July 20, 1943. H. K. JOHNSON 2,324,707

COOLING APPARATUS

Filed June 30, 1941

Fig. 1

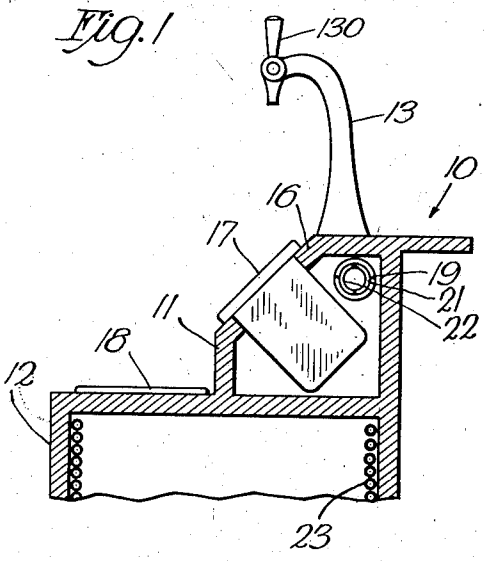


Fig. 2

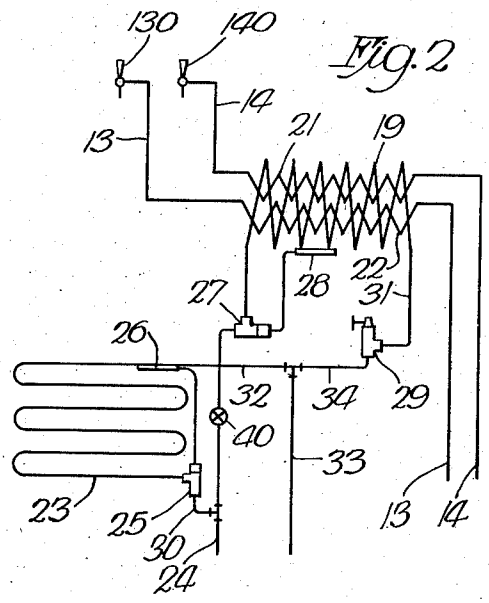
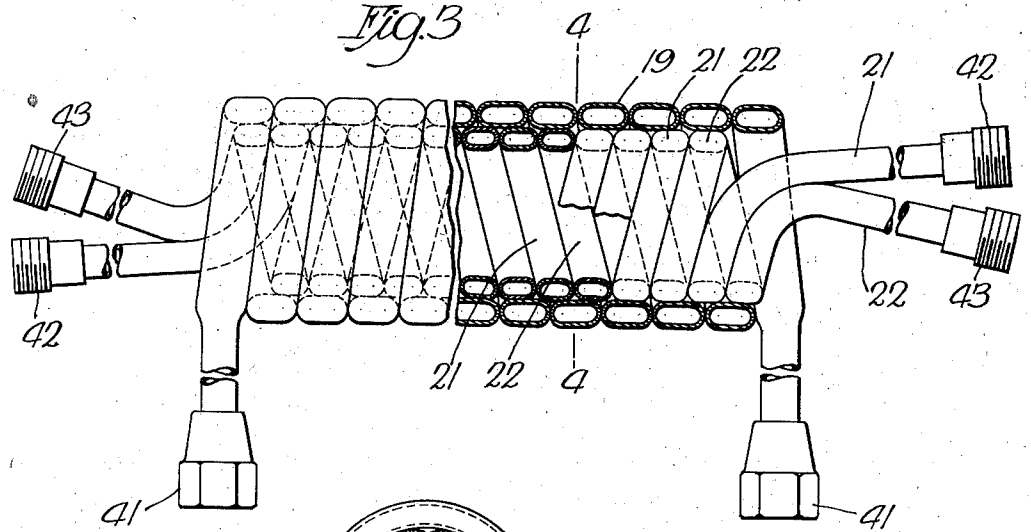


Fig. 3



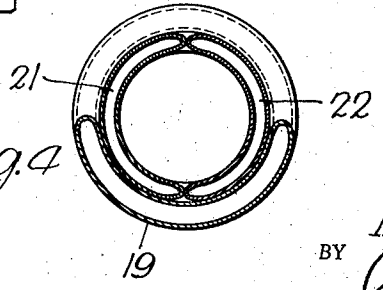


Fig. 4

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COOLING APPARATUS

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7 Claims. (Cl. 62—141)

This invention relates to cooling apparatus and more particularly to cooling systems for use in dispensing cold drinks, ice cream, confections, and the like.

