Oct. 27, 1942. F. J. KURTH 2,300,049

AIR OUTLET DEVICE

Filed Aug. 21, 1940 3 Sheets-Sheet 1

Fig. 1.

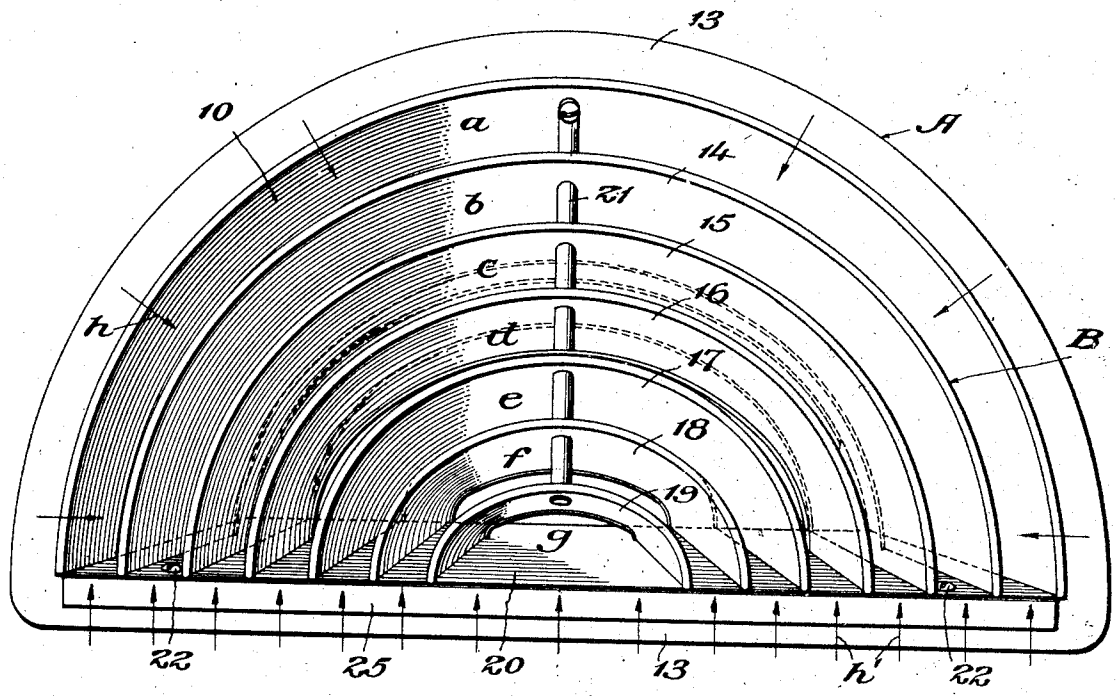


Fig. 7.

