May 4, 1954 E. S. WRIGHT 2,677,255

COOLING SYSTEM FOR BEVERAGE STORAGE AND DISPENSING INSTALLATIONS

Filed Aug. 2, 1951 2 Sheets-Sheet 1

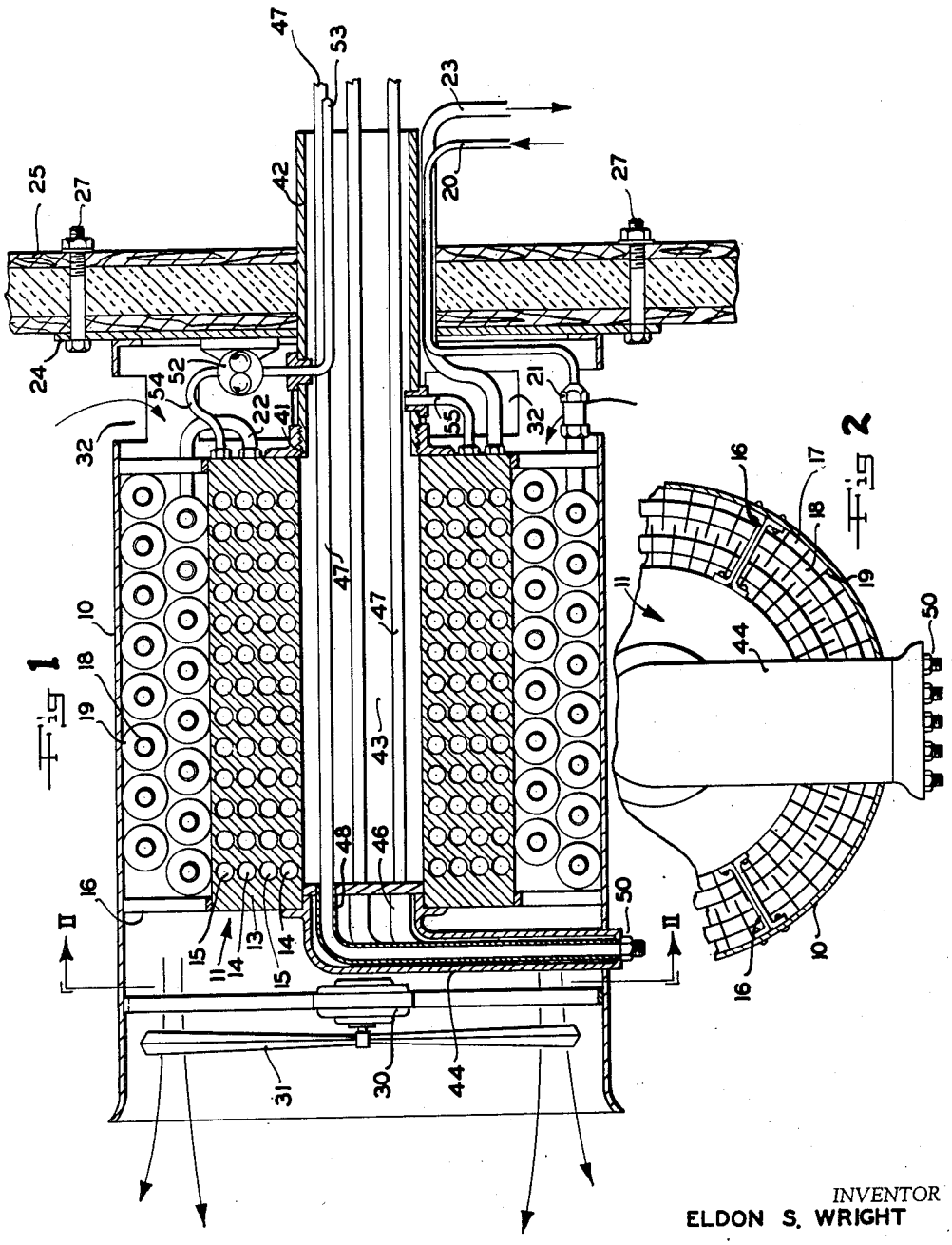



Fig. 1

Fig. 2

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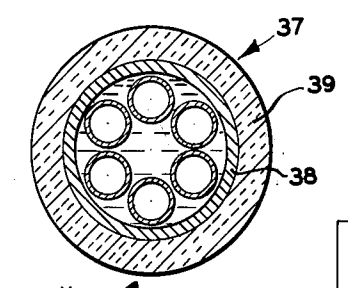



