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AIR DELIVERY DEVICE FOR VENTILATING APPARATUS

Filed Dec. 30, 1948

2 Sheets-Sheet 1

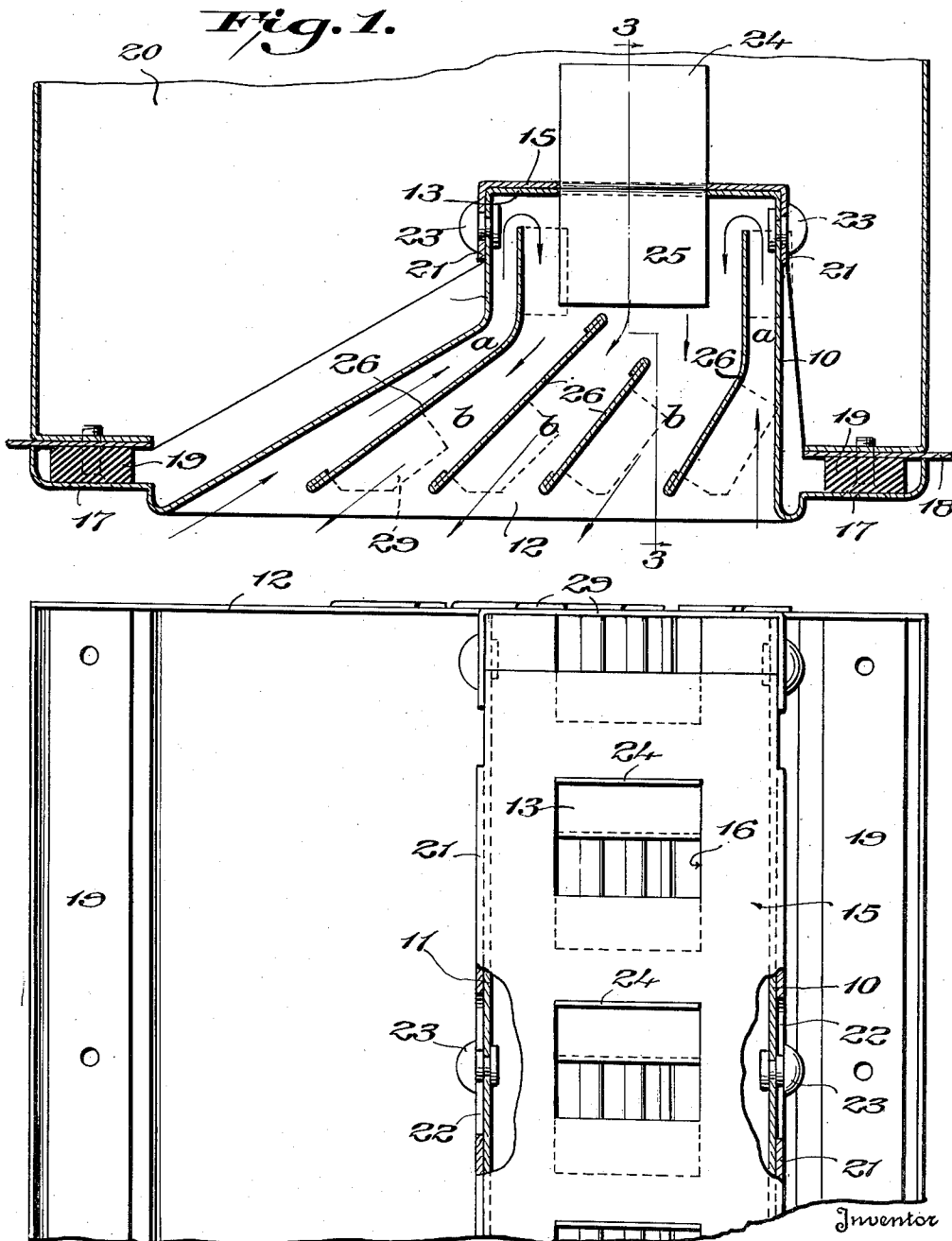


Fig. 2.

