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COOLING SYSTEM

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1 Claim. (Cl. 62-117)

This invention relates to a structurally and functionally improved heat transfer unit and system and while the same is capable of use in numerous different associations, it is primarily intended to be employed for the conditioning of air within an enclosure such as the body of a motor vehicle.

Whether employed in this or functionally equivalent installations, it is intended to furnish a unit and set-up of apparatus which may either raise or lower the dry bulb temperature of an enclosure and which system will be of such a simple nature that it may be installed by a mechanic of ordinary skill and will operate without virtually any attention or skilled supervision.

It is an object of the invention to provide a structure such that a maximum heat transfer will be accomplished, the system operating for example with heated water, secured from the cooling system of an internal combustion motor—when it is desired to raise the dry bulb temperature—and functioning with one of any number of desirable refrigerants when it is intended to reduce the dry bulb temperature.

A further object of the invention is that of furnishing a structure of this nature and in which the refrigerant will, at all times, be properly maintained so that the system will operate with maximum efficiency.

A still further object is that of providing a set-up of apparatus which will be of an extremely simple and compact nature, readily capable of being associated with and accommodated within an automobile, the parts being individually simple and rugged in construction, and capable of assembly by unskilled labor to furnish a unitary and economical system of this type.

According to certain further aspects, the present invention contemplates an improved or alternative structure to that described and shown in my previous United States Patent No. 2,118,263 of March 24, 1938, on Heat transfer apparatus, it being also noted that the present application is a division of my application for Heat transfer unit and system filed in the United States Patent Office on April 2, 1938, Serial No. 199,574.

With these and other objects in mind, reference is had to the attached sheets of drawing illustrating practical embodiments of the invention and in which:

Fig. 1 is a view showing diagrammatically the motor of a vehicle and illustrating the system in association therewith;

Fig. 2 is a front elevation of the heat transfer unit and the connections extending therefrom;

Fig. 3 is a transverse sectional view taken along the lines 3—3 and in the direction of the arrows of Fig. 2, and

Fig. 4 is a sectional plan view taken along the lines 4—4 and in the direction of the arrows of Fig. 2.

Before continuing with a consideration of the structure heretofore briefly described, it is to be understood that while in many respects the present invention is primarily intended for association with a motor vehicle, it might be employed in numerous other instances and wherever it is necessary or desired to effect heat exchange, and particularly the lowering of air temperatures. Thus, the present drawing and description are to be construed in an illustrative, and not in a limiting sense, except where otherwise indicated in the appended claim.

Thus, referring primarily to Fig. 1, the numeral 10 indicates a motor provided with the usual cooling system from which tubes 11 and 12 extend to the radiator 13. To the rear of the motor there is provided the conventional partition or dash 14 upon which is mounted a heat transfer unit generally indicated at 15, including air passages through which air is forced in heat exchange contact by means of a suitable motor driven impelling member 16.

In the present application there has not been shown the conventional and well known connection between the unit 15 and the cooling system of the motor vehicle. One of several well known and accepted manners of achieving this result may be resorted to, it being noted that the present illustration has been confined to the cooling of air rather than the raising of the temperature thereof.

The unit 15 may include any desired construction although it preferably embraces structures such as are disclosed in the application of which the present is a division. For the purpose of the present specification it will be sufficient to note that in this parent application heat transfer units or evaporators are shown which include a core section presenting surfaces over which air may pass in heat exchange relationship and which is provided at its opposite ends with heads. These heads may be coupled to the system generally by providing, for example, a passage in the lower end of one head and the upper end of the opposite head, or by connecting the conduits merely to one head and dividing the latter into two sections by an interposed baffle.

It will be seen that an outlet tube 29 is coupled to the upper end of the unit and an inlet tube 30

is coupled to the lower end of the same. Extending between these tubes is a body 31, the interior construction of which is probably best shown in Fig. 3. In this view it will be noted that a float 32 is positioned within the body and when the liquid level within the core assemblies is at proper height this float, by means of a link 33, serves to maintain valve 34 in closed position against its seat. This seat 35 is disposed below the plane of tube 30 which may form a part of, or be directly coupled to body 31. In case a core has its inlet and outlet tubes connected merely to one head, tubes 29 and 30—or the continuation thereof—will of course extend substantially in line with the body 31. If, on the other hand, the inlet and outlet openings are disposed in opposite corners of the different heads, a tube 36 will connect with the lower end of body 31 and couple the same to tube 30, it being noted that this general form of construction has been shown in my prior patent granted on July 13, 1937, and numbered 2,087,160.

Extending from the upper end of body 31 is a tube or pipe 37 which is coupled to a suitable pump 38 driven by the fan belt 39 of the motor, or by any other suitable power source. The outlet of the pump is connected to a condenser 40 which in turn discharges into a tank 41, the latter conducting the condensate through a tube 42 coupled to the lower end of body 31.

