United States Patent

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[54] **POLYGONAL TILE, SUSPENDED CEILING INTEGRATED ACOUSTIPLAQUE AIR DIFFUSER ASSEMBLY**
12 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** ..... **98/40 D**
[51] **Int. Cl.** **F24f 7/00**
[50] **Field of Search** ..... 98/40 D, 40 DL

[56] **References Cited**

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3,127,827	4/1964	Ericson	98/40 D
3,411,425	11/1968	Lambert	98/40 D

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ABSTRACT: A polygonal tile suspended ceiling integrated acoustiplaque air diffuser assembly for use with an air plenum chamber having an air outlet mounted thereon and for use with a suspended ceiling with a plurality of tile receiving square openings formed by the lower flanges of main inverted T-bar support members and intersecting cross-inverted T-bar support members, includes a square enclosing outer frame for insertion into one of the square ceiling openings; a smaller square enclosing inner frame with a square-shaped central opening; spacers for mounting the inner member within the outer frame in spaced relationship; a plaque of ceiling tile inserted into the central opening to block the passage of air from the air outlet thereover through the central opening; corner plates inserted between the inner and outer frame at the corners thereof to block the passage of air from the air outlet through the corner spaces; and nested channels inserted into peripheral passages between the inner and outer frames forming restricted passage for selectively controlling the air passing therethrough from the air outlet, with the air flowing therethrough being deflected by the lower flanges of the inverted T-bar members to flow along the ceiling throughout a room in a direction away from the sides of the square openings in the ceiling.

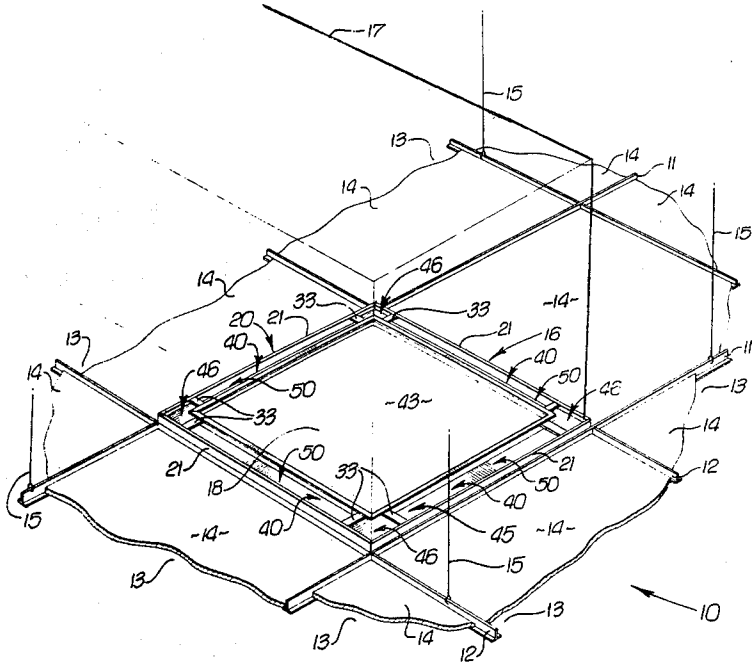


FIG. 1.