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Fig. 5.

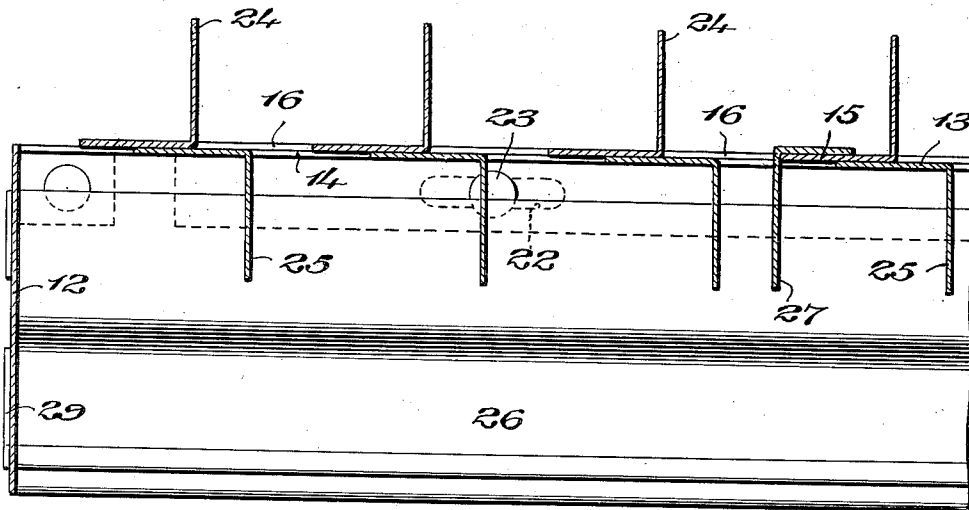
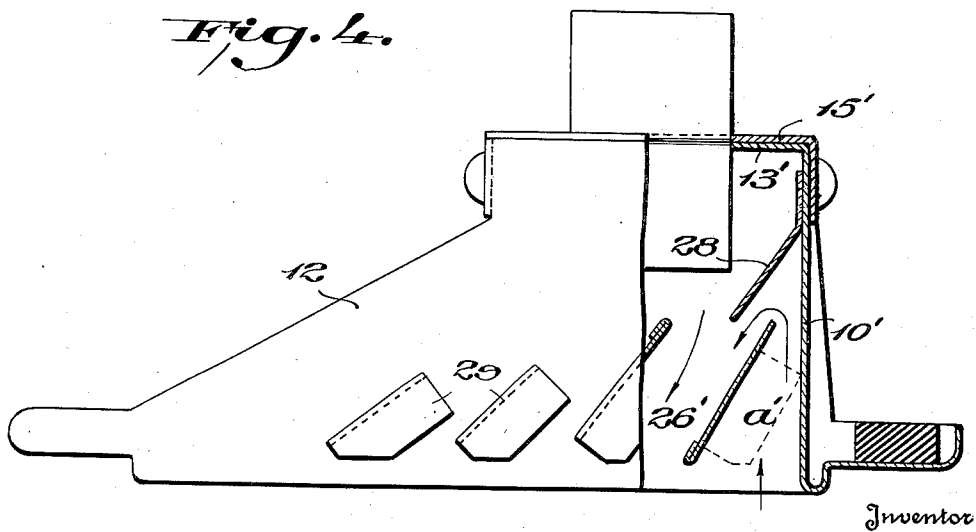


Fig. 4.



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AIR DELIVERY DEVICE FOR VENTILATING APPARATUS

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7 Claims. (Cl. 98-40)

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This invention relates to ventilating apparatus, and has particular reference to improvements in devices for effecting diffused delivery of air from air supply ducts into enclosures.

In ventilating certain long, narrow enclosures, such as railway passenger cars, motor buses and the like, it usually is desirable to have an overhead air supply duct or plenum chamber located in the roof structure of the enclosure approximately midway between the sides of the latter and extending longitudinally thereof. Moreover, in such case, it usually is desirable to have air delivered outwardly and downwardly from the duct or plenum chamber over persons seated adjacent to the sides of the enclosure in order that the persons may derive benefit from the air. At the same time, in order to avoid discomfort to the persons, it is desirable that the air be delivered in diffused rather than in blast form.

