Nov. 16, 1965 G. J. SWEENEY 3,217,627

SIDE WALL DIFFUSER

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FIG. 6

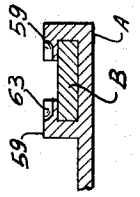


FIG. 2

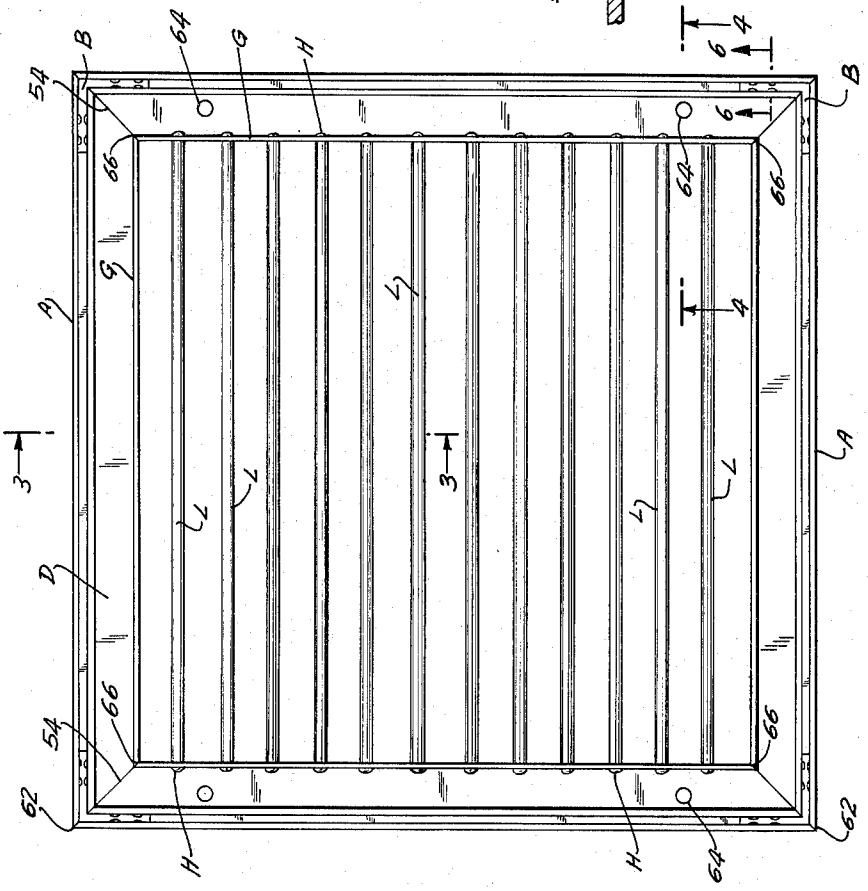
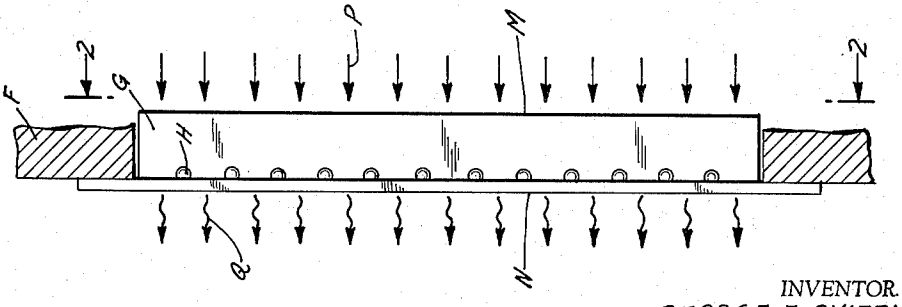


FIG. 1



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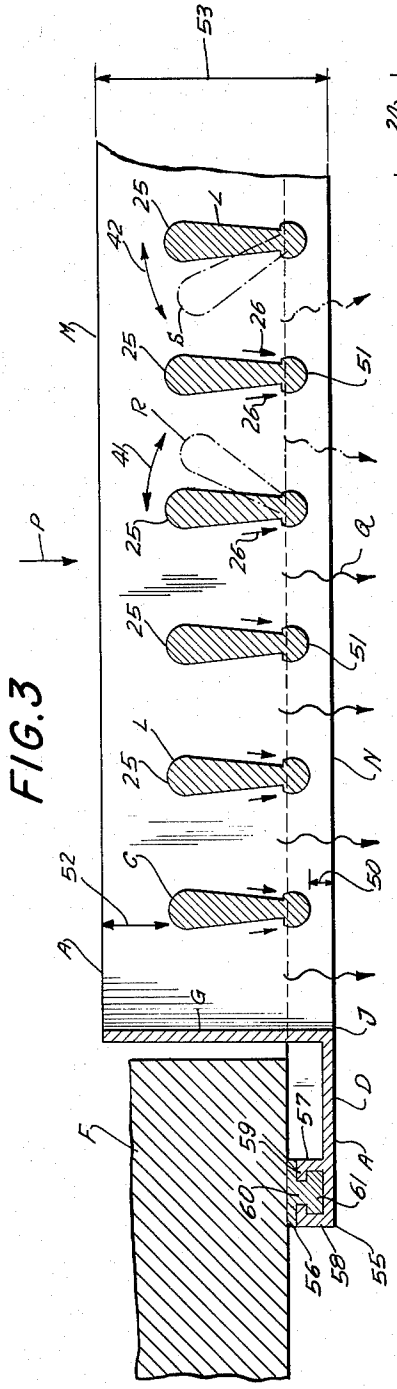


FIG. 3

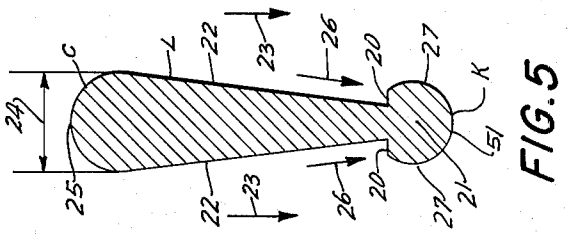


FIG. 5

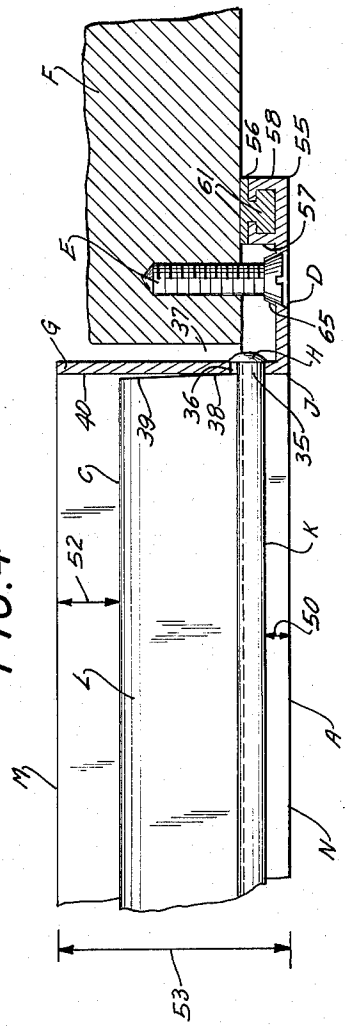


FIG. 4

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SIDE WALL DIFFUSER

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5 Claims. (Cl. 98—40)

The present invention relates to a side wall diffuser, and it particularly relates to an extruded diffuser grille.

Normally in forming grilles, it is necessary to form all shapes both of the frame and of the partition members out of coil strip stock which is fed into rolling mills and then must pass through a number of rolling pressing, and cutting operations to form the frame as well as the deflector elements.

In most of these grille structures, various elements particularly the corners of the frame must be welded which results in distortion and warping and numerous staking and mounting operations will also be required.

It is among the objects of the present invention to provide a novel wall diffuser construction in which the various shapes may be properly formed with a minimum of shaping or cutting operations and readily assembled together without the necessity of welding and with assurance that a rigid frame will be achieved which may be readily mounted upon a wall or any wall opening.

A further object is to provide an adjustable wall diffuser construction in which the flow of air may be adjusted so as to make certain patterns and at the same time will enter the room with substantial turbulence to assure satisfactory mixing thereof without descending in a stream toward the floor or to another part or enclosure of the room.

Another object is to provide an adjustable diffusion grille which will discharge incoming ventilating or conditioning air into the room in such a manner as to give a substantial uniform mixture of the incoming air with the air already in the room and so as to permit increased ventilation of incoming, ventilating or conditioning air in the room without causing discomfort to those in the room because of improper or lack of thorough mixture of diffusion of air in the room.

Still further objects and advantages will appear in the more detailed description set forth below, it being understood, however, that this more detailed description is given by way of illustration and explanation only and not by way of limitation, since various changes therein may be made by those skilled in the art without departing from the scope and spirit of the present invention.

In accomplishing the above objects, it has been found most desirable to form the frame of extruded side members having a flush wall connection portion in the plane of the wall and in the plane in the outlet face of the grille with transversely inwardly projecting flanges forming the frame within which the adjustable vanes are mounted.

Desirably the outermost edges of the frame are provided with grooves which permit the side frame structure to be keyed together by means of inserts which are right angular in shape and will extend into the grooves on each side of the corners.

These right angular keys will eliminate any welding which will distort the frame structure, and it will also permit the formation of a rigid frame suitable for rough handling and mounting and at the same time permit sufficient flexibility of the vanes therein.

The vanes are also desirably extruded, and they are formed with an axial rod which extends from side to side of the frame and has its ends projecting through the transverse portions of the side frames adjacent to the flush portions of the side frame.

These ends of the axial rod are desirably peened in position on the transverse inwardly directed flanges on the outside face of the frame portions closely adjacent to the base of said flanges, and they are held frictionally by these peened over head portions so as to prevent inadvertent adjustment thereof due to vibration.

In the preferred form of the vane, the base of the vanes consist of a pivot axial rod of cylindrical cross section except on its inside face portion it carries the vane which is flatted on each side in a plane parallel to the plane of the grille.

The vane itself is streamlined, and its side diverges forwardly until it widens to a dimension substantially greater than the dimension of the pivoted axial rod adjacent the base thereof and until it achieves a width which is greater than the dimension of the width of the pivoted axial rod and may extend the same by width of 10 to 30%.

The end of the vane desirably which is directed inwardly away from the face or outlet of the grille has a semi-cylindrical edge which will direct the incoming air, conditioning or ventilating air so as to flow over the sides thereof.

Desirably the vanes should extend through at least 50 to 75% of the depth of the grille, and they should terminate short of both edges of the grille with their pivot axial rods being spaced inside a distance of $\frac{1}{10}$ to $\frac{1}{25}$ of the width of the adjustable vane or blade, and their inside edges terminating a greater distance inside of the inside inlet edge of the grille a distance of 25 to 50% of the depth or width of the adjustable blades.

The blades are desirably individually adjustable so that any desired patterns of incoming air may be utilized and the flats on the inside edges of the pivotal axial rod will consist of suitable diffusion and breaking up of the air as it leaves the grille and flows into the room.

Desirably the spacing between the vanes should be between 50 to 125% of the depth or width of each blade or vane.

The end friction to hold the vanes in adjusted position or in stream through position may be achieved not only by the peened end of the pivotal axial rod but also by contact of the edges of the blade with the inside edges of the transverse edges of the frame.

The flush face of the grille may also be provided with suitable openings or grille to a wall structure.

With the foregoing and other objects in view, the invention consists of the novel construction, combination and arrangement of parts as hereinafter more specifically described and illustrated in the accompanying drawings, wherein is shown an embodiment of the invention, but it is to be understood that changes, variations and modifications can be resorted to which fall within the scope of the claims hereunto appended.

In the drawings wherein like reference characters denote corresponding parts throughout the several views:

FIG. 1 is an end elevational view of the grille showing the manner in which it is mounted in the wall with the wall being in section.

FIG. 2 is an inside elevational view of the grille.

FIG. 3 is a fragmentary transverse sectional view upon the line 3—3 of FIG. 2 upon an enlarged scale as compared to FIG. 2 showing the vanes in normal and adjusted position.

FIG. 4 is a transverse sectional view taken upon the line 4—4 of FIG. 2 upon an enlarged scale as compared to FIG. 2.

FIG. 5 is a transverse sectional view of a vane upon an enlarged scale as compared to FIG. 3.

FIG. 6 is a transverse fragmentary sectional view upon an enlarged scale as compared to FIG. 2 taken upon the line 2—2 of FIG. 1.

Referring to FIGS. 1 to 6, the structure is formed from the extruded side members A which are connected together by the corner right angular keys B and which are assembled with the extruded adjustable vanes C.

The frames are each provided with the outside or outlet flush face flanges D having the screw adjustments E to the wall F, and they are also provided with the inwardly directed transverse side flanges G which carry the vanes C by the peened or hammered pivot axial rod connections H.

These pivot axial rod connections H are positioned adjacent to corners J where the flush flange D and the transverse inwardly directed flange G are integrally joined.

The pivot axial rods K extend the full length of each vane or blade C, and they extend beyond the streamlined blade shape L itself.

Referring specifically to the blade shape as shown in FIG. 5, there will be noted that the pivotal axial rod K has the cylindrical cross section except at the flatted faces **20** on each side of the pivotal axis **21**.

The blade portion L has the convergent sides **22** in the direction of air flow **23** (see FIG. 5) and toward the inlet side of the grills indicated at M in FIGS. 1 and 3.

The blade will reach its maximum width indicated by the dimension **24** so that the blunt end of the blade will face the incoming air stream P as indicated in FIGS. 1 and 3 as it enters the inlet face of the grille and passes to the outlet face N of the grille.

It will be noted that the incoming air stream P is shown as if it were straightway whereas the outgoing air stream Q is represented by irregular arrows indicating that the air has achieved substantial turbulence after passing the blades.

The blunt end **25** of the blade as shown in FIG. 5 will have a streamlined effect.

Due to the streamlined shape achieved by the relatively wide cylindrical portion **25** and the convergent sides **22**, a portion of the air will flow as indicated at **26** along these convergent sides **22** in the direction of air flow at **23** as indicated in FIG. 5 and will strike the flatted face **20** acting as baffles and then will flow around the sides **27** of the pivotal axial rod K creating a substantial turbulence in the out flowing air stream Q leaving the outlet air face N of the wall diffuser or adjustable grille.

Referring to the pivot mounting as shown best in FIG. 4, the ends **35** of the pivotal axial rod will extend through the openings **36** and will be peened down on the outside face **37** of the transverse flanges G.

The peened down head H will press closely against the outside face **37** and will hold the blade C in its centrally adjusted position against movement due to vibration.

In addition, the ends of the blade portion L may be cut off as indicated at **38** and extend obliquely inwardly at **39** to be spaced in the inside face **40** of the flange G, and there will be sufficient friction at **38** adjacent the opening **36** also to hold the blade L in suitable adjustable position.

As indicated in FIG. 3, the blades may be adjusted either toward or away from each other as shown by the dot and dash line S and the double headed arrows **41** and **42** (see FIG. 3).

This may be done by applying the fingers to the inside portions or blunt edges **25** of the blades L or by suitable tool as may be desired.

Each blade L may be independently adjusted so as to give the desired direction as indicated at R (see FIG. 3) and to achieve the desired turbulence of the outgoing air indicated by the arrows Q.

It will be noted that the dimension **50** from the oultet face N to the face **51** of the cylindrical portion of the pivot axial rod K is much less than the dimension **52** to the blunt semi-cylindrical face **25** of the blade L, and that the vane extends substantially more than 50% and between 50 and 75% of the total depth of the grille or height of the flange G indicated by the numeral **53** in FIGS. 3 and 4.

In respect to the frame structure, the frame structure may be extruded in one piece of aluminum and then cut off at 45° angles as indicated at **54** in FIG. 2.

These frame elements are each formed with the outside flush flange D and the inside transverse flange G joined together integrally at the corner J.

At the outside edge **55** of each flange D, there is integrally formed the channel member **56** which has the inside wall **57** and the outside wall **58** (see FIGS. 3 and 4) and which has the inwardly directed flanges **59** with the slotted openings **60** therein which receives the gasket member **61** along the run of the channel member **56**.

At the corners **62**, however, the keys B will be inserted and will be held permanently in position by the peened down edges of the flanges **59** as indicated best at **63** in FIG. 6.

This will hold the corners rigidly together along the obliquely cut portions **54** and will assure a rigid frame construction.

The openings **64** in the flange D will receive the bevelled screw heads **65** of the attachment screws E which extend into the wall (see FIG. 4).

It is apparent that the applicant has provided a novel all extruded aluminum or other extruded metal grille construction in which the grille is formed essentially of two extruded elements, the frame elements and the vane elements.

The frame elements A and the vane elements C will have peened connections H to the side flange G, and it is possible to eliminate springs or wires and other holding means, and the friction is simply achieved by means of the enlarged head portion as well as the cut off **38** at the end of the blade which presses against the inside face of the flange G.

By the corner keys B fitting in the channel **56**, it is possible to eliminate welded connections, and the corners of the frame will be held substantially rigid together at **62** at their outer edges while the inwardly directed flanges G meeting at **66** will have sufficient give and flexibility to tightly and frictionally hold the vanes or blades C in central or adjusted position.

The in-flowing air as indicated at P will be given turbulence in both directions by the blades L with the turbulence being achieved by effect of the flatted face **20** striking the air as indicated at **26** passing down the convergent streamlined sides of the blade **22**.

It is not necessary to form the blades of flat coil strip material nor is it necessary to subject the blades or the frame to a series of cutting, forming and other sheet metal operations.

The frames as shown will not warp due to welding and their outer corners will be held firmly in position and the vanes, may be pivotally mounted in their ends H without horizontal springs or pivot means.

Both ends of the blades being rounded and the stream being constricted between both enlarged portions **25** and **27** of the blades of FIG. 5, there will be a grinding effect which will cause the air flowing through the grille to be projected into the room and into a substantial horizontal turbulence without immediately falling downwardly, and it would be possible to induce more room air and more turbulence with the same flow area.

Furthermore, it is possible to pass air more rapidly through the grille of FIGS. 1 to 6 with less noise and the flowing air may be increased from 50 to 75% if for example from 500 feet per minute to 800 feet per minute with less noise and with greater turbulence in mixing.

There will be elimination of the tendency of the air to pass through the grille to arc downwardly onto the heads of those who may be sitting in the turbulent space, and turbulence will result in substantially complete mixing at a high elevation adjacent to the ceiling and above the head level.

As many changes could be made in the above side wall diffuser, and many widely different embodiments of this invention could be made without departing from the scope of the claims, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

Having now particularly described and ascertained the nature of the invention, and in what manner the same is to be performed, what is claimed is:

1. In a side wall diffuser, a frame, a plurality of extruded metal adjustable grille blades, each having an intermediate elongated relatively wide blade portion of generally isosceles triangular cross-section with a fixed inlet edge tapering to a thin cross-section adjacent the outlet edge, said inlet edge being of semi-circular cross-section, said outlet edge being of semi-circular cross-section and interiorly shouldered to form narrow outlet baffles extending longitudinally on each side of the outlet edge, and integral pivotal extensions extending axially of said circular cross-section outlet edges beyond the ends of the blade and adapted to be pivotally received in said frame in spaced apart parallel relation.

2. An air diffuser for mounting in a wall opening comprising an outside rectangular frame comprised of four extruded metal right-angular-cross-section side and end members having outside outwardly extending flush flanges to overlie the wall around the opening and inwardly extending integral transverse flanges projecting within said opening and a plurality of parallel closely spaced pivotally mounted generally isosceles triangular cross-section

extruded adjustable vanes, said vanes having integral end projections and two of said transverse flanges having aligned openings adjacent the plane of the wall receiving said projections and each of said vanes having a semi-circular base edge and a semi-circular enlargement at the narrow edge thereof and intermediate oblique side walls forming the sides of said triangular cross-section, said circular enlargement having shoulders to baffle and create turbulence in the flow of air.

3. The diffuser of claim **2**, said enlargements terminating inside of the inlet and outlet edges of said transverse flanges.

4. The diffuser of claim **2**, said flush flanges having inwardly extending short right angular flanges turned toward one another to form an open slot channel and an elongated gasket in said open slot channel.

5. A diffuser as set forth in claim **1**, wherein the vanes are spaced apart a distance equal to or less than the width of the vanes.

References Cited by the Examiner

UNITED STATES PATENTS

2,861,659	11/1958	Hagerty	189—76
2,997,939	8/1961	Snyder et al.	98—110
3,012,494	12/1961	Drummond	98—40

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