Jan. 22, 1957 R. S. GAUGLER 2,778,200

ICE MAKING APPARATUS

Filed Nov. 20, 1953

3 Sheets-Sheet 1

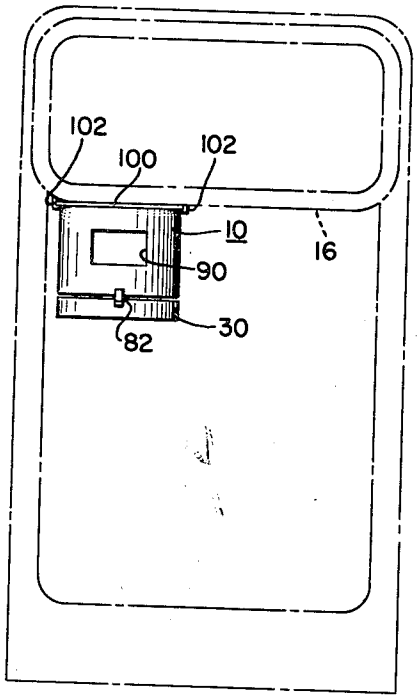


Fig. 1

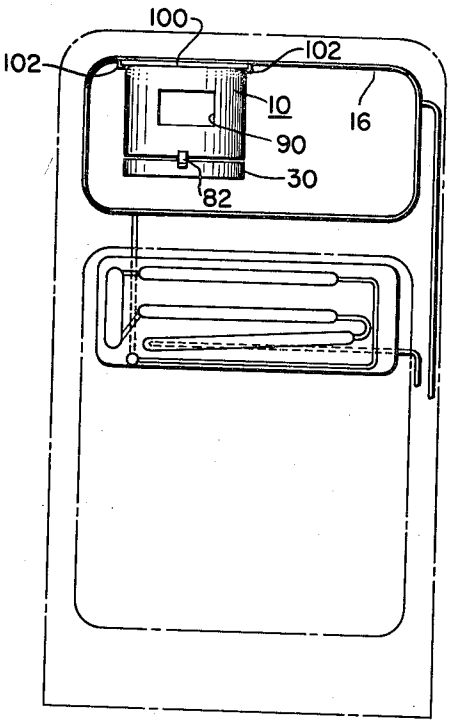


Fig. 2

