April 9, 1946. W. L. MORRISON 2,398,029

EVAPORATOR FOR REFRIGERATION

Filed March 11, 1944 3 Sheets-Sheet 1

Fig. 2.

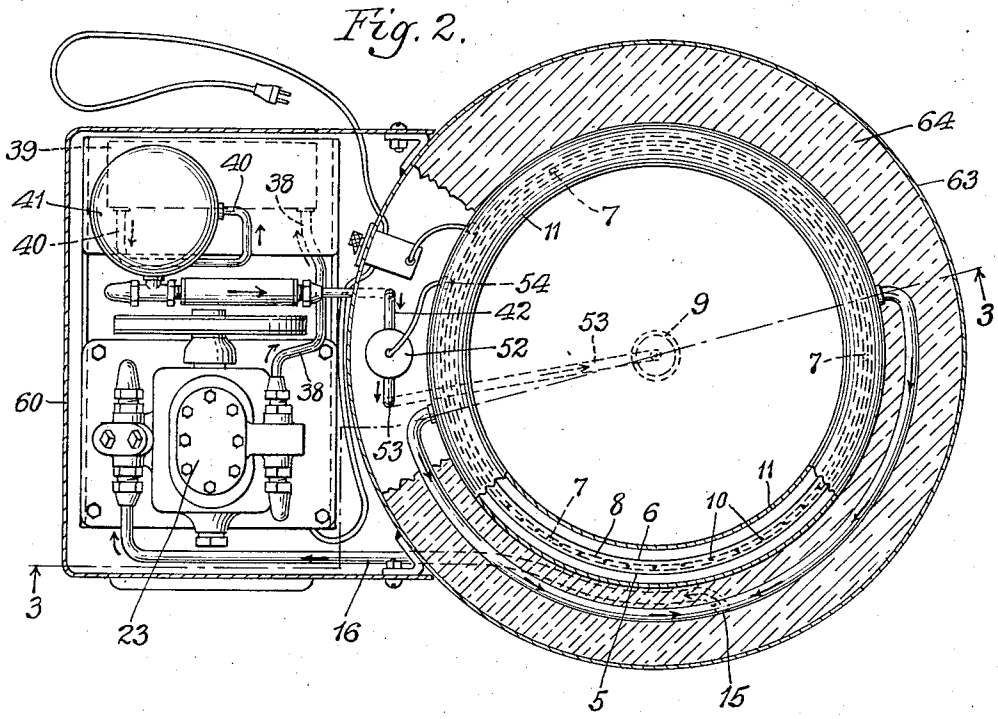
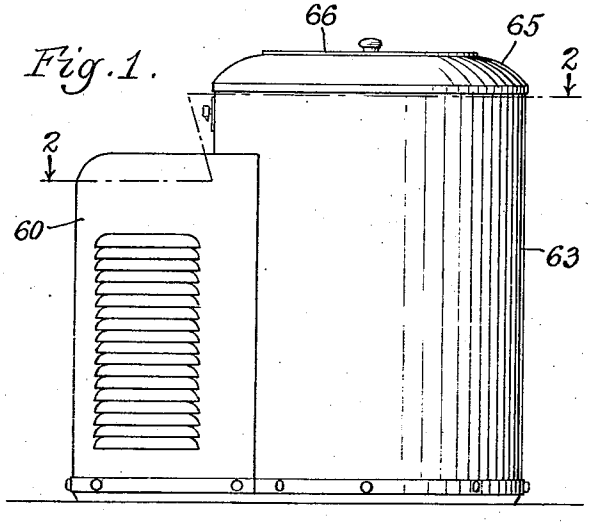


Fig. 1.



