An arrangement for supporting an open coil resistance heater to be located in a path of air. A section of the heater is positioned in a support aperture arranged in an insulator. The insulator is provided with deflection means that is effective in directing a portion of air into the aperture for cooling and preventing the premature burn out of the heater coil due to excessive heat buildup in the aperture area.

4 Claims, 4 Drawing Figures
OPEN WIRE HEATER ELEMENT SUPPORT

BACKGROUND OF THE INVENTION

1. Field of Invention

This invention generally relates to a heating unit wherein an open coil heating element is supported in apertures running through insulators that are located in an air path of an air heating apparatus and more specifically to an improved heater coil supporting insulator wherein a portion of the air flow is directed through the supporting aperture to dissipate heat from the aperture area and reduce temperatures therein. By the present invention the insulators are provided with deflecting surfaces that direct a portion of the air flow through the aperture in the insulator. This positive air flow is effective in maintaining the temperature in the support area within design levels and as such prolong heating element life. When open resistance heating coils are threaded through support apertures in insulators, the portion of the heating element in the aperture is out of the path of air flow and heat is not dissipated. As a result, the heating element conductor in the support area is much hotter than the conductor in the air stream and the life of the heating element is shortened with failure occurring in the area of the hot spot created in the support area.

2. Description of the Prior Art

Attempts have been made in the past to dissipate some of the heat trapped in the supporting insulator. U.S. Pat. No. 3,668,303 — Alexander, for example, discloses the application of an insulator having an aperture of non-circular cross-section, preferably triangular, which allowed for the circulation of air around the heating element. U.S. Pat. No. 2,921,172 — Hackman discloses an aperture in the insulator wherein the coil is held only in the central portion of the aperture while the coil at both ends of the insulator is spaced from the aperture walls to allow for the circulation of air. While both of the above patents show means for permitting the circulation of air around a heating coil, only air flow caused by natural convectional air flow will pass through the insulator.

It is therefore an object of the present invention to permit a positive air flow through the support insulator so that a controlled amount of air may be supplied to dissipate the heat from the critical high heat support area to prolong the life of the resistance wire heat coil.

SUMMARY OF THE INVENTION

By this invention there is provided an electric heater coil supporting insulator that is arranged in an air flow path of an air handling apparatus. The insulator is conveniently formed of a heat refractory insulating material and is provided with an aperture extending longitudinally therethrough. The open coil heating element is threaded through the aperture with a portion of the open coil heating element being supported in the aperture. Formed on the insulator are projections that are arranged downstream with respect to the aperture openings so that the portion of air flow that impinges on the projection is deflected into the aperture and around the heating coil. The portion of air flow that is directed into the aperture is effective in dissipating the heat contained in the aperture support area and to lower the temperature in that area to within design limits.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary top plan view of a heating unit embodying the insulator of the present invention; FIG. 2 is an enlarged sectional view taken along line 2—2 of FIG. 3; FIG. 3 is an enlarged sectional view taken along line 3—3 of FIG. 1; and FIG. 4 is an enlarged perspective view of the insulator of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, and more particularly to FIGS. 1 and 2, there is shown an open coil heating element assembly 10 used to warm air passing over the assembly. The heating assembly in the embodiment shown comprises a long helical heater coil 12 of resistance wire which may extend back and forth through a plurality of ceramic insulators 14 carried by an open metal frame 16 having a series of spaced apart parallel insulator supporting members 18 which extend crosswise of the frame 16. In heater assemblies of this type the heating coil 12 must be reliably supported and adequately insulated from the metallic support frame 16 so as to leave a sufficient portion of the coil exposed to the air flow for effective operation and heat dissipation. This type of heater coil is designed to operate in an air flow and must be in good thermal contact with the air passing over its heated surface to prevent excessive temperatures that will cause premature heater coil burnout.

Referring to FIGS. 1 through 4 the insulator 14 includes a body member or portion 20 of substantially rectangular cross-sectional configuration having a coil supporting aperture 22 also of substantially rectangular cross-sectional configuration for receiving the portion of the heater coil 12 to be supported. The support member 18, FIGS. 3 and 4, is composed of a pair of narrow metal strips 18a and 18b, with one strip spaced from the other at appropriately spaced intervals along their lengths to receive the insulator 14. To prevent longitudinal movement and to properly locate the insulator 14 there are provided guide means or projections 24. The projections 24 extend from opposite sides of the insulator and are spaced longitudinally a distance to accommodate the width of the opposed metal strips 18a and 18b as shown in FIGS. 2 and 4.

