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INFRARED SURFACE HEATING UNIT WITH TWO FILAMENTS

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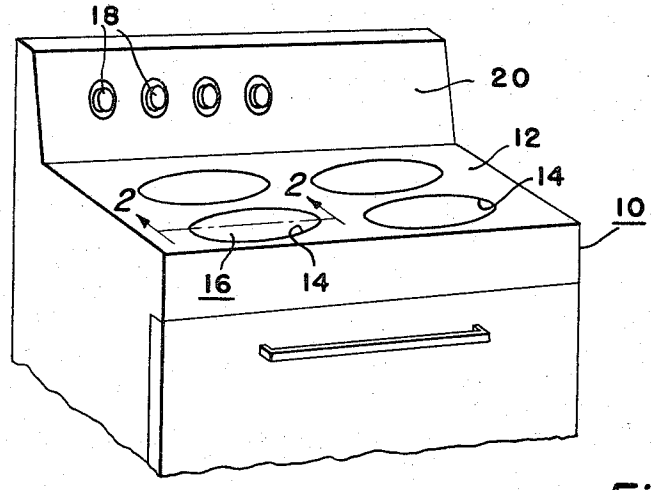


Fig. 1

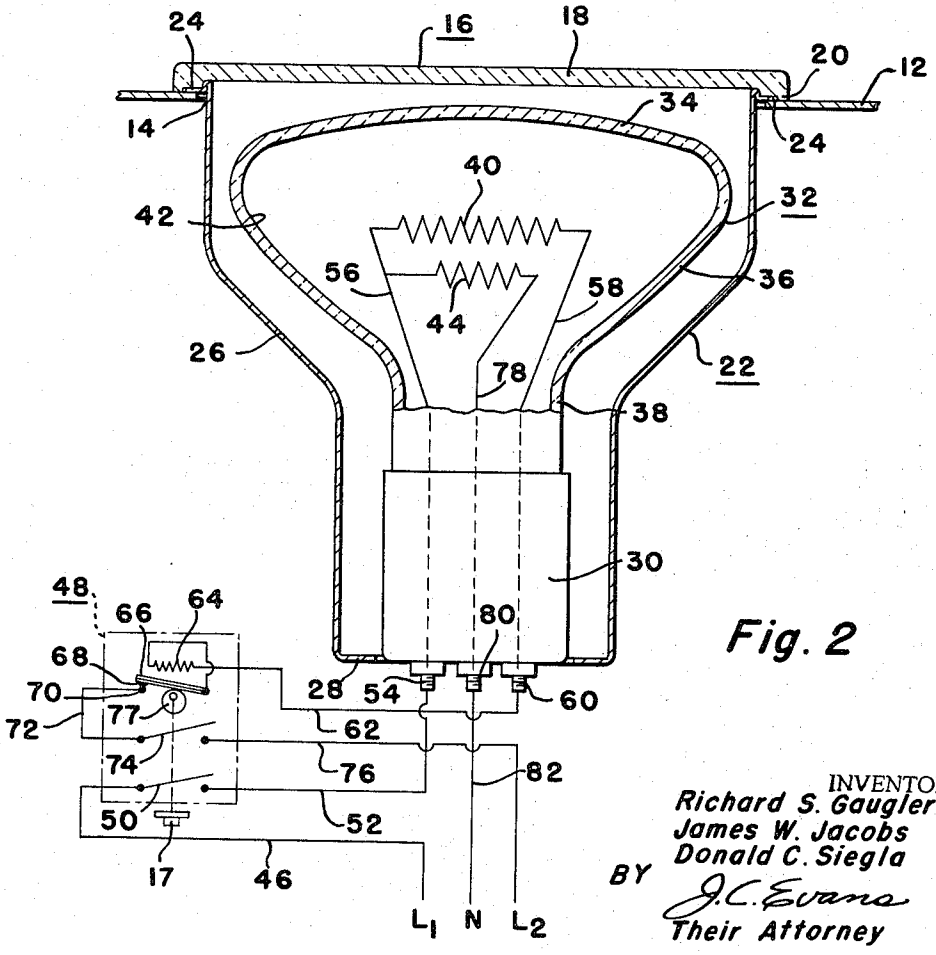


Fig. 2

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INFRARED SURFACE HEATING UNIT WITH TWO FILAMENTS

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ABSTRACT OF THE DISCLOSURE

In preferred form an infrared surface heating unit including an upper non-opaque utensil supporting plate and a lower infrared reflector plate enveloping a first resistance element and an energization circuit for pulsatingly energizing the first resistance element into a visible light range observable through the utensil supporting plate, a second smaller wattage resistance element and a second energization circuit for continuously energizing the second resistance element to continuously illuminate the upper support plate.

This invention relates to infrared surface heating units and more particularly of the type including high temperature electrical resistance elements energizable into a temperature range for producing noticeable, visible light emissions from the resistance elements.

In order to improve electrical surface heating units for use in electrical ranges or the like, it has been proposed to utilize an unsheathed high energy electrical resistance element that is energizable to be electrically self-heated into an infrared radiant temperature range. In these cases, the energy output from the resistance element primarily heats utensils supported on the surface unit through direct radiation rather than conductive heating. One such structure is illustrated in U.S. Patent No. 2,859,368, issued Nov. 4, 1958, to Biggs et al.

In such structures, it is desirable to obtain a variable heat output from the surface unit as, for example, by utilizing a thermostatic switch of the pulsing energy type. In such cases it has been found that the high temperature of the self-heated resistance elements causes a very noticeable amount of visible light to be directed outwardly from the surface heating unit and because of the provision of an energy pulsing means to vary the heat output of the surface heating unit, the visible light occurs as noticeable pulsations that are extremely distracting.

Accordingly, an object of the present invention is to improve infrared surface heating units of the type having resistance elements that are pulsatingly energized by self-heating into and out of the visible light range by the provision of a secondary lower wattage resistance element in the unit and associated switch means for continuously energizing the secondary resistance element to produce a background of illumination that damps out undesirable pulsations of visible light from a primary resistance element in the heater.

