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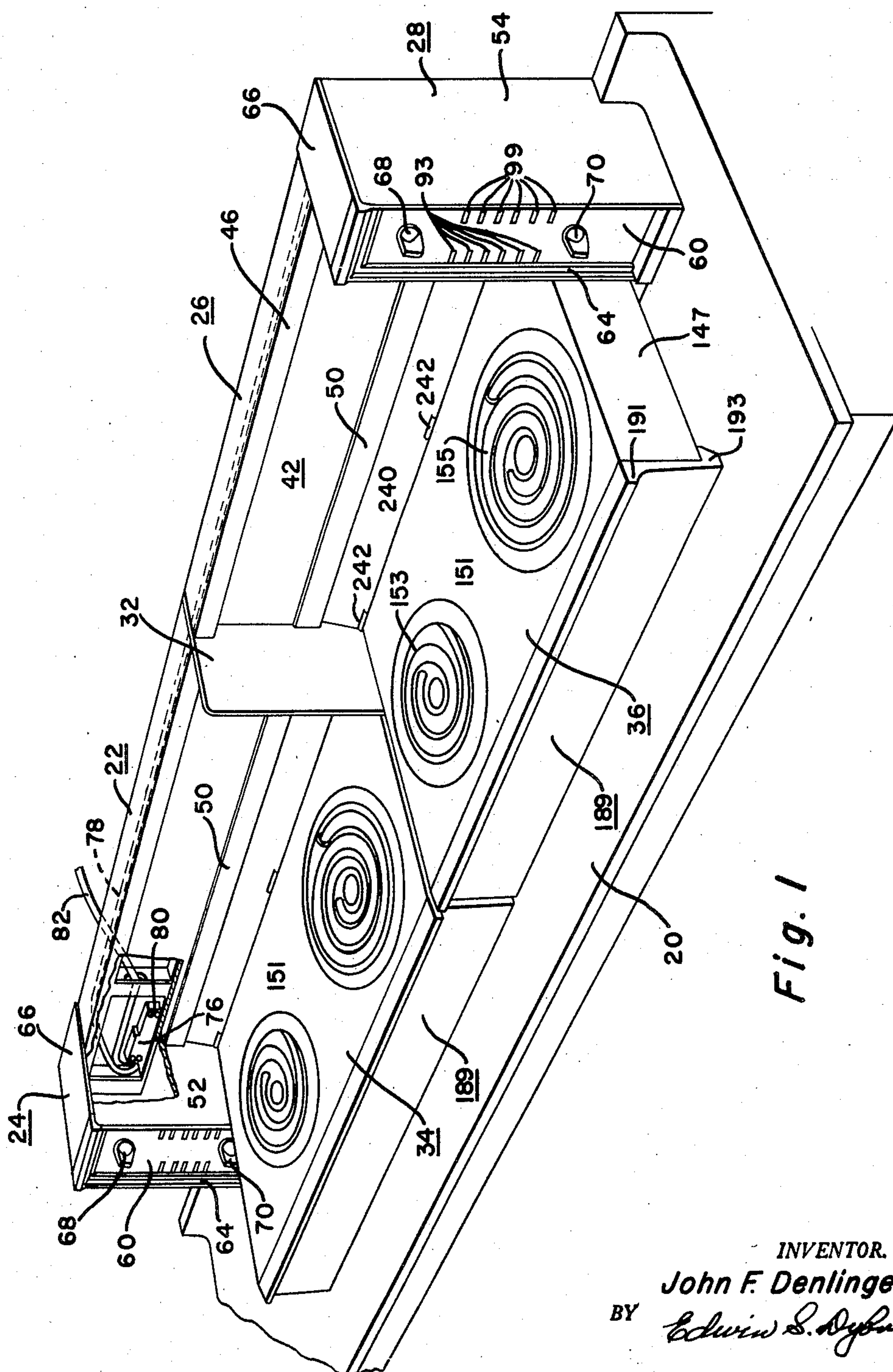
**J. F. DENLINGER**

