

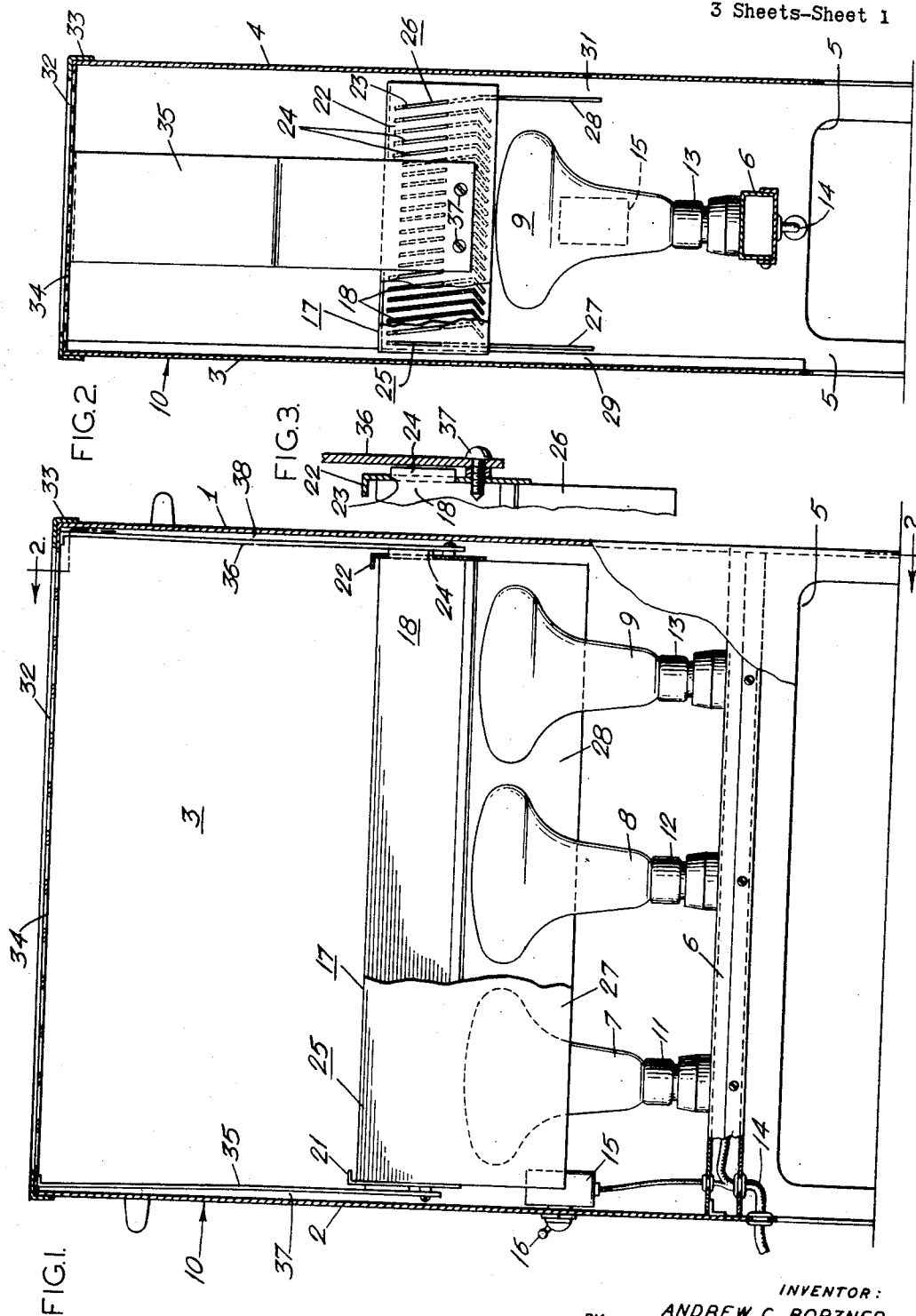
May 24, 1960

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ELECTRIC SPACE HEATERS

2,938,101

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3 Sheets-Sheet 1



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FIG. 5.