Fig 4




Fig 3

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2,677,255

## COOLING SYSTEM FOR BEVERAGE STORAGE AND DISPENSING INSTALLATIONS

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9 Claims. (Cl. 62—141)

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This invention relates to cooling systems for beverages and more particularly to such systems wherein a beverage to be dispensed is pre-cooled in a storage room located remotely of the dispensing outlet and is thereafter further cooled over its entire traverse to the outlet. The apparatus to be hereinafter described finds advantageous application in the art of cooling and dispensing beer as will become apparent.

A generally preferred method of cooling and dispensing beer and similar beverages comprises placing the beverage container or containers in an insulated storage room located remotely of the dispensing panel, usually in the basement of the establishment. Dispensing lines connect the containers, thus remotely placed, with the bar or other outlet point; conventional pressure means being utilized to urge the beverage to the outlet.

To insure that the beverage is at all times maintained at a low temperature, refrigerating means are commonly provided to cool the insulated storage room and to cool the beverage as it flows from such storage room to the outlet; the said means usually including an insulated conduit which encloses one or more beverage lines and through which chilled water is circulated to cool the beverage over the traverse from the storage room to the outlet.

In the design and manufacture of apparatus and equipment for refrigerating beverages in the manner above described there has been a definite trend toward the "package unit" containing most or many of the essential elements of the cooling system. Such a unit should be quickly mountable within the storage room and should provide means for cooling both the storage room and the beverage as it flows to the outlet. It will be apparent that such a unit would be desired by the tavern owner or operator since it may be installed with a minimum interruption of service and often a minimum outlay of capital. Furthermore such apparatus may be easily dismantled and removed in the event that it becomes necessary to move to a new location.

This invention, therefore, has, as its overall object, the provision of beverage cooling apparatus of the above described or "package unit" type wherein certain novel features of design and construction are incorporated whereby various economies are realized in the manufacture of the apparatus and whereby improved operating characteristics are obtained, particularly as relates to the pre-cooling of the beverage in the insulated storage room.

More specifically it is an object of this invention to provide a unitary cooling apparatus wherein but a single evaporative chamber is used in cooling the air of the storage room and chilling the water to be circulated about the beverage dispensing lines, and wherein, by a novel arrangement of the single evaporative chamber it is possible to cool the storage room to temperatures lower than has heretofore ben possible with apparatus of this type without resorting to the use of independently controllable evaporative chambers for each the storage room and the circulating water.

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Yet another object of the invention is the provision of apparatus as above described wherein is advantageously utilized a common commercial "instantaneous" type heat exchanger which serves as a portion of the evaporative chamber and as a cooling device for the water to be circulated about the beverage dispensing lines. As will become apparent upon consideration of the following specification my novel utilization of the commercial heat exchange unit provides an economical construction by improving and simplifying the general arrangement of the apparatus.

Another object of the invention is the provision of a package unit cooling device which may be mounted upon and removed from the wall of a storage room with a maximum of ease and with a minimum of damage to the insulated wall.

Other objects and advantages of my invention will become apparent upon full consideration of the following detailed specification and accompanying drawing wherein is disclosed a certain preferred embodiment of the invention.

In the drawing:

Figure 1 is an axial section of a "package unit" beverage cooling device constructed in accordance with the principles of my invention;

Figure 2 is a fragmentary sectional view taken along line II—II of Figure 1;

Figure 3 is a side elevation, partly in section of a typical beer dispensing installation wherein the apparatus of Figure 1 is utilized; and

Figure 4 is an axial section taken along line IV—IV of Figure 3 showing a conduit wherein a plurality of beverage dispensing lines are enclosed.

