

May 26, 1936.

J. ASKIN

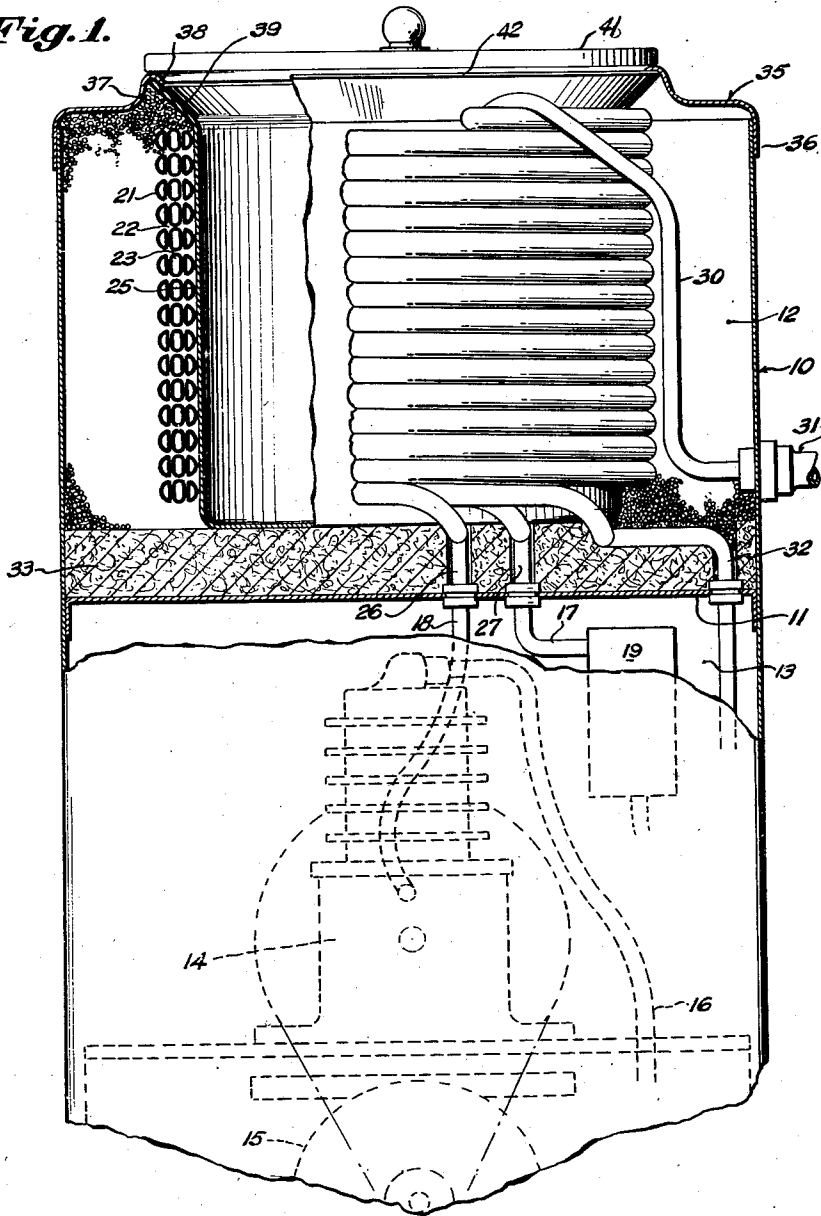
2,042,418

REFRIGERATED BEVERAGE DISPENSING APPARATUS

Filed March 29, 1933

2 Sheets-Sheet 1

Fig. 1.



Inventor

Joseph Askin

Albert R. Henry
Attorney

May 26, 1936.