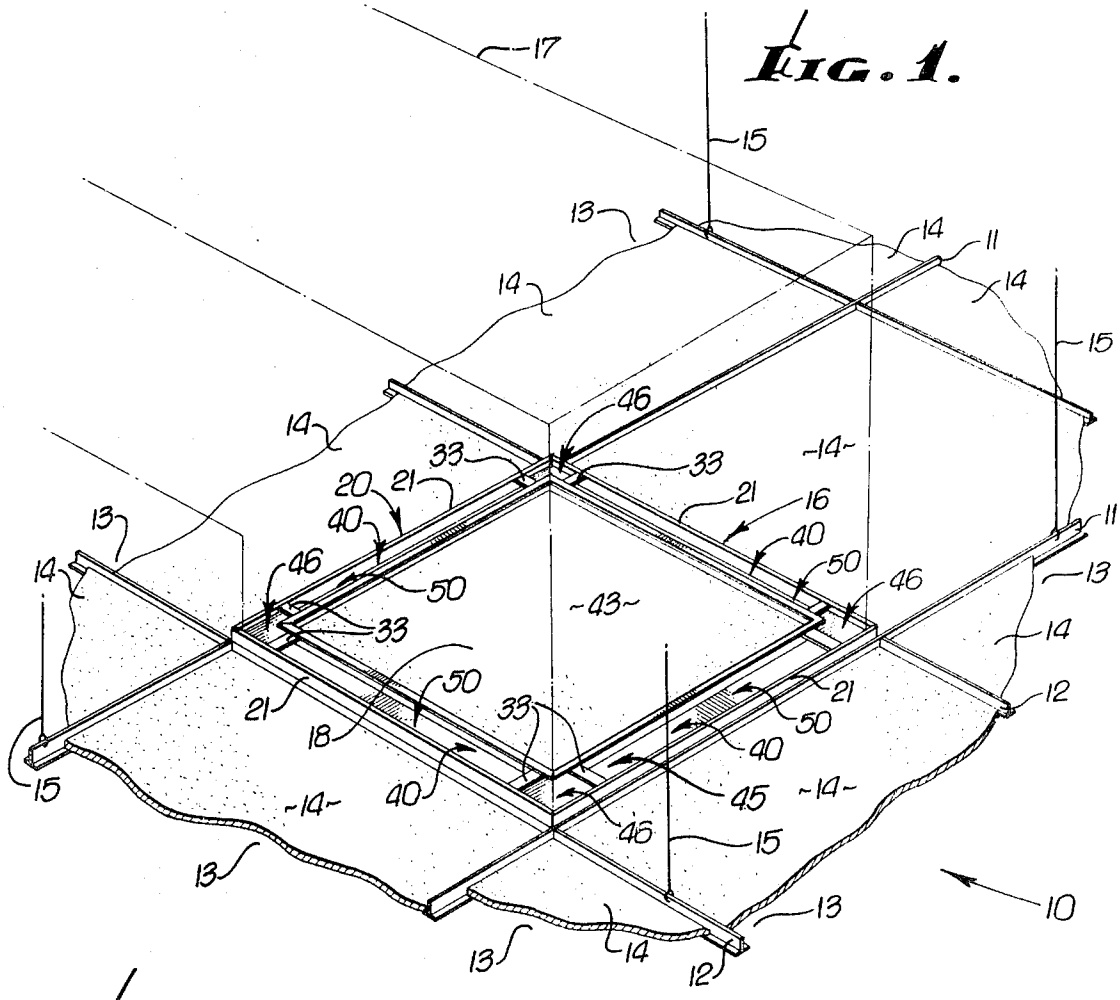
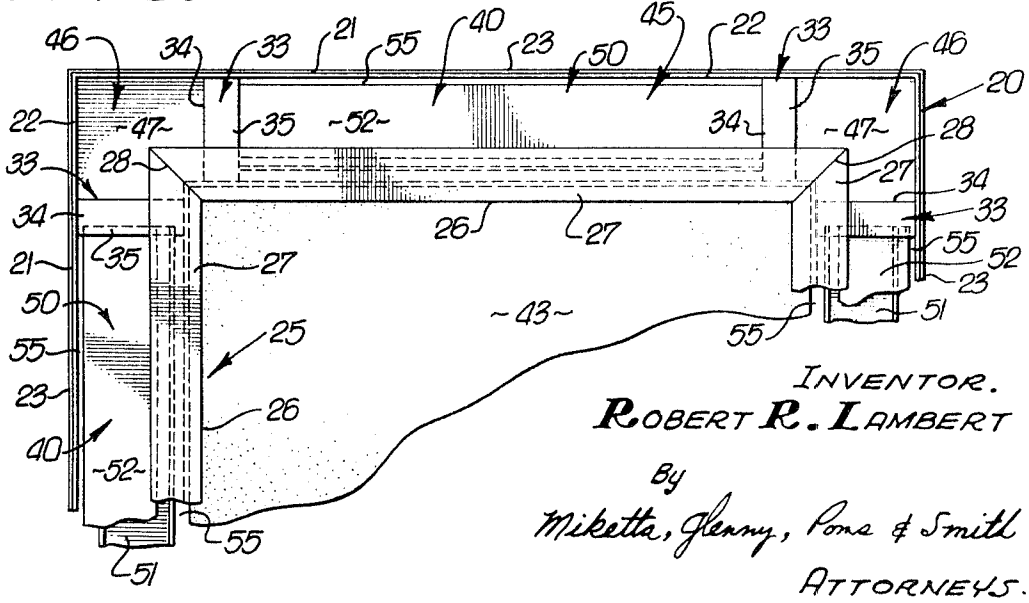


FIG. 5.