**2,850,614**

# SURFACE HEATER

Filed May 22, 1956

6 Sheets-Sheet 1



**Fig. 1**

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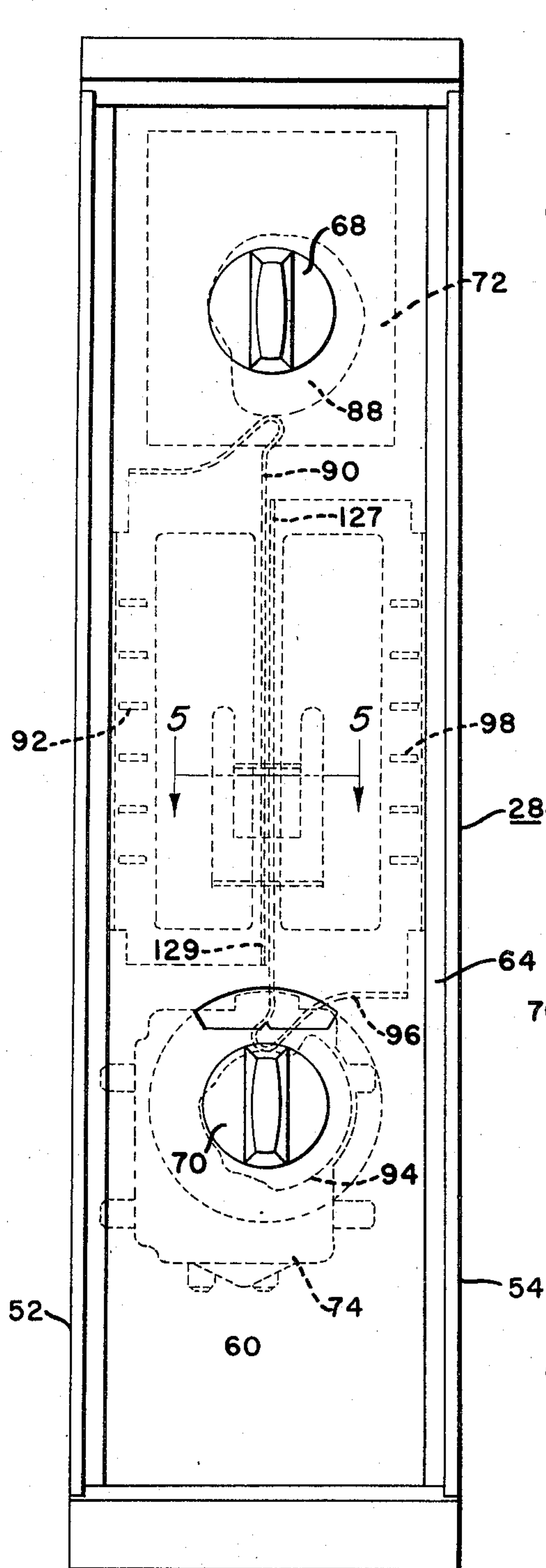
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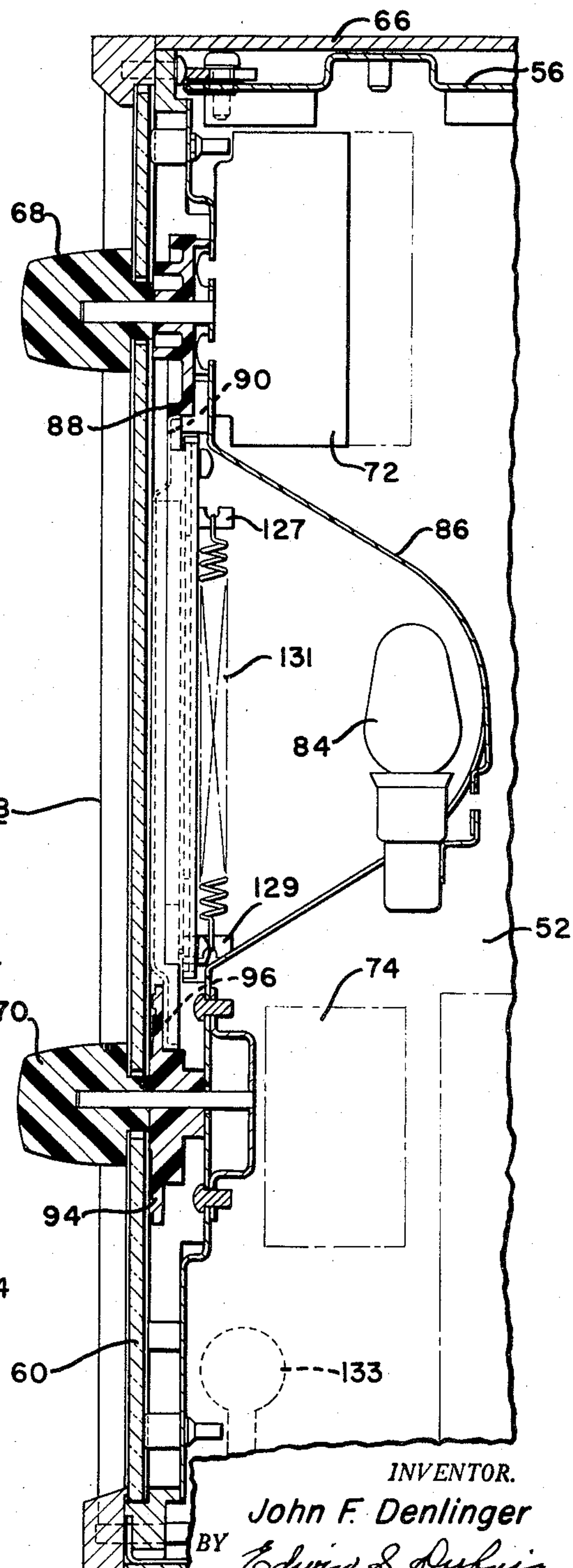
