

Aug. 8, 1967

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3,335,261

ELECTRIC HOT PLATE

Filed Oct. 12, 1965

2 Sheets-Sheet 1

Fig. 1

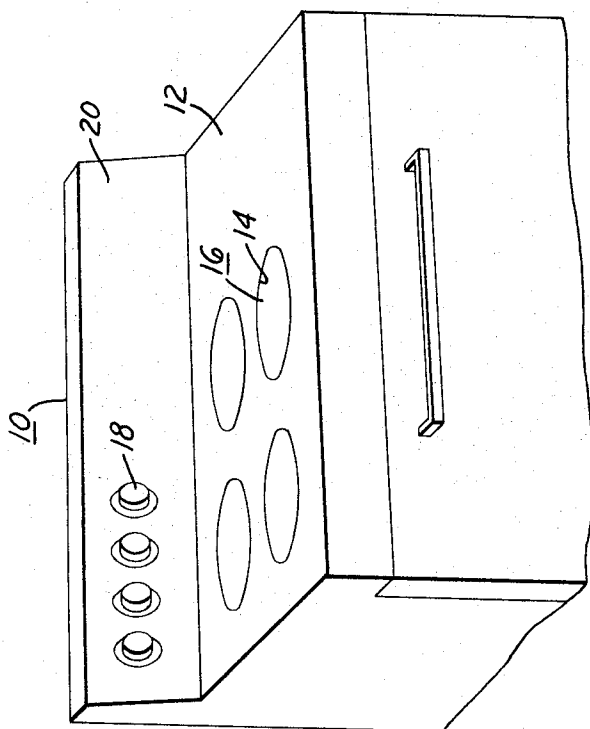


Fig. 4

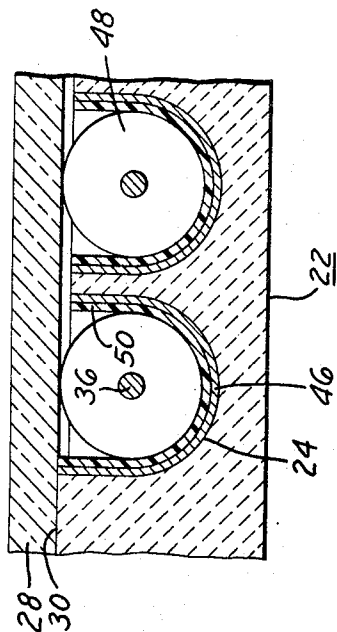
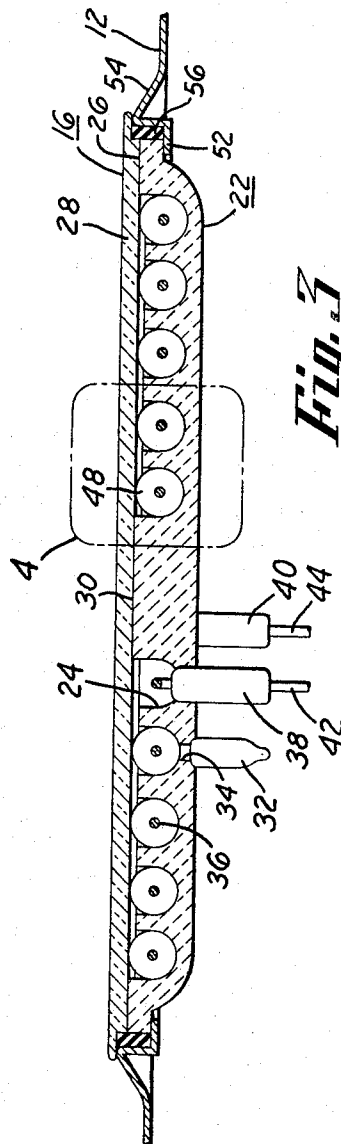


