July 19, 1927. 1,636,372

M. M. KOHN

HEATING UNIT

Filed Feb. 23. 1921 2 Sheets-Sheet 1

Fig. 1.

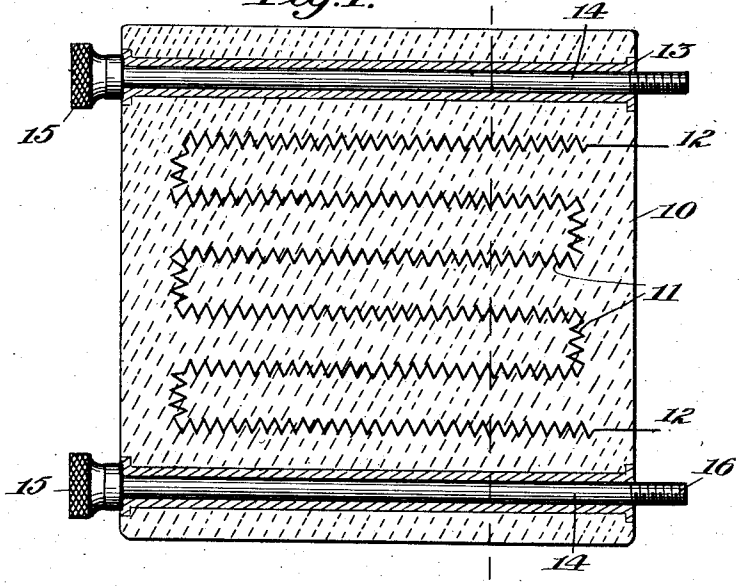


Fig. 2.

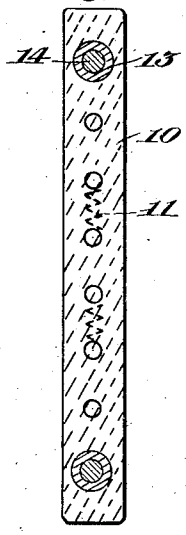


Fig. 3.

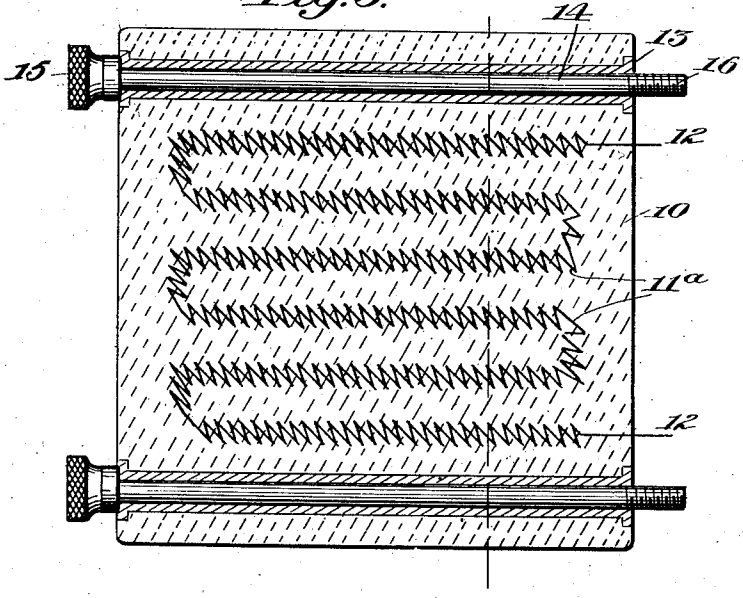
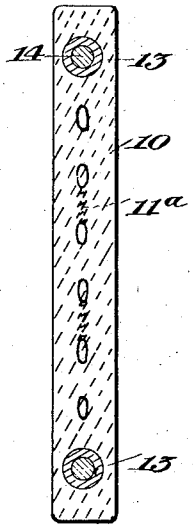


Fig. 4.



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Fig. 5.

