Dec. 4, 1956 W. R. F. CARNES 2,772,624

DIFFUSER

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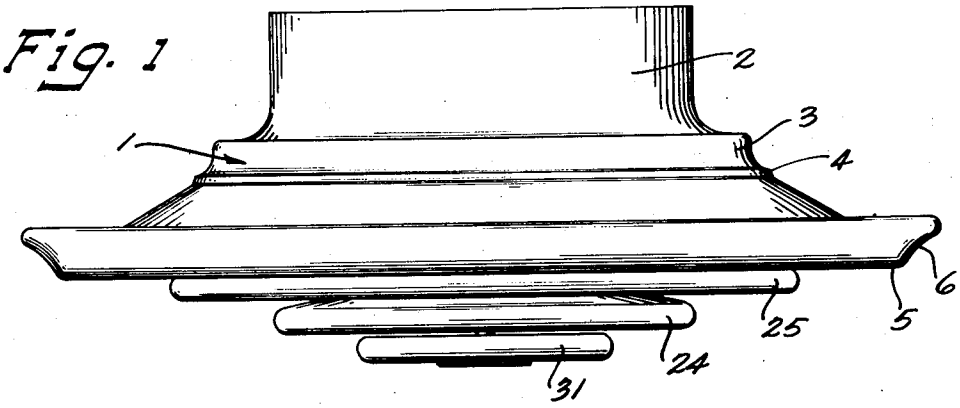
Fig. 1



