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GB 0460037 A

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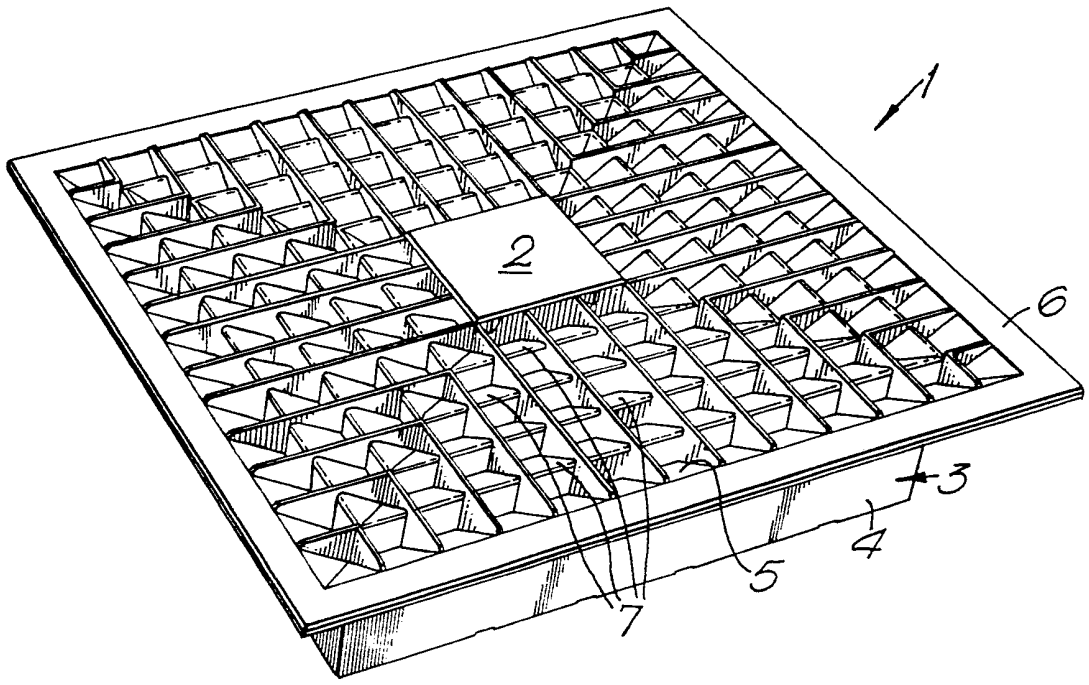
(54) Improvements in or relating to air diffusers

(57) A diffuser for use with an air supply system in a ceiling has a plurality of inclined substantially parallel louvre blades (7) defining air passages through which air is discharged into a space to be ventilated. A plurality of ribs (8) extend perpendicularly to the louvre blades, forming partitions between adjacent portions of the air passages defined between the louvre blades. The main body of the diffuser may be integrally moulded of a plastics material.

Fig.4.



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy

Fig.1.

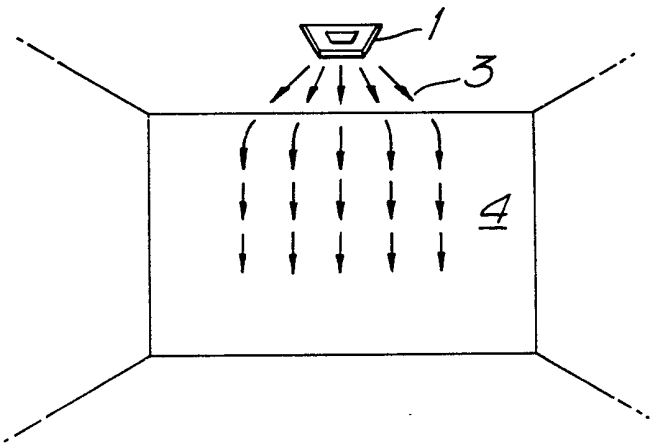

Fig.2.

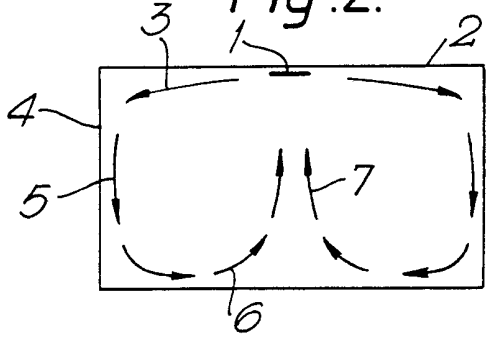

Fig.3.