Referring to the drawing and in particular to Figure 1 the cooling device of my invention comprises a cylindrical casing 10 which serves to enclose the various other elements of the device and which, as will be apparent, additionally serves to confine and guide the flow of air being

cooled therein. Suspended within the casing 10 in spaced coaxial relation thereto is a cylindrical heat exchanger block 11. In the proposed embodiment the heat exchanger block 11 is a product of manufacture common to the refrigerating art comprising a hollow cylinder 13 of cast aluminum or equivalent heat conductive material. Cast within the aluminum cylinder, in heat exchange relation therewith, are a plurality of coils (numbering two in instant example) one (14) of which is adapted to contain a refrigerant and to serve as an evaporative chamber for a conventional refrigerating device 12 (Figure 3), and the other (15) of which is adapted to carry a cooling medium as, for example, water which in turn cools the beverage to be dispensed as will become apparent. Any suitable means, such as braces 16, may be utilized to suspend the block 11 in the desired coaxial relation to the casing 10; the principal requirement being that sufficient unobstructed area be provided to allow the passage of air through the annular space between the block 11 and casing 10.

Positioned generally within the confines of the above mentioned annular space is a heat exchange coil 17 comprising a plurality of convolutions of heat conductive tubing 18 having fins 19 or equivalent appendages for increasing the exposed surface area. The coil 17 is connected in series relation to the coil 14 of the heat exchange block 11 and as will become apparent serves in cooperation therewith as the evaporative chamber for the refrigerating device 12. According to the principles of the invention the flow of refrigerant through my apparatus is from the refrigerating device 12 by way of conduit 20 into a conventional expansion valve 21. From the expansion valve 21 the refrigerant circulates first through the convolutions of the coil 17 and then through the coil 14 of the heat exchange block 11; the connection between the coils 14 and 17 being provided by a short conduit 22. After passing through the heat exchange block the refrigerant flows out through the conduit 23 and is returned to the refrigerating device 12 to be compressed in the usual manner.

In the illustrated embodiment of the invention the casing 10 is secured to a flat plate 24 by any suitable means, not shown. The entire unit may then be secured to the insulated wall 25 of a storage room 26 by means of a plurality of circumferentially spaced bolts 27 and/or suitable brackets 28 secured to and depending downwardly from the ceiling 29 of the room.

As shown in Figure 1 the outer or left hand end of the casing 10 is open. Positioned near the said open end and suspended substantially in coaxial relation to the casing 10 is a small motor 30 mounting a fan blade 31 upon its outwardly extending shaft. Near the inner end of the casing I have provided a plurality of circumferentially spaced apertures 32 to permit relatively unobstructed ingress of air into the casing. As will be observed the arrangement is such that suitable rotation of the fan blade 31 will cause air within the room 26 to flow into the casing 10 through the apertures 32, through the annular space between the block 11 and casing, and thence out into the room. The arrangement of the coil 17 is such as to define a tortuous path through which the air must pass as it flows through the annular space. Heat is of course extracted from the air as it flows through the coil 17 and thus the room 26 may be maintained at a relatively low temperature. As will become more fully apparent upon consideration of the remainder of the specification, an extremely important feature of my invention resides in the fact that the room 26 and thus the beverage contained therein may be maintained at serving temperature. Thus there is little or no need for additional cooling of the beverage between the insulated room 26 and the distribution outlet; it being necessary to merely extract the heat absorbed from the surrounding air.

For such additional cooling as may be necessary to extract the heat absorbed externally as the beverage flows to the distribution outlet and/or to reduce slightly the temperature of the beverage passing out of the room, I suggest an enclosed system connecting the room and the outlet through which the beverage line or lines are passed and through which is circulated water or other medium of heat transfer at a predetermined temperature.