Fig. 3



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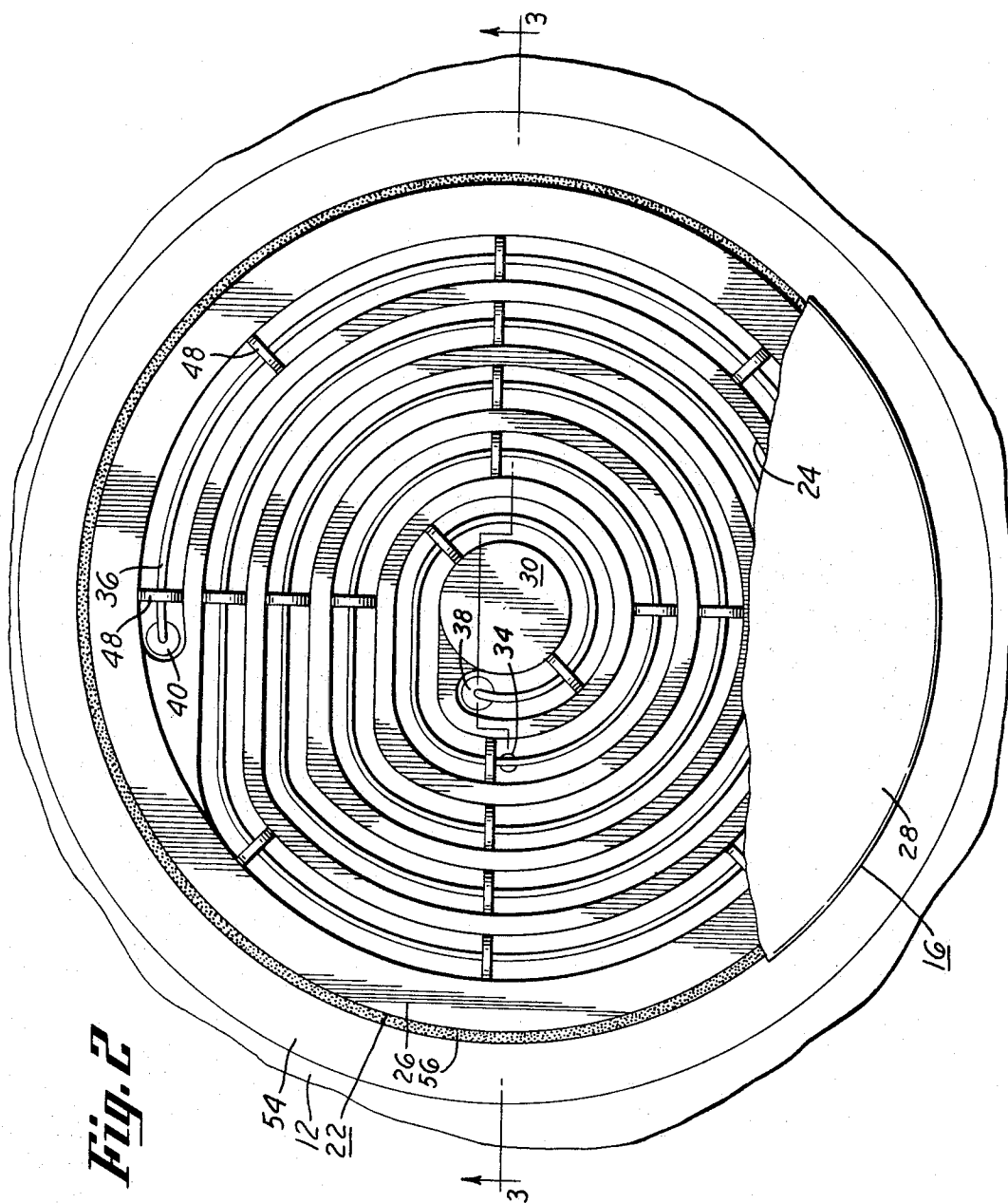


Fig. 2

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ELECTRIC HOT PLATE

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Filed Oct. 12, 1965, Ser. No. 495,060
3 Claims. (Cl. 219-468)

This invention is directed to a surface heating unit and more particularly to an improved infrared surface heating unit.