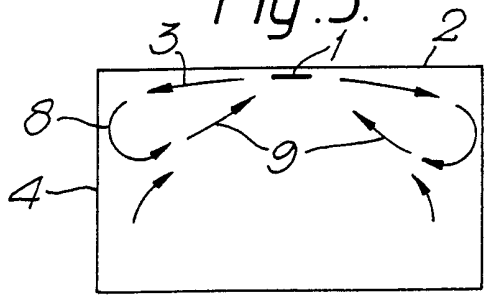

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Fig.4.

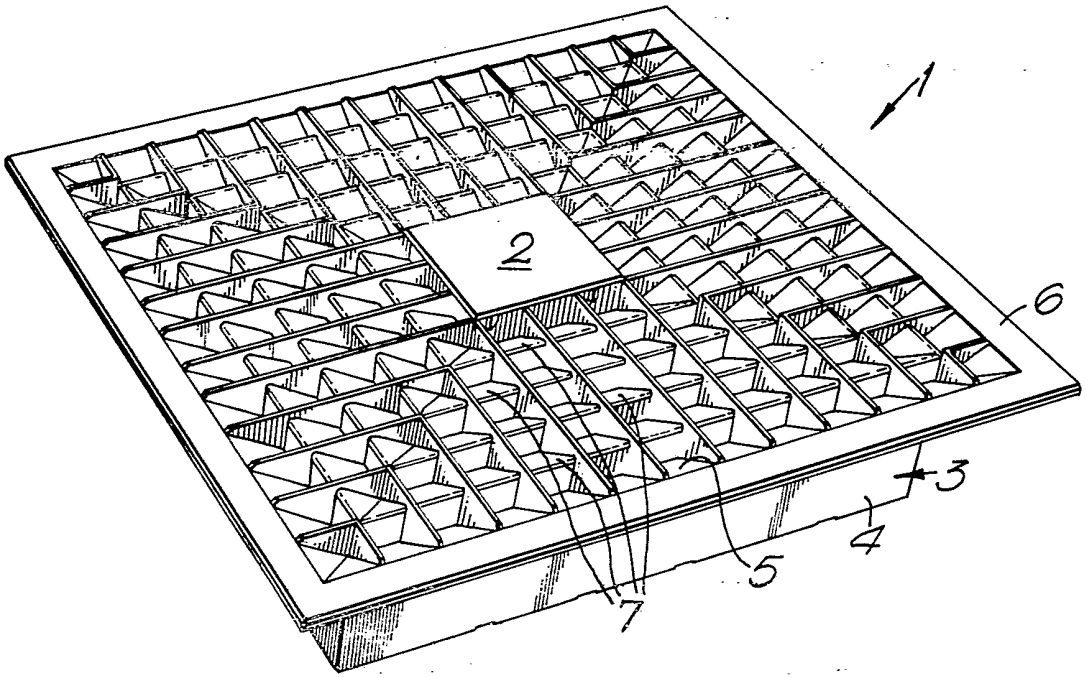


Fig.5.

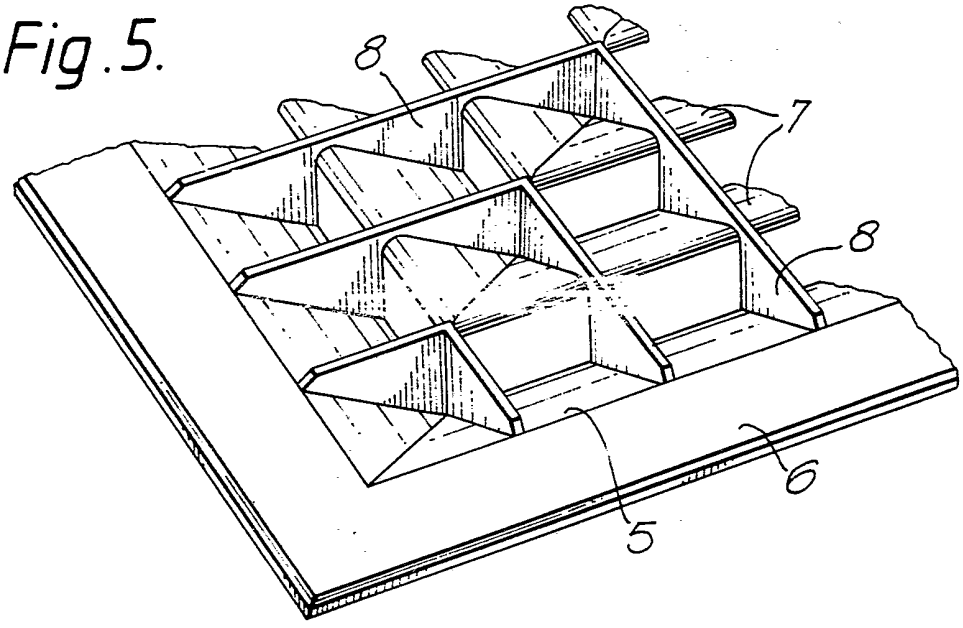


Fig.6.

