

June 22, 1965

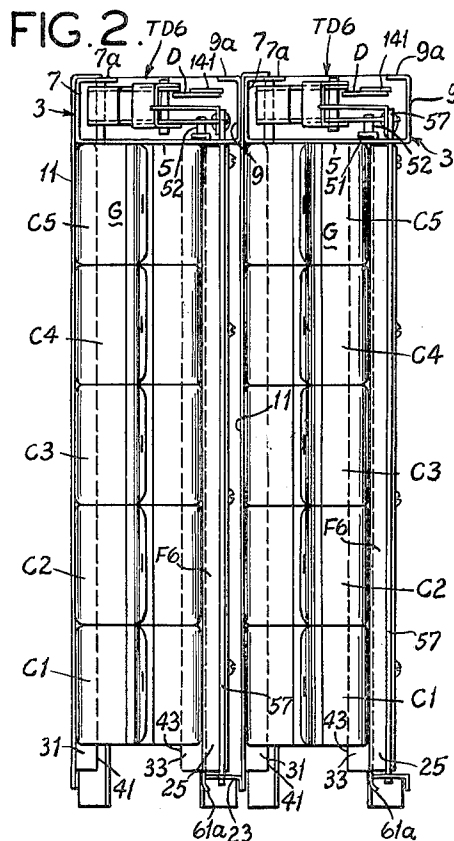
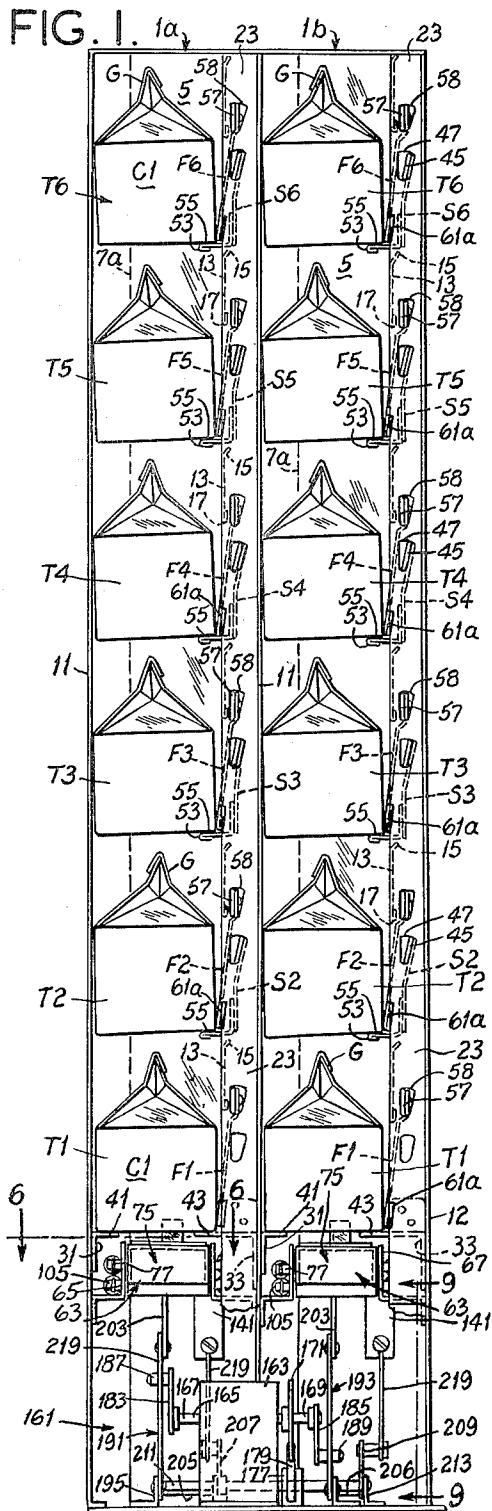
A. W. HOLSTEIN ET AL

3,190,488

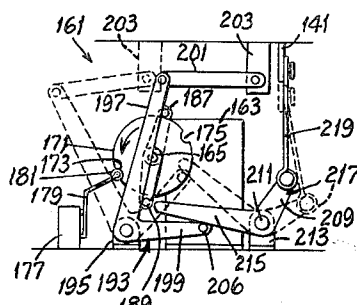
ARTICLE DISPENSER WITH SUPERPOSED RESERVE SUPPLY

Filed Aug. 16, 1963

6 Sheets-Sheet 1



**FIG. 9.**



Alvin W. Holstein,  
Harry H. Pryor,  
Robert O. Stayton,  
Inventors.  
Koenig, Pope, Senniger and Powers,  
Attorneys.

A. W. HOLSTEIN ETAL

# ARTICLE DISPENSER WITH SUPERPOSED RESERVE SUPPLY

Filed Aug. 16, 1963

6 Sheets-Sheet 2

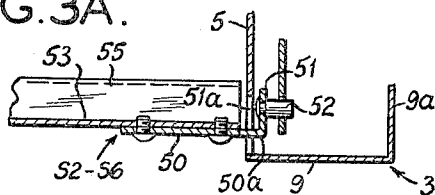


FIG. 3A.