It has been recognized that surface heating units of the type having an infrared emissive resistance element therein for heating a utensil supported on the unit by direct radiation heating have certain advantages over surface heating units of the type that include a spirally formed tubular sheathed electrical resistance element that primarily heats utensils supported thereon by conductive transfer of heat from the unit to the supported utensil. The primary advantage of infrared heaters is that they have a fast response in energy output when the input power is varied because of the low mass of the filament and its extreme compact configuration. Furthermore, infrared surface units are easier to clean.

An object of the present invention is to improve surface heating units of the infrared type by the provision of an improved resistance element supporting arrangement therein that reduces the energy transfer from the electrical resistance element by conductive heat transfer from the element into the remainder of the unit and wherein the supporting arrangement includes means for both preventing undesirable sag in the resistance element when heated and reinforcing a glass plate member in the unit.

A further object of the present invention is to provide an improved infrared surface heating unit of the type including a utensil supporting plate of infrared transmissive material and a lower reflector plate that is located in spaced relationship with the upper plate wherein a spiral groove is formed in one surface of the reflector plate through which a resistance element is directed in spaced relationship with the reflector plate and supported with respect thereto by a plurality of disc members that extend between the walls of the groove and contact the upper plate for reinforcing the upper plate and reflector plate and to prevent undesirable sagging in the wire when it is heated.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a view in perspective of a domestic range including the present invention;

FIGURE 2 is a top plan view of the surface heating unit with the cover plate thereof partially broken away;

FIGURE 3 is a view in vertical section taken along the line 3-3 of FIGURE 2; and

FIGURE 4 is an enlarged, fragmentary, sectional view of region 4 in FIGURE 3.

Referring now to the drawings, in FIGURE 1 a domestic range 10 is illustrated including a top 12 having a plurality of openings 14 therein in which are located surface heating units 16 constructed in accordance with the principles of the present invention. Each of the units 16 is associated operatively with suitable power supply means such as a controller 18 located on a rear control panel 20 of the range for varying the energization of the heating unit 16.

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Referring now more particularly to FIGURES 2 through 4, the improved surface heating unit 16 is illustrated as including a reflector plate 22 of a suitable electrically insulating glass or ceramic material, such as quartz, configured to have a relatively low thermal mass. The plate 22 has a continuously spiralled groove 24 formed therein throughout substantially the full planar extent of the plate 22. A raised peripheral edge 26 of the plate 22 supportingly receives the edge of an upper utensil supporting plate 28 constructed of a suitable infrared transmissive material having high strength characteristics such as quartz, a high silica glass such as Vycor, made by Corning Glass, or a recrystallized glass ceramic such as Cer-Vit, manufactured by Owens-Illinois.

In the illustrated arrangement the raised edge 26 of the plate 22 and a raised center portion 30 of the plate 22 locates the lower surface of the upper plate 28 in spaced relationship with respect to the grooved upper surface of the plate 22 as best seen in FIGURE 3. The upper plate 28 and reflector plate 22 are fused together into sealed relationship at their outer peripheral edges and the spiral groove 24 and space between the plates 22, 28 is charged with a small amount of inert gas.

Within the groove is located a spiralled, high energy electrically energizable resistance element 36 in the form of a tungsten filament that has one end thereof electrically connected to a terminal 38 directed through the plate 22 in sealed relationship therewith and the opposite end of the element 36 is electrically connected to a terminal 40 directed through the plate 22 in sealed relationship therewith. Lead wires 42, 44 from the terminals 38, 40 are adapted to be electrically connected across a suitable power source whereby the resistance element 36 is energizable into a temperature range of approximately 2500° K. The resistance element, when energized, emits a substantial portion of the energy therefrom in the infrared and near infrared radiation range. The radiation is directed from all sides of the element 36 through 360° with a substantial portion thereof passing directly through the infrared transmissive upper utensil supporting plate 28 and the remainder of the radiation being reflected from an infrared reflective surface 46 in the groove 24 formed by a suitable coating of gold, rhodium or the like and redirected therefrom through plate 28.