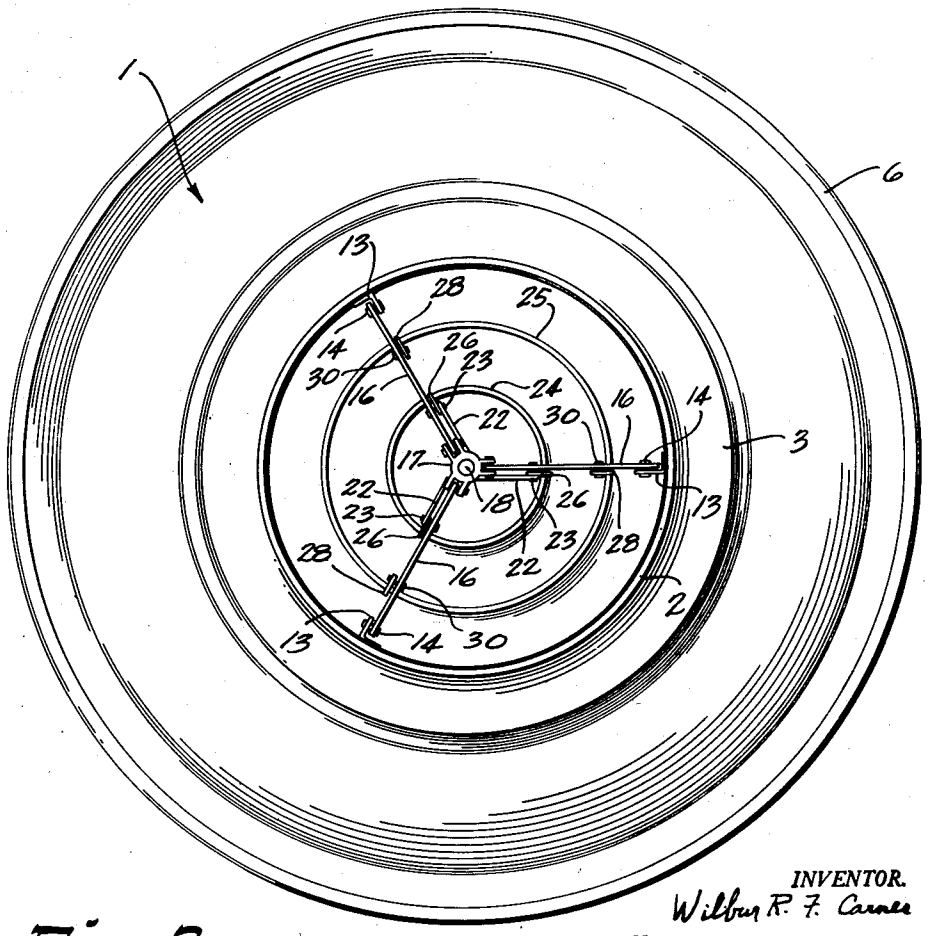


Fig. 2

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Fig. 4

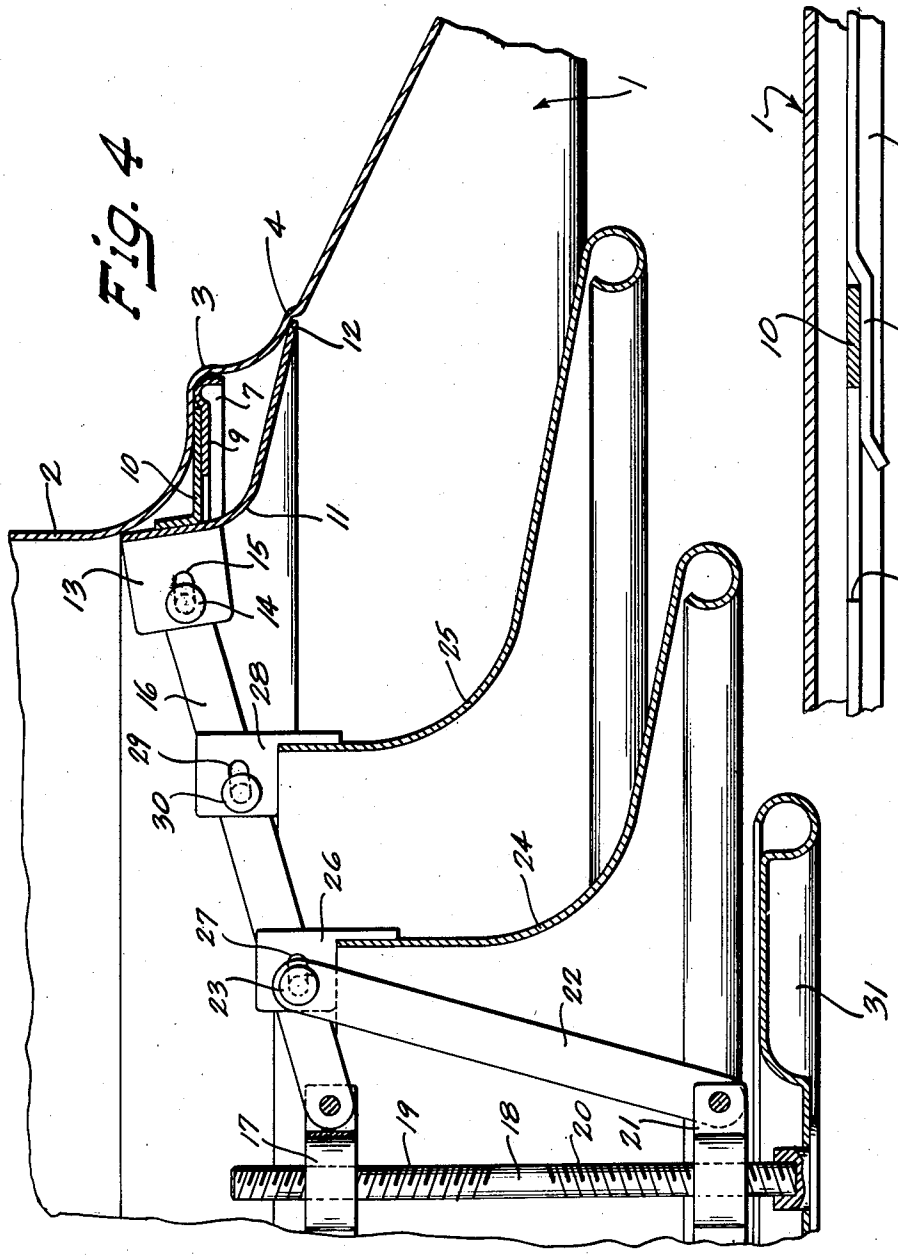