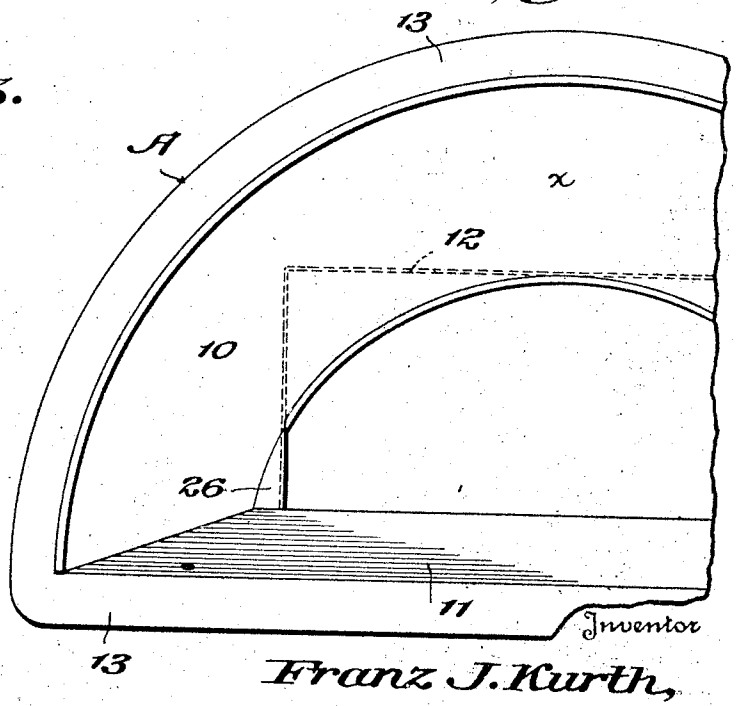
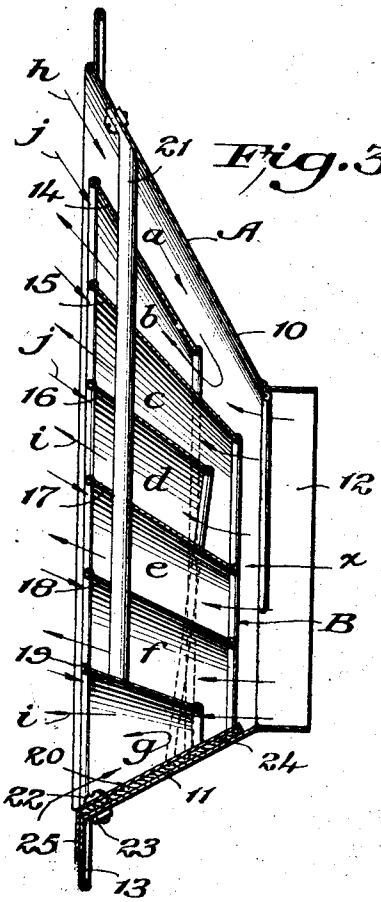


Fig. 3.



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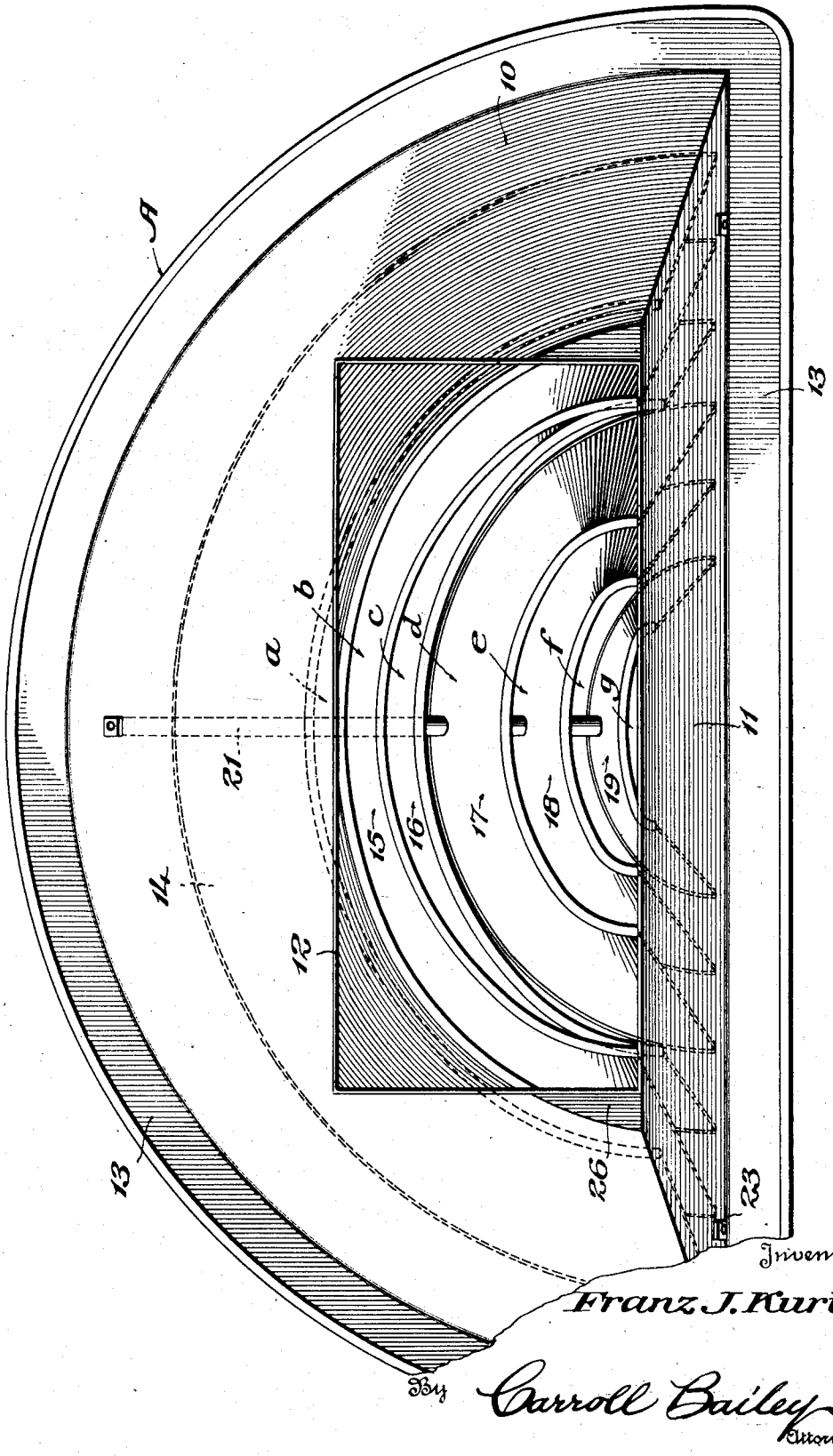
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Fig. 2.



