Nov. 15, 1960 L. C. COTTS 2,960,021

AIR DISTRIBUTOR

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FIG. 1.

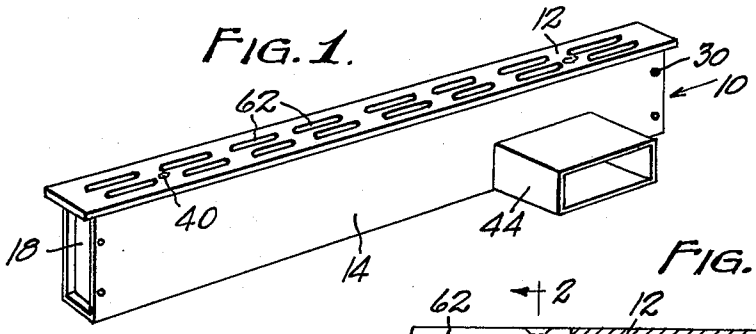


FIG. 2.

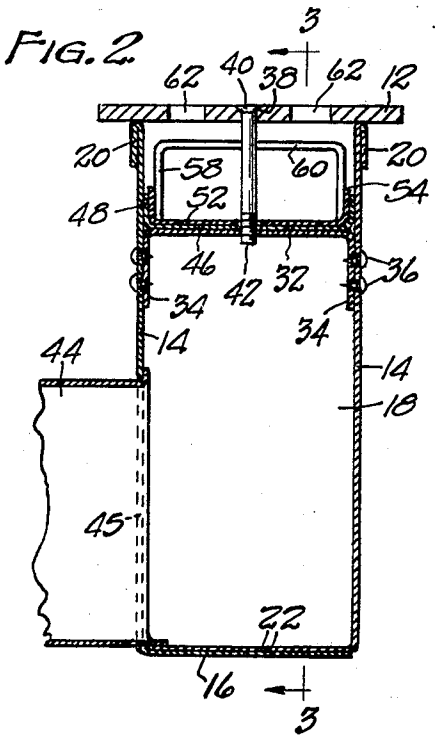


FIG. 3.

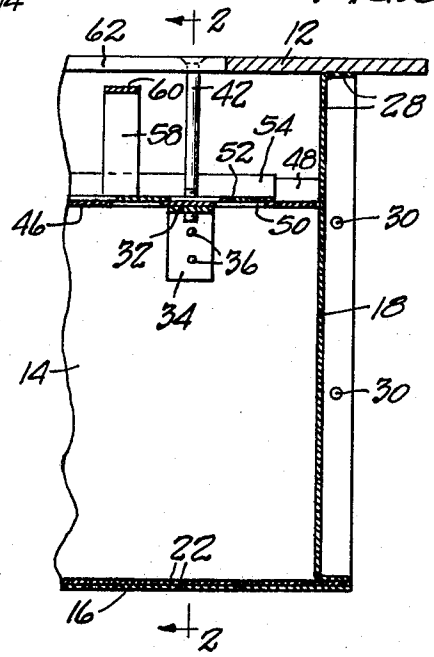


FIG. 4.

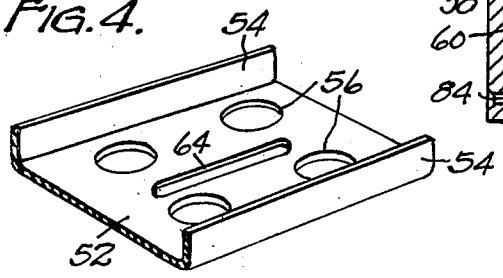
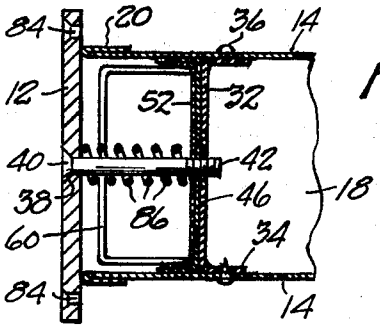


FIG. 9.



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FIG. 5.