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FIG. 2.

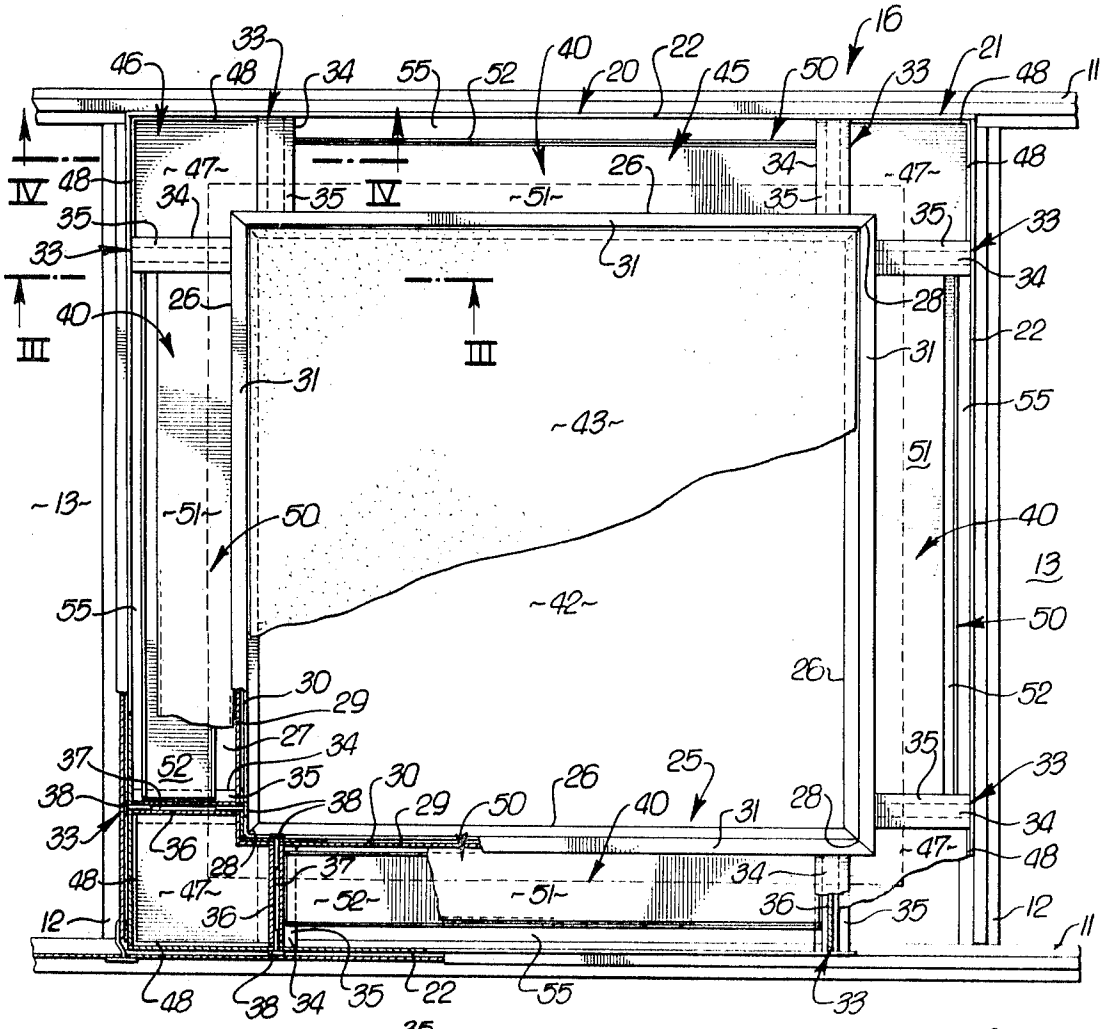


FIG. 3.