Fig. 5

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Fig. 3

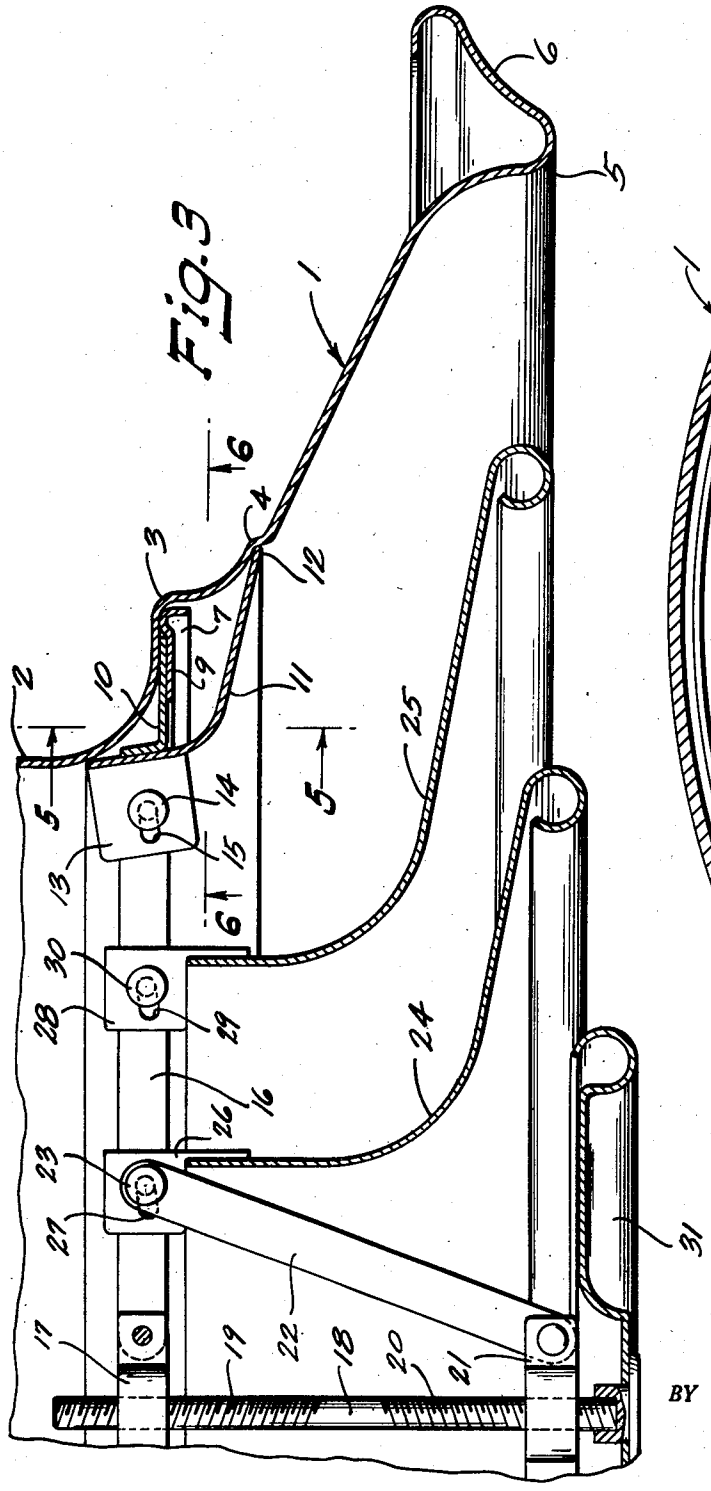
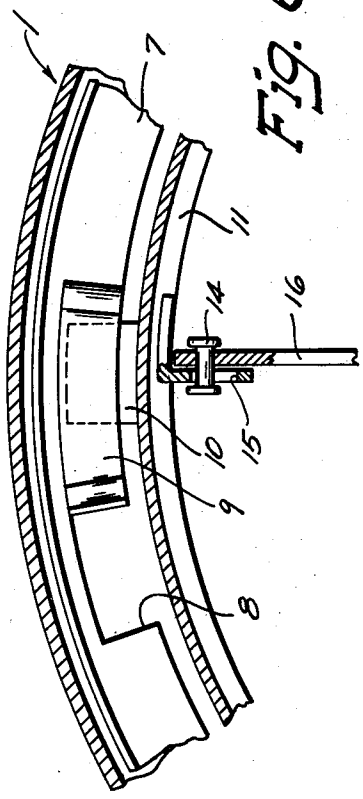


