A-COIL WITH IMPROVED AIR DEFLECTOR

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Filed: Oct. 15, 1973

Appl. No.: 406,646

U.S. Cl. .................................. 165/124, 62/515
Int. Cl. .................................. F28f 7/00
Field of Search ........................... 62/286-290;
165/101, 78, 122-126

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ABSTRACT

The present invention provides an air guide mounted in the apex area of an “A”-coil evaporator. The air guide is effective in allowing the air to pass smoothly through the evaporator coils. The air coil guide is arranged to allow an unrestricted air flow through the evaporator plates thereby eliminating eddying of the air in the downstream side of the air guide.

5 Claims, 4 Drawing Figures
A-COIL WITH IMPROVED AIR DEFLECTOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an a-shaped evaporator and more particularly to an evaporator "A"-coil as applied to central air conditioning systems as the indoor half of the split system with the coil being in series with the heating furnace blower. The "A"-coil evaporator which in common practice is two evaporator slabs or plates, is connected at its apex by an air guide member that allows a smooth unrestricted flow of air to travel through the coils by allowing the air to remain closer to the center of the coil by pulling the air streams toward a parallel flow thereby preventing displacement of the air stream.

2. Description of the Prior Art

Traditionally, "A"-coils as shown in U.S. Pat. No. 3,097,507 to T. H. Makuh and U.S. Pat. No. 3,000,193 to T. G. Crider are secured to their upper ends or apex by solid plate members that bridge both evaporator plates to cover substantially all the upper ends of the evaporators. This presently used arrangement causes the air to turn sharply from its original direction to get through the evaporator plates. This severe directional change of the air flow causes eddy currents to form on the downstream side of the connector plates. This drastic change in air flow direction tends to whip or free the condensate water from the evaporator coils and cause it to be carried into the air stream. This action can be especially damaging in that the condensate water brought from the evaporator may lodge on the internal surfaces of the duct work, or cause leakage into the system, or may be maintained in the air flow which causes a cold clammy air to be circulated. Other prior art devices such as disclosed in U.S. Pat. No. 3,212,284 to R. M. Herbert disclose an "A"-coil wherein the connecting plates or upper support members have been eliminated. This type of construction is expensive in that it does not lend itself to mass production methods and techniques in that it relates to a design that is limited in application. The slope angle of the coils, because of the angled tops is fixed and as such it is not suitable for all sizes of cooling coils because the width at the bottom of the "A"-coil is limited by the mitered top and would therefore not be adaptable to various width furnaces. Further, the plates are interconnected by the refrigerant system so that the entire assembly provides a unitary evaporator, and as such the "A"-coil must be fabricated as a unit before it is tested for leakage, this presents further problems, such as storage prior to shipment. For example, the traditional rectangularly shaped plates are assembled separately and stored or stacked prior to their assembly into an "A"-coil. Thus, less storage area is needed and handling is greater simplified resulting in less damage to the coils in their pre-assembled state.

SUMMARY OF THE INVENTION

By this invention, there is provided an inverted v-shaped or "A"-coil heat exchanger that is arranged in the path of a flow of air. The heat exchanger includes a pair of generally vertically extending plates. The lower ends of the plates are substantially parallel and spaced from each other to define an opening therebetween to allow movement of air therethrough. The plates converge upwardly so that substantially all of the air moving through the opening must pass through the plates. Provided at the apex of the plates is an air deflecting or guide means that extend longitudinally substantially the full length of the plates and is located between the upper longitudinally extending edges of the plate so as to be out of the path of air moving through the plates. The air deflecting means is substantially diamond shaped and provides air foil surfaces that cause a smooth flow of air at its upstream side while at the same time prevents eddying of said air flow at its downstream side.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a conventional hot air furnace including a heat exchanger embodying the air deflector of the present invention;

FIG. 2 is a perspective view of the air deflector forming the present invention;

FIG. 3 is a side elevation of an "A"-coil embodying the present invention in an upflow installation; and

FIG. 4 is a view similar to FIG. 3 showing a downflow arrangement.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, there is shown a hot air furnace 10, which includes a blower of air handling means (not shown) for moving air from an air inlet 12 through the furnace and for delivering air to an outlet 14 and into a distribution plenum 16. Located in the plenum 16 and positioned over the outlet 14 is an "A"-coil or inverted v-shaped evaporator assembly or heat exchanger indicated generally at 18. The evaporator assembly 18 comprises a pair of conventional air conditioning coil heat exchanger assemblies or plates 20 and 22. The plates or heat exchangers are conventional in design and are fabricated from a series of flat, thin substantially rectangular plates or fins designated generally at 23, and have the usual refrigerant tubing 24 passing therethrough as part of the refrigerant system. Other conventional components such as a base pan 26 is provided wherein the lower edges of the plates 20 and 22 are located in drip pans that are disposed in a parallel and space relationship to each other to define an opening 15 which communicates with the outlet opening 14. At their upper ends the plates converge to form the inverted "v" or A-shaped evaporator assembly 18 which, in effect, locates the plates in the path of air moving through opening 14.

In accordance with the embodiment of the present invention shown, an air guide or deflector means 28 is provided that is substantially diamond or lozenge shaped in cross section and is arranged with the acute angles vertically disposed. However, it should be clearly understood, and will be explained further hereinafter, that other configurations may be incorporated that would provide the desired results in carrying out the objects of the present invention.