June 22, 1965

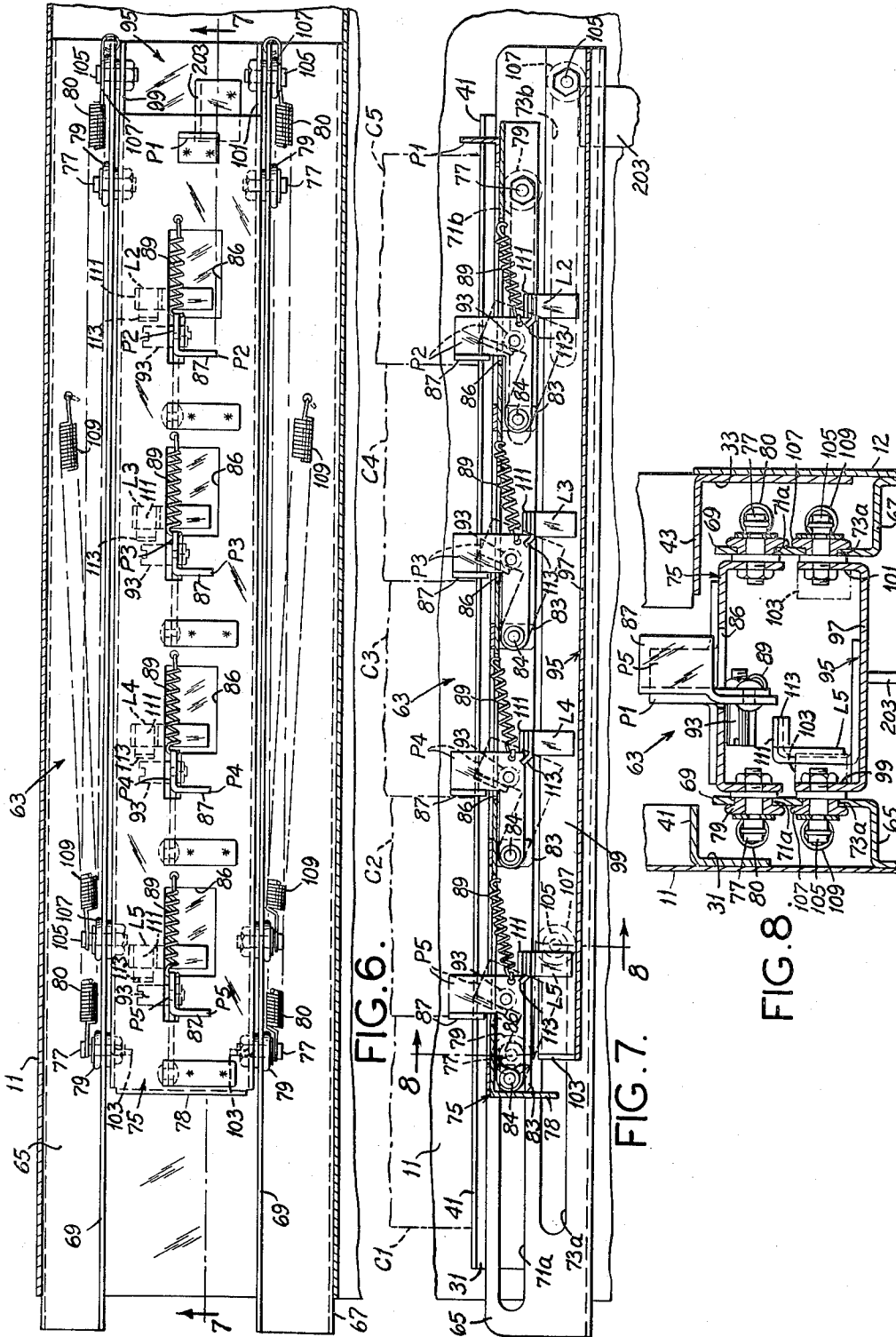
A. W. HOLSTEIN ET AL

3,190,488

ARTICLE DISPENSER WITH SUPERPOSED RESERVE SUPPLY

Filed Aug. 16, 1963

6 Sheets-Sheet 4



**June 22, 1965**

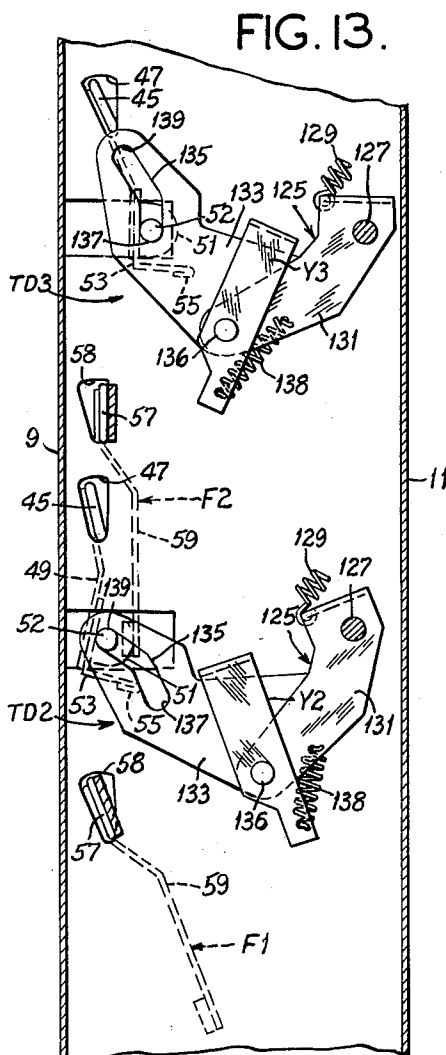
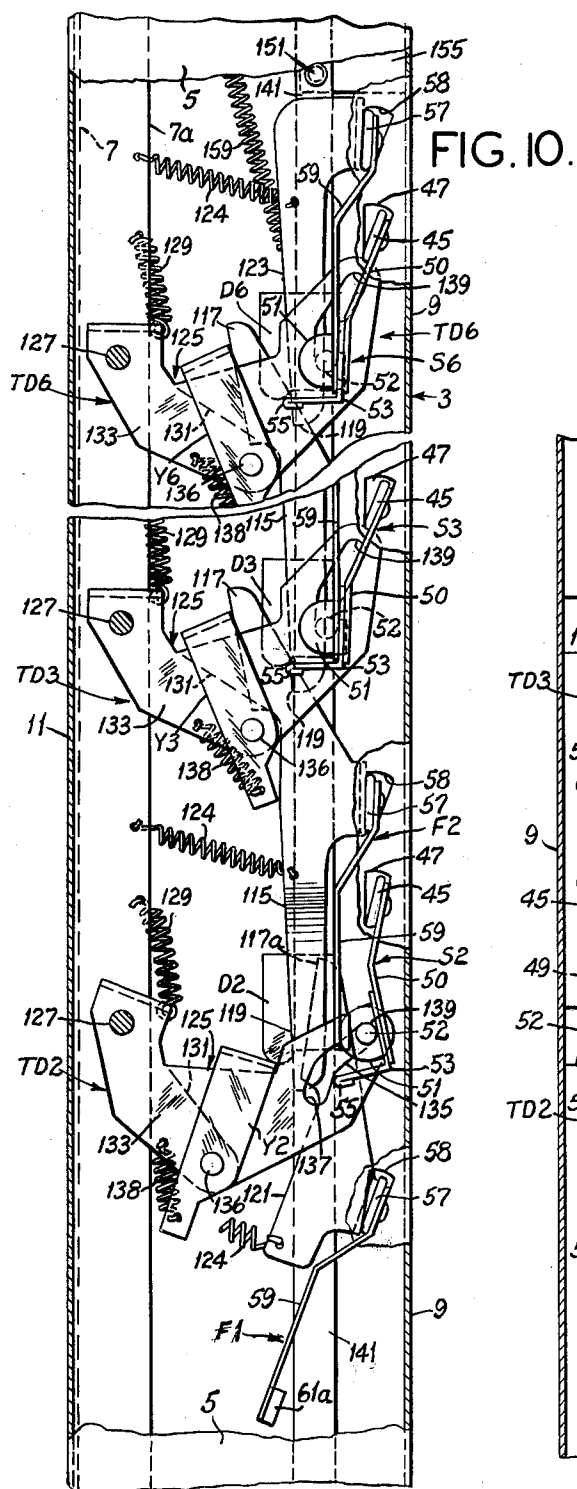
A. W. HOLSTEIN ET AL

**3,190,488**

# ARTICLE DISPENSER WITH SUPERPOSED RESERVE SUPPLY

Filed Aug. 16, 1963

6 Sheets-Sheet 5





1

2

3,190,488

## ARTICLE DISPENSER WITH SUPERPOSED RESERVE SUPPLY

Alvin W. Holstein, Brentwood, and Harry H. Pryor and Robert D. Stayton, St. Louis, Mo., assignors, by mesne assignments, to Universal Match Corporation, Ferguson, Mo., a corporation of Delaware  
Filed Aug. 16, 1963, Ser. No. 302,505  
26 Claims. (Cl. 221-11)

This invention relates to vendors and more particularly to article dispensing apparatus for use in vending machines.

The invention is especially concerned with apparatus for dispensing cartons, and particularly cartons of milk. One type of milk carton has a gable top; another has a flat top. Gable-top cartons do not lend themselves to being dispensed from a vertical stack, and among the several objects of this invention may be noted the provision of apparatus adapted for dispensing gable-top cartons, as well as flat-top cartons, for use in a vending machine in conjunction with coin-controlled purchaser-operable means for operating the apparatus; the provision of apparatus adapted for dispensing of such cartons from rows or tiers thereof, as distinguished from stacks, said apparatus having a high capacity for cartons considering its size, and being operable generally on the so-called "first-in first-out" principle. By the "first-in first-out" principle we mean that cartons loaded in the vending machine on one servicing of the machine generally are dispensed before cartons loaded in the machine on a subsequent servicing, thereby generally assuring freshness of the milk or other product in the cartons dispensed. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated,

FIG. 1 is a front elevation of article dispensing apparatus made according to this invention;

FIG. 2 is a plan of FIG. 1;

FIG. 3 is a right side elevation of FIG. 1, certain parts being omitted;

FIG. 3A is a detail section taken on line 3A-3A of FIG. 3;

FIG. 4 is a condensed left side elevation of FIG. 1, parts being broken away;

FIG. 5 is a vertical section taken on line 5-5 of FIG. 4, the cartons being removed and parts being shown in a moved position;

FIG. 6 is an enlarged horizontal section taken on line 6-6 of FIG. 1;

FIG. 7 is a vertical section taken on line 7-7 of FIG. 6;

FIG. 8 is a further enlarged section taken on line 8-8 of FIG. 7;

FIG. 9 is a vertical section taken on line 9-9 of FIG. 1;

FIG. 10 is an enlarged fragmentary front elevation similar to FIG. 1 with the cartons to be dispensed omitted, certain parts being broken away and other parts being in a moved position;

FIG. 11 is an enlarged fragmentary rear elevation of FIG. 1, certain parts being broken away and parts being shown in a moved position;

FIG. 12 is a fragment of FIG. 11, certain parts being removed for clarity;

FIG. 13 is a fragmentary view similar to FIG. 12, additional parts being removed for clarity; and

FIG. 14 is an enlarged perspective view of one of the parts illustrated in FIGS. 11, 12 and 13.

