Sept. 26, 1961 E. S. SMITH ET AL 3,002,079

TERMINAL ASSEMBLIES FOR ELECTRIC SURFACE HEATING UNITS

Filed Dec. 14, 1959 3 Sheets-Sheet 1

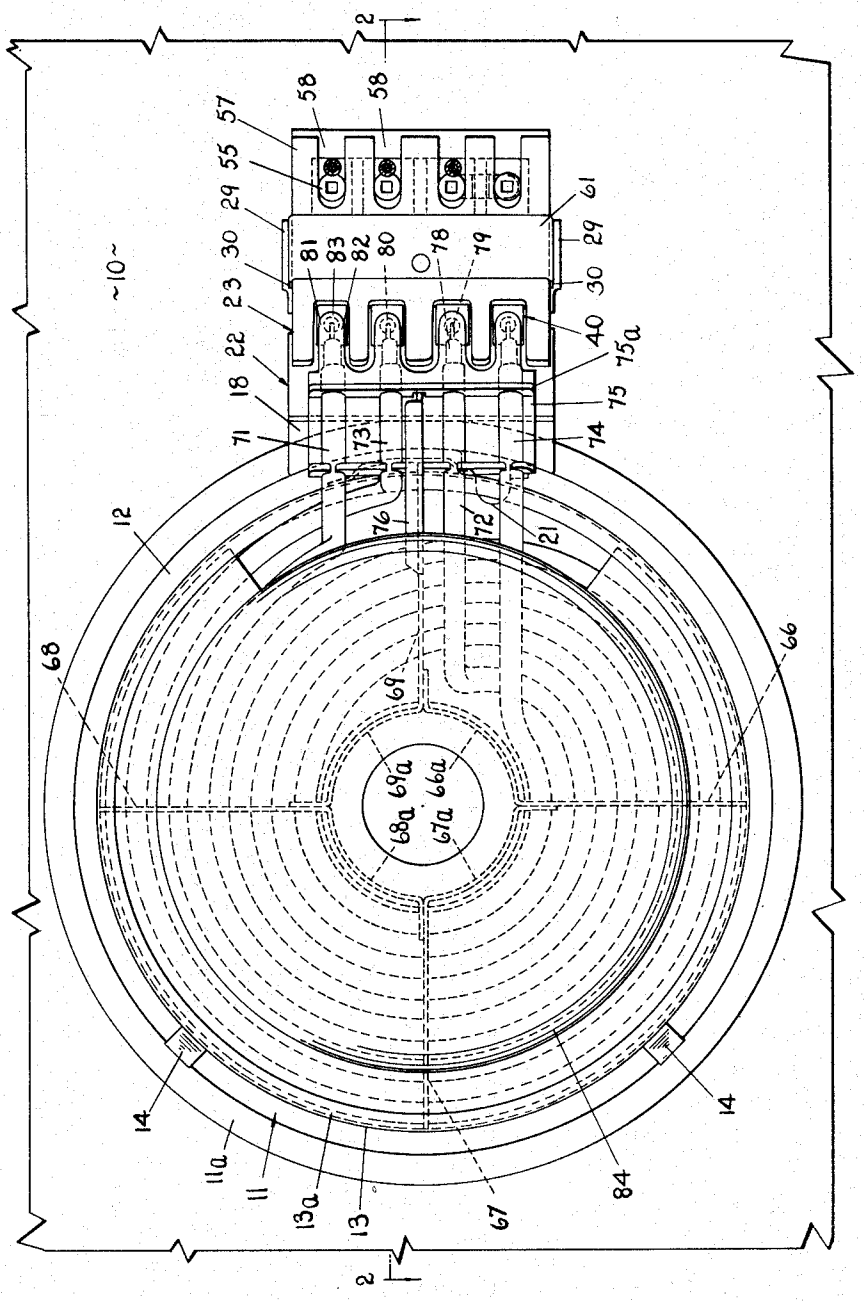


FIG. 1

INVENTORS
ELMORE STANLEY SMITH
DAVID GIBBONS SMITH

BY Maybee & Legris
