

[54] **ICE DISPENSER FOR
FREEZER-REFRIGERATORS AND THE
LIKE**[76] Inventor: **John J. Pink**, 519 33rd St. N.E.,
Cedar Rapids, Iowa 52404[22] Filed: **Jan. 16, 1974**[21] Appl. No.: **433,901**[52] U.S. Cl. **222/146 C, 222/370, 222/407**[51] Int. Cl. **B67d 5/62**[58] Field of Search 221/75, 243, 168, 265,
221/263, 260; 222/146 C, 336, 337, 370,
410, 406, 407; 62/266[56] **References Cited****UNITED STATES PATENTS**

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Primary Examiner—Robert B. Reeves*Assistant Examiner*—Joseph J. Rolla*Attorney, Agent, or Firm*—Haven E. Simmons; James
C. Nemmers[57] **ABSTRACT**

An ice dispenser for use with an ice maker in a freezer-refrigerator or the like employs a lift wheel with a series of compartments about its periphery. The compartments lift pieces of ice from a reservoir, into which the ice maker empties, and discharge them piece-by-piece through an elevated outlet. The partitions between the compartments of the wheel are formed by blades of resiliently flexible material which operate against the inner surface of a housing enclosing the wheel to reduce noise and breakage of ice. The shape of the upper portion of the housing and the resiliently flexible blades also cooperate to help discharge the ice pieces through the outlet.