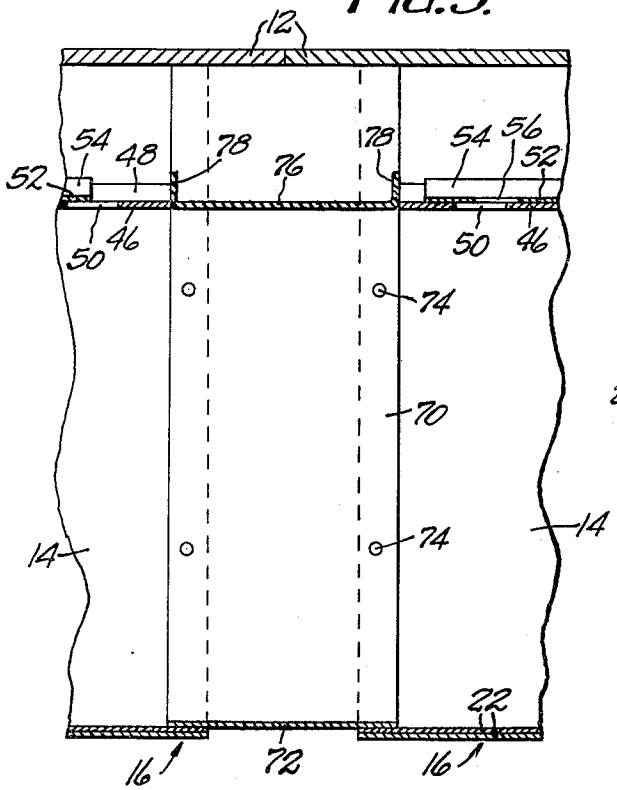


FIG. 6.

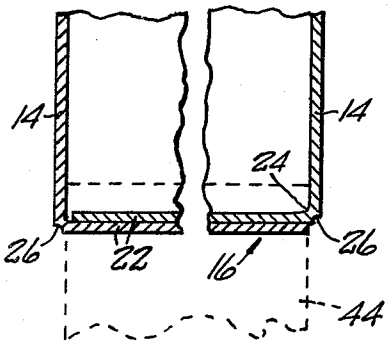


FIG. 8.

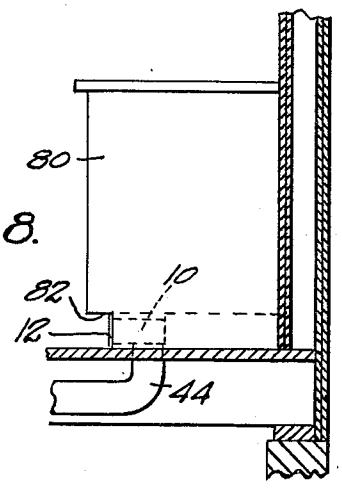
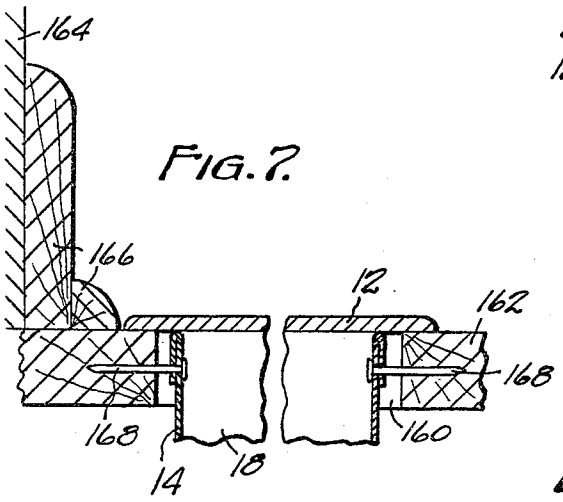


FIG. 7.



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FIG. 10.

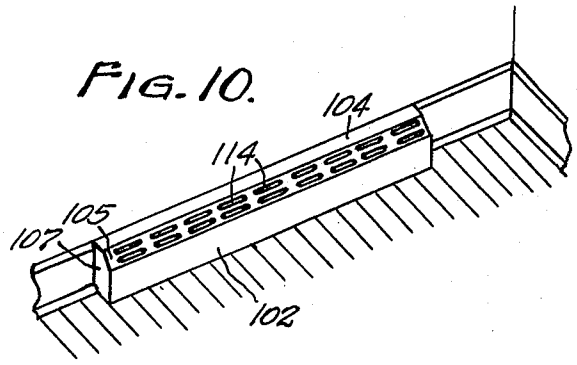


FIG. 11.