Corresponding reference characters indicate corresponding parts through the several views of the drawings.

Referring to the drawings, FIGS. 1 and 2 show two dispensing units or columns of this invention located side-by-side, as they would be in a vending machine. One column is generally designated 1a, and the other 1b. The columns are identical, each being adapted to be stocked with a plurality of cartons, the cartons being held in a plurality of horizontal tiers or rows with a series of cartons in each tier or row. Each carton bears the general reference character C and, as shown, is a commercial type milk carton of the well-known type having a gable top G. As shown herein, the cartons are held in six tiers, designated T1, T2, T3, T4, T5 and T6 from the bottom up (i.e., T1 is the bottom tier, T2 the second tier up, etc.). Also as shown herein, there are five cartons in each tier, the first carton in each tier (the carton in the tier at the front of the column being specially designated C1, the successive cartons being designated C2, C3, C4 and C5). While gable-top cartons are shown, it is to be understood that flat-top milk cartons may be loaded in the columns 1a and 1b, and, for that matter, either gable-top or flat-top cartons containing products other than milk may be dispensed by the columns.

Each of columns 1a and 1b comprises a vertical rear member 3 constituted by a sheet metal member of channel shape in cross section (see FIG. 2, particularly). This rear member or channel 3 opens toward the rear, its web being designated 5, and its left and right side flanges being designated 7 and 9. The latter have inward turned rear margins 7a and 9a. Each column has a full left side wall constituted by a vertical plate 11 having its rear margin secured as by spot welding to the left side flange of channel 3. Plate 11 extends forward from the channel a distance somewhat greater than the length of the row of cartons in a tier and is of full column height. At the right side of the column there is a lower vertical plate 12 which extends up from the bottom of the column generally only to the level of the bottom of the lowermost tier T1, and a vertical series of relatively narrow carton-confining cage plates 13 (see particularly FIGS. 3 and 5). The latter are located one above another in a vertical plane spaced from the left side wall 11 at a distance slightly greater than the carton width, and are vertically spaced to provide spaces therebetween for accommodation of certain carton-supporting catches and feelers to be described.

Each of the carton-confining cage plates 13 has an outwardly angled upper margin 15, and its lower edge is bent as indicated at 17 for stiffening purposes. Each cage plate 13 has a flange 19 at its rearward end secured to the front face of web 5 of channel 3, and a flange 21 at its forward end secured to a vertical right front corner post 23 of angle shape in cross section. A top right corner bar 25 extends between the channel 3 and the upper end of the post. This bar 25 has a flange 27 at its forward end secured to the post (see FIG. 4) and a flange 29 at its rearward end secured to web 5 of channel 3 (see FIGS. 4 and 5). Plate 12 has its forward end secured to post 23.

Cartons C in the lower tier T1 are supported on left and right side rail members generally indicated at 31 and 33. Each of these is constituted by a sheet metal member of angle shape in cross section. Member 31 is secured to the inside of plate 11, and member 33 extends between web 5 of channel 3 and post 23, having a flange 35 at its forward end secured to the post and a flange 37 at its rearward end secured to web 5 (see FIG. 3). Horizontal legs 41 and 43 of angle members 31 and 33 are opposed to one another in a horizontal plane and constitute fixed side rails for supporting cartons in tier

T1, with a space between these rails for accommodating elements of a carton ejecting mechanism as will appear.

This ejecting mechanism is adapted to push forward the cartons in the lowermost tier to effect dispensing of the cartons one at a time from the front of the column (which is open). Carton C1 is ejected first by being pushed forward off rails 41 and 43, followed by cartons C2-C5. The rows of cartons in tiers T2-T6 are releasably supported, as will appear, in such manner as to enable each row to drop down to the next lower tier after emptying of the latter. Thus, after tier T1 has been emptied, the row of cartons in tier T2 drops down to tier T1; after tier T2 has dropped to tier T1, tier T3 drops down to tier T2; etc.

The rows of cartons in tiers T2-T6 are adapted to be releasably caught and held in position in these tiers by a series of carton supports or catches, one for each of tiers T2-T6, the catches for the respective tiers being indicated at S2, S3, S4, S5 and S6. Each of these catches comprises an elongate rock shaft 45, shown as being a narrow flat bar, having its ends received in sector-shaped holes 47 in web 5 of channel 3 and post 23. Each shaft 45 is adapted for rocking movement on a horizontal axis which extends in front to rear direction adjacent the right side of the column. Shaft 45 has a pair of rocker arms 49 and 50 extending downward therefrom adjacent its front and rear ends, rear arm 50 being located immediately in front of web 5. This rear arm has a tongue 50a adjacent its lower end extending rearwardly through a hole 51a in web 5 to the interior of channel 3. The rear end of tongue 50a is bent to form a transverse ear 51 carrying a rearwardly extending cam follower pin 52 (see particularly FIG. 3A). Rocker arms 49 and 50 at their lower free ends carry an elongate sheet metal member 53 of angle shape in cross section, one leg of which constitutes a narrow carton-supporting ledge 55. The arrangement is such that each of catches S2-S6 is adapted for rocking movement with its shaft 45 on the pivot axis of shaft 45 between an operative position wherein its ledge 55 is adapted to support the row of cartons in the respective tiers T2-T6 and a retracted position wherein the ledge is withdrawn from under the row of cartons to release the row so that it may drop down to the next tier below. All the catches are shown in their operative position in FIG. 1, and FIG. 5 shows catches S2, S3 and S6 in their operative position. FIG. 10 shows catch S2 in retracted position, and catches S3 and S6 in operative position. It will be observed that when each catch is in operative position, its ledge 55 projects inward to some extent past the plane of the series of cage plates 13, i.e., the left edge of the ledge is spaced from the left side wall 11 of the column a distance somewhat less than the width of a carton C. Each of the cartons in the row in any given tier T2-T6 thus rests at its right bottom corner on the respective ledge 55 and leans against wall 11 (see FIG. 1). When the ledge 55 of any catch is withdrawn from under the respective row of cartons, the entire row of cartons is freed to drop down to the next lower tier, while being confined in the column by wall 11 and cage plates 13.

Means is provided for detecting the emptying of tiers T1-T6 and releasing catches S2-S6 in response thereto for effecting the above-described dropping of the rows of cartons from tier to tier. This means comprises a series of feelers, one for each tier, the feelers for the respective tiers T1-T6 being indicated generally at F1, F2, F3, F4, F5 and F6. Each feeler comprises an elongate rock shaft 57, shown as being a flat bar, having its ends received in sector-shaped holes 58 in web 5 of channel 3 and post 23 (and similar registering holes in flanges 19 and 21 of plates 13) for rocking movement on a horizontal axis extending in front to rear direction adjacent the right side of the column. Each rock shaft

57 carries a downwardly extending apron 59, bent to have an inwardly offset lower portion engageable by the right sides of cartons in the respective tier. The rock shaft 57 of the feeler F1 for the bottom tier T1 is located on the outside of the lowermost cage plate 13 (see FIG. 5). The apron 59 on this shaft extends downward therefrom toward rails 41 and 43, being engageable by the right side of any carton in tier T1 and retained thereby in a retracted position such as shown in FIG. 1. However, when the last carton C5 is dispensed from tier T1, apron 59 on rock shaft 57 of the feeler F1 for tier T1 is freed to swing inward under the lowermost cage plate 13 to a position such as shown in FIG. 5. The rock shaft 57 of the feeler F2 for the second tier T2 is located immediately above the rock shaft 45 of the catch S2 for the second tier T2. The apron 59 on this shaft 57 extends downward therefrom on the inside of catch S2 toward ledge 55 of catch S2, being engageable by the right side of any carton in tier T2 and retained thereby in a retracted position such as shown in FIG. 5. However, when cartons are dropped from tier T2 to tier T1, apron 59 of feeler F2 is freed to swing inward under the second cage plate 13 to a position similar to that shown for the apron of feeler F1 in FIG. 5. The aprons of the feelers F3-F6 are arranged and act similarly to the apron of feeler F2, as will be apparent.