Referring now to FIG. 2, the air deflector or guide 28 is located at the apex of the evaporator assembly 18. The air guide 28 is located between the upper edges of the plates 20, 22 and extends substantially the full longitudinal dimension of the plates 20 and 22. At each of the longitudinal ends of the deflector 28, there are provided ears 30 which are formed from the main body member of the air deflector 28 and extend outwardly. The ears 30 engage and are secured to flanges 31...
formed on the upper edge portions of the end or outer fin 23 of each of the heat exchanger assemblies 20 and 22.

In the preferred embodiment as shown in FIG. 2, the deflector 28 is fabricated from a single piece of sheet material which is bent centrally to provide a longitudinally extending ridge 34 forming the upper acute angle and terminating with its free ends adjacent each other at the lower end of the diamond. Completing the deflector 28 are upper walls 36 generating from the ridge 34 and lower walls 38 extending to the free ends. Referring to FIGS. 3 and 4, it will be noted that the upper inner edge portions of the plates 20, 22 rest on or are held against the upper walls 36 so as to be supported by the deflector 28.

The above described configuration of the deflector 28 permits a great deal of flexibility of application by providing a design that lends itself to use on heat exchangers 18 of various capacities and sizes. Generally, the height of the assembly 18 is variable depending on the desired cooling capacity of the unit. The width and height of the "A"-coils are not proportional for the various sizes of heat exchange assemblies. With the deflector 28 of the present invention as applied, the upper acute angle as defined by ridge 34 may be altered to permit different coil slopes. For example, a heat exchanger of higher capacity might require a wider base thereby changing the apex angle of the "A"-coil, in that event, it would be the simple matter during fabrication of the unit to adjust the air deflector to accommodate the different angles so that the upper inner edges of the plates would still rest on and be supported by the walls 36. The bottom edges of the deflector 28 may then be brought together again or in close proximity to each other to provide minimum resistance to air flow in the upward direction as viewed in FIG. 3. Referring now to FIG. 3, there is shown an illustration of an upflow installation wherein the blower forces the air through opening 14 towards the converging plates 20, 22 of the heat exchanger 18 and deflector 28. As indicated by the arrows, the air flow with the present air foil or deflector 28 located at the apex of the converging plates 20, 22 is allowed to pass through the plates in all areas including the portions immediately adjacent to the air deflector. This uninterrupted flow of air through the evaporator plates allows the air to remain substantially parallel as it passes through the plates so that eddying on the downstream side of the heat exchanger is eliminated. FIG. 4 illustrates a downflow installation whereby the air is directed past the ridge portion 34 through the plates 20, 22 and into opening 14. The air flowing past the deflector in each application is in effect the same in that the downstream portion of the baffle maintains the air stream substantially close to the center of the heat exchanger 18 by pulling the air stream toward a parallel flow pattern as indicated by arrows in FIGS. 3 and 4. The air stream as permitted with the use of the air deflector of the present invention provides an air flow of substantially uniform velocities and prevents air velocities in critical areas that are capable of blowing condensate water off the heat exchange surfaces. Water blown into the air stream may lodge on internal air conditioning parts, or may defeat the dehumidifying benefit of air conditioning by causing cold clammy air to be distributed.

While in accordance with the Patent Statutes, there has been described what, at present, is considered to be the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made thereto without departing from the invention, and it is intended therefore in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of this invention.

What is claimed as new and is desired to be secured to Letters Patent of the United States is:

1. An air handling structure having a heat exchanger arranged in the path of a flow of air, including a pair of generally vertically extending heat exchangers having upper and lower ends, the lower ends being substantially parallel and spaced from each other to define an opening therebetween to allow movement of air therethrough, and converging upwardly so that substantially all of the air moving through the openings contacts the heat exchangers, wherein the improvement comprises:

air deflector means located between the upper ends of said heat exchanger and extending longitudinally substantially the full length of said heat exchangers; and

said air deflecting means being substantially diamond shaped to provide a smooth flow of air at its upstream side to maintain a parallel air flow through all of said heat exchangers and thereby preventing eddying of said air flow at the downstream side of said air deflector.

2. A heat exchanger arranged in the path of a flow of air comprising:

a pair of generally vertically extending heat exchanger plates each having upper and lower ends;

said lower ends being substantially parallel and spaced from each other to define an opening therebetween to allow movement of air therethrough;

said plates converging upwardly so that substantially all of the air moving through said openings contacts and flows through said heat exchangers;

air deflecting means located between the upper ends of the heat exchangers so as to be out of the path of air passing through said heat exchangers and extending longitudinally substantially the full length of said heat exchangers; and

said air deflecting means having a central ridged portion and side walls extending downwardly and outwardly from said ridge to provide air deflecting surfaces for deflecting air moving toward said ridge portion through said plates and into said opening.

3. The invention as set forth in claim 2 wherein the downwardly and outwardly extending side walls of said air deflector means provide a support surface for the upper edges of said heat exchangers.

4. The invention as set forth in claim 3 wherein the air deflecting means is substantially diamond shaped to provide an effective air deflecting surface for air flow in either direction.

5. The invention as set forth in claim 4 wherein the air deflector is provided with outwardly projecting tabs at its longitudinal ends that are secured to said heat exchangers.

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