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G. J. SWEENEY ET AL
DIFFUSER CONSTRUCTION

3,205,809

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FIG. 2a

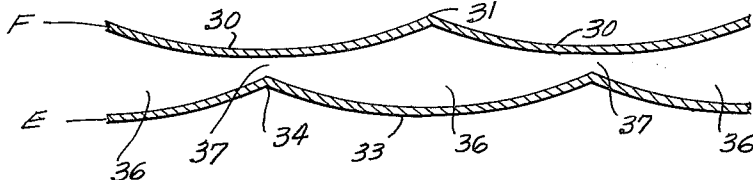


FIG. 3

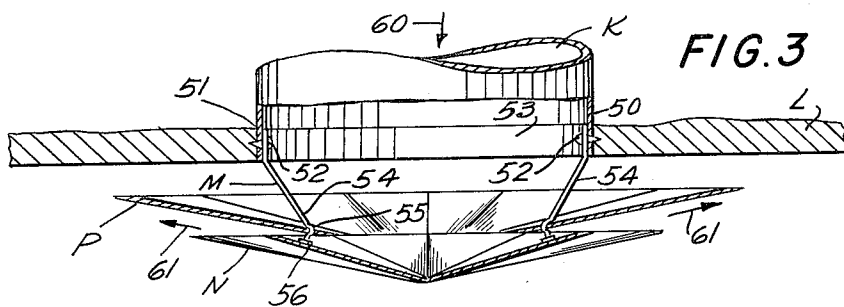
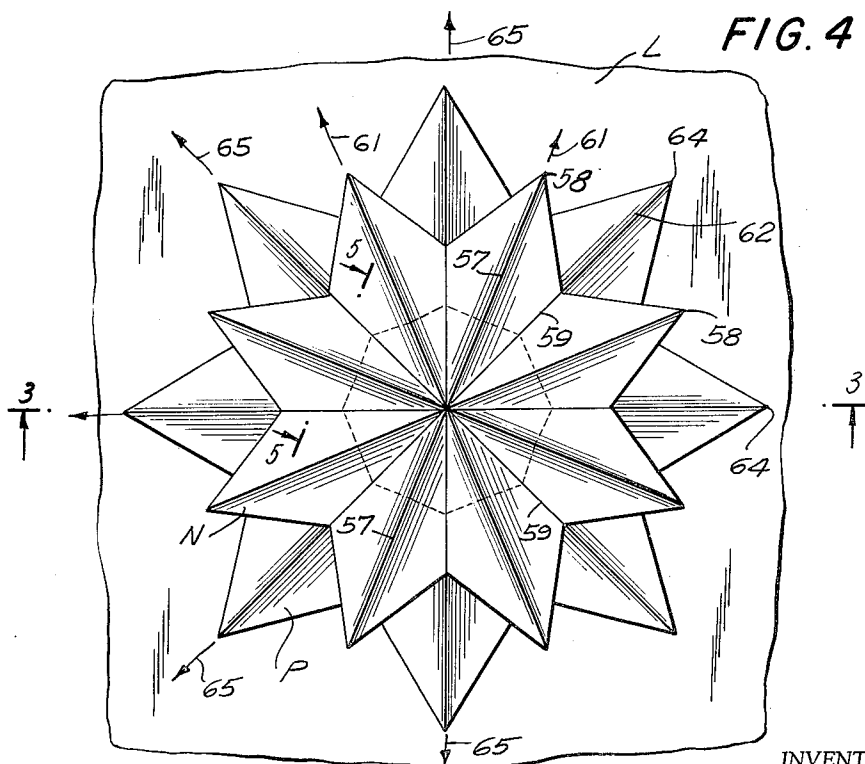