Fig. 6



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DIFFUSER

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Application November 6, 1952, Serial No. 319,146

9 Claims. (Cl. 98—40)

This invention relates to diffusers for the distribution of air from ventilating ducts into rooms, halls and the like, and it more specifically resides in a diffuser having an outer housing shell with a neck of reduced cross section adapted to be joined to a discharge outlet of a ventilating duct that extends downwardly and flares outwardly from said neck to provide an enlarged discharge mouth in which are nested a number of spaced shells of graduated size that also extend downwardly and flare outwardly to direct the discharge of air, which shells are supported by a plurality of tiltable struts that extend from the outer housing shell inwardly to join with a connecting member that may be moved downwardly or upwardly to alter the tilt of the struts to proportionally vary the relative downward extent of the shells.

In air conditioning by ventilation of rooms and halls it is desirable to diffuse the incoming air without creating discomforting drafts. So called diffusers have been widely adopted as a means for performing this function. Attached to an outlet of a ventilating duct a diffuser presents a discharge opening entering upon the room or hall that has an increasing cross section to cause a decrease in velocity of the air steam without diminishing the volume of flow. A specific course of drifting of air exiting from a diffuser must exist in order that the air will be diffused throughout the region which the diffuser is intended to serve. The pattern of flow of such drifting will be determined largely by the physical form of the diffuser. In accordance with this invention the pattern of flow may be varied to provide a pattern most desirable for the particular location of the diffuser.

A common form of diffuser is a concentric arrangement of several nested shells of graduated diameters that are open ended and flare outwardly. The shells form a number of ring shaped passages, the configuration and relative position of which largely determines the flow characteristics of the emerging air. Downward and upward adjustment of the shells, to vary the relative spacing between successive shells, alters the flow characteristics and emerging air may be given greater or less horizontal components of movement. The present invention lends itself to diffusers of this form and novel means are provided whereby the nested shells may readily be shifted in position to change the diffusion pattern of the air discharged from the apparatus. In one particular form in which the invention may be embodied the inner shells may be disconnected as a unit from the outer shell that serves as a housing. The center opening of the housing shell is then unobstructed and it may be positioned in a ceiling or wall with ease, since ready access of the interior is had for the purpose of securing the shell in place.

It is an object of this invention to provide a diffuser in which discharge members forming outlet openings may be adjusted to vary the diffusion pattern of the air emerging therefrom.

It is another object of this invention to provide a diffuser comprising a number of nested shells of graduated sizes wherein the shells may be shifted axially to alter

the spacing therebetween to cause the flow characteristics of the diffuser to be altered.

It is another object of this invention to provide a diffuser wherein the air deflecting shells nested within the outer housing shell may be removed for ease of access to the interior of the outer shell for installation and cleaning purposes.

It is a still further object of this invention to provide a diffuser embodying the foregoing objects in which a cantilever support is provided for the inner shell members which may be removed as a unit or adjusted to shift the shells downwardly or upwardly without requiring the use of special tools.

These and other objects and advantages of this invention will appear in the description to follow. In the description reference is made to the accompanying drawings in which there is shown by way of illustration and not of limitation a specific form in which this invention may be embodied.

In the drawings:

Fig. 1 is a view in elevation of a diffuser in which this invention is embodied,

Fig. 2 is a plan view of the diffuser shown in Fig. 1,

Fig. 3 is a fragmentary view in elevation and in section of the diffuser shown in Fig. 1 with the nested shells in raised position.

Fig. 4 is a fragmentary view in elevation and in section of the diffuser shown in Fig. 1 with the shell members disposed in a lower position,

Fig. 5 is a fragmentary view in section of the diffuser shown in Fig. 1 viewed through the plane 5—5 in Fig. 3, and

Fig. 6 is a fragmentary view in section of the diffuser shown in Fig. 1 viewed through the plane 6—6 in Fig. 3.

