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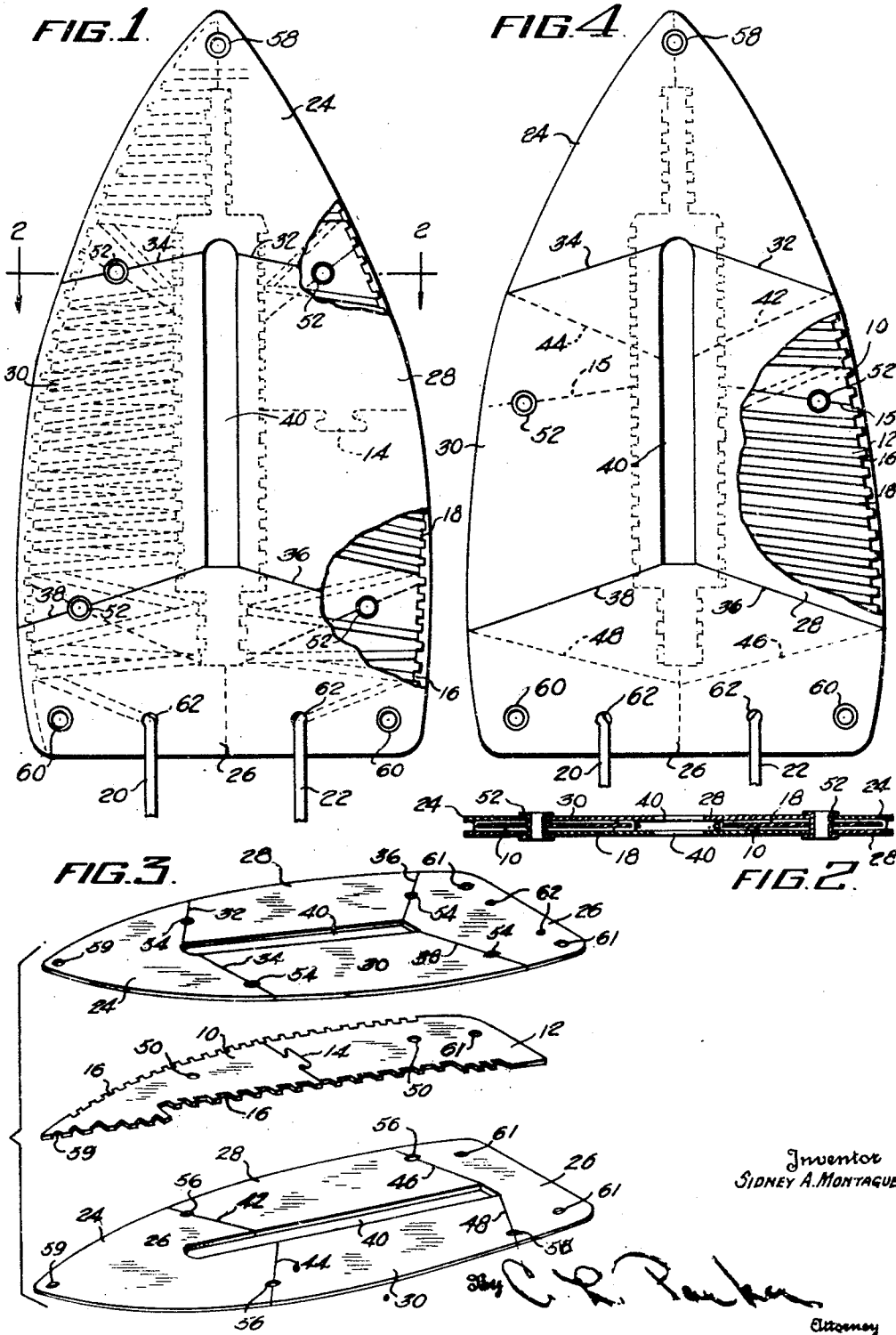
S. A. MONTAGUE