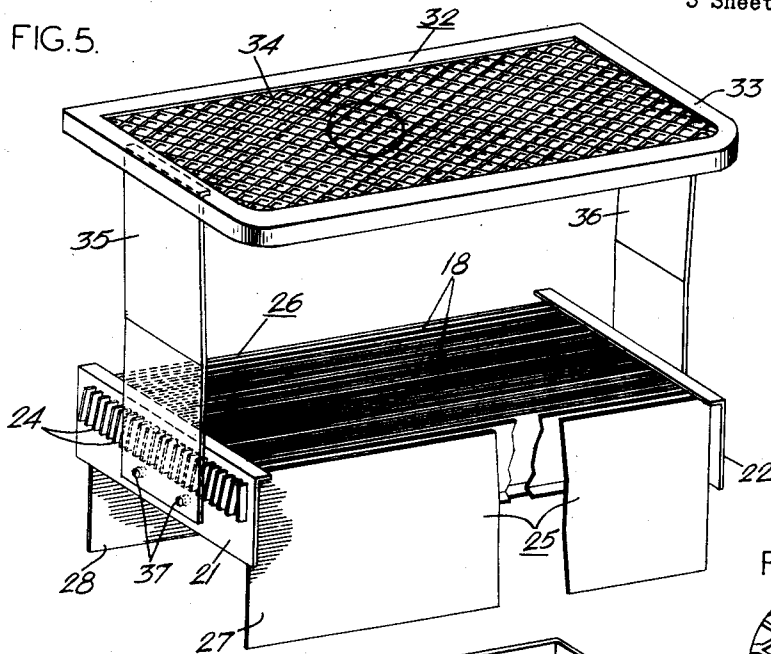


FIG. 4.

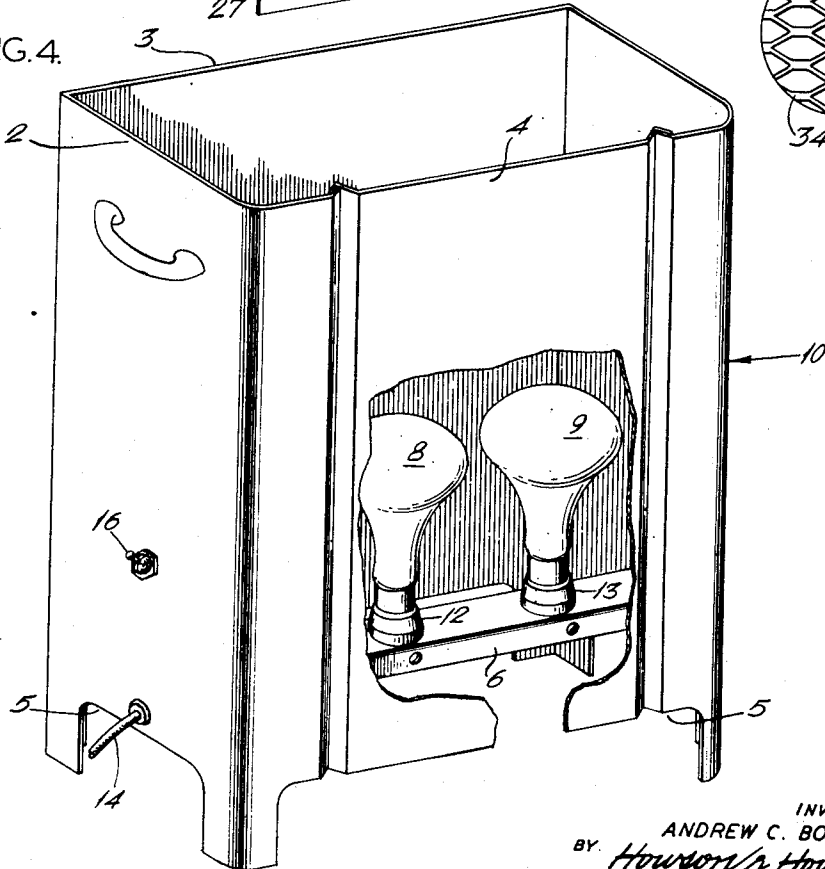
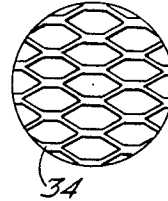


FIG. 6.



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FIG. 7.

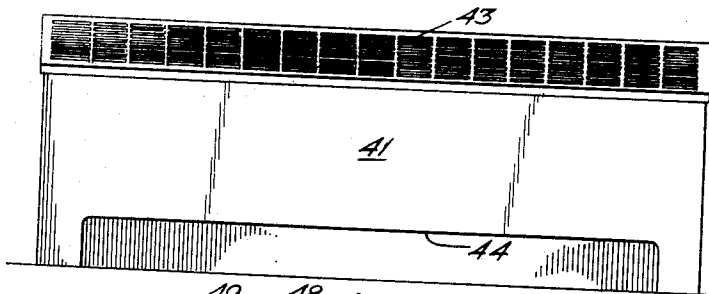


FIG. 9.

