Oct. 17, 1950 R. YUZA 2,526,526

MECHANICAL REFRIGERATOR WATER COOLER

Filed Oct. 26, 1945 3 Sheets-Sheet 1

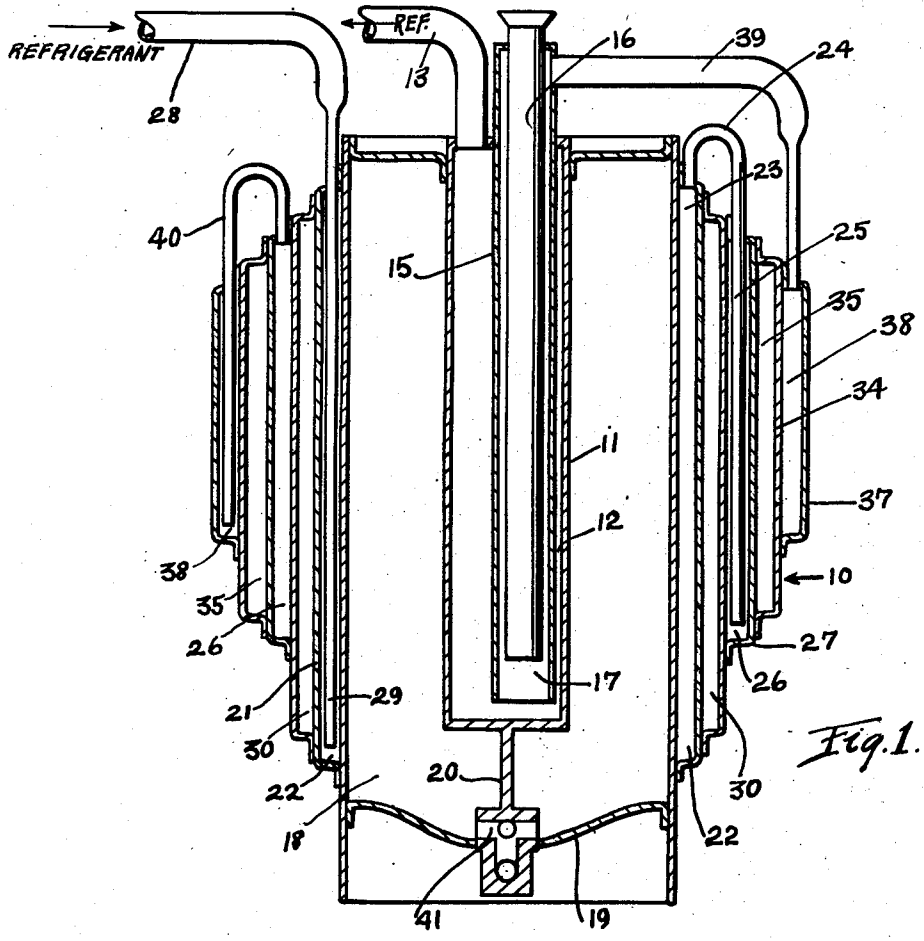


Fig. 1.

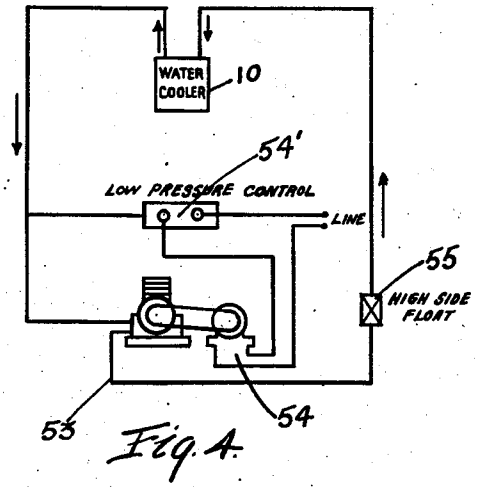


Fig. 4.

