

Sept. 21, 1965

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3,207,366

ICE CUBE MAKING AND VENDING MACHINE

Filed Dec. 3, 1962

4 Sheets-Sheet 1

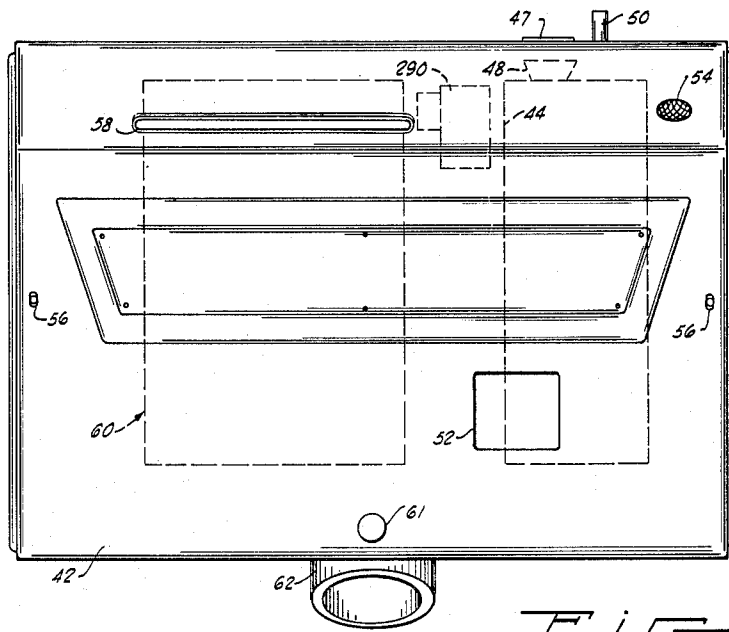


FIG. 2

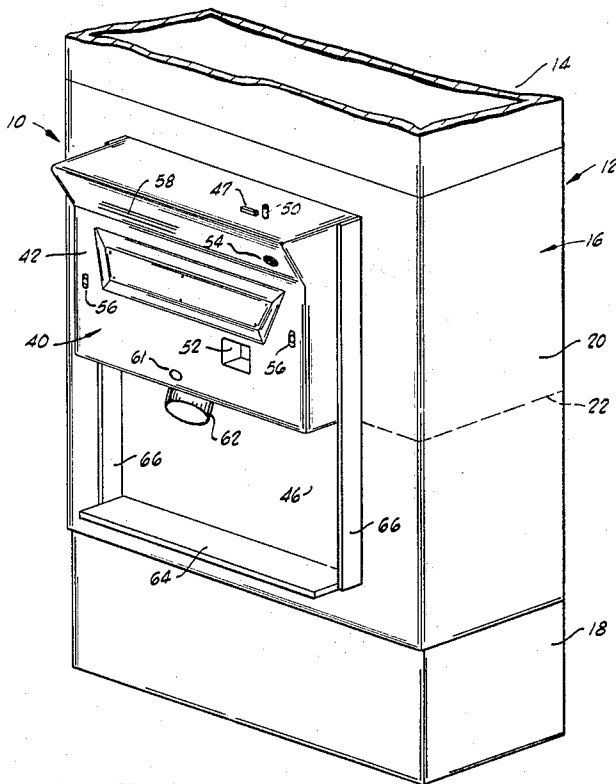


FIG. 1

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4 Sheets-Sheet 2

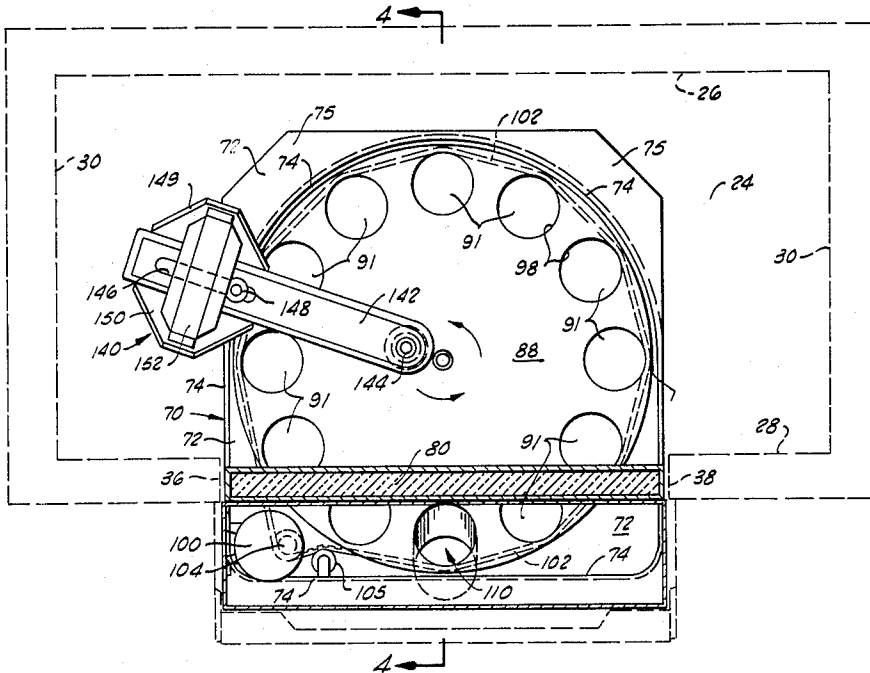


Fig-3

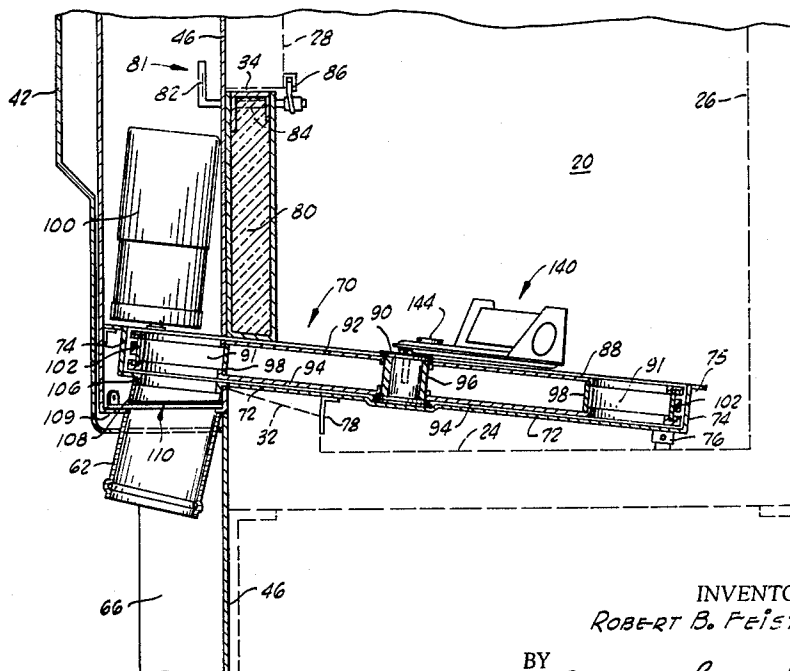


FIG. 4

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4 Sheets-Sheet 3

