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HEATER GRILL

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3 Sheets-Sheet 1

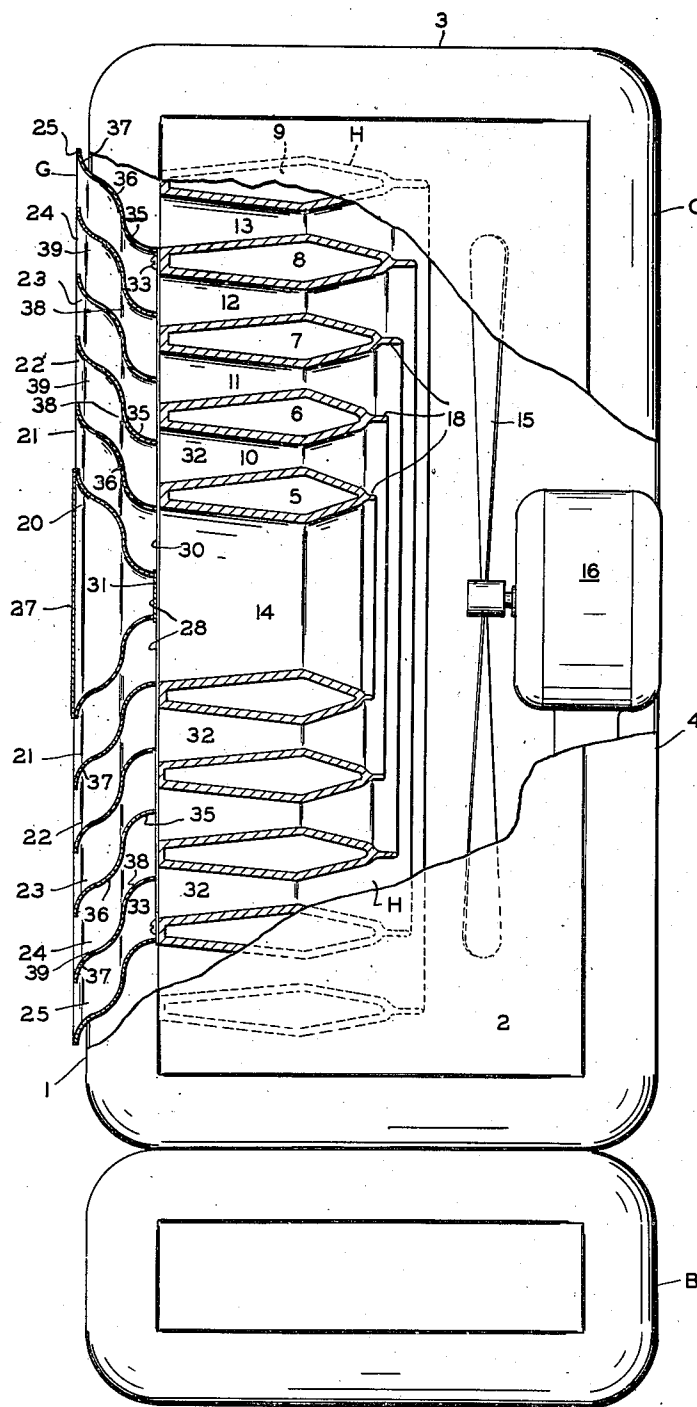


Fig. 1