ATTORNEYS

Sept. 26, 1961 E. S. SMITH ET AL 3,002,079

TERMINAL ASSEMBLIES FOR ELECTRIC SURFACE HEATING UNITS

Filed Dec. 14, 1959 3 Sheets-Sheet 2

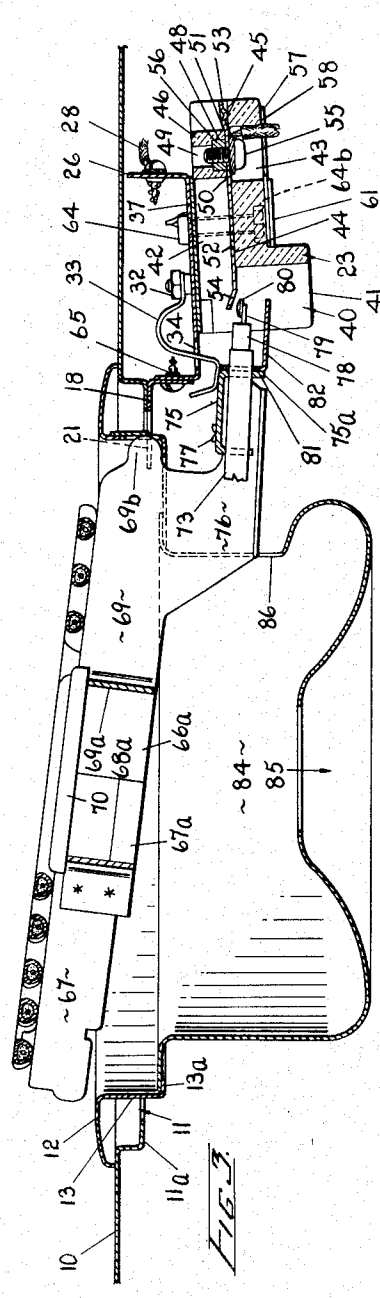


FIG. 3.

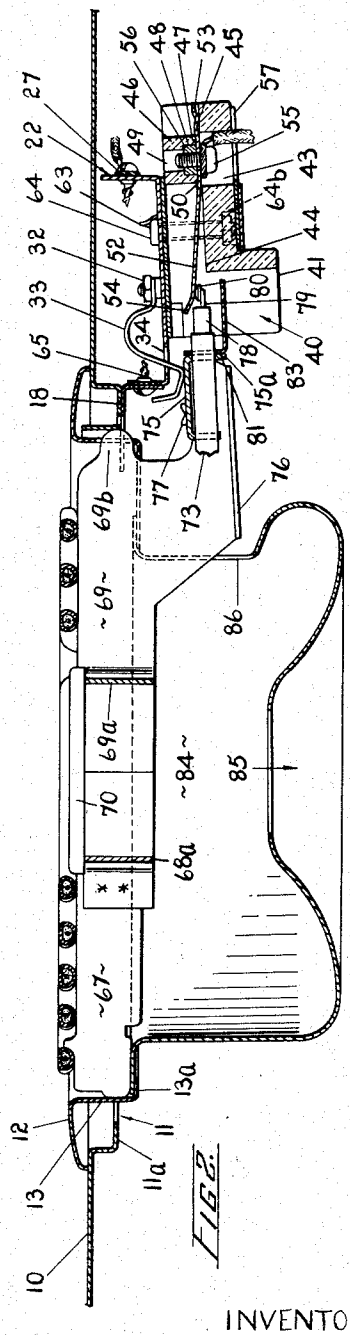


FIG. 2.