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**Fig. 2**



**Fig. 3**

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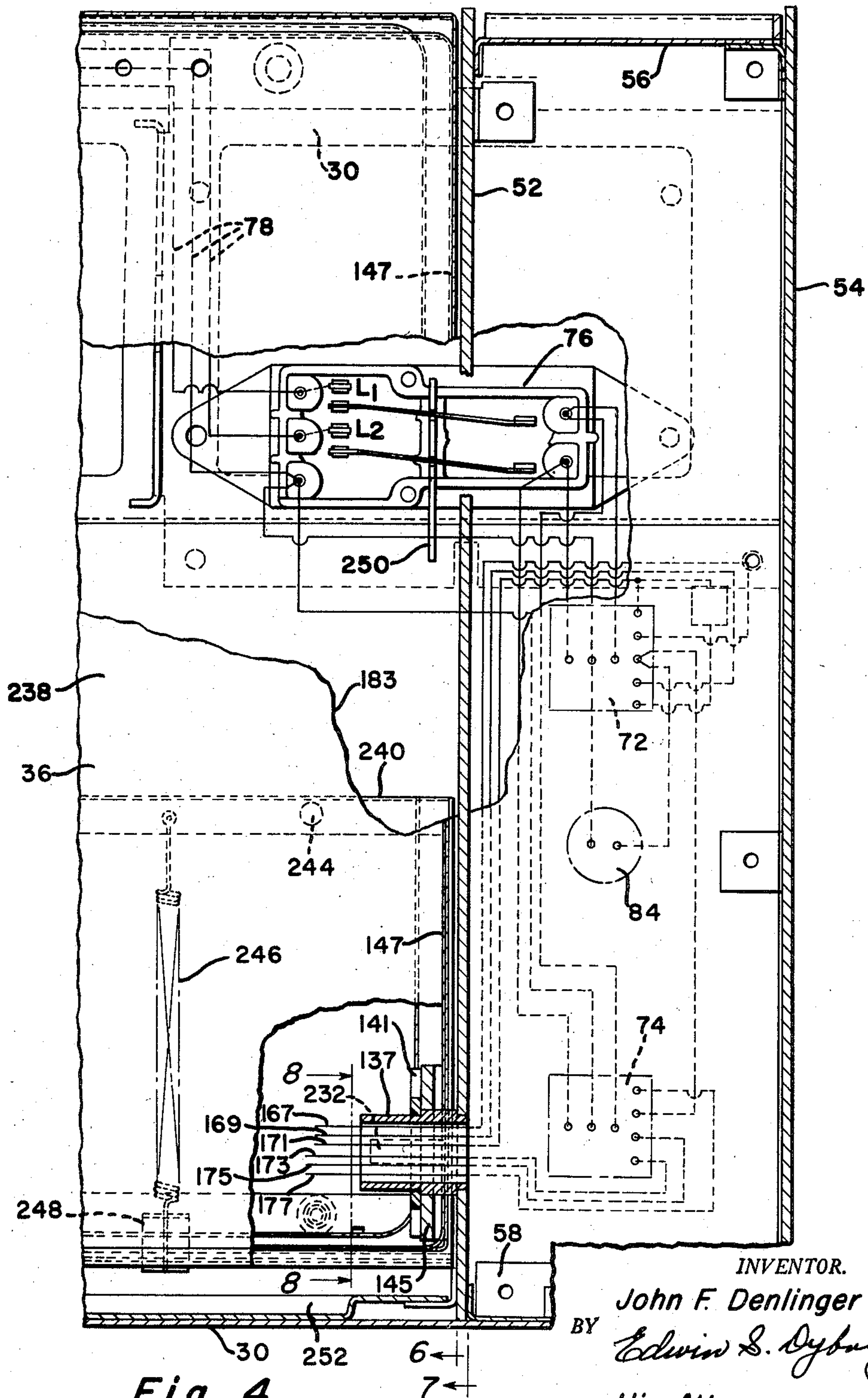
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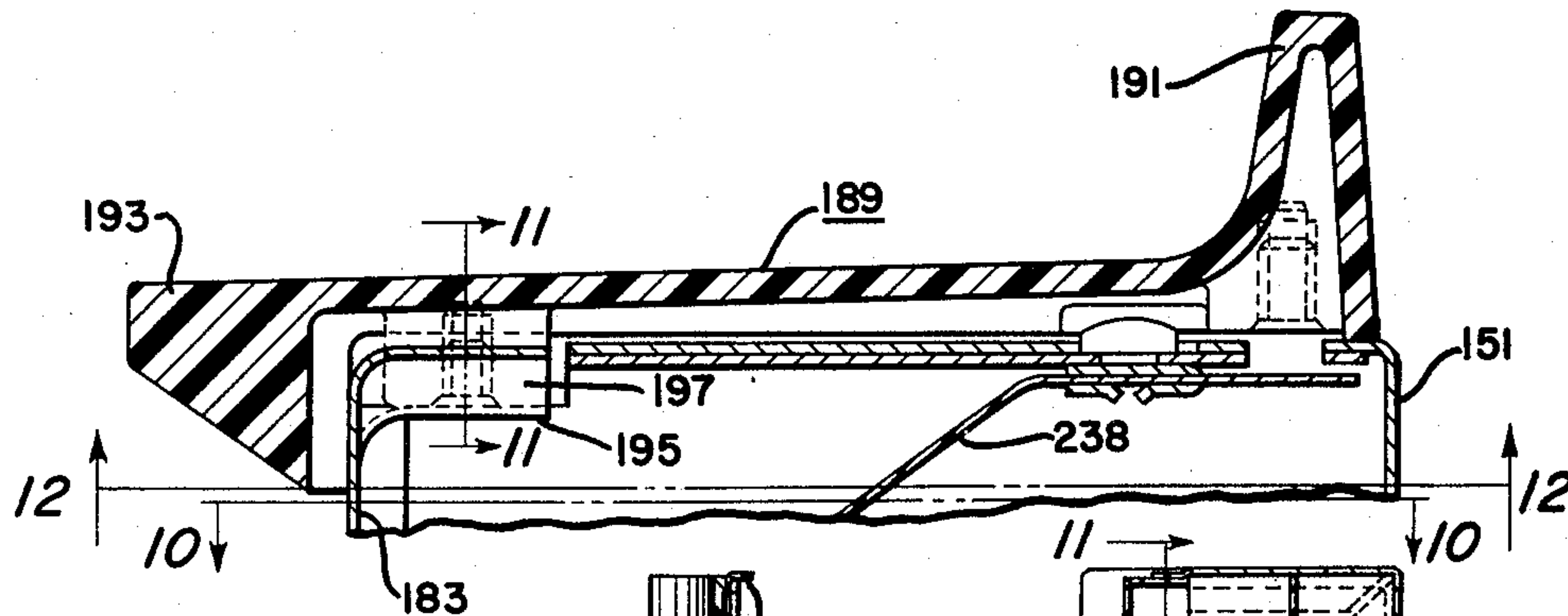


