May 9, 1950 M. A. STICELBER 2,507,387

WATER COOLING DEVICE

Filed Feb. 25, 1946

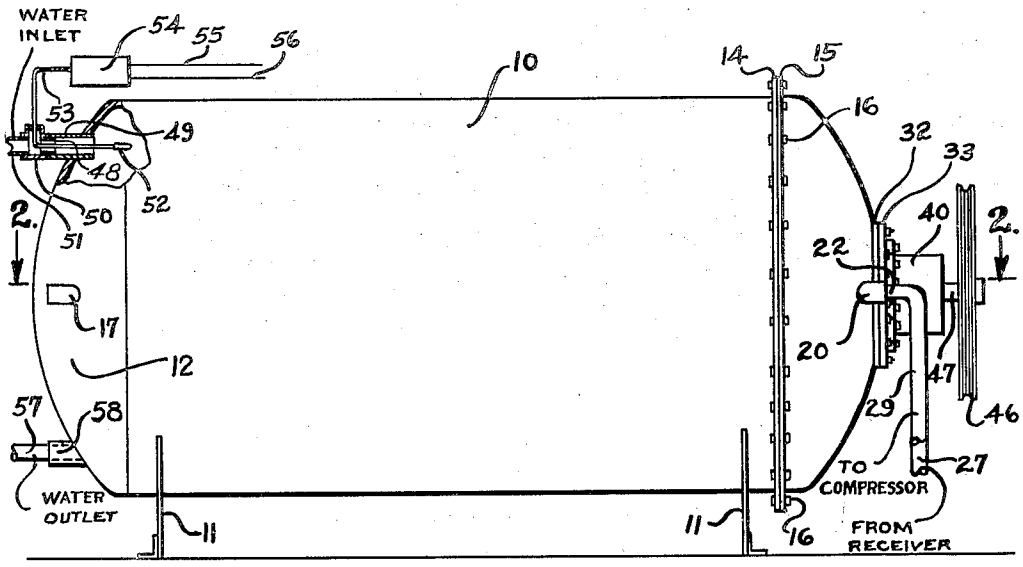


Fig. 1.

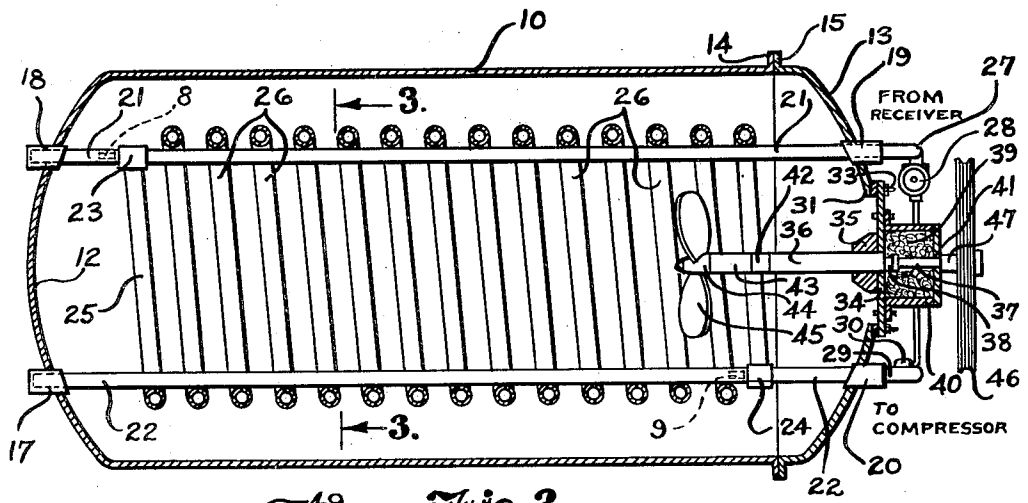


Fig. 2.

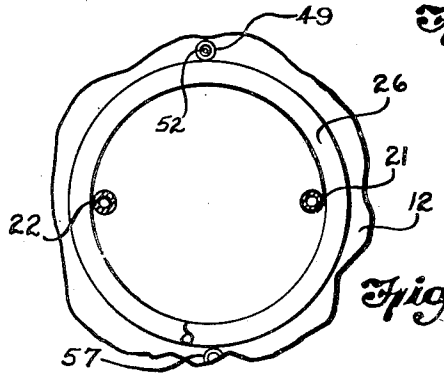


Fig. 3.