INVENTORS
ELMORE STANLEY SMITH
DAVID GIBBONS SMITH

BY

Maybee & Legris
ATTORNEYS

Sept. 26, 1961 E. S. SMITH ET AL 3,002,079

TERMINAL ASSEMBLIES FOR ELECTRIC SURFACE HEATING UNITS

Filed Dec. 14, 1959 3 Sheets-Sheet 3

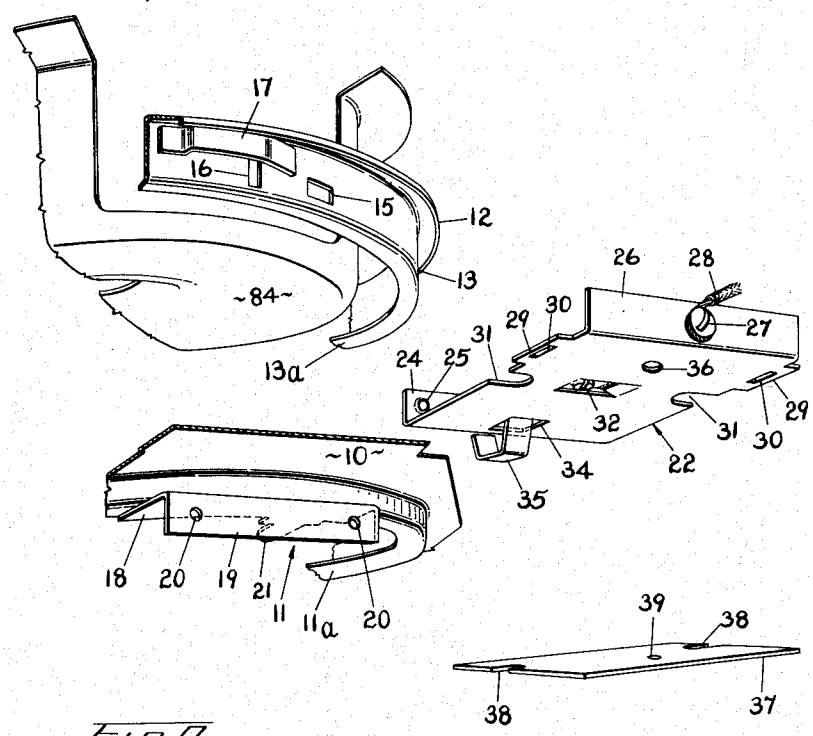
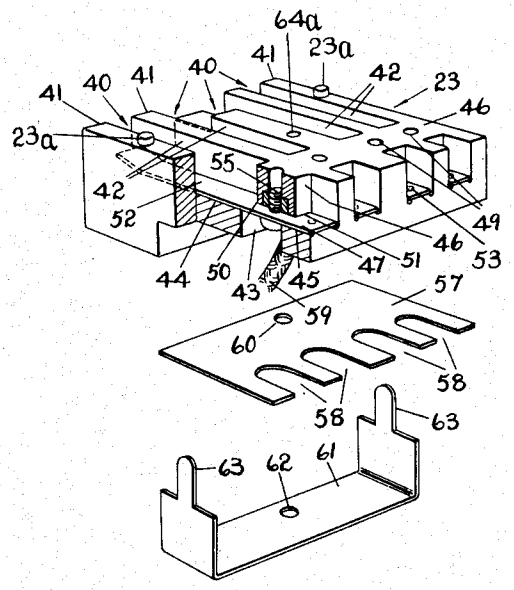


FIG 4.



INVENTORS
ELMORE STANLEY SMITH
DAVID GIBBONS SMITH

BY Maybee & Legris
ATTORNEYS

United States Patent Office 3,002,079
Patented Sept. 26, 1961

3,002,079

TERMINAL ASSEMBLIES FOR ELECTRIC SURFACE HEATING UNITS

Elmore Stanley Smith and David Gibbons Smith, Weston, Ontario, Canada, assignors to Moffats Limited, Weston, Ontario, Canada

Filed Dec. 14, 1959, Ser. No. 859,445
8 Claims. (Cl. 219—37)

This invention relates to terminal assemblies for use with electrical surface heating units in electric ranges.

For some time it has been considered desirable that the electrical surface heating units used in electric ranges should be tiltable or removable to facilitate the cleaning of the drip pan underneath the unit and the bezel ring round the unit. Constructions have been proposed in which the unit is hingeable away from the top of the range without being fully removable therefrom; other constructions have been proposed wherein the surface heating unit may be completely removed from the range and it is with these latter constructions that the invention is concerned. A surface heating unit normally comprises an elongated heater element having a generally horizontal coiled portion and adjacent, generally parallel end portions extending substantially horizontally away from, and offset below, the coiled portion. The end portions terminate in electrical terminals which are arranged to cooperate with a terminal assembly fixed to the structure of the range when the unit is in operative position in the range.

It is desirable that the terminal assembly which is attached to the structure of the range be so constructed as to minimize the risk of electrical shock to a person cleaning the range with one or more of the units removed. Moreover, the terminal assembly is desirably detachably secured to the structure of the range and is so constructed and arranged that it may easily be serviced in the field. Furthermore, the terminal assembly should be such as to provide excellent electrical contact with the terminals on the surface heating unit since comparatively high currents are required by the unit.

It is an object of the present invention to provide an improved terminal assembly for use with an electric surface heating unit in an electric range and having the desirable features set forth above.

