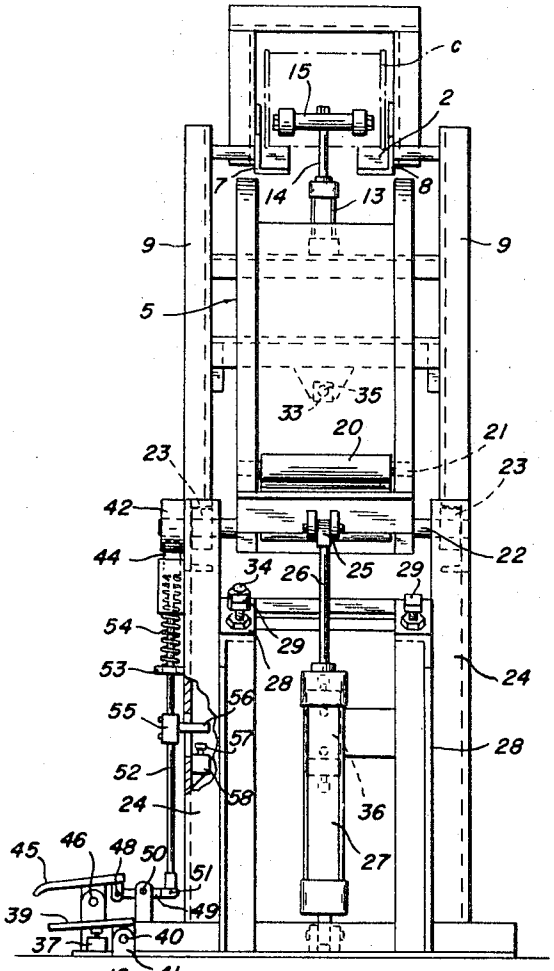


FIG. 3

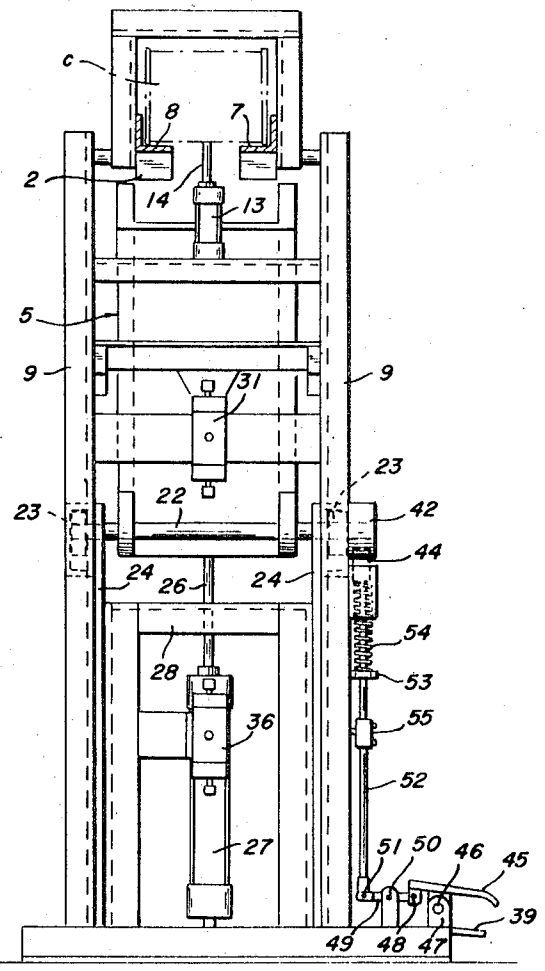
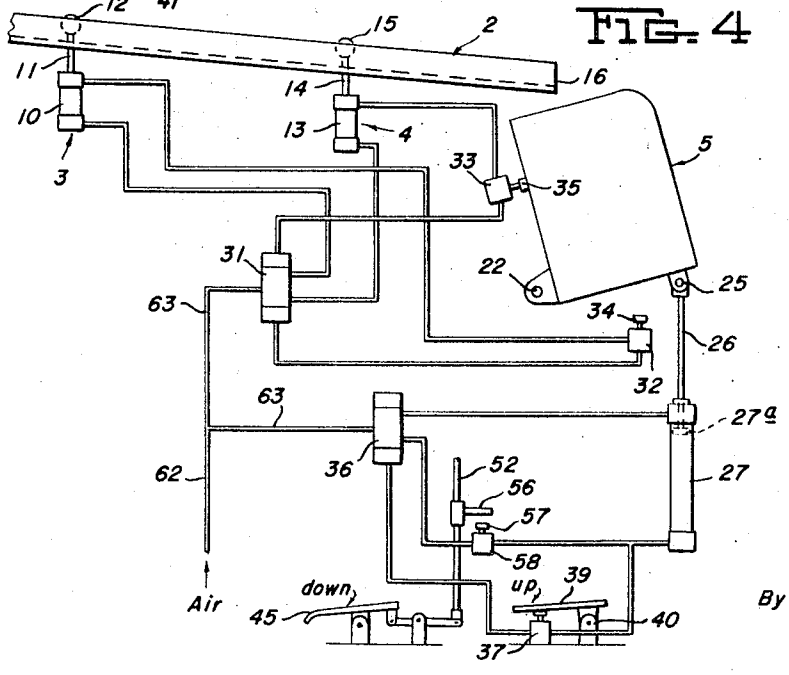