Each feeler apron 59 has a curved finger 61a at its front end. These fingers are engageable with post 23 to limit the outward (counterclockwise) swing of the feelers, and their curved form facilitates loading of cartons in the tiers from the front of the column. The rear ends of the aprons are engageable with stops 61b (see FIG. 5) on channel 3 also for limiting the outward swing of the feelers.

Now referring to FIGS. 1 and 6-8, the aforementioned carton ejecting mechanism is indicated generally at 63. This includes a pair of elongate horizontal track members 65 and 67 secured to plates 11 and 12 extending from front to rear of the column below the carton-supporting rails 41 and 43. Each of these track members has an upstanding leg 69 provided with a pair of horizontal slots 71a and 73a adjacent its forward end and a pair of horizontal slots 71b and 73b adjacent its rearward end. At 75 is indicated a carriage of the carton ejecting mechanism. As shown, this comprises an elongate member of inverted channel shape in transverse cross section, having a downwardly extending flange 78 at its forward end. The carriage has laterally extending pins 77 carrying rollers 79 riding in slots 71a and 71b of the tracks and guiding it for forward and rearward movement below the level of the carton supporting rails 41 and 43. Springs 80 bias the carriage to the rearward retracted position in which it appears in FIG. 6, determined by engagement of rollers 79 with the rear ends of slots 71a and 71b.

Carriage 75 carries five carton pushers P1, P2, P3, P4 and P5 spaced at intervals along its length corresponding generally to the front to rear dimension of a carton. Pusher P1 is fixed on the carriage at its rear, extending up from the carriage through the space between rails 41 and 43 for engagement with the rear of the last carton C5 in the bottom tier T1. It is adapted to push the entire row of cartons C1-C5 forward along rails 41 and 43 on forward movement of the carriage from its retracted position. Each of pushers P2-P5 is depressible by cartons in tier T1, and adapted to be held down thereby in a retracted position below the rails 41 and 43 (as shown in phantom in FIG. 6). Means is provided, as will appear, for moving carriage 75 forward a distance corresponding to the front to rear dimension of a carton, then allowing the carriage to return to retracted position under the bias of springs 80. On the first such forward stroke of the carriage, pusher P1 pushes the entire row of cartons C1-C5 in tier T1 forward, and ejects carton C1 from the front of the column (see FIG. 3). On the return of the carriage, pusher P2 moves up behind



5

carton C5 (now in the position previously occupied by carton C4). Then, on the next forward stroke of the carriage, pusher P2 pushes cartons C5-C2 forward and ejects carton C2. On the succeeding return of the carriage, pusher P3 moves up behind carton C5. Then, on the next forward stroke of the carriage, pusher P3 pushes cartons C5-C3 forward and ejects carton C3, and so on until the last carton C5 is ejected by pusher P5.

Each of pushers P2-P5 is depressible by reason of being pivoted at one end on a bracket 83 extending down from the top of the carriage 75, the pivotal connection of each pusher to the respective bracket being indicated at 84. Each pusher has an arm extending rearward underneath the top of the carriage from its pivoted end at 84, and an upwardly extending rear finger reaching up through a hole 86 in the top of the carriage and having a lateral flange 87 for engagement with the rear of a carton. Each pusher is biased to swing upward to operative position for pushing cartons by a spring 89, and is depressible to its retracted position (such as indicated in phantom in FIG. 6) against the bias of spring 89 by the weight of a carton bearing down on the rear end of the pusher. Each of pushers P2-P5 also carries a laterally extending latch pin 93 below the top of the carriage.

At 95 is indicated a reciprocating driver for driving carriage 75. This comprises an elongate member of channel shape in transverse cross section located directly below carriage 75. The web of actuator 95 is designated 97, its left-hand flange is designated 99 and its right-hand flange is designated 101. Flanges 99 and 101 have in-turned ears 103 at their forward ends adapted for engagement with flange 78 at the forward end of carriage 75 on forward movement of driver 95 after an interval of lost motion. Pins 105 extend laterally outward from flanges 99 and 101 and carry rollers 107 riding in the aforementioned slots 73a and 73b of tracks 65 and 67 and guiding the driver for forward and rearward movement below carriage 75. Springs 109 bias driver 95 to the rearward retracted position in which it appears in FIG. 6, determined by engagement of rollers 107 with the rear ends of slots 73a and 73b. Driver 95 carries four latches L2, L3, L4 and L5 cooperable with latch pins 93 of pushers P2, P3, P4, P5, respectively. Each of these latches is adapted to lock the respective pusher either in its raised or depressed position, as the case may be, on forward movement of the actuator 95. For this purpose, each latch has a laterally extending arm 111 and a forwardly directed upwardly inclined finger 113 on the arm with the arrangement such that upon forward movement of the driver, finger 113 passes below pin 93 on the respective pusher if the latter is raised and arm 111 then comes under pin 93 to hold the respective pusher raised. If, however, the pusher is depressed, finger 113 rides over the pin 93 and arm 111 then holds the respective pusher down. Carriage 75 moves forward with driver 95 after the interval of lost motion occurring by reason of the initial spacing of ears 103 on the driver from flange 78 at the forward end of the carriage.

Means is provided for effecting retraction of each of catches S2-S6 for tiers T2-T6 in response to emptying of the next tier below as detected by feelers F1-F5. This means includes five release mechanisms, one for each of the five tiers T2-T6 above the bottom tier, located in the channel 3. These five catch release mechanisms are designated TD2-TD6, and their positions relative to the column are indicated by the reference characters TD2-TD6 in FIG. 3. Operation of release mechanism TD2 for catch S2 is controlled by feeler F1, operation of release mechanism TD2 for catch S3 is controlled by feeler F2, etc. In conjunction with these release mechanisms, the rock shaft 57 of each of feelers F2-F5 has fixed to its rearward end a two-armed rocker 115. FIGS. 10 and 12 show the rocker 115 which is fixed to rock shaft 57 of feeler F2, and it will be understood that there is a similar rocker on the rearward end

6

of the rock shaft 57 of each of feelers F3-F5. The arms of rocker 115 are designated 117 and 119. Arm 117 angles upward from bar 57, arm 119 extends downward. A rocker 121 is fixed to the rearward end of rock shaft 57 of feeler F1, having an upwardly extending arm 117a. A rocker arm 123 is fixed to the rearward end of rocker bar 57 of feeler F6 and extends downward. Springs 124 connected to rockers 115, 121 and 123 bias feelers F1-F6 to rotate in the direction toward the cartons in the column to detect the presence or absence of cartons.

Feeler F1 is held out in retracted position such as shown in FIG. 1 against the bias of the respective spring 124 until the last carton C5 is ejected from tier T1, and rocker arm 117a occupies a corresponding retracted position. When the last carton is ejected from tier T1, feeler F1 swings into the vacated space under the bias of the respective spring 124 and arm 117a swings together with the feeler to a position as shown in FIGS. 11 and 12. This swing is counterclockwise as viewed in FIGS. 11 and 12. Each of feelers F2-F5 is held out in retracted position such as shown in FIG. 1 against the bias of the respective spring 124 until cartons are dropped from the respective tier, and each of rockers 115 then occupies a corresponding retracted position. When the cartons are dropped from a tier T2-T5, the respective feeler F2-F5 swings into the vacated space under the bias of the respective spring 124, and the respective rocker 115 swings together with the feeler in counterclockwise direction as viewed in FIGS. 11 and 12. Feeler F6 is held out in retracted position such as shown in FIG. 1 against the bias of the respective spring 124 until cartons are dropped from tier T6, and arm 123 occupies a corresponding retracted position. When the cartons are dropped from tier T6, feeler F6 swings into the vacated space under the bias of the respective spring 124, and arm 123 swings together with the feeler in counterclockwise direction as viewed in FIG. 11.