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ELECTRIC HEATING ELEMENT

Filed Feb. 3, 1947

2 Sheets-Sheet 1



Inventor
SIDNEY A. MONTAGUE

Attorney

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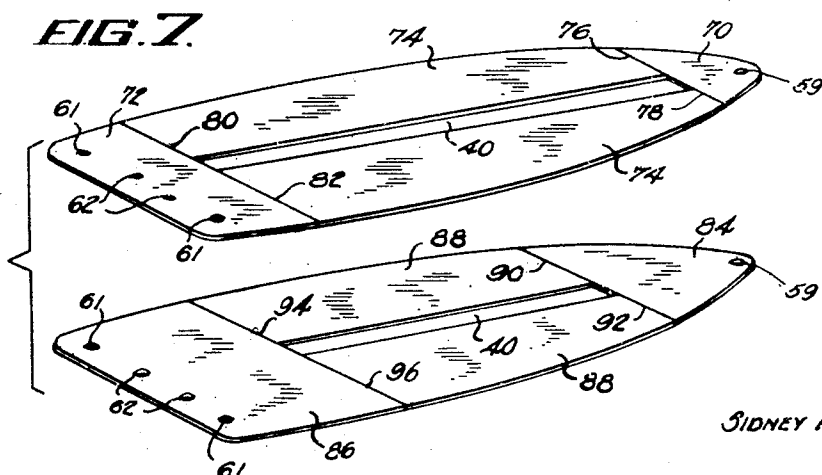
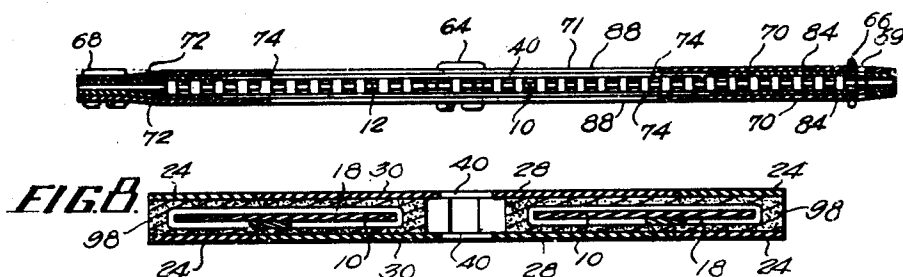
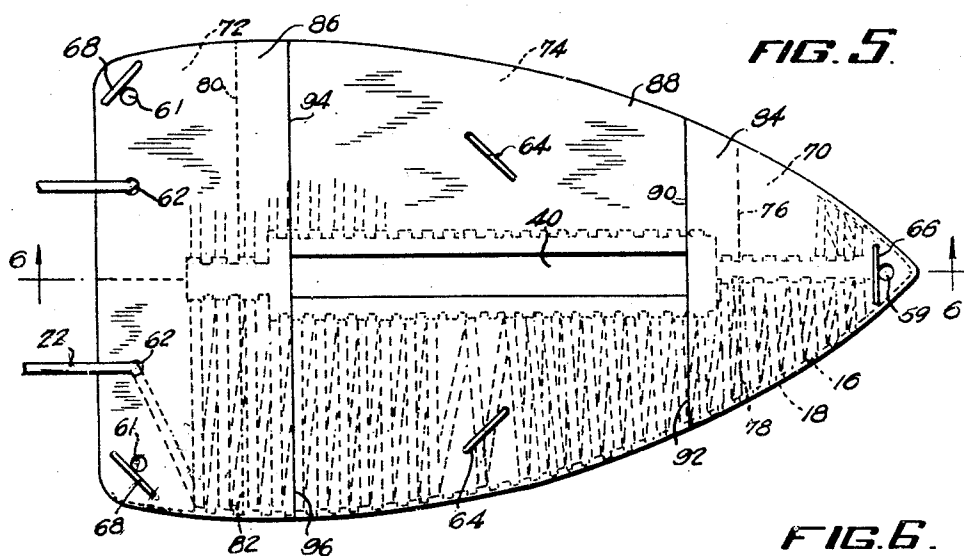
S. A. MONTAGUE

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ELECTRIC HEATING ELEMENT

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2 Sheets-Sheet 2



Inventor
SIDNEY A. MONTAGUE

Wm. C. R. Parker

UNITED STATES PATENT OFFICE

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ELECTRIC HEATING ELEMENT

Sidney A. Montague, Asheville, N. C., assignor to
Asheville Mica Company, Asheville, N. C., a
corporation of Delaware

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This invention relates generally to electric flatirons, and more particularly to resistance heating elements therefor.