Included in the above mentioned system is an insulated fluid-tight box 34 mounted upon a suitable stand 35 which may be located to best suit the requirements of the establishment. Mounted on one side wall of the box 34 are one or more dispensing faucets 36. Communicating with the opposite wall of the box 34 is a duct 37 comprising a large diameter conduit 38 covered with suitable insulating material 39. In the arrangement shown the duct 37 extends downwardly from the box 34 through the floor 40 and terminates at the wall 25 of the room 26.

Secured to the inner end portion of the heat exchange block 11 by means of a threaded collar 41 is a short length of conduit 42 which is adapted to extend through an aperture provided therefor in the wall 25 and to be connected to the conduit 38 in fluid-tight relation. As shown in Figure 1 the conduit 42 communicates directly with the axial cavity 43 of the heat exchange block 11 and the same thus becomes an element of the enclosed circuit communicating with the box 34 at the dispensing outlet.

Secured to the outer end of the block 11 in communication with the cavity 43 is a connecting head 44 which extends downwardly from the cavity and terminates externally of the casing 10. An end cap 45 is secured to the upper end portion of the connecting head and operates to substantially close off the cavity 43. A plurality of tubes 46 are secured at their lower ends to the end portion of the head 44 and at their upper ends to the end cap 45; circumferentially spaced bores being provided in the latter member to receive the tubes in fluid-tight relation. Thus it will be apparent that there is communication between the cavity 43 and the lower end of the connecting head 44 only through the tubes 46.

Beverage lines 47, terminating at the faucets 36, are enclosed within the conduit 38 and pass through the cavity 43. As shown in Figure 1 the tubes 46 are of such size in relation to the lines 47 that the latter may be passed through the former. In the embodiment shown the lower termini of the lines 47 are at the lower end of the connection head 44 and suitable connection fittings 50 are provided at this point whereby the lines 47 may be connected to tap lines 48 extending from beverage containers 49 located within the insulated room. When installing the apparatus of my invention the lines 47, which are preferably of flexible vinyl tubing are inserted

upwardly through the open bottom ends of the tubes 46 and are fed longitudinally through the block 11, fitting 42 and duct 37 until the upper ends thereof appear in the box 34 where such upper ends may be grasped and suitably connected to the faucet 36. There is thus provided smooth uninterrupted sanitary conduits extending from positions closely adjacent the beverage barrels directly to the faucet. Suitable means, such as a wrapping of friction tape, not shown, may be employed between the lower end portions of the lines 47 and of the tubes 46, 48 to prevent the leakage of water from the space 43.

In the illustrated system water or other cooling medium may be poured into the system through a removable cap 51 in the top of the box 34. To circulate the water about the beverage lines 47 I have provided a pump 52 which is mounted within the casing 10. A conduit 53 is connected to the intake of the pump and extends through the duct 37 terminating within the box 34 near the upper portion thereof as shown in Figure 3. The outlet of the pump 52 is connected through conduit 54 to the coil 15 of the heat exchange block 11. The other end of the coil 15 is connected through conduit 55 directly into the large conduit 42. Thus it may be understood that operation of the pump 52 in the direction indicated in Figure 1 will draw the higher temperature water from the uppermost part of the water circuit through the conduit 53 and cause it to circulate through the heat exchange block 11 where it is cooled to a predetermined temperature. The water then enters directly into the duct 37 to the box 34. The beverage lines 47 are thus at all points between the cooled storage room and the dispensing outlet totally immersed in chilled water and the desired temperature is always maintained.

It is important to note the particular arrangement of the refrigerant coils 14 and 17 as taught by my invention. By providing the two series connected coils in the manner described and by circulating the refrigerant first through the air cooling coil 17 and then through the water cooling coil 14 lower storage room temperatures may be obtained than has heretofore been possible with but a single evaporative chamber. In actual practice, the assembly may be made to operate at maximum efficiency by utilizing a remotely controlled expansion valve for the valve 21 in which the control bulb, not shown, is made responsive to the temperature of the refrigerant coil 17 at or adjacent to its point of entry into the casting 11. The expansion valve 21 will then operate to control the quantity of refrigerant supplied to the coil 17 in such manner that the portion of the coil 17 which is exposed to the air is maintained quite cold and frosted while the temperature within the casting 11 is maintained safely above the freezing temperature of water. I therefore provide a system which is not only simple in design and highly compact in construction but highly efficient and of large capacity for cooling the air in the storage room and for cooling the beverage lines in the duct leading to the faucets.

In apparatus of this character the temperature of the cooling medium which circulates about the beverage lines must be carefully controlled since under most conditions the beverage served will assume that temperature. In prior apparatus, wherein it has been common practice to cool a large supply of water to be used as a cooling medium and to circulate the air of the storage room in heat exchange relation to the water supply, it has been extremely impractical to cool the storage room to as low a temperature as is desired. Since the proper serving temperature of the beverage is generally about 40° F. the circulating water must be maintained at a temperature not more than a few degrees below this value. The air which is passed in heat exchange relation with the water will be cooled to a temperature which is several degrees above that of the water and which is thus many degrees above the desired temperature; it being understood that several degrees temperature differential will exist between the circulating air and the cooling means therefor and between the air and the beverage cooled thereby. Thus in prior apparatus the beverage has been merely partially cooled in the storage room and has been cooled to the final serving temperature by means of the circulating water. While this is satisfactory in some instances a large reserve supply of chilled water is necessary to provide adequate cooling of the beverage during periods of high demand. This, of course, increases the size of the apparatus and tends to defeat the principal object of the "package unit" cooler.

By providing the air cooling coil 17 in the manner taught by my invention it is possible to substantially eliminate the above described objectionable feature of prior apparatus. It will be understood that the refrigerant passing through the coils 17 and 14, in the order stated, will assume a temperature gradient which is in part a function of the physical characteristics of the coils, i. e., the length, surface area, conductivity, etc. Thus by properly proportioning the coils 14 and 17 it is possible to maintain the coil 17 at a very low temperature while at the same time maintaining the coil 14 at a considerably higher temperature in order to properly cool the circulating water. By this arrangement it is possible to pre-cool the stored beverage to approximately the desired serving temperature (40° F.), Thus the serving demand will in no way affect the operating of my apparatus. The entire supply of beverage is sufficiently pre-cooled and thus requires little or no "final" cooling before dispensing; the circulating water being used principally to extract any heat which is absorbed over the length of the duct 37. It will be understood that the absorbed heat remains constant regardless of the demand and no reserve supply of water is required as in prior apparatus. The cooling effect of the circulating water actually diminishes in importance as the serving demand increases.

The apparatus of my invention is further advantageous in respect to its physical characteristics of bulk and weight. As explained above it is possible, even desirable, by my teachings to reduce the water cooling portion of the evaporative chamber to a minimum capacity and it is also possible to reduce the required volume of circulating water to an absolute minimum. Therein lies a large fraction of the bulk and weight of prior apparatus of this type. It should thus be apparent that my apparatus is ideally suited as a "package unit." Less bulk and weight permits of simpler mounting of the apparatus and eliminates or materially reduces the need for special bracing.

Substantial economies are realized in the production of my apparatus through the novel use of a standard commercial heat exchange block for cooling the circulating water. In addition to having highly efficient heat transfer charac-

teristics these commercial units have certain physical features which simplify the construction of the entire unit.

It will be noted that, with the exception of the small holes necessarily provided for the bolts 27 or other fastening means, the mounting of my apparatus requires the cutting of but a single small hole in the insulated storage room wall. This not only simplifies the mounting operation but provides that a minimum of damage is done to the wall; a factor which becomes important should it become desirable or necessary to remove the apparatus from the premises.

Another important advantage of the apparatus of my invention is that it may be mounted in any position in the storage room without loss of efficiency. For example, in some establishments it may be advantageous to depend the apparatus vertically from the ceiling of the storage room in which case air from the refrigerant coil can be blown directly down onto the beverage barrels sitting on the floor of the storage chamber.

Many changes may be made in the physical structure of the assembly herein specifically described without departing from the spirit or scope of the invention. For example, by replacing the pump 52 with an air moving device and by making suitable alterations in the structure of the heat exchanger 11 the apparatus may be arranged to utilize air as the coolant in the duct 37 and box 34 rather than water or other liquid as herein shown.

Having thus described a preferred embodiment of my invention what I claim is novel and desire to secure by Letters Patent is:

1. In beverage cooling apparatus for use in beverage storage and dispensing systems having an insulated storage room located remotely of a beverage dispensing outlet, fluid-tight insulated duct means communicating with said dispensing outlet and said storage room, means for circulating a cooling liquid in said duct, and beverage lines communicating with said outlet and said room through said duct; the combination of a casing adapted to be mounted within said room; a heat exchange block mounted within said casing in spaced relation to the side walls thereof, said heat exchange block comprising a body of heat conductive material having therein in heat exchange relation a refrigerant coil and a cooling liquid coil, and said body having a cavity therein, one end of said cavity being closed; a second refrigerant coil positioned in the space between said heat exchange block and said casing and defining a tortuous path for air flowing axially through said space, said refrigerant coils being connected in series relation; a fan mounted within said casing adapted to cause air to flow over said second refrigerant coil; conduit means communicating with the cavity in said heat exchange block adapted to be connected to said duct means communicating with said outlet and said storage room; said beverage lines being partially housed within said conduit means and said cavity and passing out of said cavity at the closed end thereof; said duct means, said conduit means and said cavity being adapted to retain a liquid; said means for circulating comprising a pump, a first liquid line connecting the outlet of said pump and one end of said liquid coil, a second liquid line connecting the inlet of said pump and communicating with said duct means near the upper portion thereof, and a third liquid line connecting the other end of said liquid coil and communicating with said duct means near the lower portion thereof; and refrigerant compressing and condensing apparatus communicating with said second and first refrigerant coils adapted to circulate refrigerant therethrough in the direction from said second to said first refrigerant coil.

2. For use in a beverage storage and dispensing installation having an insulated storage room, a duct extending from the room to a dispensing faucet through which a beverage conducting conduit extends, and means to circulate a fluid through said duct; a unitary assembly for cooling both the fluid within said duct and the space within said room comprising a heat exchanger having a passage therethrough for said fluid and a second passage therethrough for refrigerant, means to supply refrigerant to said second passage comprising a thinned-tube refrigerating coil exposed to the air within said room, and means to circulate the air in said room over said refrigerating coil, said means to circulate being operative to circulate said fluid through said first mentioned passage and said duct in series.

3. For use in a beverage storage and dispensing installation having an insulated storage room, a duct extending from the room to a dispensing faucet through which a beverage conducting conduit extends, and means to circulate a cooling fluid through said duct; a unitary assembly comprising a cylindrical heat-exchanging block having a pair of spirally disposed and parallel related passages therein, means to supply refrigerant to one of said passages comprising a thinned-tube conduit arranged in a coil surrounding said block, means to supply fluid to the other of said passages comprising said means to circulate, said block having an axial bore therethrough, said duct connected to one end of said bore, and a manifold mounted on said block at the other axial end of said bore and having a portion extending radially outward beyond the outer periphery of said coil, a cylindrical casing encompassing said coil and having an extended end portion positioned axially outward beyond said manifold, said manifold being adapted to receive beverage supply lines passing through said bore and duct, and a motor driven fan mounted in the said extended end portion of said casing to circulate the air in said room over said coil.