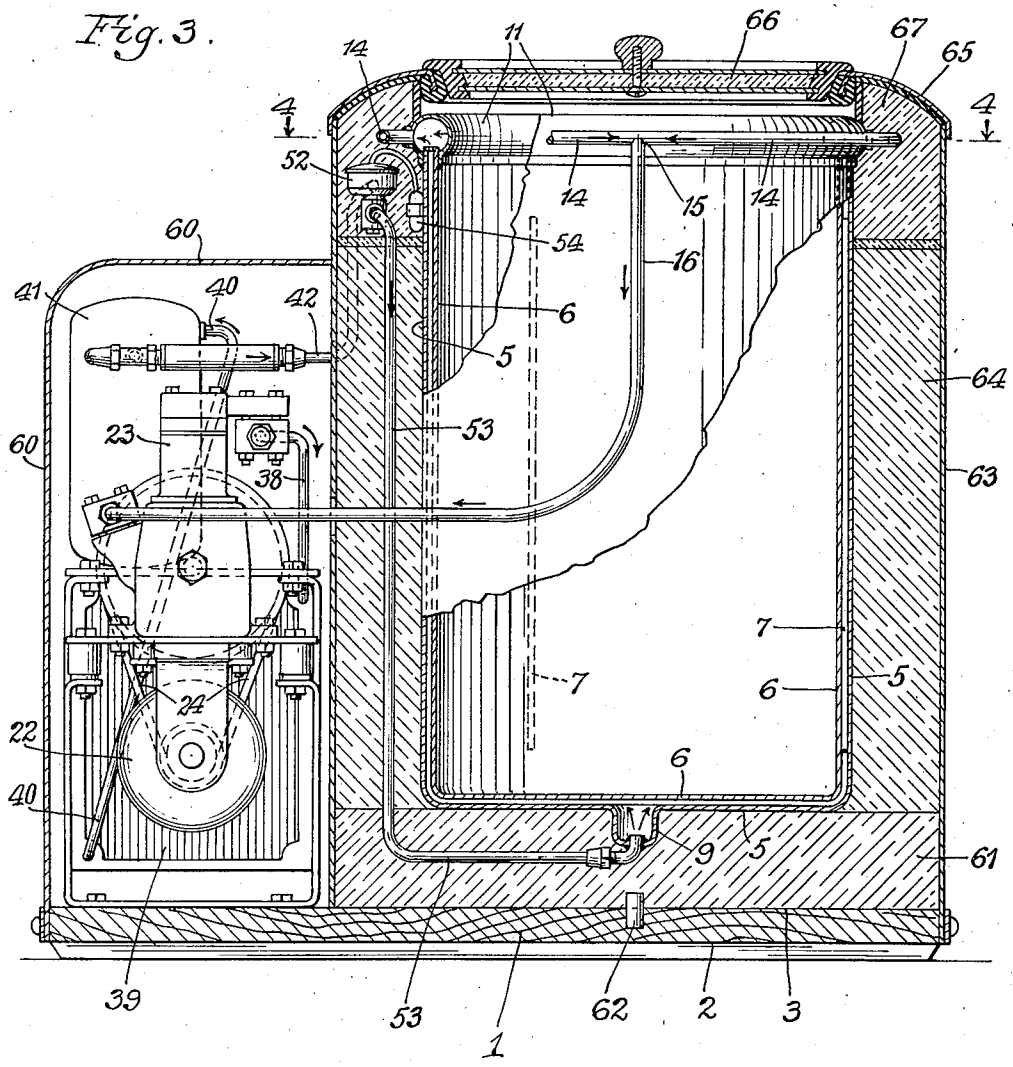
Inventor
Willard L. Morrison
by Parker & Carter
Attorneys.

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Fig. 3.



Inventor
Willard L. Morrison
by Parker & Carter
Attorneys.

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Fig. 4.