Referring now to the drawings, the diffuser there shown, is provided with an outer circular housing shell 1 having an upper portion in the form of a circular cylindrical neck 2 adapted to be fitted in telescoped connection with a discharge outlet of a ventilating duct. From the base of the neck 2 the housing shell 1 flares outwardly to form a shoulder 3 and at the foot of the shoulder 3 is a small rib 4 that forms a shallow circular indentation that extends about the inner wall of the shell 1. From the rib 4 the shell 1 extends downwardly and outwardly to form a constantly increasing smooth walled opening, as is shown in Figs. 3 and 4, that may be described as generally frusto-conical. The lower part of the frusto-conical portion merges with a lip 5 that describes a mouth or discharge outlet for the shell 1. From the lip 5 the shell 1 bends rearwardly into a moulding portion 6 that extends laterally to provide an ornamental abutment which seals against the wall or ceiling in which the diffuser is to be mounted.

On the underside of the shoulder 3 is fastened a retaining ring 7, shown in the fragmentary views Figs. 5 and 6, as well as in Figs. 3 and 4. The ring 7 is turned downwardly about its outer periphery to provide rigidity and three latch openings 8 are cut into the ring and spaced circumferentially to divide the ring 7 into equal thirds. One of the openings 8 is shown in profile in Fig. 6. Extending clockwise, as viewed from beneath, from each of the openings 8 is a latch lip 9 that is stamped from the ring 7 so as to be spaced slightly beneath the shoulder 3. The three resulting gaps formed between the shoulder 3 and the ring 7 are each of a width sufficient to receive with a snug fit a latch tab 10 which may be inserted through the adjacent opening 8.

As shown in Figs. 3 and 4, each of the latch tabs 10 serve as angle brackets for attachment to a support collar 11. The collar 11 is retained in place by insertion of the tabs 10 through the openings 8 into the spaces between the latch lips 9 and shoulder 3. When in place,

the collar 11 extends from the base or lowest part of the neck 2 to the rib 4, in which the forward edge 12 of the collar 11 nests. The collar 11 closes off the shoulder 3 from the interior of the shell 1 and provides an upward continuation of the downwardly and outwardly extending portions of the shell 1 that blends with the neck 2 to present a smooth walled air passage.

Three circumferentially spaced mounting ears 13 are fastened to the inner side of the support collar 11 and extend radially inward. A headed pin 14, inserted through a slot 15 in each ear 13 serves to pivotally mount one end of a cantilever support strut 16. The three cantilever struts 16 extend radially inwardly and each is pivotally joined at its inner end to a central connector hub 17 disposed concentrically with the outer housing 1. Also concentric with the outer shell 1 is an adjustment shaft 18 that extends through and is threadedly engaged with the hub 17. The shaft 18 has an upper threaded portion 19 that engages the hub 17 and a lower threaded portion 20 the pitch of which is the reverse of that of the upper portion 19. Mounted upon the lower threaded portion 20 is a lower connector hub 21 similar in form to the hub 17. Pivotally connected to the hub 21 are three adjustment struts 22 each of which extends upwardly and slightly outwardly to a pivotal connection through pin 23 with one of the cantilever struts 16.

The hubs 17 and 21 are both held from rotation by the struts 16 and 22. Thus, when the adjustment shaft 18 is rotated in one direction, the reverse threads 19 and 20 cause the hubs 17 and 21 to move toward one another, and upon a reverse rotation of the shaft 18 the hubs 17 and 21 are caused to move away from one another.

Three sets of triangular trusses are formed by the connected members 22 and 16, and the hubs 17 and 21 and the shaft 18. The vertices of the trusses comprise the pins 23 and the pivotal connections between the hubs 17, 21 and the respective struts 16 and 22. The triangular trusses provide a rigidity that retains the entire cantilever structure mounted within the collar 11 from collapse. Each triangular truss has two legs of fixed length and the remaining leg of each triangle is adjustable by rotation of the shaft 18. With the apparatus disposed as in Fig. 3 with the cantilever struts 16 in a horizontal position, movement of the hubs 17 and 21 toward one another will cause the cantilever struts 16 to move toward a position of inclination such as is shown in Fig. 4. The degree to tilt is dependent upon the amount of movement of the hubs 17 and 21 toward one another. Since an inclination of the struts 16 will decrease their horizontal extent the pins 14 will move inwardly in the slots 15 of the ears 13.