A further object of the present invention is to improve infrared surface heating units of the type including an upper utensil supporting plate of infrared transmissive material and a lower reflective surface located in spaced relationship with the utensil supporting plate and wherein a resistance element is included between the plate and surface that is pulsatingly energized into and out of the visible light range by the provision of a secondary lower wattage electrical resistance element that is disposed with respect to the upper plate and the reflective surface to produce a constant background of illumination directed through the upper plate by the reflective surface to damp out pulsing light from the primary resistance element throughout substantially the full planar extent of the upper plate.

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 an electrical range including the surface heating unit of the present invention; and

FIGURE 2 is an enlarged view in vertical section taken along the line 2—2 of FIGURE 1 including a diagrammatically shown associated electrical circuit.

Referring now to the drawing, in FIGURE 1 an electrical range **10** is shown including an upper surface **12** having a plurality of openings **14** therethrough. Each of the openings **14** has a surface heating unit **16** therein constructed in accordance with the present invention. Each of the surface heating units **16** has the heat output thereof varied by switch means including a manually rotatable control member or knob **17** located on a representatively shown rear control panel **20** of the range **10**.

In FIGURE 2, one of the improved surface heating units **16** is illustrated as including an upper utensil supporting plate **18** of a suitable infrared transmissive material that overlies the opening **14** through the top **12**. The plate **18** includes a downwardly depending peripheral flange **20** thereon that supportingly engages the upper surface of the top **12** around the opening **14**. The unit **16** further includes a support member **22** having an upper end portion **24** which overlies and is supportingly engaged by the top **12** at the opening **14** therein. A depending portion **26** of the member **22** has a lower inwardly turned segment **28** on which is supported an electrically insulated base **30** of an evacuated glass bulb **32** of infrared transmissive material including a top **34** located in close spaced relationship with the utensil supporting plate **18** at a point therebelow. The bulb **32** further includes a skirt **36** that is inclined inwardly and downwardly of the top **34** to merge with a sealed neck **38** of the bulb **32** which is located in the electrically insulated base **30**.