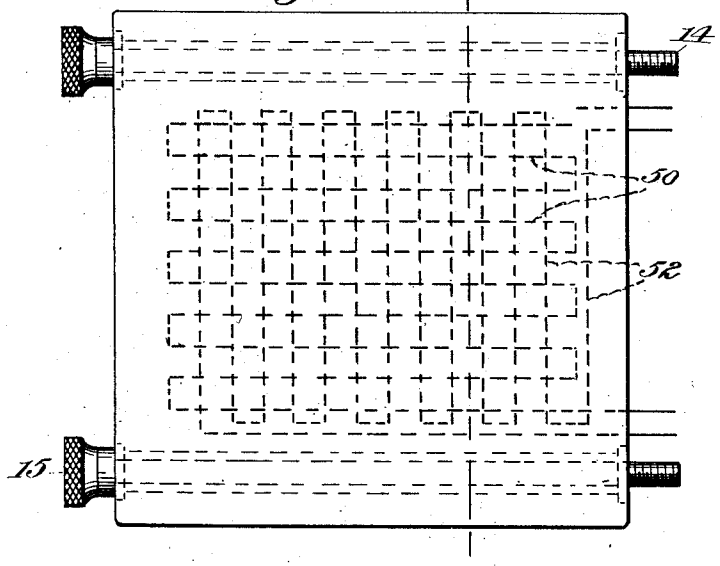


Fig. 6.

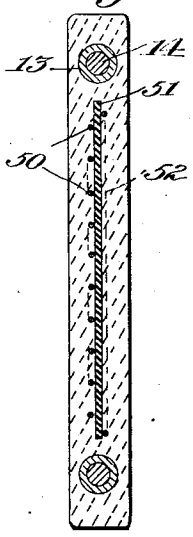


Fig. 7.

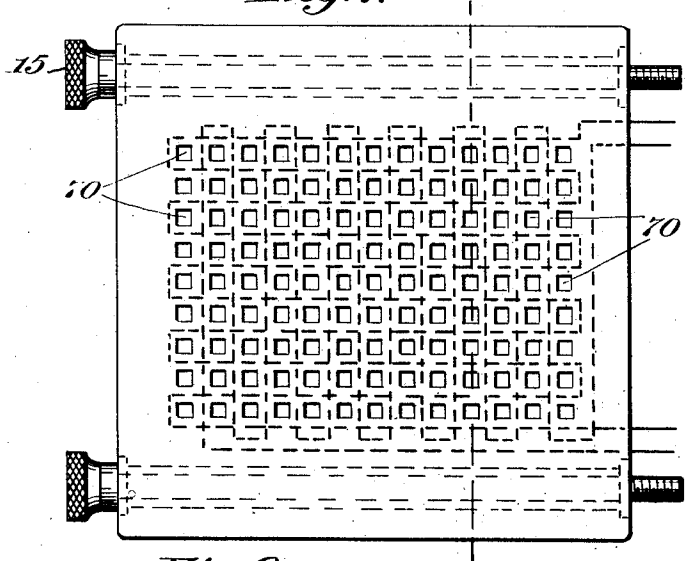


Fig. 8.

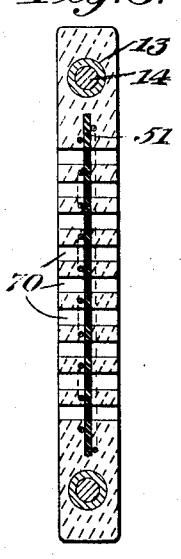
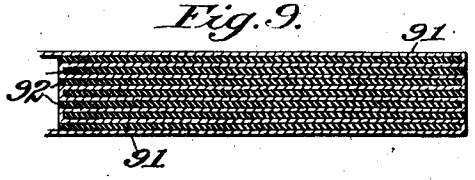


Fig. 9.



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Patented July 19, 1927. 1,636,372

UNITED STATES PATENT OFFICE.

MILTON M. KOHN, OF NEW YORK, N. Y.

HEATING UNIT.

Application filed February 23, 1921. Serial No. 447,122.

The invention relates to an easily removable, insertable and replaceable heating element for use in electrical toasters and devices used for cooking and heating purposes, such for example, as described and claimed in my co-pending application Serial No. 440,641, filed January 28, 1921.

My heating element consists preferably of a thin plate carrying the resistance element and radiating heat generated thereby from both sides thereof.

My invention is capable of various modifications, a number of which are described and illustrated herein.

Referring to the drawings:

Fig. 1 is a longitudinal section of one embodiment.

Fig. 2 is a cross section thereof.

Fig. 3 is a longitudinal section of another embodiment.

Fig. 4 is a cross section thereof.

Fig. 5 is a plan view of another embodiment.

Fig. 6 is a cross section thereof.

Fig. 7 is a plan view of a different embodiment.

Fig. 8 is a cross section thereof.

Fig. 9 is a sectional view of still another embodiment.

