United States Patent [19]

Holt

[11] **3,712,507**

[45] **Jan. 23, 1973**

[54] **ARTICLE DISPENSING APPARATUS AND METHODS**

[76] Inventor: **Wythe W. Holt,** 4202 Chesapeake Avenue, Hampton, Va. 23369

[22] Filed: **April 26, 1971**

[21] Appl. No.: **137,561**

[52] **U.S. Cl.** .....**221/82,** 221/150 B

[51] **Int. Cl.**.....**G07f 11/54**

[58] **Field of Search**.....221/82, 86, 150 HC, 150 B, 221/103, 120, 121, 133, 76, 83–85; 312/36, 97.1

[56] **References Cited**

UNITED STATES PATENTS

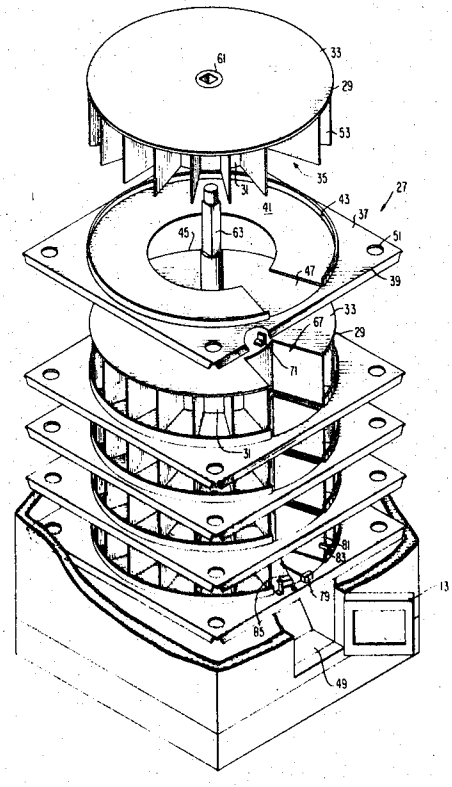
2,875,877	3/1959	Hoban	221/150 B X
2,384,863	9/1945	Warner	221/150 HC

Primary Examiner—Robert B. Reeves
Assistant Examiner—Francis J. Bartuska
Attorney—Beveridge & DeGrandi

[57] **ABSTRACT**

Provided is an apparatus for manually or automatically dispensing articles. The apparatus is especially useful for dispensing large bags of ice and generally comprises at least two drums having a common vertical axis about which the drums rotate. Each drum is provided with a plurality of radially extending compartments about its periphery. A stationary shelf is located below the compartments of each drum for retaining the articles in the compartments. When the drums rotate the articles located in the compartments slide along the shelf. Each shelf is provided with an opening vertically aligned with the openings of all other shelves, such that when a compartment containing an article is caused by drum rotation to pass over the opening, the article is dispensed from the apparatus. The drums are rotated by a rotatable vertical shaft extending along the common vertical axis of the drums. The vertical shaft, however, is only directly connected to the uppermost drum. Dispensing starts with the rotation of the uppermost drum only, which drum upon becoming empty, engages the next lower drum whereupon continued rotation of the uppermost drum by the rotatable vertical shaft also causes this next lower drum to rotate and dispense. Like engagement of each empty upper drum with its lower drum continues until the apparatus is empty of articles.

