

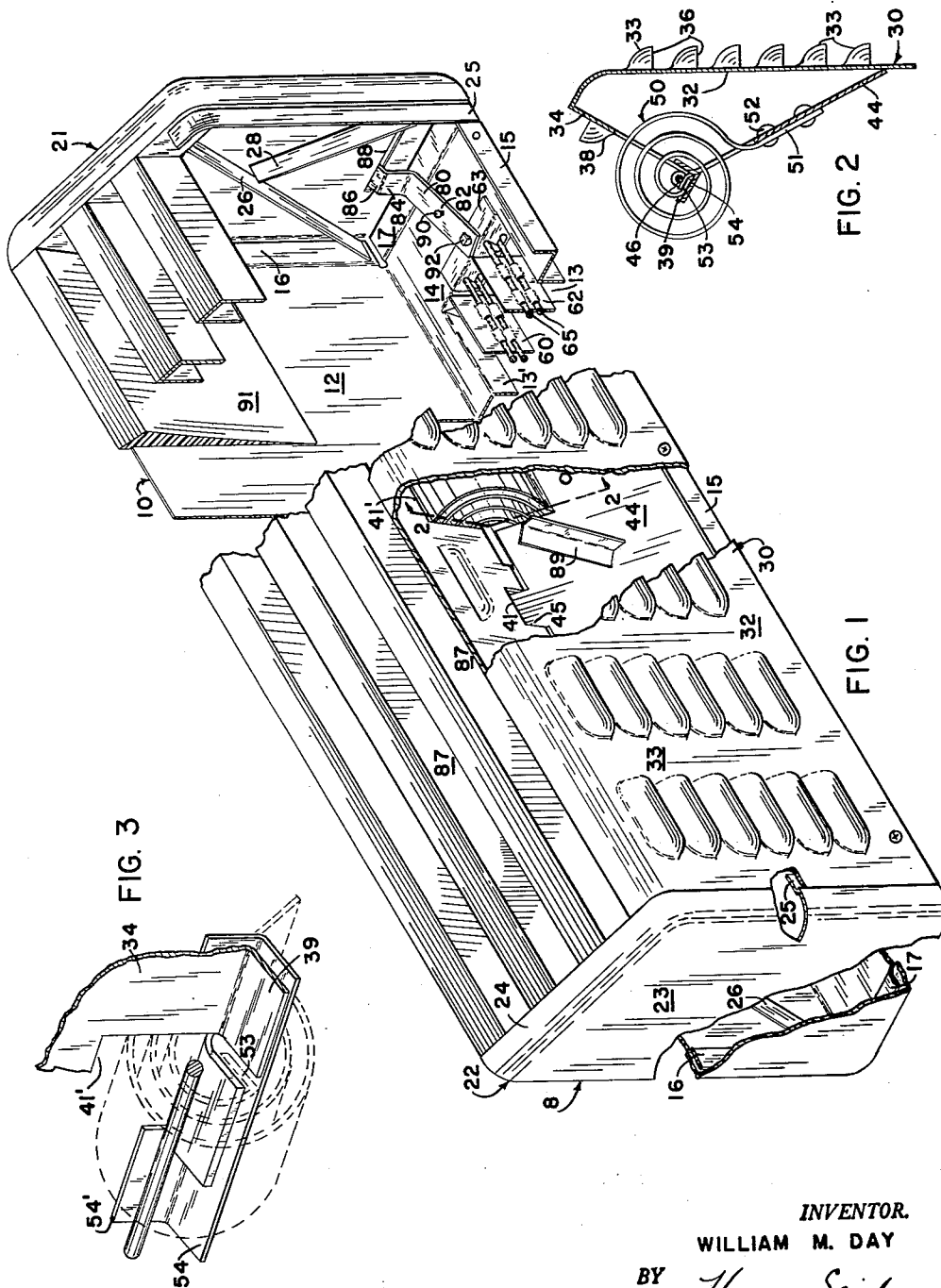
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AIR DISTRIBUTION APPARATUS

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AIR DISTRIBUTION APPARATUS

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2 Claims. (Cl. 98-40)

This invention relates generally to air distribution apparatus. More particularly this invention relates to apparatus for distributing air flowing in a duct connected to an air conditioning plant designed to vary the temperature of the air. Equipment employed to provide heating for an enclosure such as a residence is often equipped with means for supplying the enclosure with cool air under those conditions where the outdoor temperatures are such that heating is not required and cooling is desired. The equipment referred to above includes a central plant and a plurality of ducts through which air that has been heated or cooled at the central plant is transmitted to the individual rooms in the enclosure. One of the problems involved in the use of the equipment described concerns the distribution of the air into the individual rooms which comprise the enclosure. Under those circumstances where warm or hot air is being supplied to the individual rooms, it is desired that the air heated in the central plant be supplied to the room from the duct in a pattern which includes a substantial, if not total, flow of air from the duct in a direction horizontally of the room in the area adjacent the floor. Thus the warm air forced to flow outwardly across the floor and then upwardly along the walls of the room in a manner which eliminates or reduces to a minimum the existence of drafts in the area adjacent the floor.