In the past, conventional flatiron heating elements have ordinarily consisted of four flat pieces of insulating material such as mica in the form of a pair of opposite core strips having a resistance wire wound thereon and a pair of insulating plates mounted at opposite sides of the core and serving to prevent the resistance wire from short circuiting against adjacent metal parts of the iron. In order to provide adequate insulation the non-conducting portions of such heating elements were ordinarily either cut from a solid block of pure mica having over-all dimensions larger than those of the finished product or alternatively, have been molded out of a material known to the art as mica heater plate made of shellac pasted mica. As the pure mica has a decidedly better insulating value than that of the mica heater plate, it is ordinarily to be preferred for use in such heating elements except for the fact that it is both very expensive and difficult to obtain in the large sizes required.

The principal object of the present invention is to provide a heating element for an electric flatiron or the like in which the various non-conducting members are formed of a plurality of small sections of pure mica which are relatively easy and inexpensive to obtain and which retain the advantage of improved insulating value.

Another object is to provide an improved electric heating element formed of a plurality of small mica sections assembled in such manner that no portion of the resistance wire is exposed at the section joints.

A further object is to provide a core for a heating element of the type described, formed of a plurality of small mica sections interconnected in such manner as to form a relatively rigid assembly.

A still further object is to provide an improved heating element of the type described employing an adhesive material for securing the various parts together to form a relatively rigid unit.

An additional object is to provide a heating element of the type described wherein the means for securing the insulating plates and core together pass through adjacent lines of abutment of the various sections thereby adding to the stiffness of the assembled element.

Other objects and advantages of the invention will become apparent during the course of the following description.

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In the drawings I have shown three embodiments of the invention. In this showing:

Fig. 1 is a top plan view of a preferred form of heating unit, portions of the top insulating plate being broken away to show the interior construction;

Fig. 2 is a transverse cross-sectional view taken substantially along the line 2—2 of Fig. 1;

Fig. 3 is an exploded perspective view showing a major portion of the non-conducting members of the heating unit;

Fig. 4 is a top plan view similar to Fig. 1 illustrating another form of the invention;

Fig. 5 is a similar view illustrating still another form of the invention;

Fig. 6 is a longitudinal cross-sectional view taken substantially along the line 6—6 of Fig. 5;

Fig. 7 is an exploded perspective view of one of the composite insulating plates of the heating unit shown in Fig. 5; and

Fig. 8 is a transverse cross-sectional view similar to Fig. 2 but illustrating the use of an adhesive material for securing the parts together instead of mechanical fasteners.

Referring to the drawings and in particular to Figs. 1 to 3, inclusive, I have illustrated a preferred embodiment of the invention wherein the flatiron heating unit comprises a total of twelve sections preferably of pure mica, each insulating plate having four sections and the core having two opposite pairs of mica strips. The core comprises front and rear flat strips of mica 10 and 12, respectively, extending longitudinally of the heating unit and having their abutting transverse edges interconnected as by means of a suitable dovetail joint 14.

The outer edges of the strips 10 and 12 are curved to conform to the shape of a flatiron base when in assembled condition, and throughout the major extent of their length, opposite edges of the strips 10 and 12 are provided with notches 16 in which a generally flat resistance wire 18 is wound. The wire 18 is wound continuously about the strips 10 and 12 passing smoothly from one to the other, and the notches 16 serve to maintain the spacing and pattern of the turns. It will also be noted that the winding is begun at the rear or base of one of the strips 12, extends forwardly and across to the opposite pair of strips, and thence extends rearwardly to the base of the other strip 12, thus providing a pair of terminal leads 20 and 22 adjacent the base of the heating element.

