Dec. 25, 1956 L. HANSON 2,775,101

SELF-CONTAINED ICE MAKING UNIT

Filed Nov. 7, 1952

2 Sheets-Sheet 1

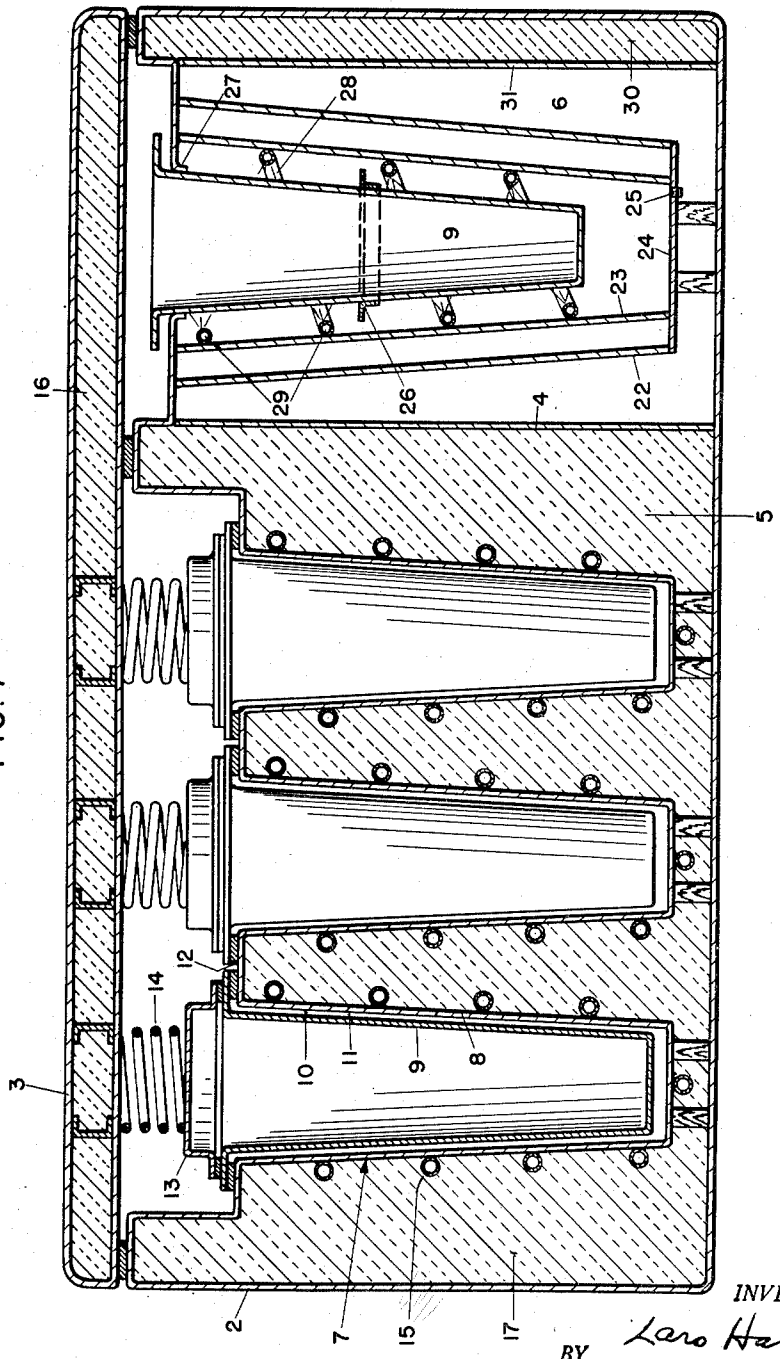


FIG. 1

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FIG. 2

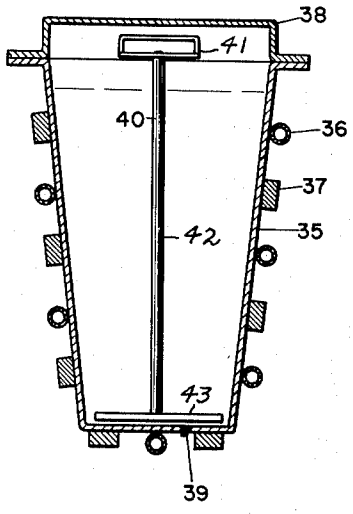


FIG. 3

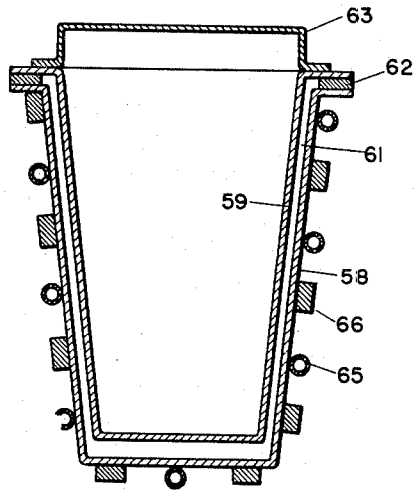
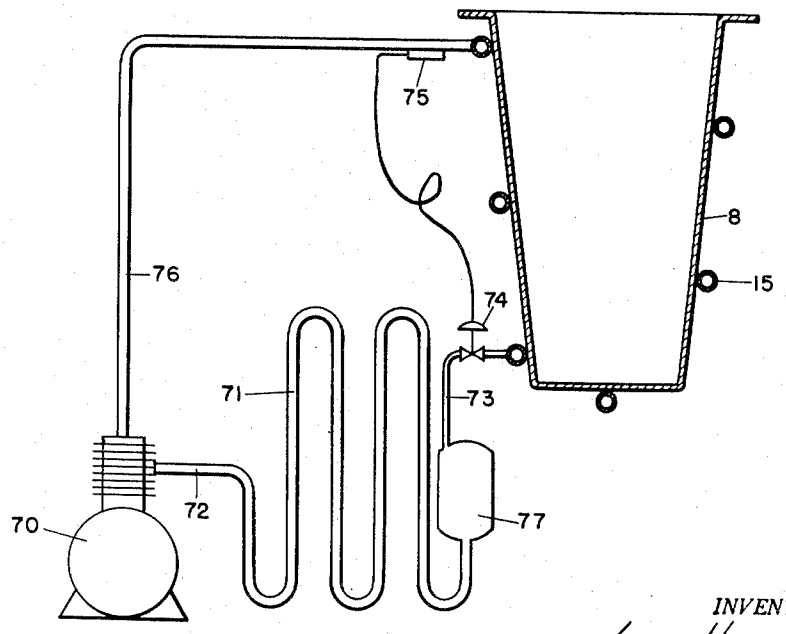


FIG. 4



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SELF-CONTAINED ICE MAKING UNIT

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2 Claims. (Cl. 62—108)

This invention relates to an apparatus for making ice and more particularly to an apparatus for forming small blocks of ice for use on ships or in similar locations where there is no other supply of ice.

One of the disadvantages of ice making apparatus of the prior art was that the large size of the apparatus prevented it from being placed in a number of different positions.

Another feature of the prior apparatus was that a secondary liquid was used to freeze the ice. This, of course, resulted in adding to the size and weight of the machine.

Another problem was the fact that the refrigeration machine normally was positioned at a point remote from the ice making apparatus and this resulted in the need of two different spaces for the complete apparatus.

The present invention eliminates these problems since a direct expansion evaporator is employed and the refrigeration machine may be located in a compact unit with the ice making apparatus. The size of the unit is sufficiently small to permit it to be positioned in any of a number of selected spaces.

The chief object of the present invention is to provide an ice making unit without the use of a relatively large body of brine solution that is capable of freezing ice in a relatively short time.

An object of the present invention is to provide an ice making unit of light weight structure which may be transported easily from one place to another.

A further object is to provide an ice making unit capable of making blocks of a size that one man can handle. Other objects of the invention will be readily perceived from the following description.

This invention relates to an ice maker comprising a container for containing a liquid to be frozen, a refrigeration system including an evaporator disposed about the container to freeze the liquid to form the ice, and means for harvesting the ice.

This invention further relates to a method of forming ice consisting of the steps of filling a container with liquid, placing the filled container inside a second contained, cooling the second container to remove heat from the first container and freeze the liquid to form ice, and separating the containers.

The attached drawings illustrate a preferred embodiment of my invention, in which

Figure 1 is a sectional view of the apparatus of the present invention;

Figure 2 is a sectional view of a modified form of the apparatus;

Figure 3 is a sectional view of another modification of the apparatus; and

Figure 4 is a diagrammatic view of a refrigeration system applied to one of the containers.

Referring to the drawings and particularly to Figure 1, there is disclosed the ice making unit of the present invention which includes a casing 2 and a cover 3 for the casing. This cover contains insulation 16 such as fiberglass. A partition 4 is positioned in the casing to

divide the casing into a refrigerated chamber 5 and a steam chest 6.