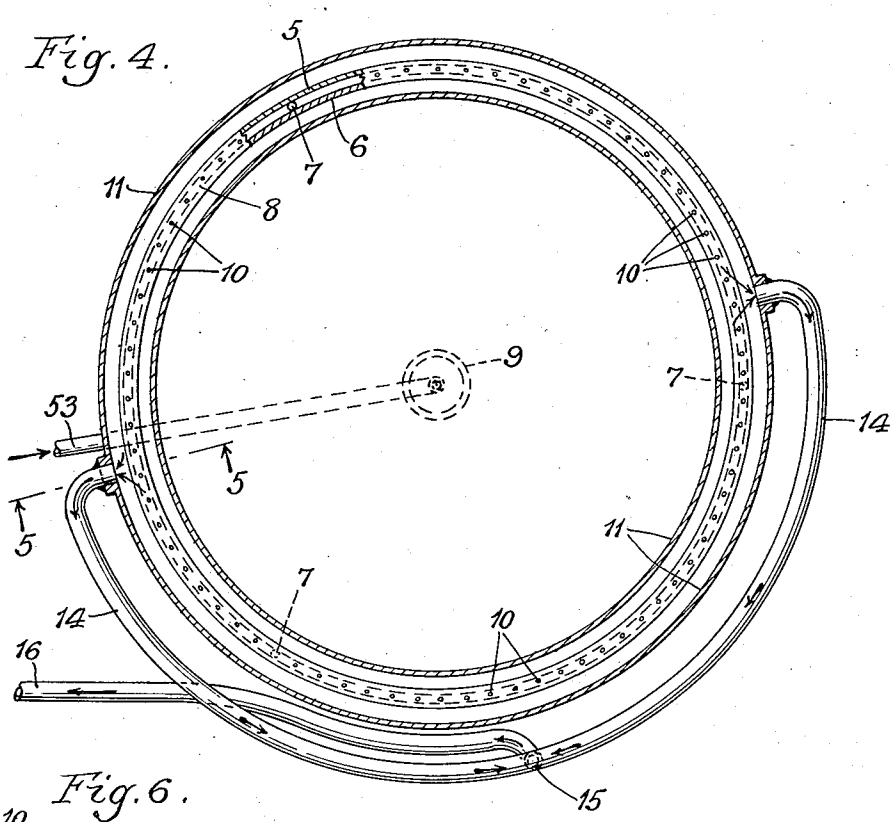


Fig. 6.

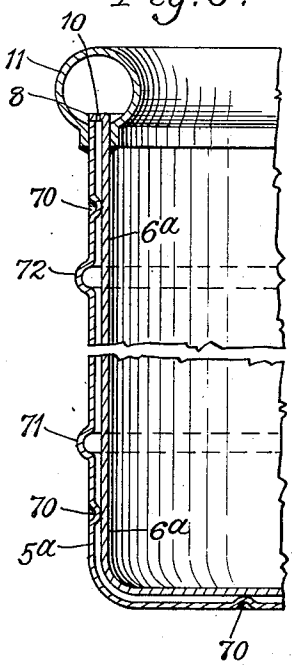
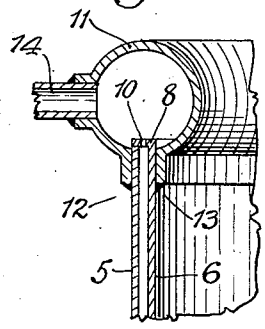


Fig. 5.



Inventor
Willard L. Morrison
by Parker & Carter
Attorneys.

Patented Apr. 9, 1946

2,398,029

UNITED STATES PATENT OFFICE

2,398,029

EVAPORATOR FOR REFRIGERATION

Willard L. Morrison, Lake Forest, Ill.

Application March 11, 1944, Serial No. 526,007

9 Claims. (Cl. 62—126)

This invention relates to refrigerating apparatus and has for one purpose to provide an improved evaporator.

Another purpose is to provide an evaporator which circumferentially defines and surrounds an open topped storage area.

Another purpose is to provide an evaporator which shall be economical and simple to manufacture.

Another purpose is to provide an evaporator unit which permits the employment of a minimum volume of a volatile refrigerant.

Another purpose is to provide an evaporator surrounding a storage space, which evaporator distributes the volatile evaporant substantially uniformly throughout the area of the evaporator which surrounds the storage space.

Other purposes will appear from time to time in the course of the specification and claims.

I illustrate the invention more or less diagrammatically in the accompanying drawings, in which:

Fig. 1 is a side elevation;

Fig. 2 is a section, on an enlarged scale, on the line 2—2 of Fig. 1;

Fig. 3 is a section on the line 3—3 of Fig. 2;

Fig. 4 is a section on the line 4—4 of Fig. 3;

Fig. 5 is a section, on an enlarged scale, on the line 5—5 of Fig. 4; and

Fig. 6 is a partial vertical radial section through a variant form of the device.

Like parts are indicated by like symbols throughout the specification and drawings.

In the construction herein illustrated, I employ a base 1 which may be generally flat and is shown as having a generally plane bottom surface 2 and a generally plane top surface 3. The evaporator is illustrated as having an outer cylinder 5 and an inner cylinder 6. Each such cylinder is shown as having an integral or an attached bottom element. The cylinders are spaced sufficiently apart to define a refrigerant receiving space, which extends entirely about the evaporator, extends from top to bottom of the evaporator, and also beneath the storage space defined by the evaporator. Any suitable means may be employed for spacing the two cylinders apart. I may employ, for example, a plurality of spacing rods 7; of these preferably three or more should be employed. The rods preferably terminate short of the top and bottom of the evaporator, as shown in Fig. 3. The cylinders 5 and 6 may be secured together at their upper ends by any suitable means. I illustrate, for example, a bridging ring 8. This ring may be formed as an outwardly extending flange from one of the cylinders 5 or 6, or it may be a separate member welded or otherwise secured to both cylinders. It serves as a top spacer and has a means for supporting the inner cylinder 6 in proper position to maintain the desired clearance between the outside face of the bottom of the cylinder 6 and the inside face of the bottom of the cylinder 5. The outside cylinder 5 is shown as having a central intake enlargement 9. The plate or ring 8 is shown as provided with a plurality of small apertures 10 distributed substantially uniformly about the circumference of the ring. In communication with the evaporator space defined between the cylinders 5 and 6 is a collector ring 11, shown as welded or otherwise secured to the inner and outer cylinders, as at 12, 13. 14, 14 indicate any suitable outlet ducts, which are joined as at 15, and deliver to the single outlet or return passage member 16. I have shown two of the ducts 14. It will be understood that under some circumstances a single outlet may be employed, or more than two. However, I find that the use of two or three outlets, in connection with the central inlet as at 9, and the use of relatively small apertures 10, insures a substantially uniform distribution of the refrigerant throughout the area of the evaporator. Thus, all parts of the inner cylinder 6 are properly cooled and a sufficiently even temperature is maintained in the storage space surrounded by the evaporator.

The refrigerating cycle and structure do not of themselves form a part of the present invention. Any suitable refrigerating apparatus may be used. In the drawings I have illustrated a refrigerating apparatus comprising a motor 22 and a compressor 23, driven from the motor by a belt 24. The gas, when compressed by the compressor, passes out through the pipe 38 and is then delivered to the top of the condenser 39. The gas then passes from the condenser through the pipe 40 into the receiving tank 41. The gas passes from the receiver 41 through pipe 42 to an expansion valve 52 from which the liquid passes by the duct 53 to the receiving enlargement 9 of the outer cylinder. 54 is any suitable bulb for assisting the automatic control of the temperature of the evaporator. The discharge passage 16 returns the gas to the compressor.

The compressor condenser unit may be mounted upon a lateral extension of the base 1 and may be surrounded by any suitable housing 60. The evaporator is shown as positioned and supported on a block or disc 61 of insulating material, which is initially held against lateral movement on the

base 1 by the dowel 62. The member 61 is recessed and channeled to receive the member 9 and the inlet passage 53. 63 is any suitable concentric surrounding housing which constitutes the exterior wall of the refrigerator cabinet. It may be of relatively thin relatively flexible material, such as sheet metal. When the insulation 64 is crowded down into the space between the evaporator and the outer wall 63, a firm structure is provided which surrounds and is reinforced by the evaporator. Any suitable top cover 65 may be employed for the insulation and a removable top closure 66 is used to protect the storage area from above. Any suitable insulation 67 may surround the upper portion of the evaporator and the collector ring 11, care being taken to avoid the use of any heat transmitting material. The cover 66 is at all points located above the space surrounded by the evaporator and does not extend down into the pool of cold air which is maintained in the space surrounded by the evaporator.

It will be realized that whereas I have described and shown a practical and operative device, nevertheless many changes may be made in the size, shape, number and disposition of parts without departing from the spirit of my invention. I therefore wish my drawings and description to be taken as in a broad sense illustrative and diagrammatical.

The use and operation of my invention are as follows:

I provide an evaporator structure for refrigerators which circumferentially defines and surrounds a storage space. In the use of the device herein shown, the storage space may be employed to receive and store foods or other substances. It may be cooled sufficiently to treat materials, such as metals, where cold temperature treatment is desired.

I provide an evaporator structure which has an effective cooling surface throughout its entire inner area, including the bottom of the surface to be cooled. The relation between the cooled area of the evaporator and the volume of the space cooled is such that I obtain a substantial avoidance of any temperature differential between the stored material and the refrigerant which would be effective to cause thermo-syphonic action. This is particularly important in connection with the storage of food stuffs, such as meats. The result is an avoidance of deterioration or desiccation of the stored substances and the reduction to a minimum of the depth of frost on the inner surface of the evaporator.

I also provide an evaporator which is economical to manufacture, and which is highly efficient in operation. I prefer to employ a pair of slightly tapered or slightly conic cylinders. This conicity may be so light that it is not indicated in the drawings. It is sufficient, however, to render it easy to insert the inner cylinder 6 within the outer cylinder 5. Where I employ an outwardly turned flange on the inner cylinder, as shown at 8 in Fig. 5, this flange initially supports the cylinder 6 within the cylinder 5 and spaces the bottoms of the two cylinders apart sufficiently to define the proper space for the outward passage of the refrigerant from the inlet area 9. I may employ any other suitable means for spacing the two cylinders apart. Referring to Figs. 2, 3 and 4, I illustrate the longitudinally extending spacer rods 7. These spacer rods may be spotted or otherwise secured in relation to one or the other of the two cylinders. For example, they may be spotted to the inner surface of the outside cylinder before the inside cylinder is positioned in place, or they may be spotted to the exterior of the inside cylinder before the inside cylinder is inserted in the outside cylinder.

In Fig. 6 I illustrate as a variant form of centering, a plurality of inwardly extending "dimples," which result in inward bulges or projections 70. A relatively small number of such projections is all that is necessary. I may, for example, employ three on the bottom of the outside cylinder 5*a* (Fig. 6). Similar spacing elements might be caused to extend outwardly from the inner cylinder 6*a*, but if any upsetting or dimpling is employed, it has the disadvantage of breaking the smooth inner surface of the inner cylinder. However, any suitable spacing means may be employed to provide a preferably substantial, uniform spacing of the two cylinders.

I may also find it desirable to provide one or more intermediate distributing passages. In Fig. 6 I illustrate two, as at 71, 72, which are merely offset in the outer cylinder 5*a*. The result is the provision of circumferentially extending distributing passages which are of greater width than the normal width or radial thickness of the space between the two cylinders.

In the actual manufacture of the device, the two cylinders are inter-fitted, as shown, and are secured together at their upper edges by the plate or flange 8 and by the collector ring 11. The result is a sturdy structure which serves not only as an evaporator, but as a container for the material to be stored or treated and as a reinforcement or central frame element for the cabinet formed by the flexible member 63 and the insulation between it and the evaporator.

It will be understood that where I employ the term "integral bottom" in connection with my description of cylinders, the bottom is to be considered structurally integral, whether it is integrally formed or merely permanently secured to the cylinder.

I claim:

1. An evaporator for refrigerators which includes an outer cylinder having an integral bottom, an inner cylinder having an integral bottom, the inner cylinder and the outer cylinder being spaced apart to define a container for the refrigerant to be evaporated, the inner cylinder being open at the top, means for delivering a refrigerant to the space between the bottoms of the two cylinders at a point generally on the axis of said cylinders, means for withdrawing the evaporated refrigerant from the top of the space between the cylinders, including a hollow collector ring, the interior of which is in communication with the space between the cylinders substantially throughout the circumference of the ring, and integral spacing means for spacing said cylinders apart.

2. An evaporator for refrigerators which includes an outer cylinder having an integral bottom, an inner cylinder having an integral bottom, the inner cylinder and the outer cylinder being spaced apart to define a container for the refrigerant to be evaporated, the inner cylinder being open at the top, means for delivering a refrigerant to the space between the bottoms of the two cylinders, and means for withdrawing the evaporated refrigerant from the top of the space between the cylinders, including a hollow collector ring, the interior of which is in communication with the space between the cylinders substantially throughout the circumference of the ring, and partition means between the cylinders and the

ring adapted to distribute substantially equally throughout the circumference the flow of the refrigerant from the evaporating space into the collector ring.