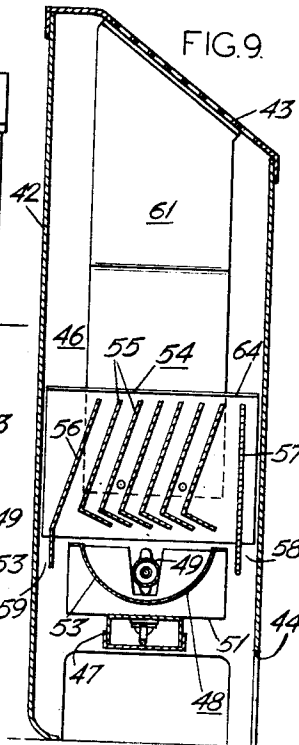


FIG. 10.

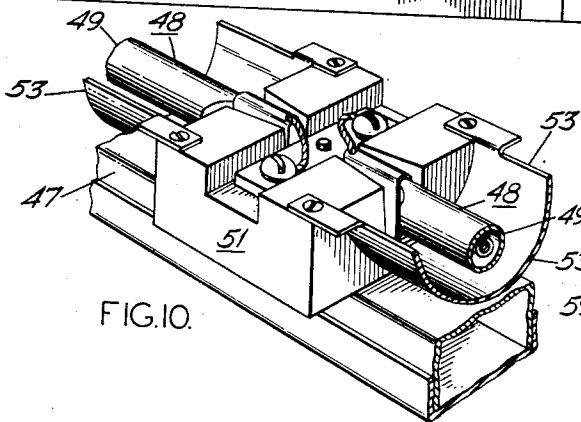
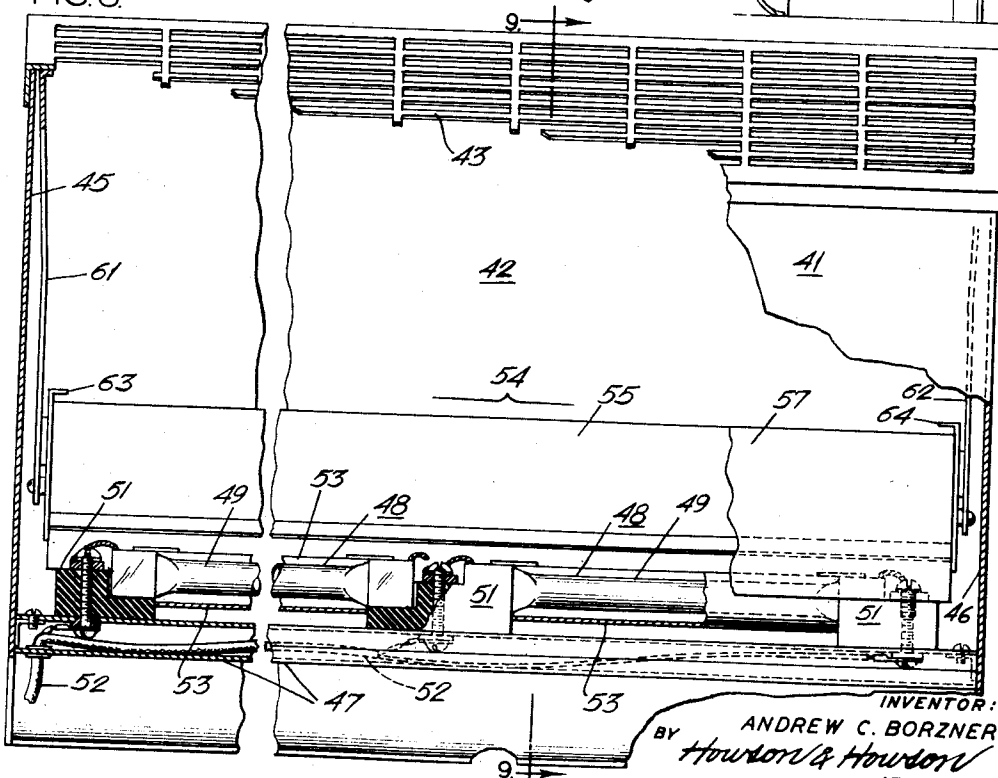


FIG. 8.



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2,938,101

ELECTRIC SPACE HEATERS

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2 Claims. (Cl. 219—34)

This invention relates to space heaters of the general type disclosed in my United States Patent No. 2,520,830. The present invention consists of certain improvements in the type of heater therein disclosed.