It is a further object of the invention to provide, in an electric range, a combination of a terminal assembly with an electric surface heating unit, the combination being constructed and arranged to minimize the risk of accidental electric shock.

The invention will now be described with reference to the accompanying drawings, in which like reference numerals indicate similar parts throughout the various views, and in which:

FIGURE 1 is an underneath plan view of an installation, in an electric range, of a terminal assembly according to the invention in combination with an electrical surface heating unit.

FIGURE 2 is a vertical section, on the line 2—2 of FIGURE 1, of the installation of FIGURE 1,

FIGURE 3 is a view similar to FIGURE 2, but showing the surface heating unit partially removed from the range, and

FIGURE 4 is an exploded perspective view of the terminal assembly shown in the preceding figures, together with the means whereby the assembly is secured to the range.

For convenience in the description and claims, the terms "upper surface," "under surface," "vertical" and horizontal" applied to the assembly refer to the assembly when it is in position in a range, i.e. when it is in the position shown in FIGURES 2 and 3.

Referring now to the drawings, the top of an electric range is indicated at **10** and is provided with an aperture **11**, defined by a recessed lip **11***a*, to receive an electric surface heating element. Received in the aperture is a bezel ring **12** having a vertical rim **13** at the lower edge of which is an inturned lip **13***a*. The ring **12** is held in position by spring clips **14** (see FIGURE 1) which engage under the recessed lip **11***a*. The vertical rim **13** of the ring is provided with two spaced apertures **15** and **16** (see FIGURE 4) and a leaf spring **17** is secured to the outer surface of the rim **13** partially to overlie the aperture **16**.

An angle member **18** is secured to the recessed lip **11***a* and has a depending flange **19** provided with spaced apertures **20** for a purpose hereinafter to be described. The angle member **18** is also provided with a tongue **21** which projects into the aperture **11** towards the center thereof and engages the aperture **15** of the bezel ring **12**. The ring **12** is thus located by the co-operating tongue **21** and aperture **15** and is retained in position by the spring clips **14**.

Secured to the flange **19** is a terminal assembly including a mounting plate indicated generally at **22** and a block of insulating material indicated generally at **23**. The mounting plate is of channel cross-section and is provided with a first upwardly extending flange **24** having apertures, one of which is indicated at **25**, to mate with the apertures **20** in the flange **19**. The second upwardly extending flange **26** of the mounting plate is provided with a terminal screw **27** to which a ground wire **28** is connected. The mounting plate includes two projecting ears **29** having slots **30** therein; the plate also has two opposed locating notches **31**. Secured to the upper surface of the mounting plate by means of a nut and screw assembly **32** is a grounding spring contact **33** which passes through an aperture **34** in the plate. The spring contact has a flattened portion **35** below the plate **22** and arranged to make ground connection with an electric surface heating unit as will hereinafter be described. The mounting plate also includes an aperture **36**.

Interposed between the underside of the plate **22** and the upper surface of the block **23** is a sheet **37** of insulating material having notches **38** which may be aligned with the notches **31** in the plate **22** and having an aperture **39** which may be aligned with the aperture **36** in the plate **22**.

The block **23** is of electrically insulating material, for example high strength electrical porcelain, and has, at one end, four vertically extending channels **40** defined by spaced vertical walls **41**. In the upper surface of the block **23** are four open-topped, substantially horizontal channels **42**, each horizontal channel being aligned with one of said vertical channels **40** and leading into said vertical channel. The base of each horizontal channel **42** has an aperture **43** therein which leads from the channel to the under surface of the block. Each aperture **43** divides the base of each horizontal channel **42** into a first lower abutment **44**, and a second lower abutment **45**. Each first lower abutment **44** extends between a vertical channel **41** and an aperture **43** and each second lower abutment **45** extends between an aperture **43** and the right hand end of the block in the drawings. In each horizontal channel **42**, each of the first and second abutments slopes slightly towards the aperture **43** which separates them. Above each aperture **43**, and extending between the side walls of each horizontal channel **42**, is a bridge member **46** the underside of which provides an upper abutment **47**. Each bridge member is also provided with a recess **48** in its under surface and with an aperture **49** which leads from the recess **48** through the bridge member. Each upper abutment **47** is defined in longi-

tudinal extent by edges 50 and 51 which are respectively nearer to, and further from, the vertical channels 41.

