June 23, 1959 C. H. STEVENSON 2,891,303

ELECTRIC FURNACE HEATING ELEMENT

Filed April 29, 1957

Fig. 1

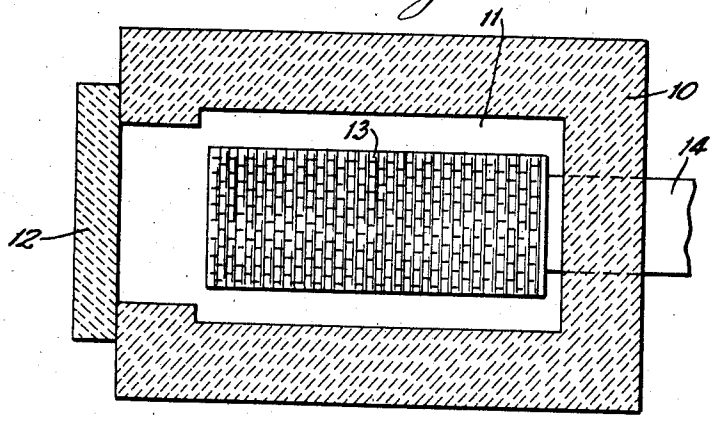


Fig. 2

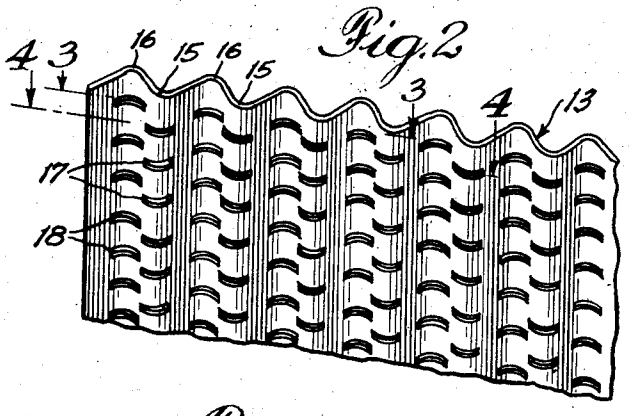


Fig. 3



Fig. 4



INVENTOR:
Cary H. Stevenson,
BY Cain Freeman & Molinare
ATTORNEYS.

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ELECTRIC FURNACE HEATING ELEMENT

Cary H. Stevenson, Chicago, Ill., assignor to Lindberg Engineering Company, Chicago, Ill., a corporation of Illinois

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2 Claims. (Cl. 29—183)

This invention relates to an electric furnace heating element and more particularly to a resistance type element for use in heat treating and melting furnaces.

It has heretofore been proposed in the co-pending application of Duffy, et al., Serial No. 569,549, filed March 5, 1956, to provide a heating element in an electric furnace of the form of a thin corrugated sheet or strip of conductive material mounted in the furnace adjacent to but spaced from the wall thereof. In practice it has been found that such sheets or strips, particularly when they are of large size, tend to warp or buckle under severe service conditions due to uneven cooling thereof when the furnace is loaded. For example, when the heating elements are up to full temperature and a large cold charge is inserted in the furnace the peaks of the corrugations facing the charge tend to be cooled more rapidly than the peaks at the side of the sheet or strip remote from the charge. As a result, there is a tendency for the sheets or strips to warp or buckle. Even if the sheets or strips return to their original form upon again reaching a uniform temperature, this warp or buckling effect is highly undesirable and may interfere with desired operation of the furnace.

It is therefore one of the objects of the present invention to provide an electric furnace heating element which will not warp or buckle in response to uneven heating or cooling thereof and in which there is substantially no interference with the electrical characteristics of the element.