FIG. 4



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FIG. 5

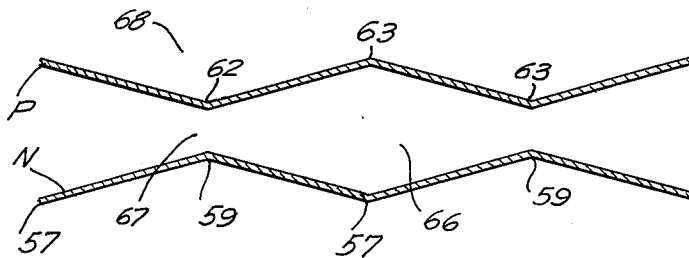
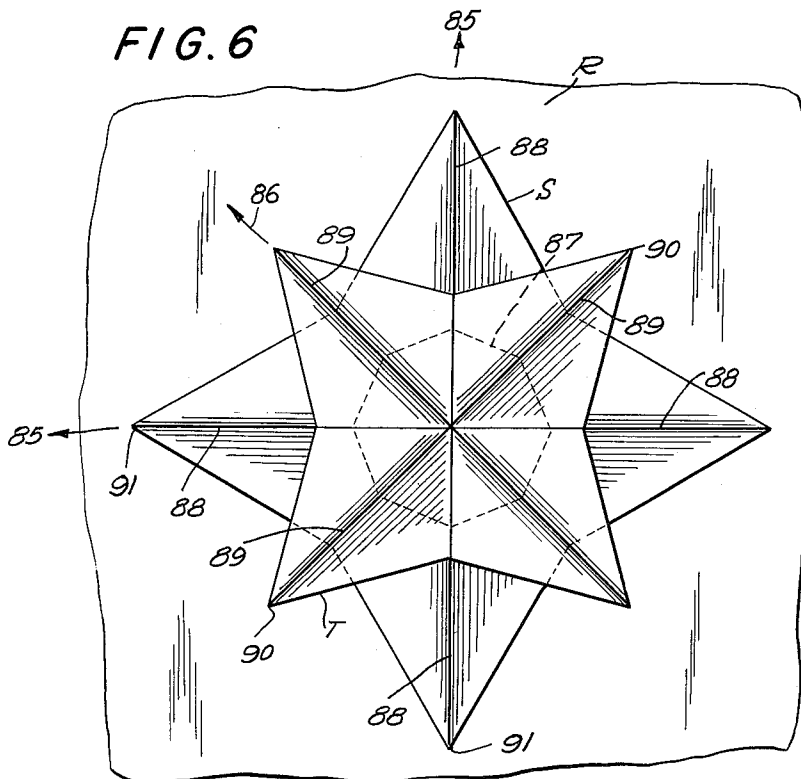


FIG. 6



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DIFFUSER CONSTRUCTION

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7 Claims. (Cl. 98-40)

The present invention relates to a diffuser construction and it particularly relates to a diffuser construction for ceiling application.

It is among the objects of the present invention to provide a simple diffuser construction which will be of a simplified construction, and, nevertheless, will assure a proper distribution of incoming conditioned or ventilating air and thorough mixture of the incoming air.

A further object is to provide a simplified diffuser construction which will result when mounted in the ceiling in a series of outwardly projected jets assuring most thorough mixture of the incoming air together with equalization of the temperature and without any specific drafts.

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 satisfactory to form the diffuser of star shaped or radially channeled plates which are positioned in superimposed channeled relationship and which may be provided with an inlet passageway which may be suspended from or positioned closely adjacent to a ceiling.

In one form of the invention, there is a lowermost dished plate acting as a bottom closure having outwardly and radially extending grooves and projects with an upper annular plate having a greater diameter between a central opening which is closed off by said lowermost dished plate.

A series of annular plates of increasing diameter may be employed superimposed above one another each being dished downwardly and centrally to a central opening.

Preferably each of these plates are constructed so that they will have radially extending channels offset in respect to one another so as to form between them a series of separate air passageways giving rise to outwardly and upwardly directed jets.

The superimposed plates may be circular or they may be star shaped, but in all instances, the outwardly and upwardly directed channels between the plates are formed by providing the plates with a series of radially extending grooves and elevations which when offset from one another will form channels through which the air being passed may be ejected into the room air in the form of upwardly directed jets.