Suspended from the cantilever struts 16 is a pair of open ended air deflecting shells 24 and 25 concentric with the outer shell 1. The shells 24 and 25 extend downwardly and flare outwardly following the general contour of the shell 1 and are disposed in a nested relation to form air discharge paths therebetween that turn outwardly to discharge the air with a lateral component of flow.

The inner shell 24 has three upwardly extending support ears 26 with slotted openings 27 to receive the pins 23. In like manner the shell 25 is attached to the struts 16 by three ears 28 that have slots 29 to receive pins 30 that are passed through the struts 16. The slots 27 and 28, like the slots 15, permit inclination of the struts 16 without interference with the lateral foreshortening that occurs upon such an inclination.

Secured to the lower end of the adjustment shaft 18 is a circular baffle shell 31 that hinders flow through a central portion of the bottom opening of the inner shell 24. The baffle shell 31 forms with the lower lip of the shell 24 a ring shaped outlet opening which is concentric with and similar to the openings between the shells 24 and 25 and between the shells 25 and 1. Rotation of the shell 31 causes rotation of the shaft 18 for adjustment of the hubs 17 and 21 to tilt the cantilever struts 16 to the position desired.

In mounting the apparatus in a wall or ceiling the cantilever assembly within the support collar 11 is removed from the housing shell 1 by disengagement of the tabs 10 from the latch lips 9. The shell 1 may then be easily handled and the interior of the neck portion 2 is accessible for fitting to a duct outlet. Upon placing the housing shell 1 in position the cantilever assembly is then placed in position by inserting the latch tabs 10 in the openings 8 of the retaining ring 7 and rotating the collar 11 and its assembly to engage the tabs 10 between the underside of the shoulder 3 and the latch lips 9.

In the position of adjustment shown in Fig. 3, the flow pattern of air leaving the diffuser is such as to induce a greater lateral entrainment. If it is desired to alter the flow pattern, the baffle shell 31 may be rotated to draw the hubs 17 and 21 toward one another. The cantilever struts 16 will thereupon tilt to lower the shell members 24, 25 and 31. Shells 24 and 25 will drop an amount proportional to the distances of the supporting pins 23 and 30 from the pins 14 about which the struts 15 pivot. Thus the shell 24 will assume a lower position with respect to the shell 25 than that shown in Fig. 3, and the shell 25 will itself occupy a lower position with respect to the shell 1. The baffle shell 31 also moves downwardly with respect to the shell 24 by an amount equal to the increased vertical height of the adjustment struts 22 and the travel of the lower hub 21 along the shaft 18. In Fig. 4 the shell members are shown in a lower position and movement of the shells to a lower position alters the flow pattern of air leaving the diffuser so as to increase downward entrainment.

I claim:

1. In a diffuser the combination comprising an outer housing shell having a neck portion adapted to be fitted to an outlet of a ventilating duct and flaring from said neck portion outwardly and downwardly to form a discharge mouth, a pair of connector hubs within said shell spaced one above the other, an adjustment shaft having two sets of threads in reverse direction to one another extending between said hubs with each set of threads in engagement with one of said hubs thereby adapted to move said hubs along said shaft toward and away from one another, a plurality of cantilever struts within said shell extending outwardly from and angularly spaced about said connector hubs each supported at one end by a sliding tiltable connection with said shell and supporting a hub at its opposite end with a tiltable connection with said hub, an adjustment strut for each cantilever strut pivotally joined at one end to one of said cantilever struts and pivotally joined at its opposite end to the second of said connector hubs to form triangular trusses each having vertices defined by the pivotal connections of the respective adjustment strut and the tiltable connection between the associated cantilever strut and the connector hub to which such cantilever strut is attached, and an air deflecting shell supported within said housing shell cooperatively connected to said cantilever struts to be vertically adjusted thereby upon movement of said hubs along said adjustment shaft.