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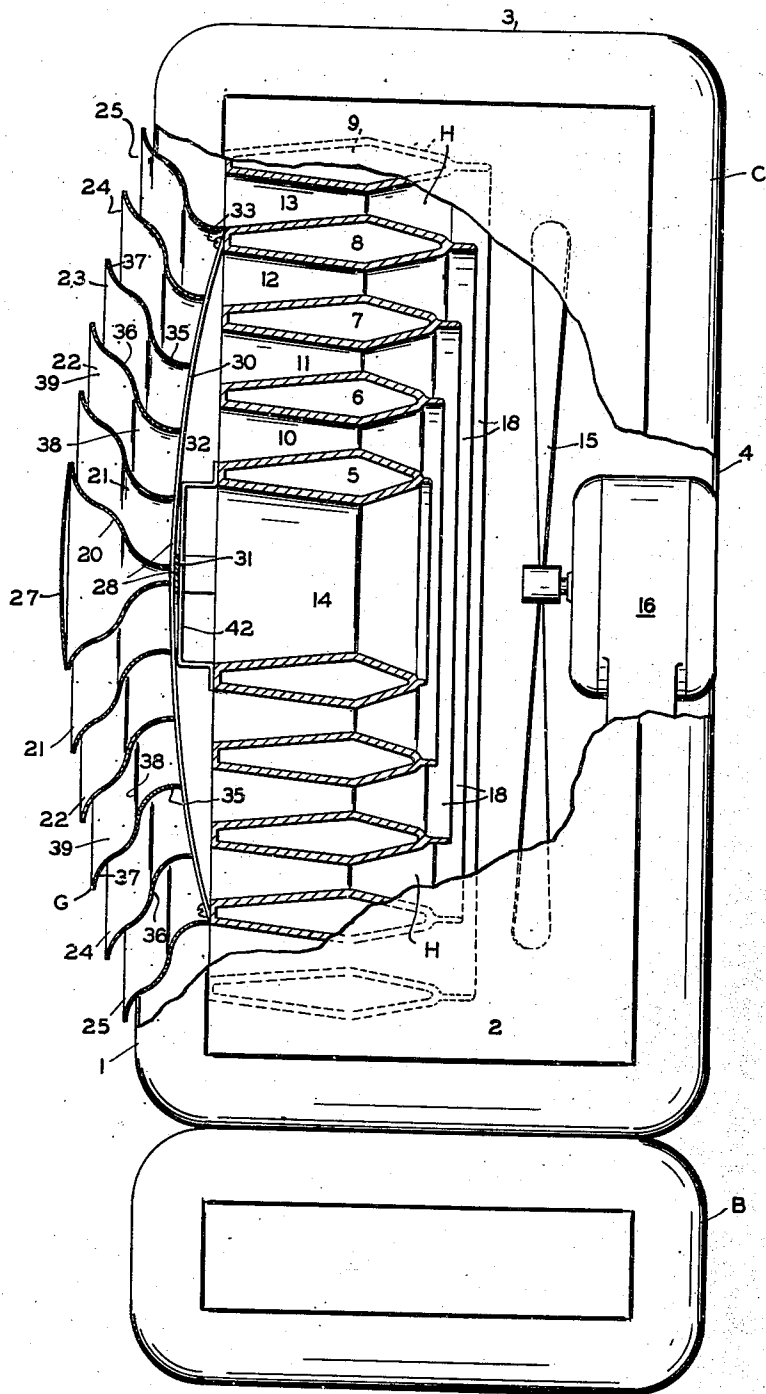


Fig. 2

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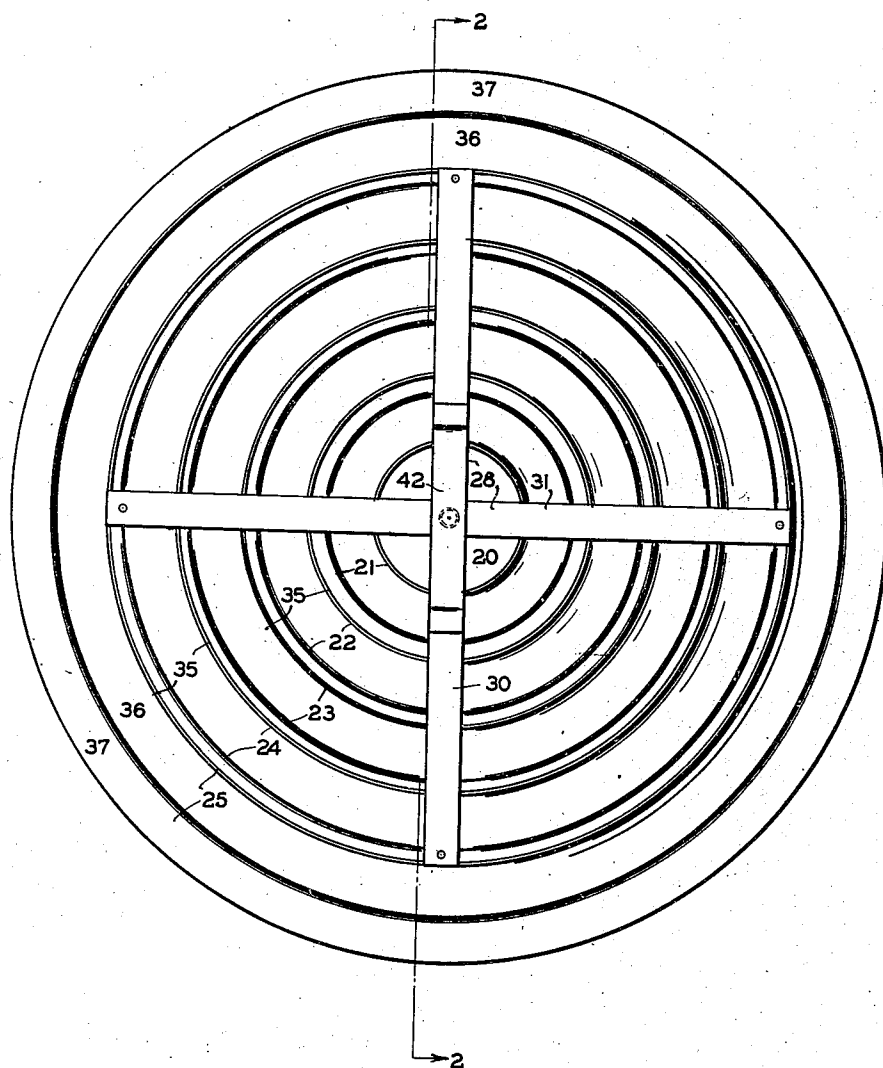