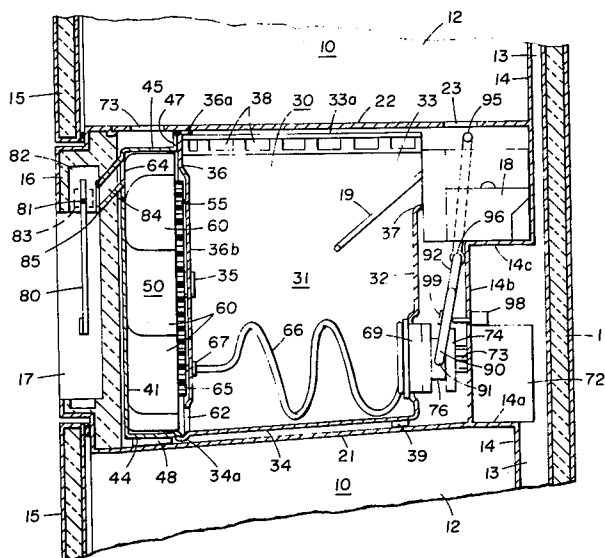
8 Claims, 7 Drawing Figures

FIG 7

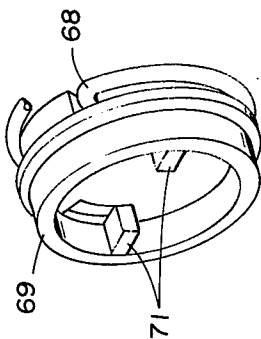


FIG 6

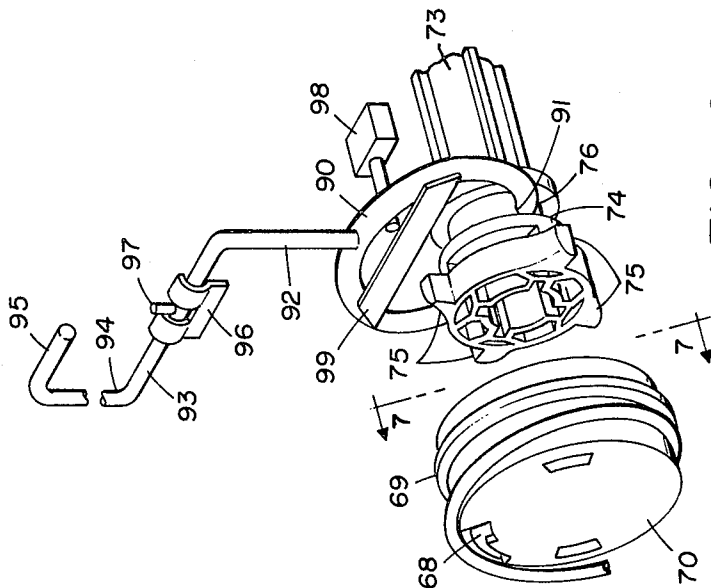
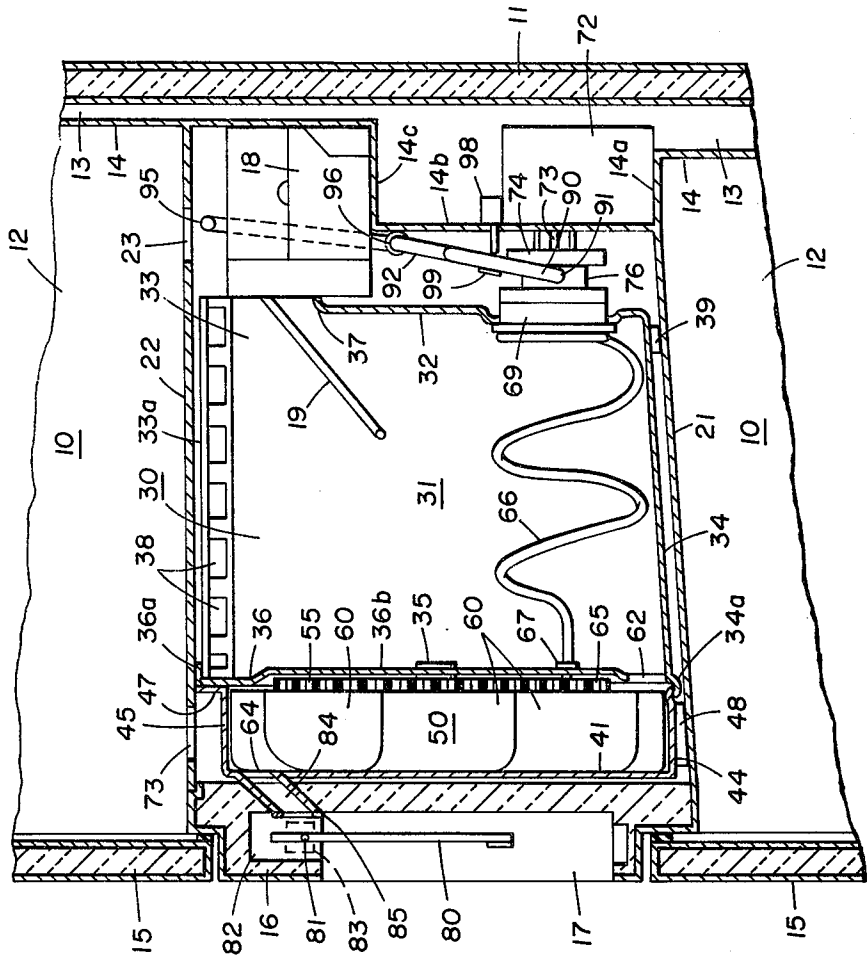