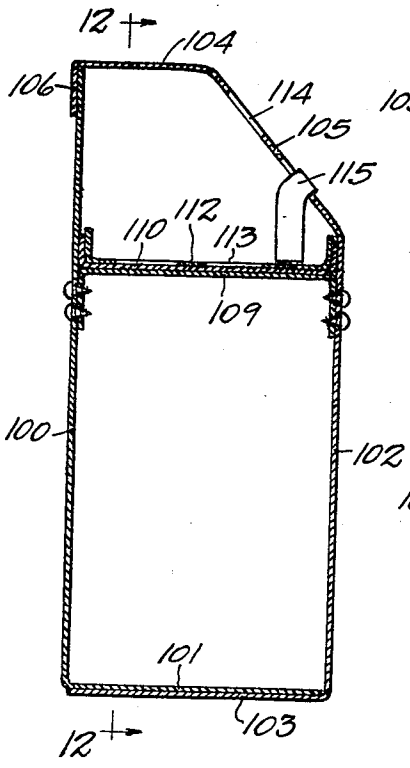
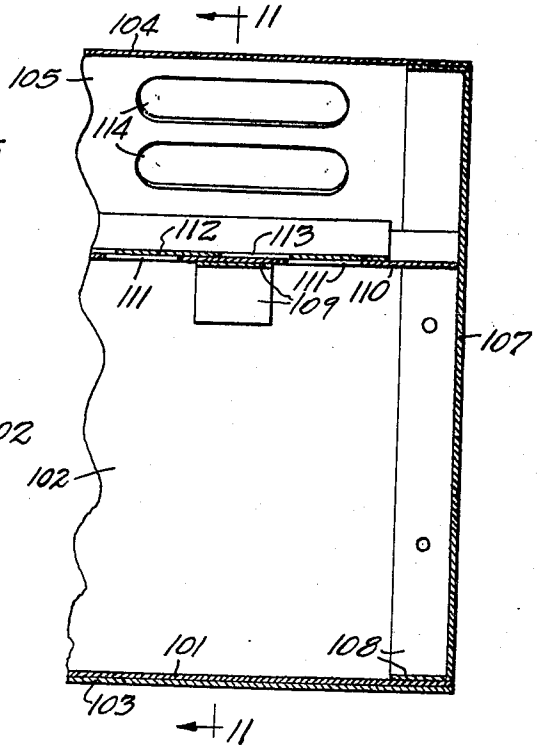


FIG. 12.



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2,960,021

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7 Claims. (Cl. 98—103)

This invention relates to improvements in air distributors, and more particularly to distributors connected in forced air circulating systems for heating and cooling buildings and serving as the means for discharging air from a supply conduit into the room of a building.

The primary object of this invention is to provide a device of this character which is elongated and provides discharge of air at the perimeter of a room substantially uniformly throughout the length of the device while being located in a sub-floor position so as to avoid interference with building parts above floor level, such as window walls, sliding doors and the like, whose appearance and utility would be reduced if an air distributor above floor level were used adjacent thereto.

A further object is to provide a device of this character comprising a horizontally elongated chamber having a horizontal apertured partition spaced below the top thereof to define a lower chamber extending full length thereof and an upper chamber extending full length thereof, the upper part of said chamber and said partition having apertures distributed uniformly along the length thereof, whereby air under pressure discharged into the lower chamber is diverted substantially full length thereof and through said upper chamber for discharge through said upper apertures substantially uniformly along the length of the device.

A further object is to provide a device of this character having a novel, simple and inexpensive housing formed in part from two angle members arranged in U-shaped relation with one flange of each overlapping and registering and formed along scored fold lines to facilitate ready breaking of the flange from the remainder of the angle member by flexing the same along said scored line, said housing having novel means for interconnecting said angle members in U-shaped relation and for connecting a top member thereto.

A further object is to provide a device of this character having a casing with top, side and bottom walls and removable end walls, wherein said top walls project beyond said side walls, and novel means for interconnecting a plurality of said casings end to end in communicating relation upon removal of adjacent end walls thereof.