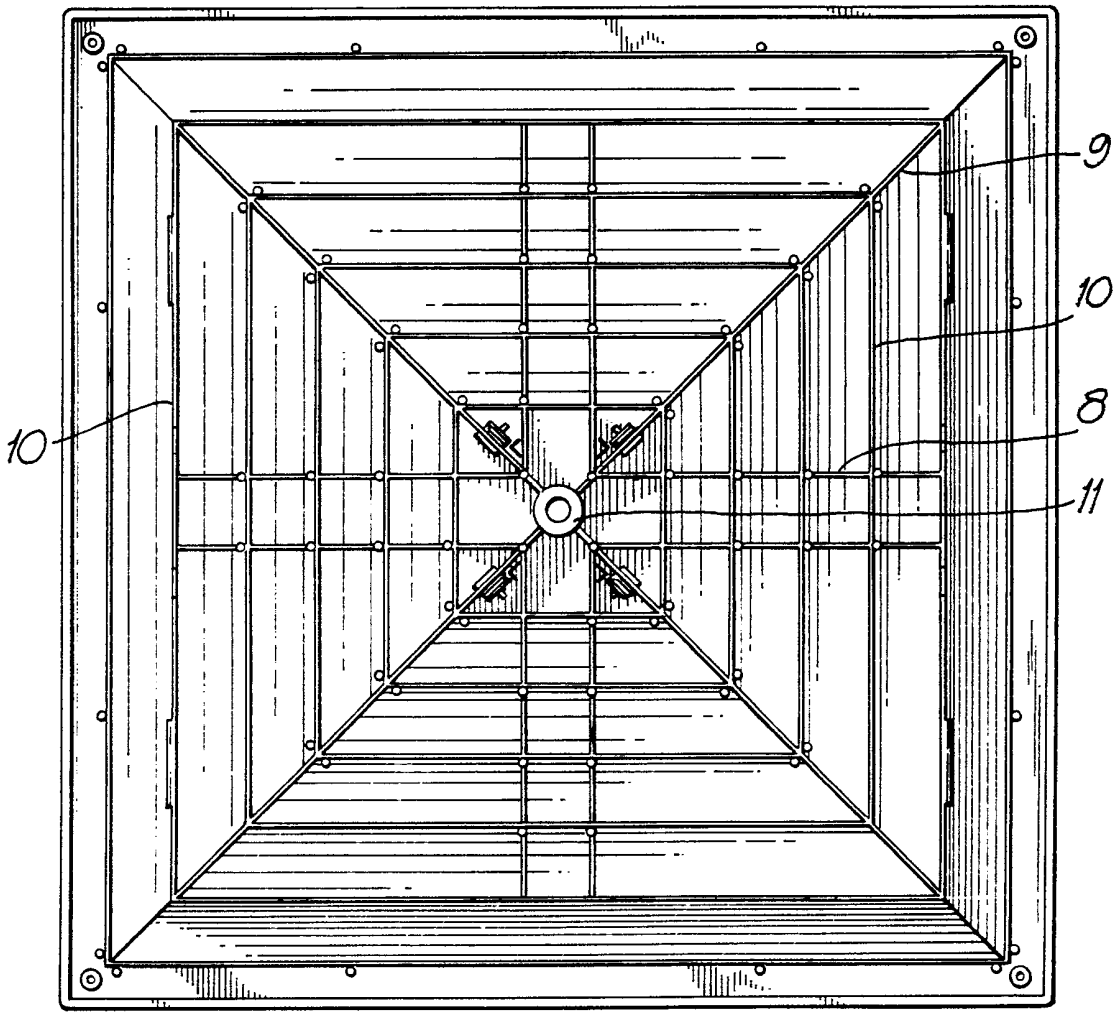


Fig. 7.