4. For use in the beverage storage and dispensing installation having an insulated storage room and a fluid-retaining duct extending from the room to the dispensing faucet through which a beverage conducting conduit extends; a unitary assembly for cooling both the fluid within said duct and the space within said room comprising a support adapted to be secured to an inner surface of an enclosure wall of said room, a cylindrical casing mounted at one end of such support and projecting into the room therefrom, said casing being opened at its inner end and having inlet apertures in its side wall adjacent said support, duct means extending longitudinally in said casing and adapted at one end to be projected through an opening in said wall for connection to said duct and at its other end extending radially outward of said casing at a point removed from the open end thereof, air moving means housed in said casing between the said open end thereof and the radially extending portion of said duct means, and heat exchangers disposed concentrically about said duct means but within said casing to cool both the air circulated by said air moving means and the fluid contained within said duct means, said duct means and duct being adapted to house beverage conducting conduit leading to said faucet.

5. Apparatus according to claim 4 further

characterized in that said heat exchangers comprise a cylindrical heat-conductive block having parallel spiral passages therein for the conduction of refrigerant and said fluid respectively and a finned refrigerant conductive tube wound spirally about the outer periphery of said block and connected at its outlet to the inlet of one of said passages.

6. For use in a beverage storage and dispensing installation having an insulated storage room, a dispensing faucet positioned remotely of said storage room, a beverage conduit communicating in said room with a beverage container and remotely of said room with a faucet, and means to circulate a cooling fluid in heat exchange relation to said conduit; a unitary assembly comprising a cylindrical heat-exchanging block positioned in said room and having a pair of spirally disposed and parallel related passages therein, means to supply refrigerant to one of said passages comprising a refrigerating coil surrounding said block, means to supply fluid to the other of said passages comprising said means to circulate, said last mentioned means including a fluid conduit communicating with said other of said passages and extending substantially to said faucet, said fluid conduit and said beverage conduit being so oriented that said fluid and beverage are in heat exchange relation substantially between said room and said faucet, and means to circulate air in said room over said refrigerating coil.

7. For use in a beverage storage and dispensing installation having an insulated storage room, a dispensing faucet positioned remotely of said storage room, a beverage conduit communicating in said room with a beverage container and remotely of said room with said faucet, and means to circulate a cooling fluid in heat exchange relation to said conduit; a unitary assembly comprising a heat exchange block positioned in said room and having a pair of parallel related passages therein, means to supply refrigerant to one of said passages comprising a refrigerating coil positioned in said room, and blower means to circulate air in said room in heat exchange relation to said refrigerating coil, said means to circulate including means to conduct said fluid in heat exchange relation to said beverage substantially from said room to said faucet.

8. For use in a beverage storage and dispensing installation having an insulated storage room, a dispensing faucet positioned remotely of said storage room, a beverage conduit communicating in said room with a beverage container and remotely of said room with said faucet, and means to circulate a cooling fluid in heat exchange relation to said conduit; a unitary assembly comprising an instantaneous-type heat exchange member positioned within said room and having means therein for circulating in heat exchange relation a refrigerant and a fluid cooling medium, means to supply refrigerant to said heat exchange member comprising a second heat exchange member exposed to the air in said room, and blower means to circulate the air in said room in heat exchange relation with said second heat exchange member, said means to circulate including means to conduct said fluid cooling medium in heat exchange relation to said beverage substantially from said room to said faucet.

9. For use in a beverage storage and dispensing installation having an insulated storage room, a dispensing station positioned remotely of said storage room, a beverage conduit communicating in said storage room with a beverage container and remotely of said room with said dispensing station, and means to circulate a cooling fluid in heat exchange relation to said conduit; a unitary assembly comprising an instantaneous-type heat exchange member positioned within said room and having means therein for circulating in heat exchange relation a refrigerant and a fluid cooling medium, means to supply refrigerant to said heat exchange member comprising a second heat exchange member exposed to the air in said room, and blower means to circulate the air in said room in heat exchange relation with said second heat exchange member whereby to cool beverage in said room substantially to serving temperature, said means to circulate including means to conduct said fluid cooling medium substantially to said dispensing station whereby to maintain fluid at said dispensing station at said serving temperature.

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