Feb. 4, 1958

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2,822,458

VENTED PANEL

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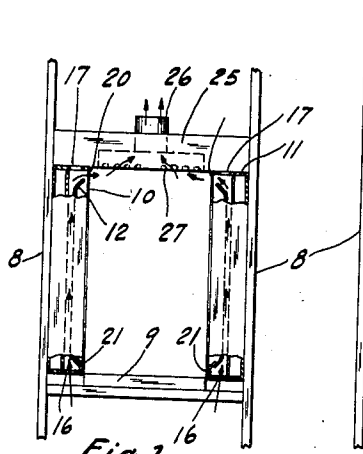


Fig. 1

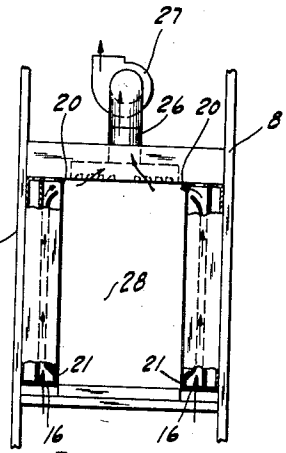


Fig. 3

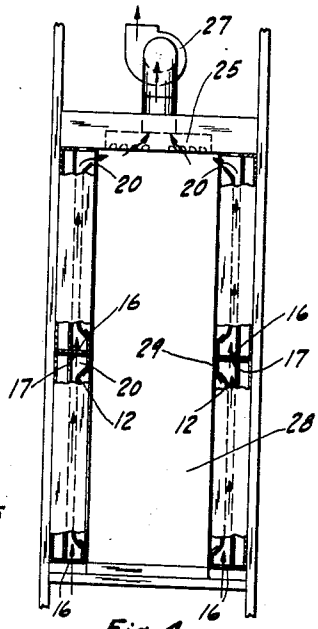


Fig. 4

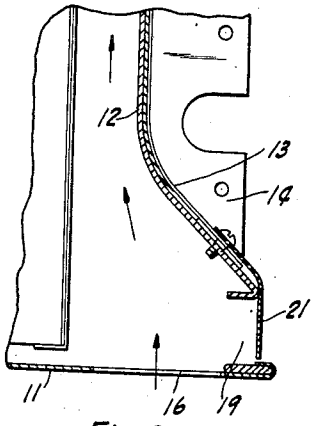


Fig. 2

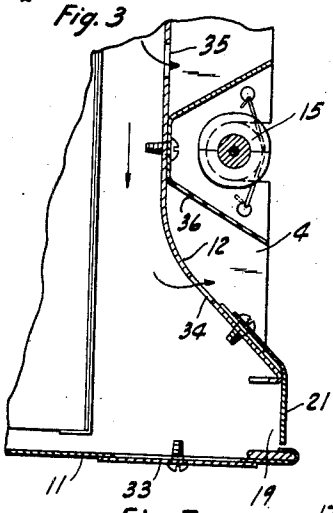


Fig. 7

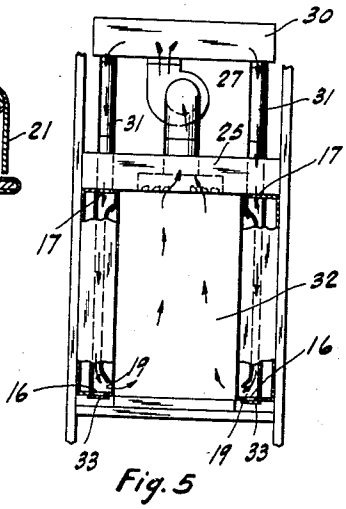


Fig. 5

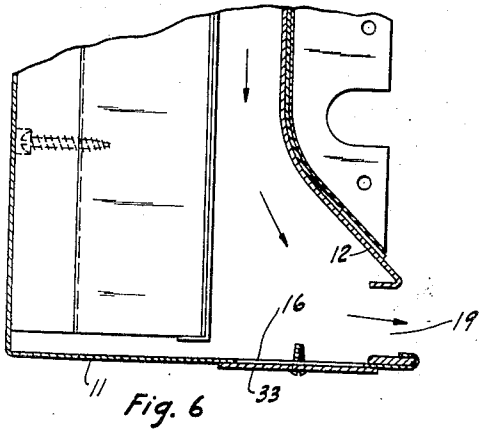


Fig. 6

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VENTED PANEL

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7 Claims. (Cl. 219—35)

This invention relates to ventilated heating panel units and ventilated oven structures. In commercial ovens using this device for batch or continuous treatment, there is not only a problem of heat dissipation but it may be desirable to circulate air or other gases either through the panels themselves, or through the oven to the exclusion of the panels, or through the treating space as well as through the panels. Where the only problem is one of heat dissipation, the circulated fluid will usually be air. However, in cases where it may be desirable to protect the heating elements or the work from oxidation, some inert gas may be circulated.