However, when the central plant is operated so that relatively cool air is supplied through the ductwork to the individual rooms, it is desirable that the flow of air from the duct into the room be such that the relatively cool air is directed upwardly along the wall adjacent the connection between the flow and the duct serving the room so as to minimize the presence of relatively cool air adjacent the floor. The presence of relatively cool air adjacent the floor is objectionable for it provides discomfort to people using the room.

Accordingly, it is the chief object of this invention to provide an improved air distribution unit, for use with the ducts serving an individual room of an enclosure, which is automatically operable to change the pattern of air distribution in accordance with the temperature of the air being supplied from the ducts to the unit for eventual flow into the room being served by the equipment.

Another object of the invention is the provision of an improved apparatus for distributing air to a room or other suitable enclosure from a duct or the like providing a supply of air to the room wherein the apparatus is easily assembled and fabricated from parts readily lending themselves to stamping operations or other inexpensive fabrication techniques.

A still further object of the invention is the provision of an air distribution unit equipped with means providing for two separate and distinct patterns of air distribution together with a control member for selectively determining the particular pattern of air distribution in accordance with the temperature of the air handled by said distribution unit.

A still further object of the invention is the provision of an air distribution unit of the kind described wherein thermal-responsive elements are utilized to govern operation of the control member for determining the pre-selected pattern of air distribution.

These and other objects of the invention will be apparent upon a consideration of the ensuing specification and drawings wherein:

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FIGURE 1 is a perspective view, partially broken in the interests of clarity, of an air distribution unit illustrating this invention;

FIGURE 2 is a sectional view taken along lines 2-2 of FIGURE 1 showing a portion of the control member regulating the pattern of air distribution forming a part of this invention; and

FIGURE 3 is a view in perspective illustrating a detail of the invention.

Referring more particularly to the drawing for an illustration of one embodiment of the invention, there is shown an air distribution unit 8 employing the features of this invention. The air distribution unit to which this invention pertains is a unit which is employed in conjunction with the terminal end of a duct through which air is supplied from a central station to a room or other enclosure to be served by the equipment forming the central station. The unit 8 is adapted to be mounted over an opening in the floor of the room being served by the central heating or cooling plant and is formed for the most part of sheet metal material that may be readily fabricated through the use of conventional stamping operations.

The air distribution unit includes a member 10 serving as the rear wall and floor of the air distribution unit. The rear wall 12 is formed so that the floor portion 14 extends forwardly from the bottom portion thereof and is integrally connected thereto. The floor portion 14 is provided with an opening 13 having a downwardly extending flange 13' formed as the metal of the floor portion 14 surrounding the opening is bent at a right angle to the plane of the floor portion 14. In addition, an upwardly extending flange 15 is provided for a purpose to be later described. The flange 13' surrounding the opening 13 engages the end of a duct member (not shown) terminating in the floor of a room or enclosure to be supplied with air from the air distribution unit 8.

As will be evident from a consideration of FIGURE 1, the end portions 16 of wall member 12 are displaced from the plane of the wall to form a flange portion for a purpose to be later described. This is likewise true of the end portions 17 of the floor portion 14 of member 10.

Connected to the end of the member 10 are side wall members 21 and 22. The end wall members 21 and 22 include a substantially planar portion 23 having a flange portion 24 bent up about the periphery thereof and an extending portion 25. The upper, front and rear sides of the end wall member are rounded off in the manner shown in FIGURE 1. Members 21 and 22 are connected to the member 10 through engagement of flanges 16 and 17. Extending from the confronting surfaces of the end wall members 21 and 22 are flat plate members 26 and 28 which serve as seal members to prevent bypassing of air around the sides of a control member to be later described. The upper end of plate member 28 terminates short of contact with the surface of plate member 26. Extension 25 of the end walls 21 and 22 serves to engage a front wall member 30.

The front wall member 30 includes a substantially vertical portion 32, the upper part of which is provided with a radius as shown in FIGURE 2. Integrally connected to the arcuate portion of the wall 32 is a downwardly inclined portion 34. Spaced portions 33 of the front wall 32 are displaced so as to provide a system of outlets permitting of passage of air from the air distribution unit downwardly across the floor of the enclosure being served by the air distribution apparatus. As clearly shown in FIGURE 1, a series of spaced notches 41 are provided in the edge of the downwardly extending portion 34.