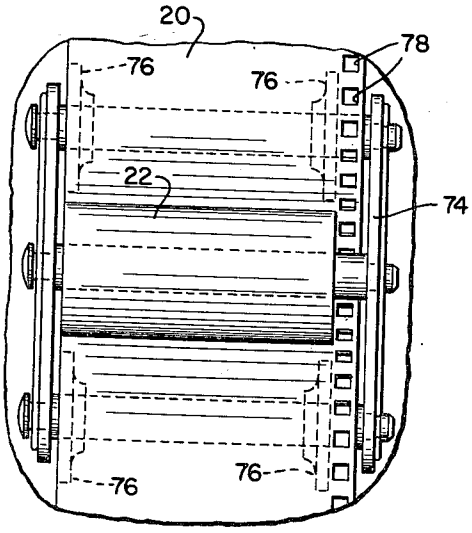


Fig. 5

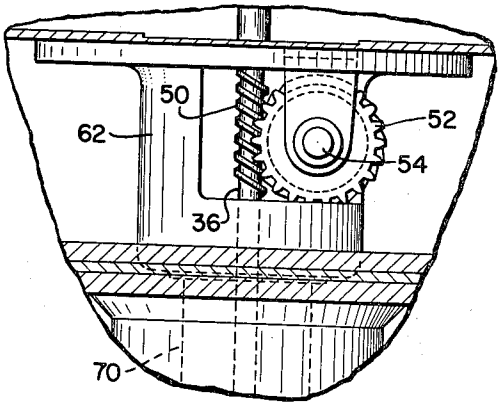


Fig. 7

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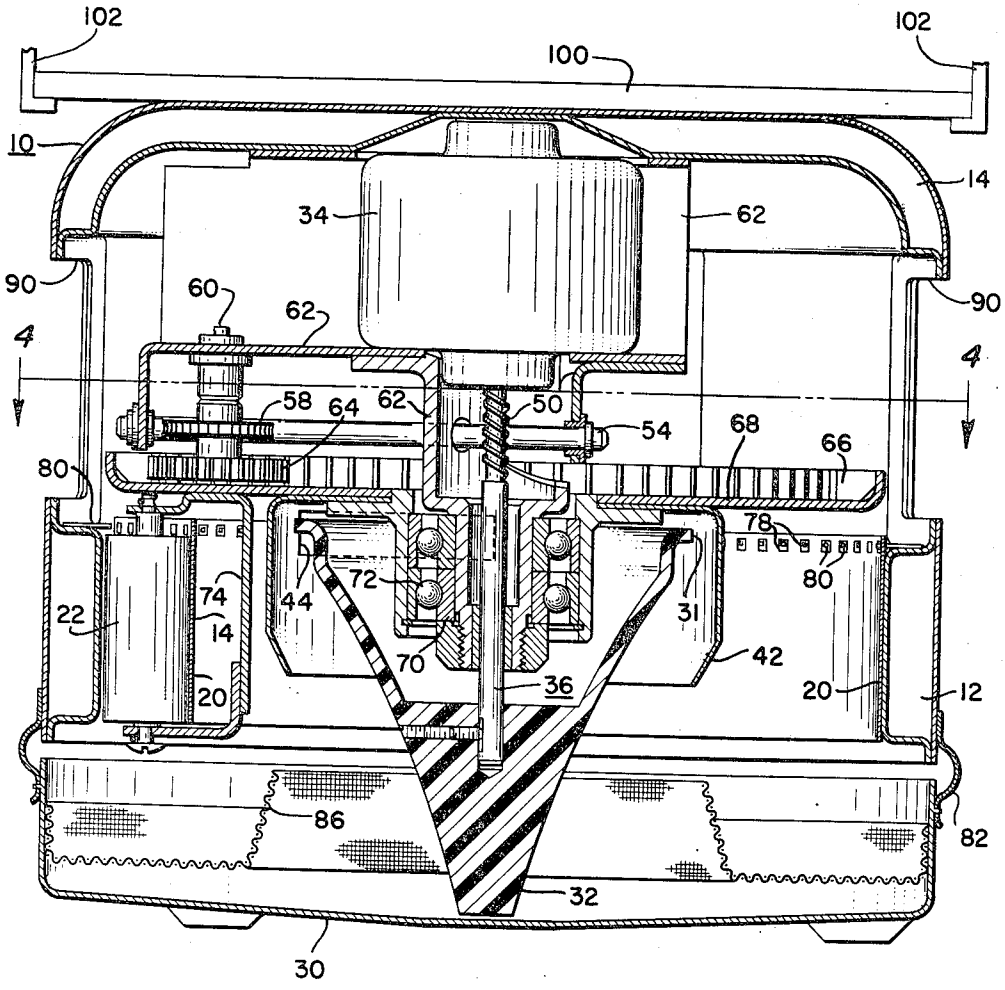


