United States Patent [19]

Gilbert

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[54] **AIR DISTRIBUTION APPARATUS**

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[30] **Foreign Application Priority Data**

May 11, 1971 Great Britain 14,305/71

[52] **U.S. Cl.** ..... **98/40 C,** 138/40

[51] **Int. Cl.** **F24f 13/06**

[58] **Field of Search** ..... 98/40 D, 40 C; 138/40

[56] **References Cited**

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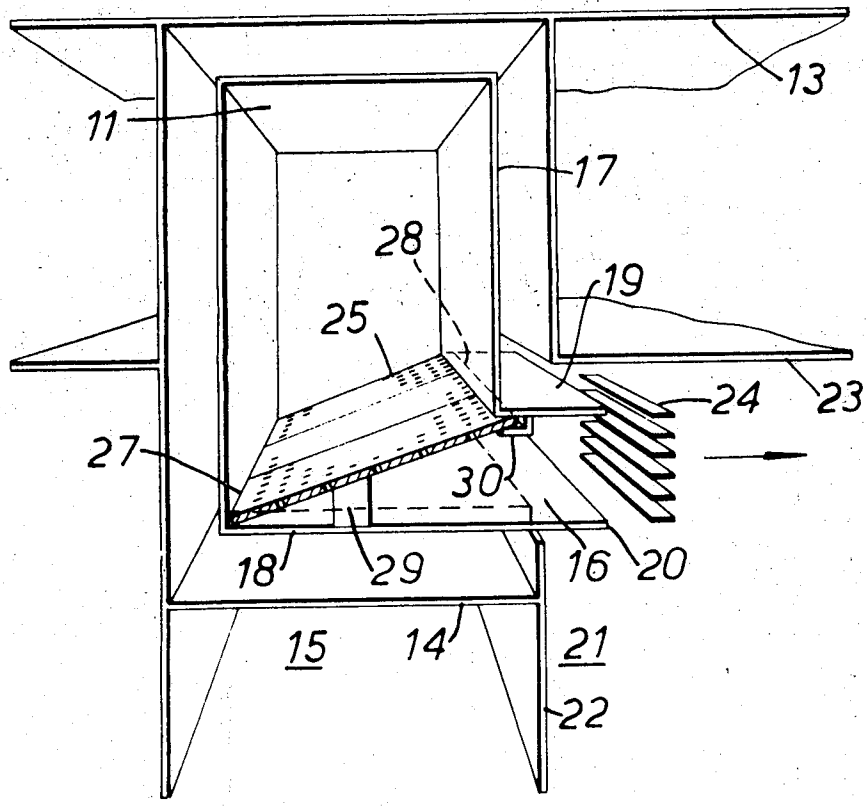
Primary Examiner—William E. Wayner

Attorney—Peter H. Smolka et al.

[57] **ABSTRACT**

An air distribution duct has an elongated opening extending along the duct through which air may pass from the duct to an enclosure, together with a plurality of restriction members providing restricted air passages for controlling air flow from the duct to the opening, each having an inner edge located within the duct and the opposite outer edge located adjacent to and substantially parallel with the elongated opening, each restriction member being tiltable between a first position in which the said outer edge is positioned adjacent one side of the elongated opening and the restriction member extends across the path between the interior of the duct and the said opening, and a second position in which the said outer edge is positioned adjacent the other side of the elongated opening thereby providing unobstructed passage between the interior of the duct and the said opening.

14 Claims, 6 Drawing Figures



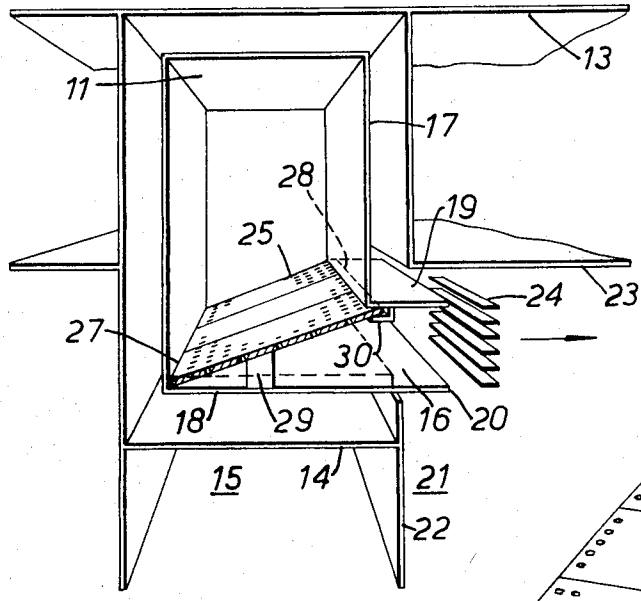


FIG. 1.