17 Claims, 6 Drawing Figures



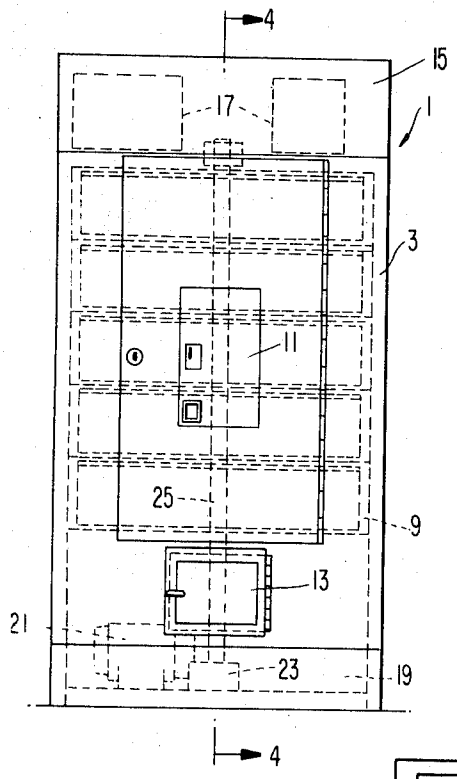
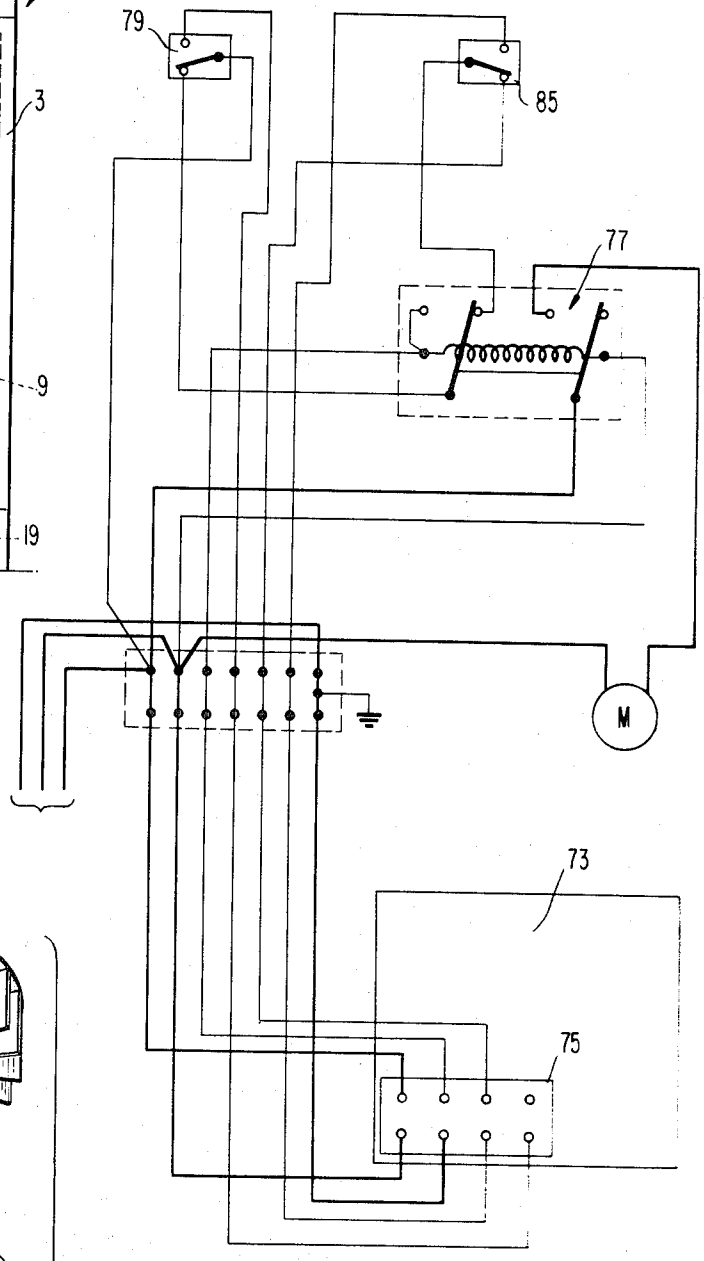