Received in each horizontal channel 42 is a contact strip 52 of resilient metal. An end portion of each contact strip is engaged by a second lower abutment 45 and by an upper abutment 47. This end portion of the contact strip is provided with a projection 53 which depends from the lower surface of the contact strip and engages the second lower abutment 45, the projection is made by stamping out a dimple in the end of the strip. The other end portion 54 of each contact strip 52 has a silver inlay and projects into the vertical channel 40 which is aligned with the horizontal channel 42 in which the contact strip is received. Each contact strip has a first position, shown in FIGURES 3 and 4, in which the strip is in contact with a first lower abutment 44. The relative vertical spacing between each second lower abutment 45 and its associated upper abutment 47 is such that the contact strip is forced into contact with the upper abutment 47 by engagement of the projection 53 with the second lower abutment 45. Each contact strip 52 is restrained from bodily movement longitudinally of the block by means of a screw 55 passing through the strip and being threadably received in a nut 56 in one of the recesses 48; each recess 48 is dimensioned to closely enbrace a nut and to prevent it from turning.

Held against the under surface of the block 23 is a sheet 57 of insulating material having notches 58 therein to register with the lower ends of the apertures 43; the sheet 57 also contains an aperture 60. Since the notches 58 are smaller than the apertures 43, the sheet 57 substantially closes the lower ends of the apertures 43 and lead-in wires, for example 59, are passed through the notches 58 to be secured under the screws 55. The sheet 57 of insulating material is retained in position against the underside of the block 23 by a metallic stirrup 61 having a central aperture 62 and legs 63. The legs 63 are adapted to be passed through the slots 30 in the ears 29 of the mounting plate 22 and to be bent over above the plate to retain the stirrup in position.

The block 23 is secured to the plate 22 by means of a screw and nut assembly 64 (see FIGURES 2 and 3) which passes through the aperture 36 in the plate 22, the aperture 39 in the sheet 37, and an aperture 64*a* in the block 23. The aperture 64*a* leads to a recess 64*b* in the under surface of the block which receives the nut of the screw and nut assembly 64 and holds the nut against turning. Any part of the screw which projects from the nut is received in the apertures 60 and 62 of the insulating sheet 57 and the stirrup 61 respectively. The block 23 is located relative to the plate 22 by means of projections 23*a* springing from the upper surface of the block and arranged to pass through the notches 38 in the plate 37 and to engage in the notches 31 in the plate 22. Moreover, the stirrup 61 assists in locating the block 23 since it embraces the block. The terminal assembly consisting of the plate 22, the block 23 with its contact strips 52, the plates 37 and 57, and the stirrup 61 is secured to the flange 19 of the angle member 18 by means of self-tapping screws 65 (see FIGURES 2 and 3) which pass through the aligned apertures 20 and 25 in the flanges 19 and 24 respectively.

Turning now to the electrical surface heating unit itself, this comprises two elongated heating elements which are coiled to provide a composite generally horizontal coiled portion and adjacent, generally parallel end portions extending substantially horizontally away from, and offset below, the coiled portion. The construction of the heating unit shown in the drawing is described in detail in co-pending patent application Serial No. 779,706 filed on December 11, 1958 by Elmore Stanley Smith. Since full details of the construction of the surface heating element may be found in said copending application only a brief description will here be given.

Referring to FIGURE 1, the unit comprises a supporting spider having radial legs 66, 67, 68 and 69; each leg has, at its inner end, a curved portion 66*a*, 67*a*, 68*a* and 69*a* respectively and these are secured to an adjacent leg to form the complete spider. Thus the portion 66*a* is secured to leg 69, portion 67*a* is secured to leg 66, portion 68*a* is secured to leg 67 and portion 69*a* is secured to leg 68. The leg 69 is provided with a finger 69*b* at its free end for a purpose hereinafter to be described. A central cap 70 is secured to the curved portions of the legs. The heating elements are convoluted in known manner to provide a composite horizontal coiled portion which rests on the tops of the legs 66, 67, 68 and 69. One of the heating elements has end portions 71 and 72 while the other heating element has end portions 73 and 74. The end portions 71, 72, 73, 74 of the elements are gripped in a channel-section clamping member 75, and the member 75 is secured to an extension arm 76 of the leg 69 by a staked over projection 77 all as more specifically described in said copending application.