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 a side sectional view of one form of the present invention taken upon the line 1-1 of FIG. 2.

FIG. 2 is a lower plan view of the diffuser device of FIG. 1.

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FIG. 2a is a fragmentary transverse sectional view taken upon the line 2a-2a of FIG. 2.

FIG. 3 is a transverse side sectional view of an alternative form of diffuser taken upon the line 3-3 of FIG. 4.

FIG. 4 is a bottom plan view of the diffuser of FIG. 3.

FIG. 5 is a fragmentary transverse sectional view taken upon the line 5-5 of FIG. 4.

FIG. 6 is a bottom plan view similar to FIGS. 2 and 4 of an alternative form of the invention.

Referring to FIGS. 1 to 2a, there is shown an inlet conduit A mounted in the wall or ceiling B and feeding conditioning or ventilating air as indicated at C into a diffuser D having a lower downwardly dished plate E and an upper superimposed annular downwardly dished plate F.

The plates E and F are carried by a support structure G.

Referring particularly to FIGS. 1 to 2a, the inlet A is a cylindrical conduit receiving conditioned or ventilating air from an internal duct system, and at its lower end 20, it is inserted in the recess 21 in the ceiling B inside of the inwardly directed flange 22 which is integral with the main flange 23 of the ceiling frame 24.

Attached to the ceiling frame 24 are a series of downwardly depending structural members 25 forming part of the support structure G which at their upper end are provided with the attachment ring 26 welded, soldered or otherwise connected to the inwardly directed tubular portion 22 of the frame 24.

The downwardly extending convergent legs 25 are connected to the upper plate at 27 and to the lower plate at 28 to hold them in proper position.

The upper superimposed annular plate F which is dished downwardly to the central opening 29 has a series of radially outwardly extending grooves or channels 30 between the upward projections 31.

These will extend radially outwardly from the central opening 29 to the periphery 32 of the upper plate F.

There may be a series of upper plates F having central openings 29 and of increasing diameter or decreasing diameter downwardly to form a nest of plates to give the radial jet effect which it is desired to achieve.

The downwardly dished lowermost plate E will close off the opening 29 in the plate or plates F, and it also will have a plurality of radially outwardly extending channels 33 separated by the elevated portions 34 with the periphery 35 being substantially inside of the periphery 32 of the next upper superimposed plate F.

It will be noted by reference to FIG. 2a that this will result in the formation of a series of channels 36 radially extending outwardly which is separated by the constricted portions 37.

This is achieved by placing the upwardly projecting portions directly under the center of the channels of the next higher superimposed element as best shown in FIG. 2a so that this offsetting will result in alternative constricted areas 37 and widened flow areas 36 around the entire periphery of the device.

As a result, the air will come out as a series of jets through the open portions 36 between the superimposed dished plates E and F.

This jet action directed upwardly toward the ceiling B as a result of the dished shape of the superimposed plates E and F will result in a turbulence inducing the secondary air to flow upwardly and be thoroughly mixed with the incoming air.

Depending upon the number of channels eight being shown in the embodiment of FIGS. 1 to 2a, there will be eight major jets between the superimposed plates E

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and F with a series of minor jets coming off the upper annular plate F.

The channels 30 and 33 will act as scoops to pick up the incoming air flowing downwardly at C to change its direction to an outwardly and upper direction.

The lower jets indicated by the arrows H will flow off parallel to, but at a lesser inclination of the jets J toward the ceiling B.

Referring to the embodiments of FIGS. 3 to 5, there is shown an inlet conduit K extending to the ceiling L which has a supporting structure M carrying the lowermost star shaped dished diffuser plate N and the superimposed upper diffuser plate P.

The lower end 50 of the main conduit K will be attached in the opening 51 in the ceiling L by the screws 52.

These screws 52 are connected to the ring 53 of the legs 54 of the support structure M and will hold the ring 53 and the lower end 50 of the conduit K in position in the ceiling opening 51.