A further object is to provide a device of this character which is simple in construction, inexpensive, easy to install, and attractive in appearance when installed.

A further object is to provide a device of this character having an apertured discharge plate and a novel damper of adjustable character for controlling the rate of discharge of air from the distributor, said damper being of simple construction and being operable in all operative positions of installation of the device regardless of whether the apertured discharge plate thereof is positioned horizontally, vertically or at an inclination.

A further object is to provide a device of this character having an elongated chamber formed from top, bottom, side and end walls and adapted to be in communication at its lower portion with an air supply conduit, said

chamber having a horizontal longitudinal partition therein above said air supply conduit and said top and said partition being provided with apertures substantially uniformly spaced along the length thereof, and damper means for closing the apertures of said partition.

Other objects will be apparent from the following specification.

In the drawings:

Fig. 1 is a perspective view of the device;

Fig. 2 is an enlarged transverse sectional view of the device taken on line 2—2 of Fig. 3;

Fig. 3 is an enlarged fragmentary longitudinal sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is an enlarged perspective view of a section or fragment of one of the parts of the device;

Fig. 5 is an enlarged longitudinal sectional view illustrating the manner in which adjacent units may be connected;

Fig. 6 is an enlarged fragmentary transverse detail sectional view illustrating the construction of the bottom portion of the device;

Fig. 7 is an enlarged fragmentary sectional view of the device illustrating the manner in which it is installed;

Fig. 8 is a view illustrating a different installed position of the device;

Fig. 9 is an enlarged fragmentary transverse detail sectional view illustrating a modified embodiment of the invention;

Fig. 10 is a perspective view of another modification of the device;

Fig. 11 is a vertical transverse sectional view of the modification shown in Fig. 10, taken on line 11—11 of Fig. 12; and

Fig. 12 is a longitudinal sectional view taken on line 12—12 of Fig. 11.

Referring to the drawings which illustrate the preferred embodiment of the invention, the numeral 10 designates the device which is in the nature of a hollow elongated casing having a top 12, side walls 14, bottom 16, and end walls 18. The side walls, bottom and end walls are preferably formed of sheet metal, and the top wall 12 is preferably formed of metal sheet or plate stock, such as aluminum plate stock. Each of the side walls 14 is formed separately and preferably has a longitudinally upwardly outwardly return bent reinforcing flange 20. The sheet metal blanks of which the side walls 14 are formed are of a width greater than the combined width of the side walls 14 and bottom 16, and the bottom 16 is formed from inturned flanges 22 bent at right angles to the said walls 14 on fold line 24, and is preferably scored or grooved at 26 to provide a reduced thickness of the metal at the fold line. The flanges 22 are of a length equal to the length of the side walls and of a width substantially equal to the bottom of the casing and are arranged in registering lapping and contacting relation, as illustrated in Fig. 6. In the preferred form the flanges 22 forming the bottom 16 are preferably free from physical connection although securing means may be employed to interconnect the flanges 22 if desired.

The end walls 18 constitute sheet metal plates having marginal flanges 28 extending perpendicularly therefrom and of a size to fit snugly within the end of the structure as illustrated in Fig. 3. Screws or any other suitable fasteners 30 pass through the ends of the side walls 14 and the flanges 28 to connect the side and end walls 14 and maintain the side walls and the flanges 22 in proper relation, as illustrated in Figs. 2 and 6.

At a plurality of longitudinally spaced and aligned points along the length thereof, the side walls 14 carry supports which preferably interconnect said side walls and constitute inverted U-shaped members. Each support may have a horizontal web 32 parallel to the bottom

16 and end flanges 34 bearing against the inner surfaces of the side walls 14 and secured thereto by metal screws or other suitable fastening members 36. The top 12 is of a length greater than the length of the side walls 14 and of a width greater than the spacing between the side walls. The top 12 bears against the upper edges of the side walls 14 and the upper flanges 28 of the end walls 18. The top plate 12 has apertures therein preferably countersunk at 38 to receive the head 40 and shank 42 of securing screws which pass through threaded openings in the member 32.