The upper and lower insulating plates in the preferred embodiment of Figs. 1-3 each comprises

a forward section 24, a rear section 26, and a pair of side sections 28 and 30, the latter extending longitudinally of the element. These sections are all relatively flat and are preferably cut as layers from suitable blocks of pure mica. As shown particularly in Fig. 3 the rear edges of the forward section 24 of the upper plate are inclined outwardly and rearwardly at opposite sides of and at approximately the same angle with respect to the longitudinal center line of the element. The front edges of the rear section 26 are likewise inclined rearwardly at opposite sides of the longitudinal center line of the element and the side sections 28 and 30 are provided with corresponding front and rear edges so that when assembled the lines of abutment 32, 34, 36, and 38 between the various sections will also be inclined rearwardly.

The various sections 24, 26, 28 and 30 of the lower insulating plate are provided with similar abutting edges but in this case the edges are so arranged that the lines of abutment 42, 44, 46 and 48 diverge forwardly at opposite sides of the longitudinal center line of the element. Accordingly, when the upper and lower plates are assembled in position at opposite sides of the core the respectively adjacent lines of abutment 32, 42; 34, 44; 36, 46; and 38, 48; are out of alignment and each pair intersects at a point.

As the amount of resistance wire which is required for a given heating element depends both upon the size of the wire used and the total wattage to be developed, the embodiment illustrated in Figs. 1 to 3 is adapted to be employed principally where these requirements are such that sufficient unwound space can be provided on the core to accommodate the section joints without exposing the wire.

Accordingly, it will be noted that the helix angle of the wire is increased at those points on the core strips 10 and 12 adjacent the points of intersection of the lines of abutment of the upper and lower insulating plates to prevent the extension of the wire 18 over such points of intersection and to provide adequate space for a plurality of apertures 50, 54 and 56 in the core and the upper and lower plates, respectively. All such apertures are located at the points of intersection of the associated pairs of abutment lines, and a plurality of eyelet fasteners 52 extend through these apertures to fasten the plates and core together. Since each core strip is engaged by a fastener and each plate section by two fasteners, the assembled unit in this form of the invention constitutes a relatively rigid structure particularly in view of the interlocking dovetail joints 14 between the front and rear core strips 10 and 12.

In order to conserve material as much as possible an empty space designated generally by reference numeral 40 is provided at the center of the upper and lower plates. It will also be noted that front and rear end fasteners 58 and 60, respectively, extend through apertures 59 and 61 in the upper and lower plates as well as the core for securing the assembled element in place in a flatiron. A pair of apertures 62 are formed in the rear section of the upper plate to serve as outlets for the terminal leads 20 and 22 of the resistance wire 18.

Referring particularly to Fig. 1 it will be noted that the turns of wire lying on the top of the core next to the under side of the upper plate are inclined relative to the longitudinal center line

of the unit at approximately the same angle as the abutment lines adjacent thereto. In a similar manner the turns of wire lying on the bottom of the core next to the top surface of the lower plate are inclined at approximately the same angle as the abutment lines of the lower plate adjacent thereto. It will thus be understood that since the lines of abutment of the various plate sections are approximately parallel to but spaced from the adjacent turns of resistance wire upon the proximate faces of the core a construction is provided whereby no portion of the wire is exposed at the joints between sections so that the danger of short-circuiting is virtually eliminated.

The modified form of heating element illustrated in Fig. 4 is quite similar to the preferred embodiment described above but is especially adapted for use in those cases where due to the heavier wattage requirements of the particular iron more turns of resistance wire around the core are required than is practicable in the embodiment of Figs. 1-3. The lines of abutment 32-38, 34, 36 and 42-48, 44, 46 and between the various sections of the upper and lower plates are inclined relative to the longitudinal axis of the element and are approximately parallel to but spaced from the adjacent turns of wire on the respective proximate core faces as in the embodiment previously described. However, it will be noted that these lines of abutment do not necessarily intersect in a point as before since the eyelet fasteners 52 in such case do not pass through the lines of abutment but instead are located centrally of the opposite side sections and consequently there is no need for such intersection.