INVENTOR
MERLIN A. STICELBER
BY Alfred R. Fuchs
ATTORNEY

Patented May 9, 1950

2,507,387

UNITED STATES PATENT OFFICE

2,507,387

WATER-COOLING DEVICE

Merlin A. Sticelber, Kansas City, Mo., assignor to Stickelber & Sons, Inc., a corporation of Missouri

Application February 25, 1946, Serial No. 650,035

3 Claims. (Cl. 257—235)

1

My invention relates to liquid coolers, and more particularly to a water cooling apparatus.

It is a purpose of my invention to provide a simple and efficient water cooling device that is so constructed and arranged as to have high efficiency and at the same time prevent formation of ice on the cooling coil, this being accomplished by setting up a rapidly moving flow of the liquid over the turns of the coil in a direction generally axial of the coil and controlling the flow of refrigerant by thermostatic means in such a manner as to maintain the temperature of the body of liquid in the cooling device at a temperature sufficiently above the freezing point to prevent such ice formation.

More particularly my invention comprises an elongated tank, preferably, substantially circular in cross section with means for mounting a cooling coil which is, preferably, helical in character, therein so that said coil extends longitudinally of the tank and the axis of said coil is co-axial with the axis of the tank, and to provide means for creating a flow of liquid in a generally longitudinal direction of said tank and cooling coil, said means comprising a propeller that is mounted with its axis of rotation substantially on the axis of the cooling coil and the tank, within the coil.

My invention further provides new and improved simple mounting means for a cooling coil of the above mentioned character, said mounting means including a pair of longitudinally extending tubular members supporting the turns of the coil and connected with said coil and with conduit means extending from the receiver of a direct expansion refrigerating system and to the compressor of such a system, so that the refrigerant will pass from the receiver into one end of the cooling coil and to the compressor from the other end thereof through said mounting means.

Other objects and advantages of my invention will appear as the description of the drawing proceeds. I desire to have it understood, however, that I do not intend to limit myself to the particular details shown or described, except as defined in the claims.

In the drawing:

Fig. 1 is a view in side elevation partly broken away, of my improved water cooling means.

Fig. 2 is a horizontal longitudinal section therethrough taken substantially on the line 2—2 of Fig. 1, and

Fig. 3 is a fragmentary sectional view taken on the line 3—3 of Fig. 2.

Referring in detail to the drawing, my improved water cooling means comprises a substantially cylindrical tank 10 mounted on suitable supports 11 and having a concavo-convex head 12 at one end thereof, which is permanently secured liquid tight to the cylindrical side wall portion of said tank, and a similar concavo-convex head 13, which is detachably secured to the cylindrical body portion of the tank 10, said body portion 10 and head 13 being provided with flanges 14 and 15, which are secured together by bolts or similar securing means 16 for securing the detachable head portion to said tank. A liquid tight joint is provided in any suitable manner between the flanges 14 and 15, suitable gasket material being provided therebetween, if this is found to be desirable.

2

Mounted in fixed position in openings in the heads 12 and 13 are the sleeve-like members 17, 18, 19 and 20, said sleeve-like members being secured in liquid tight relation in the openings in the heads 12 and 13. Mounted in the sleeve-like members 18 and 19 is a tubular member 21 and mounted in the sleeve-like members 17 and 20 is a tubular member 22, said sleeve-like members 18 and 19 being longitudinally aligned with each other and the sleevelike members 17 and 20 being longitudinally aligned with each other. The tubular members 21 and 22 may be pipes or similar members, and are of such a size as to fit snugly within the sleeves 17, 18, 19 and 20 and are, preferably welded therein so as to make a liquid tight joint between each sleeve and the tubular member mounted therein.