J. ASKIN

2,042,418

REFRIGERATED BEVERAGE DISPENSING APPARATUS

Filed March 29, 1933

2 Sheets-Sheet 2

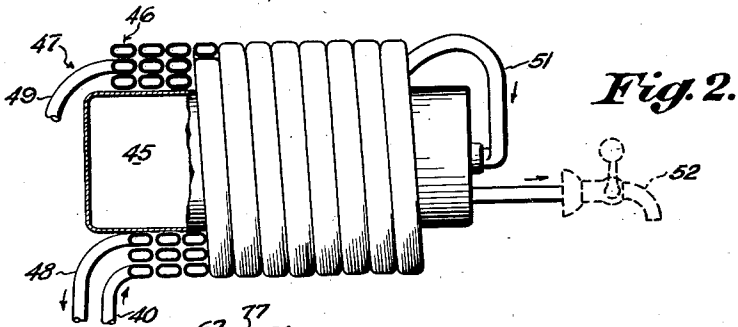


Fig. 2.

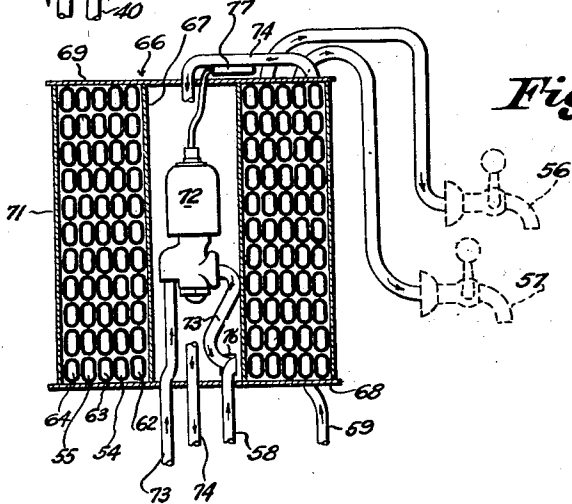


Fig. 3.

Fig. 5.

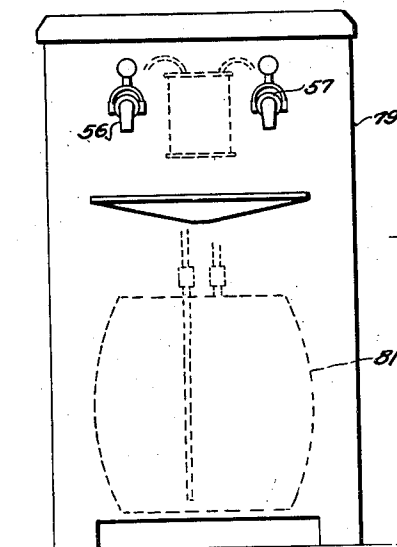
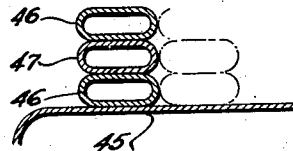


Fig. 4.

Inventor

Joseph Askin

Albat R. Henry

Attorney

UNITED STATES PATENT OFFICE

2,042,418

REFRIGERATED BEVERAGE DISPENSING
APPARATUSJoseph Askin, Buffalo, N. Y., assignor to Fedders
Manufacturing Company, Inc., Buffalo, N. Y.

Application March 29, 1933, Serial No. 663,397

1 Claim. (Cl. 62—141)

This invention relates to apparatus for dispensing refrigerated beverages and it has particular reference to a refrigerating unit in which a stream of beverage or other liquid to be cooled is caused to flow through a coil which is in thermal contact on opposite sides with coils containing a refrigerating medium and in which the various coils are so disposed with respect to each other that the liquid coil convolutions are embraced or are "sandwiched" between the convolutions of the refrigerant coils.

The invention may be applied in a variety of forms or styles, some of which are illustrated in the accompanying drawings, hereinafter more specifically described. In certain forms, the bank of coils, which may be readily made self-sustaining, are adapted to be inserted in a suitable receptacle or compartment, such as a space in a fixed counter, and, when properly connected to the refrigerant and beverage lines, may be used for cooling and dispensing purposes. In other forms, the coils are wound around a container adapted to serve as a local cold compartment for packaged goods or a supply of liquid of different kind from that flowing through the liquid coil. Or, the liquid coil through which the refrigerated beverage flows may be connected to the container to serve as a local source of cooled beverage, thereby increasing the peak load capacity of the apparatus without unduly increasing its size. The cooling and dispensing coils may further be associated with cabinet structures to form independent cooling and dispensing units.