FIG 1



SHEET 2 OF 3

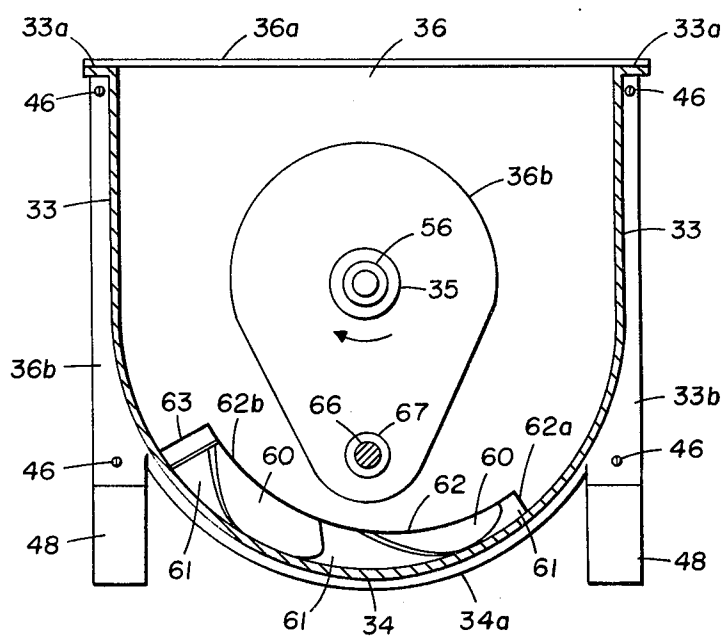


FIG 3

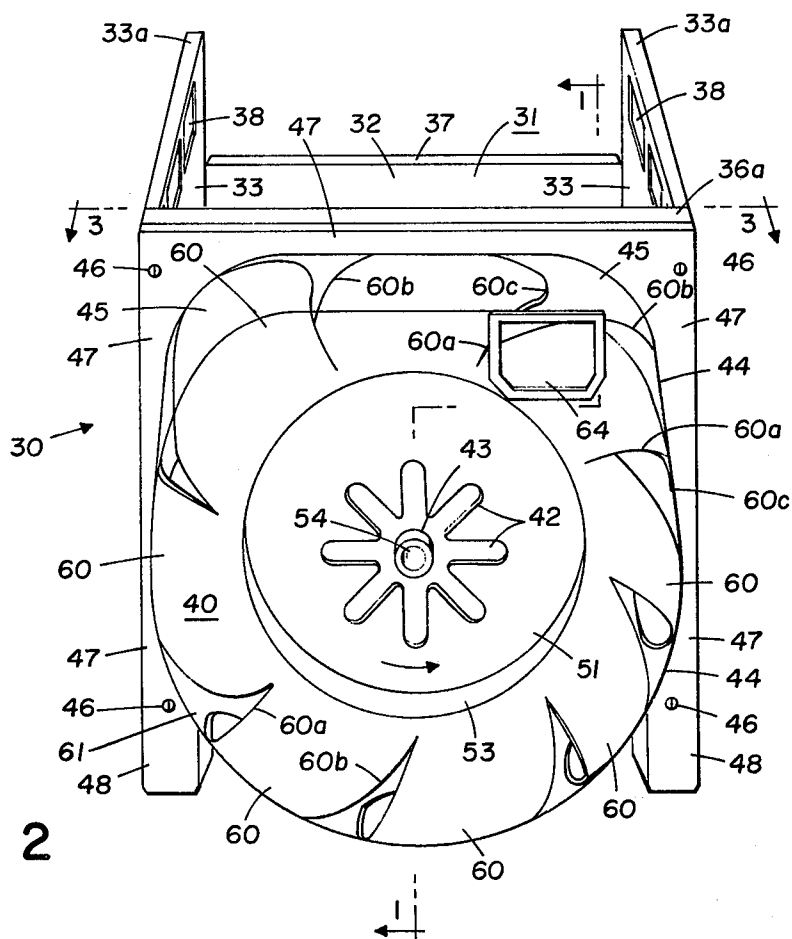


FIG 2

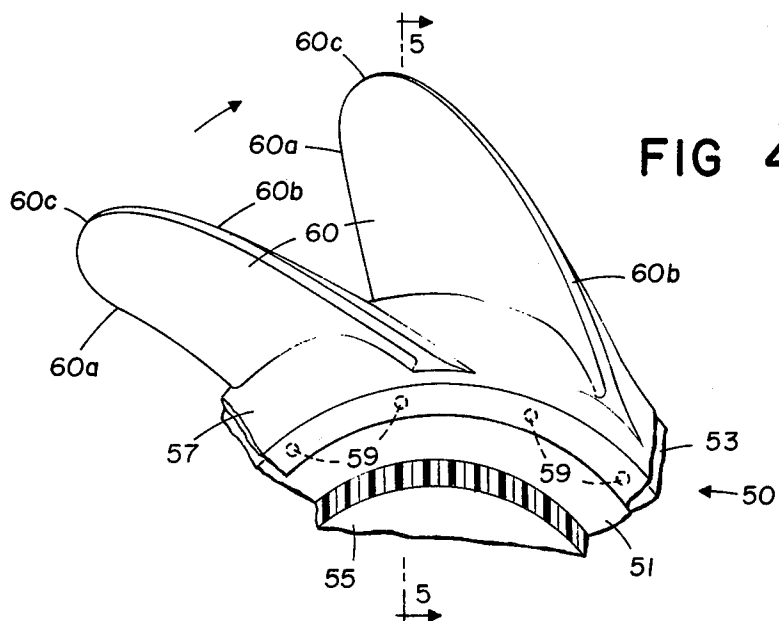
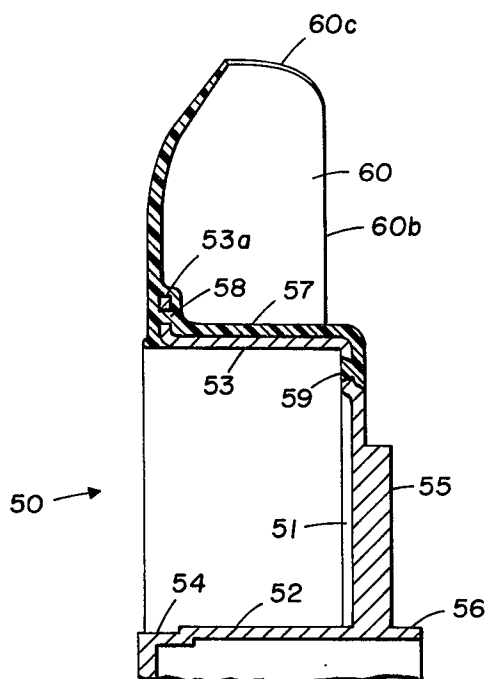


FIG 5

ICE DISPENSER FOR FREEZER-REFRIGERATORS AND THE LIKE

BACKGROUND OF THE INVENTION

The co-pending application of John J. Pink et al., Ser. No. 271,797, filed July 14, 1972, now U.S. Pat. No. 3,798,923, discloses an ice dispenser employing a wheel which lifts ice pieces from a lower reservoir to and through an upper outlet. As shown and described in that application, the wheel itself is an alloy casting having on its periphery a series of radially extending transverse fins which form walls partitioning the circumference of the wheel into a series of compartments. The wheel is mounted within a housing on the front wall of the reservoir and during its rotation the lower compartments pick up ice pieces from an inlet thereto through the bottom of the reservoir front wall. As the wheel rotates, the ice pieces are carried up and discharged through an outlet in the upper portion of the front wall of the wheel housing.

Subsequent experience with that wheel has revealed certain difficulties, among which are noise and breakage of ice caused by the pieces getting caught between the edges of the inlet or outlet and those of the fins of the wheel as the latter rotates. Sometimes particles of crushed ice even collected in the bottom of the wheel housing and solidified, impeding turning of the wheel. Hence, the chief object of the present invention is an improved ice dispenser of the type indicated in which the aforesaid difficulties are eliminated or reduced.

SUMMARY OF THE INVENTION

The foregoing object is achieved by making the partition walls of the wheel compartment in the form of blades of resilient, flexible material rather than of rigid material as is the remainder of the wheel. For this purpose, the underlying wheel is molded from a rigid material such as polycarbonate, while over its peripheral surface is molded a polyurethane assembly which partitions the periphery of the lift wheel into compartments. The partitions themselves are blade like and extend from the periphery of the wheel in a generally trailing direction, with respect to the direction of wheel rotation, and their outer end portions are further turned in the same direction so that their surfaces wipe the inner peripheral surface of the wheel housing. Additionally, the blades are angled with respect to the axis of the wheel so that their rear edges are in leading relation to their front edges, also with respect to the direction of wheel rotation. The wheel housing is itself modified so that the upper portion of its peripheral surface is somewhat squared off to provide a pair of corners at opposite sides of the housing, the ice outlet being located in the front wall of the housing at the leading one of the two flattened corners. The ice inlet to the wheel through the bottom of the front wall of the reservoir is formed in the shape of an arcuate opening extending from one side to the other of the bottom reservoir wall and increasing in size from its leading to its trailing end with respect to the direction of wheel rotation.