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AIR OUTLET DEVICE

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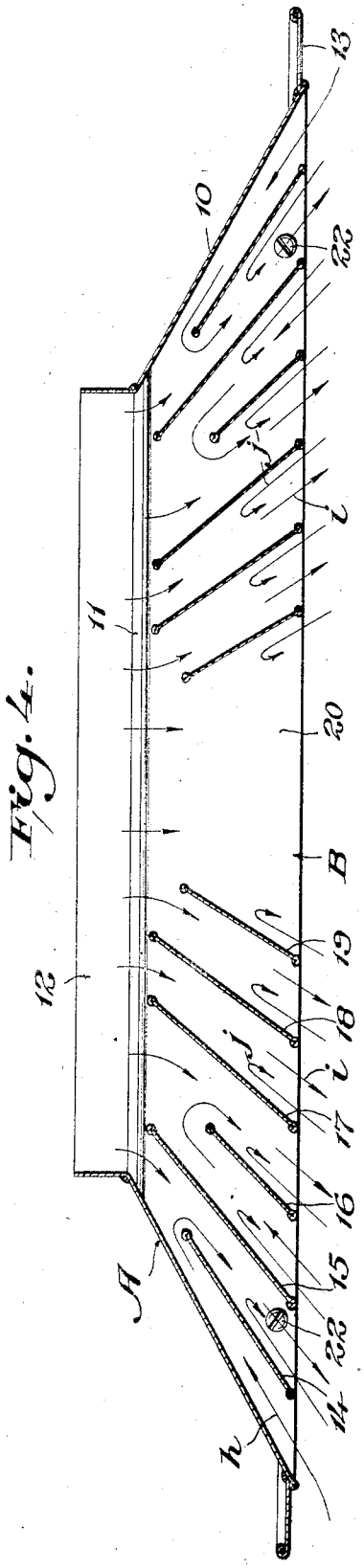


Fig. 4.