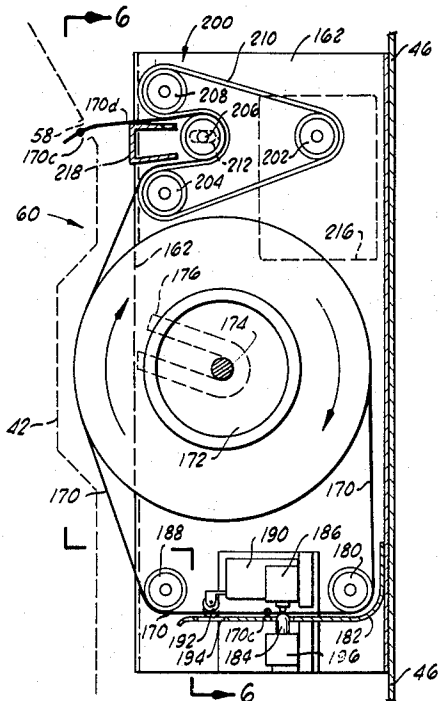


FIG. 5

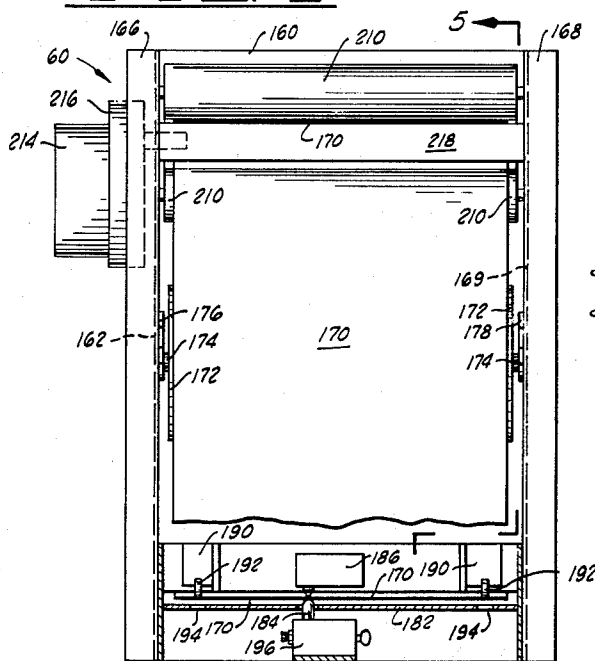


FIG. 6

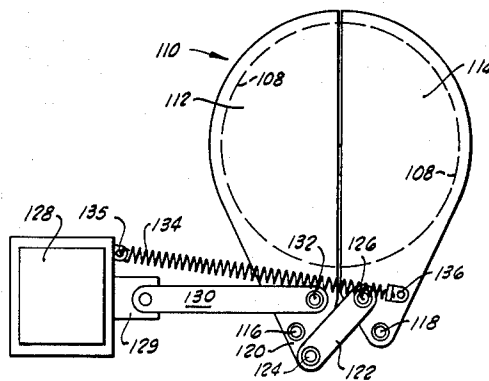


FIG. 10

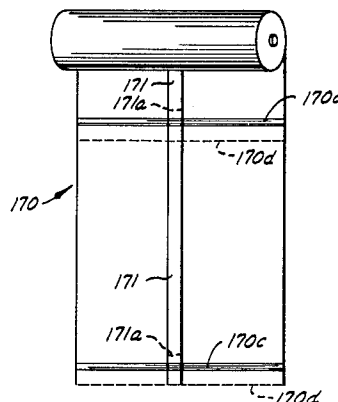


FIG. 7

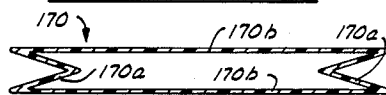


FIG. 8

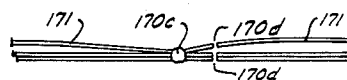


FIG. 9

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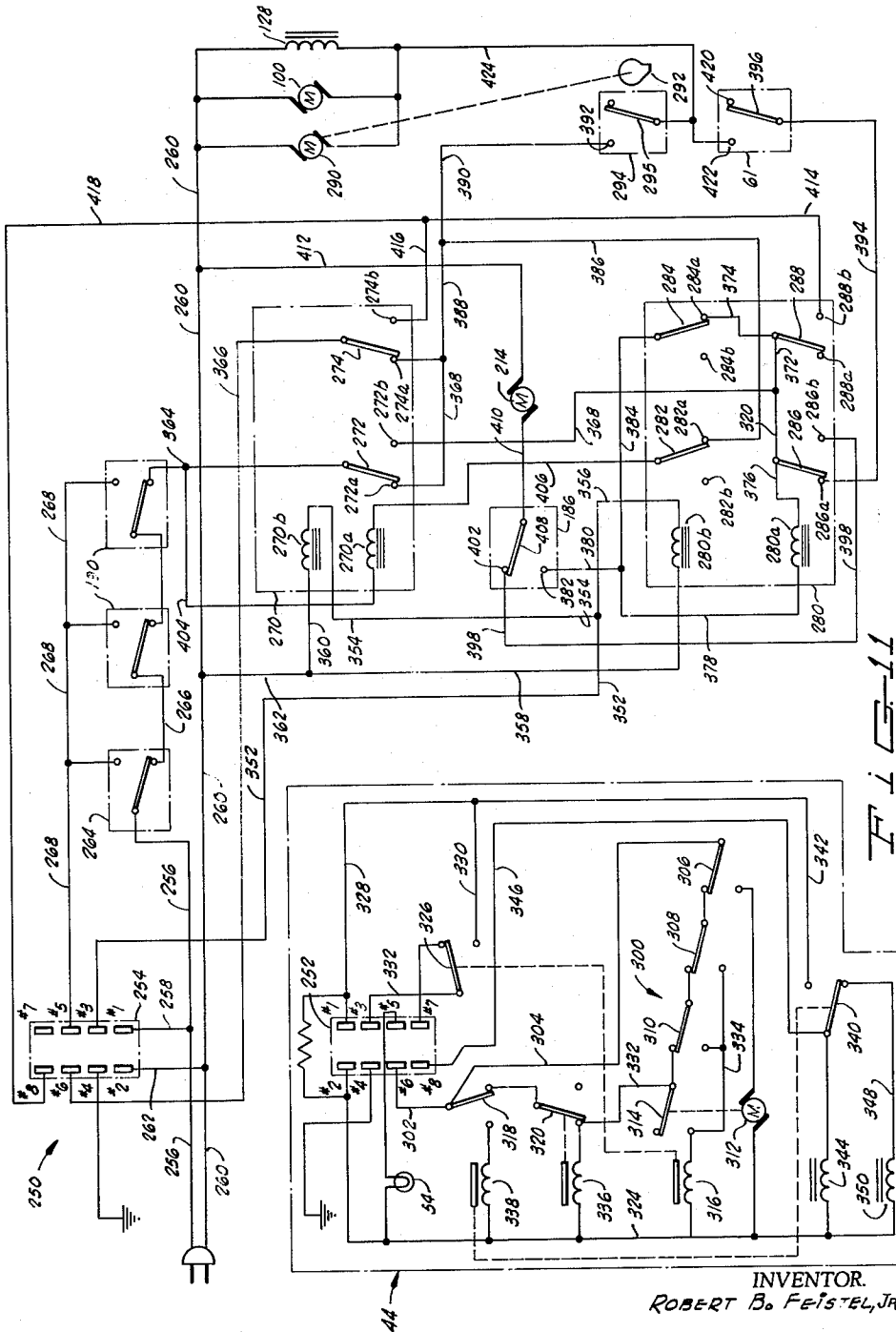
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3,207,366