The condenser-tank assembly may be provided with a filler plug 43 through which the system may be charged with a refrigerant to the proper level. It will also be noted that there extends from this assembly an air pipe 44 which connects with the return or inlet tube 30. This connection is preferably effected as shown in Fig. 4, by employing a packing assembly 45 through which the pipe 44 passes into the inlet tube of the core assembly and adjacent the lower end of the same. At this point it is preferred that the pipe terminate in an end portion having the characteristics of a nozzle 46, so that not alone is the air or vapor directed as desired, but also an expansion valve effect is achieved.

In operation the system is charged in any desired manner as aforeindicated, the plug 43 then seals the tank and as will be observed, the space above the refrigerant contains air. The refrigerant may be one of a number of commercially available substances. In certain respects, however, it is preferred to employ methylene chloride, commonly known as "Carene," in that a material of this type is non-caustic, non-corrosive, and fireproof, and also has the advantage that it is not injurious to human beings even if a leak should develop and the vapors should be inhaled.

With the pump 38 in operation, a vacuum of, for example, 15 to 20 inches will occur within tube 37. If methylene chloride is employed, it will be found that at atmospheric pressure it boils at a temperature of substantially 104° F. With 10 inches of vacuum it boils at a temperature of 85° F. If, however, air is permitted to flow through the body of liquid, it will be found that the boiling effect continues until a temperature of 58° F. is reached. Of course, when the vacuum is increased above 10 inches, this effect continues at much lower temperatures. Conversely the refrigerant will condense at a temperature of substantially 104° F. at atmospheric pressure. However, under 24 lbs. pressure, it will condense at a temperature of 125° F., while if the pressure is stepped up to 31 lbs. above at-

mospheric, the methylene chloride will condense at a temperature of 135° F.

Thus, with a vacuum exerted by pump 38 through tube 37 the temperature of the fluid within unit 15 will reduce rapidly in that it will quickly absorb heat, this being especially true with air passed through the body of liquid as afore brought out. Consequently vapor surcharged with refrigerant flows through tube 37 towards the pump 38. Necessarily, a certain amount of the refrigerant liquid will be entrained within this vapor and it would be extremely objectionable if these liquid particles were drawn into the pump. This is prevented, however, due to the body 31 which in certain respects acts as a trap. In this connection tube 29 or its continuation opens into the body 31 at a lower level than the entrance of tube 37 and at an angle to the axis of the latter tube. Consequently entrained particles of moisture will fall downwardly into the body 31 and serve to maintain the float 32 in raised position. Thus valve 34 will remain closed. If, however, the level within this body drops below that which is proper, valve 34 will open and additional refrigerant will be free to flow from the condenser and receiver assembly through tube 47 into body 31 under the influence of the pressure existing within the condenser and receiver assembly, it being understood that this pressure has assisted and accelerated the condensing of the refrigerant.

In this manner the level will at all times be properly maintained. Vapor will be discharged through pipe 44 and incident to the pressure which this vapor is under, the air will probably be surcharged with refrigerant. Incident to the expansion valve effect achieved by the nozzle 46 or otherwise, the air will, of course, expand upon entering the unit 15 and will be free to absorb additional heat from the refrigerant and thus accordingly lower the temperature within the unit.

It will be observed that the air or vapor discharged through nozzle 46 will rapidly rise through the refrigerant within the heat transfer unit and by absorbing heat in so doing it will of course cause a cooling of the whole body of refrigerant, the resultant vapors being drawn through the outlet of the evaporator or unit and distribute it as aforedescribed. The fan or impeller 16, causing air to flow through the core will result in a major heat exchange being effected. Preferably the refrigerant should extend to a point just below the outlet pipe of the unit although in certain instances where it is desired to minimize noise, the liquid level may be sufficiently high to permit a certain quantity of the liquid to flow through the outlet pipe. In that event it will be obvious that the liquid will simply flow to the float chamber and be returned through the inlet pipe so that the operation of the system will not be interfered with.

Thus, among others, the several objects of the invention as aforenoted are achieved. Obviously, numerous changes in construction, and rearrangement of the parts, might be resorted to without departing from the spirit of the invention as defined by the claim.

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

A refrigeration system adapted for use in a motor vehicle including an evaporator to be posi-

tioned within the passenger compartment of the vehicle, motor-driven means also positioned within said passenger compartment and behind said evaporator for circulating air through said evaporator, an auxiliary chamber coupled to said evaporator but positioned in the engine compartment of said vehicle for replenishing the refrigerant in said evaporator, float controlled valve means associated with said chamber for maintaining the refrigerant therein and in said evaporator at substantially the same pre-determined levels, refrigerant for such system, a compressor pump for said refrigerant and posi-

tioned in said engine compartment and being adapted to be driven by the internal combustion engine of said vehicle, a condenser for said system positioned ahead of the cooling radiator of said motor vehicle so as to be cooled by the flow of air past the same incident to the motion of said motor vehicle as well as to the action of the cooling fan of said internal combustion engine and means for coupling said system together for operation as a sealed refrigerating system.

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