The present invention is not concerned with the nature of the circulating gases, but seeks to provide panels sufficiently versatile to permit of assembly of a wide variety of structures for solving a wide variety of air circulation problems.

As disclosed in my Patent 2,756,319, entitled A Radiant Heating Unit and Oven, and issued July 24, 1956, each individual panel unit desirably comprises an outer shell and a tray which normally carries one or more heating elements and has reflector means for directing the radiation from such elements. In accordance with the present invention the space between the shell and the tray constitutes an air conduit. The shell has openings in its walls and/or between the shell and the tray, the tray itself optionally being provided with openings, and all of the openings desirably having selectively removable closures so that air may flow through the shell and behind the tray to the exclusion of any path within the oven proper or may be directed from the shell into the oven as desired.

The openings in the walls of the shell are desirably positioned to register so that the trays stacked one above another will provide continuous communicating passages through the stack. The assembly of the trays to constitute an oven likewise contemplates the use of forced air circulation means and gravity circulation at the option of the user.

In the drawings:

Fig. 1 is a view in end elevation of an oven embodying the invention and providing for gravity circulation, portions of the shells of the respective heating units being broken away.

Fig. 2 is an enlarged fragmentary detailed view in section of a portion of structure shown in Fig. 1.

Fig. 3 is a view similar to Fig. 1 showing a fan providing forced draft for the circulating gases.

Fig. 4 is a view similar to Fig. 3 but showing the oven vertically elongated by stacking panels upon each other.

Fig. 5 is a view showing a furnace in which gases are circulated under power upwardly past the work and downwardly through the heating panel units.

Fig. 6 is a fragmentary detail view showing on an enlarged scale a portion of the device of Fig. 5.

Fig. 7 is a view similar to Fig. 6 showing a modified arrangement in which the bottom outlet from the panel

unit is closed and an alternate outlet provided around the heating element.

It will be understood that the term "oven" as herein used is intended to apply generically to any type of heat treating chamber whether it is open as a "tunnel' or closed at its ends.

The oven shown in Fig. 1 comprises frame elements 8 carrying a work supporting bottom 9 and laterally spaced heating panel units 10. Each such unit comprises an outer shell 11 and a tray 12 which, as shown in Figs. 2 and 7, may comprise a reflector 13 and may comprise brackets 14 for bar type heating elements 15.

The present invention is not intended to comprehend any particular way of mounting the tray 12 on the shell 11, reference being made to the co-pending application above identified, or to my copending application Serial No. 468,322, filed November 12, 1954, for suitable mounting arrangements. It is significant to the present invention that the shell be provided in its walls with openings as shown at 16 and 17 and, alternatively with openings 19 and 20 between the margins of tray 12 and the shell. Removable closures 21 are provided for the otherwise open space between the tray and the shell. Removable closures are also provided for the openings 16 and 17 as suggested at 33 in Figs. 6 and 7.

In the arrangement shown in Fig. 1, the top of the furnace is provided with a hood 25 having a flue connection at 26 to a chimney or stack and having inlet louvers at 27 opening from the heat treating chamber. The hood closes the outlet ports 17, the arrangement being such that air or other gases admitted at 16 to the passages within the respective units must flow upwardly behind the trays and issue through the ports 20 to pass to the hood 25 and thence out through flue 26. Gravity circulation will move large quantities of air through the respective units to cool the trays where this construction is employed. However, if desired, an exhaust blower 27 may be applied to the flue connection 26 to accelerate the flow.

Fig. 4 shows a plurality of units superimposed at each side of the furnace or treating chamber 28. In this instance, removable closures 29 prevent the circulating gases from escaping at the top of the trays of the lower units. It will be noted that the inlet ports 16 of the upper units register with the ports 17 at the top of the shells of the lower units. Thus, as indicated by the arrows, the gases admitted through the ports 16 in the shell of the lower units pass upwardly behind the reflecting trays 12 of such units and thence through the port 17 and the port 16 and behind the trays of the upper units to issue from the slots 20 between the trays and shells of the upper units. Upon entering the top of the heat treating chamber 28, the gases are picked up by the hood 25 and ejected by the blower 27 as already described.