The ends of the heating elements are plugged with plugs 78 of silicone rubber and are provided with electrical terminals in the form of projecting wires 79 each of which has a silver-plated circular cap 80 secured to the end thereof. Secured to one of the flanges 75*a* of the member 75 is an angle member 81 having a flange 82 which is slotted to provide four fingers 83, see FIGURE 1. It will be seen from FIGURES 1 and 2 that the fingers 83 are of a size to substantially block the lower parts of the vertical channels 40 when the surface heating unit is in operative position as shown in said figures.

It will also be seen from FIGURE 2, that, when the heating unit is in operative position, the caps 80 forming the terminals at the ends of the heating elements bend the contact strips 52 from their first positions of FIGURES 3 and 4 to second positions in which the end portion 54 of each strip is bent about that edge 50 of the appropriate upper abutment 47 which is nearer to the vertical channels 40. When in its second position, each contact strip is substantially clear of the first lower abutment surface 44 and good contact is attained between the end portion 54 of the contact strip 52 and the cap 80 due to the natural resilience of the contact strip 52. It will further be seen from FIGURE 2 that the spring 33 makes contact with the upper surface of the clamping member 75 so that it grounds the spider of the heating unit.

The assembly is completed by a drip pan 84 which rests on the lower lip 13*a* of the bezel ring 12 and is provided with a central aperture 85 and a slot 86 to accommodate the extension arm 76 of the spider with its attached end portions of the heating element.

The method of assembly of the arrangement is as follows. Firstly, the nuts 56 are placed in the recesses 48 in the upper abutments 47; this operation is carried out with the block 23 in an inverted position relative to that shown in FIGURE 4. Then the strips 52 are inserted into the horizontal channels 42 and are pushed along until their ends pass under the upper abutments 47 and engage the second lower abutments 45; the screws 55 are then inserted to grip the strips in place. The slope of the abutments 44, 45 towards the apertures 43 simplifies assembly and assists in widening the allowable tolerances on the block 23. Secondly, the lead-in wires are attached to the screws 55. Thirdly, the terminal assembly consisting of the mounting plate 22, the insulating sheet 37, the block 23, the insulating sheet 57 and the stirrup 61 is assembled.

The completed terminal assembly is then secured to the flange 19 of the range structure by means of the self-tapping screws 65. The bezel ring 12 is then inserted into the aperture 11 in the range top, the drip pan 84 is placed in position and finally the surface heating unit is placed in position by engaging the finger 69*b* of the leg 69 in the aperture 16 in the bezel ring and then moving the unit from the position shown in FIGURE 3 to the

position shown in FIGURE 2. As the unit is moved to the position shown in FIGURE 2, the left-hand end of the leg **67** co-acts with the vertical rim **13** of the bezel ring **12** and thereby pushes the unit to the right so that the finger **69***b* acts against the leaf spring **17** which is behind the aperture **16**; the action of the spring **17** releasably retains the heating unit in position. It will be seen from FIGURE 3 that the portion **35** of the ground contact spring **33** contacts the clamping member **75** before the terminal caps **80** contact the end portions **54** of the contact strips **52**, thus providing a safety feature. As the heating unit finally assumes the position shown in FIGURE 2, the contact strips **52** are bent from their first positions to their second positions as described above and the heating unit is placed in circuit.

To facilitate cleaning and maintenance, the heating unit, the drip pan **84** and the bezel ring **12** may all be removed and replaced in the order above described. Moreover, should there be any field failure in the terminal assembly, it is a simple matter to undo the screws **65** from above through the aperture **11** in the range top and to remove the assembly. When the terminal assembly is removed, a broken contact strip or broken lead wire can be attended to easily in the field.

It will be seen that the invention provides an improved terminal assembly for use in electric cooking stoves and also an improved combination of terminal assembly with a surface heating unit.

It will be understood that the form of the invention herewith shown and described is a preferred example and that various modifications may be carried out without departing from the spirit of the invention or the scope of the appended claims.

