An evaporator coil refrigerant distributor for the evaporator of an air conditioning system. The distributor has a flat face inlet for creating turbulence in the incoming liquid and gaseous refrigerant. The mixture of liquid and gaseous refrigerant must then pass through a central discharge area into a plurality of outlets which are connected to different passages of the evaporator coil.
BACKGROUND OF THE INVENTION

This invention relates to refrigerant distribution devices, and more particularly to a refrigerant distributor adapted to be connected between the expansion valve and the evaporator coil of an air conditioning system such as an automotive air conditioning system, for example.

It is common practice to distribute the refrigerant discharged from an expansion valve of an air conditioning system into a plurality of different paths each of which is connected to a different portion of an evaporator coil. The purpose of this distributor is to provide substantially equal ratios of gas and liquid refrigerant to each of the sections of the evaporator coil. It is desirable that the ratio of gas to liquid refrigerant entering each of the sections of the evaporator coil be substantially the same so that all of the evaporator sections will perform in substantially the same manner. If a distributor were not employed in such a system it might be possible that one section of an evaporator would obtain a high ratio of gas to liquid refrigerant while another section of the evaporator coil would obtain a high ratio of liquid to gas refrigerant. This would result in less than maximum heat transfer of the coil.

According to the present invention the ratio of gas to liquid refrigerant entering into each of the sections of an evaporator coil is approximately the same.

BRIEF SUMMARY OF THE INVENTION

Briefly, this invention comprises an evaporator coil refrigerant distributor comprising a one-piece body having a flat turbulizing inlet face and a plurality of diverging outlets for distributing liquid and gaseous refrigerant mixed partially as a result of impingement on the turbulizing face of the inlet.

One of the primary objects of this invention is to provide a distributor for an air conditioning system in which liquid and gaseous refrigerant entering the distributor is thoroughly mixed prior to being discharged therefrom.

Another object of this invention is to provide a distributor of the class described which is formed of a single component, machined to provide the distribution of the liquid and gaseous refrigerant mixture therefrom.

A further object of this invention is to provide a distributor such as described which is simple and economical in construction and effective in operation.

Other objects and advantages of this invention will be made apparent as the description progresses.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings in which one of various possible embodiments of this invention is illustrated,

FIG. 1 is a side view of an evaporator and inlet line assembly including a distributor of this invention;

FIG. 2 is a cross section of the distributor forming part of the assembly shown in FIG. 1; and

FIG. 3 is an end view of the distributor shown in FIG. 2.

Like parts are shown by corresponding reference characters throughout the several views of the drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings an assembly is shown in FIG. 1 to include a main refrigerant carrying tube 1, a distributor 3, a plurality of distributor tubes 5, 7, 9 and 11 and an evaporator 13. Each of the distributor tubes 5-11 is connected to a different section of the evaporator coil 13. The inlet end of the main tube 1 is adapted to be connected to the outlet of an expansion valve (not shown) of the air conditioning system. It will be understood that the refrigerant discharged from the outlet side of the expansion valve is in both a gaseous and liquid state.

The distributor 3 is shown in more detail in FIGS. 2 and 3. As shown, it includes a circular neck portion 15 having the diameter approximately equal to the interior diameter of the main tube 1 after the latter is placed over the neck 15. Shoulders 17 limit the amount by which the neck 15 may be inserted into the tube 1. An enlarged portion 19 extends from shoulders 17. As will be made apparent, the enlarged portion 19 allows a greater distribution and divergence of the refrigerant entering the distributor than would be permitted by a portion which was approximately the same size as the neck portion 15.

The inlet 21 of the distributor is counterbored at 23 to provide a turbulizing face 25 downstream from the inlet end of the distributor. The counterbored portion 23 also provides an annular ring-shaped flange 27 at the inlet end of the distributor. The ring-shaped portion 27 has an externally inclined chamfer 28 thereon. The internal diameter of the main tube 1 is approximately the same as the external diameter of the neck portion 15. The chamfer 28 facilitates the insertion of the neck portion 15 into the tube 1. The tube 1 and distributor 3 are brazed together. The turbulizing face 25 is annular and has a centrally located opening or orifice 29 into a cylindrically shaped throat portion 31. The edge formed between the face 25 and the portion 31 is relatively sharp and the flange 27, by extending outwardly from face 25 offers some protection against burring or damaging the sharp edge during handling.

A plurality of passages or outlets 33 are formed in the distributor 3. These passages 33 are inclined with the axes thereof inclined at equal angles to the central axis of the fitting. The axes of the passages 33 intersect at the center of the opening 29 in the plane of the turbulizing face 25. The outlet ends of the distributor passages 33 are counterbored as indicated at 35 for receiving the inlet ends of the distributor tubes 5-11. It will be noted that the angle at which the passages 33 are inclined is such that the outlet ends of the passages are located radially outwardly of the neck portion 15. Accordingly it will be seen that the enlarged portion 19 permits the use of such inclined passages.

Operation of the distributor of this invention is as follows:

Assuming that refrigerant is being discharged from the expansion valve into the main tube 1 during operation of the system, such refrigerant will normally be partially in a gaseous state and partially in a liquid state. The mixture flows to the distributor 3 and a portion thereof impinges on the outer end of the ring 27 and the chamfer 28, thereby becoming turbulent. Additional refrigerant will impinge directly upon the turbulizing face 26 which will obviously increase the turbu-
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3 lency of the gaseous and liquid refrigerant, thereby mixing the gas with the liquid. The mixed gaseous and liquid refrigerant must flow through the restricted opening or orifice 29 into the cylindrical throat 31. Since this opening is considerably smaller than the internal cross sectional area of the main tube 1 the velocity of the refrigerant is increased, thus further increasing the turbulence of the liquid and gaseous refrigerant. As a result the refrigerant upon leaving the cylindrical throat 31 is thoroughly mixed so that the portions thereof which go into each of the distribution passages 33 will all have approximately the same ratio of gas to liquid refrigerant composition. The refrigerant then flow through the distributor passages 33 and the respective distributor lines 5-11 to the various sections of the evaporator 13.

It will be seen that the ring-shaped portion 27, the chamfer 28, and the turbulizing face 25 all play a part in creating turbulence of the refrigerant as it passes from the tube 1 into the distributor. This turbulence of the refrigerant thus results in a good mixture of the gaseous and liquid portions thereof.

In view of the foregoing it will be seen that the several objects and advantages of the invention are obtained.

Although only one embodiment of the invention has been disclosed and described, it is apparent that other embodiments and modifications of the invention are possible.

I claim:

1. A one-piece refrigerant distributor for a distributor assembly having a main tube, a plurality of distributor tubes, said distributor connecting said main tube to said distributor tubes, said one-piece distributor comprising a body having a passage there-through, an integral turbulizing face extending generally transverse to the direction of flow of refrigerant through said main tube toward the distributor, said passage including an orifice in said turbulizing face, a cylindrical throat extending downstream from said orifice, and a plurality of cylindrical diverging outlet passages connected directly to and merging with said throat, said passages extending downstream from said throat, and an integral ring-shaped portion extending upstream from said turbulizing face, the upstream end portion of said ring-shaped portion acting as a turbulizing element, said end portion of said ring-shaped portion having a peripheral chamfer on its outside margin to facilitate insertion of said ring-shaped portion into said main tube and to create turbulence of the refrigerant impinging on said ring-shaped portion.

2. A refrigerant distributor as set forth in claim 1 wherein said center lines of said outlet passages intersect at approximately the center of said orifice in the plane of said turbulizing face.

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