ICE CUBE MAKING AND VENDING MACHINE

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4 Sheets-Sheet 4



1

3,207,366 ICE CUBE MAKING AND VENDING MACHINE

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Filed Dec. 3, 1962, Ser. No. 241,738
7 Claims. (Cl. 222-2)

The present invention relates to vending machines and more particularly, but not by way of limitation, relates to an ice making and vending apparatus, which continually manufactures a supply of ice and upon the deposit of a predetermined value in coins automatically dispenses a receptacle and permits the acquisition, at the will of the customer, of a predetermined volume of ice sufficient to fill the receptacle, and further relates to various novel subcombinations of the vending machine having utility as hereafter described.

As is well known, coin-operated machines are presently used for vending bags of crushed ice which have been manufactured and packaged at an ice plant, then transported to remote vending stations located more conveniently to the ultimate consumer. This type of operation requires considerable manual labor and attention in order to maintain a supply of sacked ice in the storage vault in addition to the cost of packaging the ice and transporting the bags to the remote localities.

Automatic ice making machines have also been reduced to practice and are in widespread use. One such automatic ice making machine is manufactured and marketed by "Frigidaire" and the ice cubes are sometimes sold under the trademark "Party-Kubes." The present invention contemplates the combination of such an ice making machine with a novel coin operated dispensing mechanism, and the particular embodiment of the dispensing mechanism is particularly adapted and dimensioned for use in combination with the "Frigidaire" ice making machine. Generally speaking, the ice maker operates by first freezing a rectangular layer of ice of considerable size, but relatively small thickness, by running water over a sloping refrigeration plate. When the layer of ice reaches a predetermined thickness, a switch is actuated which reverses the refrigeration cycle and warms the refrigeration plate. The layer of ice then slides down the sloping refrigeration plate onto a crossed wire grid. The refrigeration cycle is reversed once again so that another layer of ice will be formed on the sloping refrigeration plate. Meanwhile, the first layer of ice is cut into small cubes by the wire grid which is slightly warmed by an electrical current. When the relatively heavy layer of ice has forced its way through the wire grid, the resulting cubes of ice fall downwardly into a refrigerated storage bin. When the bin is substantially full of ice cubes, a feeler switch stops operation of the ice making cycle. When ice is removed from the storage bin to such an extent that the ice falls below a predetermined level, the ice making cycle is automatically started once again so as to maintain a predetermined supply of ice in the storage bin at all times, so long as the ice making capacity of the particular machine is not exceeded. Heretofore, these ice making machines have been used by restaurants to make ice for their own needs, by motels where it is desired to provide a free supply of ice to guests, and by various retail organizations where the ice can first be packaged then vended, or where an attendant is continuously on duty to package and sell the ice.

Therefore, it is an important object of the present invention to provide, in combination, an automatic ice making and vending machine which may be positioned at a remote spot and which will make and sell ice without attendance by a salesman.

Another important object of the present invention is to

2

provide an ice vending machine which is readily adaptable for combination with any type of bulk storage bin for ice or other particulate material.

Yet another object of the present invention is to provide an ice vending machine of the type described which will automatically dispense a plastic bag container to a customer upon receipt of a predetermined value of coins, and then will dispense a predetermined quantity of ice to fill the bag at the command of the customer.

Another object of the present invention is to provide a bag dispensing machine for dispensing one plastic bag from a plurality of plastic bags stored as a roll.

Yet another object of the present invention is to provide an improved bag dispensing machine of the type described which is very compact and yet will contain a large quantity of bags.

Still another object of the present invention is to provide a mechanism for dispensing a predetermined quantity of ice cubes from a storage bin at the command of a customer.

A still further object of the present invention is to provide an ice dispensing mechanism of the type described which efficiently prevents the entrance of warm air into the cold storage bin during operation of the device.

Yet another object of the present invention is to provide an ice dispensing apparatus of the type described which can be started and stopped any number of times by the customer, but which will nevertheless dispense a predetermined quantity of ice.

Many additional objects and advantages of the present invention will be evident to those skilled in the art from the following detailed description and drawings, wherein:

FIG. 1 is a perspective view of an automatic ice making and dispensing machine combination constructed in accordance with the present invention;

FIG. 2 is a front view of the cover of the vending machine of FIG. 1 showing the relative positions of the bag dispensing and coin receiving mechanisms in dotted outline;

FIG. 3 is a plan view, partially in section, of the ice dispensing mechanism with the bag dispensing mechanism and the coin receiving mechanism removed;

FIG. 4 is a vertical sectional view taken substantially on section line 4-4 of FIG. 3;

FIG. 5 is a vertical sectional view of the bag dispensing mechanism of the device of FIG. 1 taken on the staggered section line 5-5 of FIG. 6;

FIG. 6 is a front view, partially in section, taken substantially on the staggered section line 6-6 of FIG. 5;

FIG. 7 is a perspective view of a roll of bags which are dispensed by the bag dispensing mechanism illustrated in FIGS. 5 and 6;

FIG. 8 is a transverse sectional view through one of the bags from the roll of bags of FIG. 7;

FIG. 9 is a side view of the joint between two successive bags on the roll of FIG. 7;

FIG. 10 is a plan view of a valve mechanism for closing the spout of the material dispensing device of FIG. 1; and,

FIG. 11 is a circuit diagram of the electrical circuit control means for the device of FIG. 1.

Referring now to the drawings, and in particular to FIGS. 1 and 2, an automatic ice making and vending machine constructed in accordance with the present invention is indicated generally by the reference numeral 10. The device 10 is comprised of the combination of a standard automatic ice making machine, indicated generally by the reference numeral 12, which may be any one of those presently available on the market. However, that ice machine illustrated is manufactured and marketed by "Frigidaire," and comprises an upper

3

ice making unit 14, which is positioned on top of a combination cold storage bin and refrigeration unit 16. A support base 18 is also available in the event it is desired to raise the machine to a more convenient level.