What we claim as our invention is:

1. A terminal assembly for use with an electric surface heating unit and comprising a block of electrically insulating material extending longitudinally between two ends and having an upper surface and an under surface, a plurality of vertically extending channels in one end of the block, a plurality of open-topped, substantially horizontal channels in the upper surface of the block extending longitudinally from the vertical channels to the other end of the block, each horizontal channel leading into, and being aligned with, one of said vertical channels, an aperture in the base of each horizontal channel between the ends thereof, each aperture leading from the channel to the under surface of the block, the base of each horizontal channel providing first and second lower abutments separated by the aperture in said base, each first abutment extending between a vertical channel and one of said apertures and each second abutment extending between one of said apertures and the other end of the block, a bridge member extending between the side walls of each horizontal channel above the aperture in the base thereof, and an upper abutment on the underside of the bridge member defined in longitudinal extent by edges nearer to and further from said vertical channels; a contact strip of resilient metal received in each horizontal channel and having one end portion located within the vertical channel aligned therewith, the other end portion of the strip being engaged by the upper abutment and the second lower abutment of the channel in which the strip is received, each strip being bendable, by engagement of said one end portion with a terminal of an electric surface heating element, about said nearer edge of the upper abutment from a first position in which the strip is in contact with a first lower abutment to a second position in which the strip is lifted substantially clear of said first lower abutment; and means to prevent substantially bodily movement of the strips longitudinally relative to the block.

2. A terminal assembly according to claim 1, wherein said first and second lower abutments in each horizontal channel slope towards the aperture in the channel.

3. A terminal assembly for use with an electric surface heating unit and comprising a block of electrically insulating material extending longitudinally between two ends and having an upper surface and an under surface, a plurality of vertically extending channels in one end of the block, a plurality of open-topped, substantially horizontal channels in the upper surface of the block extending longitudinally from the vertical channels to the other end of the block, each horizontal channel leading into, and being aligned with, one of said vertical channels, an aperture in the base of each horizontal channel between the ends thereof, each aperture leading from the channel to the under surface of the block, the base of each horizontal channel providing first and second lower abutments separated by the aperture in said base, each first abutment extending between a vertical channel and one of said apertures and each second abutment extending between one of said apertures and the other end of the block, a bridge member extending between the side walls of each horizontal channel above the aperture in the base thereof, and an upper abutment on the underside of the bridge member defined in longitudinal extent by edges nearer to and further from said vertical channels; a contact strip of resilient metal received in each horizontal channel and having one end portion located within the vertical channel aligned therewith, the other end portion of the strip being engaged by the upper abutment and the second lower abutment of the channel in which the strip is received, each strip being bendable, by engagement of said one end portion with a terminal of an electric surface heating element, about said nearer edge of the upper abutment from a first position in which the strip is in contact with a first lower abutment to a second position in which the strip is lifted substantially clear of said first lower abutment; a projection extending downwardly from the lower surface of each of said strips at the other end portion thereof, said projections engaging the second lower abutment of the channel in which the strip is received and forcing said one end portion of the strip upwardly against the upper abutment in said channel; and means to prevent substantial bodily movement of the strips longitudinally relative to the block.

4. A terminal assembly for use with an electric surface heating unit in an electric range and comprising a block of electrically insulating material extending longitudinally between two ends and having an upper surface and an under surface, a plurality of vertically extending channels in one end of the block, a plurality of open-topped, substantially horizontal channels in the upper surface of the block extending longitudinally from the vertical channels to the other end of the block, each horizontal channel leading into, and being aligned with, one of said vertical channels, an aperture in the base of each horizontal channel between the ends thereof, each aperture leading from the channel to the under surface of the block, the base of each horizontal channel providing first and second lower abutments separated by the aperture in said base, each first abutment extending between a vertical channel and one of said apertures and each second abutment extending between one of said apertures and the other end of the block, a bridge member extending between the side walls of each horizontal channel above the aperture in the base thereof, and an upper abutment on the underside of the bridge member defined in longitudinal extent by edges nearer to and further from said vertical channels; a contact strip of resilient metal received in each horizontal channel and having one end portion located within the vertical channel aligned therewith, the other end portion of the strip being engaged by the upper abutment and the second lower abutment of the channel in which the strip is received, each strip being bendable, by engagement of said one end portion with a terminal of an electric surface heating element, about said nearer edge of the upper abutment from a first position in which the strip is in contact with a first lower abutment to a

second position in which the strip is lifted substantially clear of said first lower abutment; means to prevent substantial bodily movement of the strips longitudinally relative to the block; a mounting plate for said block; cooperating locating means on said block and said mounting plate; means to secure the block to the underside of the mounting plate so that the upper ends of the vertical channels are closed by the plate; an upwardly extending flange at one end of said mounting plate; and means of said flange to detachably secure the mounting plate to structure of an electric range.