The tubular members 21 and 22 are each made up of two lengths of pipe or tubing with a T interposed between the two lengths of pipe or tubing, the T 23 being provided on the tubular member 21 and the T 24 being provided on the tubular member 22. The T 23 is located near the end of the tubular member 21 remote from the head 13, while the T 24 is located near the end of the tubular member 22 that passes through the head 13. Connected with the T 23 is one end of a spiral or helical cooling coil 25, the other end thereof being connected with the T 24. The turns 26 of the coil 25 are mounted on the tubular members 21 and 22, said tubular members 21 and 22 supporting said turns of said coil and serving as the sole support therefor, and being so located that the axis of the coil 25 coincides with the axis of the cylindrical wall portion 10 of the tank, the turns 26 of the coil being located at a point closer to the wall 10 than to the axis of the cylindrical portion 10 to thus provide a passage of relatively great diameter axially through the cooling

coil 25. Plugs 8 and 9 are mounted in the tubular members 21 and 22, respectively, to shut off the portions thereof to the left of the T's 23 and 24, respectively, from the refrigerant passage to the right thereof. The ends of the tubular members extending into the sleeves 17 and 18 may also be closed.

The end of the tubular member 21 extending through the head 13 is connected with the liquid refrigerant pipe 27, which extends from the receiver of a conventional refrigerating system, an expansion valve 28 being interposed in the pipe 27 adjacent the tubular member 21. The portion of the tubular member 22 that extends through the head 13 has the suction pipe 29 leading to the compressor of a conventional refrigerating system connected therewith, the bulb 30 of a thermostatic control for the expansion valve 28 being, preferably, mounted on the suction pipe adjacent the connection therewith to the tubular member 22. The flow of refrigerant accordingly is from the expansion valve 28 through the tubular member 21 to the end of the coil 25 adjacent the head 12 through the succeeding turns of the cooling coil 25 to the T 24 and through the tubular member 22 to the suction pipe 29.

The head 13 is provided with a central opening 31, which is provided with a flange 32 provided with screw-threaded members 33 receiving nuts to secure the base plate 34 thereto. Mounted on the base plate 34 is a collar 35 in which is mounted the bronze bearing sleeve 36 for the propeller shaft 37, a liquid tight joint being provided around the shaft 37 by means of a packing gland 38 cooperating with the sleeve 36 in the usual manner, and a mass of packing material 39 provided in the housing 40, which is mounted on the base plate 34 in any suitable manner, as by means of a flange bolted onto said base plate, as shown in Fig. 2. The housing 40 is also provided with a bearing opening 41 therein for the propeller shaft 37. The bearing sleeve 36 is fixed in the collar 35 and a suitable thrust collar 42 is provided between the end of the bearing sleeve 36 and the spacing sleeve 43 provided between the hub portion 44 of a propeller 45 and said thrust collar 42. The shaft 37 has mounted thereon to rotate therewith a pulley 46, the hub portion 47 of which is in engagement with the end wall of the housing 40.

The propeller 45 is detachably mounted on the shaft in any desired manner so as to rotate therewith. The blades of the propeller 45 have such pitch and the rotation of the shaft is in the proper direction to advance a stream of water parallel to the axis of rotation of the propeller to the left of the propeller as viewed in Fig. 2, and to draw a stream of water substantially parallel to the axis of the shaft from the right of the propeller into the same. As a result of such rotation of the propeller there is a rapid flow of a stream of water created within the coil 25 in the direction of the axis thereof, some of the stream of water being deflected by the turns of the coil 26 so as to flow between the turns and into the space outside the coil, or between the coil and the cylindrical tank wall. The major portion of the stream, however, will flow to the head 12 and be deflected by the concave wall thereof toward the cylindrical shell of the tank 10 and flow back from left to right, as viewed in Fig. 2, toward the end of the tank that is provided with the head 13. As a result there will be a rapid flow of water or other liquid around all portions of the cooling coil so as to prevent any accumulation of ice on the turns of the coil, provided that the temperature of the water is maintained slightly above the freezing point. The pulley 46 may be driven by any suitable means.

The water inlet is, preferably, through a pipe 48, which is welded or otherwise mounted liquid tight within a sleeve-like member 49, which is welded liquid tight in an opening in the head 12. A T 50 is, preferably, connected with the water inlet pipe 48 and a pipe 51 is connected with the T 50, the pipe 51 leading from a suitable source of water supply. The bulb 52 is mounted within the tank closely adjacent the water inlet and has a liquid material therein, which is also provided in the tubular member 53 extending therefrom through the T 50 to a switch 54, a liquid tight joint being provided between the tubular member 53 and the downwardly extending branch of the T 50.

