

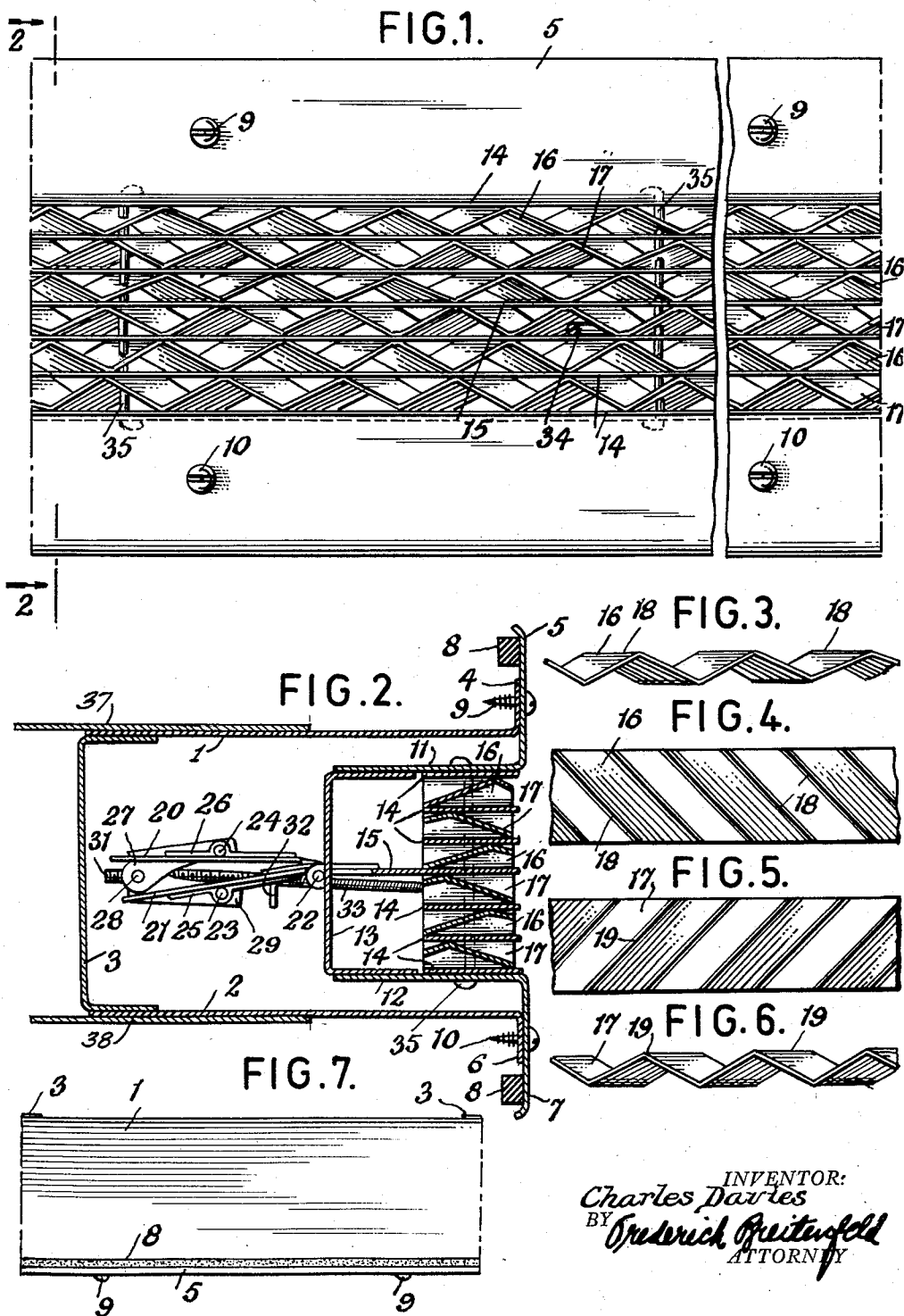
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C. DAVIES
AIR DIFFUSER

2,907,260

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2 Sheets-Sheet 1



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FIG. 8.