One object of the invention is to provide a heater of the stated type utilizing a primary radiant heat source wherein substantially all of the heat from said source is transferred from the heater to the surrounding space by convective flow of air through the heater.

To this end another object of the invention is to provide a heater of the stated type wherein the primary radiant heat source or sources together with all of the elements which participate in the transfer of the heat energy from said source to the air as it flows through the heater are effectively conductively divorced from the exposed surfaces of heater with complete elimination of radiation from said surface.

A further object of the invention is to provide a space heater of the stated type wherein transfer of heat from the source to the air passing through the heater is by way of a heat absorber exposed to and receiving substantially all of the heat energy by radiation from the source, said absorber being conductively divorced and otherwise insulated from the outer housing of the heater in a manner to preclude transfer to the housing of any material part of the said heat.

Another object of the invention is to provide a heater of the stated type wherein the aforesaid heater absorber is arranged in the housing so as to provide for a continuous flow of convection air between the surfaces of the absorber and contiguous wall surface of the housing so as to preclude transfer of any material part of the heat in the absorber by radiation to the walls of the housing.

Another object of the invention is to provide a heater structure utilizing a source of electrical radiant energy as the primary heat source together with a heat absorber which receives substantially all of the heat from said source, wherein the said source and the absorber are arranged in vertical assembly such that the natural convective flow of air through the heater will pass successively over the source of radiant energy and over the surfaces of the absorber, the air in its normal upward flow removing the heat not only from the exposed surfaces of the electric elements which constitute the source but also from the absorber so that all of the heat from the source may be picked up by a normal convective flow of air without necessity for forced circulation means, and wherein further the absorber is mounted so that it may be detached through the top of the housing to afford access to the heat sources for cleaning and servicing.

Still another object of the invention is to provide a heater of the stated type comprising a grid like cover for the housing detachable from the latter but normally preventing access to the highly heated elements of the absorber and from which cover the absorber is suspended in the aforesaid non-conductive and effectively insulated relation to the side walls of the housing, said suspension

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affording also a convenient means for removing the absorber to afford access to the heating elements.

The invention resides also in certain structural details and arrangements hereinafter described and illustrated in the attached drawings, wherein:

Figure 1 is a vertical sectional view of a space heater made in accordance with the invention;

Figure 2 is a sectional view on the line 2—2, Figure 1;

Figure 3 is a fragmentary enlarged sectional view showing a detail of construction;

Figure 4 is a view in perspective and partly in section of the housing of the heater including the elements of the primary source of energy and with the top cover and the attached heat absorber removed;

Figure 5 is a view in perspective of the top cover and the depending elements of the heat absorber;

Figure 6 is a fragmentary view on an enlarged scale showing the structural form of the housing top cover;

Figure 7 is a front elevational view of a section of baseboard heater made in accordance with the invention;

Figure 8 is an enlarged front elevational view of the baseboard heater with a portion of the front wall broken away to show the heating elements;

Figure 9 is a sectional view on the line 9—9, Figure 8, and

Figure 10 is a fragmentary view in perspective on an enlarged scale showing details of the mounting for the electrical heating elements.

With reference to Figures 1 to 6 inclusive of the drawings, the heater therein disclosed as one embodiment of my invention comprises a shell or housing 10, preferably rectangular in form, as illustrated, and consisting of four walls numbered respectively 1, 2, 3, and 4. These walls form in effect a stack which is open at the bottom, by reason of openings 5 in the said walls, and open also at top.

Extending between the end walls 1 and 2 and supported on the latter in a position slightly above the tops of the openings 5 is a hollow bar 6. This bar forms a support for the electrical heating elements which in the present instance are three in number identified respectively by the reference numerals 7, 8 and 9. These elements are shown as standard infra-red heat lamps preferably of the reflector type which are supported in conventional sockets 11, 12 and 13 attached to the bar 6. Access to these lamps is by way of the open top of the housing, as hereinafter more fully described. In the present instance the hollow bar 6 forms a receptacle for the wiring 14 by which the sockets may be connected to a suitable source of electrical energy, and in the present instance the connection is controlled by a switch 15 attached to the interior of the end wall 2 and having its operating element 16 at the outside of the housing, see Figure 1.

