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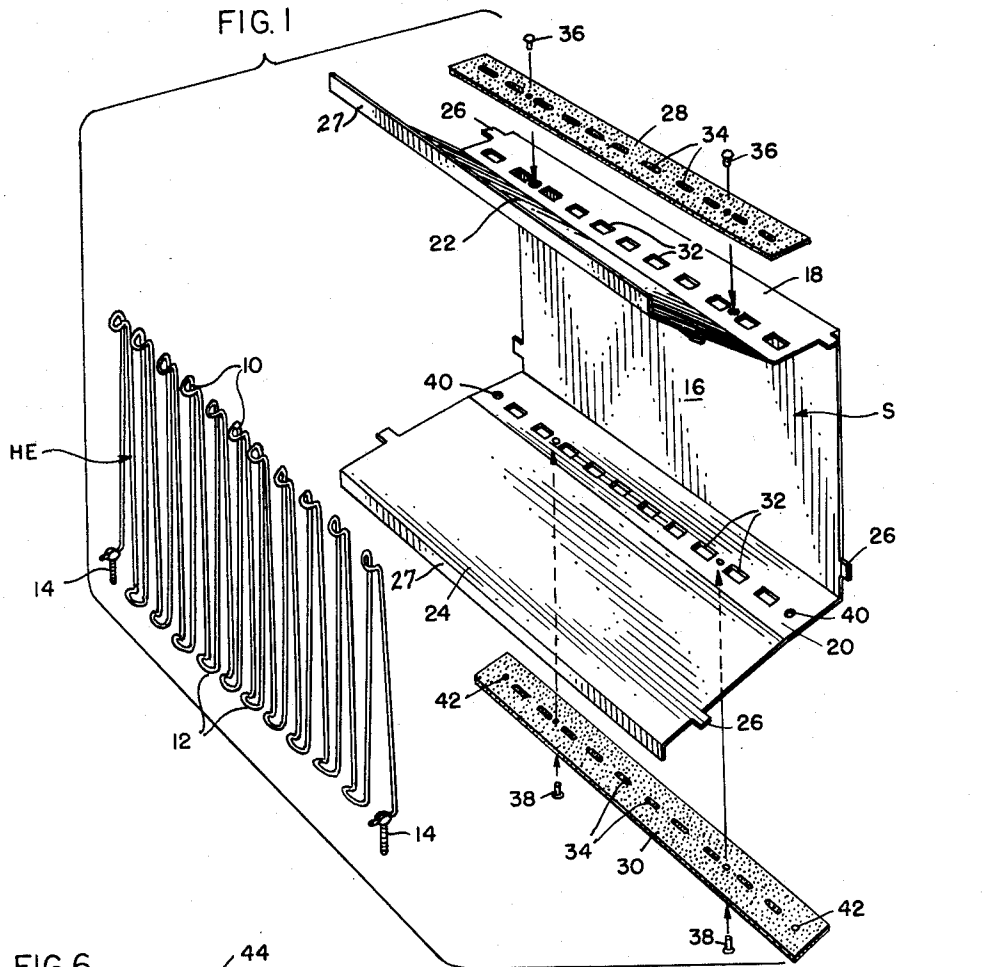
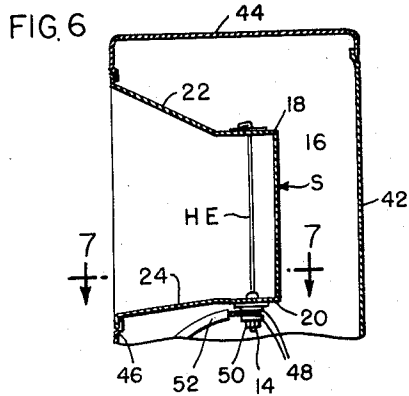
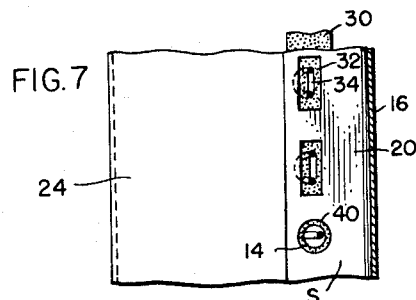
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3,119,924