One of the objects of the invention is the provision of a new and improved cooling system for cooling and maintaining in a chilled or cool condition in one section of the cabinet a plurality of different potable liquids and a number of jars containing syrup or flavoring used in various soft drinks and confections and maintaining in another section, at a lower temperature, different types of congealed foods and confections.

A further object of the invention is the provision of a new and improved arrangement of the various refrigerating or cooling coils employed in connection with the various cooling chambers associated with the dispensing portion of the cooling system.

A further object of the invention is the provision of a new and improved dispensing cabinet having various compartments, some of which are maintained at a different temperature from the remainder, together with novel means for cooling those chambers that are maintained at a uniform temperature above that of the remaining chambers.

A still further object of the invention is the provision of a new and improved cooling unit comprising an assembly of tubular members so arranged as to have a high efficiency of heat transference and so constructed that should any of the tubes of the assembly burst or spring a leak for any reason whatever, the escape of the liquid or gas therein will not mingle with the liquid or gas contained in any of the other tubes.

A further object of the invention is the provision of a new and improved cooling apparatus that is simple in construction, comparatively inexpensive to manufacture, efficient in operation and that is not likely to become disrupted or broken in use and that may be readily and inexpensively installed.

Other and further objects and advantages of the invention will appear from the following description, taken in connection with the accompanying drawing in which—

Fig. 1 is a vertical section of a cooling cabinet showing the invention in position therein;

Fig. 2 is a diagrammatic view of the apparatus;

Fig. 3 is a side elevation of the cooling and dispensing coils, with parts broken away and parts in section; and

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

In apparatuses for cooling potable liquids and extracts or flavoring liquids, it is common practice to provide separate cooling means for the two types of liquids or a heat exchange liquid such as brine is employed as a cooling medium. These systems are objectionable because the apparatus required is more or less complicated and if brine be used, it is further objectionable because of the deteriorating effect of the brine on the metallic parts. It has been proposed to pass the potable liquid tubes through the expansion coils for cooling the liquid but this too is not entirely satisfactory for should the liquid escape from the tubes into the refrigerant for any cause whatever, it would seriously interfere with the operation of the device and would injure the refrigerant.

The present invention seeks to remedy these difficulties by the provision of a simple cooling unit that will not only properly cool the potable liquids but may also function as an effective means for cooling the compartment containing the receptacles for the flavoring extracts.

Referring now to the drawing, the reference character 10 designates a cooling or refrigerating counter, fountain or cabinet which is provided with, what for convenience of description will be termed, an upper or cooling compartment 11 and a lower or refrigerating compartment 12. Extending upwardly from the upper compartment are a plurality of dispensing or draft arms 13, 14, each having valves 130 and 140 for dispensing potable liquids, as will presently appear. As shown in Figs. 1 and 2, only two draft arms are illustrated but it is understood that the apparatus may contain any number of draft arms, each draft arm being supplied by a different cooling coil, as will presently appear.

The upper compartment 11 is provided with suitable insulation and has an upper inclined wall 16 having an elongated slot therethrough for receiving a plurality of receptacles such as the syrup or flavoring jars 17, as is usual in such constructions. The jars 17 are adapted to be removed from the compartment 11 for cleaning the same, as may be desired.

The lower compartment 12 is also insulated and mounted therein are ice cream or other confection containers 18, as is usual in such constructions.

Since the arrangement of the containers in the compartments is more or less conventional, it is not thought necessary to describe the same further in detail.