It is also to be noted that the dovetail joints 14 are omitted from this construction, the front and rear core strips 10 and 12 abutting along substantially straight lines 15 and being suitably apertured to receive the fasteners 52 which thus serve to interconnect the core strips as well as to fasten the core and plates together. Since only two eyelet fasteners are provided in the central body portion of the element instead of the four employed in the embodiment of Figs. 1-3, it will be clear that more turns of resistance wire may be wound upon the core to give increased heating capacity. The usual end fasteners 58 and 60 are also provided in this embodiment as are the apertures 62 constituting outlets for the terminal leads 20 and 22.

Referring to Figs. 5 to 7, there is illustrated a third form of the invention which, similarly to the modification of Fig. 4, is particularly adapted for use where relatively heavy wattage is desired. The core and its winding in this embodiment are similar to that of Fig. 4 except that the central portion of the winding at each side of the core is arranged to provide two open or unwound spaces to accommodate a different type of fastening device in the form of staples 64. The staples 64 extend through both the upper and lower plates, the gripping portions or fingers of each staple straddling a complete turn of resistance wire and extending through a pair of core strips at opposite sides of the line of abutment of the latter. Similar staples 66 and 68 are provided at the front and rear of the element respectively, for securing the insulating plates and core together.

The upper and lower insulating plates of the embodiment of Figs. 5 to 7 are, however, substantially different from the constructions thus

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far described in that each plate is formed as a composite assembly having two layers of overlapping sections. It will also be noted that the lines of abutment between the sections of each layer are substantially at right angles to the longitudinal center line of the unit instead of being inclined in opposite directions relative thereto.

Referring to Fig. 7 the two layers of one of the insulating plates, in this case the lower plate, are shown in separated position. The inner layer comprises forward and rear sections 70 and 72, respectively, having a pair of side sections 74 extending longitudinally therebetween with their transverse edges abutting the former along lines indicated by reference numerals 76, 78, 80 and 82. The outer layer is quite similar comprising forward and rear sections 84 and 86 abutting the transverse edges of a pair of side sections 88 along lines designated by reference numerals 90, 92, 94 and 96. The usual end apertures 59 and 61 are provided for securing the assembled element in place in a flatiron as are the outlet apertures 62 for the terminal leads 20 and 22.

The particular point of interest to be observed is that although the over-all dimensions of the inner and outer layers are approximately the same, the end sections 84 and 86 of the outer layer are substantially larger than the corresponding end sections 70 and 72 of the inner layer and the side sections 88 of the outer layer are accordingly smaller than the side sections 74 of the inner layer. By reason of this construction the associated pairs of abutment lines 76, 80; 78, 92; 80, 94; and 82, 96 are substantially parallel but are out of vertical alignment so as to overlap and provide a complete layer of insulation over all portions of the resistance wire when in assembled condition. It will also be appreciated, of course, that the upper plate comprises similar inner and outer layers arranged in substantially identical but inverted manner to complete the insulation for the assembled element.

As an alternative to the use of the eyelet fasteners 52 illustrated in Figs. 1 to 4 or the staples 64, 66, 68 of Figs. 5 and 6, I have found it to be highly desirable in certain cases to dispense entirely with mechanical fasteners of any sort in favor of a suitable adhesive material for securing the various insulating plate sections and core strips together. Although numerous such binders or adhesive materials may be readily adapted to this purpose, I have found that certain of the synthetic resins, particularly vinyl or silicone resin, possess the qualities necessary to retain the composite elements in assembled relation under the extreme temperature conditions encountered in normal usage.

It is to be particularly noted that the substitution of an adhesive binder of the type mentioned above in place of mechanical fasteners may be effected with equal facility in any of the three basic embodiments of the invention disclosed herein. The result in each case is to produce an element having the external appearance of a homogeneous mass and possessing to a high degree the qualities of rigidity and hardness desired in such cases.