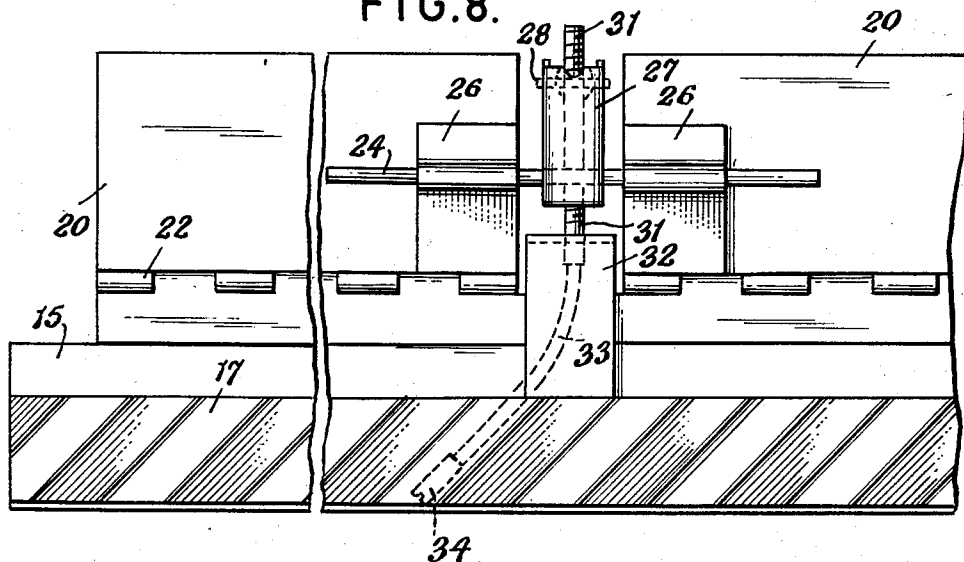


FIG. 9.

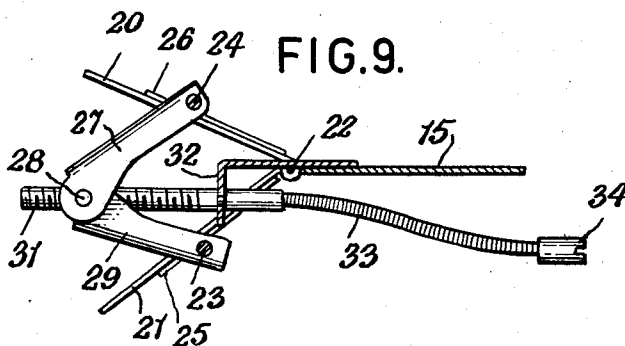


FIG. 10.

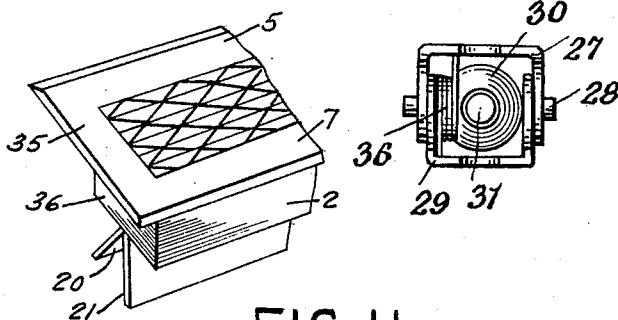


FIG. 11

INVENTOR:
Charles Davies
BY Frederick Breitenfeld
ATTORNEY

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AIR DIFFUSER

Charles Davies, New Rochelle, N.Y.

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5 Claims. (Cl. 98—40)

This invention relates generally to the art of moving air, as in air conditioning systems, and has particular reference to diffusers for employment at air duct outlets, and to air flow control means or dampers for use in connection with the diffusers.

It is one object of the invention to provide an improved diffuser which will have oblique air passages so disposed and arranged that direct air blast through the outlet will be prevented, and the delivered air diffused or diverted into crosswise flowing streams. In this way drafts can be avoided, and the noise level materially reduced.

It is an object of the invention to provide a diffuser which is particularly adaptable for elongated or so-called "strip" outlets.

A further objective is to provide a diffuser construction which is structurally simple, composed of relatively inexpensive readily manufacturable elements, economical to fabricate and assemble, easy to install, and efficient in use.

A characterizing feature of the improved diffuser resides in the formation of a grill by an assembled stack of relatively narrow corrugated strips with intervening flat planar partition strips or separators, and with oblique air passages alternately arranged in a manner to secure diffusion and turbulence in the delivered air flow. More particularly, each corrugated strip and the partitions alongside of it define a layer of adjacent parallel air passages, and the corrugations in each strip are not only at an oblique angle across the strip but arranged crosswise with respect to the angularity of the corrugations in each adjacent strip. Thus the air is delivered in successive layers flowing crosswise with respect to one another.

In accordance with this invention the corrugations in each strip are of regular essentially sinuous character whereby the air passages in each layer are substantially uniform in cross-sectional area. Also, the strips are so oriented that at the exposed face of the diffuser the crests of the corrugations in each strip are aligned with the adjacent crests and thus form a symmetrical pattern of nested substantially triangular outlet openings.