The lamps 7, 8 and 9 are directed vertically upwardly in the housing. Immediately above the lamps in a position relative to the latter most favorable to a concentration of the heat rays upon the surfaces thereof is a heat absorber of the character disclosed in my aforesaid United States Patent 2,520,830. This heat absorber 17 consists essentially of a parallel assembly of heat-absorbing metallic plates 18. In the present embodiment the upper relatively long portions of these plates are set in close proximity to each other at an inclination to the horizontal of approximately 70°, and the relatively short lower portions of the plates are offset in the opposite direction at an angle of approximately 30°. This arrangement of plates provides a complete intercepting barrier to the heat and light rays from the tubes 7, 8 and 9 so that the rays necessarily impinge on the plates with resultant transfer of substantially all of the heat of the lamps to the absorber. The plates of the assembly form therebetween a series of narrow channels extending generally in upward

3 direction through which air may pass in normal convective flow through the absorber. Since substantially all of the radiant energy from the lamps is intercepted by the plates of the heat absorber, the latter constitutes the primary means for transfer of the heat generated in the lamps to the air passing by convection flow through the housing, which flow is supplied in ample volume through the openings 5 and moves upwardly in intimate contact with the extended heated surface of the plate assembly. That relatively small part of the radiant energy which is absorbed in the reflector area of the lamp and which tends to pass to the base and socket is continuously wiped away by the convection air and acts favorably to pre-heat the air before it contacts the surfaces of the absorber. This aids in the elevation of the air temperature in passage of the air through the absorber to the desired relatively high temperature.

As illustrated in the drawings, the heat absorber comprises in addition to the plates described above two end plates 21 and 22 which are slotted at 23, see Figure 2 and Figure 3, to receive projecting tongues 24 at the ends of the plates 18. By means of these tongues the plates are retained in the end plates 21 and 22 in the aforesaid assembly. The terminal plates 25 and 26 of the heat-absorber assembly are extended below the lower edges of the intervening plates 18 and in present instance below the edges of the end plates 21 and 22, and the depending portions 27 and 28 of these terminal plates 25 and 26 confine the upper ends of the lamps 7, 8 and 9 and are spaced inwardly from the walls 3 and 4 as best shown in Figure 2 to form with the inner surfaces of those walls channels 29 and 31 which provide for passage of air upwardly over the inner surfaces of the walls 3 and 4 by-passing the absorber plate assembly. Thus while the major portion of convection air passing upwardly from the bottom to the top of the housing stack flows between the plates 18 of the heat absorber, a certain amount of relatively cool air passes upwardly through the channels 29 and 31 and serves to insulate the walls 3 and 4 from radiant heat from the absorber assembly.

In accordance with the present invention I provide the housing 10 with a grid like cover 32 which seats detachably on the upper edges of the housing walls. In the present instance the cover consists of an angle frame 33 which defines the peripheral edge of the cover and which seats on the upper edges of the walls 1, 2, 3, and 4 of the housing, and an expanded metal or other sheet 34 which is secured at its edges in the frame 33. The physical form of the sheet 34 is well illustrated in Figure 6. Depending from each side of the frame 33 of the cover member 32 is a strap, 35 and 36 respectively, the lower ends of which are attached by screws 37 to the proximate end plates 21 and 22 of the absorber assembly described above. Like the terminal plates 25 and 26 of the plate assembly of the absorber 17, the strips 35 and 36 are in spaced relation to the walls of the housing, in this instance the walls 2 and 3, so that an air space or channel, 37 and 38 respectively, is provided between the strips and the said walls through which air may move upwardly along the surfaces of the walls and between the walls and the strips. Thus the absorber assembly is not only conductively divorced from the side walls of the casing but the latter are also effectively insulated from the transfer by radiation of any material amount of heat from the absorber source. It will be noted also that the channel 6 and the elements of the electrical circuit associated therewith, and also the switch 15, are located in the normal path of relatively cool air entering the housing stack through the openings 5 and flowing upwardly in the housing stack, and are maintained thereby at a relatively low temperature consistent with a high electrical efficiency in the circuit. Any heat tending to pass upward by conduction through the straps 35 and 36 from the absorber assembly to the cover 32 will be removed from these straps by the upwardly moving mass of convection

air passing through the stack as described. Positive conductive divorce of the absorber from the cover can be effected by forming the straps of non-conductive materials. The heated air passing upwardly from the absorber, while carrying away all of the heat generated in the lamps 7, 8 and 9, will not be at temperatures sufficiently high to heat the cover 32 to a critically high temperature unsafe to the human body.