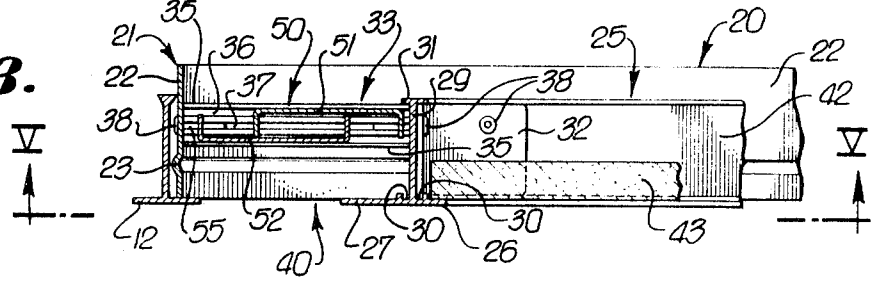
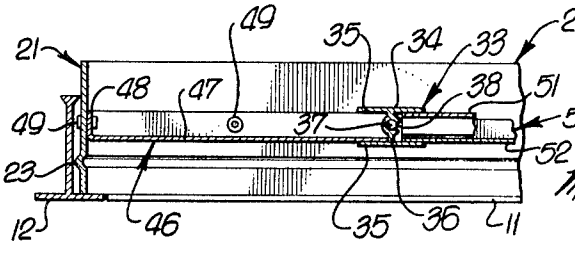


FIG. 4.



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POLYGONAL TILE, SUSPENDED CEILING INTEGRATED ACOUSTIPLAQUE AIR DIFFUSER ASSEMBLY

BACKGROUND OF THE INVENTION

This invention relates to air diffuser assemblies and more particularly to a polygonal tile suspended ceiling integrated acoustiplaque air diffuser assembly for use in a polygonal opening in a suspended ceiling and with an air plenum chamber having an air outlet.

In the past, a suspended ceiling integrated air distribution system has had an elongated plenum chamber or chambers with elongated air outlets which were mounted on elongated air diffuser assemblies extending the full length of the ceiling. The air diffuser assemblies were usually mounted on or by the main inverted T-bar support members of the suspended ceiling with ceiling tile mounted on either side thereof.

A suspended ceiling usually consists of elongated inverted T-bar main support members running the entire length of the ceiling with cross-inverted T-bar support members therebetween. The lower flanges of the inverted T-bar support members form the ceiling into a grid of polygonal (usually square) shaped openings. These openings receive ceiling tile or acoustical board, and in the proper place, light fixtures.

It is therefore a primary object of this invention to provide an air diffuser assembly which is insertable into one of the polygonal openings in the ceiling.

It is another object of this invention to provide such an air diffuser assembly with peripheral passages adjacent each of the sides of the polygon to provide for the passage of air from an air plenum chamber mounted on the air diffuser assembly, through the peripheral passages and into the room.

It is yet a further object of this invention to provide such an air diffuser assembly with a central opening and a plaque therein which blocks the flow of air from the air outlet of the air plenum chamber through the central opening and into the room.

It is yet another object of this invention to provide such an air diffuser assembly having an inner frame spaced from an outer frame and mounted thereto by spacers to form the peripheral passages.

It is yet a further object of this invention to provide such an air diffuser assembly with such a frame wherein blank-off means are provided at the corner spaces thereof to block the passage of air from the air plenum chamber through the corner spaces.

It is yet a further object of this invention to provide such an air diffuser assembly with such an inner and outer frame and blank-off means wherein weir means is provided between the blank-off means in the peripheral passages to form restricted passages to selectively control the passage of air from the plenum chamber thereover through the passages and into the room.

SUMMARY OF THE INVENTION

A polygonal tile suspended ceiling integrated acoustiplaque air diffuser assembly according to this invention has a framework of polygonal shape for insertion into one of the polygonal openings in a suspended ceiling, and has mounted thereon an air plenum chamber having an air outlet with the air therein passing through air directing means containing peripheral passages in the framework for selectively controlling the passage of air into the room. The exemplary embodiment of the air diffuser assembly has an outer frame enclosing a polygonal shaped space to mount in one of the polygonal openings in the suspended ceiling and an inner frame enclosing a smaller polygonal shaped space with a central opening therein. The inner frame is mounted within and to the outer frame by spacers to form peripheral passages therebetween. A plaque is mounted in the central opening to block the passage of air from the air outlet through the central opening, and blank-off means is mounted between the inner and outer members at the corner thereof to block the passage of air to the corner areas. Weir means is mounted in the peripheral passages between the inner and outer frame between the blank-off means to form restricted passages for selectively controlling the flow of air through the passages and into the room.