The casing may be sold in knock-down from for assembly of its constituent parts on the job. It will be apparent that, when the proper holes are punched or otherwise formed in the parts in advance to receive the securing members 36 and 42, such assembly can be accomplished on the job rapidly and with simple tools. One of the important advantages of knock-down shipments is that the parts are in a condition to have the openings necessary to receive the boot 44 cut easily and quickly at the desired location before assembly. The boot may be connected at either the side wall or bottom of the casing. In the case of a side entering boot, as illustrated in Figs. 1 and 4, the casing opening to receive the same is formed rapidly by cutting the bottom flange 22 forming part of the side wall at which the boot is to be connected and then continuing the cut up the side wall to the desired height to form a boot opening of desired size. The cut-away 45 illustrated in Fig. 2, so formed, does not open the bottom of the casing since the bottom flange 22 of the opposite side wall 18 remains intact. In cases where the boot 44 is to enter the casing at a bottom opening, a pair of similarly located cuts are made in each of the two bottom flanges 22 for the full width thereof, and the part of each flange between the cuts is then flexed once or twice along the fold line 24 at the score 26 thereof, whereupon it will break away with a clean straight break. The convenience of this arrangement for forming openings to receive the boot 44 is readily evident from the fact that the work is done on individual or constituent parts having freely accessible starting edges, and also from the fact that the constituent parts are easily gripped and handled, and are light in weight. In other words, it is not necessary to cut an opening in a complete casing member or to start a cut by punching a hole and then shaping the hole properly from that starting punch aperture.

The transverse parts 32 are positioned in equally spaced relation to the top 12 so as to lie in a common plane. The members 32 serve to support a partition member 46 which preferably has upturned side flanges 48 at its opposite sides spaced apart to bear in snug face engagement against the inner faces of the opposite side walls 14. The partition 46 is of a length to contact the end walls 18. The partition 46 is preferably held in place by the snug fit thereof within the casing, and it is further oriented by the shanks of the screws 42 which pass therethrough. The partition plate 46 has a plurality of apertures 50 formed therein and preferably arranged in one or more longitudinal rows, with the apertures in each row being spaced substantially uniformly throughout the entire length of the partition.

A damper plate 52 bears in face engagement upon the top surface of the partition 46 and preferably has upturned side flanges 54 spaced apart to fit snugly and slidably in guided relation between the partition flanges 48. The damper 52 has apertures 56 formed therein, preferably equal in number to the apertures 50 in the partition and of the same size, arrangement and spacing. The damper plate 52 is of a length shorter than the partition plate 46 so as to be slidable endwise thereon between a position in which the apertures 50 and 56 register fully and in opposite position in which the apertures 50 and 56 are completely out of register so that the damper 52 serves to close the apertures 50 in the partition 46. Any suitable means may be provided to adjust the damper. Thus I have illustrated an inverted U-shaped member having its end flanges 58 secured to the side flanges 54 of the damper at its cross part 60 positioned adjacent to and spaced below the top 12 so as to be readily manipulatable by the user by inserting a pencil or finger through the adjacent elongated discharge opening 62 in the top 12. The damper 52 has elongated slots 64 therein at spaced points to receive with clearance the shanks 42 of the securing screws so as to accommodate sliding of the damper without interference from said securing members.

The sum of the areas of the openings 50 in the partition 46 is preferably less than the cross-sectional area of the boot 44. The total cross-sectional area of the outlet aperture 62 arranged uniformly throughout the length of top 12 is preferably less than the total area of all the apertures 50. As a result of these relationships the air from the forced air circulating system, such as a warm air heating system or air cooler, enters the casing 10 below the partition 46 and encounters a slight amount of resistance to discharge thereof because of the restricted area and the longitudinally uniform spacing of the apertures 50. Consequently, the air is distributed substantially uniformly full length of the unit when the damper openings 56 register with the partition openings 50, so that the volume of air which passes through the openings farthest remote from the boot 44 is substantially the same as the volume of air passing through the partition openings adjacent to the boot. When the damper is adjusted to disalign apertures 50 and 56, the resulting restriction to discharge of air from the lower chamber improves the uniformity of air discharge through all of said openings. Thus the lower chamber below the partition serves as a primary pressure equalizing chamber. The size relation between the boot 44 and the top apertures 62, which are arranged uniformly along the length of top 12, results in a further restriction to flow at the outlet aperture 62 which renders the upper chamber or compartment of the casing a secondary pressure equalizing chamber to insure uniform air discharge through the length of the device. The unit may be formed in lengths of three or four feet, in which case the mounting of a boot 44 at one end of the device, as shown in Fig. 1, may position the openings 50 and 62 in the remote end of the casing two or more feet from the boot, but nevertheless the rate of discharge of air at the apertures 62 remains substantially uniform throughout the full length of the unit.