HEATING ELEMENT AND MOUNTING FOR RADIANT HEATERS

Filed Feb. 18, 1963

2 Sheets-Sheet 1



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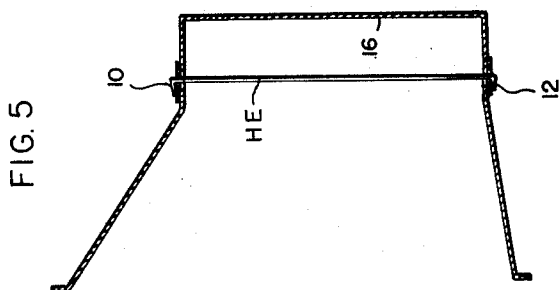
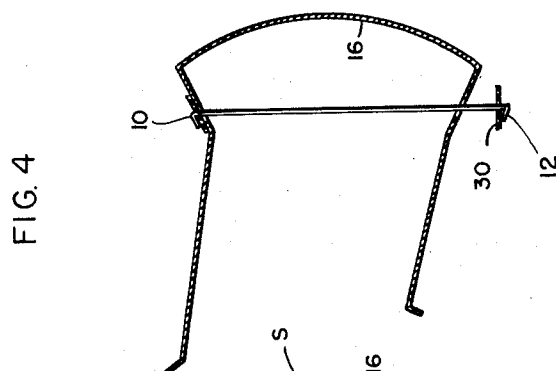
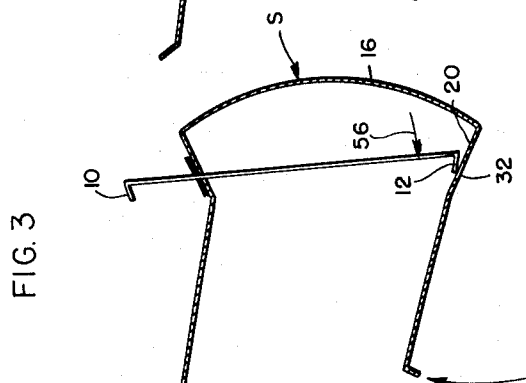
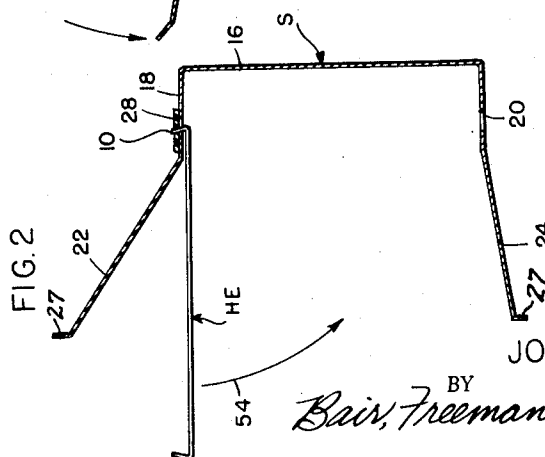
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HEATING ELEMENT AND MOUNTING FOR RADIANT HEATERS

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HEATING ELEMENT AND MOUNTING FOR RADIANT HEATERS

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7 Claims. (Cl. 219—34)

This invention relates to a preformed heating element and a mounting means therefor which are particularly adapted for radiant heaters but may be applied to other types of electrically heated appliances.

One object of the invention is to provide a rugged low-cost heating element and supporting means therefor which eliminate the usual combination of ceramic hook insulators and the tedious and time-consuming operation of stringing a heating element wire or coil back and forth in respect to them.

Another object is to provide a preformed heating element of sinuated shape in which the ends of the situations are provided with hook-like portions adapted to coact in a novel manner with insulation strips for supporting the heating element in relation to the strips.

Still another object is to provide a channel-shaped sheet metal supporting member for the heating element which may also serve as a reflector therefor and which has upper and lower flanges provided with clearance openings therethrough for the ends of the situations of the heating element, an insulation strip being provided above the upper flange and an insulation strip being provided below the lower flange with which the hook-like portions of the ends of the situations of the heating element coact for supporting the heating element.

A further object is to provide the insulation strips with openings that snugly receive the ends of the situations of the heating element and which are substantially centered relative to the clearance openings to avoid electrical contact with the channel-shaped sheet metal support, thereby insuring electrical safety.

Still a further object is to provide a heating element and a reflector which are so constructed and arranged that the heating element can be quickly mounted on the reflector for subsequent support thereby, the construction requiring only a minimum number of other parts, to wit, a pair of insulation strips.

An additional object is to provide a preformed sinuated heating element of specific dimensions in relation to the sheet metal support, and the hook-like portions at the ends of the situations bent in such a manner that they are under tension against the insulating strips when the assembly is completed to thereby retain the situations of the heating element taut.

Another additional object is to provide terminal screws for the ends of the heating element which are also supported by the insulation strips, passing through openings thereof and through enlarged openings of the sheet metal support to avoid electrical contact therewith and provide a comparatively simple and inexpensive terminal connection for the heating element.