A high wattage electrical resistance element or filament **40** is located within the bulb **32**. The filament **40** is shown schematically in the bulb **32** but it will be appreciated by those skilled in the art that suitable ceramic electrical insulating pedestals can be provided to locate the resistance element **40** at a predetermined point within the bulb **32** whereby infrared emissions therefrom will be focused with respect to an infrared reflective surface **42** formed on the skirt **36** and the neck **38** of the bulb **32**.

Additionally, a lower wattage electrical resistance element or filament **44** is located within the bulb **32** and supported therein in a manner like filament **40**.

In the illustrated arrangement, the filament **40** is electrically connected across a suitable power source shown as including wires L_1 and L_2 of a 220-volt power source. More particularly, the energization circuit for the filament **40** includes a conductor **46** from wire L_1 which is electrically connected to an electrical selector switch assembly or controller **40** which is operated by positioning the control knob **18**. When the control knob **18** is moved from an "off" position, it closes a line switch **50** to connect the conductor **46** to a conductor **52** which is electrically connected to a terminal **54** in the insulated base **30** of the unit **16**. A lead wire **56** from terminal **54** is connected to one side of the filament **40**. The opposite side of the filament **40** is connected to a lead wire **58** that is connected to a terminal **60** in turn connected to conductor **62** back to the switch assembly **48**.

In order to obtain a variable heat output from the filament **40**, the energization circuit has the conductor **62**

electrically connected to a heater **64** which is electrically connected to a polymetallic thermally responsive element **66** having a fixed end and a movable end on which is carried a contact **68** which is selectively positioned by thermal deflection of the element **66** into and out of electrical engagement with a contact **70**. The contact **70** is connected by a conductor **72** to another line switch **74** opened and closed by the positioning of the control knob **18** to complete the energization circuit through a conductor **76** back to the wire L_2. Adjusting cam means **77** or the like adjusts the relationship between contacts **68**, **70** to vary the rate of opening and closing thereof as produced by deflection of element **66** whereby a pulsing energy control is achieved.

In addition to the energization circuit for the filament **40**, the switch **48** completes an energization circuit for the second resistance element **44** from wire L_1 through conductor **46**, the line switch **50**, conductor **52**, terminal **54** and lead wire **56** to one side of the filament **44** from whence the energization circuit is completed through a lead wire **78** on the opposite end of the filament **44** that electrically connects to a terminal **80** on the insulated base **30** which is electrically connected by a conductor **82** to wire N.

By virtue of the above-illustrated arrangement, when the control knob **18** is moved from an "off" position to a predetermined heat output setting, the filament **40** will be energized pulsatingly to maintain a desired energy output corresponding to the knob setting under the control of the heater **64** and polymetallic element **66** which pulses the energy input to the resistance element **40**. In order to obtain desirable heating effects by the surface heating unit **16** in the illustrated arrangement, the resistance wire **40** is constructed of tungsten and may have an energy output capability of 2500 watts depending upon the setting of the control knob **18**.

In the illustrated embodiment, the tungsten resistance element or filament **40** is responsive substantially instantaneously to being connected across the wires L_1, L_2 to self-heat into an extremely high temperature range between 4000° F. to 5000° F. at which temperature a substantial percentage of the energy input thereto is emitted as infrared radiaion which is passed either directly upwardly through the bulb **32** and the utensil supporting plate **18** for heating utensils supported on the unit or is reflected from the infrared reflective surface **42** upwardly through the bulb **32** and the support plate **18**. A substantial amount of visible light also is directed from the filament **40** to illuminate the plate **18**. In order to obtain a controlled heat output, the filament **40** is pulsatingly energized by the controller **48** at varying rates depending on the knob and, as a result, the visible light emissions from the filament **40** pulse on and off at a frequency corresponding to the energy pulses from controller **48**. These pulsing visible light emissions can be extremely distracting. This is especially the case when part of the planar extent of the upper plate **18** is uncovered.