The aforesaid construction affords a highly efficient space heater utilizing electrical energy through medium of a standard and commercially available radiant source, wherein substantially all of the heat generated at said source is transferred first by radiation to a heat absorbing member designed for subsequent efficient transfer solely by normal convective flow to the ambient air. The heater is characterized not only by a relatively high efficiency of heat transfer but also by the fact that the electrical heating elements as well as the heat absorbing assembly which receives the heat from the electrical elements for transfer by convection to the ambient air are effectively shielded from inadvertent contact with the human body.

In Figures 7 to 10 inclusive I have illustrated application of the principle of the aforesaid heater to the so-called baseboard heating. One baseboard unit is shown in front elevation in Figures 7, 8 and 9. It consists of a front wall 41; a rear wall 42 which when the unit is installed will lie against a wall surface; and a forwardly and downwardly inclined cover element 43. As shown in Figure 7 the front wall 41 is provided at the bottom with an opening 44 which is substantially coextensive lengthwise with the said wall. The housing of the unit comprises also end walls 45 and 46 which provide a support for a hollow bar 47 on which is mounted the electrical heating elements 48. In this case the heating elements take the form of tubular quartz infrared lamps 49 and the ends of which are mounted in conventional insulated receptacles 51 and through these receptacles are connected by wires 52 extending through the hollow bar 47 to a source of electrical energy not shown. Supported on the receptacles 51, one for each of the heating lamps 49, is a trough like housing or reflector 53 which intercepts the radiant heat emanating from the lamps 49 which does not pass directly to the heat absorber 54 positioned directly above the heating elements. The heat absorbed by the interceptor 53 is continuously wiped away by convective air flow through the opening 44 and upwardly through the housing and through the said absorber and has the same beneficial pre-heating effect as described above in connection with the lamps 7, 8 and 9.

The absorber 54 consists of the typical angular plate assembly similar to that described above, the said plates being designated in the present instance by the reference numeral 55. The terminal plates of this assembly, 56 and 57 respectively, are extended downwardly past the upper edges of the interceptor troughs 53 and with the front and rear walls 41 and 42 of the casing channels 58 and 59 through which relatively cool air passing upwardly along the said walls may pass in by-passing relation to the heating absorbing elements 55 of the absorber. This upward flow of relatively cool air along the inner faces of the front and rear walls in effect insulate those walls from the heating effects of the absorber 54. The interceptor 53 precludes direct radiant heating of the walls by the heating elements 49.

In accordance with the invention the absorber 54 is suspended from the grid-like cover 43 through the medium of straps 61 and 62 which attach at the lower ends to the end plates 63 and 64 of the absorber assembly. As in the previous embodiment the straps 61 and 62 are spaced from the approximate walls 45 and 46 of the housing to provide for flow of air upwardly along the walls and over the surfaces of the said straps. As in the previous instance the straps are relatively long and afford no effective conductive path for transfer of heat from

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the absorber to the cover 43. As in the previous device all of the heat energy generated in the lamps 49 is transferred convectively to the air flowing upwardly and by normal convection circulation through the casing from the openings 44 to the grid cover 43.

I claim:

1. A space heater comprising a casing open at the top and bottom and having side walls forming a stack for convective air flow, at least one radiant heating element mounted adjacent the bottom of said casing above the bottom open end of said casing in non-conductive relation with said side walls, reflector means associated with said radiant heating element operable to reflect heat from said element directly upward in said housing toward the top portion of said housing, means mounting said reflector means in non-conductive relation with said side walls, a plurality of spaced-apart heat absorbing elements extending longitudinally of said casing intermediate said radiant heat element and the open top end of said casing and positioned relative to said radiant heat element to intercept substantially all of the radiant heat emanating from said radiant heating element, said heat absorbing elements having an extended surface area exposed to the flow of air through said casing, a stack cover detachably mounted at the top of said casing over the open top end thereof, at least one mounting plate depending from said cover and interconnected with said heating absorbing elements to support said heat absorbing in spaced relation with the side walls of said casing, and extensions projecting downwardly from the heat ab-

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sorbing elements adjacent the side walls of said casing below the extended surface portion of the heat absorbing elements in parallel relation with the side walls of said casing and providing adjacent the side walls of said casing an air passage for the unrestricted flow of air through said casing adjacent the side walls thereof to provide an insulating air space intermediate the radiant heating element and heat absorbing elements and the side walls of said casing.

2. Apparatus in accordance with claim 1 wherein an electric circuit is provided for said radiant heating element, said electric circuit including switch means mounted on said casing and electric conductors interconnecting said switch means and said radiant heating element, and means defining a conduit for said electric conductors positioned beneath said reflector means and shielded from said radiant heating element.

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