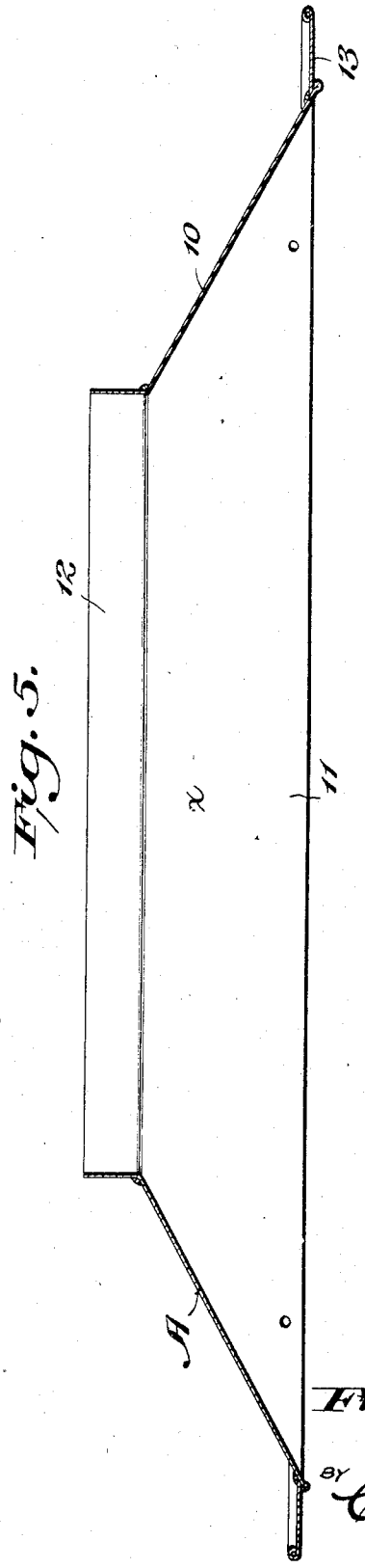


Fig. 5.

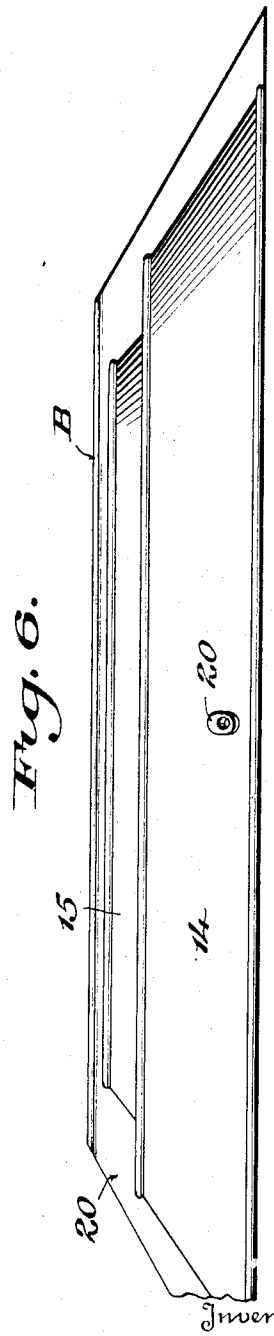


Fig. 6.

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2,300,049

UNITED STATES PATENT OFFICE

2,300,049

AIR OUTLET DEVICE

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Application August 21, 1940, Serial No. 353,561

9 Claims. (Cl. 98—38)

This invention relates to ventilating apparatus, and has particular reference to improvements in air outlet devices of the general type described and claimed in my prior application, Serial No. 176,070, for use in association with side wall outlets of air supply ducts to deliver air from such outlets substantially draftlessly into rooms or other enclosures.

Generally speaking the object of the present invention is to provide an air outlet device of the general type mentioned embodying a novel arrangement of the parts thereof whereby supplied air, particularly supplied air at a lower temperature than that of a room or other enclosure, may be delivered into the room or other enclosure in a manner to become most thoroughly intermixed with the air thereof with the least production of any sensation of draft.

With the foregoing general object and various other objects in view, which will become more fully apparent as the nature of the invention is better understood, the same consists in an air outlet device embodying the novel features of construction, combination and arrangement of parts as will be hereinafter more fully described, illustrated in the accompanying drawings and defined in the appended claims.

In the accompanying drawings, wherein like characters of reference denote corresponding parts in the different views:

Figure 1 is a front elevation of an air outlet device constructed in accordance with one practical embodiment of the invention.

Figure 2 is a rear elevation of the device.

Figure 3 is a central, vertical section through the device.

Figure 4 is a horizontal section through the device.

Figure 5 is a horizontal section through the base element of the device with the detachable unit of the device removed therefrom.

Figure 6 is a plan view of the detached unit of the device removed from the base element of the device; and

Figure 7 is a front elevation of the base element of the device with the detachable unit of the device removed therefrom.