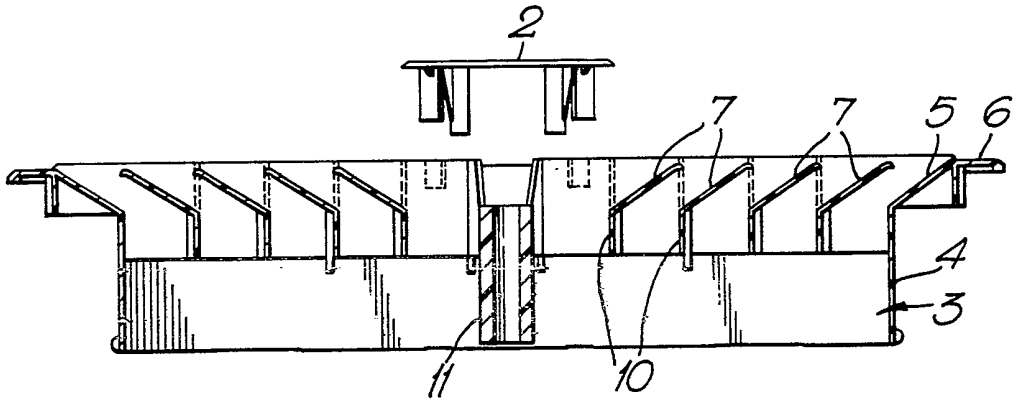


Fig. 8.

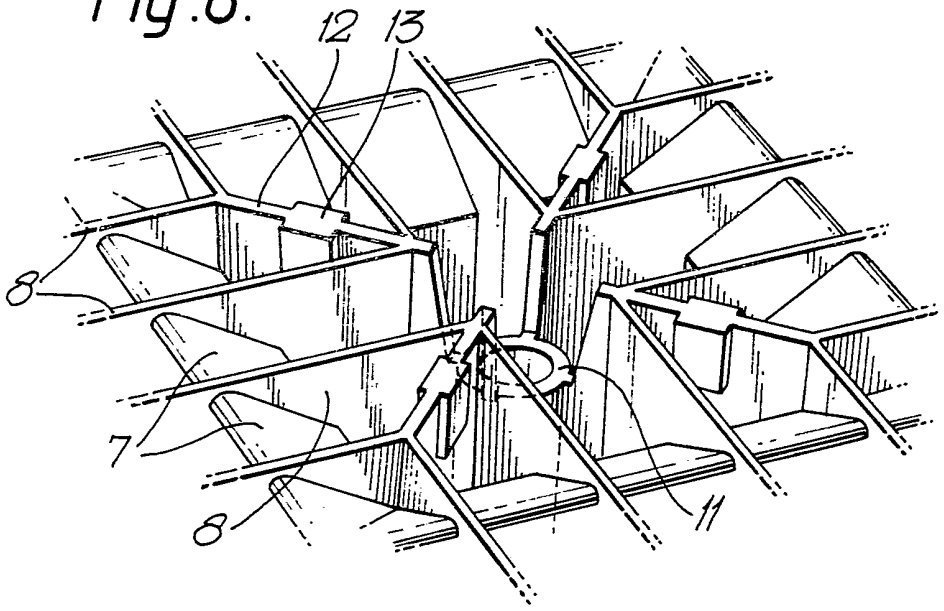


Fig. 9.

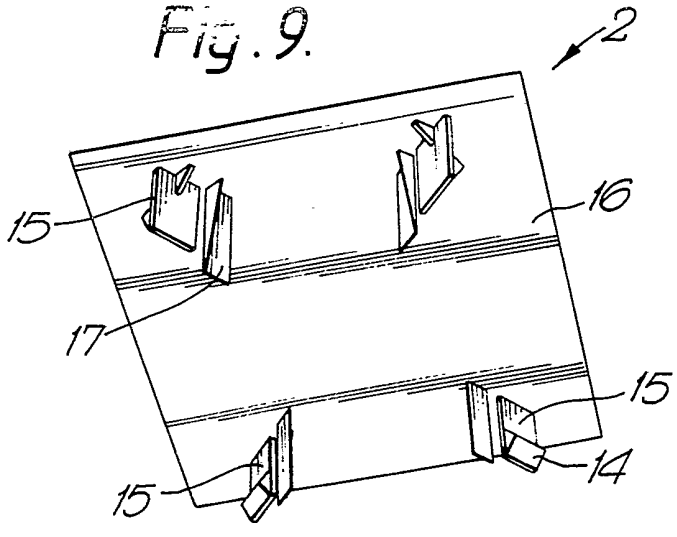


Fig.10.

