

Aug. 10, 1965

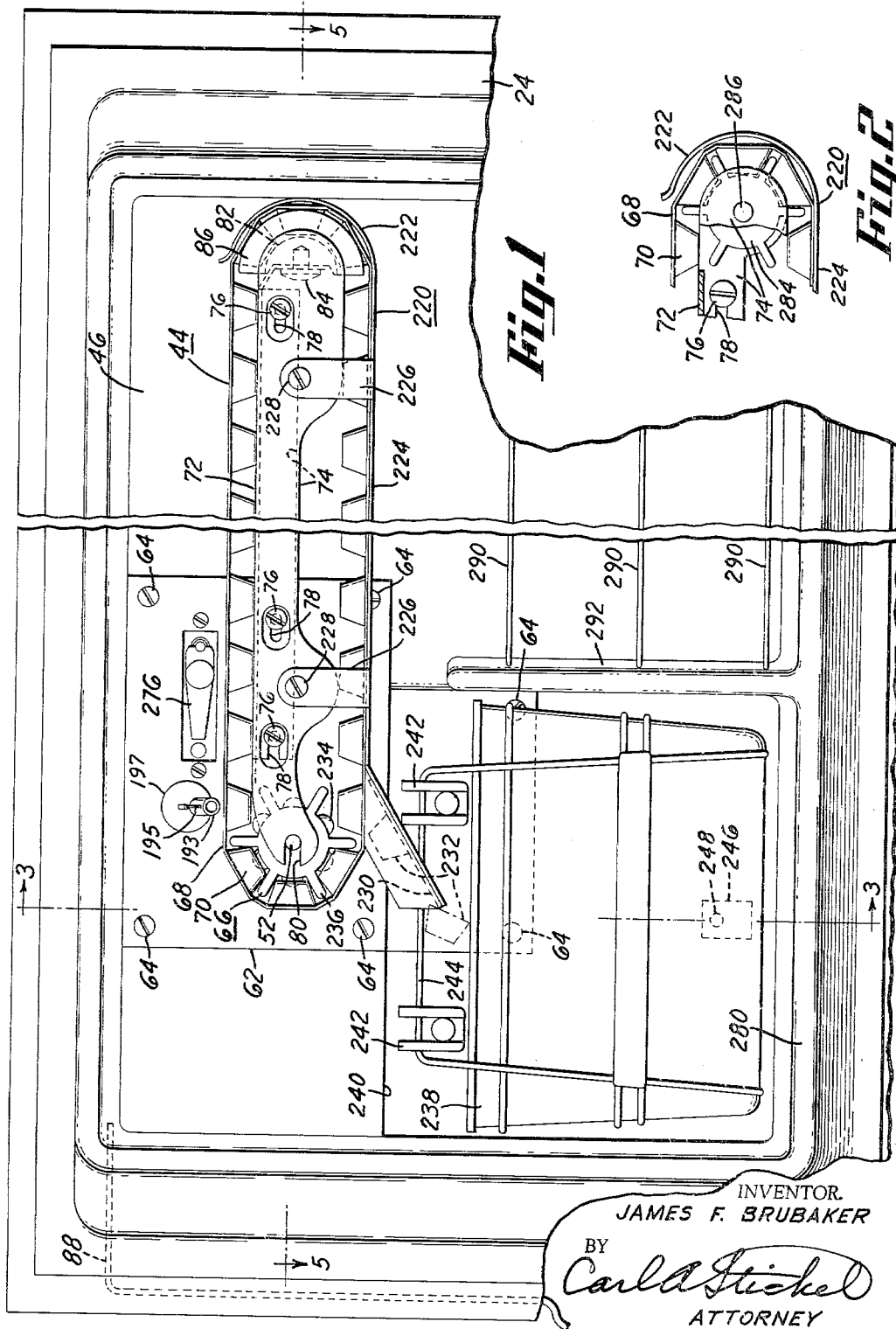
J. F. BRUBAKER

3,199,309

ICE MAKER OF THE ENDLESS FLEXIBLE BELT TYPE

Filed Oct. 29, 1962

4 Sheets-Sheet 1



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ICE MAKER OF THE ENDLESS FLEXIBLE BELT TYPE

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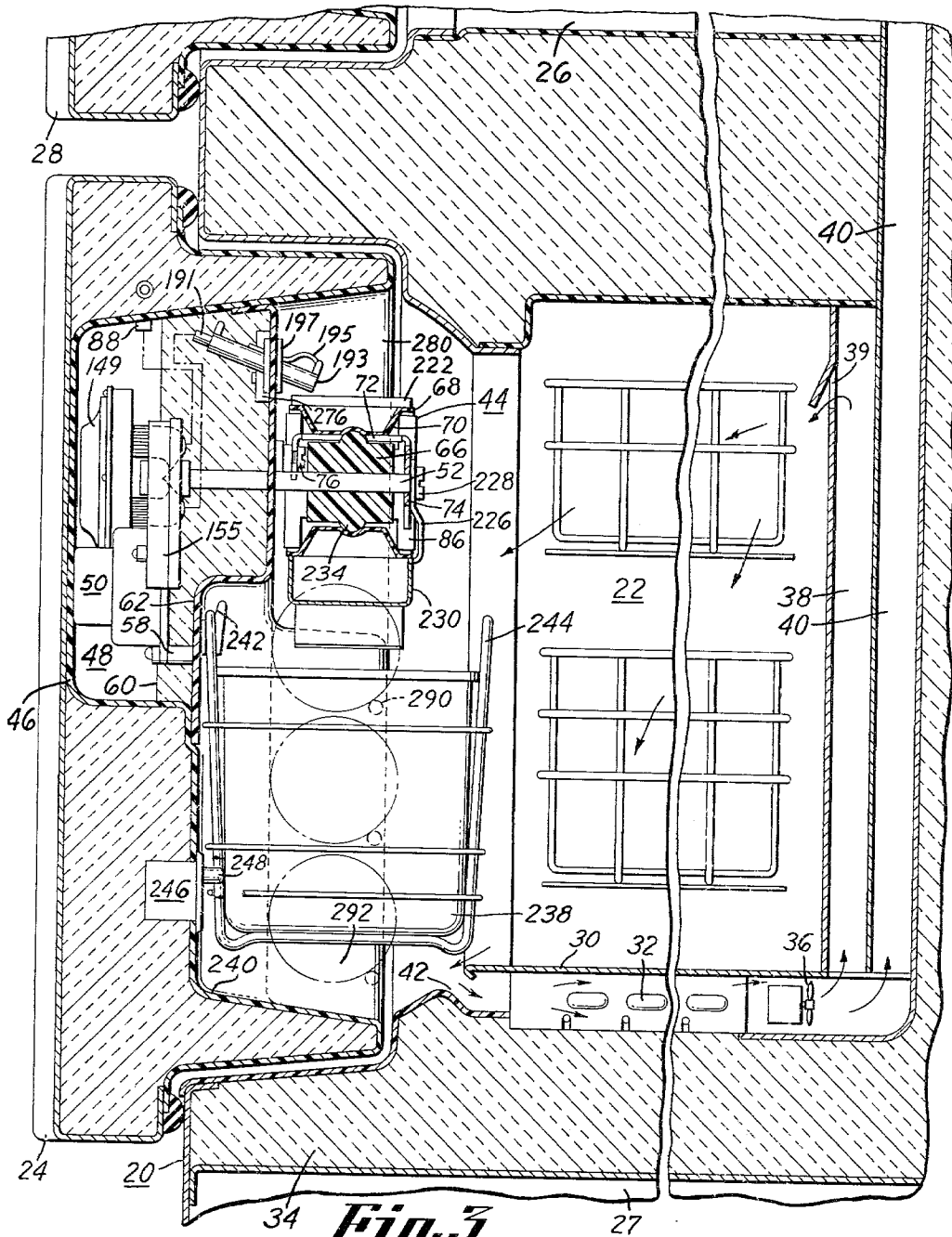