Fig. 3

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HEATER GRILLE

George Herbstler, Cleveland, Ohio

Application October 25, 1939, Serial No. 301,186

5 Claims. (Cl. 98-40)

This invention relates to an improved air delivery grille.

For the purposes of illustration the grille is herein shown and described in connection with a heat exchange unit.

A further object of the invention is to provide an efficient grille structure adapted to have air passed therethrough in a predetermined direction, which grille will be efficient in operation to deliver the air in the desired directions and at the same time it will effectually conceal all operating parts behind the grille from view at practically all angles at which the grille may be viewed by users.

Another object is to provide a circular grille arrangement in which a series of vanes or louvers are so disposed that while the grille is efficient in delivering air as from a heat exchange in that it does not restrict passage of air therethrough at any part thereof, it is nevertheless adapted to conceal from view, at practically all angles at which the grille can be viewed, the inner heater parts.

A further object is to provide an improved mounting for grille vanes and particularly circular concentric grille vanes.

Another object is to provide a grille structure in which a series of concentric grille vanes are capable of being mounted on heat exchangers of different types and with the grille vanes in a plurality of relative positions with respect to each other.

A further object is to provide a grille structure having vanes or louvers so arranged as to deliver air as from a heat exchange unit forwardly in generally divergent paths, wherein return flow of air from front to rear is blocked at the central region of the grille.

Other objects and features of the invention will become apparent from the following specification wherein reference is made to the drawings, in which:

Fig. 1 is a side elevation of a heating unit partly broken away to show a hollow heating head and to show the grille construction in central vertical section;

Fig. 2 is a view similar to Fig. 1 showing the grille mounted in a different manner from that shown on Fig. 1;

Fig. 3 is a rear elevation of the grille as though viewed from inside the heater on which mounted.

The grille herein shown is of the fixed type and so arranged as to receive heated air as from a heating head and to distribute the same practically without restriction thereof in widely di-

vergent directions into the space or compartment to be heated. If directional adjustment is desired, such can be effected by any various means known in the art, or the grille vanes can be modified for special direction of air. While the drawings show but one general form of grille and a heating head of a type especially suited thereto, application of the principles of the invention to other forms will be apparent from the illustrated embodiments.

The heating unit shown in Figs. 1 and 2 is of the type shown in my prior application Serial No. 256,326, filed February 14, 1939. Said application also shows the type of grille of which the present invention, in part, is an improvement.

Referring to Figs. 1 and 2, a sheet metal heater cabinet is shown at C having a front wall 1, side walls 2, one being shown, a top wall 3 and a rear wall 4. The rear wall may be generally open, at least for part of its extent, to afford entrance for air into the cabinet, either directly from the room or compartment to be heated or from a suitable duct. The cabinet rests upon a hollow base B which can be of any suitable form and adapted to support and contain a heating element such as a gas burner, an example of which is shown in my prior application but not shown herein.