Referring to Figs. 1 and 2, 10 designates suitable plastic insulating heat resisting material, within which is embedded coiled wire 11 having suitable terminals 12. The material 10 is preferably of such character as to have low electrical conductivity, or none at all. The coils 11 are wholly embedded within the material 10 and serve to convert the electrical energy supplied thereto into heat. Within the insulating material are sleeves 13 adapted to receive pins 14 having suitable knurled heads 15 at one end and screw threads 16 or other suitable attaching means for fastening and connecting the heating elements within the device in which they are to supply heat, at the other end, as described in my application above referred to. It may, at times, be desirable to have a very thin heating element, in which case the coils 11 may be flattened as shown at 11^a, Figs. 3 and 4.

The modification shown in Figs. 5 and 6 is similar to those already illustrated, except that instead of the coils of resistance wire, this resistance wire is wound back and forth in one direction (as illustrated at 50) on one side of the sheet of insulating material 51, for example of mica, and then back and forth in the other direction on the other side of said insulating material, as illustrated at 52, it being understood, of course, that the wires on one side of the sheet may constitute a separate coil from the wires on the other, or they may constitute one continuous coil.

The modification illustrated in Figs. 7 and 8 is like that of Figs. 5 and 6, except that perforations 70 are provided in the plastic heat conducting, but electrically insulating, mass, and may, if desired, also be provided in the mica sheet 51. These perforations, which may have any desired form, for example, rectangular, are preferably provided within the material opposite the rectangles formed by the criss-crossing wire, so that the benefit of the perforations may be had without exposing the resistance wire at any point.

The perforations are advantageous in that they permit of increased circulation of air, and when the device described in my application above mentioned is to be used merely to heat the air, the perforated modification has a decided advantage over the other embodiments.

These heating units are very useful in such a device as that described and claimed in my application above referred to wherein the material to be heated is heated on both sides and practically over its entire surface, thus permitting the heating units to be operated at a temperature much lower than is usually the case. In fact, very good results are obtained in my apparatus where the temperature of the heating units during operation is maintained so low that there is no visible glowing, and I can obtain very good cooking and toasting results in my apparatus when operating the heating units at a temperature as low as 400 to 500° F. In view of the fact that the temperature of the heating units may be maintained as low as above stated, I can use ordinary iron wire as my resistance element, it being understood, of course, that I may use any desired resistor. Iron wire, as a resistor, when operated at temperatures high enough to produce glowing, lasts but a very short time, but when operated at a temperature below glowing temperature or when operated at the low temperatures of 400 to 500° F., or even up to 800° F., which is permitted by my invention, will last for a very long time.

In the modification illustrated in Fig. 9,

a conducting sheet, strip or plate 91 is bent back and forth to form a multiplicity of connected laminæ, each of which is insulated from the adjacent laminæ by electrically insulating sheets, strips or plates 92; the whole may then be embedded in a plastic mass.

For the plastic material I find most suitable a composition consisting of silicon, 4 to 7 parts, carborundum, preferably amorphous, 85 to 90 parts, graphite (low grade) 1 to 2 parts, and commercial sodium silicate solution sufficient to make a paste. The previously formed resistor may be embedded in this paste, as may the sleeves 13. The whole is then dried and heated, and then treated with a solution of zirconium silicate to form a glaze thereon. The strength of the zirconium silicate solution is more or less immaterial, and it may be varied from a thin to a thick liquid.

My resistance elements may be in the form of wire, or in the form of flat sheets, which may be perforated, or may be in the form of very thin ribbon wound edgewise.

I claim:

1. A resistance element comprising a thin dielectric plate having a group of uniformly spaced rectangular perforations and a resistance member completely embedded in the material of the plate to surround each of the perforations therein.

2. A resistance element comprising a thin dielectric plate having transverse perforations therethrough, a resistance member embedded in said plate circumjacent each perforation, and means to support the plate, said means being disposed adjacently parallel the edges of the plate beyond the perforations.

3. A resistance element comprising a conductor embedded in a mass consisting of silicon, carborundum, graphite and sodium silicate.

4. A resistance element comprising a conductor embedded in a thin sheet of a mass consisting of silicon, 4 to 7 parts, carborundum, 85 to 90 parts, graphite, 1 to 2 parts, and sodium silicate.

5. A resistance element comprising a conductor embedded in a mass consisting of silicon, carborundum, graphite and sodium silicate, the sheet being coated with zirconium silicate.

6. A resistance material comprising a conductor embedded in a thin sheet of a mass consisting of 4 to 7 parts of silicon, 85 to 90 parts of carborundum, graphite 1 to 2 parts, and sodium silicate, the sheet being coated with zirconium silicate.

In testimony whereof I affix my signature.

MILTON M. KOHN.