Fig. 3

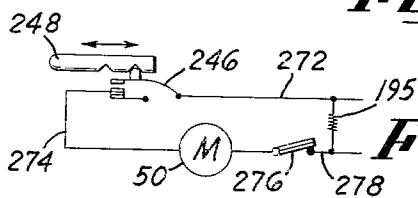


Fig. 4

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Fig. 5

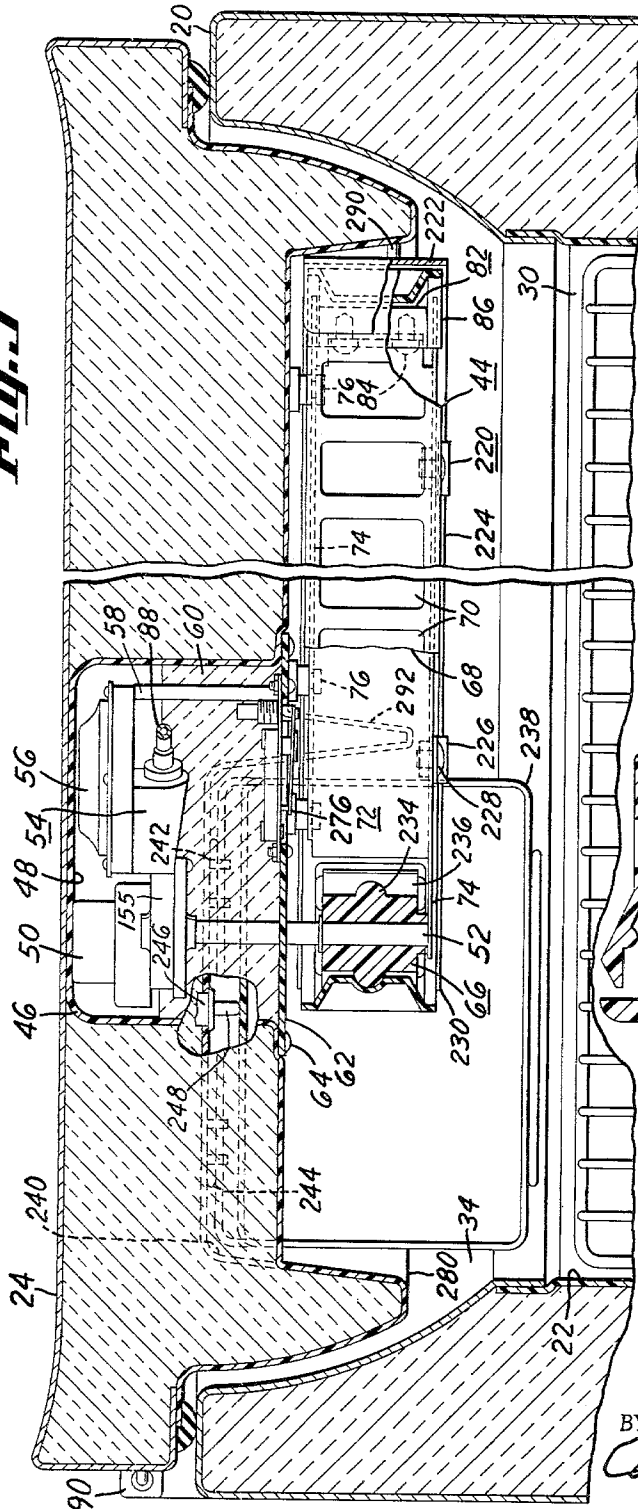


Fig. 7

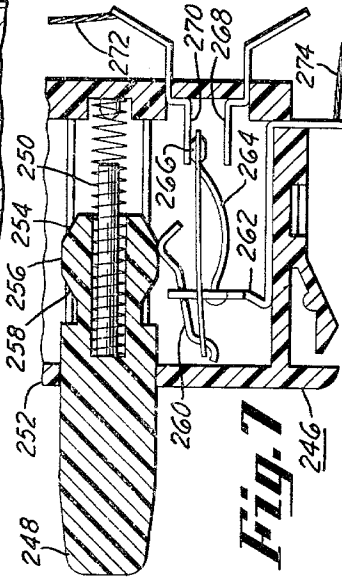
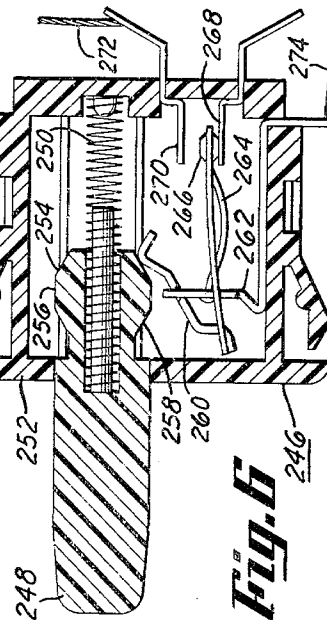


Fig. 6



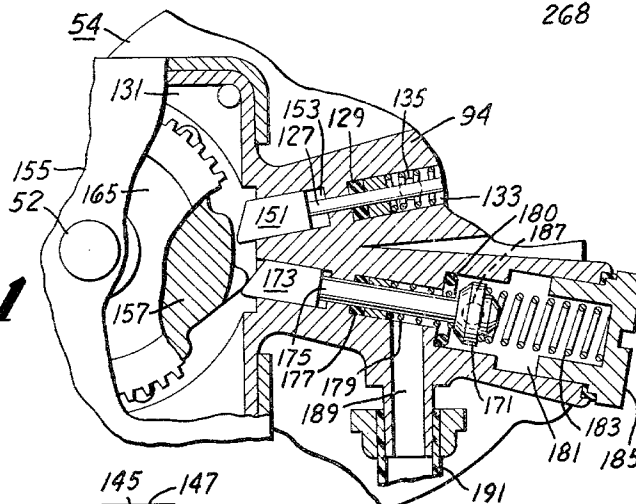
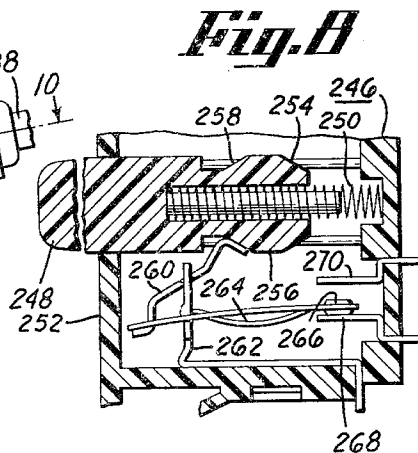
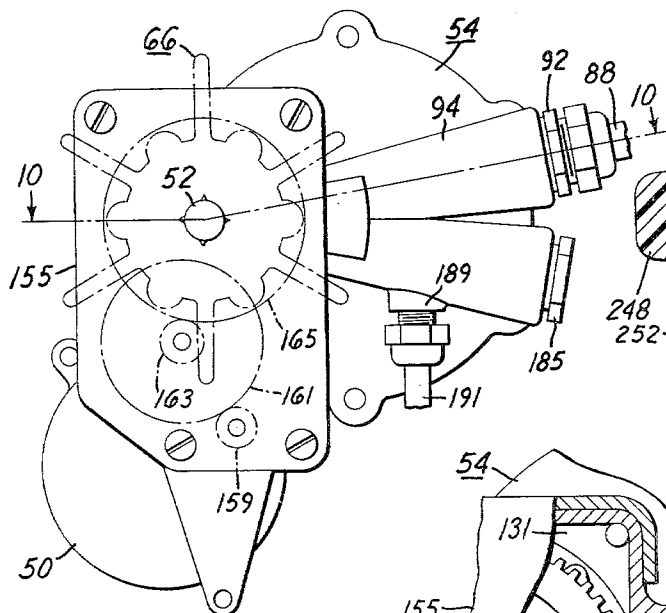
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ICE MAKER OF THE ENDLESS FLEXIBLE BELT TYPE

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3,199,309

ICE MAKER OF THE ENDLESS FLEXIBLE BELT TYPE

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Filed Oct. 29, 1962, Ser. No. 233,558

7 Claims. (Cl. 62—345)

This application repeats the disclosure in revised form and adds certain features to the belt type ice maker disclosed in my copending application, Serial No. 85,028, and now abandoned, filed January 26, 1961.

This invention pertains to refrigerating apparatus and more particularly to the freezing and storage of frozen pellets.