An air directing damper 44 serving as a control member for the air distribution apparatus is provided with a series of projecting portions 45 adapted to fit within com-

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plementary notches 41 located in section 34 of the front wall member 30. The damper 44 is hingedly connected to section 34 of the front wall member 30 so as to permit it to assume the position in FIGURE 2 or an alternative position wherein opening 13 is in communication with the outlets in the front wall 30. To this end, a hinge pin 46 is provided extending through openings provided in the projections 45. The parts are so arranged that the portions of hinge pin 46 extending between the notches 41 provided in the downwardly extending portion 34 of the front wall member 30 are supported by a flange 39 extending rearwardly with respect to the downwardly inclined portion 34 and integral therewith.

Connected to the damper member 44 is a hinge member 50 formed in the manner shown in FIGURE 2 wherein one end 51 is secured to the damper 44 by rivets 52. The member 50 is formed of a bimetallic material and is arranged so as to be responsive to changes in temperature. Bimetal member 50 is coiled in the manner shown in FIGURE 2 so that the end 53 opposite end 51 is secured to hinge mounting bracket 54 secured to the downwardly extending portion 34 of the member 30 on opposite sides of an enlarged notch 41'. Connection between the end 53 of member 50 and bracket 54 is accomplished by bending a portion of leg 54' of the bracket over the end 53 against the base of the bracket.

Assembly of the front wall member 30 and damper 44 is accomplished by connecting the subassembly, consisting of the damper 44, hinge member 50 and bracket 54, into the portion 34 of the front wall member by mounting hinge 50 into the notch 41' and securing by spot-welding bracket 54 to the portion 34 adjacent notch 41'. The parts are arranged so that projections 45 fit into notches 41. Hinge pin 46 is then assembled to connect the projections 45 and overlie leg 54' of bracket 54.

In order to regulate the volume of air to be introduced into the distribution unit 8 from the duct, control dampers 60 and 62 are shown mounted in bracket 63 adapted to be connected to the floor and the flange 13' in the manner shown in FIGURE 1. Bracket 63 is provided with substantially L-shaped openings. Rods 65 extend through the control dampers 60 and 62. More particularly, rods 65 extend through portions of the control dampers 60 and 62 that have been upset from the plane of the damper and are provided with an arcuate configuration adapted to embrace the rods 65 in the manner shown in FIGURE 1.

An actuating handle 80 is provided with a portion 82 adapted to overlie the floor 14, a vertical portion 84 formed integrally therewith, an outwardly extending portion 86 arranged to project through a slot 88 in the end wall cover member 21. The extending portion 88 serves as a handle for a person desiring to manipulate the volume control dampers 60, 62. Actuator member 80 is arranged so as to pivot about point 90 and has a loose connection with a pin 92 secured to the bracket 63. The parts are so arranged that manipulation of the actuator 80 through manual operation of the projecting portion 86 causes the bracket 63 to reciprocate along the edge of the flange 13' to which it is attached. Reciprocating movement of bracket 63 causes reciprocating movement of the L-shaped openings that accommodate the ends of the rods 65, imparting, in turn, limited rotational movement to members 60 and 62. Damper control becomes important when it is desired to regulate the volume of air being supplied to the air distributing unit 8. For example, in the winter months when heat is required the volume of air is different from the volume of air necessary to obtain comfortable conditions in the summer season when cool air is supplied to the air conditioning unit.

Considering the assembly and operation of the air distribution unit forming the subject of this invention, member 10 serving as the back wall and floor of the unit

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has the subassembly consisting of the volume control dampers 60, 62 and the actuating mechanism therefor arranged therewith so that the side or end cover members may be very readily fitted thereto. The front wall member 30, control damper and hinge are then mounted as a subassembly as described above. Suitable fastening elements connect the front wall portion to the bottom thereof through the flange 15 connected to the floor portion 14 of the combination back wall and floor member 10. As pointed out above, the air distribution unit 8 is placed over the outlet of a duct having communication with the central air conditioning plant capable of providing either heated or cooled air to the room being served by said unit. With the air distribution unit mounted over the opening in a floor so that space 13 is in communication with the outlet of the duct, air from the duct will flow into the air distribution unit and will leave the unit in a path determined by the position of the control damper 44. The position of the control damper within the air distribution is dependent upon the temperature of the air being supplied to the unit. As indicated above, the damper actuating bimetal member 50 will assume the position indicated in FIGURE 2 when relatively cool air having a temperature below 80° F. is supplied to the air distribution unit. Under these circumstances air from the duct will enter the air distribution unit and flow upwardly to the top portion thereof defined by the uppermost limit of the rear wall portion of the member 10. Preferably a plurality of louvers 87 are provided so as to assist in the flow of the air from the unit through the top portion thereof and are arranged to deflect the air just enough off the wall to prevent streaking dirt deposits. The seal members 26 and 28 are arranged so as to form extensions of the damper 44 when it is placed in either one of its operating positions. For illustration, when the damper 44 is in position illustrated in FIGURE 2, seal member 28 serves as a continuation of the damper and prevents bypassing of air around the sides of the damper.