FIG. 4



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CARTON FILLING APPARATUS

FIELD OF THE INVENTION

This invention relates to an apparatus for filling a carton with cans, where a group of cans from a labeling machine or other processing devices are fed by gravity into an open-end carton and the carton then moved to a subsequent station for final processing and shipping to consumers.

BACKGROUND OF THE INVENTION

It is of course well known that products of various kinds are filled into cans of diverse standard sizes and the cans are then packed in cartons in case lots. The number of cans in a case varies according to the size of the cans. Effective carton loading machines of various kinds have been developed for the smaller sizes of cans, but large cans, such as the 010 can commonly used for the hotel and restaurant trade, are quite heavy and equipment used for smaller cans is not well adapted to the packing of these larger sizes. Since these cans, filled with product may be quite heavy, a case lot commonly comprises only six cans. These are placed in rectangular cartons in two rows of three each, usually through an open end of the carton rather than through what would normally be considered the top of a carton used for smaller sizes of cans.

The manual packing of these large and usually heavy cans by end loading the carton is laborious and slow. The present invention has for its principal object to provide a simple mechanism which is semiautomatic for separating from a continuous progression of cans or other cylindrical objects, a case lot and charging the case lot into the open end of a carton with the cans properly arranged in the customary manner. While the invention is not necessarily restricted to packing large cans such as the 010 cans, it presently has its principal utility for these and like large or relatively heavy cylindrical objects, because, as above indicated, apparatus is available for packing smaller cans where case lots are generally of the order of 12 and 24 units.

BRIEF SUMMARY OF THE INVENTION

The present invention provides an apparatus for the gravity filling of a carton with cans. An inclined trackway has an upper end portion onto which cans to be packed are placed and down which the cans roll by gravity to a lower discharge end. Barrier means are provided to restrain the cans from premature discharge and to group the cans so that only a predetermined number or case lot of cans will be discharged from the trackway in a single carton filling cycle. There is a carton holder on the machine having rollers in the bottom thereof into which an up-ended carton is placed with the top end open, and it is pivoted so that it may rock between an upright position convenient for the placing of a carton therein and the removal of a filled carton therefrom, and a tilted can-receiving position where the upper end of a carton in the holder is located under the discharge end of the trackway. The carton holder and barrier means are pneumatically operated while a cam locking device is used to hold the carton holder in filling position. The filled cartons are removed preferably onto an adjacent conveyor so the full carton can be transported to a subsequent processing station.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of the carton filling apparatus;

FIG. 2 is a view from the front of the apparatus illustrated in FIG. 1 with the carton holder in vertical position and the removal conveyor not shown;

FIG. 3 is a view taken along the lines III–III of FIG. 1; and

FIG. 4 is a schematic illustration of a pneumatic system usable with the apparatus of the present invention.