Fig. 3

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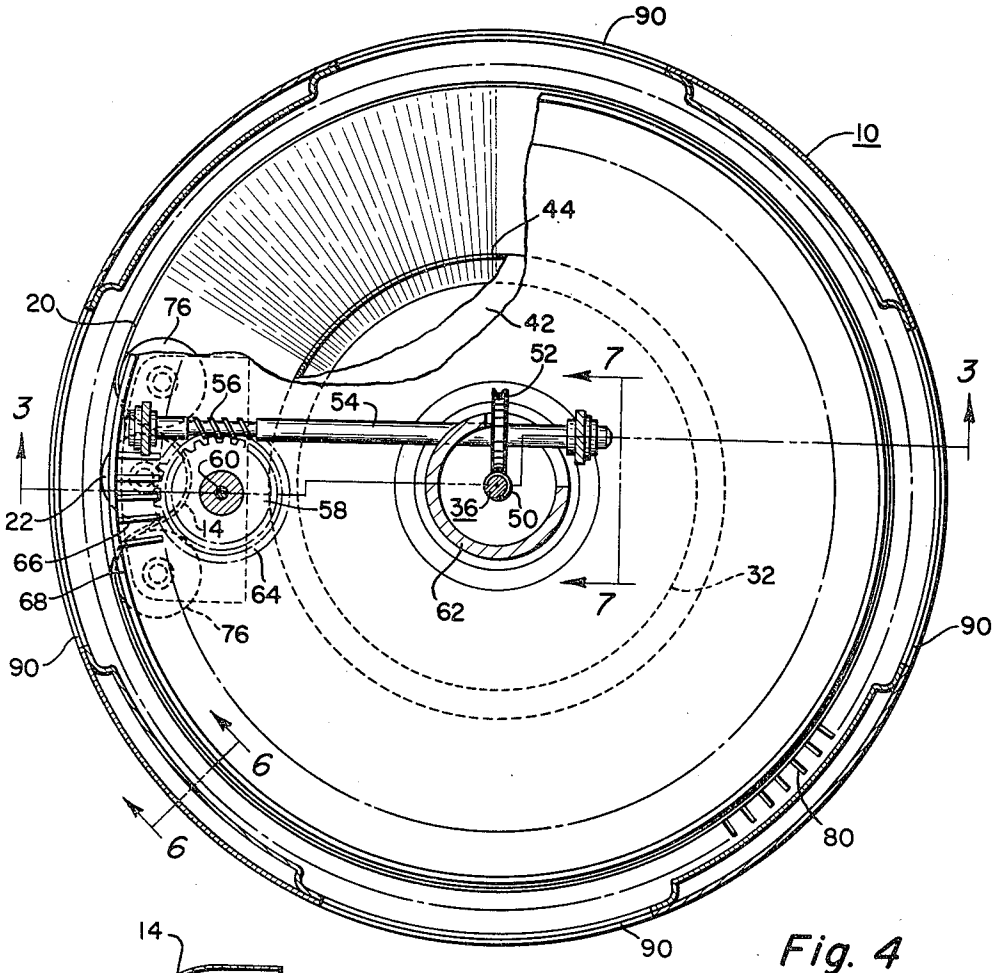


Fig. 4

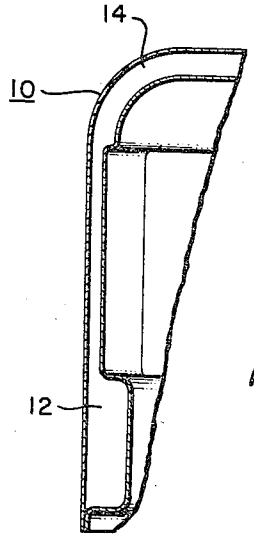


Fig. 6

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ICE MAKING APPARATUS

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Application November 20, 1953, Serial No. 393,366

8 Claims. (Cl. 62—107)

This invention relates to refrigerating apparatus and more particularly to an ice maker.

It is an object of this invention to provide a simple and inexpensive means for automatically making ice in a home refrigerator.

Another object of this invention is to provide an ice maker which may be installed in a standard home refrigerator without making any major alterations in the design of the refrigerator.

More particularly, it is an object of this invention to provide an automatic ice maker which may be installed in a home refrigerator by the owner so that those purchasers who cannot afford to buy a refrigerator with an automatic ice maker can have the privilege of buying the ice maker as a separate unit at some later date and can then install it themselves.

Still another object of this invention is to provide an automatic ice maker in which a secondary refrigerating system is used for freezing ice.

A further object of this invention is to provide a low-cost self-contained ice maker attachment which produces cracked ice.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred form of the invention is clearly shown.

In the drawings:

Figure 1 is a front elevational view showing one possible arrangement of the ice maker within one type of conventional refrigerator;

Figure 2 is a front elevational view showing another possible arrangement of the ice maker within another type of conventional refrigerator;

Figure 3 is a vertical sectional view taken substantially on line 3—3 of Figure 4, and showing the construction and arrangement of a preferred form of the invention;

Figure 4 is a horizontal sectional view with parts broken away taken substantially on line 4—4 of Figure 3;

Figure 5 is a fragmentary elevational view showing the construction of the ice chipping rollers;

Figure 6 is a fragmentary vertical sectional view taken substantially on line 6—6 of Figure 4; and,

Figure 7 is a fragmentary sectional view taken substantially on line 7—7 of Figure 4.