FIG. 1

FIG. 6



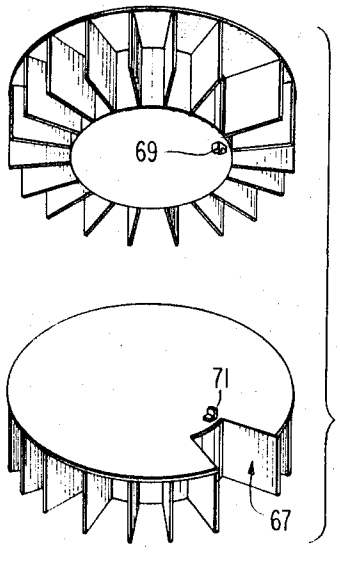


FIG. 3

INVENTOR
WYTHE W. HOLT

BY Beveridge & De Grandi

ATTORNEYS

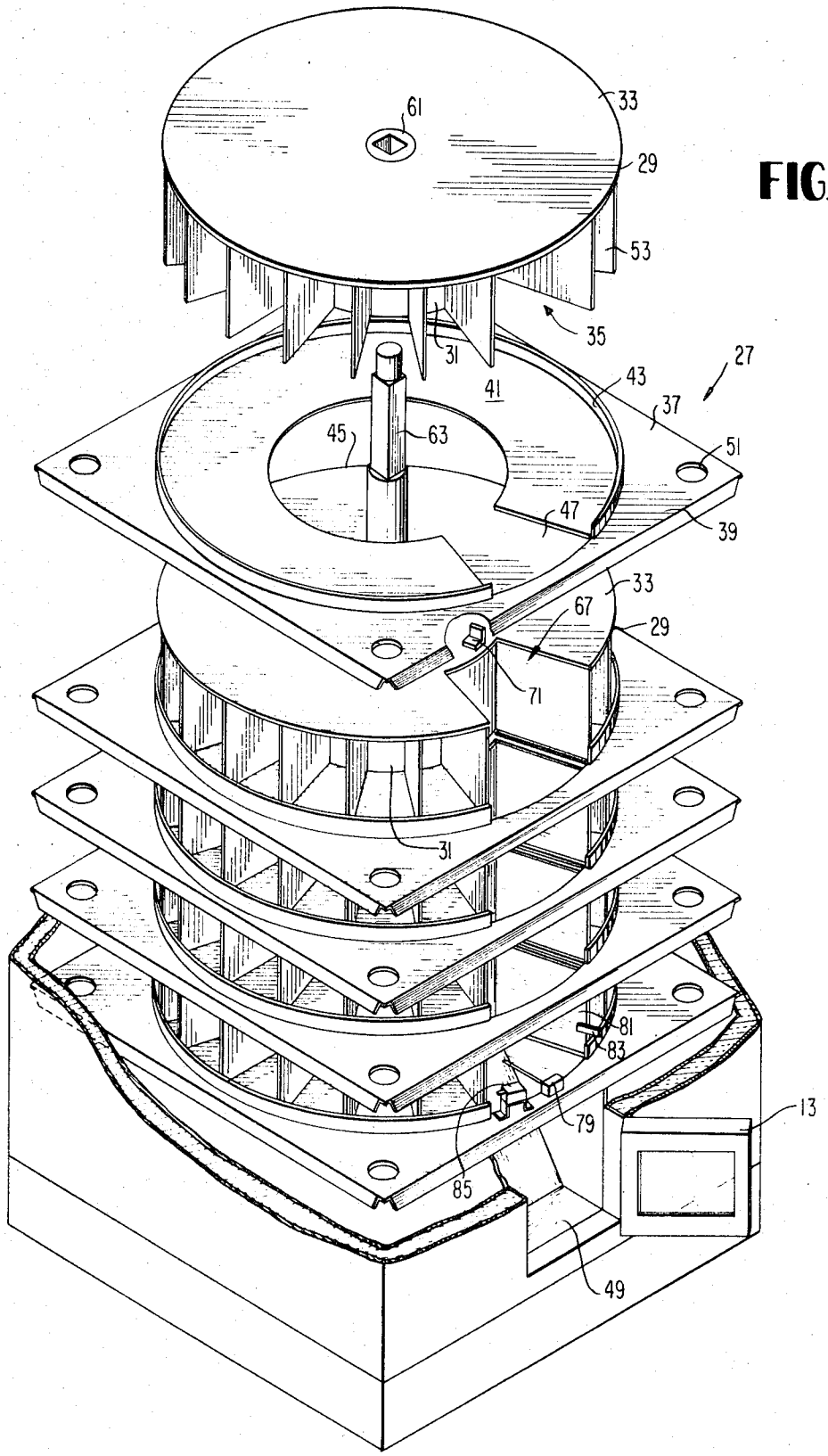

61
33
29
53
35
31
41
27
43
37
45
63
51
47
39
33
67
29
71
31
81
83
79
13
85
49

FIG. 2

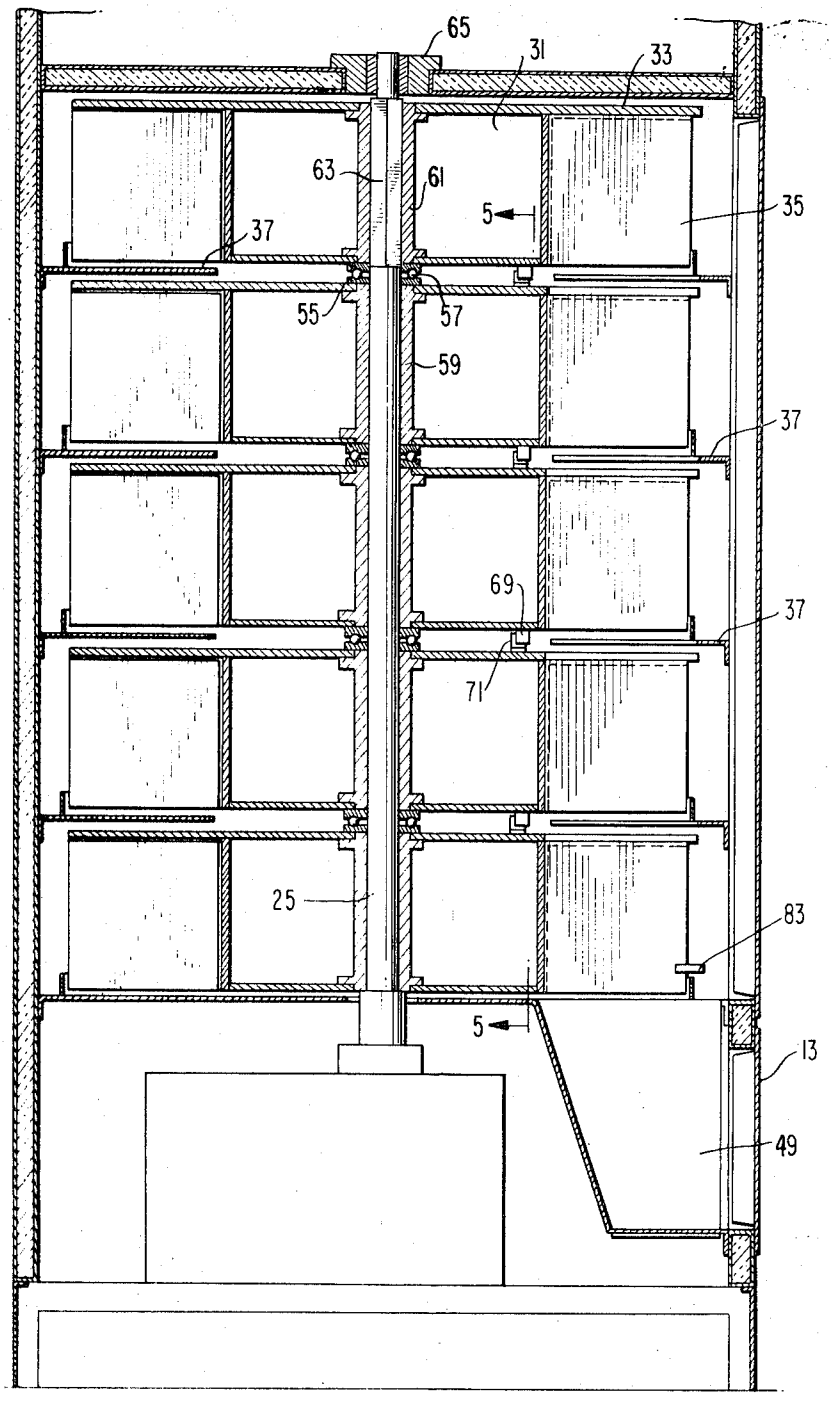
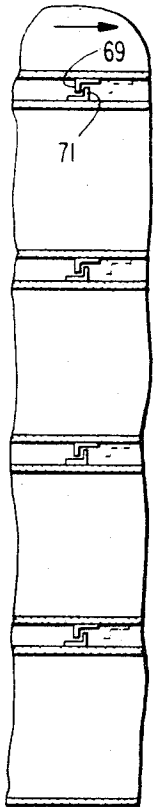


FIG. 4

FIG. 5



ARTICLE DISPENSING APPARATUS AND METHODS

This invention relates to dispensing apparatus. More particularly this invention relates to apparatus for dispensing articles sequentially therefrom in response to a signal or other action from an external source.

With the advent of packaged goods and the concept of commercial self-service came the development of a plethora of dispensing apparatus of all types and sizes. Many of these apparatus have proven to be highly successful while other have proven to be operative but economically undesirable. The success or failure (economic) of a dispensing apparatus often revolves about its simplicity of design, its durability, and its general reliability to function as intended for long periods of time. Simplicity of design is often a competitive necessity while durability and reliability decrease capital expenses and repair costs.

One particular area which has received some attention in recent years has been the art of dispensing ice. While many devices have been manufactured to produce and dispense ice in chip, flake or cube form, there has been a definite lack of successful attempts to develop dispensing apparatus which can dispense bags of ice such as 3 or 5 lb. bags of ice cubes. This is especially true if one not only desires an operative ice bag dispensing apparatus but also one which is simple in design, durable, and reliable so as to achieve the economies set forth hereinabove.

The above-described needs in the art are fulfilled by this invention which provides the art with a dispensing apparatus simple in design, durable and reliable and which may be used to dispense articles generally or bags of ice and the like more specifically.

Generally speaking the article dispensing apparatus of this invention are comprised of at least two drums having a common substantially vertical axis about which the drums are rotatable. Each drum is provided with a plurality of radially extending compartments, preferably located at the periphery of the drum. Stationary means, usually in the form of shelves, are located below each drum for slidably supporting articles located within the compartments. An opening is located in each stationary means, having a sufficient size and located such that when a compartment becomes aligned therewith, an article in a compartment thereabove will be dispensed through the opening. All of the openings in the stationary means are aligned one with the other and with a common exit in the apparatus to allow for the dispensing of an article from the apparatus. Means are provided for initially rotating the uppermost drum about its substantially vertical axis to bring its compartments sequentially into dispensing alignment with the openings until all of its compartments are empty of articles and only then sequentially rotating each lower drum about its substantially vertical axis to bring its compartments sequentially into dispensing alignment with the openings after the drum immediately thereabove becomes empty.