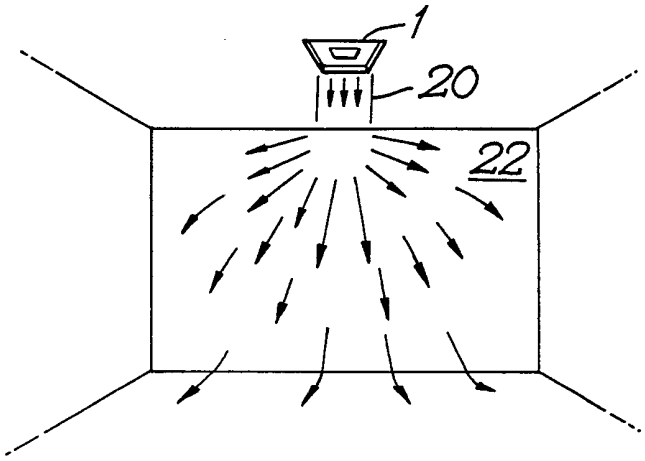


Fig.11.

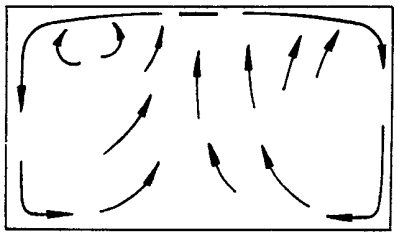
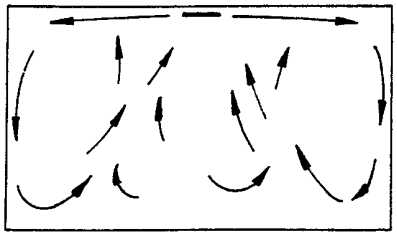


Fig.12.



PATENTS ACT 1977

P5258GB-NF/jsd

DESCRIPTION OF INVENTION

"Improvements in or relating to an air diffuser"

THE PRESENT INVENTION relates to an air diffuser and more particularly to an air diffuser intended for use in connection with a ducted air supply system.

In many offices, shops and factories a ducted air supply system is provided to supply air, which may be heated, cooled or otherwise conditioned, to occupied spaces within the building. The ducts may be exposed or concealed, and the ducts are conventionally provided with air outlets having diffusers located within spaces to be ventilated with air provided through the ducts. The function of the diffuser is to direct the air into the space to be ventilated with a predetermined flow patten.

A typical diffuser comprises a plurality of inclined blades or louvres which serve to direct the air substantially tangentially from the diffuser. Typically such a diffuser is mounted in a horizontal overhead position, and may thus be mounted in a ceiling, for example.

Figure 1 illustrates a prior art diffuser 1 mounted in the ceiling 2 of a room, the diffuser being of a generally square configuration when viewed from below, and comprising a plurality of louvres which are parallel with each side of the square. The space between adjacent louvres is unobstructed so that the air can flow freely from the diffuser.

The air flows, from the diffuser, in a substantially radial manner. The flow of air from one side of the diffuser is illustrated by the arrows 3 appearing in Figure 1 and it can be seen that the air from this side of the diffuser emerges as a diverging stream. The stream of air flows adjacent the ceiling, assisted by the coanda effect, until the flow of air reaches the wall 4. The air then decends down the wall 4. It is to be appreciated that similar streams of air are emerging from the other three sides of the diffuser 1 as shown in Figure 1.

Figure 2 is a cross-sectional view of the room of Figure 1 when cooling air is being provided through the diffuser. Cool air is relatively dense, and as can be seen from Figure 2, when the substantially horizontally extending stream of air 3 reaches the wall 4 it decends 5 to floor level where it is directed in towards the centre of the room 6, where the air finally moves upwardly 7. The air thus does not penetrate very evenly into the space to be ventilated.

A worse situation exists, with a conventional diffuser, when air which is intended to heat the space being ventilated emerges from the diffuser 2. Reference may be made to Figure 3 which is a cross-sectional view corresponding to Figure 2, but illustrating the condition that exists when relatively warm air is emitted from the diffuser 1. Because the air is buoyant, as a consequence of warm air having less density than cool air, the air emerging from the diffuser 1 as the stream 3 meets the wall 4 and extends downwardly for a short distance 8, before the buoyancy of the warm air causes the air to turn in an upward inwardly directed flow 9. It will be seen, therefore, that the warm air does not penetrate the area to be ventilated in a satisfactory manner.

A typical prior art diffuser, as shown in Figures 1 to 3, consists of concentric louvre blades which are parallel with the sides of the diffuser. The blades may be fabricated from any suitable material,such as metal. The louvre blades may be of the same configuration in plan, such as square or circular, but are of successively reduced sizes. A structure is provided behind the louvre blades to support and locate the blades. The structure is relatively complex. Thus a prior art diffuser is fabricated from a number of different components which have to be assembled together, which is time consuming and expensive.