Each of the release mechanisms TD2-TD6 includes a cam 125 for camming the respective catch S2-S6 away from and back to its operative carton-supporting position. Each of cams 125 is pivoted for swinging movement on a pin 127 extending between web 5 and lip 7a of channel 3, and is biased to swing clockwise as viewed in FIGS. 11 and 12 by a spring 129. Each cam is in the form of a yoke with a short outside arm 131 and a long inside arm 133. The long arm 133 has a cam slot 135, with angled end portions 137 and 139. The aforementioned cam follower pins 52 of catches S2-S6 are received in the slots of the respective cams 125. Each cam is swingable on its pivot for swinging the respective catch between its operative position and its retracted position, pin 52 being cammed outward by slot 135 on counterclockwise swing of the cam as viewed in FIGS. 11 and 12, and cammed back inward on clockwise swing of the cam (compare the positions shown for the upper and lower cams in FIG. 12).

Each cam 125 carries a pivoted pawl, generically designated by reference character Y, the pawls for the cams of the respective release mechanisms TD2-TD6 being specifically designated Y2-Y6. As to each cam, the pawl is pivoted on a pin 136 spanning arms 131 and 133 of the cam, and is biased by a spring 138 to swing from a retracted position such as shown for pawl Y3 in FIG. 12 to an operative position such as shown for pawl Y2 in FIG. 12. Pawl Y2 of release mechanism TD2 is controlled by arm 117a of rocker 121, being held in its retracted position by arm 117a when feeler F1 is in its retracted position. When feeler F1 swings inward on emptying of tier T1, arm 117a swings away from the pawl Y2 and allows it to swing to its operative position. Pawl Y3 of release mechanism TD2 is controlled by arm 117 of the lever 115 associated with feeler F2, being held in its retracted position by arm 117 when feeler F2 is in its retracted position. When feeler

F2 swings inward on the drop of cartons from tier T2 to tier T1, arm 117 swings away from pawl Y3 and allows it to swing to its operative position. At the same time, arm 119 of rocker 115 pushes pawl Y2 back to its retracted position. Rockers 115 associated with feelers F3-F5 act in a similar manner on the pawls of release mechanisms TD3-TD6. Arm 123 associated with feeler F6 acts on the uppermost pawl Y6 in the same manner as arm 117a acts on the lowermost pawl Y2.

A cam drive rod 141 is mounted for vertical sliding movement toward the back of channel 3, having an elongate vertical slot 143 at its lower end receiving a stud 145 on a strap 147, and having a stud 151 at its upper end received in an elongate vertical slot 153 in a bracket 155. Rod 141 is biased by a spring 159 to a raised retracted position determined by engagement of the lower end of slot 143 with stud 145 and engagement of stud 151 with the upper end of slot 153. It is movable downward by means to be described to the lowered position in which it appears in FIGS. 10 and 11. Rod 141 carries five drive lugs generically denoted by the reference character D, each of which is engageable with a respective pawl Y when the latter is in its operative position. The lugs for pawls Y2-Y6 may be specifically designated D2-D6, respectively. Rod 141 moves downward and then back upward on each vend cycle.

When the last carton C5 is ejected from tier T1, feeler F1 swings into the vacated space. Arm 117a associated with the feeler F1 swings counterclockwise to its FIG. 11 position and releases pawl Y2 to swing counterclockwise as viewed in FIG. 11 into position for engagement by lug D2 on the rod 141. On the next downstroke of the rod 141, lug D2 engages pawl Y2 and thereby swings the cam 125 of mechanism TD2 counterclockwise as viewed in FIGS. 11 and 12 thereby to cam catch S2 to its retracted position. This effects dropping of the row of cartons from tier T2 to tier T1, and these cartons swing feeler F1 back to its retracted position. Arm 117a and pawl Y2 swing back to retracted position, and rod 141 moves back upward to its raised retracted position. Upon the drop of cartons from tier T2 to tier T1, feeler F2 swings into the vacated space in tier T2. Rocker 115 associated with feeler F2 swings counterclockwise as viewed in FIGS. 11 and 12, and arm 117 of this rocker releases pawl Y3 to swing counterclockwise into position for engagement by lug D3 on the rod 141. Also, arm 119 on this rocker 115 blocks out pawl Y2 in its retracted position. On the next downstroke of rod 141, lug D3 engages pawl Y3 and thereby swings the cam 125 of mechanism TD3 counterclockwise as viewed in FIGS. 11 and 12 thereby to cam catch S3 to its retracted position. This effects dropping of the row of cartons from tier T3 to tier T2. Drop of cartons from tier T4 to T3, from tier T5 to T4 and from tier T6 to T5 is similarly effected.

The carriage driver 95 and the rods 141 of the two columns 1a and 1b are driven by means such as indicated at 161 in FIGS. 1 and 9, which is adapted to effect dispensing of cartons alternately from the bottom tiers of the two columns until both columns are completely emptied of cartons. As shown, driving means 161 includes an electric motor-speed reducer 163 having an output shaft 165. This unit is mounted at the bottom of the two columns with shaft 165 extending transversely in respect to the columns. As appears in FIG. 1, the left end of shaft 165, designated 167, is located below the driver for the carriage 75 of column 1a, and the right end of the shaft, designated 169, is located below the driver for the carriage 75 for column 1b. A circular disk cam 171 having two diametrically opposite notches 173 and 175 is fixed on shaft 165 adjacent its right end 169. This cam actuates a motor control switch 177, having an operating arm 179 carrying a follower 181 riding on the periphery of the cam, the arrangement being such that the motor is deenergized when the follower drops into

either notch. It will be understood that suitable conventional circuitry is provided for effecting energization of the motor upon deposit of an appropriate amount of coin in the vending machine in which the columns are used, and pushing of the button of a selector switch to effect dispensing of a carton from the columns, the motor continuing in operation for one-half revolution of shaft 165 and then being deenergized by follower 181 dropping into one or the other of notches 173, 175.

A crank 183 is fixed on the left end 167 of shaft 165 and a crank 185 is fixed on the right end of the shaft. These cranks are phased 180° apart, and carry crank pins 187 and 189. Crank 183 is adapted to oscillate a bell crank 191, and crank 185 is adapted to oscillate a bell crank 193. These bell cranks are pivoted on brackets as indicated at 195, each having an upwardly directed long arm 197 and a laterally directed short arm 199. Pin 187 is engageable with arm 197 of bell crank 191; pin 189 is engageable with arm 197 of bell crank 193. Bell crank 191 is adapted to pull driver 95 of column 1a forward via a link 201 interconnecting the upper end of arm 197 of bell crank 191 and a tang 203 extending down from the rear end of this driver. Bell crank 193 is adapted to pull driver 95 of column 1b forward via a similar link interconnecting the upper end of arm 197 of bell crank 193 and a similar tang on this driver. The bell cranks 191 and 193 are also adapted to operate rods 141 of columns 1a and 1b. For this purpose, arms 199 of bell cranks 191 and 193 carry pins 205 and 206 for oscillating two bell cranks 207 and 209. These are fixed on a shaft 211 journaled in brackets 213. Each of bell cranks 207 and 209 has a long arm 215 and a short arm 217. Pins 205 and 206 are engageable with the long arms 215, and short arms 217 are connected to rods 141 via links 219.