In a preferred form of this invention the means for rotating the drums continues to rotate each upper empty drum as it rotates a lower drum for dispensing. Preferably, this is accomplished by the upper drum engaging the lower drum and driving the lower drum for dispensing by continued rotation of the upper drum. In turn, this is preferably accomplished by forming the means for rotating the drums of a vertical rotatable shaft extending longitudinally through the vertical axis of the drums. Usually the vertical shaft is directly connected only to the uppermost drum and is caused to rotate either directly or indirectly by a signal or other action from an external source. The means for rotating the drums then also includes engagement means located on the drums by which an upper drum will engage a lower drum when the upper drum becomes empty. This is preferably accomplished by providing a drive lug which extends below the lower horizontal plane of the upper drum and a catch lug which extends above the upper horizontal plane of a lower drum. By aligning the lugs such that after the last compartment of the upper drum becomes empty, the drive lug engages the catch lug, further rotation of the upper drum will cause the lower drum to rotate, thus to sequentially dispense its articles in a manner similar to that of the upper drum.

The apparatus of this invention may be manually operated such as by providing an appropriate gear and manual lever for causing rotation of the drums, preferably one lever pull causing rotation of a drum sufficient only to bring one compartment into dispensing alignment with the openings. By the use of conventional coin receivers and reset mechanisms, the manual apparatus can be easily rendered commercial.

While manual operation is contemplated, the preferred apparatus of this invention are automatic. This may be accomplished by the use of a system which comprises means for issuing a signal to rotate a drum a desired distance. Such means usually comprise a conventional automated coin receiver mechanism and circuit in combination with means for actuating a drive mechanism to rotate the drums, preferably by rotating the vertical shaft described above, and means for sensing the dispensing of an article and stopping the drive mechanism which rotates the drums. In a particularly preferred embodiment automatic operation also includes a means for sensing and signaling when the apparatus is empty of articles.

The apparatus of this invention may be housed in any conventional casing such as a display container or the like. When, however, the apparatus is to dispense bags of ice or other articles in need of refrigeration, it is housed in a conventional refrigeration container and means are preferably provided in the shelves and/or drums to insure adequate communication for the refrigeration throughout the compartments.

This invention will now be further described with reference to certain specific embodiments illustrated in the accompanying drawings of which:

IN THE DRAWINGS:

FIG. 1 is a side elevational view of a dispensing apparatus in accordance with this invention in which several internal components are illustrated in dotted line fashion.

FIG. 2 is an exploded fragmentary elevational view of the apparatus of FIG. 1.

FIG. 3 is an exploded elevational view of an upper and lower drum of the apparatus in FIG. 2.

FIG. 4 is a side sectional view taken along sectional line 4—4 of FIG. 1.

FIG. 5 is a side sectional view of the engaging lug mechanism of FIG. 4 taken along sectional line 5—5 therein.

FIG. 6 is a schematic design of a preferred circuit for operating, automatically, the apparatus of FIG. 1.

The apparatus illustrated in FIGS. 1–5 is capable of dispensing bags of ice usually of the standard 3 or 5 lb. type. Such bags are of conventional dimensions and are usually formed of paper, plastic (e.g., polyethylene) or the like.

Referring to FIG. 1, dispensing apparatus 1 is comprised of an insulated housing 3 which surrounds and contains the various components of the device. Housing 3 is provided with a door 7 which allows access for refilling purposes into dispensing chamber 9. Located on door 7 is coin receiver mechanism 11. Also provided in housing 3 is article dispensing door 13.

Within the upper portion of housing 3 there is located a refrigeration chamber 15 which houses a conventional, preferably self-defrosting, refrigeration unit 17. Unit 17 provides refrigeration to dispensing chamber 9 usually by circulating air downwardly and withdrawing air upwardly through chamber 9.

Below dispensing chamber 9 there is located drive mechanism bin 19 which houses an appropriate electric motor 21 and a gear drive mechanism 23 for rotating vertical drive shaft 25. While any conventional motor, gear, and drive shaft mechanism can be employed, it is preferred to employ one which is adjusted to rotate shaft 25 at about one rpm or less for reasons more fully described hereinafter.