It is another object of the invention to provide a simplified damper construction and control therefor, which can be employed in conjunction with a diffuser grill of the character above mentioned or with other types of grills, and which will operate smoothly and effectively to regulate the air flow.

To attain these and other objects and advantages I have devised the arrangement of parts shown in the accompanying drawings wherein an illustrative embodiment of the invention is disclosed. In the drawings—

Figure 1 is a front elevational view of a diffuser constructed in accordance with the invention;

Figure 2 is a sectional view, taken substantially on the line 2—2 of Figure 1;

Figure 3 is a view of a part of one of the strips employed in the diffuser grill;

Figure 4 is a top plan view of the strip of Figure 3;

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Figure 5 is a plan view of a part of a second type of strip;

Figure 6 is a front elevational view of the strip shown in Figure 5;

Figure 7 is a top plan view, on a reduced scale, of the structure shown in Figure 1;

Figure 8 is a plan view of the damper mechanism;

Figure 9 is a transverse sectional view through the same;

Figure 10 is an end elevational view, on an enlarged scale, of the toggle mechanism for the damper; and

Figure 11 is a fragmentary perspective view showing one end of the device.

In the illustrated embodiment of the invention, I have chosen to show a diffuser of the straight-line or "strip" type wherein the grill is of relatively narrow, elongated form. It is intended for use at the outlet of an air duct. The structure illustrated includes a housing provided with a top wall 1, and a similar lower wall 2, each of these walls being in the form of a relatively thin metal plate (see Figure 2). The walls 1 and 2 may be held in spaced relation by means of rear braces 3 although obviously other mechanical expedients may be resorted to. The housing is provided at the front with spaced face plates 5 and 7 to which the offset flanges 4 and 6, respectively, of the walls 1 and 2, are attached. Each of the face plates 5 and 7 is provided at the rear with gasket material 8, such as soft rubber. Screws 9 and 10 extending through the face plates 5 and 7 and through the flanges 4 and 6, secure the device within the wall opening at the outlet of an air duct. The supply duct with which the diffuser is to be used is parallel to the longitudinal axis of the diffuser and coextensive in length. The top and bottom walls of such a duct are indicated at 37 and 38 in Figure 2. They engage snugly with the corresponding walls 1 and 2 of the diffuser housing.

The face plate 5 is provided with an integral, rearwardly-extending flange 11, and a similar flange 12 is provided on the face plate 7. These two flanges 11 and 12 are maintained in spaced relationship by braces 13.

The diffuser grill is located and held between the flanges 11 and 12 by a series of pins 35. It is composed of a stack of undulated or corrugated strips 16 and 17 arranged in alternating relation between which there are flat uncorrugated spacer strips or planar partitions 14 and 15. The pins 35 extend through this stack at spaced intervals and hold the superposed layers together. The ends of the pins extend through the flanges 11 and 12 and are turned down as shown.

The strips 16 and 17 may be produced by passing flat strip metal stock of relatively narrow width, such as $\frac{3}{4}$ of an inch or so, between corrugating rollers. The corrugations are formed in the strip at an oblique angle which has been illustratively shown as a 45° angle. The corrugations 18 in the strip 16 extend angularly in one direction, while the corrugations 19 in the strip 17 extend angularly in an opposite or crosswise direction.

In the assembly of the grill the strips 17 and 16 are alternated so that the superimposed strips form successive layers of air passages extending angularly in different directions. Each strip, along with the planar partitions alongside of it, defines a layer of air passages arranged side by side. One layer directs air in one direction, the adjacent layer in a crosswise direction, and so on. Thus, in the upper strip 16 as shown in Figure 1, the air flow between the corrugations will be angularly toward the right, while in the case of the strip 17 located below the upper strip 16, the air flow will be angularly toward the left. This disposition of the strips 16 and 17 is continued down through the grill, the strips 16 and 17 alternating and being spaced apart by the flat, uncorrugated spacing strips or partition members 14 and 15.

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It will also be noted that in the arrangement of the corrugated strips, they are so oriented that at the front of the grill the apices or crests of the corrugations meet. The corrugations are uniformly made and this produces a symmetrical pattern of outlet openings, as shown in Figure 1. The arrangement is such that the blowing of the air alternately to the left and right, by the successive layers, results in turbulence to break down the direct air blast effect which is sought to be avoided.

The device may be as long as may be desired, and may be finished off at the end in any desired manner. For example, as shown in Figure 11, a face plate 35 may be provided which joins the spaced plates 5 and 7, and an end wall 36 may be provided to connect the top and lower walls 1 and 2.