The liquid in the bulb 52 and tubular member 53 is of such a character that it expands upon rise in temperature and contracts upon drop in temperature and is operatively connected with suitable switching means in the switch 54 so that said switching means will move to circuit closing position upon rise of the temperature of the liquid surrounding the bulb 52 above a predetermined value and will open upon drop of the temperature around the bulb 52 below a predetermined value. The switch 54 is interposed in a circuit controlling operation of the compressor of a conventional refrigerating system, being interposed between the conductors 55 and 56, which are part of the controlling circuit of said compressor. Said controlling system is so arranged that the compressor will operate whenever the temperature of the water around the bulb 52 reaches a predetermined maximum temperature and will cease operating whenever the temperature of the water around the bulb 52 reaches a predetermined low temperature, said low temperature being sufficiently above the freezing point of water that with the agitation created in the body of liquid by the propeller 45 ice will not form on the coils 26 of the cooling coil 25. A cold water outlet pipe 57 is mounted liquid tight in a sleeve 58, which in turn is secured liquid tight in an opening in the head 12 near the bottom of the tank.

Due to the provision of the propeller, not only will the cooling coil be prevented from becoming covered with ice, but the liquid will be so thoroughly agitated and continuously flowing from end to end of the tank that the temperature thereof will be substantially uniform throughout, and as a result the temperature of the water flowing through the outlet pipe 57 will be kept substantially uniform at all times.

What I claim is:

1. A liquid cooling device, comprising a horizontally elongated cylindrical tank providing a liquid chamber, said tank having heads at the opposed ends thereof, a pair of straight tubular members mounted in said heads and extending horizontally between the same substantially parallel to the axis of said tank, and a helical cooling coil mounted in said tank with its axis extending horizontally on the axis of said tank, said coil having the turns thereof lying externally of said tubular members, said turns being each engaged at opposite sides thereof by said tubular members to support said coil and said coil having one end thereof secured to one of said tubular members and the other end thereof secured to the other tubular member.

2. A liquid cooling device, comprising an elongated cylindrical tank providing a liquid chamber, said tank having heads at the opposed ends thereof, a pair of tubular members mounted in said heads and extending lengthwise of said tank between the same substantially parallel to the axis of said tank, and a helical expansion coil mounted in said tank with its axis substantially on the axis of said tank and embracing said tubular members, said coil having each of the turns thereof engaged at opposite sides by said tubular members to support said coil and having the ends thereof secured one to each of said tubular members, one of said tubular members being connected with one end of said coil to provide a refrigerant inlet connection thereto, and the other of said tubular members being connected with the other end of said coil to provide a suction connection leading therefrom.

3. A liquid cooling device, comprising an elongated cylindrical tank providing a liquid chamber, said tank having heads at the opposed ends thereof, a pair of tubular members mounted in said heads and extending between the same substantially parallel to the axis of said tank, a helical expansion coil mounted in said tank with its axis substantially on the axis of said tank and embracing said tubular members, said coil having the turns thereof engaged at opposite sides by

said tubular members to support said coil and having the ends thereof secured one to each of said tubular members, one of said tubular members being connected with one end of said coil to provide a refrigerant inlet connection thereto and the other of said members being connected with the other end of said coil to provide a suction connection leading therefrom, the space within the helix of said coil being open to unrestricted flow of liquid therein in all directions from end to end thereof, and means within said coil rotating about the axis of said coil to create a flow of liquid longitudinally of said coil from end to end thereof and between the turns thereof.

MERLIN A. STICELBER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
577,925	Lothes	Mar. 2, 1897
1,175,147	Howard	Mar. 14, 1916
1,733,760	Spreen	Oct. 29, 1929
1,828,989	Wade	Oct. 27, 1931
2,071,624	Graham	Feb. 23, 1937
2,210,031	Greene	Aug. 6, 1940
2,300,058	Osborn, Jr., et al.	Oct. 27, 1942