In the preferred forms of the invention, the liquid and refrigerant coils are formed with flattened contacting faces which materially increase the thermal contact and hence the efficiency, and the coils are also so placed with respect to each other that each portion or convolution of the liquid coil is embraced on opposite sides by portions of the refrigerant coils, to the end that effective heat transference may be readily obtained.

Referring to the drawings for a more detailed description of the various principles, objects, and advantages of the invention,

Fig. 1 is a view, partly in section and partly in elevation, with portions broken away, of a cooling and dispensing apparatus associated in a cabinet with a refrigerating machine;

Fig. 2 is a view, partly in section and partly in side elevation, of the coils associated with a liquid tank providing a local storage reservoir for cooled beverage;

Fig. 3 is a section of another form of the invention, containing a greater number of coils with which is associated a refrigerant control valve;

Fig. 4 is a schematic view in elevation showing how the coils may be disposed in a cabinet structure; and,

Fig. 5 is a section of one form of the coils.

As shown in Fig. 1 of the drawings, the numeral 10 indicates a cabinet having a horizontal partition 11 therein, which divides the cabinet into a cooling compartment 12 and a refrigerating mechanism compartment 13.

The compartment 13 contains the usual refrigerating mechanism including a compressor 14 operated by a motor 15 and delivering refrigerant to a suitable condenser (not shown) through a pipe 16 and thence to an evaporator located in the compartment 12 through a pipe 17. The refrigerant is returned from the evaporator to the compressor through a pipe 18 to complete the cycle. An expansion valve, thermostat, or like control and regulating means is disposed in a control box 19, in communication with the pipe 17. This well-known form of "dry" system of refrigeration may be substituted for by any other well-known system, or the units herein located in the compartment 13 may be remotely located from the cabinet 10, without departing from the spirit of the invention.

The evaporator, generally indicated by the numeral 21, consists of a double helix formed of a length of half round tubing bent upon itself with the flattened portions in opposed and spaced relation to form a receiving pocket 22 therebetween. A liquid receiving section of tubing or cooling coil 23, also formed in a helix, is interposed between the opposed sections of the evaporator 21, and it is preferably, although not necessarily, in the form of oval or flattened tubing having a maximum cross-sectional dimension approximately equal to the major dimension of the evaporator tubing. As shown in the drawings, the evaporator and cooling coil arrangement forms a compact tube unit which may be bent or otherwise formed into a plurality of advantageous shapes. The heat transfer unit is shown as wound about a cylindrical receptacle 25 to form a helix substantially covering the vertical wall of the receptacle and having its inner evaporator section in intimate contact therewith.

The terminal portions 26 and 27 of the evaporator coil engage through the partition 11 and

are connected to the pipes 18 and 17 respectively of the refrigerator unit. The opposite ends of the liquid cooling coil 23 protrude from the refrigerator conducting unit at the upper and lower portions thereof, and the upper end 30 extends downwardly for connection to a tap fitting or faucet 31 entering through the side wall of the cabinet 10 in the compartment 12. The opposite extremity 32 of the cooling coil extends through the partition 11 to a source of liquid under pressure (not shown), such as a city water line or a pressure supply of a beverage or the like.

Structurally, the compartment 12 is provided at its lower portion with a slab 33 of insulating material which forms a base upon which the container 25 is supported. This slab is suitably perforated to permit the ends of the evaporator and cooling coil, as above described, to project into the compartment 13. The upper end of the compartment 12 is covered by a cap member 35 having a flange portion 36 engaging about the upper end of the cabinet 10 and having a central raised portion 37 terminating in an enlarged opening defined by an intumed flange portion 38. The upper extremity of the receptacle 25 is flared to provide a flange portion 39 adapted to be engaged beneath the flange portion 38 of the cap member 35. A cover 41 is provided for the opening in the cap member 35 and it is provided with a depending portion 42 seating on the flange 38 to seal the container 25 against ingress of outside air.

The space in the compartment 12, between the walls thereof and the heat exchange unit, is filled with a heat insulating substance such as granular cork or the like, which, together with the slab 33, provides an insulated casing for the heat exchange unit and the container 25.