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MECHANICAL REFRIGERATOR WATER COOLER

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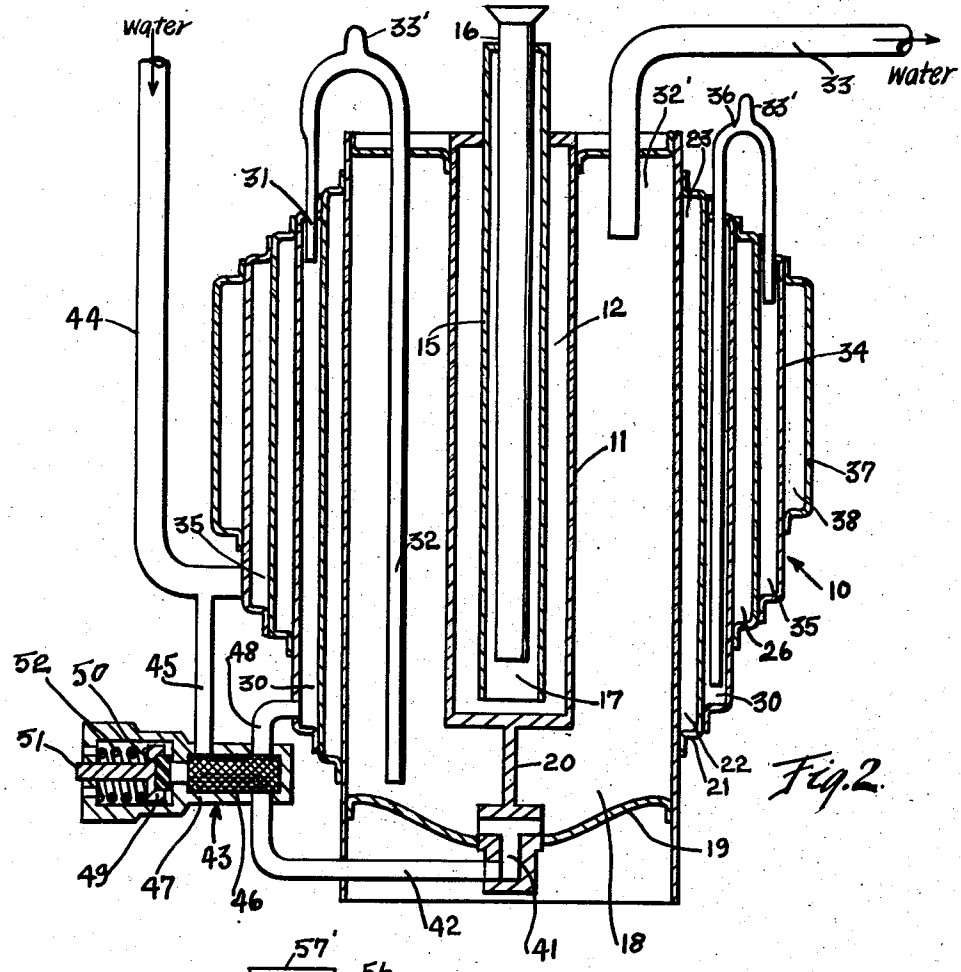


Fig. 2.

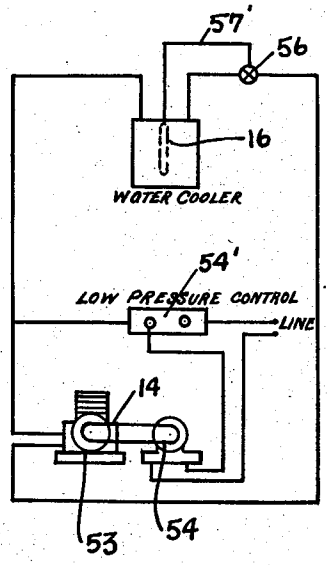


Fig. 5.