DETAILED DESCRIPTION

Referring now to the drawings, an apparatus for gravity filling of a carton C with cans is illustrated as 1 and comprises an inclined trackway 2 with arrestor means or spaced barriers 3 and 4 movable into and out of can obstructing position on the trackway. The machine has a pivotable carton holder 5 positioned at a lower level than the trackway and there is a carton receiving conveyor table 6 onto which loaded cartons are discharged for removal of a loaded carton from the area of the apparatus. The inclined trackway which comprises two angle irons 7 and 8 spaced apart a distance just slightly greater than the axial length of the cans c, guides the cans as they roll on their sides from a source of supply at the upper portion of the trackway toward the discharge end, the discharge end being fixed in a supporting structure 9. Containers, usually sealed cans from a labeling machine or, in the case of lithographed cans, from a filling machine, are delivered in continuous succession to the trackway by conventional means such as a conveyor (not shown) and so positioned on their sides that they will freely roll by gravity from the receiving end of the trackway to the discharge end. Although the present apparatus can be constructed for the loading of cartons with various quantities or sizes of cans, it is especially useful as heretofore explained where a smaller number of cans of relatively large size comprise a case lot and the apparatus is herein shown and described for use where six cans of a 010 size are to be loaded into a carton which will receive two rows of three cans each.

The upper barrier means 3 comprises a cylinder 10 having a piston rod 11 and a blocking member 12 at the outer end of the rod which is moved vertically into and out of blocking position across the trackway 2 by the cylinder 10. The lower barrier means 4 also comprises a cylinder 13, piston rod 14, and blocking member 15 at the outer end of the rod which is likewise moved vertically into and out of blocking position across the trackway by its cylinder. The barrier means 3 and 4 are positioned adjacent the trackway and spaced apart a distance *d*, that corresponds to that required for reception therebetween of a single case lot, in this instance, six cans. If desired, the discharge end of the trackway 2 designated as 16 can be pivotally attached to the frame 9 by pivot means 17 to enable adjustment of the slope of the discharge end thereof to regulate the rate of discharge of cans from the trackway into the open end of a tilted carton in the holder, about to be described.

Adjacent the discharge end of the trackway 2 and positioned at a lower level thereto there is a carton holder 5 which has an open top 18 and at least one open side 19. The carton holder preferably has free turning rollers 20 at the bottom which are carried by shafts 21 extending through the sidewalls of the carton holder and provide for the easy rolling of a loaded carton from the holder out of open side 19. The carton holder is attached to a shaft 22 which is supported by bearings 23 in supports 24 to provide for pivotal movement of the carton holder from a normally substantially vertical position for loading or unloading a carton therefrom to an inclined position where the open top thereof is aligned with the discharge end of trackway 2 for feeding of cans to a carton carried therein. The other end of the carton holder 5 is attached by pivot connection 25 to a piston rod 26 which is controllably reciprocated, at least to tilt the holder from its normal position by fluid pressure cylinder 27. The shaft 22, as shown in the drawings is preferably offset to the side of the holder nearest the main upright structure 9 whereby the weight of the carton after it has been loaded, exerts a force tending to return the holder to or slightly beyond an upright position.

A framework 28 is provided with resilient shock absorbers 29 thereon to cushion the carton holder as it returns to vertical position, while an arm 30 is provided on the frame 9 to limit the movement of the carton holder 5 to the desired maximum inclined position and align the open top 18 thereof with the discharge end of the trackway.

The barriers 3 and 4 are supplied with fluid under pressure through a manifold or distributor block 31 which is connected to a source of pressurized air and which operates in conjunction with two bleeder valves 32 and 33. Bleeder valve 32 is positioned on the framework 28 and activated by the carton holder 5. When the carton holder 5 is in vertical position, the plunger 34 of bleeder valve 32 is depressed and fluid pressure applied to the top of cylinder 10 so as to retract piston rod 11 and thereby move blocking member 12 downwardly out of can-blocking position. When the carton holder 5 is tilted, it is raised from contact with plunger 34 of valve 32 to release the operating plunger of said valve and air is directed into the bottom of cylinder 10 to raise the blocking member into position for restraining cans. Bleeder valve 33 operates the cylinder 13 and its rod 14. It is positioned on the arm 30 so that when the carton holder reaches its maximum inclined position it will depress its valve plunger 35 and cause fluid pressure to be applied to the top of the cylinder 13 thereby lowering rod 14 and its blocking member 15 out of blocking position to allow cans to roll from the lower end of the trackway into the open end of a carton held in a tilted can receiving position in the carton holder. When the carton holder is again lowered to vertical position, it moves from contact with plunger 35 and the plunger will be extended, to reverse the operation of the barrier, raising the rod 14 and its blocking member 15 into can restraining position for the next group of cans. Thus, the operation of the barrier means 3 and 4 is synchronized with the operation of the carton holder 5. When the carton holder is in substantially vertical position, the barrier means 3 operates to release another group or case lot of cans for movement down the trackway toward the discharge end where their movement is blocked by barrier means 4. When the carton holder next moves to the inclined or tilted position, the barrier means 3 blocks movement of more than the desired number of cans to the discharge portion of the trackway, and upon reaching its maximum inclined position, the carton holder triggers arresting means 4 as above explained to release the next lot of cans.