Fig. 9

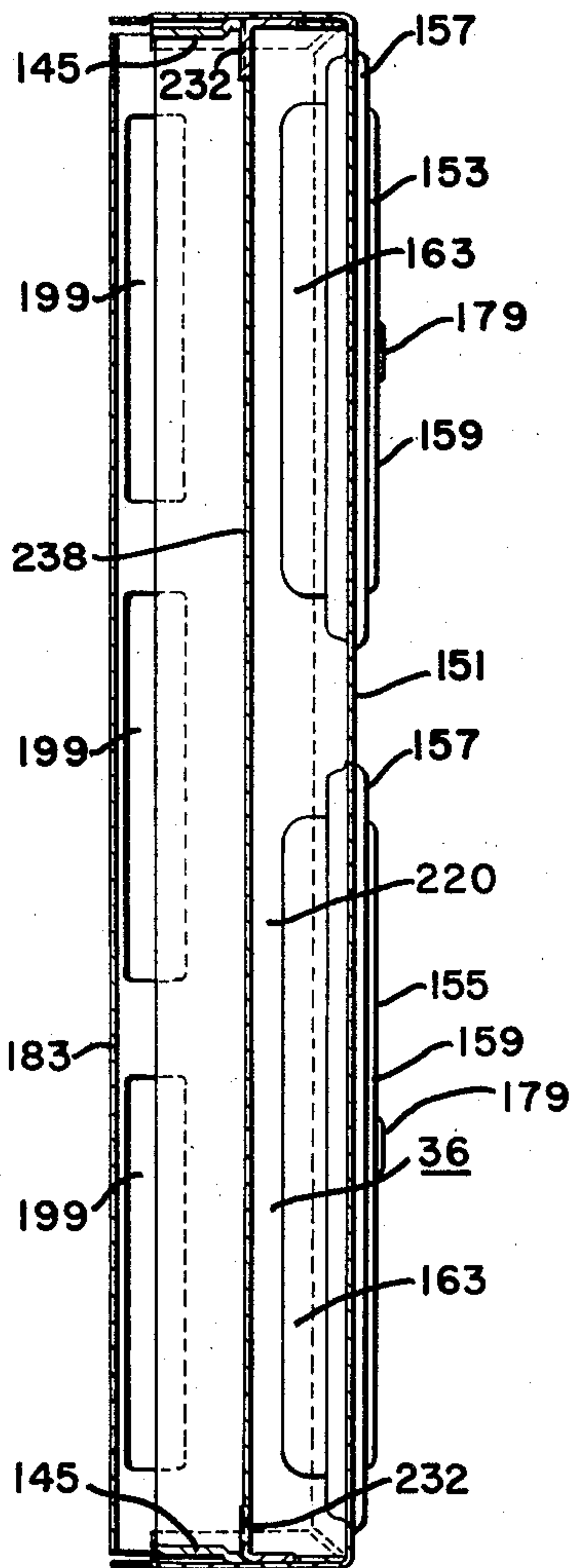


Fig. 10

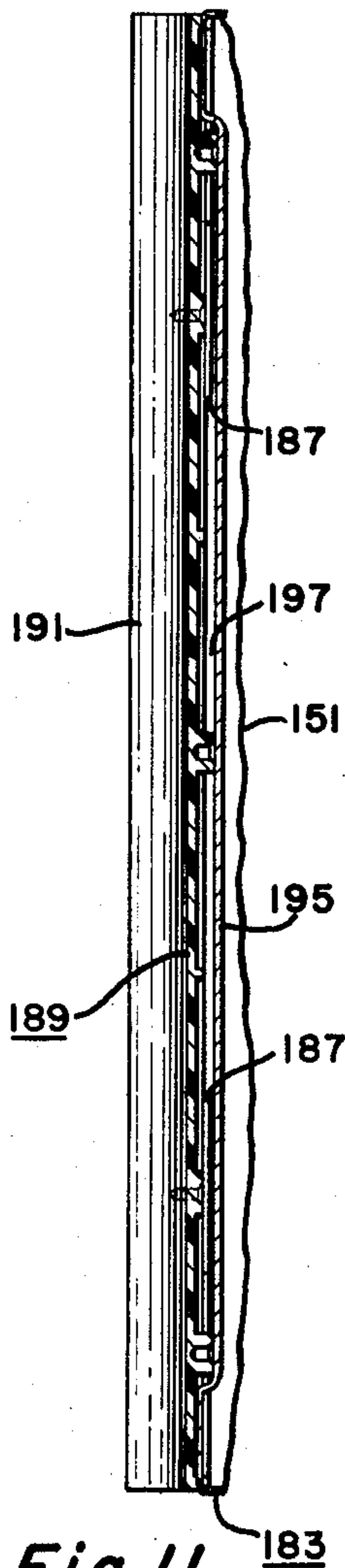


Fig. 11

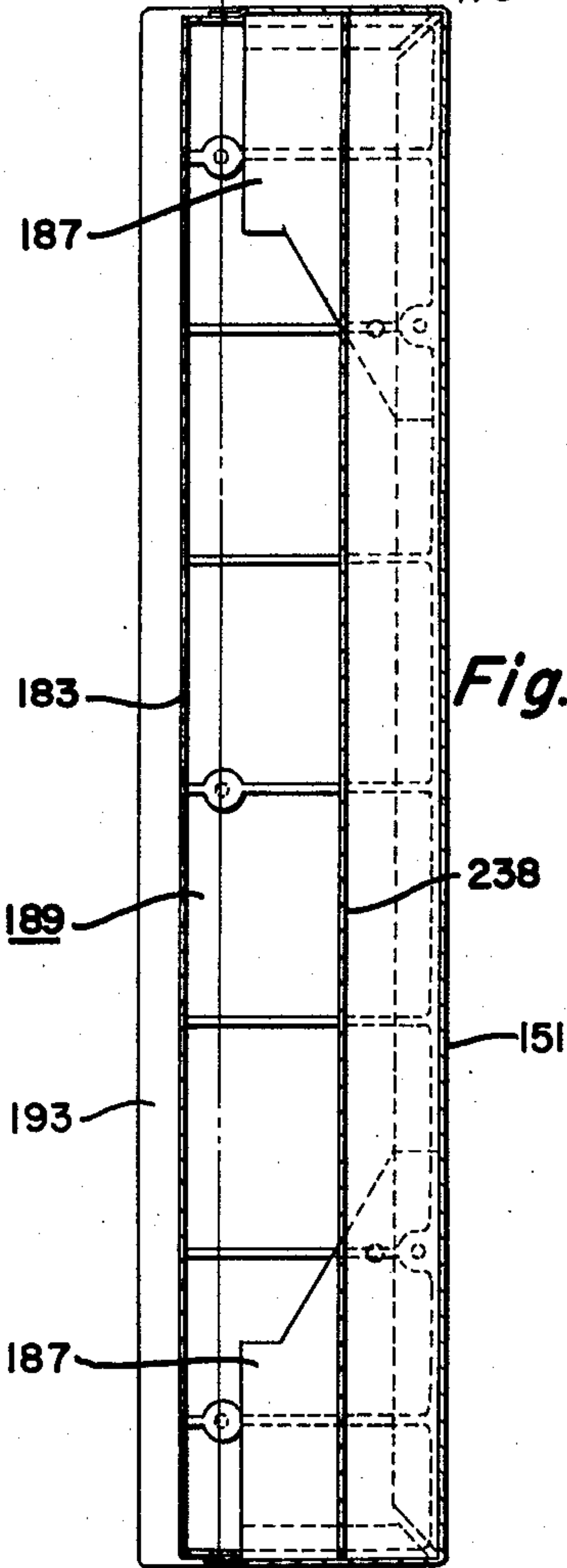


Fig. 12

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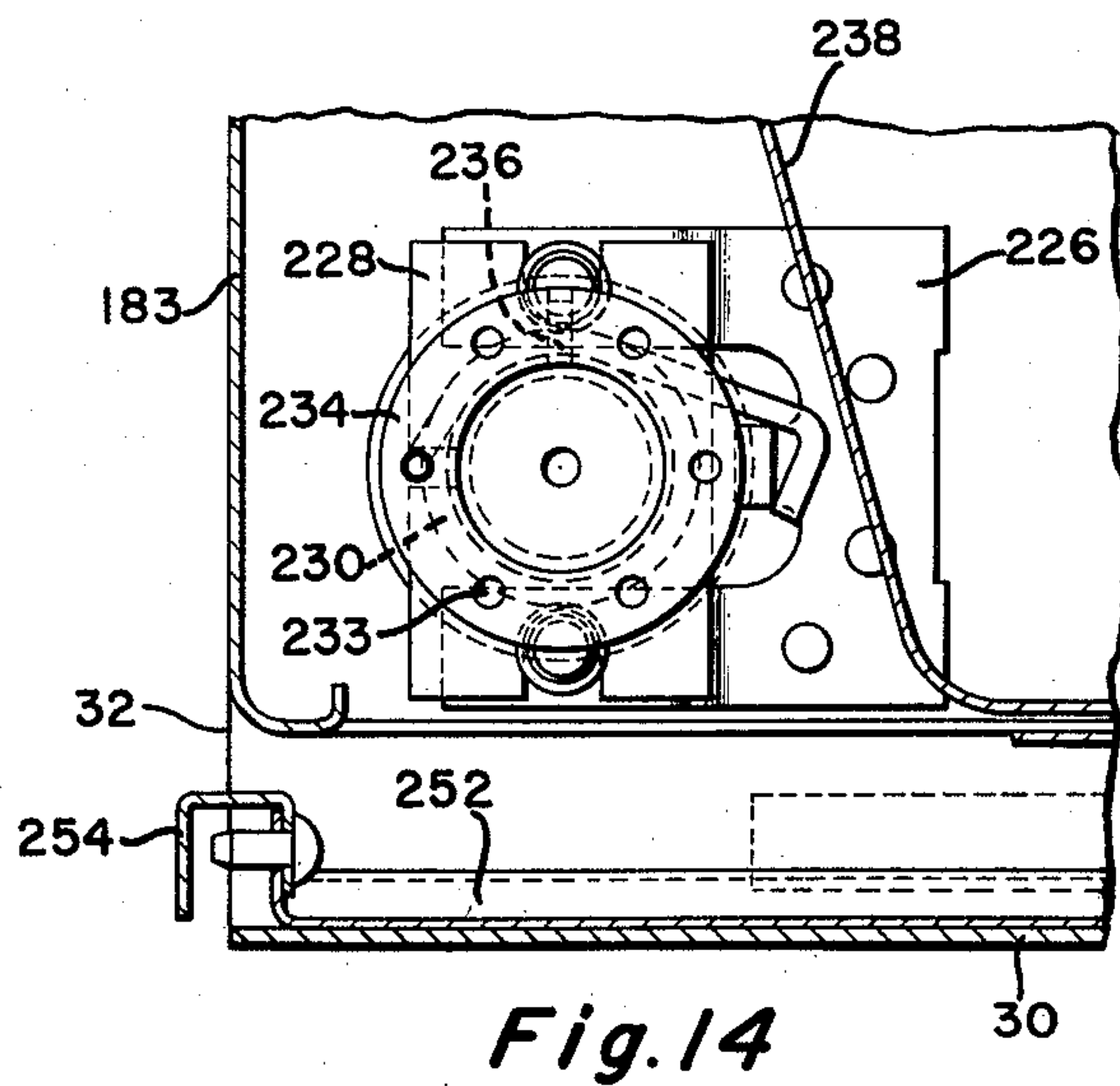
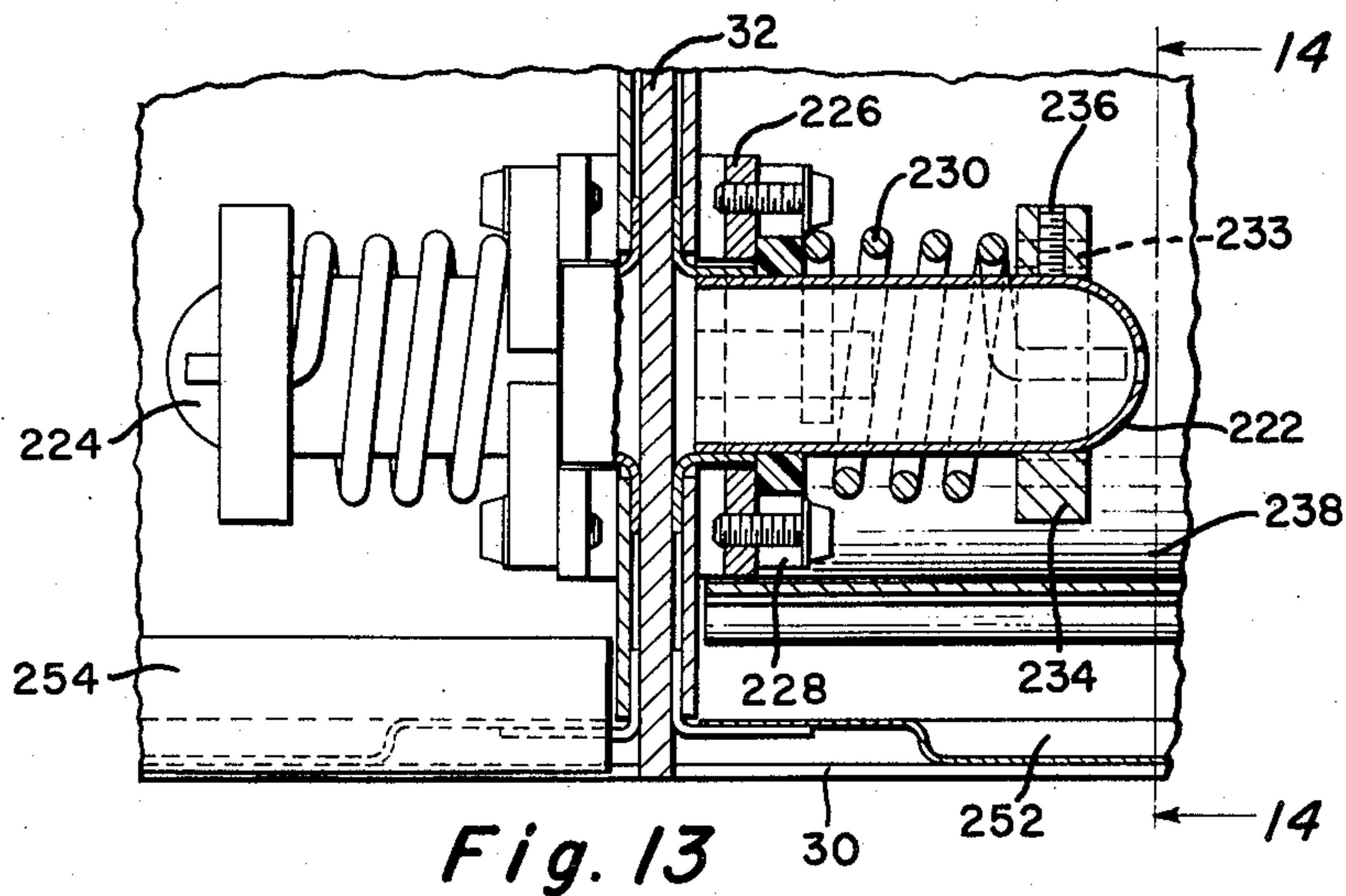
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SURFACE HEATER

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6 Sheets-Sheet 6



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2,850,614

## SURFACE HEATER

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Application May 22, 1956, Serial No. 586,473

12 Claims. (Cl. 219—37)

This invention relates to a domestic appliance and more particularly to the fold-back type of surface heaters resting upon but constructed separately from the counter top work surface.

In order to economize in work space in the kitchen there has been introduced the fold-back type of surface heaters in which the surface heaters are folded outwardly so as to lay flat upon a counter top when in use and to fold back to a vertical storage position when not in use.

It is an object of my invention to group and compact such fold-back surface heater units in such a way as to minimize the length and area of the counter top space occupied by such units.

It is another object of this invention to provide a pivoting arrangement for surface heaters in which stresses applied to the continuous connections as a result of the pivoting are minimized.

It is another object of this invention to provide a pivoting arrangement for surface heaters in which the hydraulic thermostat bulb and its capillary tube connection may be readily removed with a minimum of disassembly and in which the stresses thereon as a result of the pivoting are minimized.

It is another object of this invention to provide a control arrangement having a plurality of surface heaters in which the indicators and controls are symmetrically arranged in an attractive fashion.

It is an other object of this invention to provide a convenient arrangement for catching and removing loose food particles from the fold-back type of surface heaters and the adjacent structure.