The present invention seeks to provide a diffuser which overcomes or at least reduces the disadvantages, as described above, of the presently conventional diffuser.

According to one aspect of this invention there is provided a diffuser for use with an air supply system, said diffuser comprising means to communicate with a source of air, means defining a plurality of inclined substantially parallel louvre blades positioned to receive air and to discharge air into a space to be ventilated, there being a plurality of ribs extending perpendicularly to the louvre blades, forming partitions between adjacent portions of the air passages defined between the louvre blades.

Preferably the diffuser is of substantially square configuration, the louvre blades comprising separate sets of louvre blades parallel with each of the sides of the diffuser, said ribs extending orthogonally to the sides of the diffuser.

According to another aspect of this invention there is provided a diffuser for use with an air supply

system said diffuser comprising an element to communicate with a source of air, one end of said element supporting a peripheral frame with two opposed pairs of parallel sides which are orthogonal, a plurality of louvre blades adjacent to and parallel with each side and being evenly spaced, the louvre blades being positioned to receive air through said element and being inclined to the axis of said element to discharge the air into a space to be ventilated there being a plurality of ribs extending substantially perpendicularly to the edges of the frame and engaging successive louvre blades to retain the louvre blades in position.

The ribs may be on the front face of the louvre blades or on the rear face of the louvre blades.

The diffuser may be fabricated as an injection moulding of a plastics material.

Conveniently a central region of the diffuser is provided with a removable cover.

Advantageously the central region of the diffuser defines a cylindrical portion adapted to receive a fastening bolt or the like to secure the diffuser in position.

Preferably the cover is held in position by means of resilient arms carrying detents engagable with corresponding abutment surfaces formed on the diffuser.

The invention also relates to a ventilation system incorporating such a diffuser

In order that the invention may be more readily understood, and so that further features thereof may be appreciated, a diffuser in accordance with the invention will now be described, by way of example, with reference

to Figures 4 to 11 of the accompanying drawings in which

FIGURE 4 is a perspective view of a diffuser in accordance with the invention,

FIGURE 5 is an enlarged view of a corner region of the diffuser of Figure 4,

FIGURE 6 is a rear view of the diffuser of Figure 4.

FIGURE 7 is a cross-sectional partly exploded view of the diffuser of Figures 4 and 5,

FIGURE 8 is an enlarged perspective view of the central region of the diffuser with the cover removed,

FIGURE 9 is an underneath view of the cover,

FIGURE 10 is a view corresponding to Figure 1 illustrating a room in which a diffuser in accordance with the invention has been fitted,

FIGURE 11 is a cross-sectional view of the room of Figure 1 when air is being supplied through the diffuser to effect cooling of the room, and

FIGURE 12 is a cross-sectional view, corresponding to Figure 11, but illustrating the room when relatively warm air is being supplied through the diffuser to heat the room.

Referring to Figures 4 to 8 of the accompanying drawings a diffuser in accordance with the present invention may be injection moulded from a plastics material and comprises a main diffuser structure 1 which is integrally moulded, and a removable cover 2 which

covers a central region of the diffuser.

The diffuser structure 1 comprises a square sectioned tubular spigot 3 adapted to be connected to a plenum chamber, a damper, or the like. Each side wall 4 of the square sectioned tubular spigot 3 terminates, at its upper end as illustrated, in an outwardly inclined portion 5 which constitutes part of a louvre blade array. The portion 5 terminates in a peripheral frame 6. As can be seen from Figure 4 the peripheral frame 6 is of square configuration. Thus the frame has four sides, comprising two pairs of opposed parallel sides that are orthogonal to each other.

A plurality of louvre blades 7 are provided. Each blade 7 is orientated to be parallel with the inclined portion 5 at the top of each side wall 4 of the square sectioned spigot 3. In the illustrated embodiment of the invention there are four such louvre blades 7 between the said portion 5 and the centre of the air diffuser, which is covered by the cover 2. It will be appreciated, of course, that the louvre blades 7 closer to the edge of the frame 6 are longer than the louvre blades 7 adjacent the cover 2. The louvre blades parallel with each side are evenly spaced. Thus successive blades parallel with the four sides of the frame define a series of squares of reducing size.

It can be seen, from Figure 6, that an air space is provided between the adjacent louvre blades which constitutes part of an air passage to permit air which approaches the louvre blades through the square section spigot 3 to pass between the louvre blades, and out into a space to be ventilated.