The carton holder is tiltable from a substantially vertical position where empty open-end cartons are placed in the holder and where filled cartons are removed from the holder to an inclined position for the receipt of cans. The degree of inclination will vary depending upon the size of cans being packed and is that needed for the cans to arrange themselves into layers. If the carton holder were in a position that is too close to vertical, i.e., 90° to the horizontal, the cans will tend to nest themselves within the carton and result in incomplete filling of the carton. If the carton holder is positioned at an angle to close to the horizontal, the cans would tend to roll from the open top of the carton and also result in incomplete filling. Thus, the angle of the carton holder to the horizontal must be steeper than the angle of repose of the cans but less than 90° and can be readily determined for each size of cans. Generally, the angle will approximate an angle within a range of about 65—75° from the horizontal. For example, in loading 010 cans, an angle of about 70° to the horizontal for the carton holder during receipt of cans from the trackway has been found to give quick and complete filling of an open-ended carton carried by the holder.

The carton holder 5 is pivoted on shaft 22 by means of the movement of rod 26 by piston 27*a* in cylinder 27. A manifold cylinder 36, also connected to a source of pressurized air, is connected to a valve 37 having a plunger 38. When the plunger 38 is depressed, air and pressure are applied to the bottom of cylinder 27 to force the rod 26 upwards and raise the end of carton holder 5 pivoting the holder on shaft 22. While numerous means may be used to actuate the valve 37, a preferred means is illustrated in the drawings wherein the operator's hands are free to manipulate a carton with the operator's foot being used to actuate the valve 37 through a foot pedal arrangement. A foot pedal 39 is pivotally attached at 40 to a support 41, and by stepping on the pedal, the operator actuates valve 38 to apply pressure to the bottom of cylinder 27 to raise the carton holder and tilt a carton therein to can receiving position as above described.

In order to lock the carton holder in inclined position, a cam member 42 is provided on one end of the shaft 22, the cam member having a notch 43 in its periphery. When the carton holder tilts to the inclined position, the cam also rotates and at maximum inclined position a dog or latch 44 is urged into the notch by a spring and rod arrangement operated to then restrain the holder against movement. A foot pedal 45 is pivotally mounted at 46 (FIG. 2) on a support 47, an end of the pedal being pivotally attached at 48 to a lever 49 pivoting on a fulcrum 50. The other end of the lever 49 is pivotally attached at 51 to a rod 52, the rod 52 passing freely through a guide and support plate 53 attached to part of frame 28, the upper end of the rod 52 being attached to the dog 44. A compression spring 54 is positioned around the rod intermediate the dog 44 and the plate 53 to urge the dog and rod upwardly, which in turn lifts the foot pedal 45 into upward position. The dog 44 normally rides along the periphery of the cam member 42 but when the carton holder reaches maximum inclined position the spring 54 urges the dog 44 into the notch 43 of cam member 42 and locks the carton holder in this position.