Referring to the drawings in detail, A designates generally a base element which may be formed in any suitable manner from any suitable material and which comprises an open-ended, hollow, flaring member 10 of substantially inverted U-shape in end elevation, a horizontal bottom wall 11 connecting the lower ends of the substantially vertically disposed side portions of said member 10, a neck 12 extending rearwardly from the rear or smaller end of said flaring member 10 and also from the rear edge of said bottom wall 11 for connection with a side wall outlet of an air supply duct, and a finishing plate 13 of any suitable shape extending outwardly from the member 10 and the bottom wall 11 to cover the room or other enclosure side wall around the duct outlet therein.

The bottom wall 11 is inclined forwardly and downwardly at a suitable angle relative to the neck 12 and in conjunction with the member 10 defines an open-ended forwardly flaring recess or pocket x which, in the present instance, is of substantially semi-circular shape in end elevation having an arched top and a horizontal bottom defined by said flaring member 10 and said bottom wall 11, respectively. However, the flaring member 10 is not necessarily of semi-circular shape in end elevation, but may be of semi-elliptical shape or may not be curved at all but may have a straight, horizontal medial or top portion and straight and vertical, or substantially straight and vertical, side portions with either sharp or rounded connecting corners as desired. Accordingly, the term "inverted U-shape" employed to describe said member 10 is intended to apply not only to the semi-circular shape shown in the drawings, but to any equivalent of that shape, such as the alternative shapes mentioned.

Mounted within the recess or pocket x is a flaring member unit designated generally as B which comprises a plurality of successively smaller, open-ended, hollow flaring members of substantially inverted U-shape in end elevation spaced successively inwardly of one another to provide therebetween a plurality of successively smaller flaring passageways of substantially inverted U-shape in end elevation. In the present instance there are six of these members, designated as 14, 15, 16, 17, 18 and 19, respectively, defining therebetween five flaring passageways designated as b, c, d, e and f, respectively. The said unit may, however, comprise any other suitable number of flaring members defining therebetween any other suitable number of flaring passageways. Moreover, the term "inverted U-shape" as applied to said members has the significance as applied to the member 10. Accordingly, each of said flaring members has what may be termed a substantially horizontally disposed medial or top portion and substantially vertically disposed side portions. The side portions of said members are connected together at

their bottoms by a horizontal bottom wall 20 which closes the lower ends of the passageways between said members. This bottom wall 20 is inclined forwardly and downwardly relative to the neck 12, preferably at the same angle as the bottom wall 11 of the base element A, and overlies said bottom wall 11. In conjunction with the smallest or innermost flaring member 19 said bottom wall 20 defines a smaller or innermost flaring passageway *g*. On the other hand, the largest flaring member 14 of the unit B is smaller than the flaring member 10 and is spaced inwardly therefrom. Said members 10 and 14 thus define between them a largest or outermost flaring passageway designated as *a*. In this connection the bottom wall 20 preferably, but not necessarily, extends laterally outward beyond the side portions of the largest flaring member 14 of the unit B so as to close the bottoms of the side portions of the passageway *a*.

Besides being connected together as a unit by the bottom wall 20, the flaring members comprising the unit B preferably are additionally connected together by one or more struts 21. However, whether a strut or struts is or are employed to connect said members together, the unit B may be removably mounted within the recess or pocket *x* in any suitable manner, as for example, by means of screws 22 extending through openings in the bottom wall 20 and threaded into the bottom wall 10 or into nuts 23 at the under side of said bottom wall 10. If a strut or struts is or are employed to connect the members of the unit B together, said strut or struts may extend outwardly beyond the member 14 and may be fastened by screws or the like to the member 10 as shown, thus to hold the top portion of said unit B securely relative to the base element A.

Preferably a sheet 24 of felt or other suitable material is interposed between the bottom walls 11 and 20 to prevent leakage of air between said walls. Preferably, too, a flange 25 extends downwardly from the front end of the bottom wall 20 to overlie that portion of the finishing plate 13 which extends downwardly from the bottom wall 11 so as to conceal the sheet 24 and afford a neat finish to the bottom portion of the device at the front thereof.