The ice making unit 14 continually and automatically produces ice cubes in the manner previously described and maintains the cold storage bin of the unit 16 substantially full at all times. The cold storage bin, indicated generally by the reference numeral 20, occupies that portion of the unit 16 above the dotted line 22 in FIG. 1, and has a bottom 24, a back wall 26, a front wall 28, and two side walls 30, as best seen in FIGS. 3 and 4. The cold storage bin 20 is provided with an access opening in the front wall 28, as defined by the bottom edge 32 and the top edge 34 in FIG. 4 and the side edges 36 and 38 in FIG. 3.

A novel vending unit constructed in accordance with the present invention is indicated generally by the reference numeral 40. The dispensing unit 40 has an external cover 42 which houses a conventional coin receiving unit 44. The coin receiving unit 44 may be of any conventional design and may be bolted or otherwise suitably connected to a chassis plate 46 (see FIG. 4). Coins are deposited through a slot 47 in the cover 42 and are received in a coin hopper 48, as shown in dotted outline in FIG. 2. A coin return button 50 can be pressed to secure coins deposited by mistake, which are returned at the coin slot 52. A suitable signal light 54 may be provided to indicate when the vending device is inoperative or sold out, as will hereafter be described in greater detail. The cover 42 may be removed by inserting a key in keyholes 56 disposed on either side of the cover 42 so that the vending device may be repaired and in order to gain access to the interior of the storage bin 20. Plastic bags are dispensed through a slot 58 in the cover 42 by a bag dispensing unit 60 which will hereafter be described in greater detail. A manually operated "vend" button 61 is disposed adjacent to an ice delivery spout 62 so that a customer can control operation of the ice dispensing mechanism presently to be described. A shelf 64 is supported by the chassis plate 46 and side plates 66 to assist the customer by supporting the bag as it is being filled by ice dispensed from the spout 62.

Referring now to FIGS. 3 and 4, the ice dispensing mechanism constructed in accordance with the present invention for removing ice from the storage bin 20, is indicated generally by the reference numeral 70. The ice dispensing mechanism 70 is comprised of a pan 72 having an outline as best seen in FIG. 3, around which an integral upturned peripheral side wall 74 extends. It will be noted that the side wall 74 is substantially circular around the back side and has an upper lip or flange 75 extending therearound. A support leg 76 is provided at the rear of the pan 72 and engages the bottom 24 of the storage bin 20 to support the rear end of the dispensing device 70. The forward edge of the pan 72 rests on the lower edge 32 of the opening in the wall 28 and one or more brackets 78 are provided to prevent unauthorized removal of the pan 72 from the bin. The pan 72 passes through an elongated, rectangular slot in the chassis plate 46 and is rigidly connected to the chassis plate 46. An insulated door 80 is connected to the chassis plate 46 and to the pan 72 and fills the remainder of the opening in the front wall 28.

One or more locking means, indicated generally by the reference numeral 81, are provided to secure the dispensing mechanism 70 in place. Each locking means 81 is comprised of a lever 82 connected to a shaft 84 which extends through and is journaled in the door 80. A cam 86 is connected to the innermost end of the shaft 84 and engages the interior surface of the wall 28 adjacent the edge 34 of the opening to secure the device 70 in place when the lever 82 is pivoted. Thus it will be noted that when the pan 72 and door 80 are inserted through the opening in the front wall 28, as illustrated in FIGS. 3

4

and 4, the pan will rest on the lower edge 32 and the leg 76, and will be retained within the bin 20 by the brackets 78 and the cams 86. Then when the cover 42 is secured in place by the key, the dispensing apparatus cannot be removed from the storage bin 20 by vandals.

An ice dispensing wheel 88 is journaled on an upright spindle 90 which is rigidly connected to the center of the pan 72. The dispensing wheel 88 has a thickness substantially as illustrated such that a plurality of passageways 91 extending through the periphery of the wheel form, acting in concert with the bottom of the pan 72, a series of pockets into which ice cubes will enter by gravity from the bin. The dispensing wheel 88 is fabricated from a pair of similar circular discs 92 and 94 which are stamped from sheet metal in circular form with center apertures for receiving a bearing sleeve 96 and peripheral apertures for receiving tubular sleeves 98 which form the passageways 91. The two discs 92 and 94 may be assembled by soldering or welding the bearing sleeve and tubular sleeves 98 in place to complete the dispensing wheel 88.

The dispensing wheel 88 is rotated by a motor 100 which drives a positive traction drive belt 102. The drive belt 102 passes around a drive sprocket 104 on the shaft of the motor 100 and around each of the tubular sleeves 98, as best illustrated in FIG. 3. An idler sheave 105 may be connected to the wall 74 of the pan 72 for maintaining the desired tension in the drive belt 102. The dispensing opening 106 is provided in the bottom of the pan 72 and is so spaced from the axis of rotation of the wheel 88 as to register with each of the passageways 91 in the outer periphery of the wheel 88 as the wheel is rotated. An upper dispensing spout 108 is connected to the underside of the pan 72 around the opening 106 and is aligned with the lower dispensing spout 62 which may be connected to a lower chassis plate 109. An air valve 110 for closing the lower end of the upper spout 108 in order to assist in preventing warm air from entering the storage bin 20 and also prevent vandals from tinkering with the internal parts of the mechanism, is mounted on the lower chassis plate 109 and operates between the spouts 108 and 62.

The air valve 110 is shown in detail in the plan view of FIG. 10, and is comprised of two shutter halves 112 and 114 which are journaled on upright spindles 116 and 118, respectively, for movement in a horizontal plane. The shutter 112 has a lever arm portion 120 which extends beyond the spindle 116. A linkage arm 122 is pivotally connected to the lever portion 120 and to the other shutter member 114 by pivot pins 124 and 126, respectively. The armature 129 of a solenoid 128 is connected to a second linkage arm 130 which in turn is pivotally connected to the first shutter member 112 by a third pivot pin 132. A suitable coil spring 134 is connected to the housing of the solenoid 128 by a suitable bracket 135 and to the second shutter member 114 by an angle bracket 136.

When the solenoid 128 is energized, the armature 129 will be moved to the left when referring to FIG. 10. The linkage 130 will then pivot the shutter half 112 counterclockwise about the pivot spindle 116. This motion will in turn, by means of the linkage arm 122, pivot the shutter half 114 clockwise about the spindle 118 such that the shutter members 112 and 114 will be moved in opposite directions and completely open the upper dispensing spout 108. When the solenoid 128 is deenergized, the coil spring 134 will rotate the right hand shutter member 114 counterclockwise and, due to the linkage arm 122, rotate the left hand shutter member 112 clockwise to close the shutter members to the position illustrated in FIG. 10.