Since air-cooled, frost-free, below-freezing compartments are most popular and least troublesome and command the highest price, it is desirable to make an ice maker available as an optional added feature for such models. It is also desirable that models with and without ice makers be identical as far as possible to minimize production difficulties and costs. It is also desirable to provide an ice maker which can be installed without difficulty in existing refrigerators.

It is also desirable that the refrigeration load enclosed by the ice maker be kept as low as possible with as little interference with the maintenance of suitable refrigerating temperatures as possible. There is also a need for preventing the operation of the ice maker when there is insufficient cooling to complete the freezing of the ice pellets.

It is an object of this invention to provide in a simple, inexpensive, efficient, belt type ice maker cooled by the cold air in a frost-free, below-freezing compartment a means for prolonging the time provided for freezing the pellets.

It is another object of this invention to provide an improved heat transfer between the liquid to be frozen and the cold air provided for cooling the liquid.

It is another object of this invention to provide in a simple, ice maker cooled by the cold air in a frost-free, below-freezing compartment a means for preventing the operation of the ice maker and the delivery of the liquid to be frozen when the air is not cold enough to completely freeze the pellets.

It is another object of this invention to provide in a simple, inexpensive, efficient, belt type ice maker cooled by the cold air in a frost-free, below-freezing compartment a supplementary cooling means which can also be used for adjusting the tension on the belt.

It is another object of this invention to provide a simple, inexpensive, efficient, belt-type ice maker having greater capacity by maintaining the freezing of the liquid in the receptacle through cold air throughout the major portions of both the upper and lower passes of the belt.

It is another object of this invention to provide a belt-type ice maker with a simple, inexpensive, water-measuring and water-filling system for filling each receptacle with a measured amount of water which is mechanically interlocked with and operated by the belt drive in such a way that each receptacle is properly located when filled.

It is another object of this invention to provide a belt-type ice maker upon a door arranged in such a way that the ice pellets as well as the remaining contents of the below-freezing storage compartment are fully accessible without wasting any storage space.

It is another object of this invention to provide a control in the form of a simple, inexpensive, plunger-type snap-action switch which will stop the liquid supply and the delivery of the frozen pellets whenever the storage container is either removed or full and which will con-

tinue the liquid supply and delivery of the frozen pellets subject to satisfactory freezing conditions whenever the storage container is in position to receive the pellets and is not full.

These and other objects are attained in the form shown in the drawings in which a belt-type ice maker is mounted on the inner face of the door. The liquid to be frozen is supplied through a flexible tube extending through the hinge portion of the door to a measuring container mounted in the door. The belt is driven by an electric motor through a sprocket shaft and a sprocket. The sprocket shaft has a six-lobed cam within the door first operating the inlet valve to the measuring container and second operating the discharge valve of the measuring container which controls the flow into the receptacles in the belt which are positioned in proper coordination through the sprockets. A thermostatic switch is mounted upon the door above the belt exposed to the cold air in the freezing compartment for stopping the motor and hence the delivery of the liquid to be frozen as well as the movement of the belt and the delivery of the frozen pellets whenever the air is not sufficiently cold to insure complete freezing of the pellets. To increase the freezing rate, the upper pass of the belt rides upon a heat conducting plate cooled by the air which also supports the end of the belt opposite the sprocket. This heat conducting plate is laterally adjustable to adjust the tension on the belt. To further improve the freezing there is provided a guard of polyethylene plastic extending around the adjustable end of the belt and also beneath the lower pass of the belt so as to keep the partially frozen pellets in the receptacles substantially until they reach the drive sprocket at the other end where a chute is provided for directing the pellets ejected by the drive sprocket into a storage container. The storage container is lodged in a recess in the door partially and is pivotally mounted so that it swings against the plunger of a toggle-type switch including a simple spring pressed plunger which is projected outwardly to an extreme position when the container is removed to stop the drive motor and which, when the container is full, depresses the plunger until the switch opens also to stop the drive motor. When the container is in position empty or partially full, it will move the plunger to intermediate positions in which the circuit is closed to the drive motor subject to the air responsive thermostatic switch.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are closely shown.

In the drawing:

FIGURE 1 is a front view of the inner face of a freezer compartment door having thereon a belt-type ice maker embodying one form of my invention;

FIGURE 2 is a fragmentary view in elevation showing a modification in which an idler sprocket wheel replaces the supporting shoe at the idler end of the belt in FIGURE 1;

FIGURE 3 is a vertical sectional view taken along the line 3—3 of FIGURE 1;

FIGURE 4 is a simplified wiring diagram of the ice maker shown in FIGURES 1 and 3;

FIGURE 5 is a horizontal sectional view taken along the line 5—5 of FIGURE 1;

FIGURE 6 is a fragmentary sectional view showing the plunger toggle switch actuated by the ice pellet receptacle shown in FIGURES 1, 3 and 5 with the plunger shown in the position when the receptacle is removed;

FIGURE 7 is a view similar to FIGURE 6 excepting that the plunger is depressed by the ice pellet receptacle to normal operating position;

FIGURE 8 is a view similar to FIGURES 6 and 7 but

with the plunger fully depressed upon the complete filling of the ice pellet receptacle;

FIGURE 9 is a view in elevation of the belt driving and water fill control means;

FIGURE 10 is a sectional view taken along lines 10—10 of FIGURE 9; and

FIGURE 11 is a fragmentary sectional view taken along the lines 11—11 of FIGURE 10.