The legs 54 are attached to the superimposed plate P at 55 and to the lowermost plate N at 56.

The lowermost plate 56 has a series of outwardly extending channels 57 which terminate in the points 58 between the elevated portions 59 to form a sharp star shaped structure.

This star shaped structure will form a series of scoops through the channels 57 which will result in picking up the incoming air flowing through the conduit K as indicated at 60 and directing it outwardly as indicated by the arrows 61 (see also FIG. 5).

The upper superimposed plate P will have a series of outwardly extending channels 62 terminating in the star shaped pointed portions 64 which will be positioned midway but beyond the star shaped pointed portions 58 of the lower dished plate N (see also particularly FIG. 4).

These channels will be separated by the radially outwardly extending ridged portions 63 (see FIG. 5), so that the upper plate will deliver a series of jets of air as indicated by the arrows 65 midway between the jets 61 delivered by the lowermost dished plate N.

This effect will be achieved by offsetting the channel and ridges in FIG. 5 with there being enlarged channel portions 66 corresponding to the arrows 61 and constricted portions 67 between the channel portion 66.

The same will also be true in respect to the upper dished star like plate Q in which there will be relatively open flow channels 68 corresponding to the arrows 65 and relatively constricted portions at 63 between the outwardly projecting star like pointed elements 64.

This construction will also achieve a circular radial jet effect for distributing the air in a series of jets around the periphery of the diffuser.

This distribution of radial jets will assure thorough mixing over the entire periphery of the diffuser giving a rapid equalization of turbulence for inducing the secondary air to flow upwardly and become thoroughly commingled with the incoming jets.

In the form shown in FIG. 3 to 5, there will be eight major jets generated between the superimposed plates N and P indicated by the arrows 61, and there will be eight minor jets indicated by the arrows 65 generated between the upper plate P and the ceiling L.

In the alternative embodiments shown in FIG. 6, the number of each of these jets will be reduced to four although the construction will be of the same general type shown in FIGS. 3, 4 and 5.

In this construction, the ceiling R carries the superimposed upper plate S having eight pointed channel flowing areas and a lowermost closure plate T having four flow channels.

These flow channels are indicated by the arrows 85 for the area between the ceiling and the plate S and 86 for the space between the lowermost plate T and the upper plate S.

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The lowermost plate T will close off the opening 87 in the upper plate S.

The channels 88 in the upper plate S are positioned about 45 degrees away from the channels 89 in the lowermost plate T and that the extensions 90 of the channels in the lowermost plate T will extend midway outwardly between the extensions 91 in the uppermost plate S.

The extensions 90 are shorter than the extensions 91 and there will result a superimposed star shaped effect as indicated in FIG. 6.

The construction of FIGS. 1 to 6 will give a series of radial jets above and below the intermediate plates offset in respect to one another with the number of jets depending upon the number of outwardly extending channels.

The jets created by such superimposed plates will be offset from one another, and in the forms shown in FIGS. 1 to 6, there will be major jets between the two lower parts and minor jets between the upper plates and the ceiling.

The important feature of the present invention resides in the fact that the projecting pointed elements such as for example indicated in FIG. 4, will give rise to jets of air extending radially outwardly as indicated at 65 along the ceiling, which will tend to draw in the secondary air.

Between the jet 65 there will be formed a slight vacuum which will draw upwardly the intermediate jet 61, while the secondary air will be drawn upwardly along the lower recessed sides or radial passageways between the points, particularly in connection with the lower plate N.

As many changes could be made in the above diffuser construction, 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.

What is claimed is:

1. A peripheral jet diffuser of the type connected to a ceiling conduit and fitting into a ceiling recess comprising an encircling frame fitting into said recess, a plurality of superimposed centrally downwardly dished plates, a supporting structure suspending said plates from said frame, the upper plates having central openings said plates having a plurality of radiating offset channels and ridges to give a peripheral jet effect, said channels being formed by outwardly radiating depressions formed by bending the plates radially to a blunt edge downwardly and said ridges being formed by outwardly radiating elevations formed by bending the plates radially upwardly and sides of said channels and ridges consisting of obliquely upwardly and downwardly extending radiating sectors of increasing width outwardly and extending in a slight slope from the top of the ridge to the bottom of the channel and vice versa.