An agitator device, indicated generally by the reference numeral 140, is comprised of an elongated, flattened arm 142 which is journaled on an eccentrically located, upright spindle 144 on the wheel 88. An elongated slot

5

146 in the arm 142 receives a pin 148 which is connected to the flange 75 of the pan 72. A pair of upstanding flange portions 149 and 150 are interconnected by a cross member 152 to form a scratcher portion projecting above the elongated member 142. Thus it will be noted that as the wheel 88 is rotated about the spindle 90, for purposes hereafter described in greater detail, the elongated member 142 and the scratcher portion connected to the outer end thereof will be oscillated and will tend to agitate the ice cubes within the storage bin 20 and prevent the cubes from forming a frozen bridge across the dispensing wheel 88.

Referring now to FIGS. 5 and 6, the plastic bag dispensing apparatus 60 has a chassis formed of sheet metal and comprised of a back plate portion 160, two side plate portions 162 and 614, the latter being shown only in dotted outline in FIG. 6, and two forward flange plate portions 166 and 168 which are bent at 90 degrees to the side portions 162 and 164, respectively, and are therefore disposed parallel to the back plate 160 and serve as stiffeners. A plurality of plastic bags 170, as hereafter described in greater detail, are stored on a spool 172 having a pair of stub axles 174. A pair of U-shaped brackets 176 and 178 are connected to the side plates 162 and 164, respectively, and have a shape substantially as shown in dotted outline in FIG. 5 for receiving the stub axles 174 and rotatably supporting the spool 172. After the plastic bags 170 pass from the back side of the spool 172, they pass between an idler roller 180 and a curved guide plate 182, as best seen in FIG. 5, extend horizontally above the guide plate 182, pass between an anvil 184 and a feeler switch 186 and then pass around a second idler roller 188. A pair of "bag empty" switches 190 are held in closed position when the rollers 192 ride on the plastic bags 170. However, when the end of the last bag 170 passes, or the bags for any reason become misaligned, the rollers 192 drop into slots 194 in the guideplate 182 and open the switches 190 to discontinue operation of the vending machine, as will hereafter be described in greater detail. The height of the anvil 184 is preferably adjustable by a suitable mechanism 196 so that the feeler switch 186 can be actuated when the bottom seam of each bag 170 passes between the feeler switch and the anvil 184, as will hereafter be described in greater detail.

The plastic bags 170 pass upwardly from the idler roller 188 to the drive mechanism, indicated generally by the reference numeral 200. It will be noted that if the roll of bags 170 is sufficiently large, that portion of the bags extending between the idler roller 188 and the drive mechanism 200 will roll on the bags on the spool 172. The drive mechanism 200 is comprised of a drive roller 202, three idler rollers 204, 206 and 208 all of which are rotatably mounted between the side plate portions 162 and 164 of the chassis, and an endless belt 210 having a width slightly greater than that of the plastic bags 170. The center idler roller 206 is preferably slidably mounted in channels on the side plate portions 162 and 164, one of the channels being represented by the dotted outline 212 in FIG. 5, and is spring biased so as to eliminate slack and maintain a constant tension in the endless belt 210 during operation of the drive mechanism. A suitable electric motor 214 drives a gear train 216 which in turn drives the roller 202. A second guide member 218 interconnects the side plate portions 162 and 164 and serves as a brace as well as a support for the plastic bags being dispensed through the aperture 58 in the cover 42.

Referring now to FIGS. 7, 8 and 9, the plastic bags 170 are preferably fabricated from a circular sleeve of thermoplastic material having a long length. The circular sleeve is folded substantially as shown in FIG. 8 with pleated sides 170a and flat sides 170b. A heat welded seam 170c extends transversely across the sleeve of bag material at uniformly spaced points and each welded seam forms the bottom of a plastic bag 170. A perforation 170d is dis-

6

posed very close to the weld 170c and provides a means whereby each individual bag 170 may be easily separated from the remainder of the roll of bags. A plastic tie string 171 is also connected to each bag 170 by the thermoplastic welded seam 170c and is provided with the perforation 171a which may be easily broken such that each tie string 171 may be used to tie the upper end of the respective bag after it has been filled with ice, as hereafter described in greater detail. In brief summary, it will be noted that the continuous length of plastic bags 170 leaves the roller and passes between the anvil 184 and the feeler switch 186 before being dispensed by the drive mechanism 200. Each time that the raised, welded seam 170c passes between the anvil 184 and the feeler switch 186, the bag dispensing mechanism drive motor 214 will be stopped by control circuitry presently to be described, such that only one bag at a time will be dispensed through the slot 58 in the cover 42. The dispensed bag can easily be torn along the perforation 170d. The drive mechanism 200 will prevent any other bags from being pulled from the roller.

Referring now to FIG. 11, circuit means for controlling the operation of the ice making and vending device 10 is indicated generally by the reference numeral 250. Those parts of the device 10 which have been previously described are indicated by the same reference numerals in the schematic diagram of FIG. 11. Thus the coin receiving mechanism is that portion within the dotted outline designated by the reference numeral 44, and includes a multiple contact plug 252 which is inserted in a similar multiple contact socket 254 to unite the circuitry of the coin receiving device 44 and the remainder of the circuitry for controlling the device 10. The mating terminals of the plug 252 and socket 254 are designated by the corresponding numbers #1-8, it being understood that in the completed circuit the plug 252 is mated with the socket 254 so as to complete the electrical circuit. Terminals #1 and #2 are connected across a conventional 110 volt A.C. source by conductors 256 and 258, and 260 and 262, respectively. The conductor 256 is connected to the switchblade of an ice detector switch 264 which is positioned in the storage bin 20 and which is closed so long as there is a sufficient supply of ice, and completes a circuit through a conductor 266 to the bag detector switches 190 of FIGS. 5 and 6, which are closed by the presence of a bag 170 as previously described. When the ice detector switch 264 or either of the bag detector switches 190 is open due to the absence of ice or bags, a circuit is completed from the conductor 256 through conductor 268 to terminal #5 and through the "empty" indicator light 54 back to terminal #2 and to conductor 260.

It will also be noted that the bag seam feeler switch 186 and the bag dispenser drive motor 214, both shown in FIGS. 5 and 6, the manual vend switch 61 shown in FIGS. 1 and 2, the ice vend drive motor 100 shown in FIGS. 3 and 4, and the solenoid 128 shown in FIG. 10 are also included in the circuit diagram of FIG. 11. In addition, a synchronous timing motor 290 drives a timing cam 292 which in turn actuates a timing switch 294, as hereafter described in greater detail.