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MECHANICAL REFRIGERATOR WATER COOLER

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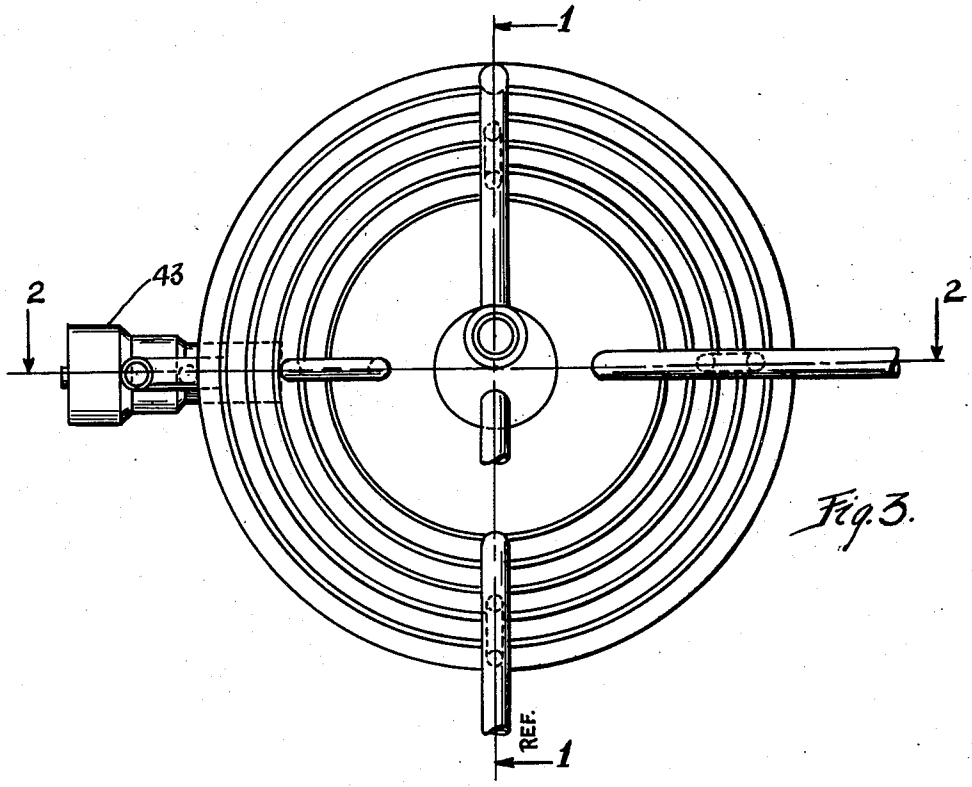


Fig. 3.

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UNITED STATES PATENT OFFICE

2,526,526

MECHANICAL REFRIGERATOR WATER COOLER

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Application October 26, 1945, Serial No. 624,753

1 Claim. (Cl. 257—232)

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This invention relates to certain novel and useful improvements in mechanical refrigerator water coolers and has for its principal object the provision of a construction of this character which will be economical in manufacture, to accomplish the function of quick heat transfer of warm water to a refrigerant through a multiple of chambers.

A further and equally important object of the invention is to provide a water cooler of the character hereinafter more fully described, which is capable of adaptation in any one of the well-known cooling circuits, which circuits are more fully hereinafter referred to.

Another object of the invention is to provide in a water cooler of the class hereinafer more fully referred to, a chamber for receiving liquid refrigerant from a surrounding chamber for the purpose of drying up the liquid refrigerant before return to the compressor, thus serving in the same capacity as a drier coil used with a thermostatic expansion valve or an accumulator used with a high side float operation.

Yet another and equally important object of the invention is the provision in a water cooler of an interior water chamber in which a given amount of cold water is stored and serves further as a refrigerant of water in a surrounding chamber or chambers, with the additional function of expediting and hastening evaporation and drying of the liquid refrigerant communicated to the refrigerant drying-up chamber. In this connection, it is an object to communicate the water in the cooler in a manner such as will result in an air space between the surface of the water and the interior of the chambers, thereby providing an air cushion above the water surface which eliminates and dissipates what is otherwise known as "water hammer" or "knocks" created by pocketed water when the dispensing valves are closed.

A still further and equally important object of the invention is to provide in a water cooler, above the water level, air cushions which cooperate with a pressure relief device connected with the extreme bottom portion of the water chambers, to prevent damage to the cooler in the event that the cooler freezes by virtue of some defective control such as a switch or a valve, the pressure relief valve being provided with an internal enclosure so arranged that water cannot circulate through the relief valve from one passage to another but must circulate through the freezing tube communicating with the relief valve.

Finally, it is an object of the invention to provide a cooler in which the refrigerant chambers are connected in series, with the refrigerant entering the chambers from the bottom and being discharged from the top; also a refrigerator unit in which the water chambers are likewise connected in series with the water finding an entrance in the bottom of the chambers and having exit from the top portion thereof, thereby providing in each instance (that is, through the refrigerant chambers and the water chambers) definite, positive circulation of water and refrigerant and thus eliminating possibility of stagnant water in the water chambers and of oil logging in the refrigerant passages. The arrangement also maintaining the passages as fully flooded as is possible with liquid refrigerant. In this type of cooler, it is desirable, and is an object of the invention, to provide the water flow in the opposite direction to the refrigerant flow.

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Other objects will appear hereinafter.

The invention consists in the novel combination and arrangement of parts to be hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings showing the preferred form of construction, and in which:

Fig. 1 is a vertical sectional detail view of the refrigerating unit embodied in the invention taken substantially on line 1—1 of Fig. 3;

Fig. 2 is a vertical sectional detail view of the same taken substantially on line 2—2 of Fig. 3;

Fig. 3 is a top plan view of the same;

Figs. 4 and 5 are schematic illustrations of refrigerating circuits showing the manner of adaptation of my improved refrigerating unit.

The drawings illustrate the preferred form of construction by which the several objects of this invention are accomplished. In this connection, 10 indicates the cooling unit comprising an inner enclosure 11 providing a drier chamber 12 having communication at the upper end portion with a return branch 13 leading to the compressor 14. In this chamber there is projected a well 15 having communication from the bottom 17 thereof with the chamber 12. In this well is arranged what is known as a temperature feeler bulb support 16 into which the feeler bulb (not shown) of a well-known construction may be arranged, when the circuit with which my unit is employed requires the use of a temperature feeler bulb. This feeler bulb is usually confined in a body of petroleum jelly, it being found necessary to so employ petroleum jelly to prevent freezing of the matter in which the feeler bulb is confined. When

the feeler bulb is not employed in the circuit, then the well 15 is filled with the petroleum jelly for protective purposes.

The enclosure 11 projects into a water cooler or storage tank 18, from the concave-convex bottom 19 of which is supported, as at 20, the enclosure 11. This storage tank 18 is surrounded by an enclosure 21 providing, together with the storage tank 18, a compartment 22. Communicating with the top 23 of this compartment or chamber 22 is an exit 24, the limb 25 of which projects into a chamber 26 provided by an enclosure 27. The refrigerant supply pipe is indicated at 28 and communicates through an extension pipe 29 with the bottom portion of the chamber 22. Between the chambers 22 and 26, there is provided a chamber 30, to the upper portion of which there communicates a pipe 31 likewise having an extension 32 extending to a position adjacent the bottom 19 of the storage tank 18. An exit pipe is indicated at 33 and has communication with the upper portion of the storage tank 18.

Surrounding the chamber 26 is an enclosure 34 which provides a chamber 35 in communication from its upper end portion with the lower portion of the chamber 30 through a communicating pipe 36. An outer shell 37 provides a chamber 38 which has communication with the upper portion of the feeler bulb support 16 by a conduit 39. Opening communication between the bottom portion of the chamber 38 and the upper portion of the chamber 26, is a communicating pipe 40.

Communicating with the storage tank 18 at the bottom thereof, is a T-shaped passage 41, a branch pipe 42 from which has communication with a relief valve 43. The water supply pipe 44 has communication with the lower end portion of the chamber 35, and leading from this pipe 44 is a branch pipe 45 which communicates with the relief valve 43. This relief valve 43 may be of any approved construction wherein there is provided an enclosure 46 for the housing of a suitable material such as will permit the seepage therethrough, under pressure, of water through the pipes 42 and 45 as well as through the bypass pipe 48 communicating with the lower portion of the chamber 30.

A suitable valve head is indicated at 49, and this valve head provides a resilient valve 50 which normally closes passage from the enclosure 46, the valve head 50 being guided in its movement by a stem 51 and movable against the action of a spring 52.