The portion of the heater coil 12 in the support aperture 22 is out of the path of the air flow that effectively dissipates the heat from the coil to provide a heated stream of air. The absence of air flow and insufficient heat dissipation in the support aperture 22 results in an excessive heat buildup and hot spot. The hot spot when permitted is the primary cause of premature heater coil failure. Means are provided to minimize or substantially eliminate hot spots caused by excessive temperature buildup in the support aperture 22 of the insulator 14. To this end deflection means 26 are provided by the present invention that effectively introduce a portion of the air flow into the aperture. In order to prevent an insulator 14 that would be self-aligning in the support frame 16 with respect to air flow, two deflection means are provided. In the present embodiment the deflection means 26 project into the air stream from the longitudinal ends of the insulator 14. The deflection means 26 are of U-shaped configuration and include a base por-
tion 28 and side walls 30. Each of the deflection means 26 is in effect an extension of the bottom wall and portions of the side walls of the aperture 22. The side walls 30 of the deflection means provide a channel 32 for entrapping and positively directing air into the support aperture 22 and axially along the heater element 12. With reference to FIG. 2 the arrows represent the direction and path of the air flow. It should easily be understood that a portion of the flow of air through the heater assembly 10 impinges on the deflector 26 and is directed into and through the aperture 22 to dissipate the heat that the heater coil 12 would otherwise build up in the confines of the aperture 22. As the cooling air passes through the support aperture 22 and exits at the other end of the insulator, the projecting deflector means 26 at the exit end creates a negative pressure as a result of the air passing around the deflector 26 assisting in directing air through the support aperture 22. It will be understood that the double headed arrows represent the fact that with the present arrangement of providing the insulator 14 with two oppositely disposed deflection means 26, the insulators 14 are effective in deflecting air passing them in either direction through the support aperture 22. The provision of opposite disposed deflection means 26 is especially advantageous during manufacture of the heater assembly wherein one of the deflection means 26 of the insulators 14 will automatically be properly oriented downstream of the support aperture.

To further facilitate the movement of air through the support aperture 22, the heater coil 12 as indicated (FIGS. 3 and 4) is of a conventional circular form. It will be apparent referring to FIG. 3 that the circular heater coil 12 contacts the walls of the rectangular aperture 22 only at four tangent points. There is accordingly a substantial area between the outer surface of heater coil 12 and the corner areas of the aperture 22 for the circulation of air through the insulator 14 and about the heater coil 12 to provide sufficient dissipation of heat to prevent the heater coil 12 from becoming overheated in the area of the insulator.

It should be understood from the foregoing description of the present embodiment of the invention that an insulator 14 has been provided that will inherently maintain the temperature of the heating element in the support aperture within design levels. This invention further provides an insulator 14 that is automatically positioned on the frame 16 with respect to the air flow across the insulator.

While there has been shown and described a specific embodiment of the invention, it will be understood that it is not limited thereto and it is intended by the appended claims to cover all such modifications as fall within the true spirit and scope of the invention.

1. A device supporting a heater coil adapted to be arranged in a path of air comprising:
   a body member formed of heat refractory insulating material having an aperture extending longitudinally through said body member receiving a portion of said coil; and
   deflection means projecting from said body member adjacent said aperture at a location downstream relative to said aperture when said insulator is located in the path of air for receiving and directing a portion of air through said aperture for dissipating the heat from said coil portion.

2. The invention of claim 1 wherein said deflection means includes a base wall and side walls forming a channel means adjacent said aperture for directing the portion of the air flow that impinges in said channel into the said aperture.

3. The invention of claim 2 wherein a second deflection means projects from the opposite longitudinal end of said body member adjacent said aperture into the path of air at a location upstream relative to said aperture when said insulator is located in the path of air.

4. The invention of claim 3 wherein the aperture is of substantially rectangular configuration.