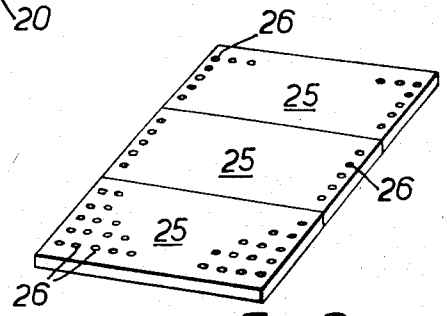


FIG. 2.

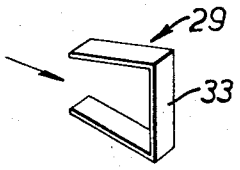


FIG. 3.

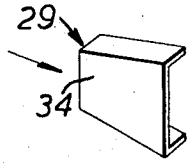


FIG. 4.

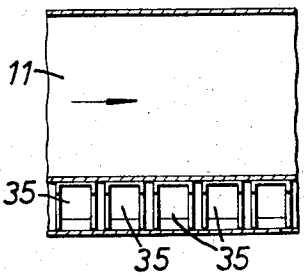


FIG. 5.

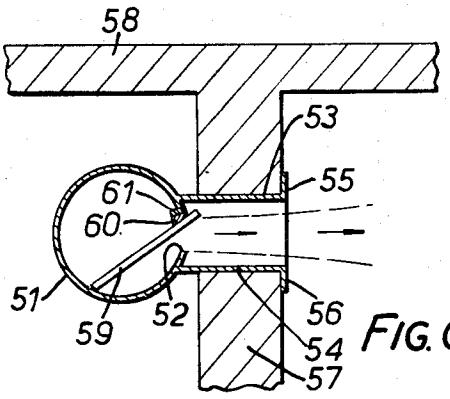


FIG. 6.

AIR DISTRIBUTION APPARATUS

BACKGROUND OF THE INVENTION

The invention relates to air distribution apparatus and particularly to air distribution apparatus for air conditioning, heating, cooling or ventilation purposes.

In such apparatus, a system of ducts may be provided around a building so that an air supply is circulated around the ducts. Air can be fed through openings in the ducts into rooms as required. The air may be circulated at relatively high velocity in the ducts and it is desirable to prevent this axial velocity persisting in the air which reaches the interior of the room. This can be achieved by providing restricted air passages between the main air passage through the duct and the outlet of the duct. Preferably the restricted air passages are arranged transverse to the direction of axial flow through the duct so as to remove the axial velocity of the air which passes through the restricted passages.

It is an object of the present invention to reduce difficulties which may be caused by blocking of such restricted air passages.

SUMMARY OF THE INVENTION

The present invention provides air distributing apparatus for delivering air to an enclosure, which apparatus comprises an air distribution duct having an elongated opening extending along at least part of the length of the duct through which air may pass from the duct to the enclosure, one or more restriction members providing restricted air passages for controlling air flow from the duct to the opening, each having an inner edge located within the duct and the opposite outer edge located adjacent to and substantially parallel with the elongated opening, the or each restriction member being tiltable between a first position in which the said outer edge is positioned adjacent one side of the elongated opening and the restriction member extends across the path between the interior of the duct and the said opening, and a second position in which the said outer edge is positioned adjacent the other side of the elongated opening thereby providing unobstructed passage between the interior of the duct and the said opening. The or each restriction member may comprise a plate provided with a plurality of apertures passing through it. Alternatively a plurality of restriction members are arranged side by side along the duct, each restriction member including a solid plate spaced from adjacent restriction members so as to provide restricted air passages between adjacent restriction members. In this case, each restriction member is preferably an elongated member of rectangular channel section.

Preferably the or each restriction member is removable from the duct through the said opening, when in the said second position. This assists assembly of the apparatus and also assists cleaning the apertures through or between the restriction members should they become blocked during use.

The or each restriction member may lie flat against the bottom wall in the second position and be provided with a releasable support means to hold the outer edge against the top of the elongated opening when in the said first position.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic section through an air distribution device embodying the invention,

FIG. 2 is a perspective view of apertured plates used in the arrangement of FIG. 1,

FIGS. 3 and 4 show alternative wedging devices which may be used in FIG. 1,

FIG. 5 shows an alternative arrangement of restriction members, and

FIG. 6 is a section through an alternative duct embodying the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

