

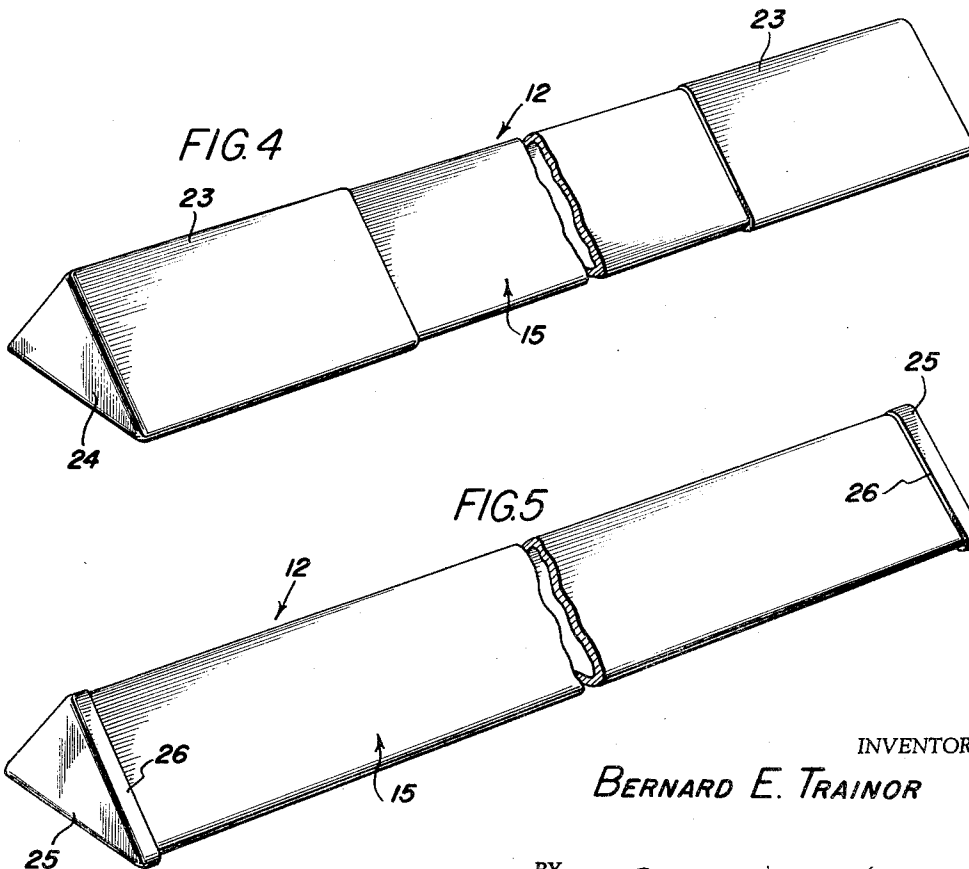
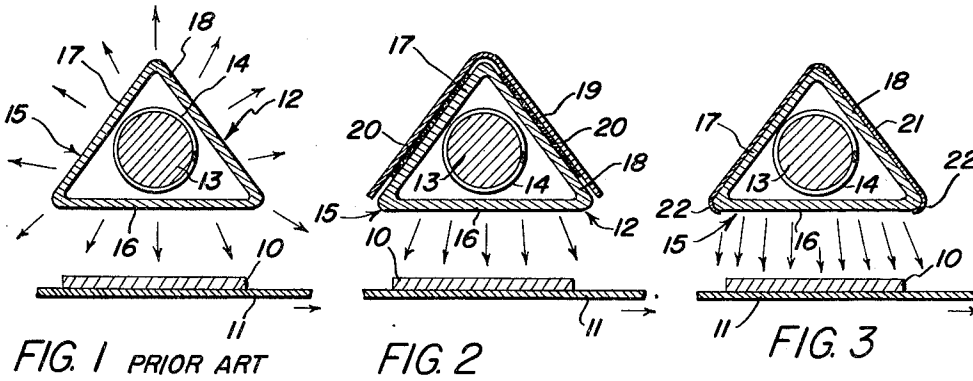
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RADIANT HEATER AND METHOD OF SHIELDING THE SAME

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RADIANT HEATER AND METHOD OF SHIELDING THE SAME

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This invention relates in general to new and useful improvements in radiant heaters, and more particularly seeks to provide a novel method of shielding radiant heaters so that the heat losses of the radiant heater are reduced, with the result that the radiant heater will produce a greater amount of heat and the temperature of the work heating zone of the radiant heater will be substantially uniform throughout.