These and other various advantages and distinct characteristics of the present invention will become apparent to those skilled in the art from the following detailed description of the polygonal tile suspended ceiling integrated acoustiplaque air diffuser assembly according to this invention. In such description, reference will be had to the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an exemplary polygonal tile suspended ceiling integrated acoustiplaque air diffuser assembly according to the present invention, mounted in a suspended ceiling, with an air plenum chamber (shown in phantom lines) mounted thereon;

FIG. 2 is a partially cut away top plan view of the air diffuser assembly of FIG. 1;

FIG. 3 is a cross-sectional elevation partial view of the assembly and structure of FIG. 1 taken along the plane III–III of FIG. 2;

FIG. 4 is a cross-sectional elevation partial view of the assembly and structure of FIG. 1 taken along the plane IV–IV of FIG. 2;

FIG. 5 is a bottom partial view of the assembly and structure of FIG. 1 taken along the plane V–V of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, and particularly to FIG. 1, a conventional suspended ceiling 10 is made up of main inverted T-bar support members 11 and cross-inverted T-bar support members 12 forming a series of square openings 13 into which ceiling or acoustical tile 14 is mounted. The T-bar support members 11 and 12 are supported from the ceiling (not shown) by ceiling or soffit hangers 15 conventionally attached thereto. In one of the openings 13, a polygonal tile suspended ceiling integrated acoustiplaque air diffuser assembly 16 according to this invention is mounted, with an air plenum chamber 17 (shown in phantom lines) with a square air outlet 18 mounted thereon.

In the exemplary embodiment, the openings 13 are shown as being square, but it should be understood that any multisided or polygonal shaped openings may also be formed by the main support members 11 and the cross-support members 12.

Referring now to FIG. 2, the polygonal tile suspended ceiling integrated acoustiplaque air diffuser assembly 16 includes a framework 20 of generally square shape for insertion into one of the square openings 13 with the framework 20 having four peripheral passages 40 in which air directing means 45 is mounted. The combination of the passages 40 and the air directing means 45 forms restricted passages 55 for selectively controlling the passage of air from the square air outlet 18 of the air plenum chamber 17 into the room. The framework 20 also has a central opening 42 into which a plaque 43 is mounted to block the passage of air through the central opening 42 from the air outlet 18. The air directing means 45 includes blank-off means 46 at the corner openings of the framework 20 to block the passage of air therethrough, and weir means 50 in the peripheral passages 40 forming restricted passages 55 to selectively control the passage of air through the passages 40.

The framework 20 includes an outer frame 21 constructed of four individual vertical thin walls 22 with a longitudinal bead 23 formed therein to give rigidity to the walls 22. The individual walls are joined together to enclose a square shaped space of a size slightly larger than the opening 13 and slightly smaller than the square opening formed by the intersections of the webs of the T-bar support members 11 and 12.

The framework 20 also includes an inner frame 25 constructed of inverted T-bar support members 26 with lower flanges 27 having mitered ends 28, and an upwardly extending web 29. The lower flanges 27 have raised portions therein adjacent the web 29 to form grooves 30, and the web 29 has a head 31 on the upper end thereof. The inverted T-bar members are joined at the ends to each other by an angle plate 32 slid into grooves 30 under the heads 31 to form the inner frame 25. The inner frame 25 so formed encloses a smaller square shaped space than that enclosed by outer frame 21.

The framework 20 has spacer means 33 including I-shaped member spacers 34 with upper and lower flanges 35 and a web 36 containing a central cylindrical groove 37 extending longitudinally thereof. The I-member spacers 34 mount and position the inner frame 25 within the outer frame 21 in spaced relationship thereto to form the four peripheral passages 40. The I-member spacers 34 are located in pairs adjacent each corner of the inner frame 25. Rivets 38 pass through the angle plates 32 and the inner frame 25 to extend into the cylindrical grooves 37 in the webs 36 of the I-member spacers 34 where they are anchored. Other rivets 38 pass through the outer frame 21 and into the cylindrical grooves 37, where they are anchored. Thus the rivets 38 secure the parts of the framework 20 together.

The lower flanges 27 of the inverted T-bar members 26 define a square central opening 42 into which the plaque 43 is inserted. The opening 42 is shown as being square shaped, but it need not be if another shape were desired, i.e. as a contrast to the rest of the ceiling openings. If another shape is desired, the lower flanges 27 of the inverted T-bar members 26 would be made accordingly.

The plaque 43 is slightly larger than the openings 42 and so will rest on the lower flanges 27 of the inverted T-bar members 26 of the inner frame 25 to close the central opening 42. The plaque 43 will generally be made of the same material as the rest of the ceiling, such as ceiling or acoustical tile 14 to blend with the balance of the ceiling.

The blank-off means 46 includes a plate 47 mounted between the inner frame 25 and the outer frame 21 at the corners thereof and between the pairs of I-member spacers 34 adjacent the corners of the frames 21 and 25. The plate 47 has turned up flanges 48 adjacent the walls 22 of the outer frame 21. The walls 22 are riveted to the flanges 48 of the plate 47 at 49 to additionally secure the individual walls 22 together and to the balance of the framework 20.

The weir means 50 are inserted into the peripheral passages 40 to form the restricted passages 55 and include an upper U-shaped channel member 51 and a lower U-shaped channel member 52 nested together and inserted between the spaced upper and lower flanges 35 of the I-member spacers 34 at either end of each peripheral passage 40. The outside flanges of the nested channels 50 and 51, the I-section 22 of the outer frame 21, and the web 29 of the inner frame 25 are spaced-apart to form two restricted passages 55 for each peripheral passage 40. The nested channels 50 and 51 are laterally spreadable or contractable to expand or shrink the width of the restricted passages 55 for controlling the direction of, velocity and volume of air discharged through the air diffuser outlet as described in U.S. Pat. No. 3,411,425.

The completely assembled framework 20 is inserted into the opening 13 with the lower ends of the walls 22 of the outer frame 21 resting on the lower flanges of the main and cross-inverted T-bar support members 11 and 12 with the lower flanges thereof extending under the side openings 40.

The air plenum chamber 17 is mounted on the outer frame 21 of the framework 20 with the rectangular air outlet 18 over both the peripheral passages 40 and the central opening 42. The air from the air plenum chamber 17 flows through the square air outlet 18 and through the restricted passages 55 past the upper and lower nested U-shaped channels 50 and 51 to be deflected by the lower flange of the main and cross-inverted T-bar support members, and by the lower flange 27 of the inverted T-bar members 26 of the inner frame 25, out the air diffuser outlet and along the ceiling in the room in a direction away from the sides of the square openings 13 to flow throughout the room. The upper and lower nested U-shaped channels 51 and 52 may be spread to close all or part of the restricted passages 55 to selectively control the direction and volume of air flow through the polygonal tile suspended ceiling integrated acoustiplaque air diffuser assembly 16.

Thus, the polygonal tile suspended ceiling integrated acoustiplaque air diffuser assembly according to this invention mounts within a single opening in a suspended ceiling to diffuse air through the ceiling and away from the sides of the ceiling opening.

I claim:

1. A suspended ceiling integrated air diffuser assembly for use with an air plenum chamber having an air outlet and a suspended ceiling including a plurality of support members forming polygonal openings for receiving ceiling tile, said air diffuser comprising:

a framework of like polygonal shape for insertion into one of the polygonal openings to mount on adjacent support members, said framework having a peripheral passage therethrough along each side of the polygon, and said air plenum chamber being mounted on said framework with the polygonal shaped air outlet thereof over all of said diffuser openings; and

air directing means mounted on said framework within said peripheral passages to form restricted passages for selectively controlling the passage of air from the polygonal air outlet through the framework, whereby the air flows into a room through the diffuser openings adjacent the sides of the polygonal opening in the suspended ceiling.

2. The air diffuser of claim 1 wherein the framework has a central opening therein under said air outlet, and

a plaque is mounted within the central opening for blocking the passage of air from the air outlet therethrough.

3. The air diffuser assembly of claim 1 wherein the framework comprises:

an outer frame enclosing a polygonal shaped opening and which mounts to the support members;

an inner frame enclosing a smaller polygonal shaped opening and;

spacer means mounting the inner frame within the outer frame and forming the peripheral passages between the frames.

4. The air diffuser of claim 3 wherein the air directing means comprises:

blank-off means mounted between the inner and outer frames at the corners thereof to block the air from the air outlet from passing through the corner areas of the framework; and

weir means mounted in the peripheral passages between the inner and outer frames and between the blank-off means forming restricted passages to selectively control the flow of air therethrough.

5. The air diffuser of claim 3 wherein the central opening is enclosed by the inner frame and a plaque of a corresponding polygonal shape is inserted therein to decoratively blend into the overall ceiling design.