These examples concern air distribution apparatus for delivering air to enclosures, such as is used in air conditioning or ventilating systems. In FIG. 1, a rectangular duct 11 forms part of a system of ducts extending around a building and providing a source of air for distribution. The duct 11 is elongated in length and may for example extend along one side wall of a room. In the arrangement shown in FIG. 1, the duct 11 is located below a ceiling or roof 13 and above a false ceiling 14 positioned above a corridor 15. An elongated opening 16 extends along the duct 11 at the bottom of a side wall 17 of the duct and immediately adjacent the base 18 of the duct. The opening 16 extends between two guide plates 19 and 20 into a room 21. The two plates 19 and 20 are secured to the duct 11 and extend horizontally along the duct one plate above the opening 16 and the other below the opening 16 in line with the base 18. The plates 19 and 20 extend through the wall 22 of the room 21 and enter the room below a false ceiling 23. A removable decorative grille 24 may be secured to the plates 19 and 20 so as to mask the opening 16 as seen from the room 21. Located within the duct 11 are a plurality of apertured plates 25. Three plates 25 are shown side by side in FIG. 2. Each plate has an array of apertures passing through the plate perpendicular to the plane of the plate. For simplicity, not all the apertures 26 have been marked in FIG. 2. Each aperture 26 is of small cross-section compared with the thickness of the plate. As is shown in FIG. 1, the plates 25 are arranged side by side along the length of the duct 11, no gaps being left between adjacent plates. The inner edge 27 of each plate 25 rests against the junction of the base 18 with the side wall of the duct 11. The inner edge 27 is not secured to the duct 11. The plates 25 are inclined upwardly relative to the base 18 so that the opposite edges 28 of the plates 25 rest against the undersurface of the upper plate 19. These plates 25 are held up in this position either by wedges 29 located between the base 18 and the undersurface of the plates 25, or catches 30 provided on the undersurface of the plate 19. A separate wedge 29 or catch 30 is provided for each plate 25. By removing the wedge 29 through the opening 16 or releasing the catch 30, each plate 25 may be pivoted about its edge 27 so as to drop flat onto the base 18. In this position, shown schematically in phantom in FIG. 1, the plate 25 can be removed horizontally through the opening 16 into the room 21, when the grille 24 is removed.

In use, air is forced along the duct 11 with considerable axial velocity. This is necessary in order to achieve effective distribution of air around an entire building. Owing to the provision of the apertures 26 in the plates 25, when the plates are in the position shown in FIG. 1, limited air flow may take place through the plates 25 and out through the opening 16 into the room 21. As the dimensions of each aperture 26 parallel to the axis

of the duct 11 is small, the axial velocity of the air from the duct 11 is killed before reaching the room 21. When the air distributing apparatus is initially installed in a building, air can be circulated around the ducts 11 before the apertured plates 25 are put in position. In this way the ducts are cleaned and the plates 25 are not initially blocked by discharge of dirt from the ducts 11. Once the ducts 11 have been cleaned in this way, the plates 25 can be inserted into the duct 11 by an operator standing in the room 21 passing the plates 25 through the opening 16. With the edge 27 of each plate pushed against the far side of the duct, the near side of the plate can then be raised upwardly with the plate pivoting about the edge 27 and the wedge 29 put in place or the catch 30 operated to secure the plate in the tilted position. This is done for each plate 25 and the air distribution apparatus is then ready for use. Should the apertures 26 become progressively blocked during operation owing to dirt or dust in the air which is circulated, individual plates 25 can at any time be removed by an operator present in the room 21. This is done by the reverse of the assembly operation. The wedge 29 or catch 30 is released and the plate 25 dropped into the horizontal position and then slid outwardly into the room 21 through the opening 16.

FIGS. 3 and 4 show alternative wedge devices 29. With the wedge shown in FIG. 3, the web 33 which faces perpendicular to the air flow passing through the opening 16 may provide some restriction of the air flow. If this is to be avoided, the wedge shown in FIG. 4 may be used in which the web 34 lies in a plane parallel to the direction of flow of air through the opening 16.

FIG. 5 shows an alternative arrangement in which instead of using plates 25 provided with arrays of apertures 26, each plate 25 is replaced by a number of elongated slats which extend across the duct 11 in the same way as the plates 25, each slat being spaced slightly from the adjacent slat. In this way, elongated gaps between each slat provide the restricted air passages instead of the circular apertures 26. These elongated gaps should have a dimension parallel to the axis of the duct which is small compared with the thickness of the slats in order to kill the axial velocity of the air. The slats may be formed of various cross-sectional shapes and may for example be of channel shape as shown in FIG. 5 and marked with the reference numeral 35. In this case the slats may be arranged perpendicular to the length of the duct as shown. Alternatively the slats may be inclined at an angle of for example 60° to the length of the duct. This can be useful where relatively wide gaps are provided between the slats 35 in providing some directional control over the air leaving the duct.

The invention is not restricted to the details of the foregoing examples. For example, many different wedges or catches may be used to secure the plates 25 in the raised position. The inner edge 27 of each plate 25 may be releasably secured within the duct 11 and need not necessarily be located at the junction of the base 18 and side wall of the duct. It could for example bear against a stop part way along the base 11 or against a stop part way up the adjacent side wall.

