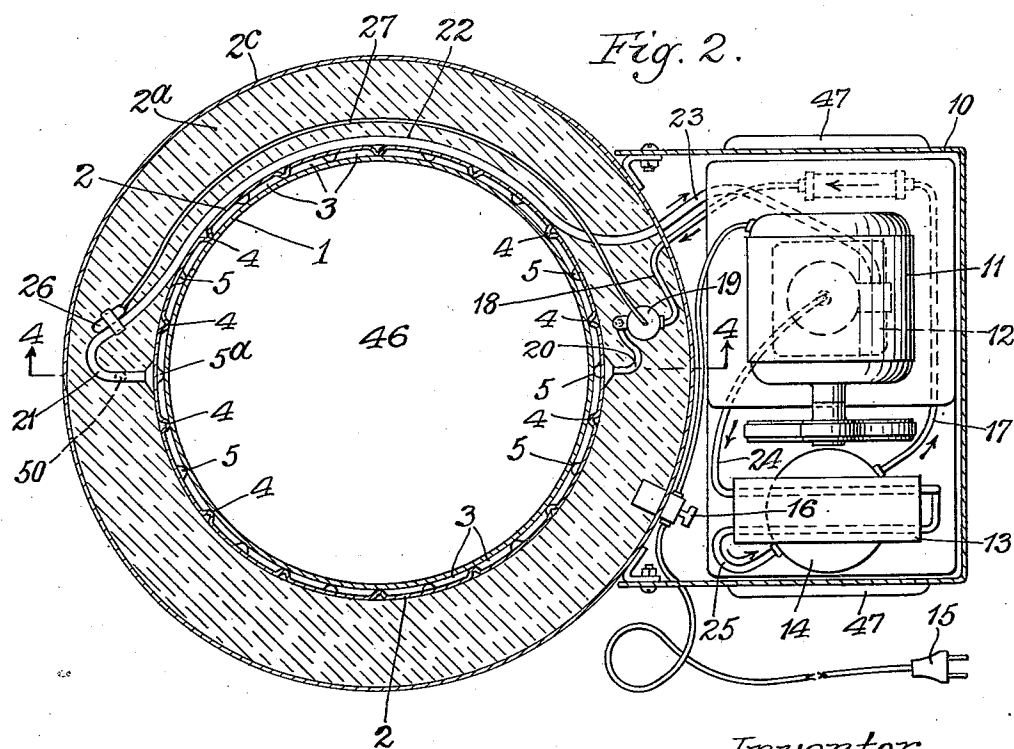
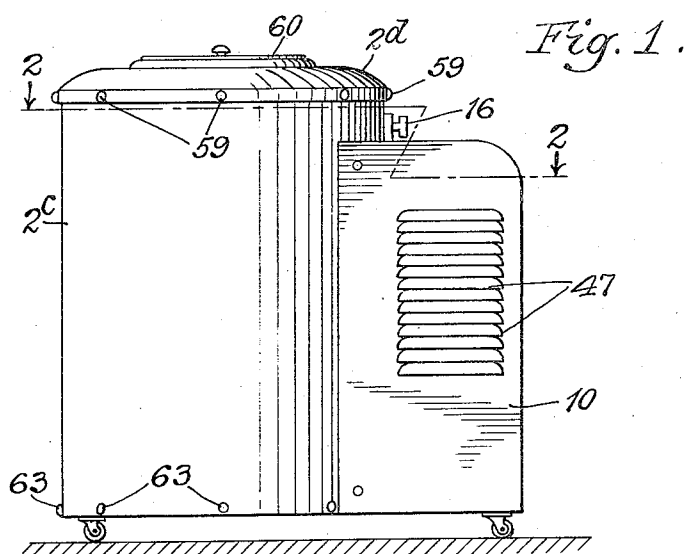