FIGS. 2 and 4 best illustrate dispensing mechanism 27 located within dispensing chamber 9. Dispensing mechanism 27 is comprised of a plurality of drums 29, in this instance five, stacked one above the other such that all of drums 29 have a common, substantially vertical, axis about which they are rotatable in their horizontal plane. Each drum 29 is comprised of a totally enclosed central portion 31, a top surface 33, and a plurality of article compartments 35 radially extending from central portion 31 and located in the periphery of the circumference of drum 29.

Below each drum 29 there is located a shelf means 37. Shelf means 37 are bracketed to housing 3 by conventional fastening means whose type will depend upon the strength necessary to support the weight of articles located in compartments 35. Weld joints or bolts are sufficient for most purposes of this invention including ice-bag dispensing. Shelves 37 comprise a horizontal surface 39 which has located thereon a slide track 41 and retaining ring 43. Within horizontal surface 39 is located circular opening 45 having a circumference equal to or slightly larger than the circumference of central portion 31 of drum 29. Also within surface 39 is dispensing opening 47 which is of a similar shape and slightly larger than or equal to the size of compartments 35 in drum 29. Each opening 47 in shelf 37 is vertically aligned with every other opening 47 such that when a compartment 35 containing an article is aligned thereabove, gravity will cause the article to fall through the opening(s) into dispensing shute 49. Horizontal surface 39 is further provided with circulation holes 51 to allow for more uniform refrigeration throughout chamber 9.

The lower surfaces of compartment walls 53 in drums 29, as illustrated in FIG. 4, do not rest upon track 41 but rather reside above it. This increases refrigeration circulation, reduces friction, and enables better sliding action of the articles along track 41 when drums 29 are rotated. Better sliding can be further improved by providing track 41 with a smooth surface such as by forming the track of polished metal or by coating the track with a suitable non-adherent material such as Teflon or the like. All drums 29, except for the upper most drum, are held in position by conventional slip joints such as those comprised of retaining rings 55, spacers 57 and slip columns 59. In this manner drive shaft 25 slidable rotates within slip columns 59 so as not to directly cause any rotation of those drums 29 lower than uppermost drum 29.

Contrary to the slip columns 59 in the lower drums, is rectangular engagement column 61 provided in uppermost drum 29. As illustrated, drive shaft 25 is provided in its upper section with rectangular journal 63 which fits snugly within engagement column 61 such that drive shaft 25 directly rotates uppermost drum 29. For stability, the upper end of drive shaft 25 is rotatably held in retainer bracket 65 located in the upper wall of dispensing chamber 9.

As best illustrated in FIGS. 3, 4 and 5, the top surface 33 of drums 29 (except for the uppermost drum) are provided with openings 67 which are initially aligned with openings 47 so as to allow dispensing of an article into shute 49 from an upper drum. Since a lower drum does not rotate prior to the emptying of an upper drum, opening 67 in a lower full drum remains aligned for dispensing purposes throughout the dispensing operation of all upper drums until they are empty.

The non-rotation of a lower drum prior to the complete dispensing of all upper drums may be accomplished in many ways such as by mechanisms located on drive shaft 25 itself. However in a preferred embodiment and as best illustrated in FIGS. 2–5, lugs are provided on each drum to accomplish the desired result. In this respect a drive lug 69 is provided on the lower surface of central portion 31. Lug 69 extends downwardly past the horizontal plane of the lower surface. Further, catch lug 71 is provided on top surface 33 of the next lower drum 29 and extends upwardly past the horizontal plane of the surface. Lugs 69 and 71, as best illustrated in FIG. 5, are so located initially (dotted lines) to allow a substantially complete rotation (in this instance, counterclockwise) of the upper drum before lug 69 engages lug 71 (full lines) so as to insure complete dispensing of the upper drum. Preferably lug 69 engages lug 71 sometime after the last compartment 35 of the upper drum aligns with the openings and dispenses its article. The next rotation, then, of shaft 35, rotates all empty drums and begins and continues the rotation, through engagement of the lugs, of the next lower drum for the next sequential dispensing of an article.

FIG. 6 illustrates a particularly preferred mechanism for automatically operating the device of FIGS. 1–5. As stated, door 7 is conveniently provided with coin receiver 11. For the purposes of this invention coin receiver 11 is preferably of a conventional accumulator coin mechanism type 73 such as coin receiver of the 10–01 Series produced by National Rejectors Inc. of St. Louis, Mo. Such a receiver is comprised of a switch generally illustrated at 75 activated by the insertion of

the proper amount of money therein. In accordance with this invention, when switch 75 is activated it causes motor relay 77 to close. This, in turn, activates motor 21 which causes shaft 25 and uppermost drum 29 to begin to rotate (in the FIGS., counterclockwise). Uppermost drum 29 continues to rotate until an article (e.g., bag of ice) is dispensed from the first compartment 35 and falls through the openings into dispensing shute 49. As best illustrated in FIG. 2, the upper forward edge of shute 49 is provided with limit switch 79 which is tripped by the falling dispensed article, causing motor relay 77 to open and stop motor 21.