A first relay 270 has a pair of switchblades 272 and 274 which are moved between contacts 272a and 272b, and 274a and 274b, respectively, by a pair of solenoids 270a and 270b. Thus it will be noted that the respective switchblades are moved against the a contacts when the solenoid 270a is energized and will remain in that position until the solenoid 270b is energized, at which time the respective switchblades will be moved against the b contacts, where they will remain until such time as the solenoid 270a is again energized. A second relay 280 of the same type has actuating solenoids 280a and 280b which move four switchblades 282, 284, 286 and 288 between a and b contacts 282a-282b, 284a-284b, 286a-286b and 288a and 288b, respectively, when energized. It will be noted that the switchblades 286 and 288 move in opposite directions to the switchblades 282 and 284 and accordingly the a and

b contacts are also reversed. All switchblades are illustrated in normal position which will be taken to mean the position prior to actuation of the device 10 by coins deposited by a customer.

The coin receiving apparatus 44 has a coin counting or so-called "stepper switch," indicated generally by the reference numeral 300, which is energized from terminal #6 by the conductors 302 and 304. The stepper switch 300 has a series of switchblades 306, 308 and 310 which are tripped by a predetermined number and denomination of coins. Assuming for the moment that the terminal #6 is energized by connection to terminal #1, as will hereafter be described, when the switch 306 is tripped the solenoid motor 312 will be energized and thereby close the switchblade 314. The vend solenoid 316 will then be energized through the circuit from terminal #6 through manually actuated cancel switchblade 318, solenoid actuated holding switchblade 320 and conductor 322 and then through conductor 324 which is connected to terminal #2 and therefore to conductors 262 and 260 and back to the source. Energization of the solenoid 316 will then actuate switchblade 326 to move from the open terminal #7 and connect terminal #1 to terminal #3 by means of conductors 328, 330 and 332 and thereby initiate a vend cycle of the device 10, as will hereafter be described. If either one of the switchblades 308 or 310 is actuated by smaller coins, a circuit will be completed directly through conductor 334 to the solenoid 316 to close the switchblade 326 and connect terminal #1 to terminal #3. In the event it is desired to cancel the deposit of coins at some point in time before the correct total has been deposited, the button 50 in FIGS. 1 and 2 may be pressed by the customer to move the switchblade 318 and break the circuit through switchblade 320 and through the coin return solenoid 336, whereby the deposited coins will be returned to the customer. At the same time, the circuit will be completed by the switchblade 318 through solenoid 338 to terminal #2 and will close switchblade 340 to conductor 342 and thereby energize the solenoid 344 to reset the stepper switch 300 to receive additional coins. Also, the movement of the switchblade 340 opens a circuit from terminal #8 through conductor 346, conductor 348 and a solenoid 350 which, when otherwise subsequently energized as hereafter described, would irretrievably pass the deposited coins into the cash box.

Terminal #3 which is energized upon closing of the switchblade 326 to the conductor 330, is connected by conductors 352, 354 and 356 to energize the solenoids 270*b* and 280*b* of the relays 270 and 280, respectively. The circuits through the solenoids 270*b* and 280*b* are completed to conductor 260 by conductors 358 and 360, respectively, each of which is connected to conductor 362 and thence to conductor 260.

Switchblade 272 is connected to power conductor 256 through the ice detector switch 264, the conductor 266 and the two bag detector switches 190, and conductor 364. Switchblade 274 is connected to terminal #6 by conductor 366. Contacts 272*a* and 274*a* are interconnected by conductor 368 such that terminal #6 and the stepper switch 300 will be energized as previously described when the switchblades 272 and 274 are in the positions illustrated. Contact 272*b* is connected to switchblades 286 and 288 by conductor 368 and conductors 370 and 372, respectively. The switchblade 288 is also connected to contact 284*a* by conductor 374. Switchblade 286 is connected by conductor 376 to solenoid 280*a* which in turn is connected by conductor 378 and conductor 380 to the normally open contact 382 of the bag feeler switch 186, and also by conductor 384 to switchblade 284. Contact 282*a* is connected by conductors 386, 388 and 368 to contacts 272*a* and 274*a*. A conductor 390 also connects the normally open contact 392 of the timing switch 294 to the three contacts 272*a*, 274*a* and 282*a*. Contacts 282*b*, 284*b* and 288*a* are open. Contact 286*a* is connected by conductor 394 to the switchblade 396 of the manual vend

switch 61. Contact 286*b* is connected by conductor 398 to the normally closed contact 402 of the bag seam feeler switch 186. Conductor 404 connects the solenoid 270*a* to conductor 364, while conductor 406 connects the solenoid 270*a* to switchblade 282. The switchblade 408 of the bag seam feeler switch 186 is connected by conductor 410 to the bag dispensing drive motor 214 which in turn is connected by conductor 412 to conductor 260. Contact 288*b* is connected by conductors 414 and 416 to contact 274*b*. Both contacts 274*b* and 288*b* are then connected by conductor 418 to terminal #8. The switchblade 396 of the manual vend switch 61 is normally biased against the open contact 420. The normally open contact 422 is connected by conductor 424 to energize the timing motor 290, the ice vend drive motor 100, and the solenoid 128, the circuit from each device being completed to conductor 260.

Operation

During normal operation, the ice storage bin 20 will be maintained substantially full by the automatic ice making machine 14. Any time the supply of ice within the storage bin 20 drops below a predetermined level, the ice making machine 14 will automatically be actuated and will continue to operate until the bin 20 is filled to the predetermined level, at which time it will automatically shut down. The ice detecting switch 264 (shown in FIG. 11) is preferably located at a low point within the storage bin 20 so as to remain closed as long as there is a sufficient supply of ice within the storage bin to satisfy one full dispensing cycle. Also, as long as both of the bag detector switches 190 are held in raised position by the bags 170, the switchblades will be in the positions indicated to properly energize the electrical circuit means 250 in such a manner as to dispense ice, as will presently be described. However, if either of the bag detector switches 190 or the ice detecting switch 264 is moved to the other position so as to complete a circuit to terminal #5, the "empty" signal light 54 will be illuminated and the device will not operate. When this occurs, coins deposited in the slot 47 by the customer will be held in escrow until such time as the deposit is cancelled by pressing the button 50 to close the switchblade 318 and de-energize the solenoid 336. The coins cannot be irretrievably delivered from escrow into the cash box because the switchblade 274 cannot be moved to contact 274*b* due to the open circuit created by the open detector switch and the solenoid 350 cannot be energized, as will presently be described, to transfer the coins to the cash box.