W. L. MORRISON

REFRIGERANT EVAPORATOR

Filed Aug. 16, 1943

3 Sheets-Sheet 1



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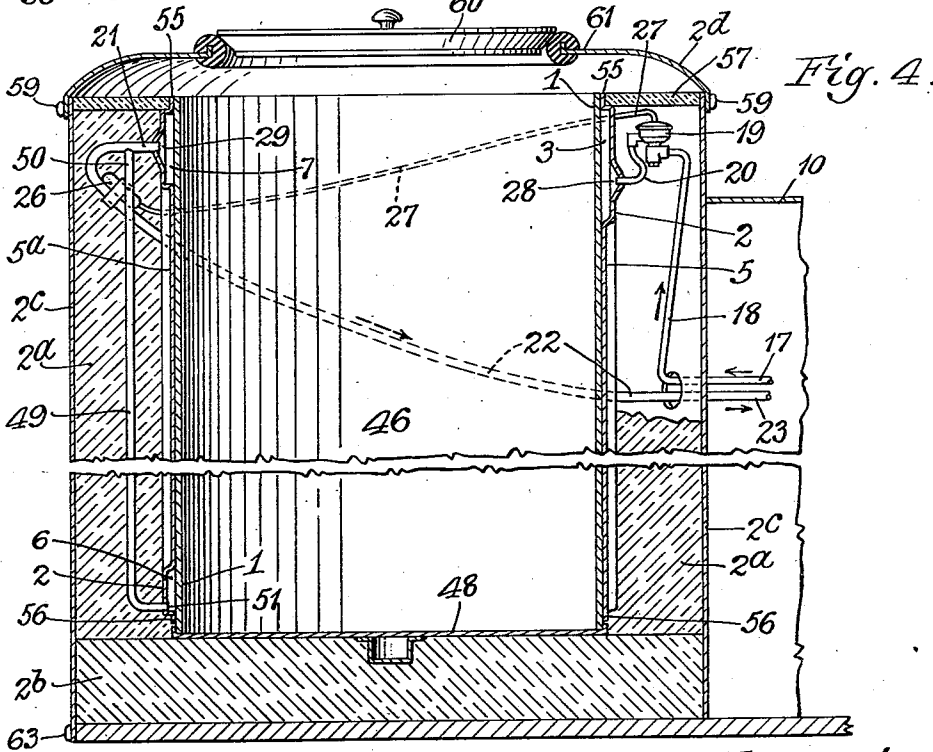
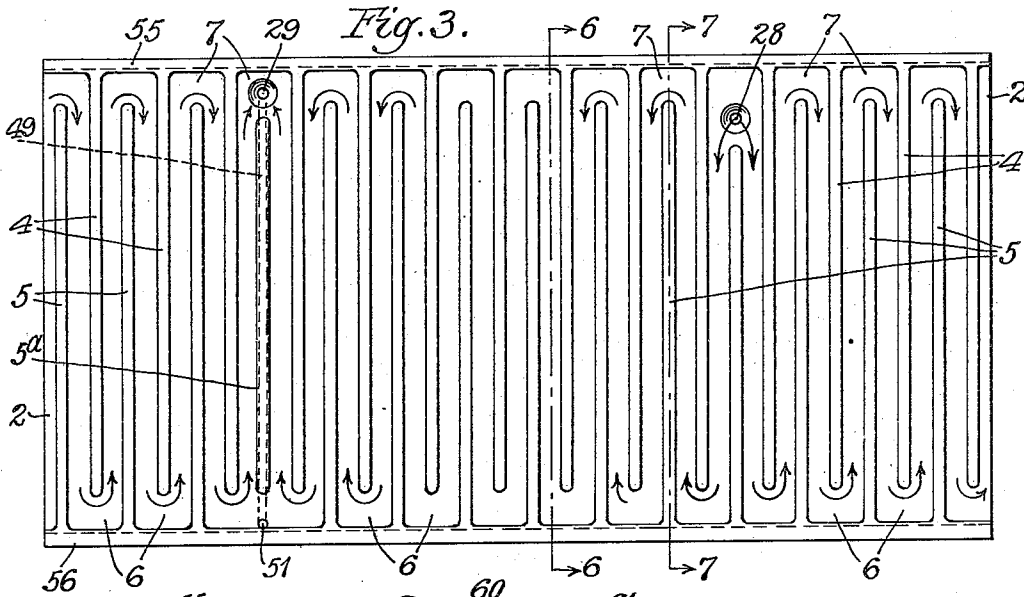
May 18, 1948.