It will be appreciated that round tubing may be substituted for the type of tubing used in the described evaporator 21 and cooling coil 23, and operate with a fair degree of efficiency. However, if maximum efficiency is desired, it will be found advantageous to provide substantial flat contact surfaces on adjoining tubes. The cooling coil 23, for example, being sandwiched between the flattened sections of the convolutions of the evaporator tubing 21, has a major portion of its surface in direct contact therewith, and the ribbon-like stream of liquid passing therethrough is continuously subjected to the heat exchange between the tubes. In some forms of the invention, particularly where no inner sleeve is provided, the assembled coils are dipped, after being formed, into a bath of solder which practically integrates the coils, and provides for a maximum of heat transfer. At the same time, the liquid and refrigerant streams are physically isolated from each other, and there is no danger of contamination of one liquid by the other, should a tube accidentally be broken.

The sandwiched coil principle is applicable to numerous fluid cooling systems. For example, in Fig. 2 a reservoir such as a settling tank 45 serves as a base for an evaporator coil 46 and a cooling coil 47. These coils (Fig. 5) are similar in relative arrangement to the evaporator 21 and coil 23 of Fig. 1, with the exception that the coil 46 is of flattened tubing so that the inner helix thereof has a large surface contact on both the coil 46 and the wall of the tank 45. In this device the refrigerant enters the outer helix of the evaporator coil 46 through the input lead 40 and discharges through the output lead 43 to the com-

pressor. The beverage or cooling coil 47 is supplied through its input lead 49, and the liquid therein is cooled in transit to its output lead 51, which feeds the tank 45. The tank 45 in this case acts as a "hold over" in anticipation of a constant withdrawal of liquid through its dispensing valve 52 for a sustained period.

When a greater number of layers of tubing is desired, as, for example, when a plurality of liquid coils are included in the same unit, the flattened type of tubing (Fig. 5) may be used to advantage. In Fig. 3, for example, a pair of helices or liquid cooling coils 54 and 55 each convey liquid to their respective dispensing valves 56 and 57 and are supplied from a source or sources of fluid under pressure which enters their input leads 58 and 59. The refrigerant coils or evaporator 61 is wound to form three spaced helices 62, 63 and 64, which, in common with the coils 54 and 55, are of the flattened tubing.

The helices of the evaporator 61 and the coils 54 and 55 are so wound that each liquid coil has two of its flat faces in intimate thermal contact with adjacent flat faces of the evaporator tubing. This results in the positioning of the coil 54 between the helices 62 and 63, and a similar positioning of the coil 55 between the helices 63 and 64.

The above described multi-layer unit may be mounted on a tank or container as in the previous embodiments, or, if these combinations are not required, a compact structure is obtainable by utilizing a spool 66 as a winding base. The arbor portion or tube 67 of the spool is of a diameter sufficient to receive the helix 62 without undue distortion or flattening during winding, and the end plates 68 and 69 of the spool, which are suitably fastened to the tube 67, form therewith three sides of a housing structure for the tubing unit. The outer layer or helix 64 is covered by a tubular section 71 of sheet metal which completes the enclosure of the unit.

The interior of the tube 67 may be advantageously utilized to contain a control device such as a thermo-expansion valve 72, and also to conceal the liquid lead 58, and refrigerant inlet and outlet leads 73 and 74, the latter lead extending through perforations in both plates 68 and 69 and thence to the end of the helix 64. The refrigerant inlet lead 73 extends through the plate 68 and through a perforation 76 in the tube 67 to the inner helix 62 and the valve 72 is interposed in this lead to control the supply of liquid refrigerant to the evaporator. A thermostatic control bulb 77 for the valve is arranged in intimate thermal contact with the suction line 74 and it responds to temperature differences and controls the valve in the usual manner.

The input lead 58 of the coil 54 may also enter through the perforation 76 while the remaining input lead 59 enters directly through the plate 68. The liquid thus directed through the unit is withdrawable through the dispensing valves 56 and 57 which may be positioned on a panel, cabinet or other convenient location. As shown in Fig. 4, a cabinet 79 may be utilized to contain this unit and also to house the liquid containers 81 which supply the cooling coils 54 and 55.

