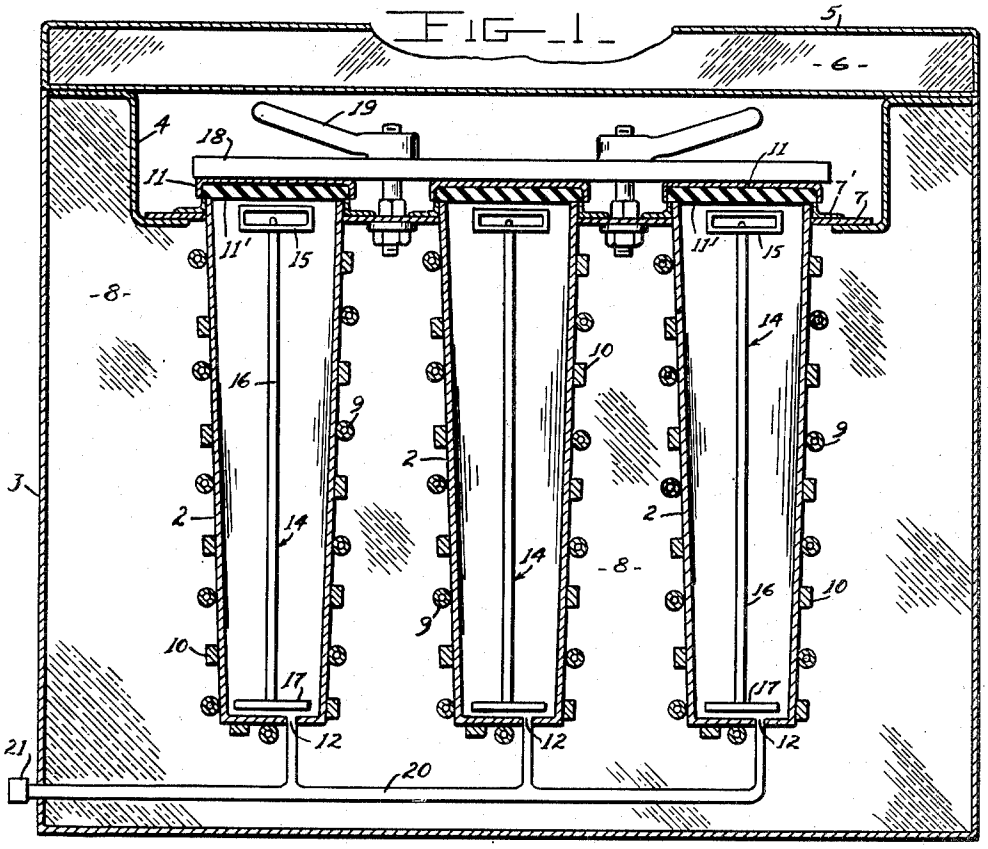
Dec. 25, 1956 S. W. BROWN 2,775,099

SELF-CONTAINED ICE MAKING UNIT

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FIG. 1



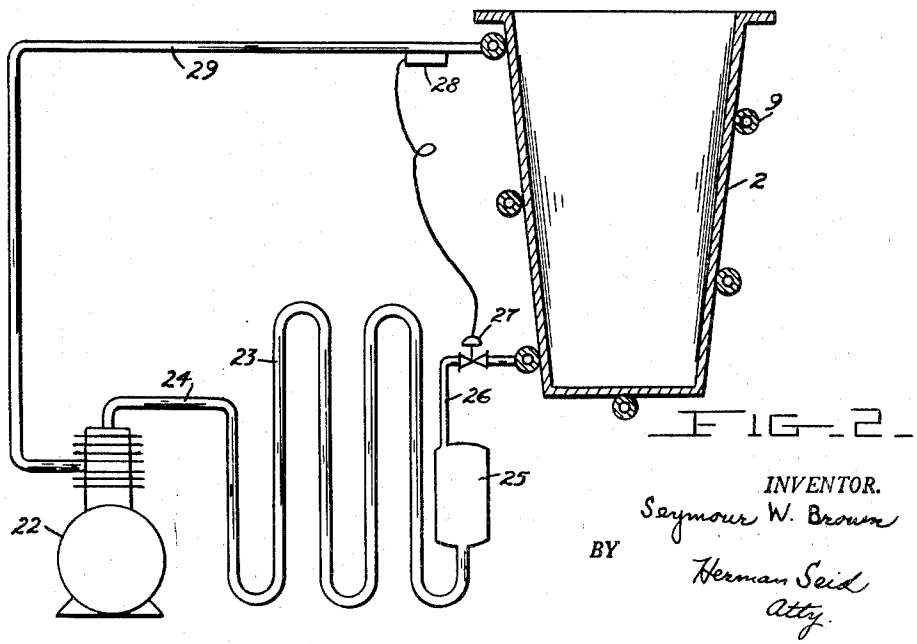


FIG. 2

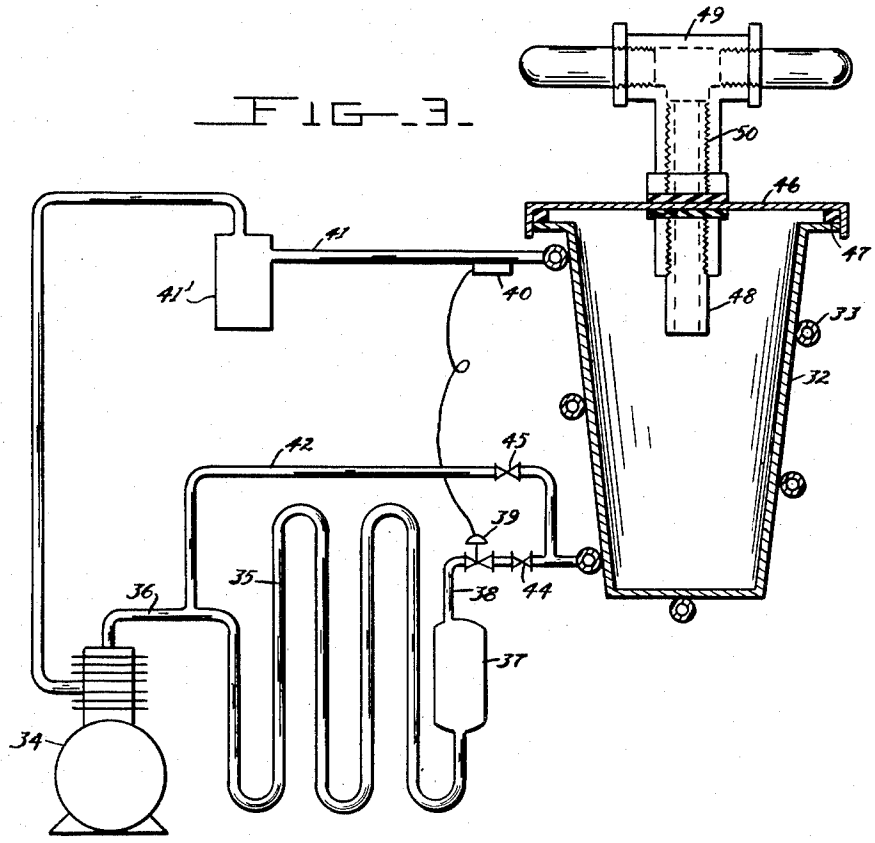
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FIG-3



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2,775,099

SELF-CONTAINED ICE MAKING UNIT

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Application May 5, 1953, Serial No. 353,116

1 Claim. (Cl. 62—106)

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 that is capable of freezing ice in a relatively short time without the use of a relatively large body of brine solution.

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.

Another object of the invention is to provide an ice making unit for use on shipboard employing a direct expansion refrigeration system.

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, passing liquid refrigerant into an evaporator surrounding the container to freeze the liquid in the container to form ice, stopping the flow of liquid refrigerant when the ice is formed, applying a source of heat to the container to thaw the ice, and removing the ice from the container.

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 diagrammatic view of the refrigeration system employed in the apparatus; and

Figure 3 is a diagrammatic view of a modification of the invention.

Referring to the drawings and particularly Figure 1,

there is disclosed the ice making unit of the present invention including a plurality of containers or cans 2 disposed in a casing 3. A can deck support 4 is disposed in the upper portion of the casing and serves to support the cans 2. A cover 5 is provided for the casing 3 to make the unit compact. This cover contains insulation 6, such as fiber glass.

The containers 2 are supported from the can deck support 4 by means of a can deck 7. The containers 2 and the can deck 7 are joined together to form a unitary assembly. Angle brackets 7' are provided to connect the containers 2 to the can deck 7. The angle brackets 7' are preferably joined to the containers 2 and the can deck 7 by welding, but other suitable means may be employed, if desired.

Each of the containers 2 is tapered downward and inward with the same amount of taper to permit easy removal of ice formed in the container. The containers or cans 2 are insulated from the casing 3 by insulation, such as glass wool 8. The evaporator coil 9 of the refrigeration system surrounds each container 2 and is fixed to the exterior surface of the container preferably by soldering or brazing. This coil is wound about the walls and bottom of the container. The refrigeration system is more fully shown in Figure 2 and will be described hereinafter.