Assume now that the three detector switches are satisfied. All switchblades will then be in the positions illustrated in FIG. 11. The stepper switch mechanism 300 will be energized through conductor 256, detector switches 264 and 190, conductor 364, switchblade 272, conductor 368, switchblade 274, conductor 366, terminal #6, and conductors 302 and 304. When the correct change is deposited in the slot 47, the solenoid 316 will be energized to close the switchblade 326 to the conductor 330 and thereby connect terminal #3 to terminal #1. In the specific circuitry illustrated, a quarter will close switchblade 306 and energize the motor 312 to close the switchblade 314 and thereby energize the solenoid 316. The correct combination of nickels and dimes will close either the switchblade 308 or the switchblade 310 and directly energize the solenoid 316. When terminal #3 is connected to terminal #1 by closing of contact 326, solenoids 270*b* and 280*b* will be energized through conductors 352, 354 and 356, the circuits being completed by conductors 358, 360 and 362 back to the conductor 260. All switchblades of the relays 270 and 280 will then be moved to the *b* contacts.

Switchblade 272 will then complete a circuit through contact 272*b*, conductors 368 and 370 to switchblade 286. Since switchblade 286 is moved against contact 286*b*, a circuit will be completed through conductor 398,

contact 402, switchblade 408 and conductor 410 to the bag dispenser drive motor 214, the circuit being completed by conductor 412 to the conductor 260. At the same time, switchblade 274 closes against contact 274b and completes a circuit through conductors 416 and 418 to terminal #8 and then through conductor 346, switchblade 340 and conductor 348 to the solenoid 350 which irretrievably passes the coins from the escrow chamber into the cash box. The reset solenoid 344 is also energized to reset the tripped switchblade of the stepper switch 300 and thereby de-energize the solenoid 316 and return the contact 326 to the open terminal #7. Of course, this simultaneously de-energizes the solenoids 270b and 280b of the corresponding relays. However, the switchblades of the respective relays 270 and 280 remain in position against the b contacts and the dispensing cycle continues as follows.

Upon energization of the bag dispensing drive motor 214, the drive roller 202 and consequently the endless belt 210 are set in motion in a clockwise direction when referring to FIG. 5. The endless length of bags 170 is held firmly between the takeup roller 206 and the endless belt 210 and is pulled from the spool 172 around the rollers 180 and 188 and dispensed over the guide member 218 and out the slot 58. When the next succeeding seam 170c passes between the anvil 184 and the bag seam feeler switch 186, the switchblade 408 will be moved away from the contact 402 and complete a circuit with contact 382. The bag dispenser drive motor 214 will continue to be energized through the circuit from the switchblade 272, contact 272b, conductors 368, 370 and 376, solenoid 280a, conductors 378 and 380, and switchblade 408. Thus the bag dispensing drive motor 214 will continue to operate until the seam 170c has passed the anvil 184 and the switchblade 408 has again left the contact 382 and returned to the contact 402. However, when the switchblade 408 closed against the contact 382 and the overrun current was fed to the drive motor 214, the solenoid 280a was also energized through the same circuit such that the switchblades of the relay 280 were moved back to the a contacts, thereby breaking the circuit through contact 286b to the contact 402 of the bag feeler switch 186 such that the bag dispensing drive motor will not continue to operate.

The customer then tears the dispensed plastic bag along the perforation 170d. The bag is then opened and placed under the dispensing spout 62. Since the solenoid 280a has again been energized, the switchblade 286 completes the circuit from switchblade 272, which is still against contact 272b, through contact 286a and conductor 394 to the switchblade 396 of the manual vend switch 61. Therefore, after the bag is positioned under the spout 62, the vend switch 61 is pressed to urge the switchblade 396 against the contact 422 and simultaneously complete a circuit through the conductor 424 to the timing motor 290, the drive motor 100 and the solenoid 128. The timing motor 290 is a synchronous motor and rotates the cam 292 by means of a suitable shaft. Until the cam 292 has rotated sufficiently to close the switchblade 295 of the timing switch 294 against the contact 392, the timing motor 290, the drive motor 100 and the solenoid 128 will continue to be energized so long as the vend button 61 is held depressed by the customer. However, should the customer have trouble filling the bag and desire to stop the vending operation at any point, he can do so simply by releasing the vend button 61. Then the timing motor 290 as well as the drive motor 100 will stop and the customer will be assured of receiving the full portion of ice upon pressing the vend switch 61 once again because the timing cam 292 rotates only when the vend button 61 is pressed and the drive motor 100 is operating.

When the solenoid 128 is energized by closing of the switchblade 396, the linkage 130 will be pulled towards the solenoid 128 and will open the shutter members 112

and 114 by rotating them in opposite directions about the pivot spindles 116 and 118, as previously described. At the same time, energization of the drive motor 100 will cause rotation of the dispensing wheel 88 in the counterclockwise direction when referring to FIG. 3, and ice cubes which have entered the passageways 91 in the periphery of the wheel 88 will fall into the dispensing spouts 108 and 62 as the passageways 91 pass over the opening 106 in the pan 72. As the respective passageways register with the opening 106, the ice will fall through the spout 62 into the plastic bag held by the customer. During rotation of the wheel 88, the agitator 140 will be reciprocated in an oval path, as previously described, and tend to cause the ice piled upon the agitator and upon the wheel 88 to fall into the passageways 91.

The constant speed of rotation of the timing cam 292 is such that a predetermined quantity of ice will be dispensed by the constant speed wheel 88 sufficient to substantially fill the plastic bag before the cam biases the timing switchblade 295 against the contact 392. When the timing switchblade 295 completes a circuit through the contact 392, the solenoid 270a will be energized through the circuit comprised of conductor 404, the solenoid 270a, conductor 406, switchblade 282, contact 282a, conductors 386 and 390, switchblade 295, conductor 424, and the parallel circuits of the timing motor 290, drive motor 100 and solenoid 128 to the conductor 260. This, of course, instantly moves the switchblades 272 and 274 against the a contacts. The timing motor 290 overruns first through the circuit just described for energizing the solenoid 270a and then also through the shifted switchblades 272 and 274 until the timing switch 294 again opens. Then the timing motor 290, drive motor 100 and solenoid 128 are de-energized because the switchblade 272 is now open and the circuit through the switchblade 286 and manual vend switchblade 396 is broken. When this sequence is completed, all relays are in the original positions and the vending device is ready for another vending cycle. The customer may then use the strip 171 to tie the top of the plastic bag so as to facilitate transportation of the newly purchased ice.

From the above detailed description of a preferred embodiment of the present invention, it will be evident to those skilled in the art that a highly novel and useful automatic ice making and vending machine has been described. The machine will continue to make and dispense ice without assistance or supervision as long as a supply of plastic bags is available within the bag dispensing apparatus. Although specifically designed for dispensing ice, it will be understood that the subcombination vending device is very compact and can easily be adapted to vend any particulate material from any storage bin of comparable size. The vending apparatus, by reason of its novel stamped sheet metal construction, can be economically manufactured. The vending device is highly reliable and substantially vandal-proof. Only one bag is dispensed at a time from the novel and compact dispensing unit which will hold several hundred plastic bags each of considerable length and capacity. A predetermined quantity or volume of ice or other particulate material is dispensed even though the customer may find it convenient or necessary to stop the dispensing operation and attend to readjustment of the bag or to other matters at hand.