The flexibility of the blades permits the ice pieces to be picked up thereby and manipulated through the ice inlet into the lift compartments and then discharged through the outlet with little or no noise or breakage. This is because the tendency of the blades, as they pass the edges of the ice inlet and outlet, to shear or catch on the ice pieces is greatly reduced, the blades instead

simply flexing to accommodate the pieces as they pass through the inlet and outlet. The corner of the wheel housing adjacent the ice outlet causes the blades to flex in a manner and direction which, together with the angle of the blades with respect to the housing front wall, causes the ice pieces to be positively ejected from the compartments through the outlet as the wheel rotates. In addition, the flexibility of the blades allows them to accommodate any ice that may become jammed in the wheel housing. Other and further features and advantages of the present invention will become apparent from the more detailed description which follows and the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical section view through the freezer compartment of a typical side-by-side freezer-refrigerator showing the ice dispenser of the invention installed therein, the view of the dispenser itself being taken approximately along the line 1—1 of FIG. 2.

FIG. 2 is an upper perspective view of the front of the ice dispenser itself.

FIG. 3 is a section view taken along the line 3—3 of FIG. 2.

FIG. 4 is a detail isometric view of a portion of the ice dispenser lift wheel.

FIG. 5 is a section view taken approximately along the line 5—5 of FIG. 4.

FIG. 6 is a partially exploded view of the releasable coupling connecting the dispenser to the drive motor.

FIG. 7 is an isometric view taken from the line 7—7 of FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in FIG. 1, the freezer compartment 10 of a side-by-side freezer-refrigerator includes a rear cabinet wall 11 and side walls 12 (only one of which is shown). Chilled air for the compartment 10 is supplied through a duct 13 formed against the rear wall 11 by a vertical partition 14. The compartment 10 is closed by a pair of upper and lower doors 15 and a fixed panel 16 between the latter having a front recess 17, all as shown in the aforementioned patent of John J. Pink. The duct wall 14 opposite the lower edge of the panel 16 is forwardly stepped to provide a ledge 14a, then carried upwards at 14b and finally rearwardly stepped opposite the upper portion of the panel 16 to provide a second ledge 14c. Upon the latter sits a transversely positioned automatic ice maker 18, having a ice level sensing arm 19. A shelf 21 extends forwardly from the ledge 14a to the lower edge of the panel 16 and a removable shelf 22 extends horizontally forward from above the ice maker 18 to the upper edge of the panel 16. Within the space thereby enclosed is located the ice dispenser, which space is supplied with chilled air through slotted inlets 23 in the upper shelf 22.

The dispenser 30 consists of a molded ice reservoir 31 having an open front, and a rear wall 32 and side walls 33, the latter flanged at 33a along their top edges. The front edges of the side walls 33 are flanged at 33b down to approximately where they merge into an arcuate bottom wall 34 generally concentric with respect to a bushing 35 centrally located in a partition 36, overlapping the flanges 33b, whose lower portion is received in a forwardly extending lip 34a along the front of the bottom wall 34. The top edge of the partition 36

is itself flanged at 36a which overlaps the side wall top flanges 33a. The upper edge of the rear wall 32 terminates in a lip 37 below the body of the ice maker 18 so that the latter can empty into the reservoir 31, and the side walls 33 are provided with inlets 38 along their tops for circulation of chilled air into the reservoir 31, the rear end of the latter being supported on the shelf 21 by legs 39 integral with the bottom wall 34.

To the outer face of the partition 36 is mounted a generally cylindrical, molded lift wheel housing 40 having a front wall 41 which is indented to provide a series of strengthening ribs 42 extending radially from an inset integral bushing 43 axially aligned with the bushing 35 of the partition 36, the latter in effect forming the rear wall of the housing 40. The peripheral wall 44 of the housing 40 is concentric with the bushings 36 and 43 except that its upper portions adjacent the top edges of the reservoir side walls 33 are formed with a lesser radius than that of the remainder of the wall 44 in order to provide a pair of opposite "corners" 45, all as indicated in FIG. 2 in which for purposes of clarity the housing 40 is shown as if it were of transparent material. The housing 40 is secured by screws 46 through a flange 47 on the rear edge of the peripheral wall 44 which overlaps the corresponding margins of the partition 36 and so fastens the latter and the housing 40 to the reservoir 31 through the side wall flanges 33b. The lower end of the flange 47 is carried down to provide a pair of legs 48 which support the front end of the dispenser 30 on the shelf 21.