The structure of the diffuser as described so far corresponds generally with the structure of the

prior art diffusers, which have been typically formed from extrusions of a metal, such as aluminium. However, the presently described embodiment of the invention also incorporates a plurality of ribs 8, which are illustrated most clearly in Figure 5, the ribs 8 extending perpendicularly from each edge of the frame 6, and extending towards the opposite side of the diffuser. A primary function of the ribs 8 is to support the louvre blades 7 and retain them in position. The ribs 8 and the louvre blades 7 are formed integrally. In the illustrated embodiment each rib comprises a vertical plate or web which acts as a partition which extends between the adjacent louvre blades, thus dividing the space defining the air passage between the adjacent louvre blades into a number of discrete portions. The ribs towards the middle of each side extend to the region of the diffuser covered by the cover 2. However, the ribs 8 which commence at positions adjacent the corners of the peripheral frame 6 only extend until they meet a corresponding rib commencing at a corresponding position on the adjacent side of the frame.

As can be seen from Figure 6 some of the ribs 8 extend rearwardly behind the louvre blades 7. The ribs serve to divide part of the air passage behind the louvre blades into discrete portions. Also on the rear a set of four diagonally extending ribs 9 is provided. It will be appreciated from a consideration of Figure 8, that the louvres 7 and the ribs 8 are formed integrally, and serve to define a plurality of air outlets through which air may flow. The inner end of each louvre blade 7 may terminate with an axially directed end portion 10 extending in a direction defined by the axis of the spigot 3.

The central region of the diffuser is covered by the cover 2 which, as illustrated in Figure 7, may be

removed from its position when desired. Located beneath the cover 2 is a tubular portion 11 adapted to accommodate a fixing bolt or the like, to be used to secure the described diffuser in position.

Figure 8 illustrates, on an enlarged scale, the central region of the diffuser with the cover 2 removed. The tubular portion 11 can be seen. It will be noted that adjacent the tubular portion 11 four diagonally outwardly directed flanges 12 are provided each extending between two adjacent ribs 8, the flanges 12 being provided with enlarged blocks 13. The flanges 12 are constituted by forwardly extending parts of the ribs 9. The enlarged blocks 13 are provided to define abutment surfaces to engage with detents 14 carried by flexible arms 15 provided on the under-surface of a generally square plate-like element 16 which constitutes the top of cover 2, as can be seen from Figure 9. Four flexible arms 15 are provided, and adjacent each arm 15 a substantially rigid guide arm 17 is provided. The cover 2 may be snapped in position by engaging the guide arms 17 with the flanges 12 and pressing the cover down until the detents 14 engage with the undersides of the blocks 13.

Whilst the diffuser has been illustrated and described with the spigot 3 extending downwardly it is to be appreciated that, in use, the spigot 3 would extend upwardly into a plenum chamber mounted, for example, above a false ceiling so that the frame 6 is flush with the ceiling, and the louvre blades 7 and the ribs 8 are exposed to a space to be ventilated.

A diffuser 1 in accordance with the present invention is illustrated in Figure 10 mounted in the ceiling of a room, and the air issuing from one side of the diffuser is illustrated. It has been found that as

a consequence of the action of the ribs 8, the stream of air emerging from the diffuser does not diverge, as in the prior art, but continues as a substantially parallel sided stream of air 20 having a substantial momentum across the ceiling 21 of the room towards a side wall 22. The stream of air then diverges and flows downwardly, still with considerable momentum or velocity. If the air is cold, the air flow is as illustrated in Figure 11, with the air flowing with considerable velocity down the side wall across the centre of the room and back up into the main occupied area of the room.

However, if the air is warm, then the air flow, as illustrated in Figure 12, is considerably better than in the prior art. Because the air in the air stream 20 has substantial momentum, this momentum overcomes the effect of the buoyancy of the warm air. Thus, even though the air is warm, the air is directed down the side wall and is then directed inwardly to provide good penetration into the space that is being ventilated.

Because the louvre blades 7 of the described embodiment are supported by the ribs 8, which are effectively framed integrally with the louvre blades, the main structure of the diffuser may be injection moulded integrally in a simple moulding operation. Thus to assemble the diffuser it is only necessary to snap the cover onto the diffuser structure 1. This need only be done after the diffuser has been installed.

Whilst the invention has been described with reference to an embodiment in which the ribs 8 are visible from the front (or exposed side) of the diffuser it is to be appreciated that in certain embodiments of the invention the ribs supporting the louvre blades could all be behind the louvre blades like the ribs 8

shown in Figure 6) and thus need not be visible from the front of the diffuser.

The invention also relates to a ventilation system comprising a source of air, such as a fan or blower, ducting and one or more diffusers of the type described mounted on the ducting to diffuser air driven through the ducting by the fan or blower.