Within the cabinet is a heating head H which may comprise a casting or assembly of castings providing a series of concentrically arranged hollow tubes, as at 5, 6, 7, 8 and 9, preferably of narrow diamond-shaped cross section. Provision (not shown) is made whereby the tubes are open adjacent the burner in the base B for receiving products of combustion therefrom, and each of the tubes communicates with a suitable delivery pipe or flue (not shown) to convey the spent gases from the head H. The diamond-shaped cross section of the tubes and side by side spaced arrangement of them affords elongated concentric venturi-shaped air passages such as 10, 11, 12 and 13 through the head from rear to front, right to left as illustrated. It has been found that the venturi-shaped air passages are efficient in effecting a heat exchange relationship between the heating media in the tubes 5, 6, etc., and columns of air passed through the concentric venturi-shaped passages 10, 11, etc., and that, although the air is projected against the head as a whirling column, there is very little resistance to free flow of air through the head.

The central air passage 14 in the particular construction shown does not function to carry any considerable volume of air because of the

type of air forcing means used and the coaxial relationship thereof to the head. The air forcing means as shown comprises a coaxial propeller type fan 15 driven as by an electric motor 16 suitably supported in the cabinet. Other types of air forcing means could be used effectually. Assuming the back wall 4 of the cabinet is generally open, air is supplied to the fan from the rear thereof, and driven through the openings 10 to 14 toward the grille, indicated generally at G, and mounted at the front of the unit.

The most effective portion of the fan lies outwardly from the center of rotation, hence the tubes and air passages, which lie outwardly from the center passage 14, receive volumes of air proportionate to their exposed surfaces. Auxiliary guides for air are provided to secure proportionate distribution, these comprising a rearwardly stepped series of flanges formed on and along the heater tubes as at 18. As shown the flanges are integral with the head casting or castings and operate to intercept portions of the whirling and outwardly moving column of air thrown by the fan.

As shown in Fig. 1, the grille comprises a series of concentric vanes 20, 21, 22, 23, 24 and 25 disposed substantially in a common plane close to the discharge side of the heating head. The number of vanes may be the same as the number of concentric air passages 10, 11, etc., but for the sake of better concealing the head from view, a slightly greater number of vanes is used. The space bounded by the inner vane member 20 is closed preferably at the front of the unit, as by a disk 27. The grille vanes are preferably maintained in concentric relation to each other by a mounting 28 which preferably comprises a cross-shaped sheet metal structure made of two flexible strips 30 and 31 which are abutted by the inner edges of the rings which form the grille vanes as at 32. Said edges can be fastened to the strips as by butt welding. The strips are employed to secure the grille in place by the provision of attaching screws 33 adapted to pass through openings near the end portions of the strips 30 and 31 and into threaded holes in the heating head casting.

In order to conceal the inner portions of the heater unit from view, and to direct the heated air into the room or space to be heated at widely variant angles, the vanes successively overlap each other in an outward direction, that is to say, the innermost vane ring 20 outwardly overlaps the vane 21, vane 21 overlaps 22, etc. The outermost portion of the outer vane 25 lies in spaced relation to the front wall 1 of the cabinet at a circular opening therein having its outer limit within the area defined by the outer perimeter of the vane 24. Now, if the vanes are frusto-conical, as shown in my co-pending application, it is possible to view the inside construction of the heater unit from a great number of angles. However, by forming the section of the individual vanes as a series of relatively reversed contiguous curves, one curve merging gradually into another, providing, for instance, a curve as at 35 and concomitant rearward and outward concavity or back surface of vane, contiguous convexity at 36, and contiguous concavity at 37, it is practically impossible for one to see the interior of the unit from any angle. This concealment may be enhanced by reflective treatment of the forwardly disposed grille vane surfaces. Even though no special treatment, such as enameling or plating and polishing, is

used one notices only the vane outlines and a series of concentric highlights within the grille. The resulting contrast prevents clear perception of the interior parts even though such may be in the line of vision at certain angles.

The inner edge portions of the various grille vanes are preferably parallel to each other and directed at right angles to the transverse principal plane of the heating head so that the air volumes are received by the grille without resistance and turned gradually outwardly by the first curve 35, then slightly inwardly by the second (36) and being finally discharged in an outward direction by the final curves 37. The relative gradual restriction followed by gradual enlargement, noted on Fig. 1 at 38 and 39 respectively, causes no appreciable restriction to free flow of air because of constituting substantially venturi passages. However, the restriction can be nearly eliminated by variations in the relative curvatures of the vanes and when the same cross section of vanes shown in Fig. 1 is used with the vanes offset from each other, as will be described in connection with Fig. 2, the restrictions and enlargements are practically eliminated.