The flaring members 14—19 have successively lesser amounts of flare and their smaller or rear ends are disposed at the rear or air inlet end of the device. Moreover, the rear or smaller ends of said members are related to each other and to the neck 12 in a novel manner. The smaller or rear end of the member 14 is disposed outwardly of the smaller or rear end of the member 10. Therefore, supplied air does not flow into the passageway *a* but flows forwardly across the mouth of said passageway. This causes suction or aspiration in the passageway *a* as indicated by the arrows *h*. Moreover, due to the forward and downward inclination of the bottom wall 20, supplied air flowing across said wall causes suction or aspiration entirely across the bottom of the device as indicated by the arrows *h'*. Thus, supplied air flowing through the device produces an aspirating or inward flow of air entirely around the device.

The smaller or rear end of the member 15 is disposed inwardly of the smaller or rear end of the member 10. Therefore, supplied air flows into and through the passageway *b*.

The top portion of the rear end of the member 16 is disposed inwardly of or spaced downwardly from the top of the rear end of the member 15. On the other hand, the side portions of the rear end of the member 16 are disposed either outwardly of the side portions of the rear end of the member 15, or in line therewith forwardly and rearwardly of the device, or at least are spaced lesser distances inwardly therefrom than the top portion of the rear end of said member 16 is spaced downwardly from the top portion of the rear end of the member 15. Therefore there is a forward flow of supplied air through the top portion of the passageway *c* and either a lesser forward flow or actual aspiration in the side portions of said passageway, depending upon whether the side portions of the rear end of the member 16 are disposed as far outwardly as the side portions of the rear end of the member 15. In the present instance the lower side portions of the rear ends of the members 15 and 16 are approximately alined forwardly and rearwardy of the device and the inward spacing of the top and upper side portions of the rear end of the member 16 from the top and upper side portions of the member 15 gradually decreases toward the lower side portions of said members. Therefore, there is a forward flow of air through the medial or top portion of the passageway *c*, a lesser or progressively diminishing forward flow of air from the medial or top portion of said passageway toward the lower side portions thereof, and aspiration in the said lower side portions thereof.

The top and the side portions of the smaller or rear end of the member 17 are spaced inwardly from the top and the side portions, respectively, of the rear end of the member 16; the top and the side portions of the rear end of the member 18 are spaced inwardly from the top and the side portions, respectively, of the rear end of the member 17, and the top and the side portions of the rear end of the member 19 are spaced inwardly from the top and the side portions, respectively, of the rear end of the member 18. Therefore, air flows forwardly through the side portions as well as the top portions of each of the passageways *d*, *e* and *f*. However, there is a certain amount of aspiration in the outer portion of each of the passageways through which there is a forward flow of air, because the supplied air, in being deflected outwardly by the flaring members, tends to concentrate at the inner sides of the passageways and to produce negative pressures or suction effects in the outer side portions of said passageways. In Figs. 3 and 4 of the drawings the arrows *i* indicate forward flow and the arrows *j* indicate aspirating flow of air in the respective passageways.

The medial or top portion of the rear end of the smallest member 19 is disposed sufficiently above the rear edge of the bottom wall 20 to permit enough air to flow forwardly through the upper portion of the passageway *g* to produce the desired aspirating action in the bottom portion of said passageway *g*.

In order that the described spacing of the rear ends of the flaring members relative to each other may not result in constricting the mouths of the passageways, between said members, certain of said members have their rear ends spaced forwardly of the rear ends of certain other of said members. In this connection it will be observed that the rear end of the member 14 is spaced forwardly from the rear ends of the members 10 and 15 and that the rear end of the

member 16 is spaced forwardly from the rear ends of the members 15 and 17; also, that the side portions of the rear end of the member 16 are inclined downwardly and forwardly in consideration of the previously described lateral spaced relationship between the side portions of the rear ends of said members 15 and 16 to maintain a desired width for the mouth of the passageway *c* between said members. It will further be observed that the rear end of the member 19 is disposed forwardly of the rear edge of the bottom wall 20, which results in said bottom wall obstructing flow of supplied air through the side portions of the passageway *g* and consequent aspiration in said side portions.

Regarding the front ends of the flaring members of the device, same may be disposed in a common or substantially common vertical plane as shown, or in any other desired manner.