Referring now more particularly to FIGURES 1, 3 and 5, there is shown an insulated refrigerator cabinet 20 of the frost-free type having a below-freezing compartment 22 closed by an insulated door 24 and an above-freezing compartment 26 closed by an insulated door 28. The below-freezing compartment 22 is provided with a false bottom wall 30 beneath which there is a refrigerant evaporator 32 of the fin and tube type located in an air passage located beneath the false bottom 30 and above the insulated bottom wall 34. Below the wall 34 is the machinery compartment 27 containing a motor compressor-condenser unit which is not shown. An electric motor driven fan 36 draws air from both the below freezing compartment 22 and the above-freezing compartment 26 into the air duct passageway beneath the false bottom wall 30 through the evaporator 32 and discharges the air through upwardly extending ducts 38 and 40 in the rear wall, respectively, to the below-freezing compartment 22 and the above-freezing compartment 26. The entrance 42 for the air from the below-freezing compartment to the evaporator compartment is provided at the front of the false bottom 30. The evaporator 32 is kept at a below-freezing temperature preferably by a thermostatic control such as is illustrated in Patents 3,026,668 and 3,050,961 issued respectively on March 27 and August 28, 1962. This control operates the refrigerating system so as to maintain the below-freezing compartment 22 normally between the temperatures of +11° F. and -2° F. This air is sufficiently dry to prevent the formation and accumulation of frost in the compartment 22.

Refrigerators of this type are increasingly popular. These refrigerators also command the highest prices. Therefore, it is most likely that added features at extra cost would be desired by those persons who have purchased refrigerators of this type. One of the added features sometimes desired is an automatic ice maker. In the past these have been made either as separate machines, which are relatively expensive, or a relatively expensive system has been incorporated in a household refrigerator at considerably added cost and expense. Adding an ice maker to such a refrigerator has been a difficult problem since the modifications required interfere with the normal production of such refrigerators. The modifications required in the refrigerator have been relatively extensive and expensive. According to my invention, to avoid making any major modifications in a part of the refrigerating system or cabinet which is relatively difficult to modify, I provide upon the inner face of the freezing compartment door a belt-type, automatic ice making machine which incorporates all of the elements of the machine so that no other modification of the cabinet or refrigerating system need be made in any part thereof excepting the substitution of a different freezing compartment door containing the automatic, belt-type ice maker and the provision of water and electrical supply connections.

According to my invention, the door 24 is made interchangeable with a standard refrigerator cabinet door for the same model. This interchangeable door 24 is provided with a belt-type ice maker 44 on the inner face thereof. The door 24 is provided with a recessed inner sheet 46 of suitable plastic on its inner face providing a cavity 48 containing a geared driving motor 50 which drives the sprocket shaft 52, a valve control mechanism 54 controlled by a cam on the sprocket shaft 52 and a measuring chamber 56 to which the water or other liquid to be frozen is sent into and removed from by the valve

mechanism 54. This mechanism is fastened to insulating supports 58 extending through the insulation piece 60 and are fastened to the plate 62 of insulating material which serves to close the cavity 48. This plate 62 is fastened by the screws 64 to the inner sheet 46. The sprocket shaft 52 has fixed to the portion extending beyond the plate 62 a six-blade sprocket 66 which through its blades drives the belt 68 of flexible polyethylene provided with a series of receptacles 70.

The upper pass of the belt 68 is supported by having the bottoms of the receptacles 70 resting and moving laterally upon the conductor plate 72. The conductor plate 72 has downwardly extending flanges 74 on both sides. The rear downwardly extending flange 74 is fastened to the inner face 46 of the door 24 by the screws 76 extending through the slots 78 into appropriate threaded apertures in the plastic member 46 forming the inner face of the door 24. These threaded apertures may be reinforced by metal or additional plastic to provide adequate support for the screws and the conductor plate 72. The flanges 74 adjacent the shaft 52 may be provided with slots 80 in which the shaft 52 is lodged. The opposite end of the conductor plate 72 is provided with a semicircular plastic shoe 82 of nylon or similar material which is fastened to the conductor plate 72 by the screws 84. The plastic shoe 82 includes a recessed portion which is inclose to but out of contact with the bottoms of the receptacle 70 and flange portions 86 which support the edges of the belt 68, so that the bottoms of the receptacles 70 will not be contacted as they pass thereabout. By loosening the screws 76, the conductor plate 72 may be moved laterally to provide the proper tensioning of the belt 68. In addition, the conductor plate aids in transferring heat from the bottoms of the receptacles 70 to the air in the freezing compartment 22. This cold air is discharged from the duct 38 through the aperture 39 so that it envelops the belt 68 as well as the conductor plate 72. This increases the freezing rate for the water or other liquid which is disposed in the receptacles.

The water or other liquid to be frozen is supplied from a supply source under pressure through a supply conduit 88 which may extend through the hinge 90 of the door 24. Preferably this supply conduit is of some sort of suitable plastic such as a vinyl chloride resin. The end of this tube 88 connects to a nipple 92 leading into the inlet valve mechanism 94 including the valve spring 96 located in the spring chamber 98 and provided with a valve seat 121. The valve seat 121 is provided with an elastomeric ring 123 commonly called an O-ring upon which the valve 125 seats under the force of the spring 96. The valve 125 is provided with a valve stem 127 extending through a valve stem guide and sealed by the valve packing 129 normally compressed by a gland which is in turn compressed by a spring so as to normally keep the packing 129 in sealing engagement with the valve body 131. The valve seat 121 leads to an outlet chamber 133 containing the spring for the packing 129. This outlet chamber 133 is provided with an outlet passage 135.