In some instances it is desired to withdraw gases both from the top and the bottom of the treating chamber 28. This can be done by simply modifying the device of Fig. 3 by using the closure 33 to shut the bottom inlet ports 16, while removing the closure 21 to open ports 19. These changes in the device of Fig. 3 will result in drawing air through the ports 19 to the bottom of the treatment chamber 28, as well as from the top thereof, the gases from the bottom of the chamber passing behind the reflector in an upward direction as indicated by the arrows in Fig. 3.

Through the use of a blower it is possible to reverse the direction of flow. It is also possible to recirculate the gases as shown in Fig. 5. Here the outlet from blower 27 is connected to a plenum chamber 30 from which pipe 31 leads downwardly into the ports 17 of the respective panel units. The air flows downwardly behind

the trays of such units, and in this instance, escapes through the slots at 19 into the heat treating chamber 32, to return upwardly to the chamber to the hood 25 and thence to the blower. The closure 21 for slots 19 have been removed to permit egress of the air at this point and closures are provided at 33 for the ports 16 which have heretofore served as inlets. Fig. 6 shows an enlarged detailed view of the manner in which the downwardly circulating currents are returned through slot 19 into the treating chamber.

In the construction shown in Fig. 7 the downwardly moving currents of gases are precluded by closure 21 from escape through slot 19 but openings are provided at 34 and 35 which direct such gas past the heating element 15 in close proximity thereto at points below and above the element. In this instance the element has a separate reflecting channel 36 so that the element itself is not cooled by the current of gas. The use of such a reflecting or air guiding channel is optional.

There are many other ways in which the versatile heat panel units herein disclosed can be assembled in ovens of various types. The constructions shown are intended merely to be illustrative. While the units illustrated are elongated horizontally, and have their heating elements extending horizontally as suggested in Fig. 7, the invention is by no means limited to this disposition of the parts.

Use of the invention not only makes it possible to control oxidation in a heat treating oven, but also makes it possible to limit the treating operation to radiant heating while maintaining the ambient air and the metallic shell reasonably cool.

I claim:

1. In a heat treating oven, a ventilated panel unit comprising in a unitarily removable separately fabricated structure, a shell and a tray disposed within the shell and spaced from a rear wall portion thereof to provide a passage for gas movement, a plurality of heating elements disposed wholly at the side of the tray opposite the passage, said unit having spaced inlet and outlet openings communicating with said passage, certain of said openings communicating with the interior of said oven, the unit being provided with closure means for at least one such opening.

2. A heat treating oven comprising a plurality of independent radiant heat panel units spaced to constitute opposing walls of the oven and each including in unitary assembly a shell and a tray in mutually spaced relation to provide passages for the movement of gas, a plurality of heating elements disposed wholly at the side of the tray opposite the passage, said oven including top and bottom portions having means for accommodating gas circulation through said passages.

3. The device of claim 2 in which the oven is provided with means for the forced circulation of gas through said passages.

4. In a device of the character described, a prefabricated heating panel unit for oven assembly, said unit comprising in unitary assembly a shell, a tray and heating

elements mounted on the tray, the tray being in spaced relation to the shell to provide an air passage between the shell and tray, a plurality of heating elements disposed wholly at the side of the tray opposite the passage, marginal portions of the tray being spaced from the shell to provide slots communicating with such passages and the shell having wall portions provided with ports communicating with such passages at opposite sides of the units, and closure means selectively applicable to the slots and ports.

5. The device of claim 4 in which the tray is provided with ports means opening into the tray adjacent to a heating element, together with ventilating means interposed between the port means and the heating elements.

6. In a heat treating oven, side walls comprising superimposed channel units, each comprising a shell and a reflector tray, the respective side wall portions being correspondingly apertured and providing a continuous passage through the shells of the superimposed units behind the reflector trays thereof, and heating elements disposed wholly at the side of the tray opposite the passage.

7. In a heating treating oven, side walls comprising vertically stacked corresponding prefabricated units each of which comprises an external shell having a back and having top and bottom walls provided with air-flow apertures, the apertures in the top wall of a lower unit being in registry with the apertures in the bottom wall of an upper unit, and a reflector tray in each such shell spaced from the back thereof to provide an open passage through which air may circulate vertically through the several units between the shells and back walls thereof, a continuous passage being provided behind the reflector trays through the several shells, and heating elements associated with the reflector trays and disposed within the oven and wholly separated by the trays from said passage, whereby heat developed in said elements is reflected to the interior of the oven and the heating elements are not substantially cooled by cooling air circulating through the passages behind said trays.

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