There is obviously a time lapse during the fall of the article wherein the dispensing drum continues to rotate despite the fact that an article has been dispensed therefrom but prior to the time that it hits limit switch 79. Where speed of rotation is minimized, i.e., kept under about 1 r.p.m., "excess" rotation is minimal to the point of being negligible for almost all drums and compartments contemplated for dispensing 3–5 lb. bags of ice and 5-drum stacks (i.e., falls less than about 10 ft. in height with radial compartment dimensions of greater than about 10° or more). However, where extremely high stacks and small compartments are employed (i.e., as where other articles are dispensed) rotation speeds should be adjusted using simple trial and error techniques to determine optimum operating conditions and minimal "excess" rotation or limit switches should be provided on the upper shelves to minimize fall distance to the switch.

The above procedure will continue with each new insertion of a coin until the uppermost drum is empty. Upon the next insertion of a coin, the upper drum will drive lug 69 into contact with lug 71 which will then drive the lower drum through its necessary sequential dispensing rotation (i.e., until limit switch 79 is tripped). This procedure continues until all compartments in all drums are empty.

In order to safeguard against lost coin insertion after the dispensing apparatus is completely empty and to indicate that the apparatus is empty, rearward wall 81 of the last compartment in the lowermost drum is provided with switch activator 83. As the last article is dispensed, activator 83 (after a counterclockwise revolution from its position in FIG. 2) will trip empty switch 85, which, in a known fashion, will light up an "empty" sign on the receiver 11 and cause it to return all further money deposited therein. Upon reloading and resetting, the "empty" light is extinguished and receiver 11 reactivated to initiate rotation upon deposition of a coin therein.

Reloading of the apparatus may be effected after rerotating the drums into initial alignment. A preferred reloading procedure which allows for reloading through door 7 without the removal of housing 3, is to, if the apparatus is completely empty, open door 7 and disengage the clutch (not shown for convenience) between motor 21 and gear 23 so as to allow shaft 25 to freely rotate. Next the uppermost drum is rotated counterclockwise (which of course rotates all other drums) until the first compartment to be dispensed is in the first position counterclockwise from opening 47. This compartment is then loaded and counterclockwise rotation and loading of each compartment in the aforesaid first position is accomplished until all compartments are loaded and the first loaded compartment is in the first dispensing position (first position clockwise from opening 47). Each next lower drum is then, in turn, counterclockwise rotated and filled in the same manner as the uppermost drum. When all compartments are filled in this manner and the clutch reengaged all drums and lugs thereon are aligned properly and the apparatus is set to start anew the dispensing procedure described hereinabove.

Reloading a partially filled apparatus differs from the above procedure in that after clutch disengagement one begins with the lowest drum partially or completely emptied. The drum is rotated clockwise until the first empty compartment is in the first dispensing position. The compartment is then loaded and the drum is rotated clockwise until all compartments are filled. Each next higher drum, in turn, is then refilled in a like manner. When all compartments are filled all is in readiness for reengagement of the clutch and the start of a new dispensing operation.

In order to prevent reloading error, aligned markings may be placed on the drums to signify when all drums are aligned. This may be done by marking the outer forward wall of the first dispensing compartment of each drum with a vertical arrow. Simple viewing of the vertical arrows and their alignment prior to shutting of door 7 after reloading, then indicates whether reloading has been proper or erroneous.

Once given the above disclosure many other features modifications and improvements will become apparent to the skilled artisan. Such other features, modifications and improvements are considered to be a part of this invention, the scope of which is to be determined by the following claims:

I claim:

1. An article dispensing apparatus comprising at least two drums having a common substantially vertical axis about which the drums are rotatable, each drum having a plurality of radially extending compartments, stationary means located below each drum for slidably supporting articles located within the compartments, an opening located in each of said stationary means of a sufficient size and located such that when a compartment becomes aligned therewith an article in the compartment will be dispensed through said opening, all of the openings in said stationary means being aligned one with the other and with a common exit in said apparatus to allow for the dispensing of an article from the apparatus, means for rotating the uppermost drum about its substantially vertical axis to bring its compartments sequentially into dispensing alignment with said openings, said means initially rotating only said uppermost drum until all of its compartments are empty of articles, and means for causing each upper drum, only after said upper drum is empty of articles and as said upper drum continues to rotate, to sequentially rotate the next lower drum about its substantially vertical axis to bring its compartments into dispensing alignment with said openings.