The rod 52 also has a sleeve 55 attached thereto, the sleeve having an outwardly extending arm 56 which is arranged to depress a plunger 57 of valve 58. Valve 58 controls the bleeding of air from the bottom of cylinder 27 to permit lowering of the piston rod 26 and the carton holder 5. Thus, when the operator steps on foot pedal 45, the rod 52 is forced downwardly, releasing the dog 44 from cam member 42 and at the same time, actuating bleeder valve 58 to bleed air from the bottom of cylinder 27. Upon release of the cam member 42 and bleeding of air from the bottom of cylinder 27, the weight of the carton holder 5 and loaded carton, being off center, will cause the carton holder to return by gravity to a vertical position or slightly beyond vertical position. The operator then pulls the carton manually from the carton holder, the carton rolling easily therefrom on rollers 20, or upon the correct positioning, the weight of the cans and the movement of the holder to vertical position or slight downward position can cause the full carton to roll by gravity onto the adjacent conveyor 6.

The conveyor 6, of conventional design has a continuous belt 59 which is driven by a motor 60 through a drive belt system 61 to transport the full carton to the next station for processing.

While the pneumatic circuits described are generally conventional and comprise the use of valves, bleeders, manifolds and cylinders common to the industry, FIG. 4 discloses a simple schematic diagram of a pneumatic system usable for control of the apparatus. Pressurized air, or other fluid under pressure is supplied by a compressor or other source (not shown) to a supply line 62 and into a line 63 that has two branches. One branch is connected to manifold 31 through which air is supplied for operating barrier means 3 and 4. As heretofore described, the carton holder 5 acts as a trigger to alternately cause the cylinders to lower the blocking members 12 and 15 from restraining position to a nonobstructing or clear position to allow cans to roll on the trackway. In one position, vertical position as described in FIGS. 1—3, the carton holder will activate valve 32 to supply air to the top of cylinder 10 and lower the stop member 12, while in the alternate position, i.e., inclined position, the carton holder will activate valve 33 to supply air to the top of cylinder 13 and thus lower stop member 15. The second manifold 36 to which the other branch of feedline 63 supplies pressurized air, operates the carton holder cylinder 27. When foot pedal 39 is depressed by the operator to open valve 37, air blows to the lower end of cylinder 27 to raise the carton holder to inclined position. When the carton holder is to be lowered, the foot pedal 45 is depressed to lower rod 52 and, in addition to releasing the mechanical cam lock, activates bleeder valve 58 to bleed air from the bottom of cylinder 27 so that the carton holder is returned to vertical position by gravity.

In operation, an open ended carton is placed in the carton holder by the attendant with the open end up and the flaps opened out, the holder being in a substantially vertical position. The operator depresses the foot pedal **39** which actuates valve **37** and supplies air to the bottom of cylinder **27**. This allows air to pass through the cylinder block **36** to the carton holder cylinder **27** tilting the carton holder to an inclined position. As the carton holder **5** moves off of bleeder valve **32**, the upper stop cylinder **10** is activated so as to raise the restraining bar **12** to hold back the supply of cans on the inclined trackway over and above the number of cans desired in the group that is to be immediately loaded into the carton. When the carton holder reaches its maximum inclined position, it depresses the bleeder valve **33** so as to activate the lower stop cylinder **13** and drop the blocking member **15** and allow the group of cans to roll by gravity into the carton through its open top. Also, when the carton holder reaches its maximum inclined position, the cam **42** will have been rotated to a point where the notch **43** engages the dog **44** attached to the rod **52**. After the predetermined number of cans on the trackway that were between the two barriers have dropped into the open-ended carton, dog **44** is lowered by the operator depressing foot plate **45**, which lowers rod **52** and the attached dog **44**, to release the latch. As rod **52** is lowered, arm **56** carried thereon actuates valve **58** so as to bleed air from the bottom of cylinder **27**. The full carton holder, now carrying its load, returns to a vertical position, breaking contact with bleeder valve **33**, thereby causing the blocking member **15** to raise into blocking position. When the carton holder is restored to vertical position, bleeder valve **32** is activated and air is supplied to cylinder **10** to lower restraining bar **12** and another group of cans roll down for discharge, but discharge is blocked until the foot pedal **39** is again depressed. The space between the two barrier means is only great enough to permit a case lot, i.e., six cans in the example here described to roll into said space, so that with each cycle of operation a new case lot is separated from the oncoming procession of cans ready for discharge when a carton is next brought into can receiving position.