3. An evaporator for refrigerators which includes an outer cylinder having an integral bottom, an inner cylinder having an integral bottom, the inner cylinder and the outer cylinder being spaced apart to define a container for the refrigerant to be evaporated, the inner cylinder being open at the top, means for delivering a refrigerant to the space between the bottoms of the two cylinders at a point generally on the axis of said cylinders, and means for withdrawing the evaporated refrigerant from the top of the space between the cylinders, including a hollow collector ring, the interior of which is in communication with the space between the cylinders substantially throughout the circumference of the ring, and partition means between the space between the cylinders and the ring adapted to limit the flow of the refrigerant from the evaporating space into the collector ring, including a partition ring having a plurality of small apertures circumferentially distributed thereabout.

4. An evaporator for refrigerators which includes an outer cylinder having an integral bottom, an inner cylinder having an integral bottom, the inner cylinder being open at the top, means for spacing said cylinders apart and for thereby defining an evaporator space between said cylinders, means for delivering a refrigerant to the space between the bottoms of the two cylinders, and means for withdrawing the evaporated refrigerant from the top of the space between the cylinders, including a hollow collector ring, the interior of which is in communication with the space between the cylinders.

5. An evaporator for refrigerators, which includes an outer element and an inner element, each element having a closed bottom, one of said elements being located within the other, the two elements defining therebetween an evaporator space extending substantially throughout the area of the inner element, a collector element extending about the upper edges of the inner and outer element and means for delivering a refrigerant to the space between the bottoms of the two elements.

6. An evaporator for refrigerators, which includes an outer element and an inner element, each element having a closed bottom, one of said elements being located within the other, the two elements defining therebetween an evaporator space extending substantially throughout the area of the inner element, a collector element extending about the upper edges of the inner and outer element and means for delivering a refrigerant to the space between the bottoms of the two elements, and means for withdrawing refrigerant from the collector element at a plurality of points spaced about its circumference.

7. An evaporator for refrigerators, adapted to serve as an open topped storage element, which includes an outer cylinder and an inner cylinder nested in the outer cylinder, said cylinders having closed bottoms and being spaced apart to define an evaporating space for the refrigerant to be evaporated, the inner cylinder being open at the top, means for delivering a refrigerant to the space between the bottoms of the two cylinders at a point adjacent the axis of said cylinders, and means for withdrawing evaporated refrigerant from the top of the space between the cylinders, including a hollow collector ring located above and sealed in relation to the upper edges of the two cylinders.

8. An evaporator for refrigerators, adapted to serve as an open topped storage element, which includes an outer cylinder and an inner cylinder nested in the outer cylinder, said cylinders having closed bottoms and being spaced apart to define an evaporating space for the refrigerant to be evaporated, the inner cylinder being open at the top, means for delivering a refrigerant to the space between the bottoms of the two cylinders at a point adjacent the axis of said cylinders, means for withdrawing evaporated refrigerant from the top of the space between the cylinders, including a hollow collector ring located above and sealed in relation to the upper edges of the two cylinders, and means adjacent the upper edges of said cylinders for bridging the space between said cylinders and for forming a plurality of relatively small, circumferentially spaced outlet apertures from the space between the cylinders to the interior of the collector ring.

9. An evaporator for refrigerators, adapted to serve as an open topped storage element, which includes an outer cylinder and an inner cylinder nested in the outer cylinder, said cylinders having closed bottoms and being spaced apart to define an evaporating space for the refrigerant to be evaporated, the inner cylinder being open at the top, means for delivering a refrigerant to the space between the bottoms of the two cylinders at a point adjacent the axis of said cylinders, means for withdrawing evaporated refrigerant from the top of the space between the cylinders, including a hollow collector ring located above and sealed in relation to the upper edges of the two cylinders, and integral spacing means adapted to space said cylinders apart, the clearance between cylinders being of the order of the thickness of the metal of which the cylinders are formed.

WILLARD L. MORRISON.