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REFRIGERANT EVAPORATOR

2,441,833

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3 Sheets-Sheet 2



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2,441,833

Filed Aug. 16, 1943

3 Sheets-Sheet 3

Fig. 6.

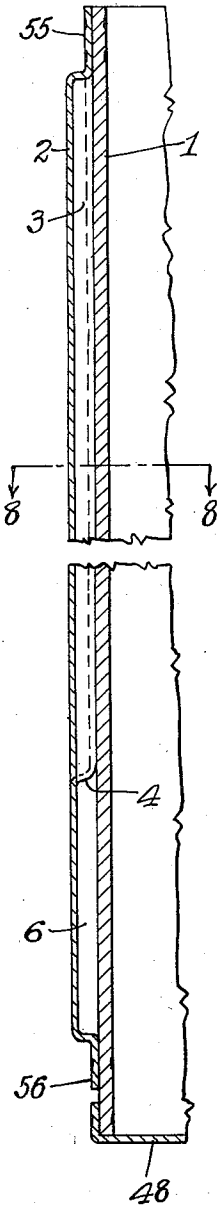


Fig. 7.

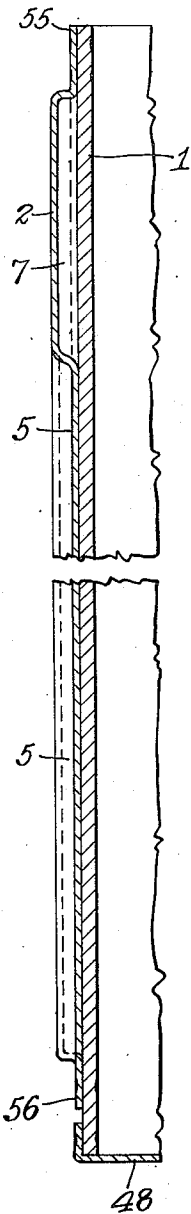


Fig. 5.

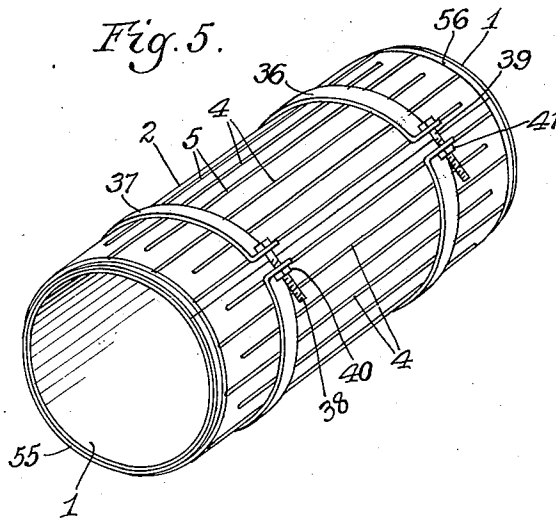


Fig. 8.

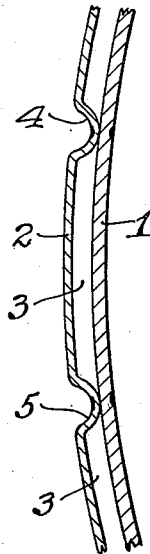
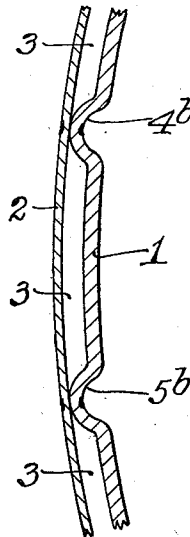


Fig. 9.



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UNITED STATES PATENT OFFICE

2,441,833

REFRIGERANT EVAPORATOR

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Application August 16, 1943, Serial No. 498,813

2 Claims. (Cl. 62-126)

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This invention relates to refrigerating apparatus and has for its object to provide a new and improved apparatus of this description.

The invention has for a further object to provide a refrigerating apparatus for freezing foods to preserve them, particularly adapted for household family use.

The invention has as a further object to provide an apparatus for freezing foods which is within the reach of the small grocer and by means of which losses previously taken on left-over perishables are eliminated and the grocers are able to carry every day of the week many items which were formerly only carried on Saturday, thus increasing the grocer's profits and reducing his losses.

The invention has other objects which are more particularly pointed out in the accompanying description.

Referring now to the drawings:

Fig. 1 is a view of one form of apparatus embodying the invention.

Fig. 2 is a sectional view taken on line 2-2 of Fig. 1.

Fig. 3 is a view of the inside face of the corrugated metal sheet before it is formed into one of the cylinders.

Fig. 4 is a sectional view taken on line 4-4 of Fig. 2.

Fig. 5 is a perspective view showing the outer cylinder in position around the inner cylinder, with means for compressing it to bring the passageway forming members into proper contact with the inner cylinder.

Figure 6 is a vertical section on an enlarged scale through the wall of an evaporator involving my invention;

Figure 7 is a similar section taken at a different point;

Figure 8 is a section on the line 8-8 of Figure 6;

Figure 9 is a similar section illustrating a variant form of my device.

Like numerals refer to like parts throughout the several figures.

In this construction there is an inner cold cylindrical member 1 of heat-conducting material into which the food or other material to be cooled is placed. Surrounding the cylinder 1 is a second cylinder 2 preferably of heat-conducting material. The two cylinders are of different diameters and are spaced apart to form a space 3 between them through which the cooling agent passes when the device is in operation. Surrounding the cylinder 2 is the insulating material

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2a, a portion of which 2b extends under the cylinders 1 and 2. There is an outer cylinder 2c which surrounds the insulating material and which holds the insulating material from being displaced and the insulating material holds and supports the cylinders 1 and 2. The cylinder 2 is preferably formed from a sheet of metal which is corrugated to form the inwardly projecting corrugations or members 4 and 5. One set of these corrugations or members, as, for example, the members 4 extend to one edge of the sheet and they are shorter than the width of the sheet so that there is a space 6 free from the corrugations left at the other end. The other members 5 extend to the other edge of the sheet and are shorter than the width of the sheet, so that there is a space 7 free from the corrugations at the other end of these members 5.

When the cylindrical shaped member 2 is in position around the cylindrical shaped member 1, these corrugations or members 4 and 5 are brought into contact with the face of the cylinder 1 so as to form passageways extending longitudinally along the space 3 between the cylinders, these longitudinal passageways being connected together at their ends by the free spaces 6 and 7 to form one or more continuous passageways extending entirely around the cylinder 1. The corrugations or members 4 and 5 have a somewhat loose engagement with the cylinder 1 so that a small amount of the refrigerant can leak past them laterally and the inner cylinder becomes, in fact, a complete primary cooling surface.

For cooling purposes I have illustrated a refrigerating apparatus preferably enclosed in an enclosing device 10 and which may be of any of the usual constructions and having a motor 11 and a compressor 12 driven by the motor, a condenser 13 and a liquid receiver 14. The motor is shown as having an extension plug 15 for connecting it to an electric circuit and there is preferably a thermostatic electric back pressure switch 16 in the electrical connection, which is accessible from the exterior of the device, see Figs. 1 and 2. The refrigerant passes from the liquid receiver 14 through the pipe 17 to the pipe 18 which is preferably embedded in the heat insulating material 2a surrounding the cylinders 1 and 2. There is an expansion valve 19, preferably a gas filled valve, also embedded in this heat insulating material which is loosely filled in the space and a pipe 20 leading from the expansion valve to the top of the space 3 between the cylinders 1 and 2, so that the refrigerant passes into this space at the top. The valve 19 is easily accessible when

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desired, by simply removing the top member 2d. A return pipe 21 is connected to the space 3 at the top and has a portion 22 which is preferably embedded in the insulation 2a and a portion 23 which connects with the compressor 12. The refrigerant material passes from the compressor 12 through the pipe 24 to the condenser 13 and thence by the pipe 25 to the liquid receiver 14. There is preferably a bulb 26 in proximity to the pipe 21 which is connected by the connecting means 27 with the expansion valve 19 so that the admission of the refrigerant material through the expansion valve is controlled by the temperature of the outflowing refrigerant through the pipe 21. Any of the usual devices for this purpose may be used.

Instead of having the same refrigerant material pass all the way around the cylinders, I may divide the refrigerant material into a plurality of sections or portions, each section or portion passing only part way around the cylinders. There may be as many of these sections or portions as desired. In Fig. 3 I have shown the refrigerant material divided into two sections or portions. This refrigerant material enters at the inlet 28 and there divides, one portion passing in one direction around the cylinders and the other portion in the other direction around the cylinders, the two portions being discharged at the outlet 29 and returned to the source of refrigerant supply through the pipe 21.

This method of admitting and controlling the movement of the refrigerant material through the passageway by dividing the refrigerant material into sections or portions and having each section or portion pass only part way around the cylinders, I have found to be of very great importance. It will be noted that there is here a continuous freely open passageway and that the refrigerant material enters this freely open passageway at a given point or points, for example, and then divides, part going in one direction and another part going in the other direction, each part only going part way around the cylinders. If, for example, after the device has been in operation and the material inside of the inner cylinder 1 has become cooled, some new uncooled material is inserted at one side of the cylinder, more refrigerant will automatically pass around that way instead of the other way, so as to bring the temperature of that portion of the cylinder or evaporator down much more quickly, to much more quickly lower the temperature at that place which has been raised by the warm material being placed on the interior of the cylinder. It will thus be seen that more refrigerant expands on the hot side than on the cold side, thus insuring the quick automatic equalization of the temperature. Since the refrigerant material passes only part way around the cylinders, the pressure drop is less than if the same refrigerant traveled all the way around and there is therefore less obstruction so that the velocity of the refrigerant is not so greatly reduced. I am enabled to get a lower temperature than if the refrigerant went all the way around the cylinders before it is directed back to the compressor.

With an apparatus of this kind, lubricating oil is drawn from the compressor and mixed with the gas and passes through the passageway formed between the cylinders 1 and 2. Due to the large cooling surface of this device and its construction, this lubricating oil, instead of passing back to the compressor, accumulates in the bottom of the space between the cylinders 1 and

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2 so that if this is not remedied, substantially all the lubricating oil is withdrawn from the compressor and as the compressor continues to run without sufficient lubricating oil it becomes heated and injured or stops operating altogether. I have provided means for insuring the return of the oil to the compressor so as to insure the continuous successful operation of this apparatus, by having one or more oil suction pipes located outside of the space between the cylinders 1 and 2 and embedded in the insulating material 2a and connected to the bottom of this space and to the pipe running directly to the compressor, so that this oil is drawn up through the oil suction pipe or pipes and returned to the compressor. Any number of these oil suction pipes as required or thought advisable may be used. I have illustrated in Figs. 2 and 3 an oil suction pipe 49 which is connected at the bottom to the pipe 51 which connects to one section of the passageway between the cylinders and to the pipe which connects to the other section of the passageway between the cylinders, the pipe 49 being connected at the other end 50 to the pipe 21 leading back to the compressor, so that the oil deposited at the bottom of the space between the cylinders will be delivered back to the compressor.

It is important that the corrugations or members 4 and 5 on cylinders 2 engage the other cylinder 1 with a sufficient pressure to guide the refrigerating material along the back-and-forth passageway formed thereby, but this pressure must not be too great as it must permit leakage of the refrigerant and the accumulated oil laterally past the corrugations so that the cylinder 1 will be a complete primary surface and the oil can get back to the pipe 49.

One means of securing this result is illustrated in Fig. 5. In this construction the sheet forming the outer cylinder 2 is formed of the proper length and is then folded around the inner cylinder 1 with the ridges or members 4 and 5 facing the cylinder 1. Adjustable bands 36 and 37 are then placed around the outer cylinder. The ends of the bands are bent outwardly and threaded bolts 38 and 39 are inserted through openings in the ends of these bands. These bolts have nuts 40 and 41 which are tightened up to cause the outer cylinder to bring the ridges or members 4 and 5 into proper contact with the outer face of the cylinder 1. This brings the edges of the outer cylinder in proximity to each other and they are then welded together to form a hermetically sealed connection. The bands 36 and 37 are then removed. The ends of the space 3 between the cylinders 1 and 2 are closed in any desired manner. As herein illustrated, the upper edge of the cylinder 2 is bent inwardly to form the engaging end piece 55 which is welded to the cylinder 1 to close that end of the space 3. The cylinder 2 has its other end bent inwardly to form the engaging end piece 56 which engages the cylinder 1 and which is welded thereto to close the lower end of the space 3. By this means the upper and lower ends of the space 3 between the cylinder are hermetically sealed. There is a heat insulating member 57 at the top (Fig. 4) which is interposed between the cylinder 2 and the cylinder 2c. There is a top member 2d which preferably engages the outer cylinder 2c and which is connected therewith by the fastening devices 59. This top member is preferably of metal and has no heat conducting connection with either of the cylinders 1 or 2. It projects

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up above the cylinders as shown and has a central opening which is preferably smaller in diameter than the diameter of the inner cylinder 1. There is a cover 60 for this opening. By having this cover and the inner edge 61 of the top member above the cylinder 1, they are out of the cold area and therefore do not sweat nor become frosted. The cylinder 2c is connected to the base 62 by the fastening devices 63.

The material to be cooled is placed in the receptacle 46 formed by the cylinder 1. The enclosing device 10 for the refrigerating apparatus comprising the compressor 12 and associated parts is provided with ventilating devices, such as the louvers 47.

The cooling receptacle for the material to be cooled is provided with a bottom 48. The switch 16 is preferably a thermostatically controlled cycling switch that automatically controls the electric motor.

By means of this device I am enabled to freeze the food in the chamber 46 to various degrees of hardness, from comparatively soft to extremely hard, and maintain it in a frozen condition as long as the motor and compressor operate properly.

It will further be seen that there is here provided a separate oil pipe 49 connected in the refrigerating system in multiple with the passageway extending longitudinally along the cylinders 1 and 2 in the space 3 between them.

I claim:

1. A refrigerating evaporator-container comprising an inner cylinder into which the material to be cooled is placed, an outer cylinder larger in diameter than the inner cylinder surrounding the inner cylinder with a space between them, the outer cylinder being crimped to form a plurality of inwardly projecting ridges integral therewith which engage the outer face of the inner cylinder, said ridges being shorter than the height of the outer cylinder, one end of some of said ridges being nearer the upper edge of the cylinder than the lower edge thereof, and one end of certain of the intermediate ridges being nearer the lower edge of said cylinder than the upper edge thereof, the upper and lower ends of said outer cylinder being bent inwardly to engage the outer face of the inner cylinder and a hermetically sealed connection between said bent ends of said outer cylinder and the face of said inner cylinder.

2. A refrigerating apparatus comprising an in-

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ner smooth cylindrical member and an outer crimped cylindrical member, the outer crimped cylindrical member surrounding the inner cylindrical member with a space between them, the crimps of the outer cylindrical member engaging the face of the inner smooth cylindrical member, said crimps, together with the face of the inner smooth cylindrical member, forming a series of longitudinally extending passageways connected together at their ends, through which the refrigerant for cooling the inner cylinder is passed, said crimps having a leaking engagement with the face of said inner cylinder so that a small portion of the refrigerant may leak laterally past said crimps, an admission opening for admitting the refrigerant into the space between the cylinders, means for dividing said refrigerant when admitted and guiding a portion thereof in one direction around the inner cylinder and another portion thereof in an opposite direction around the inner cylinder, a discharge opening for said refrigerant, means for applying suction to said discharge opening to cause the major portion of said refrigerant to pass along the series of passageways and a smaller portion of said refrigerant to move laterally past said crimps.

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