It is desirable to have more air delivered from the medial portion of the device than from the side portions thereof. Therefore the medial or top portions of the passageways between the flaring members preferably are made wider, generally speaking, than their side portions. In the present instance this is accomplished by a progressive flattening of the successively smaller flaring members; that is, by progressively increasing the width to height proportions of said members.

The air supply neck 12 preferably is of rectangular shape in cross section to avoid complications in its production and in connecting same with an air supply duct, and may correspond in size to the rear end of the flaring member 10 if said member also is of rectangular instead of substantially semi-circular or substantially semi-elliptical shape in end elevation. Usually, however, the members of a device constructed in accordance with the invention are of substantially semi-circular or substantially semi-elliptical shape in end elevation, and in this connection a feature of the invention resides in employing a neck 12, the side walls of which are disposed inwardly of the outermost, lower portions of the rear end of the flaring member 10, and in closing the outermost, lower side portions of the passageway *a* at its rear end by walls 26 extending inwardly from the lower side portions of the member 10, whereby a lesser amount of air flows forwardly through the lower side portions of the passageway *b* than through the portions of said passageway thereabove, with consequent increased aspiration in the lower side portions of said passageway.

The present device operates to divide the supplied air into a plurality of separate, expanding streams of reduced velocity as compared with the direct velocity of the supplied air and this, combined with the aspiration produced by the device insures a thorough intermixing of the supplied air with the room or other enclosure air within the passageways of the device and in the immediate vicinity of the device. Besides any delivery of air from the device in the form of a blast is avoided. On the contrary the device operates to effect a diffused delivery of air even though the air may have a high duct velocity. Consequently, even though there may be a decided temperature differential between the supplied air and the room or other enclosure air, and despite a high duct velocity of the supplied air, little or no sensation of draft is experienced by persons occupying a room or other enclosure into which fresh or treated air is delivered through the present device.

As will be apparent, a device constructed as herein generally described operates to deliver the greatest amount of air forwardly and upwardly from the medial portion of the device and lesser amounts of air laterally outward from the device. This is particularly advantageous for the reason that even though it may be necessary or desirable in many instances to locate the device at a comparatively low elevation, the supplied air will become intermixed with the room or other enclosure air at a higher elevation and will settle gently into the room or other enclosure without producing any noticeable sensation of draft. Moreover, the aspiration produced by the device not only insures a thorough mixing of the supplied air with the room or other enclosure air, but induces circulation of the room air in a desirable manner. Furthermore, the aspirating flow of air around the device very materially assists in avoiding smudging of the wall in surrounding relationship to the device.

Without further description it is thought that the features and advantages of the invention will be readily apparent to those skilled in the art, and it will of course be understood that changes in the form, proportion and minor details of construction may be resorted to, without departing from the spirit of the invention and scope of the appended claims.

I claim:

1. An air outlet device comprising a series of successively smaller, open-ended, hollow, flaring members of substantially inverted U-shape in end elevation spaced successively inwardly of one another with their smaller ends disposed at the rear or air inlet end of the device to provide therebetween a series of flaring passageways of substantially inverted U-shape in end elevation having substantially vertically disposed side portions, a neck connected to the largest of said members for supplying air to said passageways, and means closing said passageways at the bottoms of their side portions, said closing means being inclined forwardly and downwardly relative to said neck whereby air flowing forwardly through upper side portions of said passageways produces aspiration and rearward flow of air in the lower side portions of said passageways.

2. An air outlet device comprising a series of successively smaller, open-ended, hollow, flaring members of substantially inverted U-shape in end elevation having successively lesser amounts of flare and spaced successively inwardly of one another with their smaller ends disposed at the rear or air inlet end of the device to provide therebetween a series of flaring passageways of substantially inverted U-shape in end elevation, at least one of said members having the medial portion of its rear edge disposed above the medial portion of the rear edge of the next smaller member and the side portions of its rear edge disposed lesser distances outwardly from the side portions of the rear edge of the said next smaller member than the said medial portion of its rear edge is disposed above the said medial portion of the rear edge of said next smaller member, whereby more air is delivered through the medial than through the side portions of the passageway between said members.