These and other objects are attained in the form shown in the drawings in which two pivoting fold-back units each having two surface heaters are grouped together to make an attractive layout. The controls and indicators are provided in a housing in each end of the assembly. The length of the units is minimized by eliminating the controls between the surface heaters and placing all the controls at the opposite ends. A hollow pivoting pin arrangement is provided between the control structure and the fold-back unit structure into which passes the electrical conduits for the adjacent two units as well as the capillary tube connecting the thermostat bulb with the hydraulically operated switch unit to provide thermostatic control of one or more of the surface heaters. The hollow pivoting pin is provided with axially extending slots which register with similar slots in the bearing to permit removal of the capillary tube connecting the thermostat bulb and hydraulically actuated switch.

The units are arranged to provide concealed ventilation to minimize the effect of heat upon the counter top. A crumb tray is provided beneath each fold-back unit to catch any crumbs which may fall from the units. In addition the rear surface of the unit is fastened to a pivoted shield which prevents crumbs and foreign matter from dropping behind the units in either the vertical or hori-

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zontal position. The entire unit may be connected to a single power connection to minimize installation costs.

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 form of the present invention is clearly shown.

In the drawings:

Figure 1 is a perspective view of a counter top fold-back surface heater assembly embodying one form of my invention;

Figure 2 is a front view of one of the control assemblies;

Figure 3 is a vertical sectional view of one of the control assemblies;

Figure 4 is a front view of the right end of the assembly with the front and covers removed and showing portions thereof in section;

Figure 5 is a fragmentary sectional view taken along the line 5—5 of Figure 2;

Figure 6 is a vertical sectional view taken along the line 6—6 of Figure 4;

Figure 7 is a fragmentary sectional view with the unit folded down as in Figure 1 taken along the line 7—7 of Figure 4;

Figure 8 is a fragmentary sectional view taken along the line 8—8 of Figure 4;

Figure 9 is a fragmentary vertical sectional view through the top of one of the fold-back units when in the vertical position;

Figure 10 is a sectional view taken along the line 10—10 of Figure 9;

Figure 11 is a sectional view taken along the line 11—11 of Figure 12;

Figure 12 is a sectional view taken along the line 12—12 of Figure 9;

Figure 13 is a view partly in section and partly in elevation showing the pivoting arrangement at the center of the assembly for the two fold-back units; and

Figure 14 is a fragmentary view taken along the line 14—14 of Figure 13.

Referring now to the drawings and more particularly to Figure 1, there is shown a counter top 20 upon which is supported a left hand fold-back unit 22 provided with a control housing 24 at the left end and a second fold-back unit 26 provided with a control housing 28 at the right end. As shown in Figures 4 and 6 there is provided a single sheet member 30 forming the rear and bottom wall structure of each unit. The bottom of this sheet member 30 is adapted to be fastened by wood screws or bolts to the counter top 20. The center of the combined wall structure 30 has connected thereto the common center plates 32 extending between the fold-back units 34 and 36 and fastened to the member 30.

The rear member 30 has an upward portion 38 which is offset forwardly by forward and upward 90° bends and is covered by a folded back top portion 40 wormed by a rearward 90° bend. This forms a chamber 41 which is enclosed by a vertical rear plate or sheet 62 at the end containing the disconnect switch. The forward offset portion 38 is provided with a large aperture therein providing access to the connecting connectors. This portion is covered by the ornamental cover 42 of thin stainless steel which hooks over the top of the box shaped portions formed by the parts 38 and 62. This cover 42 has a hook at the rear and an enlarged square forwardly extending top rail portion 46 forming a stop to limit the movement of the fold-back units 34 and 36 to the vertical position and keeping the surface heater 159 away from the remainder of the structure including the parts 42, 38, 50. Beneath the almost square rail portion 46, the cover 42 extends downwardly and covers the front of portion 38. It is fastened in place by the spring clips 48



extending from the rear of the ornamental trim strip 50 through apertures in the vertical offset portion 38.

Also fastened to the rear wall 30 at the opposite ends are the vertical plates 52 which form the inner wall of the control housings 24 and 28. A second vertical plate 54 forms the outer side walls of the control housings. These plates 52 and 54 are connected together and to the rear wall 30 by the top structural member 56 and a bottom structural member 58. The front of each control housing is provided by a glass panel 60 held in place by an ornamental rectangular frame 64. The glass panel 60 may be generally opaque with the exception of the two rows 93 and 99 of clear windows arranged vertically on each side. Each control compartment is also provided with a top cover 66.

The glass panels 60 are each provided with apertures which are covered by the control knobs 68 and 70. These handles connect directly to operating shafts extending through the apertures in the panel 60 rearwardly to the selector surface heater switches 72 and 74 located behind the panel 60 in the control compartment. As shown best in Figure 4, these two selector switches 72 and 74 connect to the double pole, off-on switch 76 which is connected by the three conductors 78 extending through the top portion of the rear wall 30 to the double pole, off-on switch 80 located at the opposite end of the assembly as shown in Figure 1. This off-on switch 80 is connected by a conduit 82 containing 3 conductors which connect through a suitable plug to a suitable supply receptacle connection. This makes it necessary to provide only one electrical receptacle for the entire assembly.

The selector switches 72 and 74 also connect to and control the pilot light 84 which is also used to illuminate the glass panel 60. This pilot light 84 projects through an aperture into the focal point of the flat reflector 86 which has its upper and lower edges connected to the supports for the switches 72 and 74.

The knob shaft of each of the switches is provided with cams located between the glass panel 60 and the housings of the switches 72 and 74. The knob 68 operates a cam 88 which engages the follower 90 provided with a plurality of horizontal slots 92 arranged in a vertical column on its left side. These slots 92 are adapted to be moved successively into registration with the clear windows 93 on the left hand side of the glass panels 60. By this arrangement, each of the windows indicate the energization of the corresponding surface heater at one of its six heating rates. The lower knobs 70 operate a similar cam 94 which in turn engages and operates the follower 96 having on its right side a similar vertical column of horizontal slots 98. These slots are adapted to register successively with the clear windows 99 on the right side of the glass panel 60 to indicate energization of the right surface heater of each unit at one of the six heating rates.

The turning of either of the knobs 70 or 68 to any one of the heats will cause the energization of the pilot light 84. The followers 90 and 96 on their adjacent edges have rearwardly turned flanges which ride in adjacent parallel grooves 121 and 123 in the structural member 125 of polyamide material which connects the upper and lower portion of the reflector and switch mounting member 86. The followers 90 and 96 each have rearwardly extending projections 127 and 129 which are connected by a tension coil spring 131 so as to keep the followers in engagement with their respective cams. The projection 129 is on the lower portion of the follower 90 while the projection 127 is upon the upper portion of the follower 96.