In the space between the coils of the evaporator on the outer surface of the container and fixed to the container are heating rods 10 of an electric heater. The rods 10 of the heater are disposed about the walls and bottom of the container. The container 2 is provided with a cover 11 that may be held in position by any well known locking means; the preferred type will be described hereinafter. Disposed inside the cover is a rubber gasket 11'. When the cover is locked in position on the container, this rubber gasket serves as a seal between the can and the cover. Drain 12 is provided in the bottom of the container 2 to permit the flow of water therefrom during cleaning operations.

A handle or extractor 14 is disposed in the container 2. This handle consists of an upper grip 15, a rod 16 connected to the upper grip and to a bottom 17. The bottom of the handle, which is at a substantial angle to the rod, rests on the base of the container and when water is in the container it is separated from the base of the container by a film of this water.

The specific locking means for the cover 11 of each container includes a cover clamp 18 disposed above the cover 11. Each clamp is preferably disposed over all of the covers of the unit. Two clamps are desirably used. Clamping levers 19 are positioned above each cover clamp 18, as clearly shown in Figure 1, to lock the cover to the container. Two levers 19 are preferably placed over each clamp 18.

Disposed in the bottom portion of the casing 3 is a line 20. Each of the drains 12 is connected to this line 20. The line 20 leads to a cleanout drain 21, which is positioned outside the casing. Suitable means are provided to convey the water from the cleanout drain 21.

Considering the operation of the device, water is placed in each of the containers 2. The handle 14 is then placed into the water after which the cover 11 is clamped on the container 2 by the clamping lever 19.

Refrigerant is then supplied to the evaporator coil 9 and ice is formed within the container 2. Upon completion of the freezing of the water, the supply of refrigerant is stopped and the heater is placed in circuit preferably by a manual switch. These rods 10 of the heater serve to thaw the ice from the interior surface of the container 2. The cover 11 is next removed and the handle 14 is grasped. While a thin layer of ice may exist between the bottom of the handle and the base

of the container 2, 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 or it could be used immediately, if desired. This particular embodiment has the advantage of freezing a block of ice of 15 to 18 lbs. per can in about 6 hours.

With particular reference to Figure 2, the container 2 and the evaporator coil 9 of Figure 1 are shown combined with the refrigeration system employed to form the ice. The refrigeration system includes a compressor 22 and a condenser 23. The refrigerant is compressed in compressor 22 and flows to the condenser 23 through discharge line 24. After being cooled in the condenser, the refrigerant flows through receiver 25 and line 26 to the evaporator. The flow through line 26 is throttled by expansion valve 27 which is responsive to a thermostatic bulb 28 placed in suction line 29. After passing through the evaporator, the refrigerant flows through suction line 29 to the compressor. This is the well known type of refrigeration system and no further explanation of this operation is deemed necessary.

A modification of the present invention is disclosed in Figure 3. There is shown a can 32 which is preferably tapered to facilitate removal of ice to be formed therein by means to be described hereinafter. An evaporator coil 33 of a refrigeration system 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.

In addition to the evaporator coil 33, the refrigeration system includes a compressor 34 and a condenser 35. The refrigerant is compressed in the compressor 34 and flows to the condenser 35 through a discharge line 36. After being cooled in the condenser, the refrigerant flows through the receiver 37 and line 38 to the evaporator. The flow through line 38 is throttled by an expansion valve 39, which is responsive to a thermostatic bulb 40 placed in suction line 41. After passing through the evaporator, the refrigerant flows through suction line 41, in which accumulator 41' is disposed, to the compressor. It will be understood that other suitable means, such as a capillary tube, may be employed in place of the expansion valve, if desired.

Line 42 connects discharge line 36 and line 38 to provide a bypass around the condenser 35, receiver 37, and expansion valve 39. Line 42 is employed to permit hot gaseous refrigerant to be supplied to the evaporator coil 33 when it is desired to thaw the ice to permit its removal from the container 32. To permit the freezing and thawing operations to be carried out, valve 44 is disposed in line 38 between expansion valve 39 and the juncture of lines 38 and 42. Line 42 is provided with a valve 45 similar to valve 44.

It will be understood that other suitable means may be employed for thawing, if desired. For example, monofluorotrichloromethane or dichlorodifluoromethane or brine could be heated in a boiler and then passed through the evaporator coil. The source of heat for the boiler could be an electric heater, a steam coil or other suitable means. If desired, condenser water may be circulated through a second coil mounted on the container 32 to thaw formed ice from the container.