6. The air diffuser of claim 5 wherein the plaque is made of ceiling tile similar in appearance to the balance of the ceiling tile in the ceiling to decoratively blend with the balance of the ceiling tile.

7. A suspended ceiling integrated air diffuser assembly for use with an air plenum chamber having a polygonal shaped air outlet, and a suspended ceiling, including a plurality of inverted T-bar support members forming a plurality of like polygonal shaped openings with the lower flanges thereof receiving ceiling tiles, said air diffuser comprising:

a framework including an outer frame enclosing a like polygonal space for insertion into a polygonal shaped opening and mounting on the lower flanges of the T-bar support members, an inner frame with a central opening

therein, and spacers mounting the inner frame to the outer frame in spaced relationship forming continuous peripheral passages adjacent each side of the polygonal shaped opening, said air plenum chamber being mounted on the framework with the air outlet over all of the said peripheral passages and said central opening of the framework;

a plaque inserted into the central opening and mounted to the inner frame to block the passage of air from the air outlet through the central opening; and

air directing means mounted to the framework in the peripheral passages to form restricted passages for selectively controlling the passage of air from the air outlet through the passages of the framework whereby the air flows into a room through the passages adjacent the sides of the polygonal shaped openings in the ceiling.

8. The air diffuser assembly of claim **7** wherein the inner frame is formed from a plurality of inverted T-bar members joined at the intersections thereof, and the plaque is mounted to the inner frame by the edges of the plaque sitting on the lower flanges of the inverted T-bar members.

9. The air diffuser assembly of claim **7** wherein the outer frame has a lower edge which rests on the lower flanges of the inverted T-bar support members adjacent the web thereof, and the lower flanges of the inverted T-bar support members protrude under the air diffuser openings.

10. The air diffuser assembly of claim **9** wherein the air directing means includes:

blank-off means mounted between the inner and outer frame at the corners thereof to block the air from the air outlet passing through the corner areas of the framework; and

weir means mounted to the framework in the peripheral passages between the inner and outer frame and between the blank-off means to form restricted passages for selectively controlling the flow of air through the passages, said lower flanges of the inverted T-bar support members and inverted T-bar members below said restricted passages deflecting the flow of air therethrough away from said members respectively.

11. The air diffuser of claim **10** wherein:

the spacers are a pair of spaced I-members mounted adjacent each corner of the frames;

the blank-off means is a plate between the two I-members at each corner of the framework; and

the weir means is a pair of nested channels inserted between the spaced flanges at the I-members and extending between the two I-members on a side.

12. A suspended ceiling integrated air diffuser assembly for use with an air plenum chamber with a rectangular air outlet, and a suspended ceiling including a plurality of main inverted T-bar support members and intersecting cross-inverted T-bar support members forming with the lower flanges thereof a plurality of rectangular openings for mounting ceiling tile therein, the air diffuser assembly comprising:

a framework including an outer frame enclosing a rectangular shaped space and for insertion into a rectangular opening, with lower edge of the outer frame resting on the lower flange of the inverted T-bar support members adjacent the web, and with the flanges of the inverted T-bar support members extending inwardly under the outer frame; an inner frame enclosing a smaller rectangularly shaped space and made of a plurality of inverted T-bar members joined at the corners and forming with the lower flanges thereof a central opening of rectangular shape; and I-member spacers mounted to the outer frame and mounting the inner frame in spaced relation to and within the outer frame to form continuous peripheral passages therebetween, said I-members extending between the frames adjacent each corner thereof, and said air plenum chamber being mounted on said outer frame with the rectangular outlet over all of said peripheral passages and said center opening;

a plaque made of ceiling tile in a rectangular shape for insertion into the central opening to rest on the flanges of the inverted T-bar members of the inner frame, said plaque blocking the passage of air from the air outlet through the central opening;

corner plates inserted between the inner and outer frame and between the I-members spacers adjacent the corners to block the passage of air from the air outlet through the space between the inner and outer frames at the corners thereof; and

nested channels inserted into the peripheral passages and between the flanges of the I-members spacers to slidably mount between the I-members spacers to form restricted passages for selectively controlling the flow of air from the air outlet of the plenum chamber through the passages of the framework, the air flowing through the restricted passages being deflected by the lower flanges of the inverted T-bar support members and the inverted T-bar members below the restricted passages away from said members and along the ceiling to flow throughout a room in directions away from the sides of the rectangular openings in the ceiling.