Within the housing 40 is disposed the ice lift wheel 50 which includes a disc or spider 51 with a hollow hub 52 and flanged rim 53 extending forwardly therefrom, all integrally molded of polycarbonate. The forward end of the hub 52 is necked down to form a journal 54 which is received in the bushing 43 in the housing front wall 41. The rear of the hub 52 extends through a large driven gear 55 molded integrally on the rear face of the spider 51, and terminates in a sleeve 56 which is journaled in the bushing 35, the drive gear 55 itself being accommodated in a shaped offset 36b in the housing rear wall 36. Over the rim 53 is molded a polyurethane assembly including an outer sleeve 57, tucked under the forward edge of the rim 53, and anchored thereto through a series of ports 58 in a flange 53a on the rim 53. The sleeve 57 is then carried around over the rear edge of the rim 53 and anchored to an inset in the rim of the spider 51 by means of a series of tapered ports 59 therethrough (one of which is shown in FIG. 5). From the outer periphery of the sleeve 57 and integral therewith extend a series of flexible blades 60 whose roots cross the sleeve 57 at a skewed angle, as best shown in FIG. 4, such that their forward edges 60a are in trailing relation to their rear edges 60b with respect to the direction of rotation of the wheel 50 indicated by the arrows in FIGS. 2, 3 and 4. In addition, as indicated in FIGS. 2 and 4, the blades 60 partially overlap each other, are somewhat cupped toward their indicated direction of rotation, and their respective edges 60a and 60b are tapered and formed with rounded tips 60c. Within the housing 40 the blades 60 extend transversely between and wipe the housing walls 36 and 41, and are maintained bent in their trailing direction by the housing peripheral wall 44, as shown in FIG. 2, so that their tips 60c at all times wipe the interior of the latter. The housing 40 and the blades 60 thus form a series of ice holding compartments 61 (see FIG. 3)

spaced circumferentially about the wheel 50. The housing rear wall 36, at its juncture with the bottom wall 34, is cut away to provide an arcuate ice inlet 62 extending roughly across the bottom wall 34 between the side walls 33 as shown in FIG. 3. The inlet 62 increases in height from its leading end 62a to its trailing end 62b with respect to the indicated direction of wheel rotation, the trailing end 62b being provided with an integral deflector 63 bent back from the housing rear wall 36 into the interior of the reservoir 31. A generally rectangular ice outlet 64 through the housing front wall 41 is located just below the leading corner 45, with respect to the indicated direction of wheel rotation, of the housing peripheral wall 44.

The lift wheel 50 is driven in the direction indicated by means of a pinion gear 65 below the gear 55 and accommodated in a lower extension of the offset 36b just above the inlet 62. The pinion gear 65 is fixed to the forward end of a wire-formed helix 66 journaled in a bushing 67 in the housing rear wall 36. The helix 66 extends rearwardly along the reservoir bottom wall 34, its rear end being fixed at 68 to the periphery of a driven bushing 69 journaled in the reservoir rear wall 32. The inner end of the bushing 69 is closed at 70 while the interior of its outer, open end is provided with a pair of opposite driven dogs 71 (see FIG. 7). The dispenser 30 sits on the shelf 21 beneath the shelf 22, and to the rear of the duct wall 14b is secured a drive motor 72 whose output shaft is equipped with an externally splined, forward extension 73 axially aligned with the dispenser driven bushing 69. Slidably mounted on the extension 73 is an internally splined drive bushing 74 fitting within the bushing 69 and provided on its periphery with four drive dogs 75, which engage the driven dogs 71 when the bushing 74 is slid forwardly to within the bushing 69, and a peripheral groove 76 for purposes later described. The drive faces of the dogs 71 and 75 are angled so that when in driving engagement, torque tends to pull the bushing 74 within the bushing 69. Hence, the motor 72 and the bushings 69 and 74 drive the helix 66 and, through the gears 55 and 65, the lift wheel 50 in the direction indicated by the arrows.