When it is desired to freeze the liquid in the container 32, valve 44 is opened and valve 45 is closed to permit the refrigeration system to work in its normal cycle to supply liquid refrigerant to evaporator coil 33 so that heat is removed from the liquid in the container to permit the liquid to change to ice. Upon completion of the freezing of the block of ice, it is necessary to provide means for removing the ice from the container.

In this particular modification, the compressor continues to operate even though no more cooling is required. When the ice is formed, valve 44 is closed and valve 45 is opened. These valves are preferably manually controlled but suitable automatic means may be used, if desired. This causes the refrigerant from the compressor 34 to flow directly to the evaporator coil 33 and bypass the condenser, receiver, and expansion valve. The refrigerant leaving the compressor is a hot gas and has sufficient heat therein to thaw the ice from the inner surface of the container. After the thawing step is completed, suitable means, which will be described hereinafter, are employed to remove the ice from the container. The ice may be used immediately or placed in a suitable storage compartment.

The preferred means for removing the ice from the container of this modification includes a cover 46 disposed on the can 32. A rubber gasket 47 is provided between the cover 46 and the can 32 to prevent leakage. A hollow pipe 48 is formed integral with the cover 46. This pipe extends about half the length of the container. It will be understood that this pipe could extend to the base of the container, if desired. This pipe extends upwards above the cover 46 and the handle 49 is threaded on to this pipe as shown at 50. This permits the handle 49 to be removed from the pipe 48 for a reason to be described hereinafter.

It will be understood that after the container 32 is filled with water, this cover 46 is placed on top of the container. When the cover is so positioned, the pipe will extend into the water. Upon completion of the freezing step, the pipe will be securely embedded in the block of ice. Therefore, once the ice is thawed from the inner surface of the container, it may be easily removed by grasping the handle 49. After removal of the ice from the container, the handle 49 is removed from the pipe 48 and hot water or steam is supplied to the hollow interior of the pipe 48. This thaws the ice from the exterior surface of the pipe so that it is not necessary to chop the ice from the pipe. This ice is then placed in a suitable storage compartment or it may be used immediately. It will be understood that, if desired, the ice may be chopped from the pipe rather than thawing the ice from the pipe by the use of hot water or steam.

It will be understood that the combination handle and cover could be used with the modification of Figure 1. Similarly, the handle and cover of Figure 1 could be employed with the embodiment of Figure 3. It is only necessary that means be provided to freeze the ice in the container, to thaw the ice from the inner surface of the container, and to remove the ice from the container. It also will be understood that the modification of Figure 3 would be used in conjunction with a casing similar to casing 3 of Figure 1.

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.

An advantage of the present invention is the operation of the direct expansion refrigeration system of the ice making unit at a higher efficiency than the indirect system heretofore employed. By eliminating the brine solution in the present invention, there is no problem of corrosion of the coils and the ice cans, preparation and maintenance of the brine, and the expense of charging a fresh brine solution at regular intervals.

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 claim.

I claim:

Ice making apparatus comprising a housing, a deck supported in the housing, said deck being provided with a plurality of openings therein, a container adapted to contain liquid to be frozen positioned in each opening,

means for fixedly securing the top portion of each container to the deck, a refrigeration system including an evaporator disposed about the container for freezing liquid therein, means for overcoming the bond between the ice and the inner surface of the container, means for removing the ice after the bond has been overcome, a cover for each container and closure means including an elongated bar adapted to engage a plurality of the covers and clamping means arranged to exert a force on the bar sufficient to cause the covers to tightly engage the containers.

References Cited in the file of this patent

UNITED STATES PATENTS

522,137	Walker	June 26, 1894
984,052	Voorhees	Feb. 14, 1911
989,690	Berryman	Apr. 18, 1911
1,521,709	Pownall	Jan. 6, 1925
2,145,773	Muffly	Jan. 31, 1939
2,221,694	Potter	Nov. 12, 1940
2,259,066	Gaston	Oct. 14, 1941
2,340,721	Whitney	Feb. 1, 1944
2,361,137	Terry	Oct. 24, 1944
2,414,264	Kirkpatrick	Jan. 14, 1947
2,418,572	Brennan	Apr. 8, 1947
2,493,900	Schaberg	Jan. 10, 1950
2,498,645	Bobby	Feb. 28, 1950
2,542,892	Bayston	Feb. 20, 1951
2,563,093	Bayston	Aug. 7, 1951
2,596,036	MacDougall	May 6, 1952

FOREIGN PATENTS

10,944	Great Britain	1905
21,357	Great Britain	Sept. 14, 1910
177,144	Great Britain	Mar. 1, 1923
629,812	France	Aug. 8, 1927