On each vend cycle, shaft 165 rotates through half a revolution, and cranks 183 and 185 rotate therewith through half a revolution. Referring to FIGS. 1 and 9, it will be observed that crank 183 is up and crank 185 is down. During the initial phase of the ensuing half-revolution of shaft 165, pin 187 on crank 183 swings bell crank 191 counterclockwise as viewed in FIG. 9 to pull driver 95 of column 1a forward, and during the final phase this driver is pulled back to its retracted position by the respective springs 109, thereby returning bell crank 191 to its initial position. As bell crank 191 swings away from and back to its initial position, it acts via bell crank 207 to pull rod 141 of column 1a down and then spring 159 pulls rod 141 back up. Also, bell crank 209, being fixed on shaft 211 along with bell crank 207, acts to pull down rod 141 of column 1b and then spring 159 pulls it back up. Crank 185 is brought around to the upper position and, during the initial phase of the next half-revolution of shaft 165, pin 189 on crank 185 swings bell crank 193 counterclockwise as viewed in FIG. 9 to pull driver 95 of column 1b forward. Then, during the final phase of the half-revolution of shaft 165, this driver is pulled back to its retracted position by the respective springs 109, thereby returning bell crank 193 to its initial position. As bell crank 193 swings away from and back to its initial position, it acts via bell crank 209 to pull rod 141 of column 1b down and then spring 159 pulls it back up. Also, bell crank 207, being fixed to shaft 211 along with bell crank 209, acts to pull down rod 141 of column 1a and then spring 159 pulls it back up. Thus, carriage drivers 95 of columns 1a and 1b are actuated alternately on successive vend cycles, and rods 141 of both columns are moved down and then back up on every vend cycle.

Operation is as follows:

Each of the six tiers T1-T6 of both columns 1a and 1b is loaded with five cartons C. Cartons are loaded in tier T1 by insertion from the front, and sliding them back on rails 41 and 43. As the cartons are pushed back on rails 41 and 43, they swing down the pushers P5, P4, P3 and P2 and hold them depressed, as indicated in phantom in

FIG. 6. Pusher P1 projects up between the rails 41 and 43 behind the last carton C5 (which is the first to be inserted) in the bottom tier. Cartons are loaded in each tier T2-T6 above the bottom tier also by insertion from the front, and by sliding them back on the ledges 55 (all of which are initially in carton-supporting position extending into the column from the right side thereof). The rows of cartons in tiers T2-T6 constitute reserve rows.

Assuming that operations start with cranks 183 and 185 in the position shown in FIG. 9, on the first vend cycle, carriage driver 95 of column 1a is pulled forward through a forward stroke by the respective link 201, then returned to its retracted position by the respective return springs 109. As the driver 95 slides forward, there is a lost-motion interval before ears 103 at the forward end of the driver engage flange 78 at the forward end of the carriage 75 of column 1a. Upon engagement of ears 103 with flange 78, driver 95 drives the carriage 75 forward. During the lost-motion interval, fingers 113 of latches L2-L5 ride over pins 93 on pushers P2-P5 and latch these pushers down. As the carriage 75 of column 1a moves forward with the driver, pusher P1 at the rear of the carriage pushes the entire row of cartons C1-C5 forward a distance corresponding to the front-to-rear dimension of a carton, and the first carton C1 is ejected through the open front of the column 1a, and delivered to the purchaser.

Following ejection of carton C1, driver 95 returns to retracted position, and carriage 75 is pulled back to its retracted position by springs 80. Cartons C2-C5 remain in the position to which they were advanced by pusher P1, C5 now occupying the position formerly occupied by C4, C4 occupying the position formerly occupied by C3, etc. When the carriage 75 returns to retracted position, latches L2-L5 disengage from pusher pins 93 and pusher P2 springs up behind the rearmost carton C5 (now at the C4 position). Pushers P3-P5 remain held down by the cartons.

Concurrently with the ejection of carton C1, the rods 141 of both columns 1a and 1b are driven downward away from and then returned upward back to their raised retracted position. However, since all the pawls Y2-Y6 at this time are held in retracted position clear of the lugs D on the rods, the rods simply idle through their downward and upward strokes. It will be apparent that the pawls are held in retracted position since all the feelers F1-F6 are held in retracted position by cartons in tiers T1-T6.

On the next vend cycle, carriage driver 95 of column 1b is pulled forward through a forward stroke (driver 95 of column 1a remaining in retracted position), and then returned to retracted position. This results in ejection of carton C1 from tier T1 of column 1b in the same manner as described above for ejection of carton C1 from column 1a.

On the third vend cycle, pusher P2 of carriage 75 of column 1a pushes forward the four cartons C2-C5 remaining in tier T1 of column 1a to eject carton C2, and on return of this carriage 75, pusher P3 thereof springs up behind carton C5 (now at the C3 position) in tier T1 of column 1a.

On the fourth vend cycle, pusher P2 of carriage 75 of column 1b pushes forward the four cartons C2-C5 remaining in tier T1 of column 1b to eject carton C2 from column 1b, and on return of this carriage 75, pusher P2 thereof springs up behind the carton C5 (now at the C3 position) in tier T1 of column 1b.

Ejection of the remaining cartons in tiers T1 of columns 1a and 1b occurs alternately from columns 1a and 1b in a manner similar to that above described on the fifth to the ninth vend cycles until the last carton C5 is ejected from tier T1 of column 1a on the ninth cycle. Immediately upon ejection of this carton, feeler F1 for tier T1 of column 1a swings inward from its retracted position to carry arm 117a associated with column 1a away from

pawl Y2 of column 1a, permitting this pawl to swing to its operative position as shown in FIGS. 11 and 12.

On the tenth vend cycle, the last carton C5 in tier T1 of column 1b is ejected. Rod 141 of column 1a moves downward during this cycle and lug D2 on this rod engages the respective pawl Y2 resulting in downward swing of the cam 125 of release mechanism TD2 of column 1a to effect retraction of catch S2 of column 1a. The row of five cartons C in tier T2 of column 1a is thereby released to drop down to tier T1 of column 1a.

Immediately upon drop of the cartons from tier T2 to tier T1 of column 1a, feeler F2 for this tier T2 swings inward from its retracted position and swings the rocker 115 associated with feeler F2 counterclockwise as viewed in FIGS. 11 and 12 so that pawl Y3 of column 1 is released for movement to its operative position, and pawl Y2 is pushed back by lower arm 119 of this rocker 115 to its retracted position.

As a result of the above-described operations, tier T1 of column 1a now has five cartons C1-C5 therein (dropped from tier T2 of column 1a). Tier T2 of column 1a is empty. Tier T1 of column 1b is empty. On the next vend cycle (the eleventh cycle), carton C1 is ejected from tier T1 of column 1a. Rod 141 of column 1b functions to retract catch S2 of column 1b (in the same manner as above described for retraction of catch S2 of column 1a) thereby to drop the row of cartons in tier T2 of column 1b to tier T1 of column 1b. Also, rod 141 of column 1b functions to retract catch S3 of column 1a thereby to drop the row of cartons in tier T3 of column 1a to tier T2 of column 1a. Here it is to be noted the cam slot 135 in cam 125 is so shaped that the catches are locked in carton-catching position and cannot swing outward under impact of the cartons dropping down onto ledge 55 thereof. Thus, three operations occur on this eleventh vend cycle: carton C1 is ejected from tier T1 of column 1a; cartons are dropped from tier T2 to T1 of column 1b and cartons are dropped from tier T3 to tier T2 of column 1a.

The following chart specifies the operations which occur on each of the above-described eleven vend cycles and on ensuing vend cycles until all the cartons (of which there are sixty in the two columns) are dispensed.