When the requirements of the enclosure being served by the air distribution unit indicate that warm air is needed, any conventional means, such as a thermostat, will provide a signal to the central plant for the purpose of supplying heated air to the ductwork to the air distribution unit. Under these circumstances, the bimetallic actuating damper element senses a temperature in excess of 90 or 100° F. and responds through unequal expansion of its components sufficient to cause rotation of the damper member 44 to a position wherein opening 13 is in communication with that portion of the air distribution unit having the outlets 36. Under these circumstances the relatively warm air flows from the ductwork into the unit and outwardly through openings 36 into the room being provided with the relatively warm air. If desired, a portion of the downwardly extending member 34 may be displaced from the plane thereof in the manner shown in FIGURES 1 and 2 so as to provide a single outlet 38 for the purpose of directing relatively warm air upwardly out of the unit in order to combat the effects of cool or cold air falling from a window in the event that the unit is positioned underneath the window.

A further feature of the invention involves the provision of a guide member 89 for the purpose of directing the relatively warm air flowing from the duct into immediate contact with the bimetal actuator element 50.

As pointed out above, it may be desirable to vary the volume of air supplied to the air distribution unit from season to season. In other words, when the unit is operable to distribute warm air, as indicated in the manner above, the dampers 60 and 62 may be moved to a position wherein the volume of air flowing from the central station is throttled. On the other hand, during the cooling season when it is desirable to increase the volume of air flowing to the air distribution unit, handle 88 on the damper actuating means may be rotated to

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cause the dampers 60 and 62 to assume a position wherein a greater volume of air may be supplied to the air distribution unit.

It may likewise be desirable to provide an air deflection member 91 to the back wall 12 of the member 10 in order to vary the path of flow of cold air so that overcooling of the wall against which the air distribution rests will be avoided, as well as to provide a member adapted to cooperate with the orientation of the members 87 to prevent streaking due to deposits of dirt on the wall.

With the construction described, the undesirable effects of the flow of stagnant or relatively cool air maintained in suspension in the system during off-cycle periods in the heating season are substantially eliminated, for unless the bimetallic hinge member 50 controlling the position of the damper 44 senses an air temperature in excess of 90° F., for example, it assumes a position such that damper 44 directs air upwardly from the away from the floor of the enclosure served by the unit.

If it is desired to avoid adjustment of handle 80 when changing from heating to cooling, or from cooling to heating, in order to assure the supply of a proper volume of air to assure comfortable air temperature conditions in the enclosure, the members 87 and the outlets 33 may be designed to create a predetermined resistance to air flow such that the desired volume required is maintained once damper 44 connects either outlet with the supply of air being delivered to the air distribution unit.

While I have described a preferred embodiment of the invention, it will be understood that the invention is not limited thereto since it may be otherwise embodied within the scope of the following claims.

I claim:

1. Air distribution apparatus comprising wall means forming an enclosure to surround an inlet serving to supply air to said enclosure for distribution therefrom,

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said wall means arranged to provide a first enclosure outlet for flow of air upwardly from said enclosure, said wall means including a front wall provided with a plurality of openings defining a second enclosure outlet for the flow of air laterally of said enclosure and a downwardly and rearwardly extending portion formed proximate the top thereof; pivotally mounted damper means connected to said downwardly and rearwardly extending front wall portion and coextensive therewith; thermal responsive hinge means connecting said damper to said front wall portion so that when air above a predetermined temperature is supplied to said apparatus the hinge means will move said damper to establish communication between said inlet and said second outlet to the exclusion of said first outlet and when air below a predetermined temperature is supplied to said apparatus the hinge means will move said damper to establish communication between said inlet and said first outlet to the exclusion of said second outlet.

2. The invention set forth in claim 1 wherein said downwardly and rearwardly extending portion of said front wall is provided with an opening for the flow through said first outlet of a predetermined amount of air delivered to said second outlet when the second outlet is in communication with said inlet.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,068,776

December 18, 1962

William M. Day

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 30, after "air" insert -- is --;
column 5, line 18, after "the" insert -- unit --.

Signed and sealed this 24th day of September 1963.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents