

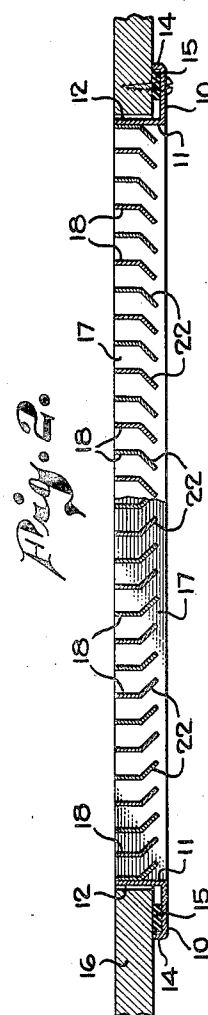
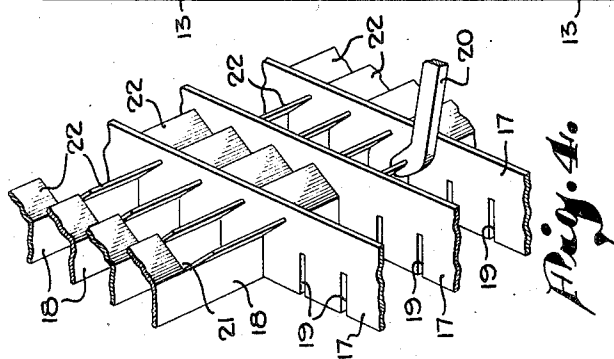
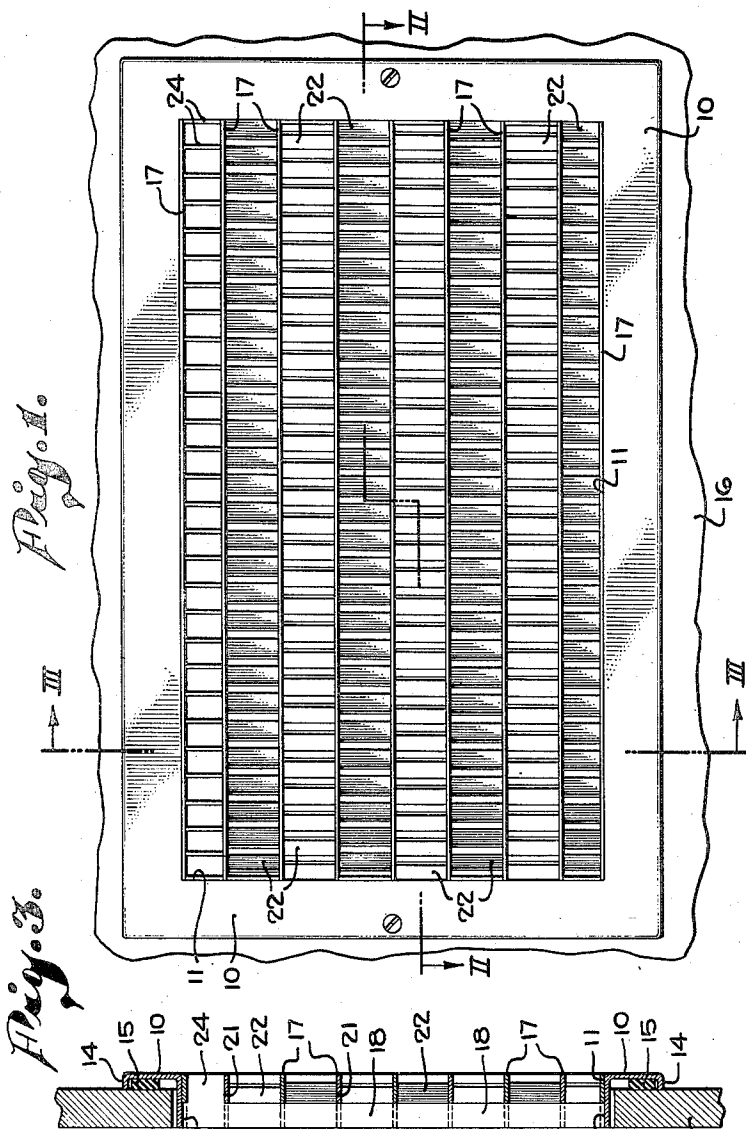
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LAMINAR COUNTER-FLOW GRILLE

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LAMINAR COUNTERFLOW GRILLE

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5 Claims. (Cl. 98—121)

1

This invention relates to grilles or air registers and, more particularly but not necessarily, to grilles or registers used in connection with forced air in heating, ventilating, air-conditioning and evaporating cooling systems.

Air conditioning, humidifying, heating and cooling systems employ ducts or conduits for conveying the air or gas being used, and grilles are provided between such ducts and the rooms or other enclosures being heated, cooled or ventilated. Recently the art has employed higher velocity gas streams in such systems and it has been found that prior grilles were unsatisfactory because they vibrated, whistled and interposed an undesirable resistance to the passage of gas therethrough. Moreover, persons sitting in the vicinity of such grilles are exposed to undesirable drafts and currents of air.

The present invention is directed to grille construction which is more economical and more efficient than those known heretofore. A grille of the present invention permits air or gas to be discharged therefrom in various predetermined directions, thereby expediting the mixing of the gas being supplied with the air originally present in a room or enclosure, such as a theater.

I have found that if the grille is arranged to supply air divided into separate stratas in such a manner that adjacent stratas will be delivered at different angular directions, the blast of the incoming air is greatly reduced, the noises usually resulting from the rush of air through the grille are eliminated and the incoming air more readily comes in contact with the air being treated, which produces a more even and desirable result.

It is, therefore, a primary object of this invention to provide a grille for use in heating, ventilating, air-conditioning and the like, that will supply air separated into stratas, wherein each strata is directed at an angle to its adjacent strata.

Another object is to provide a grille for use in forced air systems so constructed as to eliminate the noise of the air rushing through the vanes of the grille.

A further object is to provide a grille having the above characteristics that will cause the air being supplied through the grille to readily mingle with the air being treated.

A still further object is to provide a grille arranged to supply air in separate stratas that will eliminate the usual blast flowing from grilles supplied with air at an appreciable pressure.

Another object is to provide a method of construction which permits production of standard,

2

direct flow grilles in a simple and economical manner, such grilles being then readily adjusted to the requirements of a given installation to impart directional laminar flow characteristics thereto before installation and which may be re-adjusted to impart a selected directional laminar flow after installation.

A further object is to provide a grille that will be simple and rugged, inexpensive to manufacture, neat and pleasing in appearance and effective in operation.

The above and other objects will be made apparent throughout the further description of the invention when taken in connection with the accompanying drawings, wherein like reference characters refer to like parts. It is distinctly to be understood that the drawings are not a definition of the invention but merely illustrate a preferred form by means of which the invention may be effectuated.

Referring to the drawings:

Fig. 1 is an elevational view of a grille embodying the invention.

Fig. 2 is a sectional view taken along the line II—II of Fig. 1.

Fig. 3 is a sectional view taken along the line III—III of Fig. 1.

Fig. 4 is a fragmentary view of the grille work shown in perspective.

Referring to the drawing, the present grille includes a frame having a face portion 10, which may be rectangular in shape and providing an air opening 11 therethrough. The inner edges of the face portion 10 may have an integrally, inwardly extending flange surrounding the opening 11 and forming end members 12 and side members 13. The face portion 10 may terminate at its outer edges in an inwardly extending, relatively short flange 14, the latter forming a channel with the end members 12 and side members 13. The channel may be used to house a gasket 15. The gasket 15 may rest between the under surface of the face portion 10 and an associated wall 16 or other structure on which the grille is mounted.

The end members 12 and side members 14 may constitute a supporting frame for the grille work. The grille work consists of a plurality of longitudinally disposed bars or strips of metal 17 arranged in longitudinally and uniformly spaced relation relative to the air opening 11. A second set of bars or metal strips 18 is arranged in transversely and uniformly spaced relation relative to the face plate 10 and opening 11. In order to enable the two sets of grille bars to be connected

3

in nested relation, cooperating notches or grooves 19 and 21 are provided in the bars 17 and 18, respectively. For supporting the grille work within the frame members 12 and 13 the adjacent transverse extending bar 18 to the end member 12 may be spot welded to the members 12, while the longitudinally extending bar 17 adjacent each of the side members 13 may be similarly welded.

The longitudinally extending bars 17 divide the air opening 11 into a plurality of longitudinal sections. The slots 21 in the transverse bars 18 provide a series of tabs or vanes 22, these vanes 22 being separated by the longitudinal bars 17. In order to direct the air entering adjacent sections at different angles the tabs or vanes 22 in adjacent sections defined by the longitudinal bar 17 are bent at opposite angles as more clearly indicated in Figs. 2 and 4. These vanes may be bent so that the width of the air passage at the intake side of each vane is greater than the width of the passage between the inclined tongue portions 22. Therefore, a high velocity is imparted to the air due to the Venturi effect of the inclined slot. Turbulence on the negative pressure side of each inclined tongue is eliminated by reason of this increased velocity. It is to be noted that each of the tabs or vanes 22 extends from one transverse bar 17 to the adjacent bar 17 and is inclined uniformly from end to end of each vane, without protuberances or portions which would cause a passageway (formed by adjacent vanes and bars) to depart from a rectangular cross section, the rectangular cross section being maintained from inlet to outlet with but a reduction in width and no reduction in length. It is thought that this particular construction of the vanes is responsible for eliminating the noise of the air passing through a grille even when air at an appreciable pressure is fed to the grille work. The straight portion of the air passage reduces to a minimum turbulent action of the air before it strikes the deflected portions of vanes and eliminates the turbulence created in the passageway.

Preferably the length of the unbent portion of the tongue or vane is equal to the length of the bent portion of the tongue as measured in the direction of the flow of the air. This relationship produces smooth flow of air before it impinges upon the bent portion, and there is less turbulence. Certain conditions may require a different relationship of the length of the tongue with the unbent portion of the tongue and the bent portion may be lengthened or shortened by lengthening or shortening the cooperating slots 19 and 21. Also, the bent portion of the tongue may be readjusted to direct the air at selected directions. Any suitable tool such as shown at 20 may be employed to adjust the position of the tongues 22.

By having the tongues or vanes deflect the air in alternate planes in different directions, an aspirating effect is attained, thereby facilitating the comingling of the incoming heated air with the air being treated.

When a tall grille work is used for supplying either air-conditioning or humidified air or heated air in a large enclosure, such as a theater, the upper rows or sections defined by the longitudinal bars 17 may have the tongues 22 in the same plane as the unbent portion and thereby permit the upper sections so arranged to discharge the air directly and in perpendicular relation to the plane of the grille, as shown in the upper row 24 in Fig. 1. The angular adjustment of the tongues or vanes in the lower rows may vary so that per-

4

sons seated near the grille are not subjected to a direct blast of air. In the construction of the device, the longitudinal and transverse bars may be of the same cross-section and the bars assembled in nested relation in the frame, after which time selected alternate rows of the longitudinal sections may have the tongues or vanes bent in the directions desired.

The various slotted or notched bars 17 and 18 are nested and interlocked while in plane, unbent condition, so as to form a direct-flow grille. Thereafter alternate rows of vanes 22 are bent in the same direction while intermediate rows are bent in an opposite direction. It has been found that this bending operation can be easily and controllably performed by passing the assembled grille-work beneath properly positioned rollers which roll and bend the vanes to the desired inclination.

Accordingly, there is provided a grille or air register for use with ventilating, air-conditioning and heating systems that is simple in structure, strong and durable, effective in reducing the air blasts from the grille, eliminating noise due to the rush of air through the grille and operates effectively to comingling the air supplied there-through with the air being treated.

While I have illustrated and described the preferred form of the invention in connection with a grille having horizontally disposed sections, it will now be obvious to those skilled in the art that the section may be vertically disposed and provide separate vertical stratas of air rather than horizontal stratas of air. Other modifications, substitutions and changes may be made in the exemplary form without departing from the spirit and scope of the appended claims.

I claim:

1. A virtually noiseless grille, having an air inlet plane and a spaced air discharge plane, adapted for distribution of high velocity air, comprising: a plurality of parallel, longitudinally extending spacing bars of appreciable depth lying in planes perpendicular to the inlet and discharge planes of the grille; and a plurality of uniformly spaced, transversely extending strip members, each provided with a plurality of tongue portions, said strip members being arranged in nested and interconnected relation with the spacing bars, tongue portions of the strips extending from one bar to an adjacent bar, said spacing bars dividing the grille into longitudinally extending sections, each section including a plurality of air passageways of rectangular cross section throughout their length, the tongue portions in at least some of said sections lying in parallel planes inclined to the planes of their associated strips, whereby the passageways are of rectangular and smaller cross section at the air discharge plane of the grille than at the air inlet plane.

2. A virtually noiseless grille, having an air inlet plane and a spaced air discharge plane, adapted for distribution of high velocity air, comprising: a plurality of parallel, longitudinally extending spacing bars of appreciable depth lying in planes perpendicular to the inlet and discharge planes of the grille; and a plurality of uniformly spaced, transversely extending strip members, each provided with a plurality of tongue portions, said strip members being arranged in nested and interconnected relation with the spacing bars, tongue portions of the strips extending between adjacent spacing bars, said spacing bars dividing the grille into longi-

5

itudinally extending sections, each section including a plurality of air passageways of rectangular cross section, the tongue portions in at least some of said sections being bent out of the plane of their associated strips, each of the bent tongues in a section having a uniform inclination throughout its length, whereby the passageways are of rectangular and smaller cross section at the air discharge plane of the grille than at the air inlet plane, the tongues in some of the sections being inclined in a direction opposed to the inclination of the tongues in the adjacent longitudinal section, whereby aspiration of ambient air and mixing of discharged air therewith is facilitated.

3. A virtually noiseless grille, having an air inlet plane and a spaced air discharge plane, adapted for distribution of high velocity air, comprising: a plurality of parallel, longitudinally extending spacing bars of appreciable depth lying in planes perpendicular to the inlet and discharge planes of the grille; and a plurality of uniformly spaced, transversely extending strip members, each provided with a plurality of tongue portions with uninterrupted surfaces, said strip members being arranged in nested and interconnected relation with the spacing bars, tongue portions of the strips extending from one bar to an adjacent bar, said spacing bars dividing the grille into longitudinally extending sections, each section including a plurality of air passageways of rectangular cross section throughout their length, the tongue portions in at least some of said sections lying in planes inclined to the planes of their associated strips, whereby the passageways are of rectangular and smaller cross section at the air discharge plane of the grille than at the air inlet plane.

4. A virtually noiseless grille having an air inlet plane and a spaced air discharge plane, adapted for distribution of high velocity air, comprising: a plurality of parallel longitudinally extending spacing bars of appreciable depth lying in planes perpendicular to the inlet and discharge planes of the grille; and a plurality of uniformly spaced transversely extending strip members each provided with a plurality of tongue portions, said strip members being arranged in nested and interconnected relation with the spacing bars, tongue portions of the strips extending from one bar to an adjacent bar, said spacing bars dividing the grille into longitudinally extending sections, each section including a plurality of air passageways of rectangular cross section throughout their length, each passageway including an entrance portion adjacent to the air inlet plane for passage of air therethrough per-

6

pendicular to said inlet plane and an outlet portion adjacent to the air discharge plane for passage of air therethrough at an angle to the discharge plane, said outlet portion having a rectangular cross sectional area less than the cross sectional area of the entrance portion of the passageway and defined by tongue portions lying in parallel planes disposed at an angle to their associated strip members, the tongue portions of each strip member disposed in adjacent longitudinal sections lying in planes diverging at the air discharge plane.

5. A virtually noiseless grille having an air inlet plane and a spaced air discharge plane, adapted for distribution of high velocity air, comprising: a plurality of parallel longitudinally extending spacing bars of appreciable depth lying in planes perpendicular to the inlet and discharge planes of the grille; and a plurality of uniformly spaced transversely extending strip members each provided with a plurality of tongue portions, said strip members being arranged in nested and interconnected relation with the spacing bars, tongue portions of the strips extending from one bar to an adjacent bar, said spacing bars dividing the grille into longitudinally extending sections, each second including a plurality of air passageways of rectangular cross section throughout their length, each passageway including an entrance portion adjacent to the air inlet plane for passage of air therethrough perpendicular to said inlet plane and an outlet portion adjacent to the air discharge plane for passage of air therethrough at an angle to the discharge plane, said outlet portion having a rectangular cross sectional area less than the cross sectional area of the entrance portion of the passageway and defined by tongue portions lying in planes disposed at an angle to their associated strip members, the tongue portions in some of the longitudinal sections lying in planes intersecting the planes in which tongue portions of an adjacent longitudinal section are disposed.

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