2. In a diffuser the combination comprising an outer housing shell having a neck portion adapted to be fitted to an outlet of a ventilating duct and flaring from said neck portion outwardly and downwardly to form a discharge mouth, a pair of connector hubs within said shell spaced one above the other, an adjustment shaft extending between said connector hubs having an upper threaded portion in engagement with the uppermost of said connector hubs and a lower threaded portion with a thread reversed from said upper portion in engagement with the lowermost of said connector hubs whereby a rotation in one direction of said shaft will move said connector

hubs toward one another and a reverse rotation of said shaft will move said connector hubs from one another, a plurality of cantilever struts within said shell extending outwardly from and angularly spaced about said connector hubs each supported at one end by a sliding tiltable connection with said shell and supporting a hub at its opposite end by a tiltable connection with said hub, an adjustment strut for each cantilever strut pivotally joined at one end to one of said cantilever struts and pivotally joined at its opposite end to the second of said connector hubs, said adjustment and cantilever struts forming with said connector hubs and the shaft therebetween a cantilever truss work, and an air deflecting shell nested within said housing shell supported from said cantilever truss work.

3. In a diffuser the combination comprising an outer housing shell having a neck portion adapted to be fitted to the outlet of a ventilating duct and flaring from said neck portion outwardly and downwardly to form a discharge mouth, a plurality of cantilever struts within said housing shell each pivotally connected at one end in a sliding engagement with said housing shell and converging inwardly from said housing shell, an upper connector pivotally connected to each of said cantilever struts at the ends thereof opposite the connections with said housing shell, a lower connector disposed beneath said upper connector and movable toward and away from said upper connector, an adjustment shaft having two sets of threads in reverse direction to one another extending between said upper and lower connectors with each set of threads in engagement with one of said connectors thereby adapted to move said connectors along said shaft toward and away from one another, a plurality of adjustment struts each pivoted at one end to said lower connector and extending upwardly to a pivoted connection with one of said cantilever struts to form a plurality of triangular trusses each having vertices defined by the pivotal connections of an adjustment strut and the pivotal connection between the associated cantilever strut and the upper connector, and a plurality of spaced air deflecting shells supported within said housing shell cooperatively connected to said cantilever struts to be vertically adjusted thereby upon movement of said connectors along said adjustment shaft.

4. In a diffuser the combination comprising an outer housing shell having a neck portion adapted to be fitted to the outlet of a ventilating duct and flaring from said neck portion outwardly and downwardly to form a discharge mouth, a plurality of cantilever struts within said housing shell each pivotally connected at one end in a sliding engagement with said housing shell and converging inwardly from the wall of said housing shell, an upper connector pivotally connected to each of said cantilever struts at the ends thereof opposite the connections to said housing shell, a lower connector disposed beneath said upper connector and movable toward and away from said upper connector, an adjustment shaft extending between said upper and lower connectors having an upper threaded portion in engagement with said upper connector and a lower threaded portion with a thread reversed from said upper portion in engagement with said lower connector whereby a rotation in one direction of said shaft will move said connectors toward one another and a rotation of said shaft in the opposite direction will move said connectors from one another, a plurality of adjustment struts each pivoted at one end to said lower connector and extending upwardly to a pivoted connection with one of said cantilever struts, and a plurality of spaced air deflecting shells supported within said housing shell each connected to said cantilever struts and flaring from an upper intake portion downwardly and outwardly to form a discharge mouth for each.

5. In a diffuser the combination comprising an outer housing shell having a neck portion adapted to be fitted to the outlet of a ventilating duct and flaring from said neck portion outwardly and downwardly to form a discharge mouth, a plurality of cantilever struts within said housing shell each pivotally connected at one end in a sliding engagement with said housing shell and converging inwardly from the wall of said housing shell, an upper connector pivotally connected to each of said cantilever struts at the ends thereof opposite the connections to said housing shell, a lower connector disposed beneath said upper connector and movable toward and away from said upper connector, an adjustment shaft extending between said upper and lower connectors having an upper threaded portion in engagement with said upper connector and a lower threaded portion with a thread reversed from said upper portion in engagement with said lower connector whereby a rotation in one direction of said shaft will move said connectors toward one another and a rotation of said shaft in the opposite direction will move said connectors from one another, a plurality of adjustment struts each pivoted at one end to said lower connector and extending upwardly to a pivoted connection with one of said cantilever struts, a plurality of spaced air deflecting shells supported within said housing shell each connected to said cantilever struts and flaring from an upper intake portion downwardly and outwardly to form a discharge mouth for each, and a baffle shell fixed to the lower end of said adjustment shaft for rotation therewith blocking a portion of the discharge mouth of the housing shell.