In the various embodiments of the invention as shown in Figs. 1, 2, and 3, it will be noted that the flow of fresh refrigerant coming from the condenser is in some instances directed first to the inner coil and in other cases to the outer coil. In Fig. 1, the refrigerant flows through the

pipe 17 to the inner coil, and thence around the compartment 25. If the compartment is used simply as a chilling chamber, such flow will be found satisfactory. In Fig. 2, however, the refrigerant coming from the condenser flows first around the outer coil, and the last turns of the evaporator are in contact with the storage cylinder 45. In Fig. 3, refrigerant flows first through the inner convolutions, as in the case of Fig. 1.

In the embodiment shown in Fig. 2, it is markedly advantageous to direct the refrigerant first through the outer convolutions, or those spaced from the hold-over tank 45. This is particularly true in systems using refrigerants such as sulphur dioxide, which is a common refrigerant for small capacity installations. A condition of satisfactory operation is that the liquid be cooled to a proper low temperature, say 38° to 40° F., that cooling be effected in the length of time available for warm liquid to run through the system (a factor practically determined by the size of the pipe and the maximum opening of the dispensing faucet), and, withal, there be little or no likelihood of freezing the beverage during periods of light draft.

These conditions require a close regulation of the refrigerant temperature, and hence a close regulation of refrigerant pressure. When using the apparatus shown in Fig. 2, for example, a back pressure of from five to six pounds is employed, with sulphur dioxide as the refrigerant. This corresponds roughly to about 28° F. refrigerant temperature for saturated vapor, and a somewhat higher temperature for mixed vapor and liquid, such as obtains in an expansion valve system as is herein indicated. This refrigerant temperature is sufficiently low to cool the contents of the liquid coil 47 and the hold-over tank 45 satisfactorily, but it is not so low as to induce freezing during low draft periods. On the other hand, if the back pressures used in "flooded" systems of say eight inches vacuum were used, the refrigerant temperature would be so low as to make freezing a certainty during off-load periods, and inadequate cooling a result of peak draft operation.

Still referring to the apparatus shown in Fig. 2, it may be additionally noted that if the refrigerant from the expansion valve is first directed to the inner coils, the cooling of liquid in hold-over tank 45 may be inefficient. Attempts to rectify this condition by reduction of

the back pressure lead invariably to the unsatisfactory working conditions noted above. What is desired, therefore, is a maximum heat exchange within close limits, with a relatively high refrigerant temperature, and the means shown in Fig. 2 have been found adequate for this purpose.

Referring now to Fig. 3, since the coils are not associated with a hold-over compartment, the application of the refrigerant to either the inner or outer coils is not a matter of such vital importance to good operation. In this case, satisfactory cooling can be obtained irrespective of the direction of flow of refrigerant. In Fig. 1, it will now be understood that the compartment 25 will be cooled only to a limited extent, since its heat exchange surface is in contact with the warmest refrigerant. As thus intentionally illustrated for descriptive purposes, it may be assumed that the compartment 25 is intended for use for foods or a separate beverage wherein a slightly higher temperature is desired.

The foregoing discussion of direction of flow applies to the usual case of liquid cooling, wherein the dispensed beverage is served at a temperature not much above its freezing point. Where a greater temperature difference is permissible, the flows may be reversed or varied from those described.

It will be understood that the invention, as herein illustrated and described with reference to a number of forms, may be embodied in other forms and relationships, and hence the scope of the invention should be determined from the nature of the following claim.

I claim:

Refrigerant cooling and dispensing apparatus comprising, in combination with a source of fluid refrigerant and a source of liquid to be cooled, a refrigerant coil and a liquid coil, the said coils being wound in helical form with the convolutions thereof in intimate thermal contact at opposed points, a liquid receiving cylinder disposed within said coils, the wall of said cylinder being in intimate thermal contact with the innermost convolutions of said refrigerant coil, certain convolutions of said refrigerant coil being disposed exterior of said cylinder and said innermost convolutions, said exterior convolutions being connected to said source of fluid refrigerant, and said liquid coil being connected at one end to said cylinder.

JOSEPH ASKIN.