The closing of the central region of the grille by the elements 27 or 28 as illustrated in Fig. 1, so as to block the direct communication between the central portion of the heat exchange unit and room space forwardly from the central region has been found to be highly important from the standpoint of proper diffusion of heated air in the space to be heated and in respect to efficient operation of the device. It has been found that if the interior of the grille ring 20 is open at both ends, air travels rearwardly from the room space into the central part of the heat exchange head. This air becomes heated in its rearward travel and passes directly onto the central portion of the fan 15, thereby transferring a large amount of heat to the blades and fan shaft, which, in turn, is transferred to the motor 16 causing a dangerous or damaging temperature rise. Furthermore, if this air reaches the fan, it is again passed forwardly through the heat exchanger and becomes heated so that all of the air currents from the heat exchanger are relatively hot and create hot blasts or drafts. When the element 20 is closed at the ends so as to block the return passage of air to the fan, not only is the fan free from the deleterious effects of the heat, but cool air is caused to flow around the motor to the fan. At the same time, a slightly reduced atmospheric pressure zone is created in the room, this zone being roughly in the form of a cone with its apex at the element 20 and with its side elements extending generally parallel to the direction of expansion of the element 20 from rear to front. As a result of the creation of this zone of lowered pressure, the air in the room tends to flow toward the central region of the grille throughout the generally conical shaped zone as the air from the other portions of the grille flows outwardly around the outer limits of this zone. When the returning air strikes the plate 27 and cannot pass to the same, it is redirected outwardly due to the suction effect created at the outlet of the space between the vanes and thus becomes mixed with the highly heated air issuing from between the vanes. This mixture of the relatively cool returning air with the much more heated air between the vanes tends to provide a more uniform temperature and eliminates the

hot blast effects, at the same time providing more efficient circulation of the air in the room.

An economical manner of making the vanes described above is to provide straight flat strips of metal with their ends secured to form cylindrical rings, and then spinning or drawing the strips to the desired form. The ends of such strips can be joined by butt or lap welding. The vanes can of course be drawn or spun from annular discs of sheet metal but at greater expense because of waste of sheet stock.

The grill vane assembly may be formed into a general dome or partial globe shape of any desired curvature simply by bowing the supporting or base strips 30 and 31 as by means of a spacer 32 (Fig. 2) and attaching the free ends of the strips to the heating head in the manner already mentioned. Since the grille vanes are attached individually to the strips, the former naturally occupy successively forwardly disposed positions with the inner grille ring 20 farthest forward, as shown. So mounted, the restrictions at 38 are greatly reduced when the same cross sectional shape is used for the grille vanes as that employed with the relative disposition thereof shown by Fig. 1. When disposed as in Fig. 2, the greater area of openings between adjacent grill vanes compensates for any loss of velocity that may be occasioned by the absence of guiding portions as at 35 of the grill vanes closely adjacent the air discharge face of the head.

I claim:

1. An air delivery grille comprising a plurality of substantially concentric annular relatively thin vanes of undulating cross section between

their inner and outer peripheries and wherein each undulation is a substantial portion of the whole, the vanes being of generally frusto-conical form and spaced apart in such manner that inwardly disposed vanes outwardly overlap adjacent vanes disposed outwardly therefrom.

2. A grille according to claim 1 wherein the vanes have outwardly curved and forwardly convex portions adjacent their inner and outer edges and contiguous outwardly curved and forwardly concave portions intermediate said outwardly curved portions.

3. An air delivery grille comprising a plurality of vanes in mutually overlapping relationship and spaced apart from each other, characterized by being undulating in cross section and with the convex portions of each disposed approximately opposite concave surface portions of adjacent vanes.

4. An air delivery grille comprising a plurality of concentric mutually overlapped spaced vanes of undulating cross section and with convex surface portions of each generally opposite concave surface portions of adjacent vanes so that air is passed through the grill in a series of tortuous paths of gradually changing direction.

5. An air delivery grill comprising a set of annular vanes of sheet metal secured together at mutually adjacent edges and diverging with respect to a common axis, the inner edge margins of the vanes being substantially parallel to each other and to said common axis, and free portions of the vanes being forwardly convex near said margins and forwardly concave farther forwardly from said margins.

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