Vend cycle	Carton dispensed	Drop
1	C1 from 1a	
2	C1 from 1b	
3	C2 from 1a	
4	C2 from 1b	
5	C3 from 1a	
6	C3 from 1b	
7	C4 from 1a	
8	C4 from 1b	
9	C5 from 1a	
10	C5 from 1b	
11	C1 from 1a	T2-T1 of 1a
12	C1 from 1b	T3-T2 of 1a, T2-T1 of 1b
13	C2 from 1a	T4-T3 of 1a, T3-T2 of 1b
14	C2 from 1b	T5-T4 of 1a, T4-T3 of 1b
15	C3 from 1a	T6-T5 of 1a, T5-T4 of 1b
16	C3 from 1b	T6-T5 of 1b
17	C4 from 1a	
18	C4 from 1b	
19	C5 from 1a	
20	C5 from 1b	
21	C1 from 1a	T2-T1 of 1a
22	C1 from 1b	T3-T2 of 1a, T2-T1 of 1b
23	C2 from 1a	T4-T3 of 1a, T3-T2 of 1b
24	C2 from 1b	T5-T4 of 1a, T4-T3 of 1b
25	C3 from 1a	T5-T4 of 1b
26	C3 from 1b	
27	C4 from 1a	
28	C4 from 1b	
29	C5 from 1a	
30	C5 from 1b	
31	C1 from 1a	T2-T1 of 1a
32	C1 from 1b	T3-T2 of 1a, T2-T1 of 1b
33	C2 from 1a	T4-T3 of 1a, T3-T2 of 1b
34	C2 from 1b	T4-T3 of 1b
35	C3 from 1a	
36	C3 from 1b	
37	C4 from 1a	
38	C4 from 1b	
39	C5 from 1a	
40	C5 from 1b	
41	C1 from 1a	T2-T1 of 1a
42	C1 from 1b	T3-T2 of 1a, T2-T1 of 1b
43	C2 from 1a	T3-T2 of 1b

Vend cycle	Carton dispensed	Drop
44	C2 from 1b	T2-T1 of 1a T2-T1 of 1b
45	C3 from 1a	
46	C3 from 1b	
47	C4 from 1a	
48	C4 from 1b	
49	C5 from 1a	
50	C5 from 1b	
51	C1 from 1a	
52	C1 from 1b	
53	C2 from 1a	
54	C2 from 1b	
55	C3 from 1a	
56	C3 from 1b	
57	C4 from 1a	
58	C4 from 1b	
59	C5 from 1a	
60	C5 from 1b	

It will be readily understood that the drop of cartons from tier T4 to tier T3, from tier T5 to tier T4, and from tier T6-T5 occurs in the same manner as above described for the drops from tier T2 to tier T1 and from tier T3 to tier T2, i.e., by release of the respective pawls Y into position for engagement by the respective lug D on the respective rod 141 for operation of the respective catch-operating cam 125. Thus, as regards the drop from tier T4 to T3 in column 1a, for example, when cartons drop out of tier T3, feeler F3 swings into the vacated space. Rocker 115 associated with feeler F3 swings counter-clockwise as viewed from the rear of the apparatus, and its upwardly extending arm 117 moves out to release pawl Y4 of release mechanism TD4 for swinging of pawl Y4 into operative position for engagement by lug D4 on rod 141 on the next downstroke of rod 141. On this next downstroke of rod 141, lug D4, engaging pawl Y4, drives cam 125 of release mechanism downward to retract the catch S4.

It is to be noted that when cartons drop from tier T6 of either column, arm 123 associated with feeler F6 swings in to block out pawl D6 from swinging to operative position. This puts release mechanism TD6 for tier T6 out of operation on ensuing strokes of rod 141. When cartons drop from tier T5, the rocker arm 119 associated with feeler F5 swings in to block out pawl D5 from swinging to operative position. This puts release mechanism TD5 for tier T5 out of operation on ensuing strokes of rod 141. The remaining release mechanisms TD4-TD2 are similarly put out of operation on drop of cartons from tiers T4-T2.

While the dispensing apparatus of this invention is herein shown as comprising two columns with alternate dispensing from the columns, it will be understood that the principles of the invention are applicable to a single-column apparatus or one having more than two columns.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. Article dispensing apparatus comprising fixed supporting means for supporting a row of articles to be dispensed in a first tier, means for releasably holding a reserve row of articles in a second tier directly above the first tier, said holding means being movable from a reserve-row-supporting position for supporting articles in said reserve row by their bottoms to a retracted position clear of articles in said reserve row to permit said reserve row to drop, means for dispensing articles from the first tier, and means for moving said holding means to its said retracted position to release said reserve row to drop down

from the second tier to the first tier after emptying of the first tier.

2. Apparatus as set forth in claim 1 wherein said means for dispensing articles from the first tier comprises means for pushing articles in the first tier in one direction lengthwise of the first tier.

3. Article dispensing apparatus comprising fixed supporting means for supporting a row of articles to be dispensed in a first tier, means for releasably holding a plurality of reserve rows of articles to be dispensed in tiers one directly above another and directly above the first tier, each of said holding means being movable from a reserve-row-supporting position for supporting articles in the respective reserve row by their bottoms to a retracted position clear of articles in the respective reserve row to permit the respective reserve row to drop, means for dispensing articles from the first tier, and means for moving the holding means for said reserve rows to retracted position to release each said reserve row to drop down to the next lower tier after emptying of the latter.

4. Apparatus as set forth in claim 3 wherein said means for dispensing articles from the first tier comprises means for pushing articles in the first tier in one direction lengthwise of the first tier.

5. Article dispensing apparatus comprising fixed supporting means for supporting a row of articles to be dispensed in a first tier, means for releasably holding a reserve row of articles to be dispensed in a second tier directly above the first tier, said holding means being movable from a reserve-row-supporting position for supporting articles in said reserve row by their bottoms to a retracted position clear of articles in said reserve row to permit said reserve row to drop, means for dispensing articles from the first tier, means for detecting dispensing of the last article from the first tier, and means controlled by said detecting means for moving said holding means to its said retracted position to release said reserve row to drop down from the second tier to the first tier after dispensing of the last article from the first tier.

6. Apparatus as set forth in claim 5 wherein said means for dispensing articles from the first tier comprises a carriage reciprocable lengthwise of the first tier and carrying pusher means for pushing articles lengthwise of said first tier.

7. Article dispensing apparatus comprising fixed supporting means for supporting a row of articles to be dispensed in a first tier, means for releasably holding a plurality of reserve rows of articles to be dispensed in tiers one directly above another and above the first tier, each of said holding means being movable from a reserve-row-supporting position for supporting articles in the respective reserve row by their bottoms to a retracted position clear of articles in the respective reserve row to permit the respective reserve row to drop, means for dispensing articles from the first tier, means for detecting emptying of the tiers, and means controlled by said detecting means for moving the holding means for said reserve rows to retracted position to release each said reserve row to drop down to the next lower tier after emptying of the latter.

8. Apparatus as set forth in claim 7 wherein said means for dispensing articles from the first tier comprises a carriage reciprocable lengthwise of the first tier and carrying pusher means for pushing articles lengthwise of said first tier.

9. Article dispensing apparatus comprising a column having means at the sides thereof for retaining articles therein, means fixed adjacent the bottom of the column for supporting a row of articles to be dispensed in a first tier in the column, a movable catch for releasably holding a reserve row of articles in the column in a second tier directly above the first tier, said catch being movable from a reserve-row-supporting position for supporting articles in said reserve row by their bottoms to a retracted position clear of articles in said reserve row to permit said reserve row to drop, means for dispensing articles

13

from the first tier, a feeler for detecting dispensing of the last article from the first tier, and means controlled by said feeler and operable to move the catch to its said retracted position to release said reserve row of articles to drop down to the first tier after dispensing of the last article from the first tier.

10. Apparatus as set forth in claim 9 wherein said means for dispensing articles from the first tier comprises a carriage reciprocable lengthwise of the first tier and carrying a series of pushers for pushing articles lengthwise of the first tier.

11. Article dispensing apparatus comprising a column having means at the sides thereof for retaining articles therein, means fixed adjacent the bottom of the column for supporting a row of articles in a first tier in the column, a series of movable catches for releasably holding reserve rows of articles in the column in tiers one directly above another and above the first tier, each of said catches being movable from a reserve-row-supporting position for supporting articles in the respective reserve row by their bottoms to a retracted position clear of articles in the respective reserve row to permit the respective reserve row to drop, means for dispensing articles from the first tier, a series of feelers for detecting emptying of the tiers, and means controlled by said feelers and operable to move the catches to retracted position to release each said reserve row of articles to drop down to the next lower tier after emptying of the latter.

12. Apparatus as set forth in claim 11 wherein said means for dispensing articles from the first tier comprises a carriage reciprocable lengthwise of the first tier and carrying a series of pushers for pushing articles lengthwise of the first tier.