Suitable means are pro ided for cooling both compartments and for maintaining the upper or

cooling chamber or compartment 11 at a higher temperature than that maintained in the refrigerating or hardening compartment 12. The compartment 11 is maintained at a temperature slightly above that of freezing by means of an expansion coil 19 that extends from one end of the cabinet to the other through this compartment 15, as shown more clearly in Fig. 1 of the drawing. The coil 19 is preferably, though not necessarily, in the form of a helical, each turn being oblong in cross-section with an inner and an outer flat side, as shown in Fig. 3. The coils are closely wound so as to form a continuous heat exchange sleeve, the turns of which are of uniform inner and outer diameters. A plurality of cooling coils 21 and 22 are provided and they are in the form of a single helical; that is, they are intercoiled, and are so wound that a single sleeve is provided and this sleeve is within the outer helical 19 and in contact therewith throughout its entire length, as shown in Fig. 3 of the drawing. Where there are only two tubes or cooling coils, as 21 and 22, the turns will alternate, as shown in said figure. There are as many cooling coils as draft arms and the entire number is arranged in like manner. If there are three different liquids to be dispensed at the dispensing counter, then every third turn will be the same tube or coil.

One of the tubes or pipes, as 21, may be employed for conveying drinking or sweet water to the dispensing valve 140 and the other pipe, as 22, may be used to conduct carbonated water to the corresponding draft arm 13 and dispensing valve 130.

It will be thus seen that with this arrangement, the coils 21 and 22 are cooled by contacting the inner peripheral surfaces of the expansion coil 19 and that the outer peripheral surfaces of the turns of this coil 19 absorb heat from the compartment thereby maintaining the compartment at a low temperature for cooling the jars or containers 17.

The refrigerating or hardening chamber 12 is adapted to have positioned therein a refrigerating or hardening coil 23 shown diagrammatically in Fig. 2, for maintaining the containers 18 below the freezing point for maintaining ice cream and other confections within these containers in frozen condition.

A diagram for the cooling and refrigerating coils is shown in Fig. 2 and in this figure, a refrigerant conduit 24 conducts the refrigerant from the compressor-condenser, not shown, to the coils 19 and 23 in multiple. The conduit 24 conducts the refrigerant to the cooling coil 19 and has a branch conduit 30 for conducting a portion of the refrigerant in the conduit 24 to the refrigerating or hardening coil 23. A manually operated valve 40 is preferably provided in the conduit 24 between the two expansion coils 19 and 23 for controlling the amount of refrigerant flowing along the conduit 24 beyond the conduit 30. This valve may be closed when, for any reason, it is not desired to operate the expansion coil 19. A thermally controlled expansion valve 25 is provided for automatically admitting refrigerant to the coil 23 for maintaining the containers 18 at a predetermined temperature. A thermostat device 26 responsive to the temperature within the lower or refrigerating section or, in heat exchange relation with the chambers 12, is provided for automatically controlling the operation of the valve 25. The remaining portion of the refrigerant flowing along the pipe 24 is admitted to the cooling coil 19, Fig. 2, through a thermally controlled expansion valve 27. The expansion valve 27 is controlled by a suitable thermostat arrangement 28 which may be of the usual or any well known construction. The thermostat device 28 is responsive to the temperature within the compartment 12 and automatically controls the operation of the valve 27 so as to maintain the said compartment at a predetermined temperature. A pressure reducing valve 29 is provided in the return conduit 31 for the coil 19 so as to maintain a predetermined temperature in the upper compartment of the cabinet for cooling the liquids that are to be dispensed by the valves 130 and 140 and also for cooling the jars containing the flavoring or other syrups.

The return conduit 32 for the refrigerating coil 23 is connected to the suction conduit 33 which conveys the gaseous refrigerant back to the compressor. A return conduit 34 conveys the refrigerant from the valve 29 back to the suction conduit 33.

The conduit 34 is in communication with the low pressure refrigerating coil 23. The gas escaping from the valve 29 into the pipe 34 is of higher pressure than the low pressure, low temperature gas within the coil 23 and hence it will expand into the refrigerating coil 23 which will function as a surge tank.