The passage 135 opens into the diaphragm chamber 137 containing the truncated cone-shaped plastic diaphragm 139 which is spring pressed to collapse by a diaphragm follower 141 having a stem 145 extending through the valve passage 147 in the housing member 149. A conical spring 143 surrounds the stem 145 and extends between the follower 141 and the casing 149 to provide sufficient force to move the follower 141 and the diaphragm 139 to its extreme position collapsing the diaphragm chamber 137 in the absence of substantial water pressure. However, if the conduit 88 is supplied with water under pressure, the opening of the valve 125 will depress the diaphragm 139 to fill the diaphragm chamber 137. This fills the chamber 137 with a measured amount of water or other liquid to be frozen. The

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end of the valve stem 127 contacts the cam follower 151 which is slidably mounted in a groove 153 provided in the valve housing. This groove 153 is closed by the removable cover 155 which closes the cam and gear chamber.

A six-lobed cam 157 is fixed to a sprocket shaft 52 and consequently it rotates with the shaft 52 whenever the motor 50 is in operation. The electric motor 50 is provided with internal reduction gearing and has an external drive pinion 159 which drives the reduction gear 161 which in turn has fixed to it a drive pinion 163 which drives final gear 165 fixed to the drive shaft or sprocket shaft 52 as shown in FIGURE 10. The gear 165 and the cam 157 are formed integrally and are directly mounted on the shaft 52. The shaft 52 is rotatably mounted in a rear bearing 167 and a front bearing 169 located on opposite sides of the combined cam 157 and gear 165.

After each lobe opens and closes the inlet valve 125, the same lobe of the cam 157 also opens and closes an outlet valve 171 through the cam follower 173 and the valve stem 175. This valve is likewise provided with a packing 177 held compressed by the spring 179. The valve 171 is adapted to seat upon an elastomeric ring or O-ring 180 which is provided on the shoulder in the spring chamber 181 containing the valve spring 183. This spring chamber 181 is closed by the plug 185 serving as a retainer for the spring 183. The measuring chamber 137 is provided with an outlet passage 187 into the spring chamber 181 so that when the valve 171 is open the water or other liquid to be frozen can flow past the open valve 171 to the discharge passage 189 which connects through the tube 191 with the discharge spout 193 which discharges the liquid to be frozen in separate discharges successively into the individual receptacles 70 as they are moved into position beneath the spout 193 by the sprocket 66. The inlet valve 125 is located 20° in advance of the outlet valve 171 so that the lobes of the cam 157 can be used to operate each valve in succession through the followers 151 and 173. The inlet valve 125 will open and close to charge the measuring chamber 137 before the outlet valve 171 begins to open. The outlet valve 171 and its follower 173 as well as the lobes of the cam 157 are coordinated through the shaft 52 with the sprocket wheel 66 so that one of the receptacles 70 is always positioned beneath the discharge spout 193 when the valve 171 is in the open position. The measuring chamber 137 measures the quantity of water or other liquid to be frozen for each receptacle 70. If the receptacles 70 are made larger or smaller, the enclosing housing 149 can be changed to reduce or increase the stroke of the diaphragm follower 141 to reduce or increase the amount of water or other liquid discharged into each of the receptacles 70. Since a portion of the discharge spout 193 is exposed to the cold air in the compartment 22, there is provided a small electric heater 195 adjacent the end of the discharge spout 193 electrically connected across the supply conductors 272, 273 to prevent the freezing of any of the water or other liquid to be frozen in the discharge spout 193. The discharge spout 193 is held in a grommet 197 of elastomeric material provided in the wall or plate 62.

The water or other liquid to be frozen is cooled by the cold air prevailing in the compartment 22 and especially the cold air which is discharged from the outlet 39. In addition, the water in the receptacles 70 is further cooled by having the bottoms of the receptacles 70 ride on the conductor plate 72 which is likewise kept cool by the cold air in the compartment 22 and especially the cold air discharged from the outlet 39. In the past, it has been customary to discharge the frozen pellets from the belt at the end opposite the sprocket 66 after the receptacles 70 have made the path across the top above the center line of the sprocket 66. This requires a relatively long belt and

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a relatively long distance between the sprockets or supports at the opposite ends of the belt. Alternatively, it also may require very cold temperatures to increase the rate of freezing or slower belt speeds which reduces the number of pellets frozen per hour. The outside of the liquid to be frozen in the receptacles will be frozen during the upper pass when the belt 68 is driven at normal speeds or faster. However, the liquid in the center of the receptacles 70 may not become completely frozen when it reaches the end of the upper pass.

Consequently, according to my invention, I provide a means of holding the partially frozen liquid in the receptacles 70 substantially throughout the lower pass. This is done by providing a guard or holding means 220 which holds the pellets in the receptacles 70 until they substantially complete the lower pass. This guard 220 includes a semicircular portion 222 surrounding the shoe 82 which connects with a straight portion 224 beneath the lower pass of the belt 68. This guard 220 prevents the escape of the frozen pellets from the receptacles 70. Preferably it is of some sort of material to which the frozen liquid will not readily adhere, such as polyethylene or polypropylene. The cold air in the compartment 22 is sufficiently dry to prevent the frozen pellets from sticking to the guard during any stoppage of the belt 68. This guard 220 has upwardly extending supporting straps 226 fastened by screws 228 to the front flange 74 of the conductor plate 72. At the opposite end of the guard 220 the straight portion 224 merges into a downwardly extending chute 230 located directly beneath the sprocket wheel 66. The sprocket wheel 66 has ejecting projections 234 between the spokes or blades 236 which engage the bottoms of the receptacles 70 to eject the pellets 232 therefrom which will drop onto the chute 230 and slide into the receptacle 238 located beneath the chute 230.

So that the receptacle 238 may be centered directly below the chute 230, the door 24 is provided with a suitable recess 240 in which the receptacle 238 is partially lodged. The receptacle 238 is spaced sufficiently from the face of the recess 240 to provide for the circulation of the cold air completely around it for keeping frozen the pellets 232. The door 24 is also provided with a pair of hook supports 242 connecting with the bore or loop 244 so as to pivotally support the container or bucket 238 in such a manner that it can be readily removed and yet is securely supported. The cold dry air in the compartment 22 circulates slowly through the receptacle 238 to prevent the pellets 232 deposited therein from sticking together. This pivotal support also serves a part in the control of the ice making machine. The mass of the bucket or receptacle 238 pivots about the pivotal connection of the bail 244 in the pivotal supports 242 to cause it to exert a corresponding force upon the spring pressed plunger 248 of the control switch 246. This control switch 246 is sunk into the insulation of the door behind the lower portion of the bucket or receptacle 238. The plunger 248 is held in contact with the bucket 238 by a spring 250 within the control switch 246. When the bucket or receptacle 238 is removed, the spring 250 pushes the plunger 248 outwardly to its fullest extent as shown in FIGURE 6.

The plunger 248 is slidably mounted within the casing 252 of the switch 246. Within the casing 252 the plunger is provided with a central high cam surface 256 flanked by the oppositely facing bevelled cam surfaces 254 on its inner edge and 258 on its outer edge. A primary lever 260 is pivotally mounted at an intermediate point upon the upper portion of a Z-shaped contact member 262. This primary lever 260 includes a cam follower portion shown in FIGURE 6 in contact with the bevelled cam portion 254. At the opposite end the lever 260 connects with the central tongue of a three-tongued, snap-acting toggle blade 264 carrying the movable contact 266 of the switch mechanism. When the plunger 248 is in its forward, outward position shown in FIGURE 6 which it assumes when the bucket or receptacle 238 is removed, the

cam surface 254 is in engagement with the lever 260 causing the contact 266 to rest against the stop 268. This stop 268 is not electrically connected into any control circuit in this installation. However, it could be connected to a warning circuit if desired. When the plunger 248 is pushed part of the way in by the replacement of the bucket or receptacle 238 to the position shown in FIGURE 7, the engagement of the follower of the lever 260 with the cam surface 255 will pivot the lever 260 so as to snap the toggle blade 264 to the position shown in FIGURE 7 in which the contact 266 snaps into engagement with the switch contact 270.

As shown in the wiring diagram FIGURE 4, this completes the circuit from the supply conductor 272 through the switch mechanism 246 and the conductor 274 to the belt driving motor 50 which in turn connects through the thermostatic switch 276 normally closed under normal running conditions to the second supply conductor 278. This wiring diagram also shows the heater 195 connected directly across the supply conductors 272 and 278 so that it is energized at all times that the refrigerator is in operation. The conductor 274 connects to the terminal 262 while the conductor 272 connects to the terminal 270. When the bucket or receptacle 238 is substantially completely filled with pellets of ice or frozen liquid, the plunger 248 will be further depressed to the position shown in FIGURE 8 in which the follower end of the lever 260 is in engagement with the cam surface 258 thereby moving the snap-acting blade 264 away from the contact 270 to snap the contact 266 back into engagement with the stop 268. Thus, whenever the bucket or receptacle 238 is either removed or filled, the switch 246 will be in the position shown in FIGURES 6 and 8 in which the contacts 266, 270 are open to de-energize the motor 50. This prevents the depositing of the pellets 232 either when there is no receptacle there to catch the pellets or when the receptacle 238 is filled. When the unfilled receptacle is present, the motor 50 will operate subject to the control of the thermostat switch 276.

Should an abnormally large warm food load be placed in the compartment 22, there is a possibility that the temperatures in the compartment may rise so high that proper freezing cannot take place within the time provided during the movement of a belt receptacle from the filling point to the ejecting point. To avoid the possibility of improperly frozen pellets, I provide the snap-acting bimetal thermostat 276 on the plate 62 directly above the belt 68 as shown in FIGURES 1 and 5. This switch 276 may be set to open at 20° F. to de-energize the motor 50 and to reclose at 10° F. to restore the ice maker to normal operation subject to the control of the bucket switch 246. This assures that when the ice maker 44 operates, the air within the compartment 22 will be sufficiently cold to freeze the pellets 232. The door 24 is provided with a strengthening rib or projection 280 extending completely around its inner periphery partially enclosing the ice making machine 44. The space beneath the ice making machine 44 may be filled by appropriate storage shelves 290 for cans containing frozen juices and/or packages. These shelves may be formed of heavy wire extending between the central projection 292 and the peripheral projection 280.

In FIGURE 2, there is shown a modification in which an idler sprocket 284 replaces the shoe 82. It is rotatably mounted by a pin 286 upon the adjacent end of the conductor plate 72. The idler sprocket 284 is arranged so that its projections or blades extend between the receptacles 70 into contact with the belt 68 between the receptacles 70. The guard 222 extends around the sprocket 284 in a manner similar to that shown in FIGURE 1. The sprocket 284 and the guard 222 prevent the ejection of the cubes from the receptacles 70 as they move from the upper pass through the lower pass. The sprocket wheel 284 is recessed sufficiently between the projections that the bottoms of the receptacles 70 will not be pushed

outwardly. In this way the partially frozen pellets can be carried around the end of the conductor plate 72 where the shoe 82 or the sprocket 284 is located and continue throughout the major portion of the lower pass in which the belt 68 is supported by the guard 220 until the chute 230 is reached.

While the embodiments of the present invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A pellet freezing machine including means enclosing a compartment containing a gas, an endless belt located in said compartment and moveable from an upper pass to a lower pass and return, said belt containing a plurality of receptacles, a heat conductor means extending into heat transfer relation with and cooled by said gas within said compartment located beneath and supporting the bottoms of said receptacles of the upper pass of said belt, means for moving said belt over said heat conductor means, means for supplying a liquid to be frozen to said receptacles, means for cooling the gas in said compartment substantially below the freezing point of said liquid, and holding means for preventing the exit of frozen liquid from the receptacles in a portion of the lower pass.
2. A pellet freezing machine including means enclosing a compartment containing a gas, an endless belt located in said compartment and moveable from an upper pass to a lower pass and return, said belt containing a plurality of receptacles, means for supplying liquid to be frozen to said receptacles, a heat conductor means cooled by said gas within said compartment located beneath and supporting the bottoms of said receptacles of the upper pass of said belt, said conductor means being provided with an end support for the belt, a guard extending beneath a major portion of the lower pass of said belt and around said end support adjacent the outer face of said belt for holding the frozen surface of the liquid in the receptacles for prolonging the holding of the frozen surface in the receptacles until the liquid is substantially completely frozen and means for moving said belt over said heat conductor means and adjacent said guard.
3. A pellet freezing machine including means enclosing a compartment containing a gas, an endless belt located in said compartment, said belt containing a plurality of receptacles, said belt being arranged for an upper pass and a lower pass with the receptacles upright in the upper pass and inverted in the lower pass, means for moving said belt through said upper and lower passes and for inverting the receptacles as they move from the upper to the lower pass, means for supplying a liquid to be frozen to the receptacles in the upper pass, means for cooling the gas in said compartment substantially below the freezing point of said liquid, and holding means for preventing the exit of frozen liquid from the receptacles as the receptacles are inverted and move inverted in a major portion of the lower pass.
4. A pellet freezing machine including means enclosing a compartment containing a gas, an endless belt located in said compartment, said belt containing a plurality of receptacles, said belt being arranged for an upper pass and a lower pass with the receptacles upright in the upper pass and inverted in the lower pass, means for moving said belt through said upper and lower passes, means for supplying a liquid to be frozen to the receptacles in the upper pass, means for cooling the gas in said compartment substantially below the freezing point of said liquid, and a guard extending beneath a major portion of the lower pass of the belt directly adjacent the outer face of the belt for holding the frozen surface of the liquid in the receptacles as the receptacles move inverted through a major portion of the lower pass for prolonging the holding of the frozen surface in the receptacles until the liquid is substantially completely frozen.
5. A pellet freezing machine including means enclosing a compartment containing a gas, an endless belt located

in said compartment, said belt containing a plurality of receptacles, driving means at one end of the belt for moving the belt and support means at the opposite end of the belt providing upper and lower passes with the receptacles upright in the upper pass and inverted in the lower pass, means for supplying a liquid to be frozen to said receptacles, means for cooling the gas in said compartment substantially below the freezing point of said liquid, and a guard extending beneath a major portion of the lower pass and around a substantial portion of one end of the belt directly adjacent the outer face of the belt for holding the frozen surface of the liquid in the receptacles for prolonging the holding of the frozen surface in the receptacles until the liquid is substantially completely frozen.

6. A pellet freezing machine including an endless belt containing a plurality of receptacles, a sprocket for driving the belt, a driving means including a sprocket shaft for rotating the sprocket, a measuring container, a supply conduit including a first valve for delivering liquid to be frozen to said measuring container, a discharge conduit including a second valve for delivering liquid to be frozen from said measuring container to said receptacles, a separate cam follower directly connected to each of said valves, said sprocket shaft being provided with a first cam operatively associated with the cam follower of said first valve; for opening said first valve to deliver liquid to be frozen to said measuring container and then reclosing said first valve, said sprocket shaft being provided with a second cam operatively associated with the cam follower of said second valve and; coordinated with said sprocket to open said second valve after the reclosing of said first valve to deliver liquid through said discharge conduit to a receptacle positioned beneath the conduit, and means for freezing the liquid in the receptacles.

7. A refrigerator including a cabinet having insulated

walls and an insulated door enclosing a storage compartment to be cooled, means for cooling the air in said compartment substantially below water freezing temperatures, an endless belt containing a plurality of receptacles located in said compartment adjacent the inner face of said door, the inner face of said door being provided with a deep cavity therein, a driving means located in said cavity having a projecting shaft provided with a sprocket for driving said belt, supply means located in said cavity responsive to the operation of said driving means for supplying a liquid to be frozen to each of said receptacles, a plate upon the inner face of said door for closing said cavity, low heat conducting support means extending between said plate and said supply means for supporting said means and insulating said supply means from said plate.

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2,891,385	6/59	Nelson	62—137
2,982,111	5/61	Dahl	62—344 X
3,024,618	3/62	Janquart	62—353
3,055,186	9/62	Linstromberg et al.	62—344 X

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