Still another additional object is to provide a heating element and a mounting therefor which may be quickly assembled, the assembly involving a very few number of steps as distinguished from threading a heating element back and forth and hooking it over a considerable number of ceramic hook insulators as heretofore, thereby substantially reducing both the material and labor costs of producing a heating element and mounting assembly.

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With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my heating element and mounting means therefor, whereby the objects above contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in detail on the accompanying drawings, wherein:

FIG. 1 is an exploded perspective view of a heating element and mounting means therefor embodying my invention;

FIG. 2 is a sectional view through the mounting means and shows an end elevation of the heating element with the hooks at its upper end inserted as a first step in the assembling operation;

FIGS. 3 and 4 are similar views showing second and third steps in the assembling operation;

FIG. 5 shows the fourth and final step;

FIG. 6 shows the heating element and its mounting means installed in the casing of a radiant heater, the view being a vertical section therethrough, and

FIG. 7 is a horizontal sectional view on the line 7—7 of FIG. 6.

On the accompanying drawing I have used the reference character HE to indicate in general a heating element and S a support therefor. The heating element HE is formed of round resistance wire and is sinuated to the shape disclosed with hook-like portions 10 and 12 at the upper and lower ends of the situations. The terminal ends of the resistance wire forming the heating element are swaged into slots of the heads of terminal screws 14. A heating element assembly is thus provided which may be formed in a sinuating machine and the hook-like ends 10 and 12 bent to somewhat more than a right angle as shown in FIG. 2. The situation forming provides a rugged reliable heating element of the radiant type wherein a single resistance wire is sinuated in the machine in a manner which predetermines exactly the length of each situation so that the dimension across the length of the situation can be depended upon to be accurate, after which the top and bottom ends of the situations are formed to the angles shown in a die operation which again accurately predetermines the distance between the hook portions 10 and 12. A heating element assembly of this character is thus fabricated with only two electrical connection operations and a bare minimum of material and parts involved.

The support S is formed of sheet metal having a back web 16, an upper flange 18 and a lower flange 20. The support may also constitute a reflector for the heating element HE, being provided with reflector flanges 22 and 24 forming extensions of the flanges 18 and 20. For reflector purposes the support S may be formed of polished aluminum or a suitable metal which is chrome plated. It may also be provided with mounting ears 26 and flanges 27 for convenience in mounting it in a radiant heater casing.

An upper insulation strip 28 and a lower insulation strip 30 are adapted to be associated with the flanges 18 and 20 respectively in a manner which will hereinafter appear. These strips may be made of mica or the like. The flanges 18 and 20 are provided with clearance openings 32 and the strips 28 and 30 are provided with heating element receiving openings 34. The openings 34 may be slot-like in character to each snugly receive two stretches of the heating element as shown in FIG. 7 whereas the openings 32 as shown here are larger in both length and width to provide electrical clearance around the heating element so that it does not short circuit across to the sheet metal support S.

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It will be noted that the slots 34 in FIG. 7 are substantially centered relative to the clearance openings 32. This is insured by rivets 36 for securing the strip 28 to the flange 18 and rivets 38 for securing the strip 30 to the flange 20, the openings for these rivets being so located as to insure the desired centering in an obvious manner.

The flange 20 is also provided with two additional clearance openings 40 for the threads of the terminal screws 14, and the insulation strip 30 has openings 42 which snugly receive the terminal screws for mounting each of them as shown in FIG. 6 with washers 48 and a terminal nut 50 for electrical connection with a circuit wire 52.

Formation of the sinuated heating element HE as shown in FIG. 1 provides a relatively simple assembling operation as illustrated in FIGS. 2 to 5. In FIG. 2 the first step consists of hooking the upper hooks 10 through the slots 34 of the upper insulation strip 28 after this strip has been riveted to the flange 18. The heating element is then swung downwardly as indicated by the arrow 54 and shifted upwardly to the position shown in FIG. 3 while the support S is deformed as illustrated (but not beyond its limit of elasticity). Thereupon the lower hooks 12 may be passed through the clearance openings 32 of the flange 20 as indicated by the arrow 56 and the heating element then drops down as in FIG. 4 to permit association of the lower insulation strip 30 therewith. Thereupon the support S may be released in order to return to its initial shape such as shown in FIG. 2 and the heating element will then be in mounted position as shown in FIG. 5. The dimensions of the sinuated heating element are such that when in the position of FIG. 5, the hooks 10 and 12 will be under bending pressure and will thereby exert tension on the sinuations of the heating element to keep them taut. The original angle of the hooks may, for instance, be 10° and when the installation is completed as in FIG. 5, they may be something like 5°. After the FIG. 5 position, the rivets 38 are installed for centering the slots 34 of the insulation strip 30 with respect to the clearance openings 32 and the heating element and its mounting means are thereby completed as an assembly.