13. Carton dispensing apparatus comprising a column having means at the sides thereof for retaining cartons therein and being open at the front, means fixed adjacent the bottom of the column for supporting a row of cartons one behind another in a first tier in the column, a catch for releasably holding a reserve row of cartons in the column in a second tier directly above the first tier, said catch being carried by the column for movement between a carton-supporting position extending partly into the column from one side thereof for supporting the cartons in said second tier by their bottoms at said one side and a retracted position clear of the cartons to enable the cartons to drop down to the first tier, means for ejecting cartons one at a time from said first tier including pusher means for pushing cartons in the first tier forward toward the front of the column, a feeler carried by the column for detecting dispensing of the last carton from the first tier, and means controlled by the feeler and operable to move the catch to retracted position to release said reserve row to drop down to the first tier after dispensing of the last carton from the first tier.

14. Apparatus as set forth in claim 13 wherein the means for supporting the cartons in the first tier comprises a pair of rails extending in front-to-rear direction in the column at the sides thereof, said pusher means being operable in the space between the rails.

15. Carton dispensing apparatus comprising a column having means at the sides thereof for retaining cartons therein and being open at the front, means fixed adjacent the bottom of the column for supporting a row of cartons one behind another in a first tier in the column, a series of catches for releasably holding reserve rows of cartons in the column in tiers one directly above another and above the first tier, each of said catches being carried by the column for movement between a carton-supporting position extending partly into the column from one side thereof for supporting the cartons in the respective tier by their bottoms at said one side and a retracted position clear of the cartons to enable the cartons to drop down to the next tier below, means for ejecting cartons one at a time from said first tier comprising pusher means for pushing cartons in the first tier forward toward the

14

front of the column, a series of feelers carried by the column, one feeler for each of the tiers up to the upper tier, for detecting emptying of the tiers, and means controlled by said feelers and operable to move said catches to retracted position to release each said reserve row to drop down to the next lower tier after emptying of the latter.

16. Apparatus as set forth in claim 15 wherein the means for supporting the cartons in the first tier comprises a pair of rails extending in front-to-rear direction in the column at the sides thereof, said pusher means being carried by a carriage reciprocable lengthwise of the first tier below said rails.

17. Apparatus as set forth in claim 16 wherein said pusher means comprises a pusher fixed to the carriage at its rear and extending upward therefrom between the rails, and a series of depressible pushers spaced at intervals along the carriage and biased to rise to a position extending up between the rails.

18. Article vending apparatus comprising first and second columns each having means for holding a row of articles to be vended in a first tier, means for releasably holding a reserve row of articles in a second tier above the first tier, and means for dispensing articles from the first tier; means for effecting alternate actuation of said dispensing means of said columns for alternately dispensing articles from said columns on successive vend cycles; and means for effecting operation of the reserve row holding means of the first column on the vending cycle occurring after emptying of the first tier of the column to release the reserve row of the first column to drop down to the first tier of the first column and for effecting operation of the reserve row holding means of the second column on the next vend cycle to release the reserve row of the second column to drop down to the first tier of the second column.

19. Article vending apparatus comprising first and second columns each having means for holding a row of articles to be vended in a first tier, means for releasably holding a plurality of reserve rows of cartons in tiers one above another and above the first tier, and means for ejecting articles from the first tier; means for effecting alternate actuation of said ejecting means for alternately ejecting articles from said columns on successive vend cycles; and means for effecting operation of each reserve row holding means to release each reserve row to drop down to the next tier below on successive vend cycles occurring after emptying of the next tier below.

20. Article vending apparatus comprising first and second columns each having means adjacent its bottom for holding a row of articles to be vended in a first tier therein, a series of movable catches for releasably holding reserve rows of articles in tiers one above another and above the first tier, means for ejecting articles from the first tier, and a series of feelers for detecting emptying of the tiers; means for effecting alternate actuation of said ejecting means of said columns for alternately ejecting articles from said columns on successive vend cycles, and means controlled by said feelers for effecting operation of said catches to release each reserve row to drop down to the next tier below on successive vend cycles occurring after emptying of the next tier below.

21. Carton vending apparatus comprising a first and a second column each having means at the sides thereof for retaining cartons therein and being open at the front, means adjacent the bottom of the column for supporting a row of cartons one behind another in a first tier in the column, a series of catches for releasably holding reserve rows of cartons in the column in tiers one above another and above the first tier, each of said catches being carried by the column for movement between a carton-supporting position extending partly into the column from one side thereof for supporting the cartons in the respective tier at said one side and a retracted position clear of the cartons to enable the cartons to drop down to the next tier below,

means for ejecting cartons one at a time from said first tier including pusher means for pushing cartons in the first tier forward toward the front of the column, and a series of feelers carried by the column, one for each of the tiers up to the upper tier, for detecting emptying of the tiers; means for effecting alternate actuation of said ejecting means for alternatively ejecting cartons from said columns on successive vend cycles; and means controlled by said feelers and operable to move said catches to retracted position to release each reserve row to drop down to the next tier below on successive vend cycles occurring after emptying of the next tier below.

22. Article vending apparatus comprising a column having means at the sides thereof for retaining articles therein and being open at the front, a pair of fixed rails extending in front-to-rear direction in the column at the sides of the column and adjacent the bottom of the column for supporting a row of articles one behind another in a first tier in the column, a series of catches for releasably holding reserve rows of articles in the column in tiers one directly above another and above the first tier, each of said catches having a carton-supporting ledge and being carried by the column for sidewise movement relative to the column between an article-supporting position wherein its ledge extends partly into the column from said one side of the column for supporting articles in the respective tier at said one side and a retracted position wherein its ledge is clear of the cartons to enable the cartons to drop down to the next tier below, a series of feelers carried by the column, one feeler for each of the tiers up to the upper tier, for detecting emptying of the tiers, each feeler being mounted for sidewise movement relative to the column and biased inward toward the respective row of articles, being held out in a retracted position by engagement with any carton supported in the respective tier and moving inward on emptying of the respective tier, means for ejecting articles one at a time from said first tier including pusher means operable in the space between said rails for pushing articles in the first tier forward toward the front of the column, and a series of release mechanisms, one for each of the tiers above the first tier, each controlled by the feeler of the next tier below and including means for moving the respective catch to its retracted position after emptying of the next tier below.

23. Apparatus as set forth in claim 22 wherein each catch is pivoted for swinging movement on a horizontal axis extending in front-to-rear direction at one side of the

column and each feeler is pivoted for swinging movement on a horizontal axis extending in front-to-rear direction at one side of the column.

24. Apparatus as set forth in claim 23 wherein said series of release mechanisms is located at the rear of the column, said apparatus including a driver at the rear of the column common to all the release mechanisms operable through a drive and a return stroke on each of successive vending cycles, each release mechanism comprising means coupled to the rear end of the respective catch for swinging it between its article-supporting and retracted positions, and means controlled by the feeler of the next tier below for effecting actuation of said catch-swinging means by said driver to swing the respective catch to retracted position after emptying of the next tier below.

25. Apparatus as set forth in claim 22 wherein said pusher means comprises a carriage reciprocable lengthwise of the first tier below said rails, a pusher fixed to the carriage at its rear and extending upward therefrom between the rails, and a series of depressible pushers spaced at intervals along the carriage and biased to rise to a position extending up between the rails.

26. Article dispensing apparatus comprising a pair of rails for supporting a row of articles one behind another, a carriage reciprocable lengthwise of said row below said rails, a pusher fixed to the carriage at its rear engageable with the rearmost article of a full row for pushing a full row of articles forward along the rails for dispensing of the foremost article, and a series of depressible pushers spaced at intervals along the length of the carriage and biased to rise to a position extending up between the rails, said depressible pushers being adapted to be held down by articles on the rails, successive depressible pushers starting with the rearmost depressible pusher rising up behind the last article in a row as articles are dispensed.

#### References Cited by the Examiner

##### UNITED STATES PATENTS

1,881,894	10/32	Olsen	221—11
2,407,968	9/46	Von Stoesser	221—11
2,735,578	2/56	Woodruff	221—11

##### FOREIGN PATENTS

135,708	8/59	U.S.S.R.
---------	------	----------

LOUIS J. DEMBO, *Primary Examiner*.

HADD S. LANE, *Examiner*.