6. In a diffuser the combination comprising an outer circular shell, a first hub centrally disposed within said shell for axial movement with respect to said shell, a plurality of supporting struts angularly spaced about said first hub and each extending between and cooperatively engaged with said first hub and said shell by a tiltable connection with each and wherein one of the connections has a sliding engagement to allow for tilting movement and radial displacement of a strut end as said first hub is moved axially, a second hub axially spaced from said first hub, an axially extending adjustment shaft extending between said first and second hubs and threadedly engaged therewith with threads having a pitch to displace said hubs relative to one another upon rotation of said shaft, an adjustment strut pivotally joined at one end to said second hub and pivotally joined at the opposite end to one of said supporting struts, and an air deflecting shell carried by said supporting struts for axial movement upon rotation of said adjustment shaft.

7. In a diffuser the combination comprising an outer housing shell having a neck portion and flaring outwardly and downwardly from said neck portion to form a discharge mouth, an outwardly extending shoulder formed in the flaring portion of said shell encircling the shell to provide a recessed groove in the interior of the shell, a removable collar adapted to be received within said shell having an upper edge with a periphery matching the cross sectional opening of the shell immediately above the groove and a lower edge with a periphery matching the cross sectional opening of the shell immediately below the groove to thereby engage the shell above and below the groove to cover said recessed groove and seal the same from the remainder of the interior, latching members disposed within said recessed groove and supported by the shoulder forming the groove, latch means for engagement with said latching members disposed on the outer face of said collar supporting said collar in groove sealing position when engaged with said latching members, strut means supported by said collar and extending inwardly thereof, and an air deflecting shell supported by said strut means nested within said outer housing shell upon disposing said collar within said housing shell and engaging said latch means with said latching members.

8. In a diffuser the combination comprising means forming an outer shell having an intake and extending axially downwardly to a discharge mouth, means disposed within the shell forming a first hub movable in upward and downward directions, a plurality of means

forming cantilever struts extending between the first hub means and the shell, first connecting means for each strut means supporting the strut means and joining the same to the shell with tiltable freedom, second connecting means for each strut means joining the same to the first hub means with tiltable freedom, each strut means and its associated connecting means including parts relatively shiftable to permit said first hub means to move axially upwardly and downwardly, means spaced axially from the first hub means forming a second hub, rotatable control shaft means extending between and having a connection with each of said hub means, which connections are adapted to transmit thrust from the shaft means to each of the hub means upon rotation of the shaft means for moving the hub means relatively to one another in an axial direction and which restrain movement of each hub means along the shaft means in the absence of a rotation of the shaft means, means forming a link extending between and tiltably connected with said second hub means and one of said strut means, and means forming a deflecting shell cooperatively connected to said strut means to be adjusted in position upon moving of said first and second hub means toward and away from one another.

9. In a diffuser the combination comprising an outer shell having an intake flaring downwardly and outwardly therefrom to form a discharge mouth, a first hub disposed within said shell for movement upwardly and downwardly with respect to said shell, a plurality of supporting struts circumferentially spaced about said first hub each supported at one end by a tiltable connection with said shell and having a tiltable connection at the opposite end with said first hub, each strut and its associated connections including parts relatively shiftable to permit said first hub to be displaced upwardly and downwardly with respect to said shell, a second hub spaced from said first hub in an upward-downward direction from said first hub, a rotatable control shaft extending between and having a connection with each of said hubs, which connections are adapted to transmit thrust from the shaft to each of the hubs upon rotation of the shaft for moving the hubs relative to one another in an upward-downward direction and which restrain movement of each hub along the shaft in the absence of a rotation of the shaft, an adjustment strut tiltably connected at one end to said second hub and tiltably connected at the opposite end to one of the said supporting struts, and an air deflecting shell carried by said supporting struts for upward-downward movement upon relative displacement of said hubs.

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