This assembly may then be mounted in the casing of a radiant heater or the like as shown, for instance, in FIG. 6 wherein the back of the casing is illustrated at 42, the top thereof at 44 and the front thereof at 46.

It will be understood that it is very desirable that the heating element be maintained in taut condition, both for purposes of desirable appearance and safety. In previous constructions which utilize a coil wire heating element, the coil itself permitted of stretching so as to provide tension which would maintain the heating element taut. In other previous constructions, ribbon-type heating elements have been used, but invariably it was required to put such ribbon heaters under spring tension. In using resistant wire that is relatively stiff and shape-sustaining, as disclosed herein, there does not exist any problem concerning appearance but there may be a safety problem since as the wire heats and expands there would normally be a tendency for the wire to loosen in its supports, and this might cause an unsafe condition.

However, the construction herein disclosed is preferably designed to always maintain the heating element taut, and so as to prevent an unsafe condition. Thus, the heating element HE cooperates with the combination reflector and support S, to normally impose, when the heating element is in non-energized condition, a compressive force on the opposed flanges 18 and 20, which normally tends to slightly bow the back web 16. Then, as the heating element expands during energization, the web 16 tends to straighten and thus maintains a tensile force on the strands of the heating element HE, thereby insuring that the heating element is constantly maintained in a taut and safe condition.

From the foregoing specification it will be obvious that a comparatively simple heating element is provided and likewise a comparatively simple insulating means there-

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for in the form of the strips 28 and 30 provided with slots through which the sinuations of the heating element extend. The assembly is such that all sinuations of the heating element are associated with the clearance openings 32 and the slots 34 at one and the same time instead of weaving the heating element back and forth between a number of insulators in the way that heating elements were previously formed. The resistance wire forming the heating element is relatively stiff so that the sinuated heating element is easily handled during the assembling operation. The resulting structure is of low cost, both from the standpoint of material and labor in its assembly, and in use is rugged and safe.

Some changes may be made in the construction and arrangement of the parts of my heating element and mounting means without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may reasonably be included within their scope.

I claim as my invention:

1. In a heating element and mounting for electrically energized heaters, the combination of a sheet metal reflector unit and a preformed heating element supported thereby wherein said heating element is of sinuated form and is provided with hook-like portions at the ends of the sinuations, said reflector unit comprising a back web, and upper and lower mounting flanges for the heating element extending forwardly of the back web, said upper and lower mounting flanges having clearance openings there-through for the ends of said sinuations of said heating element, insulation strips above said upper flange and below said lower flange having smaller openings through which said ends of said sinuations extend, said smaller openings being substantially centered with respect to said clearance openings and the hook-like portions of said heating elements being spaced from said reflector and adapted to engage the outer surfaces of said insulation strips.

2. A heating element and mounting for electric heaters according to claim 1 wherein said hook-like portions are under bending tension against said insulation strips to retain the sinuations of said heating element taut.

3. A heating element and mounting therefor in accordance with claim 1 including means separate from the heating element for positioning the insulation strips on the reflector unit with the opening in the insulating strips aligned and centered with the openings in the mounting flanges.

4. A heating element and mounting for electric heaters in accordance with claim 1 wherein terminal connectors are provided for the ends of said heating element, said reflector unit having other clearance openings for said terminal connectors, said insulation strips having mounting openings receiving said connectors, and said mounting openings being substantially centered with relation to said other clearance openings.

5. In a heating element and mounting means therefor, a channel-shaped sheet metal supporting unit, a heating element of sinuated form provided with hook-like portions at the ends of the sinuations thereof, said channel-shaped supporting unit having clearance openings in the flanges thereof through which the ends of said sinuations extend, insulation strips outside of said flanges and having smaller openings through which said ends of said sinuations extend, said smaller openings being substantially centered with respect to said clearance openings, and the hook-like portions of said heating element being spaced from the sheet metal supporting unit and adapted to engage the outer surfaces of said insulation strips.

6. A heating element and mounting according to claim 5 wherein said hook-like portions are under bending tension against said insulation strips to retain the sinuations of said heating element taut.

7. In a heating element and mounting means there-

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for, a channel-shaped sheet metal supporting unit, a pre-formed sinuated heating element provided with hook-like portions at the ends of the sinuations thereof, said channel-shaped supporting unit having clearance openings in the flanges thereof through which the ends of said sinuations extend, insulation strips outside of said flanges and having smaller openings through which said ends of said sinuations extend, means for securing said insulation strips to said flanges so that said smaller openings are held substantially centered with respect to said clearance openings, and the hook-like portions of said heating element being spaced from the sheet metal supporting

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unit and being adapted to engage the outer surfaces of said insulation strips.

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