5. A terminal assembly for use with an electric surface heating unit in an electric range and comprising a block of electrically insulating material extending longitudinally between two ends and having an upper surface and an under surface, a plurality of vertically extending channels in one end of the block, a plurality of open-topped, substantially horizontal channels in the upper surface of the block extending longitudinally from the vertical channels to the other end of the block, each horizontal channel leading into, and being aligned with, one of said vertical channels, an aperture in the base of each horizontal channel between the ends thereof, each aperture leading from the channel to the under surface of the block, the base of each horizontal channel providing first and second lower abutments separated by the aperture in said base, each first abutment extending between a vertical channel and one of said apertures and each second abutment extending between one of said apertures and the other end of the block, a bridge member extending between the side walls of each horizontal channel above the aperture in the base thereof, and an upper abutment on the underside of the bridge member defined in longitudinal extent by edges nearer to and further from said vertical channels; a contact strip of resilient metal received in each horizontal channel and having one end portion located within the vertical channel aligned therewith, the other end portion of the strip being engaged by the upper abutment and the second lower abutment of the channel in which the strip is received, each strip being bendable, by engagement of said one end portion with a terminal of an electric surface heating element, about said nearer edge of the upper abutment from a first position in which the strip is in contact with a first lower abutment to a second position in which the strip is lifted substantially clear of said first lower abutment; means to prevent substantial bodily movement of the strips longitudinally relative to the block; a channeled section mounting plate having upwardly extending flanges; means to secure the block to the underside of the mounting plate so that the plate closes both the upper ends of the vertical channels and the tops of the horizontal channels between the vertical channels and said bridge members; means of one flange of the channel member to secure the mounting plate to structure of a cooking stove; means on the other flange of the plate for making a ground connection to the mounting plate; and a resilient strip connected to said plate to make a ground connection with said surface heating unit.

6. A terminal assembly according to claim 5, including a sheet of insulating material juxtaposed against the under surface of said block partially to close said apertures, slots being provided in said insulating material to permit the passage of lead-in wires for attachment to said contact strips.

7. A terminal assembly according to claim 6, wherein said sheet of insulating material is held in position by a U-shaped stirrup which embraces said block and has legs passing through said mounting plate, said legs being bent above the mounting plate to retain the stirrup in position.

8. The combination of a terminal assembly with an electric surface heating unit in an electric range, the terminal assembly comprising a block of electrically insulating material extending longitudinally between two ends and having an upper surface and an under surface, a plurality of vertically extending channels in one end of the block, a plurality of open-topped, substantially horizontal channels in the upper surface of the block extending longitudinally from the vertical channels to the other end of the block, each horizontal channel leading into, and being aligned with, one of said vertical channels, an aperture in the base of each horizontal channel between the ends thereof, each aperture leading from the channel to the under surface of the block, the base of each horizontal channel providing first and second lower abutments separated by the aperture in said base, each first abutment extending between a vertical channel and one of said apertures and each second abutment extending between one of said apertures and the other end of the block, a bridge member extending between the side walls of each horizontal channel above the aperture in the base thereof, and an upper abutment on the underside of the bridge member and defined in longitudinal extent by edges nearer to and further from said vertical channels; a contact strip of resilient metal received in each horizontal channel and having one end portion located within the vertical channel aligned therewith, the other end portion of the strip being engaged by the upper abutment and the second lower abutment of the channel in which the strip is received, each strip being bendable about said nearer edge of an upper abutment from a first position in which the strip is in contact with a first lower abutment to a second position in which the strip is lifted substantially clear of said first lower abutment; and means to prevent substantial bodily movement of the strips longitudinally relative to the block; and the electrical surface heating unit comprising an elongated electrical heater element having a generally horizontal coiled portion and adjacent generally parallel end portions extending substantially horizontally away from, and offset below, the coiled portion, the said end portions terminating in terminals and being arranged to enter said vertical channels so that the terminals make contact with said one end portion of said resilient contact strips and bend the strips from their first positions to their second positions; and fingers attached to said end portions and extending below said terminals and in insulated relation thereto, the fingers being of a size to substantially block lower parts of the vertical channels when the terminals are in contact with the strips.

References Cited in the file of this patent

UNITED STATES PATENTS

2,502,988	Price	Apr. 4, 1950
2,760,173	Cunningham	Aug. 21, 1956
2,810,056	Aldous	Oct. 15, 1957