The motor 72 is energized when a container or the like is thrust against the lower end of a vertical arm 80, pivoted at 81 at its upper end in a pocket 82 in the panel 16 above the recess 17, which closes a switch 83 in series with the motor 72. The helix 66 then moves the ice in the bottom of the reservoir 31 forwardly against the housing rear wall 36, as well as agitating the remaining pieces to break apart those which have cohered. Some ice is thus pushed into the wheel compartments 61 through the inlet 62, the rear edges 60b of the blades 60, the arcuate extent and increasing height of the inlet 62, as well as the deflector 63, all contributing to this end. Instead of catching or shearing ice pieces only partially through the inlet 62, the flexible, resilient blades 60 and the deflector 63 cooperate to work the pieces through the inlet 62 or, if they fail, simply to push them aside in favor of the other pieces which then present themselves, all with relatively little noise and commotion. Once in the compartments 61 the ice is carried up to the outlet 64. At this point, the blade tips 60c reach the leading corner 45 of the housing wall 44 which permits the blades 60 to flex or straighten somewhat with the result that they "eject" the ice toward the outlet 64 owing to their skewed angle on the wheel 50. Again, the flexible, resilient nature of the blades 60

prevents shearing of the ice between the forward blade edges 60a and those of the outlet 64. If the pieces are not "ejected" straightway, the blades 60 may nevertheless gently work them out or, failing this, simply carry the pieces full circle around the housing 40 for another attempt. In that event the trailing corner 45 of the housing wall 44 causes a second flexing of the blades 60 which allows any ice trapped therebetween to be re-oriented, partly by gravity, as the ice passes the trailing corner 45 and descends the down side of the wheel 50.

From the dispenser outlet 64, the ice enters a discharge passage 84 which slants down through the panel 16 and emerges through the rear wall of the pocket 82, the forward or lower end of the passage 84 being normally closed by an outwardly swinging trap door 85. The latter may open of its own accord by the weight of the ice descending the passage 84 or may be linked to the arm 80 to be opened positively when the arm 80 is pushed. In that case, a suitable dash-pot or the like may be incorporated to delay closing of the door 85 after the arm 80 is released and the drive motor 72 halted in order to assure that the passage 84 is free of ice before the door 85 closes. Also, the passage 84 may be provided with a suitable heater to prevent sweating and to melt ice chips becoming lodged therein.

The dispenser 30 is removable for cleaning or repair simply by taking off the shelf 22 and lifting the unit up and then out of the freezer compartment 10 after raising the sensing arm 19 and disconnecting the drive bushings 69 and 74. For the latter purpose, the groove 76 of the bushing 74 is embraced by a yoke 90, having ends 91 turned radially into the groove 76, secured to the bottom of an upright lever arm 92. The latter above the yoke 90 is cranked first horizontally to provide a second arm 93 extending toward the adjacent cabinet side wall 12, then upwardly to form a third arm 94 between the side wall 12 and the ice maker 18, and finally reversely over the ice maker 18 to provide a handle 95. The arm 93 is journaled in a split plate 96 secured to the front face of the partition 14b and laterally located by a stop pin 97 operative in the split of the plate 96. When the handle 95 is pulled forwardly, the yoke 90 forces the bushing 74 rearwardly on the extension 73 until clear of the bushing 69, whereupon the dispenser 30 is free for removal. In order to shut down the ice maker 18 and render the drive motor 72 inoperative when the dispenser 30 is removed, a switch 98 in series with both is located behind the duct wall 14b above the motor 72, its plunger being activated by a plate 99 across the yoke 90 whenever the handle 95 is forward and the bushings 69 and 74 disengaged.

Though the invention has been described in terms of a particular embodiment, being the best mode known of carrying out the invention, it is not limited to that embodiment alone. Instead, the following claims are to be read as encompassing all adaptations and modifications of the invention falling within its spirit and scope.