In accordance with certain of the principles of the present invention, the provision of the secondary low wattage resistance element or filament **44** eliminates this problem in the following manner. As soon as the surface heating unit **16** is turned on, the knob **18** will close the energization circuit for the lower filament **44** so as to continuously energize it during the "on" time of the surface unit **16**. The continuously energized filament **44** will continuously emit visible light that either directly illuminates or illuminates the upper plate **18** by reflection from the surface **42** so as to produce a continuous background of illumination throughout the planar extent of the upper plate **18** that will damp out the pulsing light emissions from the higher wattage primary heating filament **40** during the operation of the unit **16**.

The illustrated embodiment of the invention is merely one form of an infrared surface heating unit that can include a primary heating element that pulses visible light emissions therefrom and a secondary lower wattage continuously energized resistance wire for effectively masking the pulsating effect of the first resistance wire. The provision of such dual filaments for eliminating pulsing visible light in an infrared surface heating unit is equally applicable to a surface heating unit of the type wherein the resistance wires are unsealed and formed of high temperature electrical resistance material such as electrical resistance material from the nickel-chromium family or the iron-chromium-aluminum family that is energizable in the range of 1500° F. to 2000° F. which temperatures also produce visible light emissions from the resistance elements. In this case, the resistance elements are able to operate in an unevacuated atmosphere as contrasted to the evacuated glass bulb environment of the illustrated embodiment. Furthermore, it will be appreciated that the filaments might be supported with respect to the infrared transmissive upper utensil supporting plate in a fashion other than that illustrated. One example of another suitable manner of relating an infrared emissive high temperature resistance element to an upper plate of infrared transmissive material is fully disclosed in a copending application of an infrared surface unit, Ser. No. 429,305, filed Feb. 1, 1965, in the name of Donald C. Siegla. This application may be referred to for examples of infrared transmissive materials suitable for use in the plate **18** and bulb **32**.

The words "top," "bottom," "upper" and the like are used merely for facilitating the description and are made with reference to the parts of a surface unit positioned as in FIGURES 1 and 2.

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. An infrared surface heater unit for a range or the like comprising, an upper utensil supporting plate of infrared transmissive material, a support member located below said upper utensil supporting plate, said support member having an infrared reflective surface thereon underlying said upper utensil supporting plate, a first electrical resistance element disposed between said upper utensil supporting plate and said support member out of direct heat transfer contact with said upper plate and said support member, a second electrical resistance element disposed between said upper utensil supporting plate and said support member out of direct heat transfer contact with said support member and said upper plate, said second electrical resistance element having a wattage rating less than that of said first electrical resistance element, first energization circuit means including means for continuously energizing said second electrical resistance element during operation of the heater unit to produce continuously visible light observable through said upper utensil supporting plate, second energization circuit means having switch means including energy pulsing means for pulsatingly connecting said first resistance element across a source of power for varying the energization thereof into and out of the visible light range, said continuously energized second resistance element serving to produce a background illumination of said upper utensil support plate for masking out the pulsing light output of said first electrical resistance element during energy controlling operation by said second energization circuit means.

2. An infrared surface heater unit for a range or the like comprising, an upper utensil supporting plate of infrared transmissive material, a support member located below said upper utensil supporting plate, said support member having an infrared reflective surface thereon underlying said upper utensil supporting plate, a first electrical resistance element disposed between said upper utensil supporting plate and said support member out of direct heat transfer contact with said upper plate and said support member, a second electrical resistance element disposed between said upper utensil supporting plate and said support member out of direct heat transfer contact

with said support member and said upper plate, said second electrical resistance element having a wattage rating less than that of said first electrical resistance element, a first energization circuit including means for continuously energizing said second electrical resistance element during operation of the heater unit to produce a continuous visible light source observable through said upper utensil supporting plate, a second energization circuit having switch means including energy pulsing means for pulsatingly connecting said first resistance element across a source of power for varying the energization thereof into and out of visible light range, said continuously energized second resistance element serving to produce a background illumination of said upper utensil support plate for masking out the pulsing light output of said first electrical resistance element during the energy controlling operation thereof by said second energization circuit means, said

first and second resistance elements being formed of tungsten, an evacuated enclosure, said resistance elements being located within said evacuated enclosure, said reflective surface being formed on an inner portion of said evacuated enclosure.

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