The refrigerant is admitted to the bottom portion of the chamber 22 through the pipe 29 from whence it flows from the top portion thereof through the pipe 24 leading to the lower portion of the chamber 26. From this chamber 26 the refrigerant flows from the upper portion thereof through the pipe 40 into the lower portion of the chamber 38, and from this chamber 38 the refrigerant is taken from the upper portion thereof through the pipe 39 into the feeler bulb support 16 and thence into the drying chamber, from which the condensed refrigerant vapor passes out through the pipe 13 back into the compressor 53 operated by a suitable motor 54.

The water finds admission into the unit through the pipe 44 into the lower portion of the chamber 35, from whence it flows from the upper portion thereof through the pipe 36, where it is admitted into the lower portion of the chamber 30 and taken out from the upper portion of this latter chamber by the pipe 32 for passage into the storage tank 18 at a point from the bottom portion thereof. From this description, it is apparent that the several water chambers, as well as the several refrigerant chambers, are connected in series and that the refrigerant is admitted to the refrigerant chambers at the lower portion of these various chambers and finds exit from the upper portions thereof; likewise that the water finds entrance into the water chambers at the lower portions of these several chambers and finds exit from the upper portions thereof. The storage tank being surrounded by the refrigerant chambers and the refrigerant chambers being surrounded by the several water chambers, it is obvious that it requires less refrigeration to maintain a supply of cold water in the storage chamber, thus resulting in a plentiful supply of cold water for rapid dispensing thereof.

It will be noted from the description herein that the pipes entering the various water chambers at the upper end portions thereof, extend a substantial distance into these chambers, thereby to maintain a constant water level, a water level which is spaced from the top walls of these various water chambers. The space 32' between the water level and the top wall of these water chambers constitutes an air pocket providing an air cushion which dissipates "hammer knocks" resulting when the dispensing valves are manipulated, particularly when closed.

These spaces 32' also serve to compensate for expansion of the water in the event of defect in the system resulting in water freezing and, with the cooperation of the relief valve, rupture or damage to the unit is reduced to a minimum by virtue of the relief of pressure within the water chambers by the relief valve in the event of a freeze-up. Like air-traps 33' for a like purpose are provided at the bends of the pipes 32 and 36.

My improved cooler is capable of being incorporated in any of the standard circuits, two of which have been shown in Figs. 4 and 5. In the circuit shown in Fig. 4, which I term a "self-contained" circuit, this circuit includes, in addition to the cooler 10 and compressor 53, a low pressure control 54' and a high side float 55, both of which are of a well-known standard construction and their functions well-known in the art.

In the circuit shown in Fig. 5, there is substituted for the high side float included in the circuit shown in Fig. 4, a thermostatic expansion valve 56 having communication through a conduit 57' with the feeler bulb 16'.

From the foregoing description, it is apparent that I have provided a cooling unit which is capable of accomplishing all the objects hereinbefore recited and one which may be manufactured in a practical manner and at an economical cost, the characteristics of the construction of the cooler resulting in one which requires the minimum degree of attention while being capable of supplying a constant flow of cold water.

The construction of the unit as hereinbefore described, results in a unit having a plurality of upright, substantially cylindrical walls arranged one within the other and spaced apart to provide chambers providing two circulating paths, one enveloped within the other, for the circulation of the refrigerant and the water, and in which relation of the circulating paths quick refrigeration results, with an adequate storage of cold water at all times.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation

and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claim.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

A cooling unit comprising a plurality of upright substantially cylindrical walls mounted one within the other in substantially concentric relation and spaced apart to provide a plurality of chambers providing two separate circulatory paths, conduit means connecting the chambers of one of said paths in communication with each other for the flow of fluid from the upper portions of the chambers providing said one of said paths to the lower portions thereof, said conduit means comprising conduits each formed substantially U-shaped to provide limb portions one of which being shorter than the other and extending into the upper portion of its respective chamber of said chambers of said one path and the other terminating short of the bottom of its respective chamber of said chambers of said one path, the

bight portion of said conduit being exterior of the chambers of said one path and providing at a medial point between the ends thereof an air trap, and means connecting the chambers providing the other of said paths in communication with each other for the flow of fluid from the upper portion of the chambers providing said other path to the lower portions thereof.

RUDOLPH YUZA.

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