2. An apparatus according to claim 1 wherein there are more than 2 drums and every upper empty drum continues to rotate, as the drum upper to a dispensing next lower drum rotates said next lower drum.

3. An apparatus according to claim 2 wherein said means for rotating said uppermost drum comprises a

drive mechanism for rotating a shaft extending longitudinally through the vertical axis of the drums.

4. An apparatus according to claim 3 wherein said means for causing each upper drum to rotate said next lower drum includes a drive lug extending below the lower horizontal plane of an upper drum and a catch lug extending above the upper horizontal plane of said next lower drum, said lugs being so aligned that after the last compartment of the upper drum becomes empty, the drive lug engages said catch lug in a manner such that further rotation of said upper drum will cause said next lower drum to rotate.

5. An apparatus according to claim 1 which also includes an automating system comprising means for actuating the rotation of the uppermost drum upon the issuance of an appropriate signal and means for deactivating the rotation of the uppermost drum upon the dispensing of an article.

6. An apparatus according to claim 5 wherein said means for activating said rotation comprises a coin receiver, a switch responsive to the receipt of the appropriate amount of coin, and a drive motor activated by said switch.

7. An apparatus according to claim 6 wherein said means for deactivating said rotation comprises a switch responsive to the dispensing of an article which deactivates said drive motor.

8. An apparatus according to claim 7 which also includes a means for indicating when said apparatus is empty of articles.

9. An apparatus according to claim 8 which also includes a means for rejecting any further coin when said apparatus is empty of articles.

10. An apparatus according to claim 1 which includes an insulated housing and refrigeration means for maintaining said compartments at a temperature below the ambient temperature of the environment.

11. An apparatus according to claim 1 wherein said compartments are in the periphery of said drums and said compartments do not touch said stationary means, said stationary means being comprised of a shelf surface having located thereon a slide track upon which said articles reside and along which said articles slide upon rotation of their drum.

12. An apparatus for dispensing bags of ice comprising a housing having located therewithin a refrigeration means, a dispensing means, and a drive means, said dispensing means comprising a plurality of vertically stacked drums having a commonly aligned, longitudinal, substantially vertical, axis and a rotatable shaft extending therethrough, a plurality of compartments located circumferentially about each drum and shelf means located below each drum for supporting articles located in said compartments, each shelf means and each drum having an opening which is capable of being vertically aligned with each other opening in each other shelf and drum when all compartments of all drums are fully loaded with articles, said openings being sufficiently large to allow said bags to pass therethrough, means for connecting said shaft to said drums such that when said shaft rotates it engagedly rotates the uppermost drum but only slidably rotates about the common axis of all lower drums, and means located between each of said drums for causing an adjoining upper drum to rotate the next lower drum with continued rotation of said adjoining upper drum, said means being so aligned that rotation of said lower drum only begins after said upper drum is empty of articles, said drive means comprising a mechanism capable of rotating said shaft.

13. An apparatus according to claim 12 wherein said means located between each of said drums comprises a drive lug extending below the lower horizontal plane of an upper drum and a catch lug extending above the upper horizontal plane of the next lower drum, said lugs being so aligned that after the last compartment of the upper drum becomes empty, the drive lug engages the catch lug in a manner such that further rotation of said upper drum will cause said lower drum to rotate.

14. An apparatus according to claim 13 wherein the respective drive lugs and catch lugs of each empty drum and the next lower drum remain engaged until all articles are dispensed from the apparatus.

15. An apparatus according to claim 14 which also includes a dispensing shute vertically aligned with the openings in said shelf means, and a door located in the wall of said housing above said shute, which when opened brings into view all of the openings in said drums when all of said openings are vertically aligned.

16. A method of re-loading the apparatus of claim 15 when it is completely empty comprising opening said door, rotating the uppermost drum in the direction of dispensing rotation until the first compartment to be dispensed is in the first position in the direction of dispensing rotation past the opening in said shelf means, loading said compartment and each next compartment after continued rotation of the drum in the direction of dispensing rotation such that the compartment to be loaded is past said opening in the shelf means, and rotating and filing sequentially each next lower drum in the same manner as the first drum until all compartments are filled.

17. A method of re-loading the apparatus of claim 15 when it is only partially empty comprising opening said door, rotating the lowest drum partially or completely emptied in a direction opposite that of the direction of dispensing until the first empty compartment is in the first dispensing position before the opening in said shelf means, loading said compartment and each next compartment after continued rotation of the drum in the direction opposite that of dispensing rotation such that the compartment to be loaded is dispensingly before said opening in the shelf means, and rotating and filling sequentially each next higher drum in the same manner as the first drum until all compartments are filled.

* * * * *