Although a particular embodiment of the present invention has been described in detail, it is to be understood that various changes, substitutions and alterations can be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

1. An automatic ice making and vending machine comprising, in combination:
automatic ice making means having a cold storage bin for the ice;

- electrically controllable ice dispensing means for dispensing the ice from the storage bin;
 manually operable electric circuit means operatively connected to the ice dispensing means for controlling operation of the ice dispensing means throughout a predetermined period of time;
 electrically controllable bag dispensing means for dispensing a single bag;
 coin receiver means; and,
 automatic circuit means operatively connected to the coin receiver means, to the bag dispensing means, to the manually operable electric circuit means and to the ice dispensing means, the automatic circuit means being operative responsive to the deposit of coin in the coin receiver means to sequentially actuate the bag dispensing means, energize the manually operable circuit means so that the material dispensing means may be manually operated, and automatically de-energize and render the ice dispensing means inoperative after a predetermined period of manual operation.
2. A machine for vending particulate material from a storage bin, the machine comprising:
 electrically controllable material dispensing means for dispensing the material from the storage bin;
 manually operable circuit means operatively connected to the material dispensing means for controlling operation of the material dispensing means throughout a predetermined period of time;
 electrically controllable container dispensing means for dispensing a single container for the particulate material;
 coin receiver means; and,
 automatic circuit means operatively connected to the coin receiver means, to the container dispensing means, to the manually operable circuit means and to the material dispensing means, the automatic circuit means being operative responsive to the deposit of coin in the coin receiver means to sequentially actuate the container dispensing means, energize the manually operable circuit means so that the material dispensing means may be manually operated, and automatically de-energize and render the material dispensing means inoperative after a predetermined period of manual operation.
3. An automatic ice making and vending machine as set forth in claim 1 wherein said storage bin having an access in the sidewall thereof and said ice dispensing means comprise:
 a door for closing the access opening in the bin;
 a horizontally elongated slot in the door;
 a generally horizontally disposed plate extending through the slot in the door into the interior of the bin;
 a dispensing opening in the plate outside the bin;
 a dispensing wheel rotatably journaled on the plate and disposed in close sliding relationship thereto, the wheel extending through the elongated slot into the interior of the bin and extending over the dispensing opening in the plate;
 a plurality of passageways extending through the periphery of the wheel and aligned to register with the dispensing opening in the plate; and,
 drive means for rotating the wheel whereby particulate material within the bin will enter the passageways and be removed from the bin by rotation of the wheel and will fall downwardly through the dispensing opening as the respective passageways register with the dispensing opening.
4. An automatic ice making and vending machine as defined in claim 3 wherein the dispensing wheel is comprised of:
 a pair of substantially identical sheet metal discs having a plurality of openings around the outer periphery and a central opening, disposed in parallel relation-

- ship with the corresponding openings aligned, a tubular sleeve having a cross sectional configuration corresponding to the configuration of the peripheral openings in the discs disposed around each of the aligned openings in the periphery of the discs and interconnecting the discs to form the passageways therethrough, and a bearing sleeve aligned with the central openings in the discs and interconnecting the discs to form a bearing for journaling the wheel upon the plate.
5. An automatic ice making and vending machine as set forth in claim 1 wherein said bag dispensing means comprises:
 an elongated sheath of material having a plurality of transversely disposed, longitudinally spaced seams and means between each of the seams for permitting easy transverse separation of the sheath adjacent one of the seams to form a bag;
 means for supporting the elongated sheath;
 electrically powered drive means for moving the sheath by a detection point to a dispensing point;
 detection means for detecting the passage of each transverse seam by the detection point; and,
 electrical circuit means operatively connected to the electrically powered drive means and to the detection means for starting operation of the drive means and for automatically stopping operation of the drive means upon passage of a predetermined number of seams by the detection point,
 whereby a predetermined number of bags will be delivered to the dispensing point each time the drive means is started.
6. An automatic ice making and vending machine as set forth in claim 1 wherein said bag dispensing means comprises:
 a spool;
 an elongated sheath of material rolled around the spool, the sheath having a plurality of transversely disposed, longitudinally spaced seams of greater thickness than the sheath and means between each of the seams for permitting easy transverse separation of the sheath adjacent one of the seams to form a bag;
 means for supporting the spool for rotation;
 idler roller means for guiding the sheath by a detection point;
 electrically powered drive means for pulling the sheath from the spool over the idler roller means by the detection point and delivering the end of the sheath to a dispensing point;
 detection means for detecting the passage of each transverse seam by the detection point; and,
 electrical circuit means operatively connected to the drive means and to the detection means for starting operation of the drive means and for automatically stopping operation of the drive means upon passage of a predetermined number of seams by the detection point,
 whereby a predetermined number of bags will be delivered to the dispensing point each time the drive means is started.
7. An automatic ice making and vending machine comprising, in combination:
 automatic ice making means having a cold storage bin for the ice and an access opening in the side of the bin;
 a door for closing the access opening in the bin;
 a horizontally elongated slot in the door;
 a generally horizontally disposed plate extending through the slot in the door into the interior of the bin;
 a dispensing opening in the plate outside the bin;
 a dispensing wheel rotatably journaled on the plate and disposed in close sliding relationship thereto, the wheel extending through the elongated slot into

the interior of the bin and extending over the dispensing opening in the plate;
 a plurality of passageways extending through the periphery of the wheel and aligned to register with the dispensing opening in the plate;
 5 drive means for rotating the wheel whereby ice within the bin will enter the passageways and be removed from the bin by rotation of the wheel and will fall downwardly through the dispensing opening as the respective passageways register with the dispensing opening;
 10 manually operable electric circuit means operatively connected to control said dispensing drive means throughout a predetermined period of time;
 a chassis frame connected to the door;
 15 an elongated sheath of material having a plurality of transversely disposed, longitudinally spaced seams and means between each of the seams for permitting easy transverse separation of the sheath adjacent one of the seams to form a bag;
 20 means connected to the chassis frame for supporting the elongated sheath;
 electrically powered drive means for moving the sheath by a detection point to a dispensing point;
 25 detection means for detecting the passage of each transverse seam by the detection point;
 electrical circuit means operatively connected to the electrically powered drive means and to the detection means for starting operation of the drive means and for automatically stopping operation of the drive means upon passage of a predetermined number of seams by the detection point;
 30 coin receiver means; and,
 automatic circuit means operatively connected to the coin receiver means, to the bag dispensing means, to the manually operable electric circuit means and to the ice dispensing means, the automatic circuit means being operative responsive to the deposit of

coin in the coin receiver means to sequentially actuate the bag dispensing means, energize the manually operable circuit means so that the material dispensing means may be manually operated, and automatically de-energize and render the ice dispensing means inoperative after a predetermined period of manual operation.

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