For controlling the air flow through the diffuser, an improved damper mechanism is provided, as best disclosed in Figures 2 and 8 to 10 inclusive. It will be noted that one of the separator or partition plates (e.g., 15) is extended rearwardly. Connected to its rear end, by means of the hinge 22, is a pair of wings or damper elements 20 and 21. The pivotal connection 22 between these wings is such that the wings may be moved toward each other to open the damper, as shown in Figure 2, or separated to any desired extent to close off the back of the grill. A partly open position of the damper is shown, for example, in Figure 9.

The wing or damper element 20 is provided on one of its faces with straps 26 through which a rod 24 extends, this rod projecting through a leg 27 of a toggle. Similarly, the wing or damper element 21 is provided with straps 25 through which a rod 23 extends, this rod 23 passing through the leg 29 of the toggle. The toggle legs 27 and 29 are pivotally mounted on the pivot pin 28 and spring-biased toward open or spread position by means of the torsion spring 36 (Figure 10) extending about the pivot pin 28. Pivot pin 28 carries a nut 30 (Figure 10) which threadably engages an adjusting screw 31. This screw is rotatively mounted in bracket 32 carried by the plate 15. One end of the adjusting screw 31 is secured to a flexible shaft 33, and this shaft is provided at its free end with a slotted head or terminal 34 adapted for engagement by the blade of a screw driver or other tool. Thus the flexible shaft 33 may be manually rotated whereby the adjusting screw 31 operates the toggle and causes the wings 20 and 21 to be either spread apart or moved toward one another. The flexible shaft 33 is extended forwardly and angularly through one of the cells of the grill and is thus accessible at the front of the housing.

By the simple use of a screw driver or other tool the flexible shaft can be easily turned in the direction required to position the damper wings in the desired relation to control the air flow through the grill.

In this way, notwithstanding the fact that the damper is behind the grill, the air flow may be readily regulated from the front, without requiring any dismounting of the diffuser housing and by a regulator which is inconspicuous and which does not mar the appearance of the installation.

From the foregoing, the operation of the structure will be apparent. The alternating oblique air passages or cells in the grill tend to divert the air streams in two different directions and create a desirable turbulence; and by the use of the damper behind the grill, quantitative control of the air flow may be readily achieved. By the arrangement disclosed the corrugated strips may be made relatively narrow thus avoiding undue frictional resistance to the air flow between them. The corrugated strips are made by simple corrugating methods and may thus be readily and economically produced.

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Although I have described only a single embodiment of the invention, it is obvious that the invention is not to be restricted thereto, but is broad enough to cover all structures coming within the scope of the claims appended hereto.

What I claim is:

1. An air diffuser for attachment to the outlet of an air duct, comprising a stack of relatively narrow corrugated strips arranged one above the other and having planar partitions between them, means for holding said strips together, and means for supporting said stack at said air duct outlet, each corrugated strip and the partitions alongside of it defining a layer of adjacent parallel air passages of appreciable lengths, the corrugations in each strip extending at an oblique angle across the strip and at a crosswise angularity with respect to the angularity of the corrugations in each adjacent strip, whereby the air is delivered by said diffuser in successive layers flowing crosswise with respect to one another.

2. An air diffuser as set forth in claim 1, the corrugations in each strip being of regular essentially sinuous character so that the air passages in each layer are of substantially uniform cross-sectional area.

3. An air diffuser as set forth in claim 2, the strips being so oriented that at the exposed face of the diffuser the convex portions of the corrugations in each strip are aligned with the adjacent convex portions of each adjacent strip, thereby forming a symmetrical pattern of nested substantially triangular outlet openings.

4. In an air diffuser installation, an air duct, and an air outlet housing provided with a diffuser grill including a plurality of flat, straight, narrow separator strips arranged in spaced parallel relation, and corrugated strips located between the separator strips, said corrugated strips having the convex portions of their corrugations contacting the separator strips, each corrugated strip being crimped along parallel oblique lines, said corrugated strips and separator strips defining oblique air passages of appreciable lengths through the grill, the angularity of the convex portions of the corrugations of some of the strips being opposite to that of the convex portions of the corrugations of other strips.

5. In an air diffuser installation, the combination with the elements defined in claim 4, of a damper means supported in the housing behind the grill, said damper means including a pair of pivoted wings adapted to be spread apart or brought together, a screw-operated toggle connecting the wings and operative to move them apart or toward one another, a screw operatively connected to the toggle, along an axis perpendicular to the plane of the grill, and a flexible shaft connected to the screw, said shaft extending obliquely forwardly through the grill and having a terminal positioned in one of the air passages for engagement to rotate the flexible shaft and cause rotation of the screw to operate the toggle and control the adjustment of the wings.

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