Thus in Fig. 8 the preferred form of the invention of Figs. 1 to 3 has been illustrated in a view similar to Fig. 2 as having been assembled without the use of the eyelet fasteners 52. The adhesive material which serves to connect the various parts together has been designated by reference numeral 98 and is seen to comprise thin layers between the opposite core strips and their

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associated insulating plates which join to form thickened layers at the edges of the strips. It will be appreciated that the core strips are bonded to the plates over a large portion of their surface area by reason of the spaces between the turns of wire which are filled with the adhesive material as a continuous coating.

The adhesive material may be applied in a similar manner in assembling the form of element illustrated in Fig. 4 and in the form of Figs. 5 to 7 may also be employed as a coating to secure the various layers of both the upper and lower insulating plates together.

As previously stated, pure mica has been found to be the most satisfactory material for the making of the insulating elements of a heating unit of this character because of its high dielectric characteristics. However, mica has become quite expensive, and the cost of the material as the pieces increase in size increases as a substantial multiple as compared with the sizes. As an example, a piece of mica twice as large as the piece 24 costs perhaps five or six times as much as the piece 24. The use of a single sheet of mica on each side of the heating element, therefore, renders the cost of the heating unit prohibitive in flatirons of conventional size. The present invention, therefore, very materially reduces the cost of the heating unit.

I claim:

1. An electric heating unit, comprising a core having a heating wire wound thereon, said core being formed of opposite pairs of flat insulating strips interconnected by dovetail joints, a pair of flat insulating plates of substantially the same shape but slightly larger than said core mounted adjacent opposite faces of the latter, each of said insulating plates including a forward and a rear section and a pair of opposite side sections abutting said forward and rear sections along lines oppositely inclined relative to the longitudinal center line of the unit, the corresponding lines of abutment of opposite sections being inclined relative to each other so as to intersect at a point from which all points of said wire are spaced, and fastening means to secure said insulating plates and core together.

2. An electric heating unit, comprising a core having a resistance wire wound thereon, said core being formed of opposite pairs of flat insulating strips, a pair of flat insulating plates of substantially the same shape but slightly larger than said core mounted adjacent opposite faces of the latter, each of said insulating plates including a forward and a rear section and a pair of opposite side sections abutting said forward and rear sections along lines oppositely inclined relative to the longitudinal center line of the unit, the corresponding lines of abutment of opposite sections being inclined relative to each other so as to intersect at a point, and fastening means extending through said core and said plates at said points to secure said insulating plates and core together.

3. An electric heating unit comprising a core formed of non-conducting material having a resistance wire thereon, and means for insulating said core including a pair of flat plates of non-conducting material mounted at opposite sides thereof each having a pair of end sections and a pair of side sections, said side sections abutting said end sections along lines at opposite sides of and inclined relative to the longitudinal center line of said unit and each being out of alignment with the corresponding abutment line of the opposite sections.

4. An electric heating unit comprising a flat core formed of non-conducting material having a resistance wire helically wound thereon, and means for insulating said core including a pair of flat plates of non-conducting material mounted adjacent opposite faces thereof each having at least two abutting sections, the lines of abutment of said sections being approximately parallel to but spaced from the adjacent turns of said wire upon the proximate faces of said core whereby substantially no portion of said wire is exposed at such lines of abutment.

5. An electric heating element comprising a core, a heating wire wound on said core, and a pair of flat insulating plate units fixed against opposite sides of said core, each plate unit including a plurality of insulating layers each formed of individual sections lying wholly in a common plane, the edges of adjacent sections being arranged in abutting relationship substantially throughout their lengths and said wire crossing the line of one such pair of abutting edges, the point at which said wire crosses said line being offset from all of the abutting edges of the sections of the other layer of such plate unit.

6. An electric heating element comprising a

core having a heating wire thereon, and a pair of flat insulating plate units fixed against opposite sides of said core, each plate unit comprising a plurality of sections lying wholly in a common plane, and each adjacent pair of said sections having edges abutting substantially throughout their lengths, the abutting edges of the sections of each plate unit being out of alinement with the abutting edges of the sections of the other plate unit whereby the sections of each plate unit are in relatively overlapping relationship to sections of the other plate unit to impart a substantial degree of rigidity to the assembled device.

SIDNEY A. MONTAGUE.

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