I claim:

1. In an ice dispenser for use with refrigeration apparatus, the dispenser having an ice reservoir effective to receive pieces of ice from an ice maker, the reservoir including an upstanding front wall, a rear wall and a bottom wall interconnecting the front and rear walls, a power drivable ice lift wheel mounted outside of the reservoir front wall for rotation in one direction about an axis extending forwardly from said front wall, a lift wheel housing mounted forward of the reservoir front

wall and including a front wall and a peripheral wall enclosing the lift wheel, a plurality of compartments for holding ice pieces disposed peripherally about the lift wheel, the compartments being formed by the reservoir front wall, the housing front and peripheral walls and a plurality of spaced compartment partition walls extending between the lift wheel periphery and the housing peripheral wall and transversely of and between the reservoir and housing front walls, the compartments opening rearwardly toward the reservoir front wall and forwardly toward the housing front wall, means in the reservoir effecting movement of ice pieces therein toward the reservoir front wall, an ice inlet through the reservoir front wall effective so that the ice moving means also impels pieces of ice in the reservoir through the ice inlet into lower ones of the lift wheel compartments during said rotation of the wheel, and an ice outlet through the housing front wall communicating with upper ones of the lift wheel compartments during said rotation of the wheel, the lift wheel compartments being effective to transport ice pieces received therein from the ice inlet up to the ice outlet and to discharge the same therethrough during said rotation of the wheel, the improvement wherein said partition walls comprise blades formed of resiliently flexible sheet material carried by the lift wheel.

2. The ice dispenser of claim 1 wherein each of the blades includes a rearward edge portion adjacent the reservoir front wall and a forward edge portion in resilient contact with the housing front wall, the forward edge portion being disposed in trailing relation to the rearward edge portion with respect to said direction of rotation of the lift wheel.

3. The ice dispenser of claim 2 wherein the upper portion of the housing peripheral wall is formed with a lesser radius at two peripherally spaced locations to provide a pair of corner portions disposed in leading and trailing relation to each other on said wall with respect to said direction of rotation of the lift wheel, the ice outlet being disposed in the housing front wall at the leading one of said corner portions, the blades having outer end portions in resilient contact with the peripheral wall of the housing during said rotation of the lift wheel.

4. The ice dispenser of claim 3 wherein the housing peripheral wall maintains the outer end portions of the blades curvilinearly deflected in a direction opposite to said direction of rotation of the lift wheel.

5. The dispenser of claim 4 wherein the forward portion of the reservoir bottom wall is substantially concentric with the lift wheel, and the ice inlet comprises an arcuate opening in the reservoir front wall extending circumferentially with respect to the lift wheel from one side to the other of the bottom wall, said opening increasing in size from the leading to the trailing end thereof with respect to said direction of rotation of the lift wheel.

6. The ice dispenser of claim 5 including an ice piece deflector disposed at said trailing end of the ice inlet and operative upon pieces of ice partially therethrough into the lift wheel compartments, the deflector curving rearwardly from the reservoir front wall effective in conjunction with said rotation of the lift wheel to deflect said ice pieces the remainder of the way into the lift wheel compartments.

7. The ice dispenser of claim 5 wherein the ice moving means is power driven and comprises a helix ex-

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tending between the reservoir front and rear walls, the forward end of the helix being operatively associated with the lift wheel for driving rotation thereof in said direction, and wherein the dispenser includes a source of power having an output shaft and means for releasably connecting the output shaft to the rear end of the helix for driving rotation thereof about its axis.

8. The ice dispenser of claim 7 wherein the releasable connecting means comprises a cylindrical driven member journaled for rotation in the rear wall of the reservoir, the rear end of the helix being fixed to the forward end of the driven member, the rear end of the driven member having an axially extending cylindrical recess

therein opening through the rear wall of the reservoir, the inner peripheral surfaces of the recess being provided with driven dogs, and a drive member fixed to the power source output shaft for driving rotation thereby, the outer peripheral surface of the drive member being provided with drive dogs engageable with the driven dogs of the driven member for driving rotation thereof, the drive member being axially movable upon the power source output shaft for engagement and disengagement of the drive dogs with the driven dogs, and manually operable means for effecting said movement of the drive member.

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