2. A peripheral jet diffuser of the type connected to a ceiling conduit and fitting into a ceiling recess comprising an encircling frame fitting into said recess, a plurality of superimposed centrally downwardly dished plates, a supporting structure suspending said plates from said frame, the upper plates having central openings said plates having a plurality of radiating offset channels and ridges to give a peripheral jet effect, said channels being formed by outwardly radiating depression formed by bending the plates radially to a blunt edge downwardly and said ridges being formed by outwardly radiating elevations formed by bending the plates radially upwardly and sides of said channels and ridges consisting of obliquely upwardly and downwardly radiating depressions formed by bending the plates outwardly and extending in a slight slope from the top of the ridge to the bottom of the channel and vice versa, said channels and grooves being offset in respect to the channels and ridges in the next adjacent plate.

3. A peripheral jet diffuser of the type connected to a ceiling conduit and fitting into a ceiling recess comprising an encircling frame fitting into said recess, a plurality of superimposed centrally downwardly dished plates, a sup-

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porting structure suspending said plates from said frame, said plates having a plurality of radiating offset channels and ridges to give a peripheral jet effect, said channels being formed by outwardly radiating depressions formed by bending the plates radially to a blunt edge downwardly and said ridges being formed by outwardly radiating elevations formed by bending the plates radially upwardly and sides of said channels and ridges consisting of obliquely upwardly and downwardly extending radiating sectors of increasing width outwardly and extending in a slight slope from the top of the ridge to the bottom of the channel and vice versa, said plates each taking the approximate shape of an inverted conical section and the upper plate having a central opening and the lowermost plate blocking said opening and having a smaller diameter than the upper plate.

4. A star shaped diffuser for ventilating and conditioning air, for attachment to a ceiling opening, having a frame mounted on said opening, superimposed centrally downwardly dished deflector plates, a suspension structure suspending said plates from said frame, said plates having a plurality of outwardly radiating channels and ridges, arranged so that the channels and ridges in each plate are offset to form constricted and enlarged outwardly projecting radial air passageways in side by side relationship to form a series of outwardly directed spaced jets, said channels being formed by outwardly radiating depressions formed by bending the plates radially to a blunt edge downwardly and said ridges being formed by outwardly radiating elevations formed by bending the plates radially upwardly and sides of said channels and ridges consisting of obliquely upwardly and downwardly extending radiating sectors of increasing width outwardly and extending in a slight slope from the top of the ridge to the bottom of the channel and vice versa, said

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plates being of increasing diameter upwardly and the uppermost plate being provided with a central opening to permit passage of air and the lowermost plate covering said central opening to force all air outwardly between said plates.

5. A star shaped double superimposed dish plated circular diffuser mounted in a ceiling opening and having a circular frame fitting into said ceiling opening and supporting the diffuser therein, said diffuser including a central top inlet for air, superimposed star shaped closely spaced dished plates each having a plurality of outwardly radiating grooves and channels and outwardly radiating ridges and elevations and the upper plates being provided with central openings and the lowermost plate being centrally closed and the ridges and channels in each successive plate being offset from each other so as to form narrowed and widened passageways for radiating outward flow of air in form of radiating upper and lower jets.

6. The diffuser of claim 5, said plates having outwardly extending points projecting between the points of the next upper plate.

7. The diffuser of claim 5, the points of the star forming the jets.

References Cited by the Examiner

UNITED STATES PATENTS

915,178	3/09	Hillyard	98—40
2,269,376	1/42	O'Day	98—40
2,552,236	5/51	Trane	98—40

FOREIGN PATENTS

726,483	10/42	Germany.
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