The wall 52 is provided with a vertical keyhole slot 133 which at its lower end opens into the forwardly extending slot 135 at the bottom of the plate 52 as shown in Figures 7 and 8. Bonded to the rounded portion of the keyhole slot 133 is a hollow pivot pin 137

having an axially extending slot 139 opening directly into the slot 133. A bearing plate 141 of polyamide or nylon material is rotatably mounted upon the hollow pivot pin 137 against the inner shoulder thereof. This bearing plate 141 is also provided with a slot 143 which registers with the slots 139 and 133 when the units 34 and 36 are folded forwardly to their horizontal position as shown in Figure 1. The bearing member 141 is fastened to a U-shaped bracket 145 which in turn fastens to the adjacent portion of the side wall 147 of the unit 36. The side wall 147 is provided with a notch 149 extending to and surrounding the hollow pivot pin 137.

The top and side walls of the unit 36 are integral and are formed of a sheet member 151. The top of this sheet member 151 is provided with two large apertures which receive the surface heater unit assemblies 153 and 155. Each of these assemblies (see Figure 6) include a trim ring 157, a spirally shaped sheathed tubular heating element 159, a heating element support 161 and a drip pan 163. The heating element 159 extends to a terminal 165 having three conductors 167, 169 and 171 extending from it. The heating element 159 of the surface heater assembly 153 has the conductors 173, 175 and 177 extending from it. In addition the central portion of the support 161 is ring shaped and encircles a spring mounted hydraulic bulb 179 which is adapted to press against the bottom of any vessel which rests upon the heater element 159. This bulb 179 is connected by a capillary tube 181 which extends through the hollow pivot pin 137 to the lower switch member 74. The conductors 167 to 177 inclusive also pass through the hollow pivot pin 137 along with the capillary tube 181. This portion of the conductors may be enclosed within a sheet or wrapping of electrical insulating material.

If it is desired to remove the switch 74, the capillary tube 181 and the bulb 179, the unit 36 may be folded down forwardly. The knobs 68, 70, the frame 64 and the glass panel 60 are removed. Its bottom member 183 is then removed so that the bulb 179, the capillary tube 181 and the switch 72 may be removed by passing the capillary tube 181 out through the slots 139, 133 and 135. This entire assembly including the switch 74, the capillary tube 181 and the bulb 179 may be then removed as a unit without any disconnection and replaced with a new part.

The bottom member 183 overlaps the bottoms of the side walls of the sheet member 151. The member 151 is provided with integral gussets 187 at its front corner. The top or the front members 189 of the units 34 and 36 are molded of a suitable plastic. This plastic has a forwardly or upwardly extending gripping bead 191 and a bottom projection 193 adapted to engage the counter top 20 to hold the remainder of the bottom 183 of the units 34 and 36 spaced away from the top surface of the counter top 20.

The bottoms of the units 34 and 36 are spaced about one-half inch from the counter top 20 to provide an air space between the bottoms of the units and the counter top. This prevents the scorching of the counter top by heat from the surface heaters.

The mid portions of the forward or upper edge 195 of the bottom 183 are indented away from the plastic member 193 so as to provide an air inlet 197 into the interior of the unit 36 for cooling purposes. The air may pass through the interior of the unit and out through the central opening in the drip pan 163. The units 34 and 36 also contain a baffle 238 in the form of a sheet metal partition between the top and bottom of each unit. This baffle 238 is located beneath the drip collectors and minimizes the downward flow of heat from the surface heaters and keeps the bottoms of the units sufficiently cool. The air may also enter the unit 36 through the three large apertures 199 in the rear wall 220 of the unit 36.

The opposite side wall of the unit 36 is provided with an aperture receiving the hollow pivot pin 222 which has



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its flanged open end fastened to the central vertical wall 32. A second hollow pivot pin 224 is fastened to the opposite side of the wall 32 for pivotally supporting the unit 34. The left side wall of the unit 36 is provided with a U-shaped bracket 226 similar to the bracket 145 in Figure 8. A nylon bearing plate 228, similar to the bearing plate 141, is fastened by screws to the bracket 226. The weight of the unit 36 is counter balanced by a torsion spring 230 having one end connected to the projection 232 upon the bracket 226 while the other end extends through one of the apertures 233 in the ring 234 fastened to the hollow pivot 222 by a set screw 236. A corresponding bearing and counter balance spring arrangement is provided with the hollow pivot pin 224. The ring 236 can be rotated to any angular position to obtain the desired spring tension in the torsion spring 230. Any one of the series of apertures 233 in the ring 236 can receive and hold the one end of the counter balance spring 230. The tension of the spring 230 may be changed at any time by either inserting the adjacent end of the spring 230 into a different one of the several different axially extending circumferential spaced holes 233. Also the ring 236 may be turned about the axis of the pivot pin 222 to obtain greater adjustment of its tension so that the desired amount of counter balance may be readily obtained. The corresponding spring and ring for the pivot pin 224 are similarly constructed and adjusted.

To prevent crumbs from falling down behind the units when they are folded back against the projection 46, a sheet metal shield 240 is hinged by the hinge pins 242 to the rear or bottom edge of the top surface of the sheet member 151 of the unit 36 and the corresponding sheet member of the unit 34. The upper rear portion of the shield 240 is bent downwardly and pierced so as to receive a plurality of buttons 244 of polyamide or nylon material. A light tension type coil spring 246 is hooked at its upper end to one of the buttons 244 upon the upper portion of the shield 240 and is connected at its lower end to a hook 248 which extends across the rear or bottom wall 220 and is hooked into one of the openings 199 of the unit 36. This spring 246 holds the shield 240 so that the buttons 244 are always maintained in contact with the rear wall 30. Thus any crumbs or any material on the surface of the units 34 and 36 will fall on to the shield 240 and will prevent such material from getting into the back of the units where it might be relatively inaccessible and difficult to remove.

The shield 240 is also used to operate the off-on switch or disconnect switch 76. The disconnect switch 76 has an operating bar 250 of electrical insulating material which extends downwardly into the upper position of the shield 240. Thus the upward movement of the shield 240 will raise the actuating bar 250 and move the disconnect switch 76 to its closed circuit position to connect both switches 72 and 74 to the supply conductors 78. Whenever the units are folded back the shield 240 moves downwardly away from the actuated bearing 250 thus allowing the disconnect switch 76 to move downwardly to the disconnect position to disconnect the switches 72 and 74 from the supply conductors.