The device may be installed in an opening 160 in a floor 162, as illustrated in Fig. 7, which shows the opening 160 adjacent to a building wall 164 and alongside the base board and trim members 166. Thus the device can be positioned to discharge heat along the outer walls of a dwelling or other building to discharge a long curtain of air along the wall. When the air is heated it provides a barrier to the entry of cold air into the room and, when cooled, it serves to cool the room effectively. The mounting of the device is accomplished by the simple expedient of driving nails 168 through the upper margins of side walls 14 and into the floor 162 while the device is so positioned that the top member 12 will bear flat upon the floor surrounding the opening 160. In cases where a slab floor construction is involved, wherein the slab is provided with tile or other conduit defining passages leading to a furnace, cooler or air circulator, the openings 160 will be formed in the slab to communicate with the passage, and the unit is seated in the opening with the top 12 spanning the opening and bearing against the surface of the floor. In such installations the distributor may simply be suspended in the floor opening without anchorage and with the margin of plate 12 bearing on the floor around the opening. Thus in such constructions it is customary to omit the use of a boot since an intake opening formed in the bottom 16 communicates with the duct leading to the air circulator.

The construction of the device accommodates interconnection of distributors end to end where a distributor of a length greater than the length of an individual casing is desired. An arrangement of this character is illustrated in Fig. 5 wherein the top plates 12 of two adjacent distributors are positioned in end abutment while the adjacent ends of the side walls 14 and bottoms 16 of the two casings are spaced apart. A U-shaped metal joint member of a width greater than the spacing of adjacent edges of the side walls and bottoms of the two casings serves to span the units. This joint member includes side walls 70 and a bottom 72 which fit snugly into the adjacent end portions of the two casings and are anchored in place therein by suitable securing members 74, such as metal screws. The side walls 70 will preferably extend full height of and in free contact with the casing side walls 14 and the bottom member 72 will preferably extend full width of and in face contact with the casing bottoms 16. A partition or spacer plate 76 spans the side walls 70 of the joint member in substantially coplanar relation to the partitions 46, as illustrated in Fig. 5, and preferably abuts the adjacent ends of said partitions. If desired, the plates 76 may have flanges 78 bent from the margins thereof to reinforce and strengthen the same. The partition 76 cooperates with the partitions 46 of the connected casings to provide a continuous lower chamber below said partitions and full length of the combined casings and a continuous upper chamber between said partitions 46 and 76 on one hand and the tops 12 of the casings on the other hand to extend full length of the combined casings.

The top plate 12 will preferably project approximately one inch beyond the adjacent end edges of the side walls 14. This arrangement permits the adjacent ends of the tops 12 to be abutted and present an attractive and continuous base plate or discharge plate to the eye of the observer even though the two casings with which they are associated are in fact separated, as by a floor joist in cases where the floor joist extends perpendicular to the longitudinal dimension of the air distributor. In instances where the distributors are of a length greater than the spacing of the floor joists, an opening through the floor joists is required, the same being provided by connecting shortened floor joists by means of a header in the manner well understood in the building trades. In other words, the floor joists are cut short of their outer support or foundation a distance slightly greater than the width of the distributor, and a header is nailed across those shortened floor joists and is secured at its ends to floor joists which extend to the supporting wall or foundation. Since headers should preferably be of limited length for best construction, the opening will preferably be of a length to accommodate one distributor only in cases where a number of aligned distributors are to be mounted at a single wall. In such cases, of course, a boot must connect each distributor with the air source. In cases where full and unrestricted communication is provided, as illustrated in Fig. 5, between two or more casings, it is not necessary that a separate boot be connected at each of the casings so connected.