When the resistance element 36 is heated into the temperature range mentioned above, thermal expansion is such that the element 36 may sag against the reflector plate whereby a substantial amount of the energy input to the filament will be passed by direct conductive heat transfer into the reflector plate 22. This can cause a reduction in the temperature of the element 36 to reduce the effectiveness of the infrared radiation therefrom and furthermore can cause an undesirable temperature increase in the reflector plate 22.

To prevent such sagging, in accordance with certain principles of the present invention, a plurality of supporting discs 48 are located in spaced relationship throughout the length of the resistance element 36 as best seen in FIGURE 2. The discs 48 have a central opening therethrough through which the resistance element 36 passes and the spacing between adjacent ones of the spaced apart disc 48 is such that the element 36 is continuously supported against the undesirable sagging mentioned above.

The discs 48 in the illustrated arrangement are formed of temperature resistant tungsten but, if desired, might be formed of a ceramic material having high temperature resistance characteristics.

When the discs 48 are of a metallic material, means must be provided to electrically insulate the discs from the metallic reflective coating 46. Accordingly, in the illustrated arrangement, the coating 46 has an overcoat

50 of infrared transmissive material deposited thereon such as vapor deposited quartz or silicon monoxide.

In addition to preventing sagging of the resistance element 36, the spaced apart discs are configured whereby a portion of their outer peripheral edges support the undersurface of the plate 28 at spaced apart points therealong. The discs 48 thereby constitute a plurality of reinforcing members that strengthen the planar extent of plate 28 inwardly of its peripheral edge.

In the illustrated arrangement the reflector plate 22 is supported on a radially inwardly turned edge 52 of a formed ring portion 54 of the range top 12 that defines the opening 14 therein. A suitable annular sealing member 56 is located between the outer edge of the reflector plate 22 and the ring 54 to prevent spillage from passing from the top 12 underneath the surface heating unit 16.

By virtue of the above-described configuration, an improved infrared surface heating unit is formed that has a resistance element that converts energy input thereto into infrared energy which is passed by radiant heat transfer to a utensil supported on the unit 16 for raising the temperature thereof. The surface heating unit 16 is substantially immediately responsive to being connected across a power source to produce sensible energy that will raise the temperature of the supported utensil without any undesirable thermal lag. Furthermore, the improved disc support arrangement will prevent undesirable sagging of the resistance element 36 as it is heated into the infrared emissive temperature range.

Additionally, the illustrated infrared surface heating unit has desirable strength characteristics that are in part due to the location of the plurality of resistance element supporting discs at spaced apart locations throughout the planar extent of the cover plate 28 and in contact with the reflector plate 22 at the grooves therein for distributing loadings on the unit 16 evenly and uniformly throughout the plate 22.

In cases where there is a substantial amount of visible light energy emitted from the resistance element 36, if desired, a suitable filtering material can be applied to the upper plate 28 for reducing the brightness of the unit at high temperature settings thereof.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In an infrared surface heating unit, the combination of, a reflector plate having a spiral groove formed therein throughout the planar extent of said plate, an upper utensil supporting plate supported by said reflector plate at the outer peripheral edge thereof, said upper utensil supporting plate being spaced from the grooved surface of said reflector plate, an infrared emissive resistance element located within said spiralled groove, a plurality of discs located at spaced points along said resistance element, an infrared reflective surface formed in said groove for directing radiation from said resistance element through said upper plate, said discs contacting said upper support plate and said reflector plate for reinforcing said plates, and means for electrically insulating said reflective surface from said support discs.

2. In the combination of claim 1, said upper plate and reflector plate being fused at their outer peripheral edges, means for evacuating said grooved portion of said reflector plate, said resistance element consisting of a tungsten filament energizable into a temperature range of approximately 2500° K.

3. In the combination of claim 2, said reflector plate being formed to have a low thermal mass, said reflective surface being formed of a deposited metallic material, said insulating means including an electrical insulating infrared transmissive layer for spacing said filament support discs out of direct electrical contact with said reflective surface coating.

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