The conventional radiant heater now in use includes a jacket, which is normally formed of metal, heated by passing an electric current through a heating element disposed within the jacket. The jacket thereby becomes hot and radiates heat. However, unfortunately, the radiation of heat is uniform in all directions about the periphery of the jacket. As a result, there are relatively great heat losses.

One form of radiant heater has a jacket which is triangular in outline, one face of the jacket facing the work which is to be heated. On the other hand, heat is normally radiated uniformly in all directions from the jacket, with the result that two-thirds of the radiated heat of the radiant heater is lost for all practical purposes.

In view of the foregoing, it is another object of the invention to provide a radiant heater which has been shielded so as to greatly reduce the heat loss from the jacket of the radiant heater in directions other than the direction of the work which is to be heated, whereby the heat losses of the radiant heater may be greatly reduced and the heat normally lost may be concentrated into the work heating zone of the radiant heater so as to produce much higher temperatures with the same amount of input energy.

Another object of the invention is to provide a radiant heater which is shielded on the surface areas thereof with the exception of the surface area facing the work to be heated, the shielded radiant heater producing a much higher heating temperature in the work heating area and at the same time, greatly reducing the loss of heat to the surrounding area.

Since the average radiant heater includes an electrical heating coil, and since the jacket for the heating coil has end portions through which the heat may radiate, it will be readily apparent that the heat loss at the ends of a radiant heater is much greater than the heat loss in the central portion of the radiant heater. Accordingly, with all conditions being equal, the work heating zone of the radiant heater will have higher temperature areas at the central portion thereof and lower temperature areas at the ends thereof. This, of course, is undesirable inasmuch as under most conditions a uniform heating temperature throughout the length of the heating area is desired.

In view of the foregoing, it is a further object of the invention to provide a novel shielding device for radiant heaters, the shielding device being primarily mounted on the ends of the radiant heater, whereby the heat losses at the ends of the radiant heater are cut down to substantially those of the central portion of the radiant heater, so that the radiant heater will produce the desired constant temperature heating throughout the length thereof.

A further object of the invention is to provide a very simple method of producing substantially uniform tem-

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peratures throughout the work heating zone of a radiant heater, the method including the step of applying to the ends of the radiant heater a reflective metallic covering which will greatly reduce the heat losses at the ends of the radiant heater and thus permit the end portions of the radiant heater to produce heating temperatures substantially equal to those produced by the central portion of the radiant heater.

Yet another object of the invention is to provide a novel method of shielding radiant heaters, the method including the step of applying a reflective metal foil in overlying relation to areas of undesired heat loss, the metal foil being in intimate contact with the jacket of the radiant heater.

With the above, and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims, and the several views illustrated in the accompanying drawing:

In the drawing:

FIGURE 1 is a schematic view showing a conventional type of radiant heater in the process of heating a flat member lying on an endless conveyor belt, the radiant heater being shown in section.

FIGURE 2 is a schematic view similar to FIGURE 1, and shows the radiant heater shielded by means of a bright metal sheet which conforms to the general configuration of the heat loss area of the radiant heater.

FIGURE 3 is a schematic elevational view similar to FIGURE 1, and shows the radiant heater in cross-section with a modified form of shielding.

FIGURE 4 is a perspective view of a radiant heater, such as the radiant heater of FIGURE 1, an intermediate portion of the radiant heater being broken away, and only the end portions of the radiant heater being shielded.

FIGURE 5 is a perspective view of the radiant heater of FIGURE 1 with an intermediate portion thereof omitted, the ends of the radiant heater being shielded against heat losses.