While the device is primarily intended for installation in floor openings, it may be positioned above a floor with the discharge plate 12 thereof in a vertical or inclined position, as illustrated in Figs. 8 and 9. The size and shape of the casing make it particularly well suited for installation below a cabinet 80, as illustrated in Fig. 8, as at a recessed portion or toe well 82 of a kitchen cabinet. The plate 12 may be provided with openings 84 to receive securing screws (not shown) for anchoring the device in place in the cabinet in such installations. Since such an installation positions the damper 52 in substantially a vertical plane, the damper may tend to work clear of the partition plate 46 during use thereof and thereby detract from the efficiency of the damper as a means to control the rate of flow of air through the openings in the partition. For such installations, a coil spring 86 may be interposed between the damper plate 52 and the top plate 12, as illustrated in Fig. 9, thus serving to press the damper plate 52 into firm frictional engagement with the partition plate 46 to insure the efficiency of the damper for its intended purpose without reducing adjustability of the damper.

By slight alteration of the device it may be useful as an air distributor located above the floor level alongside a wall. Such a construction is illustrated in Figs. 10, 11 and 12. In this construction the back panel 100 may constitute a part of an angle member including a base forming flange 101. Another panel may form the front 102, a bottom flange 103, and a top 104. If desired, an inclined or configured portion 105 may be provided. A flange 106 projecting downwardly from the rear margin of the top panel 104 may engage the upper end of the rear wall 100. The overlapping bottom panels 101 and 103 may be scored at their junctions with the back panel 100 and the front panel 102, respectively, for accomplishment of the advantages mentioned with reference to the scoring of the parts 22 at 26, as previously described. End caps 107 having marginal flanges 108 may be secured to the rear panel 100 and the front panel 102 to interconnect the same in desired shape and define a substantially closed container. This construction defines the casing which can be mounted in a building in the manner illustrated in Fig. 10 and which may have connection with a forced air system by means of a boot (not shown) either at its bottom or at its rear wall.

At spaced points brackets 109 are anchored to the front and rear walls 100, 102 by screws or other securing means and provide supports for an elongated partition member 100 provided with apertures 111 at regularly spaced intervals along the length thereof, which partition corresponds to partition 46 previously described and is preferably located spaced below the inclined or configured casing portion 105. The partition 110 may have marginal upturned flanges bearing against the front and back walls therebelow, as illustrated.

A damper plate 112 provided with apertures 113 of the same size, number and arrangement or spacing as the apertures 111 in the partition 110, is slidable upon said partition between a position in which the apertures 113 register with the apertures 111 and a position in which the apertures are out of register with each other.

The casing is provided with air discharge openings 114 preferably longitudinally elongated and arranged uniformly along the full length thereof, as at the inclined wall 104. The total area of the openings 114 will not be substantially greater than, and preferably less than, the total cross-sectional area of the partition openings 111, and the total cross-sectional area of the partition openings 111 will preferably be less than the cross-sectional area of the inlet aperture to the device at which the boot (not shown) is connected below the level of the partition.

The damper 112 may mount a finger piece 115 below one of the openings 114, which finger piece may project adjacent to or through one of said openings to provide means for conveniently adjusting the longitudinal position of the damper 112 relative to the partition 110.

This device makes possible the uniform discharge along its length of air supplied at a boot connected with a forced air circulating system centrally thereof or at any other point along its length. The uniform longitudinal spacing of the apertures 111 of the partition 110 and the comparatively small size of those apertures forces air entering the lower chamber below the partition to be dispensed substantially uniformly throughout the length thereof. The uniform spacing of the apertures 114 along the length of the casing, inconjunction with the size relation thereof to the apertures 111, assures further a longitudinal uniformity of air distribution from the device. The discharge at the inclined face 105 serves to direct

air in an upward direction into the room deflected slightly away from the back wall 100 and the wall of the building against which that back wall abuts, but the discharge openings 114 may be formed in either horizontal or vertical casing parts at the upper end of the casing. Hence the device provides a highly effective perimeter heating member of the so-called baseboard type.

While the preferred embodiments of the invention have been illustrated and described, it will be understood that changes in the construction may be made within the scope of the appended claims without departing from the spirit of the invention.