The coils 19, 21 and 22 when assembled as shown in Fig. 3 form a cooling unit that may be installed in a cooling system as a single unit or may be removed therefrom as a unit, as occasion may require. The ends of the conduits of the coils 19, 21 and 22 are provided at their ends with suitable connectors 41, 42 and 43, respectively, whereby the connections may be easily and readily made.

While the drawing discloses two compartments that are cooled and maintained at different temperatures by the use of a single refrigerating apparatus, it is understood that additional expansion coils for cooling additional compartments may be employed if desired, or if preferred the arrangement shown in Fig. 3 may be used alone for cooling purposes.

It is thought from the foregoing, taken in connection with the accompanying drawing, that the construction and operation of my device will be apparent to those skilled in the art and that changes in size, shape, proportion and details of construction may be made without departing from the spirit and scope of the appended claims.

I claim as my invention:

1. In a cooling cabinet, a cooling syrup jar compartment, a plurality of syrup jars extending into said compartment, a plurality of draft members mounted on said cabinet above said compartment, a plurality of conduits connected one to each of said draft members, said conduits having their intermediate portions helically wound in multiple to form together a single closely wound elongated cooling member in the form of an open cylinder open at both ends with the turns in side by side relation with each convolution interposed between and in heat exchange relation with two other convolutions substantially throughout the length of said member, exposed directly to the air within said compartment for cooling the interior of the latter for reducing the temperature of the contents of said jars.

2. In an apparatus for cooling a plurality of liquids, an external refrigerant coil wound helically in turns in heat exchange relationship with each other forming a cylinder of a single layer of convolutions, and an internal two coil system wound helically in side by side heat exchange relationship with each other forming an internal cylinder, said internal cylinder being in heat exchange relationship with the outer cylinder such that any two turns of the refrigerant coil are in contact with at least one turn of one of the internal coils and with two turns of the other internal coil.

3. A cooling unit for a beverage dispensing fountain comprising a plurality of cooling conduits for cooling a different liquid in each conduit, said conduits having their intermediate portions wound in parallel convolutions side by side in the form of a cylinder, each of said convolutions except the end ones being between two convolutions of a different conduit, an expansion coil of a single layer of convolutions wound around the convolutions of said cooling conduits, certain of the convolutions of said expansion coil each being in thermal contact with at least the convolutions of two different cooling conduits.

4. A cooling unit for a beverage dispensing apparatus comprising a plurality of cooling conduits, one for each liquid to be cooled, said conduits having their intermediate portions closely wound in side by side relation and in thermal contact with one another to form a tubular member of a single layer of convolutions, the convolutions of said conduits being so wound that any two convolutions of any one conduit will be separated by a convolution of another conduit, and a refrigerant coil in telescopic relation with said tubular member and in thermal contact with each convolution thereof.

5. A cooling unit comprising a refrigerant conduit wound to form a tubular member with the convolutions in thermal contact with one another, a plurality of cooling conduits in telescopic relation with said tubular member for cooling a different liquid in each conduit, said cooling conduits having their intermediate portions closely wound to form a tubular member, the intermediate convolutions of any one cooling conduit being in thermal contact at each side thereof with a convolution of another cooling conduit and with at least one convolution of said refrigerant conduit.

6. A unit for cooling a plurality of liquids and for equalizing the temperature thereof, comprising a conduit for a refrigerant and a plurality of cooling conduits for conducting liquids through said unit for cooling the same, a cooling conduit for each different liquid, each of said cooling conduits having a portion in thermal contact with a cooling conduit at opposite sides thereof, said portion being also in thermal contact with said refrigerant conduit whereby when the liquid in any cooling conduit is replaced by liquid at a higher temperature the temperature of all the conduits will tend to equalize and lower the temperature of the replacing liquid.

7. A device for equalizing the temperatures among a plurality of fluids when a temperature differential exists between any two of the said device comprising a conduit for a heat conveying fluid wound helically with the convolutions thereof in thermal contact with one another, a plurality of conduits for separate fluids wound helically with their convolutions alternately in thermal contact with one another and nested in thermal contact with the convolutions of the first mentioned conduit, said nesting and contact being such that two convolutions of the first conduit are in thermal contact with at least three of the alternately arranged convolutions of said plurality of conduits.

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