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WATER COOLING APPARATUS

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3 Sheets—Sheet 3

36 24

26 54

46 44

52 99

43

99

Fig. 4

Fig. 3

Fig. 6

Fig. 5

Fig. 7

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This invention relates to refrigeration apparatus and has particular relation to refrigeration apparatus which shall be especially applicable for cooling liquids.

An object of the invention is to provide a general arrangement of the elements embodied in a liquid cooler that can be manufactured at a relatively low cost.

Another object of the invention is to provide a refrigerant evaporating unit for a liquid cooler which consists of a relatively small number of easily manufactured parts capable of being readily assembled into an operable unit.

For a better understanding of the invention, reference may now be had to the accompanying drawings forming a part of this specification, in which:

Figure 1 is a side elevational view of a liquid cooler having certain portions of the structure broken away in order to show the interior thereof in cross section.

Figure 2 is a cross sectional view of another form of liquid cooler in which the invention is embodied.

Figure 3 is a cross sectional view of another form of refrigerant evaporator which may be embodied in the structures disclosed by Figures 1 and 2.

Figure 4 is an end elevational view of the evaporator disclosed by Figure 3.

Figures 5, 6 and 7 are cross sectional views of still other forms of evaporators embodying the invention which may be incorporated in the water coolers disclosed by Figures 1 and 2.

Referring particularly to Figures 1 and 2, a preferred embodiment of the invention comprises a sheet metal outer casing 10 divided into an upper refrigerating compartment 11 and a lower machine compartment 12. A refrigerant condensing unit 13 (Fig. 2), consisting of a motor 14, compressor 16 and condenser 17, is mounted on a frame or support 18 which is disposed on resilient balls 19 seated in openings formed in the upper surface of a rectangular frame member 21. The lower part of the casing 10 is rigidly secured to the outer edge surfaces of the frame member 21 and the latter supports the entire structure upon legs 22 secured to the lower surface thereof.

Refrigerant liquid is supplied from the condensing unit through a liquid supply line 23, which communicates at one end with the condenser 17 and at the opposite end with a fitting 24 secured to a head 26 closing an opening in a refrigerant evaporating unit 27. A needle valve 28, controlling the admission of fluid from the fitting 24 to the interior of the evaporating unit, is pivotally connected as indicated at 29 to a bell crank 31 which is pivoted, as indicated at 32, upon an end portion of a support 33 projecting from the inner surface of the head 26. A float 34 is connected to the opposite end of the crank 31 and by moving up and down as the level of refrigerant in the interior of the evaporating unit rises and falls, it controls the admission of liquid refrigerant into the interior of the evaporating unit.

Refrigerant fluid, when evaporated, is withdrawn from the evaporating unit 27 through a fitting 36 connected to the head 26, and a conduit 37, which is connected between the fitting and a suction service valve 38 associated with the low side of the compressor 16. The low side of the refrigerating system also is connected by a conduit 39 to a pressure controller 41 by which the operation of the motor 14 is initiated and discontinued.

The head 26 is secured by bolts 42 to a flanged plate 43 which is welded or otherwise secured to one end of a cylindrical sleeve or shell 44 in which the refrigerant fluid is contained. A second shell 46 is disposed in spaced relation around the shell 44, and annular plates 47 and 48 are welded or otherwise suitably secured between the shells to provide a closed chamber between them. Flanged annular fins 49, secured on the exterior surface of the shell 44 and projecting into the space between the shells, provide increased heat exchanging or transmitting surface therewith. Openings 51 are formed at the upper and lower extremities of the fins to provide communication between the spaces on opposite sides thereof.

Cork or other suitable insulating material 51 is disposed in the space between the evaporating unit 27 and the refrigerating compartment 11 of the casing 10 for the purpose of thermally isolating the refrigerating elements.

Water, or other liquid which the apparatus may be employed to cool, is admitted from a suitable source of supply (not shown), through a conduit 52 connected by a flanged coupling 53 to a lower portion of the space between the shells 44 and 46. A discharge conduit 54, connected by a coupling 56 to an upper portion of the outer casing or sleeve 46, is in turn connected, by an elbow 57 and conduit section 58, to a bubbler 59 or other suitable draft means from which liquid may be dispensed. The bubbler is provided with a control device 61 which...
may be manipulated to initiate the discharge of fluid therefrom. The upper wall 62 of the casing 10, is provided with a depressed portion 63 forming a sump or well into which liquid overflowing the bubbler 59 may be collected. A drain pipe 64, connected to the depressed portion 63, projects downwardly therefrom, through the insulating material 51 between the evaporating unit 57 and the opposite end of the shell 44 and the bottom. A perforated disk 66, having a centering device 67 projecting downwardly therefrom into the conduit 64, prevents the entrance of large objects into the discharge conduit. The lower end of the conduit 64 is secured rigidly to the casing 11 by means of a pair of lock nuts 68 associated with the conduit on opposite sides of that portion of the casing. A T-coupling 69 and elbow 71, connect the lower end of the conduit 64 to a conduit 72 communicating with any suitable reservoir for receiving waste material.