Instead of using wedges of the type shown in FIGS. 3 and 4, the wedges 29 may be formed of solid blocks having a variety of cross-sectional shapes. For example, the wedges may be rectangular, circular or tapered, in plan view.

The outer edge of the apertured plate or slat adjacent the outlet of the duct may be held in the raised position by magnetic tape secured to the duct and to the plate or slat by adhesive. Alternatively, pivoted legs may be provided at the outer edge of each apertured plate or slat to hold it in the raised position.

An arrangement using magnetic tape is shown in the alternative embodiment shown in FIG. 6. In this case the duct 51 is of circular tubular form with an elongated outlet slot 52 along one side of the tube. Two flat horizontal plates 53 and 54 are secured to the exterior of the duct 51 so as to form an outlet channel 55 into which the slot 52 opens. Flanges 55 and 56 are provided on the free ends of the plates 53 and 54. The plates 53 and 54 are mounted in a wall 57 just below a ceiling 58, with the flanges 55 and 56 lying flush with the wall. A plurality of spaced channel slats 59 are located within the duct 51 similar to those described with reference to FIG. 5. A strip of magnetic tape 60 is secured to the top face of the outer edge of each slat 59 and a similar strip 61 of opposite polarity is secured along the interior of the duct 51 immediately above the slot 52. The tapes hold the slats in the raised position when in normal use but allow release of the slats for removal through the channel 55 when required. The operation of this embodiment is the same as that already described with reference to FIGS. 1 and 2. The duct 51 may be of rectangular or other suitable shape if required.

It will be appreciated that a number of apertured plates 25 can be provided with standard external dimensions but with varying arrays of apertures and aperture sizes. In this way, the particular plates used for any one room in a building can be selected to suite the air requirements of the room and may be interchanged at any time should the requirements for the room change.

I claim:

1. Air distributing apparatus for delivering air to an enclosure, which apparatus comprises an air distribution duct having an elongated opening extending along at least part of the length of the duct through which air may pass from the duct to the enclosure, a plurality of restriction members extending across the duct and providing restricted air passages for controlling air flow from the duct to the opening each having an inner edge located within the duct and the opposite outer edge located adjacent to and substantially parallel with the elongated opening, each restriction member being tiltable between a first position in which the said outer edge is positioned adjacent one side of the elongated opening and the restriction member extends across the path between the interior of the duct and the said opening, and a second position in which the said outer edge is positioned adjacent the other side of the elongated opening thereby providing unobstructed passage between the interior of the duct and the said opening.

2. Air distributing apparatus as claimed in claim 1 in which the or each restriction member comprises a plate provided with a plurality of apertures passing through it.

3. Air distributing apparatus as claimed in claim 1 in which a plurality of restriction members are arranged side by side along the duct, each restriction member including a solid plate spaced from adjacent restriction members so as to provide restricted air passages between adjacent restriction members.

4. Air distributing apparatus as claimed in claim 3 in which each restriction member comprises an elongated channel member.

5. Air distributing apparatus as claimed in claim 1 in which each restriction member is removable from the duct through the said opening, when in the said second position.

6. Air distributing apparatus as claimed in claim 1 in which each restriction member is rectangular in shape.

7. Air distributing apparatus as claimed in claim 1 in which the duct has a flat bottom wall with the said elongated opening extending along the lower part of one side wall of the duct, each restriction member having the said inner edge supported on the bottom wall of the duct with the opposite outer edge projecting into the opening.

8. Air distributing apparatus as claimed in claim 7 in which the duct is of rectangular cross-section.

9. Air distributing apparatus as claimed in claim 8 in which the inner edge of the or each restricting member rests against the corner of the duct formed by the bottom wall and the side wall opposite to the side with the elongated opening.

10. Air distributing apparatus as claimed in claim 9 in which the or each restriction member lies flat against the bottom wall in the second position and is provided with a releasable support means to hold the outer edge against the top of the elongated opening when in the said first position.

11. Air distributing apparatus as claimed in claim 10 in which the releasable support means comprises a wedge member for insertion between the bottom wall of the duct and the or each restriction member.

12. Air distributing apparatus as claimed in claim 1 in which the duct is provided with guide plates extending outwardly from the elongated opening, one guide plate extending along each side of the opening, and each restriction member is removable through the gap between the guide plates.

13. Air distributing apparatus as claimed in claim 12 in which each restriction member is located with its outer edge secured to the top guide plate by a releasable support, the duct airway thereby including the space between each restriction member and the top guide plate.

14. Air distributing apparatus as claimed in claim 2 in which each restriction member comprises an apertured plate provided with an array of perforations which pass through the plate and have a cross-section which is small compared with the thickness of the plate.

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