Referring now to the drawings wherein a preferred embodiment of the invention has been shown, reference numeral 10 generally designates secondary refrigeration unit in the shape of an inverted, hollow walled, cup-shaped housing which serves to enclose the ice making mechanism to be described more fully hereinafter. A secondary refrigerating medium is sealed within the hollow walls of the housing 10 whereby the hollow lower portion 12 of the housing will serve as a secondary evaporator and the upper portion 14 will serve as a secondary condenser. As best shown in Figures 1 and 2 of the drawing, the secondary condenser of the ice maker

is placed in direct thermal exchange relationship with the primary evaporator 16 of a conventional home refrigerator. Figure 1 shows the ice maker located in the unfrozen food compartment whereas Figure 2 shows it located in the frozen food compartment. By virtue of the above described arrangement the primary evaporator 16 serves to energize the secondary system so as to maintain the secondary evaporator 12 below ice freezing temperatures.

The ice freezing surface comprises a flexible band 20 which is arranged within the lower portion of the inverted cup-shaped housing so as to lie flat against the cold inner wall of the secondary evaporator 12. The flexible band 20 is slightly longer than the internal circumference of the secondary evaporator 12 whereby an inwardly bulged portion 14 is formed which projects far enough from the evaporator 12 to permit insertion of a cam or roller element 22 between the band 20 and the cold evaporator for a purpose to be described hereinafter.

The water to be used in forming the ice is adapted to be contained in a hollow pan 30 and is sprayed onto the flexible belt 20 by means of a cone-shaped spray element 32 which has its lower end disposed within the pan 30 and has its upper end 31 arranged to deliver a spray of water to the upper edge of the flexible band 20. The cone is driven by a motor 34 which is carried by the inner top wall of the housing 10 as shown. The main shaft 36 of the motor serves to support and drive the cone 32 at a speed high enough to spray water from the pan 30 onto the flexible belt 20.

It is not practical to spray water onto the entire endless belt continuously and for this reason a circular shield 42 has been provided which has a window opening 44 adjacent its one side which extends throughout approximately 60° and only allows water to be sprayed onto a limited area of the endless belt 20. The amount sprayed is preferably greater than that which will freeze on the band and the excess water drains back into the pan 30. The shield 42 serves to intercept the sprayed water throughout most of the circumference of the shield and the water thus intercepted drains back into the water pan 30. The shield 42 is adapted to be slowly rotated by the motor 34 so as to progressively move around the full length of the belt 20. The means for rotating the shield 42 includes a worm gear drive which enables one to operate the shield 42 at a much slower speed than the cone-shaped spray element 32. The worm gear drive includes a driving worm 50 provided directly on the motor shaft 36 and a driven wheel 52 carried by a shaft 54. The shaft 54 includes a driving worm 56 which meshes with a wheel 58 journalled on a fixed shaft 60 carried by the stationary framework 62. The wheel 58 has secured to it a pinion gear 64 which meshes with gear teeth 66 formed on the inner periphery of a rotatable element 68 arranged as shown in Figure 4. The element 68 is supported for rotation on a depending portion 70 of the stationary frame 62 by means of ball bearing elements 72. The various gears used in transmitting power from the main motor shaft 36 to the element 68 make it possible to operate the element 68 at a very slow speed in comparison to the speed of the water flinging cone element 32.

As best shown in Figure 3 of the drawing, the roller 22 is directly supported on the lower side of the rotatable member 68 by means of a U-shaped element 74 which straddles the flexible band 20. Movement of the roller 22 causes the flexible band 20 to be progressively flexed so as to cause cracking and release of the ice frozen onto the freezing surface of the belt 20.

Roller elements 76 carried by the U-shaped element 74 engage the upper and lower edges of the flexible band

20 on opposite sides of the roller 22. The roller elements 76 hold that portion of the band 20 which is to be flexed against the roller 22 and also hold the adjacent portions of the band 20 in contact with the evaporator 12. The upper edge of the flexible band 20 is provided with perforations 78 which engage fixed projections 80 carried by the evaporator 12 as best shown in Figure 3 so as to prevent slippage between the flexible band or belt 20 and the evaporator 12.

As pointed out hereinabove, the water is sprayed onto a limited portion of the belt only, and the arrangement of the window 44 which determines which portion of the belt is sprayed with water is such that the water is sprayed onto the belt directly behind the roller 22. By virtue of this arrangement an appreciable lapse of time is provided between the time that the water is sprayed onto the belt and the time that the roller 22 comes along to crack the ice. This time lag makes it possible for the ice to be firmly frozen before the belt is distorted, with the result that the hardness of the ice facilitates removal of the ice and the released ice will be at a temperature considerably lower than 32° F.

The water pan 30 is adapted to be removably held in place by means of spring clips 82. The ice which is released from the flexible band is adapted to drop downwardly into a circular wire trough or receptacle 86 carried by the pan 30 as best shown in Figure 3 of the drawing. The amount of water placed in the water receptacle 30 is determined by the quantity of ice to be frozen but at no time would one put in more water than that required to fill the ice receptacle 86. It will be noted that the cone-shaped spray element 32 is spaced slightly from the bottom of the water receptacle with the result that a small quantity of water will always be left in the pan 30. This final quantity of water will contain the impurities which are objectionable in frozen ice and which if frozen would produce milk colored ice. Each time the ice freezing cycle is repeated the residual water left in the pan 30 would be thrown away and the fresh quantity of water introduced into the pan.

The motor 34 is preferably manually controlled although it is within the purview of this invention to provide means for automatically starting and stopping the motor. Thus, one could provide an adjustable timer which the housewife could set so as to operate the motor for any given length of time depending upon the quantity of ice desired. Another type of control which could be used would be a thermal control which would automatically stop the motor in response to a predtermined decrease in the temperature of the freezing surface which would indicate that all of the available water has been frozen.

It will be noted that the casing 10 comprises a pair of sheet metal stampings which have been assembled one within the other and then brazed or otherwise sealed together adjacent the lower edges and around the edges of the window openings 90 in the side walls of the casing 10. These window openings have been provided so as to facilitate assembly and inspection of the parts.

The ice maker unit is preferably provided with a mounting plate 100 secured to the top wall of the casing 10 as shown. This plate is removably held in contact with the primary evaporator by means of the brackets 102 which permit one to slide the ice maker in and out of the refrigerator.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. In combination with a refrigerator having a primary refrigerating system including a primary evaporator, a self-contained automatic ice maker comprising a secondary refrigerating system, said secondary refrigerating system having a secondary condenser arranged in thermal exchange relationship with said primary evaporator and

having a secondary evaporator connected to said condenser, means for delivering a stream of water to be frozen into thermal exchange relationship with a portion of said secondary evaporator, means for causing removal of ice thus formed, said last named means including means for delivering the ice in a multiplicity of pieces to a given storage area, and means for removably supporting said self-contained ice maker in said refrigerator.

2. In combination with a refrigerator having a primary refrigerating system including a primary evaporator, an ice maker comprising a secondary refrigerating system, said secondary refrigerating system having a secondary condenser arranged in thermal exchange relationship with said primary evaporator and having a secondary evaporator connected to receive liquefied refrigerant from said condenser, means for delivering a stream of water to be frozen into thermal exchange relationship with a portion of said secondary evaporator, and means for causing removal of ice thus formed, said secondary refrigerating system comprising an inverted cup shaped housing having hollow walls with an upper portion in thermal exchange relationship with said primary evaporator, the hollow walls of said cup shaped housing serving as a chamber for the secondary refrigerant, said means for delivering said water and said ice removal means being disposed within said cup-shaped casing.

3. In an ice maker attachment for use with a primary refrigerating system, a secondary refrigerating system including a secondary condenser adapted to be placed in thermal exchange relationship with a portion of said primary refrigerating system, said secondary system including a secondary evaporator, a flexible member arranged in thermal exchange relationship with said secondary evaporator, movable means for progressively supplying water to portions of said flexible member so as to cause ice to freeze on said flexible member, and movable means spaced rearwardly from said first named movable means for flexing said member so as to promote the release of ice therefrom a predetermined timed interval after the water has been supplied to said flexible member.

4. An ice maker comprising a refrigerating system including a refrigerant liquefying portion and a cylindrical evaporator supplied with liquid refrigerant by said liquefying portion, a flexible band on which is to be frozen a quantity of ice, said band being arranged in thermal exchange relationship with the inner surface of said cylindrical evaporator, a water receptacle disposed beneath said evaporator, a motor, a cone shaped element driven by said motor and having its vertex extending downwardly into said water receptacle and having its base portion so arranged relative to said flexible band that upon rotation of said cone by said motor water is lifted from said water receptacle and sprayed onto the upper portion of said band, and means for returning water draining from the lower edge of said flexible band into said water receptacle.

5. An ice maker comprising a refrigerating system including a refrigerant liquefying portion and a cylindrical evaporator supplied with liquid refrigerant by said liquefying portion, a flexible band on which is to be frozen a quantity of ice, said band being arranged in thermal exchange relationship with the inner surface of said cylindrical evaporator, a water receptacle disposed beneath said evaporator, a motor, a cone shaped element driven by said motor and having its vertex extending downwardly into said water receptacle and having its base portion so arranged relative to said flexible band that upon rotation of said cone by said motor water is lifted from said water receptacle and sprayed onto the upper portion of said band, means for returning water draining from the lower edge of said flexible band into said water receptacle, a shield surrounding a portion of said cone, and means operated by said motor for rotating said shield at a speed less than the speed of said cone, said shield having a window formed therein through

which water sprayed by said cone is free to flow onto a restricted portion of said evaporator.

6. An ice maker comprising a refrigerating system including a refrigerant liquefying portion and a cylindrical evaporator supplied with liquid refrigerant by said liquefying portion, a flexible band on which is to be frozen a quantity of ice, said band being arranged in thermal exchange relationship with the inner surface of said cylindrical evaporator, a water receptacle disposed beneath said evaporator, a motor, a cone shaped element driven by said motor and having its vertex extending downwardly into said water receptacle and having its base portion so arranged relative to said flexible band that upon rotation of said cone by said motor water is lifted from said water receptacle and sprayed onto the upper portion of said band, means for returning water draining from the lower edge of said flexible band into said water receptacle, a shield surrounding a portion of said cone, means operated by said motor for rotating said shield at a speed less than the speed of said cone, said shield having a window formed therein through which water sprayed by said cone is free to flow onto a restricted portion of said evaporator, means for progressively releasing ice from said band, and means disposed beneath the lower edge of said band for collecting the ice released from said band.

7. An ice maker comprising a refrigerating system including a refrigerant liquefying portion and a cylindrical evaporator supplied with liquid refrigerant by said liquefying portion, a flexible band arranged in thermal exchange relationship with the inner surface of said cylindrical evaporator, a water receptacle disposed beneath said evaporator, a motor, a cone type spray element operated by said motor and having its vertex extending downwardly into said water receptacle and having its base portion so arranged relative to said flexible band that upon rotation of said cone by said motor water is lifted from said water receptacle and sprayed onto the upper portion of said band, means for returning water draining from the lower edge of said flexible band into said water receptacle, means for progressively releasing ice from said band, and means disposed beneath the lower edge of said band for collecting the ice released from said band, said ice collecting means comprising a circular trough carried by said water receptacle.

8. An ice maker comprising a refrigerating system including a hollow cylindrical evaporator portion, a flexible band arranged in thermal exchange relationship with the inner wall of said cylindrical evaporator, rotatable spray means for progressively spraying water onto the upper portion of said band, cam means disposed between a portion of said band and said evaporator, and means for progressively rotating said cam means about the central axis of said cylinder so as to progressively flex said band a predetermined interval after the ice is formed for promoting the release of ice therefrom.

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