Referring to the drawing in detail, attention is first directed to FIGURE 1 wherein there is illustrated a flat work piece 10 to be heated, the work piece 10 being mounted on an endless conveyor belt 11 for movement from left to right, as indicated by the arrows. A conventional type of radiant heater, generally referred to by the numeral 12, is mounted above the endless conveyor belt 11 for heating the work piece 10 as it passes therebeneath. The radiant heater 12 includes a heat resistant, insulated rod 13, which may be formed of quartz. An electrical heating coil 14 is coiled about the rod 13, and is preferably disposed within recesses in the rod 13 so as to lie within the confines of the rod 13. Normally the rod 13 and the coil 14 are sheathed within a jacket, although the rod 13, which is usually formed of quartz, may function as the sole support for the coil 14 and the heat being directly radiated from the coil 14 and the rod 13. When a jacket is provided, the jacket is generally triangular in cross-section, as is best illustrated in FIGURE 1. The jacket is referred to by the numeral 15, and includes a bottom wall 16 and a pair of upwardly converging walls 17 and 18.

As indicated by the arrows in FIGURE 1, in the conventional radiant heater construction, such as the radiant heater 12, heat is not only radiated towards the work piece to be heated, but also in all other directions from the radiant heater. This, of course, results in a loss of heat which is accompanied by a loss of electrical power. Further, not only does the loss of heat result in the loss of electrical power, but the heat is radiated to other parts of the equipment which, in many instances, are not desired to be heated. Therefore, the heat losses from a

radiant heater in many instances will present problems other than the loss of power.

The heat loss from the jacket of a radiant heater also results in uneven temperatures in the work heating zone in that the heat losses at the ends of the jacket are greater than the heat losses of the central portion of the jacket. This is undesirable in most instances, since normally a uniform temperature is desired throughout the work heating zone.

Applicant at first attempted to reflect back the lost heat rays to the work heating zone through the use of a parabolic reflector. While the use of such a reflector in conjunction with a radiant heater did produce a greater temperature at the work piece, it failed to solve all of the problems, including the differential in temperatures throughout the work heating zone.

Contrary to the principle of a parabolic reflector, applicant proposes to substantially prevent the escape of heat from the jacket of a radiant heater so that a major portion of the heat emitted from the radiant heater jacket will be towards the work piece. This may be accomplished in numerous different manners, two of which are illustrated in FIGURES 2 and 3.

Referring first to FIGURE 2, it will be seen that the jacket 15 of the radiant heater 12 is provided with a shield 19. The shield 19 is formed of a sheet of bright metal having good reflective qualities, and is of a shape to conform generally to the configuration of the upper portion of the jacket 15, the shield 19 being of an inverted V-shape in cross-section and overlying in slightly spaced relation the walls 17 and 18 of the jacket 15. The shield 19 may be secured to the jacket 15 in any desired manner, including the use of an adhesive 20, as is best illustrated in FIGURE 2.

A modified form of shield, referred to by the numeral 21, is illustrated in FIGURE 3. The shield 21 is formed of a bright metal foil, such as aluminum foil, and is disposed in intimate contact with the exterior surface of the jacket 15. It is to be noted that the shield 21 completely covers the upper walls 17 and 18 and has edge portions 22 which fit about the corners intermediate the bottom wall 16 and the walls 17 and 18.

If it is merely desired to increase the output of the radiant heater and to reduce the heat loss, thereby increasing the efficiency of the radiant heater, the shields 19 and 21 will extend the full lengths of their respective radiant heaters. Under test conditions, utilizing a radiant heater, such as that illustrated in FIGURE 1, the typical heating temperature produced thereby was 525° F. Taking the same radiant heater and providing it with an aluminum sheet shield, as illustrated in FIGURE 2, the typical temperature was raised to 675° F. Further, when the same radiant heater was shielded with an aluminum foil shield in intimate contact with the exterior surface of the jacket of the radiant heater, as illustrated in FIGURE 3, the typical temperature was raised to 800° F. Although the intimate covering has been illustrated and described as being in the form of foil, it is to be understood that the shield 21 could be formed of other materials. For example, leafing aluminum pigment was applied to the radiant heater without resin or binder of any type. Also, an organic coating containing leafing aluminum was applied. Further, the shield may be in the form of an integral coating of a suitable metal placed thereon either by spraying or through electrodeposition.