CLAIMS:

1. A diffuser for use with an air supply system, said diffuser comprising means to communicate with a source of air, means defining a plurality of inclined substantially parallel louvre blades positioned to receive air and to discharge air into a space to be ventilated, there being a plurality of ribs extending perpendicularly to the louvre blades, forming partitions between adjacent portions of the air passages defined between the louvre blades.

2. A diffuser according to Claim 1 wherein the diffuser is of substantially square configuration, the louvre blades comprising separate sets of louvre blades parallel with each of the sides of the diffuser, said ribs extending orthogonally to the sides of the diffuser.

3. A diffuser for use with an air supply system said diffuser comprising an element to communicate with a source of air, one end of said element supporting a peripheral frame with two opposed pairs of parallel sides which are orthogonal, a plurality of louvre blades adjacent to and parallel with each side and being evenly spaced, the louvre blades being positioned to receive air through said element and being inclined to the axis of said element to discharge the air into a space to be ventilated, there being a plurality of ribs extending substantially perpendicularly to the edges of the frame and engaging successive louvre blades to retain the louvre blades in position.

4. A diffuser according to Claim 1, 2 or 3 wherein the ribs are on the front face of the louvre blades.

5. A diffuser according to Claims 1, 2 or 3 wherein the ribs are on the rear face of the louvre blades.

6. A diffuser according to any one of Claims 1 to 5 fabricated as an injection moulding of a plastics material.

7. A diffuser according to any one of the preceding Claims wherein a central region of the diffuser is provided with a removable cover.

8. A diffuser according to Claim 7 wherein the central region of the diffuser defines a cylindrical portion adapted to receive a fastening bolt or the like to secure the diffuser in position.

9. A diffuser according to Claim 7 or Claim 8 wherein the cover is held in position by means of resilient arms carrying detents engagable with corresponding abutment surfaces formed on the diffuser.

10. A ventilation system comprising a mechanically operated source of air, ducting and one or more diffusers according to any one of Claims 1 to 9 mounted on the ducting to diffuse air driven through the ducting from said source of air.

11. A diffuser substantially as herein described with reference to and as shown in Figures 4 to 9 of the accompanying drawings.

12. A ventilation system substantially as herein described with reference to and as shown in Figures 4 to 9 of the accompanying drawings.

13. Any novel feature or combination of features disclosed herein.

Amendments to the claims
have been filed as follows

1. A diffuser of substantially square configuration for use with an air supply system, said diffuser comprising means to communicate with a source of air, means defining four separate sets of inclined substantially parallel louvre blades positioned to receive air and to discharge air into a space to be ventilated, the separate sets of blades being parallel with the sides of the diffuser, there being a plurality of ribs extending perpendicularly to the louvre blades of each set, forming partitions between adjacent portions of the air passages defined between the louvre blades, said ribs extending orthogonally to the sides of the diffuser.

2. A diffuser for use with an air supply system said diffuser comprising an element to communicate with a source of air, one end of said element supporting a peripheral frame with two opposed pairs of parallel sides which are orthogonal, a plurality of louvre blades adjacent to and parallel with each side and being evenly spaced, the louvre blades being positioned to receive air through said element and being inclined to the axis of said element to discharge the air into a space to be ventilated, there being a plurality of ribs extending substantially perpendicularly to the edges of the frame and engaging successive louvre blades to retain the louvre blades in position.

3. A diffuser according to Claim 1 or 2 wherein the ribs are on the front face of the louvre blades.

4. A diffuser according to Claim 1 or 2 wherein the ribs are on the rear face of the louvre blades.

5. A diffuser according to any one of Claims 1 to 4 fabricated as an injection moulding of a plastics material.

6. A diffuser according to any one of the preceding Claims wherein a central region of the diffuser is provided with a removable cover.

7. A diffuser according to Claim 6 wherein the central region of the diffuser defines a cylindrical portion adapted to receive a fastening bolt or the like to secure the diffuser in position.

8. A diffuser according to Claim 6 or Claim 7 wherein the cover is held in position by means of resilient arms carrying detents engagable with corresponding abutment surfaces formed on the diffuser.

9. A ventilation system comprising a mechanically operated source of air, ducting and one or more diffusers according to any one of Claims 1 to 8 mounted on the ducting to diffuse air driven through the ducting from said source of air.

10. A diffuser substantially as herein described with reference to and as shown in Figures 4 to 9 of the accompanying drawings.

11. A ventilation system substantially as herein described with reference to and as shown in Figures 4 to 9 of the accompanying drawings.

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