The refrigerated chamber 5 includes a plurality of ice makers 7. The ice maker consists of an outer container or can 8 and an inner container or can 9. Each of these containers is tapered downward and inward with the amount of taper. The inner container 9 is so designed that there is a space 10 between the exterior surface of the inner container 9 and the interior surface of the outer container 8. This space 10 is shown filled with a fluid 11 such as an anti-freeze compound or brine solution. The anti-freeze compound may be triethylene glycol and the brine solution may be a solution of water and calcium chloride. It should be noted that the quantity of anti-freeze compound or brine solution to fill the space 10 between the containers is very small. A rubber gasket 12 may be employed between the inner and outer containers to prevent the fluid 11 from escaping from the space 10 and to prevent air from entering this space. The ice makers 7 are insulated from the casing 2 and the partition 4 by insulation such as glass wool 17.

A cover 13 is provided for the inner container. This cover may be held in place by means of springs 14 suspended from the bottom of the casing cover 3. However, other suitable means may be employed, if desired, to hold the cover 13 in position.

The evaporator coil 15 of a refrigeration system surrounds the other container 8 and is fixed to the exterior surface of the container preferably by soldering or brazing. This coil is wound about the walls and the bottom of the container. The refrigeration system is more fully shown in Figure 4 and will be described hereinafter.

The steam chest 6 includes an outer casing 22 and an inner casing 23. Both of these casings are tapered downward and inward and have a common base 24. In this base 24, inside of the inner casing, is a suitable drain 25 to permit the removal of condensate.

Angle brackets are provided on the interior of the inner casing at 26 and 27 to serve as a guide for one of the ice containers.

Spaced around the interior of the inner casing 23 is a steam coil 28 which has orifices 29 spaced throughout. When steam is supplied to the coil 28, these orifices spray the steam onto the sides of the container 9. Insulation 30 is placed between the casing 2 and member 31. This insulation is preferably fiberglass.

Considering the operation of the device, water is placed in the inner container 9, which is then positioned inside of the outer container 8. Before the inner container 9 has been positioned in the outer container 8, a quantity of fluid 11 has been placed in the bottom of container 8. This quantity is such that when the inner container 9 is positioned in the outer container 8 a film of the fluid 11 is distributed over the interior surface of the outer container 8.

After the inner container has been positioned in the outer container, refrigerant is supplied to the evaporator coil 15. Due to the low heat resistance value of the fluid 11, heat from the liquid in the inner container 9 is easily transmitted to the coil 15. Thus, ice is formed within the inner container 9. Upon completion of the freezing of the liquid in the inner container 9, this inner container may easily be removed from the outer container since the fluid 11 has prevented any contact between the exterior surface of container 9 and interior surface of container 8 and has also prevented any freezing between these two surfaces.

After the inner container with its ice has been removed from the outer container, this ice must be removed from the inner container. This is preferably accomplished by placing the container in the steam chest 6. However, it

could be removed by running water over the container or in any other suitable manner. After the container is positioned in the inner casing 23 of the steam chest, steam is supplied to the steam coil 28 and sprayed over the container in a quantity sufficient to free the ice from the interior sides of the container 9. The container 9 is then removed from the steam chest and the ice is readily removed from the can. The ice may be used immediately or placed in a suitable storage compartment.

This particular apparatus is advantageous in eliminating the brine as the secondary refrigerant by using a direct expansion evaporator. In addition, the ice is easily removed from the can and one man may operate the unit since the blocks will only weigh about 15 to 18 pounds. This particular apparatus will freeze a block of ice in 8 to 9 hours so that a sufficient amount of ice will always be on hand. This particular two-can apparatus has the advantage of the inner container being removable so that it may be easily cleaned.

The embodiment disclosed in Figure 2 uses only one can or container, indicated at 35. This container has an evaporator coil 36 attached to its exterior surface and in contact therewith. Spaced between the evaporator coil on the outer surface of container 35 and fixed to the container are heating rods 37 of an electric heater. The container 35 is provided with a cover 38 that may be held in position by any well known locking means. A drain 39 is provided in the bottom of container 35 to permit the flow of water therefrom during cleaning operations.

Considering the operation of the modification of Figure 2, the container 35 is filled with water which is to be frozen. A handle 40 is then placed into the water. This handle consists of an upper grip 41, a rod 42 connected to the upper grip and to a bottom 43. The bottom of the handle, which is at substantially a right angle to the rod, rests on the base of the container and is separated therefrom by a film of the water. The cover 38 is then positioned upon the container 35.