From the foregoing it will be seen that the invention provides a simple, inexpensive, easily operated apparatus for rapidly packing cylindrical cans in even layers into cartons. The operator has only to place the empty cartons into the carton holder with the end flaps at the top end opened out and then operate the foot pedals. The cans are automatically separated into case lots, and the holder, being supported on an offcenter pivot at **22**, returns the carton after it is filled to a substantially upright position, or preferably just beyond a vertical position where the carton easily rolls out of the holder onto the endless belt receiving table structure **6** so that no heavy lifting is required by the machine operator. The operation is semiautomatic, but has few parts subject to wear. The maximum distance which the cans fall is such that they are not damaged by the impact of one upon another, particularly since the cans fall sideways in a manner such that the shock of any impact is distributed along the length of the contacting can surfaces.

I claim:

1. An apparatus for loading a carton with a predetermined number of filled cans or like cylindrical objects comprising:

a. a supporting structure,

b. a tiltable carton holder into which a carton with an open end may be received, said carton holder being tiltably supported in the supporting structure for tilting movement between a generally upright position in which cartons may be placed in the holder and removed therefrom and a tilted loading position in which the holder and a carton received therein are inclined from the horizontal,

c. an inclined track in which the cans are guided and down which they roll having its lower end terminating just above and over a carton in said holder when the holder is in tilted loading position, and

d. means arranged to release a predetermined number of cans on the track to roll down the track and off its lower end into the carton, the inclination of the carton being such that the cans arrange themselves in the carton in vertical rows containing equal numbers of cans.

2. An apparatus for loading a carton with a predetermined number of filled cans or like cylindrical objects as defined in claim **1** wherein said means comprises spaced barriers along the track movable into and out of can blocking position, the spacing between the barriers being sufficient to accommodate said predetermined number of cans between them.

3. An apparatus for loading a carton with a predetermined number of filled cans or like cylindrical objects as defined in claim **2** wherein said spaced barriers comprise a pair of pneumatically operated blocking members each of said pair arranged to operate in opposed blocking and nonblocking position for cans on the track.

4. An apparatus for loading a carton with a predetermined number of filled cans or like cylindrical objects as defined in claim **1** wherein said tiltable carton holder is pivotally mounted on the support structure for said tilting movement.

5. An apparatus for loading a carton with a predetermined number of filled cans or like cylindrical objects as defined in claim **4** including locking means to hold the carton holder in tilted loading position and wherein the carton holder is pivotally mounted so as to lower by gravity to substantially vertical position upon release of said locking means.

6. An apparatus for loading a carton with a predetermined number of filled cans or like cylindrical objects as defined in claim **1** wherein said carton holder has free turning rollers in the bottom thereof arranged to permit rolling of a full carton therefrom.

7. An apparatus for loading a carton with a predetermined number of filled cans or like cylindrical objects as defined in claim **1** wherein said tiltable carton holder and a carton received therein when in tilted loading position are inclined at an angle of approximately 70° from the horizontal.

8. An apparatus for gravity filling of a carton with cans comprising:

a. an inclined trackway down which cans roll by gravity having an upper end for receiving cans to be packed and a lower can discharge end,

b. barrier means along the trackway movable into and out of can restraining position,

c. a carton holder having an open top and at least one open side positioned at a lower level than and adjacent to the lower end of the trackway, the carton holder being pivotally mounted for movement from a substantially vertical position for the loading and unloading of successive cartons to an inclined position with the open top thereof under the discharge end of the trackway,

d. means for effecting pivotal movement of the carton holder and,

e. means arranged to sequentially move the barrier means from a can restraining position when the carton holder is in vertical position to a nonrestraining position for the discharge of a predetermined number of cans by gravity into a carton in the carton holder when the carton holder is in said inclined position.

9. An apparatus for gravity filling of a carton with cans as defined in claim **8** wherein said barrier means comprises first and second blocking members spaced from each other a distance sufficient to accommodate said predetermined number of cans therebetween with the first and second blocking members operating in opposed blocking and nonblocking position with respect to cans on the trackway.

10. An apparatus for gravity filling of a carton with cans as described in claim **9** wherein the carton holder when in substantially vertical position activates means for moving said first blocking member from blocking position, and when in inclined position activates means for moving said second blocking member from blocking position with respect to cans on said trackway.