Another object is to provide an electric furnace heating element in the form of a thin corrugated sheet in which spaced openings or slots are formed in the peaks of the corrugations on at least one side of the sheet to eliminate any tendency thereof to buckle or warp. According to a feature of the invention, the sheet is mounted in a furnace adjacent the side wall thereof and slots or openings are formed in the peaks of the corrugations facing the charge and preferably in the peaks of the corrugations on both sides of the sheet with the openings on opposite sides being staggered relative to each other in either direction.

The above and other objects and features of the invention will be more readily apparent from the following description when read in connection with the accompanying drawing, in which:

Figure 1 is a partial sectional view of a furnace equipped with a heating element embodying the invention;

Figure 2 is a partial perspective view of the heating element; and

Figures 3 and 4 are sections on the lines 3—3 and 4—4, respectively of Figure 2.

As illustrated in Figure 1, the heating element of the present invention is applied to a furnace having a refractory body 10 defining a chamber 11 access to which is had through an opening at one end closed by a door 12. The furnace is adapted to receive a charge of material to be heated either for heat treating or melting purposes

and may take a number of different forms, the form shown being solely for the purpose of illustration.

The material in the furnace is adapted to be heated by one or more heating elements, generally indicated at 13, each of which is in the form of a relatively thin sheet or strip of conductive metal formed into parallel corrugations over its area and mounted in the furnace in spaced relation to the walls of the furnace chamber 12. In heating elements as shown mounted adjacent the vertical sides of the furnace chamber the corrugations extend vertically to define channels for circulation of heated gases and in the case of heating elements at the top or bottom of the furnace, the corrugations will preferably run from side to side of the furnace chamber. The elements are connected to terminals 14 extending through the wall of the furnace and connected to a low voltage, high amperage source of current to heat the elements.

As best seen in Figure 2, any tendency of the heating elements to warp or buckle in response to uneven heating or cooling thereof is eliminated or minimized by forming in the peaks of the corrugations on at least one side of the sheet or strip a series of spaced openings or slots. As shown, the peaks of the corrugations indicated at 15, which face the furnace charge and which accordingly tend to be cooled more rapidly than the peaks 16 on the opposite side of the sheet or strip which face the furnace wall, are formed with slots 17 extending over the peaks of the corrugations and approximately half way through the full thickness of the corrugated sheet. As shown, the slots 17 are in alignment along the length of the heating element and may be formed by saw cuts made in the corrugated sheet after it is completed or by punching out the sheet in the proper places before it is corrugated. If desired, similar slots or openings 18 may be formed in the peaks 16 on the side of the sheet facing the furnace wall.

It will be seen that the formation of the slots 17 and 18 does not appreciably reduce the overall cross sectional area of the sheet or strip so that the element may still be effectively energized with a very low voltage on the order of 10 to 25 volts, as more fully set forth in the Duffy et al. application, Serial No. 569,549. If necessary, the width or thickness of the sheet could be increased slightly to maintain the desired cross sectional area in spite of the slots. If the sheet is heated or cooled unevenly, as frequently occurs in loading the furnace, the slots separate the peaks into a series of relatively short strips which can move relative to each other without creating any tendency toward warping or buckling of the entire sheet. This construction does not interfere with efficient operation of the furnace and serves effectively to eliminate a difficulty encountered with sheets having no slots or openings therein.

While one embodiment of the invention has been shown and described herein, it will be understood that it is illustrative only and not to be taken as a definition of the scope of the invention reference being had for this purpose to the appended claims.

What is claimed is:

1. A heating element for an electric heating furnace comprising a thin sheet of conductive material formed with a series of parallel corrugations extending thereacross and a series of spaced narrow slots extending transversely to the corrugations through the peaks only of the corrugations at one side of the sheet.

2. A heating element for an electric heating furnace comprising a thin sheet of conductive material formed with a series of parallel corrugations extending thereacross, and spaced narrow slots extending transversely to the corrugations cutting through the peaks only of the corrugations at both sides of the sheet, the openings at

opposite sides of the sheet being staggered relative to each other in the direction of the corrugations.

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