To further prevent the accumulation of crumbs and dirt in the bottom of the assembly there is provided a removable shallow crumb tray 252 extending between the walls 32 and 52 beneath the unit 36 and is slidable upon the bottom of the sheet member 30. A second similar tray is provided between the corresponding walls beneath the unit 34. This shallow tray 252 is provided with an inverted U-shaped raised ornamental front 254 which substantially closes the space beneath the units when they are in their vertical position so as to hide the space beneath the units. This makes a useful ornamental arrangement which keeps the assembly clean and when removed also provides the necessary space for removing the capillary tube 181 through the slots 135, 133, 139 communicating

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with the hollow pivot pin 137. In this way a very useful compact surface heater arrangement is provided which is attractive in appearance and economical to manufacture.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. A heating appliance including an upwardly extending wall, a surface heater having a pivotal connection with a lower portion of said wall, a shield connected to and movable in consequence to the movement of said surface heater and extending upwardly along said wall, said surface heater having a horizontal position for normal use and a vertical position for storage when not in use, and switch means mounted upon said wall having operating means in the path of movement of and operated by said shield for deenergizing said surface heater in the vertical position.

2. A heating appliance including an upwardly extending wall, a surface heater provided with a support, a hollow pivotal connection connecting said surface heater support and said wall, said connection including a hollow pivot pin having a longitudinal slot therein and a bearing for the pivot pin having a longitudinal slot therein, said wall having an open ended slot extending to one of the slots of said pivotal connection, and electrical conductor means extending from said wall through said hollow pivot pin and connecting to said surface heater, said slots registering in one pivotal position of said support to provide an avenue for the withdrawal of said electrical conductor means.

3. A heating appliance including an upwardly extending wall, a surface heater provided with a support, a hollow pivotal connection connecting said surface heater support and said wall, said connection including a hollow pivot pin having a longitudinal slot therein and a bearing for the pivot pin having a longitudinal slot therein, said wall having an open ended slot extending to one of the slots of said pivotal connection, a temperature sensing means associated with said surface heater for sensing the temperature of cooking utensils supported thereon, a control device for the surface heater connected to the wall structure, and a linear connection extending from said temperature sensing means through said hollow pivot pin to said control device, said slots registering in one pivotal position of said support to provide an avenue for the withdrawal of the linear connection from the pivotal connection.

4. A heating appliance including an upwardly extending wall, left and right surface heaters having a pivotal connection with the lower portion of said wall, a control housing located at one end of said wall having a first control device located in the upper portion and a second control device located in the lower portion, electrical conductor means connecting one of said surface heaters to the first control device and connecting a second surface heater to the second control device, said control housing having a first vertically slidable indicating means located on the left side operated by the control device connected to the left surface heater and having a second vertically slidable indicating means located on the right side operated by the control device connected to the right surface heater, and manual manipulating means for each of said control devices.

5. A heating appliance including an upwardly extending wall, a surface heater provided with a support, a hollow pivotal connection connecting said surface heater support and said wall, said connection including a hollow pivot pin having a longitudinal slot therein and a bearing for the pivot pin having a longitudinal slot therein, said wall being provided with a control device adjacent one end containing a control device, electrical conductor means extending from said surface heater through said hollow pivot pin into said control housing and connecting to said control



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device, said upwardly extending wall having a portion supporting said bearing, said portion having an open ended slot extending to the slot in said bearing providing an avenue for quick removal of said electrical conductor means, said longitudinal slots in said pivot pin and bearing registering with said open ended slot in one pivotal position of said support to provide an avenue for removing said connection.

6. A heating appliance including an upwardly extending wall, a surface heater provided with a support, a hollow pivotal connection connecting said surface heater support and said wall, said connection including a hollow pivot pin having a longitudinal slot therein and a bearing for the pivot pin having a longitudinal slot therein, said wall being provided with a control device adjacent one end containing a control device for controlling the energization of said surface heater, a temperature sensing means associated with said surface heater for sensing the temperature of cooking utensils supported thereon, and a connection extending from said temperature sensing means through said hollow pivot pin into said control housing and connecting with said control device, said wall having a portion extending between said control housing and said surface heater support providing a support for said bearing and having an open ended slot extending to the slot in said bearing for removing said connection, said longitudinal slots in said pivot pin and bearing registering with said open ended slot in one pivotal position of said support to provide an avenue for removing said connection.

7. A heating appliance including an upwardly extending wall, a generally flat rectangular box-shaped sheet metal structure provided with a surface heater upon one of the larger faces, a pivotal connection connecting said structure to the lower portion of said wall, said structure being provided with front and rear ventilating openings, and an ornamental plastic front at the front of said structure spaced from and located in front of said front ventilating openings.

8. A heating appliance including an upwardly extending wall, a surface heater provided with a support, a pivotal connection pivotally connecting said wall and said support to permit the heater and support to fold back against the wall or to pivot forwardly, and a removable tray located and supported forwardly of said wall and extending laterally substantially coextensively beneath and free of the support when back against the wall.

9. A heating appliance including an upwardly extending wall, a surface heater provided with a support, a pivotal connection pivotally connecting said wall and said support to permit the heater and support to fold back against the wall or to pivot forwardly, a removable tray located forwardly of said wall extending laterally substantially coextensively beneath the support when back against the wall, said tray having an upturned front edge substantially aligned with the side of the support exposed when the heater and support are folded back against the

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wall, and means for slidably supporting said tray beneath and free of said support when back against the wall.

10. A heating appliance including an upwardly extending wall, a box-shaped support provided with a surface heater upon one face and a removable wall portion upon the opposite face, a hollow pivotal connection pivotally connecting said support and said wall, said connection including a hollow pivot pin having an axially extending slot therein and a bearing for said pin also having an axially extending slot therein, one of the wall portions of said support having an open ended slot extending between said removable wall portion and one of the slots of said pivotal connection, a temperature sensing means associated with said surface heater for sensing the temperature of cooking utensils supported thereon, a control device for the surface heater connected to the wall structure, and a linear connection extending from said temperature sensing means through said hollow pivot pin to said control device, said slots registering in one pivotal position of said support to provide an avenue for the withdrawal of the linear connection from the pivotal connection.

11. A heating appliance including an upwardly extending wall, a surface heater having a pivotal connection with a lower portion of said wall, a shield connected to and movable in consequence to the movement of said surface heater and extending upwardly along said wall, said surface heater having a horizontal position for normal use and a vertical position for storage when not in use, and switch means mounted upon said wall having operating means in the path of movement of and operated by said shield for opening said switch means in the vertical position.

12. A heating appliance including an upwardly extending wall, a surface heater having a pivotal connection with a lower portion of said wall, illuminating means on said appliance including a light, a shield connected to and movable in consequence to the movement of said surface heater and extending upwardly along said wall, said surface heater having a horizontal position for normal use and a vertical position for storage when not in use, and switch means mounted upon said wall having operating means in the path of movement of and operated by said shield for deenergizing said light in the vertical position.

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