Refrigerant is then supplied through the evaporator coil 36 so that the water is frozen and ice is formed. Upon completion of the freezing of the water, the supply of refrigerant is stopped and the heater is placed in circuit by a manual switch. These rods 37 serve to thaw the ice from the interior surface of the container 35. The cover 38 is next removed and the handle 40 is grasped. While a thin layer of ice may exist between the bottom of the handle and the base of the container 35, a slight pull on the handle will free the block of ice and the entire block may be removed. The ice is then chopped in smaller sections and placed in a suitable storage compartment.

This particular embodiment has the advantage of freezing a block of ice of 15 to 18 pounds in about six hours. However, it is not as easy to clean as the modification of Figure 1. It will be understood that a number of these containers 35 may be placed in a unit such as shown in Figure 1.

In Figure 3, there is shown a modified form of the invention. This particular modification has an outer container or can 58 and an inner container or can 59. Both containers are tapered inward and downward and are so constructed that a space 61 is left therebetween. This space is approximately 1/16 to 1/8 of an inch. A rubber gasket 62 may be provided between the inner and outer containers to seal off this space 61. A cover 63 is provided for the inner container 59 and may be held in place by any well known locking means. An evaporator coil 65 is positioned upon the exterior wall of the outer container 58. Also positioned upon the exterior wall of the outer container 58 and between the evaporator coil 65 is a heater 66 similar to heater 37 previously described.

In the operation of this modification, water is placed in the inner container 59 and this container is put in the outer container 58. The cover 63 is then positioned on top of the inner container 59. Next, refrigerant is supplied through the evaporator coil 65 and ice is formed in the inner container 59. The containers are reasonably tight fitting so as to get satisfactory heat transfer between the coil 65 and the inner container 59, even though a narrow air space is present. With this construction, frost will form between the two containers, which will not permit the inner container to be removed from the outer container without a defrosting or thawing operation. Thus, the heater 66 is employed to not only thaw the inner can for removal but also thaw the ice from the inner container so that the ice can be dumped out of the can and placed in a suitable storage compartment.

The modification of Figure 3 has the particular advantage of eliminating necessity for a steam chest or other thawing means. It will be understood that this type of container may be constructed as a unit with a number of other similar containers such as shown in the refrigerated chamber of Figure 1.

With particular reference to Figure 4, the outer container 8 and the evaporator coil 15 of the modification of Figure 1 are shown combined with the refrigeration system employed to form the ice. The refrigeration system includes a compressor 70 and a condenser 71. The refrigerant is compressed in compressor 70 and flows to the condenser 71 through discharge line 72. After being cooled in the condenser, the refrigerant flows through receiver 77 and line 73 to the evaporator. The flow through line 73 is throttled by expansion valve 74, which is responsive to a thermostatic bulb 75 placed in suction line 76. After passing through the evaporator, the refrigerant flows through suction line 76 to the compressor. This is the well known type of refrigeration system and no further explanation of this operation is deemed necessary.

The present invention provides an economical and easily operated machine for forming blocks of ice. This machine is particularly adaptable for use on ships where space is at a premium since it is compact in size and economical in operation. It permits a large quantity of ice to be formed by a small and easily transported unit that may be placed in any number of suitable spaces on a small ship such as a destroyer.

While I have described a preferred embodiment of my invention, it will be understood my invention is not limited thereto since it may be otherwise embodied within the scope of the following claims.

I claim:

1. In an ice maker, the combination of a casing, a refrigerated chamber within said casing, a steam chest within said casing, and a partition within said casing separating the chamber from said chest, said chamber including a container for containing the liquid to be frozen and means for lowering the temperature of the liquid so as to form the ice, said steam chest including a receptacle to receive the container of said chamber, a steam coil disposed about the interior walls of the receptacle, said coil having spray means adapted to supply steam over the exterior surface of said container to thaw the ice from said container.

2. Ice making apparatus comprising a housing, a cover for the housing, said housing including a partition forming a refrigeration compartment and a harvesting compartment, a first container in the refrigeration compartment, a second container having an annular flange surrounding the top thereof, positioned within the first container with the external surface thereof in spaced relation to the internal surface of the first container, means associated with the first container for extracting heat from the second container, a cap assembled in engagement with the top flange of the second container and means interposed between the housing cover and cap for preventing separation of the cap and the second container when the housing cover is applied to the housing.

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