I claim:

1. An air distributor adapted for connection with a forced air circulating system, comprising an elongated casing having top, side, bottom and end walls, a longitudinal partition spanning said casing and dividing it into upper and lower chambers, said casing having an inlet opening extending part length thereof for communication with said system at said lower chamber, a plurality of apertures substantially uniformly longitudinally spaced in said partition throughout its length, a damper plate slidable endwise in face engagement with said partition and having a plurality of apertures adapted to register with said partition apertures in one poistion thereof, said damper plate spanning said partition apertures in a second position thereof, one of the walls defining said upper chamber having therein a plurality of discharge apertures substantially uniformly spaced throughout its length, the total area of said discharge apertures being less than the total area of said partition apertures, and the total area of said partition apertures being less than the cross-sectional area of said inlet.

2. An air distributor adapted for connection with a forced air circulating system, comprising a pair of elongated casings, each casing having two side walls, a bottom wall, an end wall, an open end and an apertured top wall projecting longitudinally beyond said open end, an apertured longitudinal partition dividing each casing into two chambers, an apertured damper slidable on said partition, the ends of the top walls of said casings adjacent said open casing ends abutting each other and the ends of the remaining walls of said casing being spaced apart, a U-shaped joint spanning and arranged in lapping engagement with said side and bottom walls adjacent said open ends, and a plate interconnecting the side walls of said joint in abutting coplanar relation to the partitions in said casings.

3. An air distributor comprising a pair of elongated side wall members each having a perpendicular longitudinal flange, a member extending between and interconnecting said side wall members intermediate their height to position said flanges in lapped relation to define a a double thickness bottom wall, an apertured top wall bearing on the top edges of said side wall, a securing member connecting said top wall to said interconnecting member, end walls having marginal perpendicular flanges secured in face engagement with said top, side and bottom walls, an apertured longitudinal partition supported by said interconnecting member and engaging said side and end walls to form upper and lower chambers, and an apertured damper slidable on said partition.

4. An air distributor as defined in claim 3, wherein said side wall members are scored longitudinally at the junction between the same and their flanges.

5. An air distributor adapted for connection with a forced air circulating system, comprising an elongated casing having top, side, bottom and end walls, a longitudinal partition dividing said casing into upper and lower chambers, said casing having an inlet opening for communication with said system at said lower chamber, a plurality of substantially uniformly longitudinally spaced apertures in said partition, a damper plate slidable endwise in face engagement with said partition and having a plurality of apertures adapted to register with said partition apertures in one position thereof, one of the walls defining said upper chamber having a plurality of longitudinally spaced discharge apertures therein, said casing being formed of a plurality of parts, each of said side walls constituting an L-shaped member having a bottom-forming flange extending substantially full width of said casing, said bottom flanges being arranged in substantially registering and contacting relation to form a bottom wall of double thickness, and means interconnecting said side walls and supporting said partition.

6. An air distributor adapted for connection with a forced air circulating system, comprising an elongated casing having top, side, bottom and end walls, a longitudinal partition dividing said casing into upper and lower chambers, said casing having an inlet opening for communication with said system at said lower chamber, a plurality of substantially uniformly longitudinally spaced apertures in said partition, a damper plate slidable endwise in face engagement with said partition and having a plurality of apertures adapted to register with said partition apertures in one position thereof, one of the walls defining said upper chamber having a plurality of longitudinally spaced discharge apertures therein, spaced coplanar supports spanning said casing and supporting said partition and said partition having longitudinal upturned side flanges engaging the inner faces of said side walls, said damper having upturned side flanges in sliding guided engagement with said partition flanges.

7. An air distributor adapted for connection with a forced air circulating system, comprising an elongated casing having top, side, bottom and end walls, a longitudinal partition spanning said casing to divide it into upper and lower chambers, said casing having an inlet opening for communication with said system at said lower chamber, a plurality of apertures substantially uniformly longitudinally spaced in said partition throughout its length, a damper plate slidable endwise in face engagement upon said partition and having a plurality of apertures adapted to register with said partition apertures in one position thereof, one of the walls defining said upper chamber having a plurality of discharge apertures substantially uniformly longitudinally spaced throughout its length, and a coil spring compressed in said casing and bearing on said top and said damper for urging said damper into face engagement with said partition.

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