3. An air outlet device comprising a series of successively smaller, open-ended, hollow, flaring members of substantially inverted U-shape in end

elevation having successively lesser amounts of flare and spaced successively inwardly of one another with their smaller ends disposed at the rear or air inlet end of the device to provide therebetween a series of flaring passageways of substantially inverted U-shape in end elevation, at least one of said members having the medial portion of its rear edge disposed above the medial portion of the rear edge of the next smaller member and the lower side portions of its rear edge spaced rearwardly from the lower side portions of the rear edge of the next smaller member and also approximately alined forwardly and rearwardly of the device with the said lower side portions of the rear edge of the said next smaller member, whereby supplied air flows forwardly through the medial portion of the passageway between said members and is directed forwardly across the lower side portions of said passageway to produce aspiration and rearward flow of air in said side portions.

4. An air outlet device comprising a series of successively smaller, open-ended, hollow, flaring members of substantially inverted U-shape in end elevation having successively lesser amounts of flare and spaced successively inwardly of one another with their smaller ends disposed at the rear or air inlet end of the device to provide therebetween a series of flaring passageways of substantially inverted U-shape in end elevation having substantially vertically disposed side portions and medial or top portions therebetween, means closing said passageways at the bottoms of said side portions, and a neck connected to the larger of said members for supplying air to said passageways, the side portions of said neck being disposed inwardly of the lower side portions of the rear edge of the largest flaring member to constrict the lower side portions of the mouth of the passageway between said largest flaring member and the next smaller member, thus to reduce the flow of air through the lower side portions of said passageway as compared with the flow of air through the medial or top portion thereof.

5. An air outlet device comprising a series of successively smaller, open-ended, hollow, flaring members of substantially inverted U-shape in end elevation having successively lesser amounts of flare and spaced successively inwardly of one another with their smaller ends disposed at the rear or air inlet end of the device to provide therebetween a series of flaring passageways of substantially inverted U-shape in end elevation having substantially vertically disposed side portions and substantially horizontally disposed medial or top portions, means closing said passageways at the bottoms of their side portions, and a neck connected to the largest of said members for supplying air to said passageways, said flaring members having the medial or top portions and also the side portions of their rear edges spaced successively inwardly of one another and further having the side portions of their rear edges spaced lesser amounts inwardly of one another than their medial or top portions whereby more air is delivered through the medial or top portions of the passageways between said members than through the side portions of said passageways.

6. An air outlet device comprising a base element including an open-ended, hollow, flaring member of substantially inverted U-shape in end elevation having a substantially horizontally disposed medial or top portion and substantially vertically disposed side portions, a horizontally disposed bottom wall connecting the lower ends of the side portions of said member, a neck connected to the rear or smaller end of said flaring member and to said bottom wall for supplying air to the device, said bottom wall being inclined forwardly and downwardly relative to said neck, a unit separate from said base element disposed within said hollow, flaring member and comprising a plurality of successively smaller, open-ended hollow, flaring members of substantially inverted U-shape in end elevation spaced successively inwardly of one another with their smaller or rear ends disposed at the rear or air inlet end of the device and with the larger flaring member thereof spaced inwardly from the flaring member of said base element to provide between said flaring members a plurality of flaring passageways, the flaring members of said unit each including a substantially horizontally disposed medial or top portion and substantially vertically disposed side portions, a plate connecting the members of said unit at the bottoms of their side portions and closing the bottoms of the passageways therebetween, said plate being inclined forwardly and downwardly and overlying the bottom wall of said base element, and means detachably mounting said unit within the flaring member of said base element.

7. An air outlet device as set forth in claim 6 comprising screws extending through the plate of the unit and into portions of the base element for detachably mounting the unit within the flaring member of the base element.

8. An air outlet device as set forth in claim 6 including strut means connecting together the flaring members of the unit, and means detachably connecting said strut means to the base element and thereby detachably mounting said unit within the hollow flaring member of the base element.

9. An air outlet device as set forth in claim 6 including a layer of material between the bottom wall of the base element and the plate of the unit sealing the space between said wall and plate against leakage of air therethrough.

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