Although the invention has been illustrated in conjunction with a jacketed type of radiant heater, particularly wherein the jacket is formed of metal, it is to be understood that the shielding material may be applied to other types of radiant heater constructions, including the forms wherein either no covering or jacket whatsoever is provided for the coil, or the coil of the radiant heater is encased within a quartz tube.

Although it would appear that the parabolic reflector would produce the desired results when first considering

the problem, extensive tests proved the parabolic reflector to be improper for the situation of the type illustrated in FIGURE 1. In the instance where the typical temperature of the radiant heater without shielding was 525° F., the addition of the parabolic reflector raised the typical temperature to only 540° F., as compared to a typical temperature in excess of 800° F. with the metal foil shield.

Although the shielding of the entire upper portion of the radiant heater will produce the maximum heat on a work piece, in many instances, it is desired that the heat applied to the work piece be uniform throughout the length of the radiant heater. Because of the extra heat losses at the ends of the radiant heater, as well as the additional space at the ends of the radiant heater jacket, unless the coil 14 is specially wound, an even temperature cannot be obtained through the complete covering of the upper portion of the radiant heater. Accordingly, it is proposed to shield only the end portions of the radiant heater to produce a uniform temperature throughout the heating zone. This is best shown in FIGURE 4 wherein the end portions of the jacket 15 of the radiant heater 12 are provided with suitable shields 23. The shields 23 may be of any of the aforementioned constructions and extend only over the end portions of the jacket 15. Each of the shields 23 also includes an end wall 24 which overlies the end of the jacket 15. By controlling the length of the shields 23, the temperature output of the radiant heater 12 may be made constant throughout the length of the radiant heater 12.

In FIGURE 5, a simplest form of the invention is illustrated. The radiant heater 12 has the jacket 15 thereof provided with end caps 25 which form the sole shielding for the jacket 15. The end caps 25 will be of any of the aforementioned shielding constructions, and will have only limited edge portions 26 overlying the longitudinal portions of the jacket 15. The edge portions 26 will be of extents only to assure the proper securing of the end caps 25 onto the jacket 15.

From the foregoing, it will be readily apparent that there has been devised an extremely simple method of shielding radiant heaters so as to either produce a maximum temperature-to-power ratio or a uniform temperature heating zone. Although the shielding is extremely simple in nature, extensive tests have clearly shown the results to be outstanding.

From the foregoing, it will be seen that novel and advantageous provision has been made for carrying out the desired end. However, attention is again directed to the fact that variations may be made in the example method and apparatus disclosed herein without departing from the spirit and scope of the invention, as defined in the appended claims.

I claim:

1. In combination with a radiant heater of the type wherein the heating temperatures of the end portions thereof are normally less than the heating temperature of the central portion, a separate external partial shielding device, said shielding device overlying only those surfaces of said end portions which face away from the area to be heated to reflect heat from said end portions towards said area to be heated, whereby the heating temperature of said radiant heater is uniform throughout, said shielding device being formed of heat reflective material.

2. The structure of claim 1, wherein the shielding device overlies only the extreme end of said radiant heater.

3. In combination with an electric radiant heater of the type including a triangular cross-sectional outer jacket having faces and ends of which it is desired to transmit heat through only one face, and wherein the normal heat loss through said jacket ends results in lower temperatures at the ends of said jacket than at the center, an external shielding device comprising a pair of end caps engaged over the ends of said jacket to prevent the transmission of heat through the ends of said jacket, said end

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caps having portions overlying only the other faces of said jacket, said end caps being separate from said jacket and formed of bright metal sheet material.

4. The structure of claim 3 wherein each end cap has an extension overlying the other faces of said jacket and restricts the heat loss from the end portions of said jacket, the extensions of the two end caps being spaced apart and serving to secure said end caps to said jackets.

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