In the structure disclosed by Figure 1, the shell 46 is entirely closed at one end, as indicated at 73, and is provided with a flange 74 at the opposite end thereof by which the shell is secured, by means of bolts 77, between the retaining ring 76 and the flanged disk 43. Also in this structure, the liquid to be cooled is discharged from an inverted bottle 78 which is supported adjacent its neck on a resilient ring 79 of rubber, or other suitable material, disposed in an annular enlarged portion 81 formed at the top of a metallic receiver 82. The receiver 82 is further reduced as indicated at 83, to provide an annular shoulder which is supported adjacent the opening in the upper wall 62 of the casing 10. A lower portion 84, of the receiver, projecting through the aforesaid opening, is connected at its lower extremity by a coupling 86 with the space between the shells 46 and 44. Liquid is discharged from the space between the aforesaid shells through a conduit 87 connected therewith and projecting outwardly through the end thereof, a fluid discharge conduit communicating with the chamber at a point remote from the fluid supply conduit, for the passage of fluid to be cooled, the openings in adjacent fins being diametrically opposed as indicated at 102. The structure disclosed by Figure 6 is substantially the same as that disclosed by Figure 5 except that the mutual axes of the shells 44 and 46 are vertical rather than horizontal. In this form of the invention, refrigerant fluid is admitted and discharged through openings formed in the upper horizontal wall of the structure. The admission of refrigerant fluid is controlled by a vertical float valve structure 103, in which a pair of links 104 are supported at their outer ends on lugs 106 projecting beneath a ring 107 which is seated, or otherwise secured on an inwardly projecting cylindrical portion 108 of the evaporator head 26. The adjacent ends of the links 104 are seated in an annular groove formed in a ring 109 rigidly secured adjacent the upper end of a needle valve 111, which, at its upper end, operatively engages a removable valve seat 112, and at its lower end slidably engages an opening formed in a boss 113 secured rigidly to the lower end of the inner shell 44. A float 116, surrounding the needle valve 111, actsuates the latter through lugs 117 projecting downwardly from intermediate portions of the links 104 in such relation to the float as to be engaged thereby when it is elevated.

Figure 7 discloses a structure employing an inner shell 44 which is spirally corrugated to provide a continuous spiral channel between it and the shell 46. Fluid to be cooled is circulated through such channel from one end of the shells to the other between admission and discharge ports 114. It will be apparent to those skilled in the art that many variations and changes may be made in the preferred forms of the invention without departing from its spirit or from the scope of the appended claims. I claim:

1. In a fluid cooler, the combination of a pair of casings disposed one within the other, said casings being spaced apart to provide a chamber for fluid to be cooled, a plurality of heat-exchanging fins interposed between the casings, each of said fins being provided at its periphery with an opening through which the fluid to be cooled, the openings in adjacent fins being diametrically opposed, a fluid supply conduit communicating with the chamber adjacent one end thereof, a fluid discharge conduit communicating with the chamber at a point remote from the supply conduit, and means for supplying and discharging refrigerant fluid to and from the interior casing.

2. In a fluid cooler, the combination of a pair of horizontally arranged cylindrical casings disposed one within the other, said casings being spaced apart to provide a chamber for fluid to be cooled, a plurality of fins disposed in thermal contact with the inner casing and extending across the chamber substantially perpendicularly to the walls thereof, each of said fins being provided at its periphery with an opening for the passage of fluid to be cooled, the openings in adjacent fins being diametrically opposed, a fluid sup-
3. In a liquid cooler, the combination of a pair of casings disposed one within the other, a plurality of annular fins supported by the exterior surface of the inner casing, each of said fins being provided at its periphery with an opening for the passage of fluid to be cooled, the openings in adjacent fins being diametrically opposed, a liquid supply conduit connected to the exterior casing, a liquid discharge conduit connected to the exterior casing in a region remote from the supply conduit so that fluid supplied to said casing must pass through each of said openings successively, and means for supplying and discharging a cooling medium to and from the interior casing.

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