Accordingly, the primary object of the present invention is to provide an air delivery device which is specially designed to deliver air downwardly and laterally outward and in diffused form from an air supply duct or plenum chamber under circumstances such as mentioned in order to obtain greatest benefits from the air.

Another special and important object of the invention is to provide an air delivery device which not only is specially designed to deliver air downwardly and laterally outward in diffused form from an air supply duct, or plenum chamber, but which is so constructed as to have an aspirating action whereby the ventilating air is, to a considerable extent, intermixed with and tempered by the enclosure air in the immediate vicinity of the device so that persons over whom the ventilating air is delivered experience little or no sensation of draft even though there may be a considerable difference in temperature between the enclosure air and the ventilating air.

Another object of the invention is to provide an air delivery device which operates in the manner stated and which includes novel damper means to regulate the amount of air delivered through the device and to insure substantially uniform delivery of air from the device at all points along the length thereof regardless of its length.

With the foregoing and 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 delivery device embodying the novel features of construction, combination and arrangement of parts as are illustrated by way of example in the accompanying drawings

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and as will be hereinafter more fully described and claimed.

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

Fig. 1 is a transverse section through an air delivery device constructed in accordance with one practical embodiment of the invention.

Fig. 2 is a top plan view of a portion of the device shown in Fig. 1.

Fig. 3 is a vertical, longitudinal section on the line 3-3 of Fig. 1; and

Fig. 4 is a view similar to Fig. 1 illustrating an alternative form of the device.

Referring to the drawings in detail, it will be observed that the present air delivery device is composed, primarily, of an inner side wall 10, an outer side wall 11, end walls 12, a top wall 13 having therein at points spaced apart along its length a plurality of air inlet openings 14, and a valve plate 15 overlying said top wall 13 and slidable longitudinally relative thereto and likewise having therein at points spaced apart along its length a plurality of air inlet openings 16.

The device may be of any desired length and may be straight or curved as viewed in plan. In either case, at least the lower portion of the outer side wall 11 is inclined downwardly and outwardly. The lower portion of the inner side wall 10 also may be inclined downwardly and outwardly. Preferably, however, the inner side wall is disposed vertically, or substantially vertically so that the lower or air outlet portion of the device is of downwardly flaring form in cross section and, as an entirety, is inclined downwardly and outwardly relative to the upper or air inlet portion of the device.

At their bottoms, the side walls 10 and 11 preferably are flanged outwardly, as indicated at 17, to underlie the portions of a ceiling 18 to either side of an opening therein through which the device extends. Between the flanges 17 and the ceiling 18 may be interposed sealing strips 19 of sponge rubber or any other suitable material.

The top portion of the device may simply be disposed in a relatively wide air supply duct or plenum chamber 20, as shown, or, if desired, a narrower air supply duct or plenum chamber may be connected directly to the top wall 13, whereby air is supplied from said duct or plenum chamber, to the device through the openings 14 and 16 when said openings are more or less aligned with each other. In either case, the duct or plenum chamber 20 is coextensive in length with the device.

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While the valve plate 15 may be mounted in overlying relationship to the top wall 13 and for longitudinal sliding movement relative to the latter in any suitable manner, one simple, practical manner of so mounting said plate is to provide the same with downwardly extending side flanges 21 having slots 22 therein and extending longitudinally thereof, and to extend suitable fasteners 23 through said slots into the front and rear walls 10 and 11.

The device may be provided with only a single valve plate 15 substantially coextensive in length with the device, or with any desired plurality of separate valve plates 15 which collectively are substantially coextensive in length with the device. In either case the openings 14 and 16 and the closed portions of the top wall 13 and the valve plate, or plates, between said openings are of lengths such that said openings may be more or less aligned by longitudinal adjustments of the valve plate or plates. Thus, the effective areas of the openings 14 and 16 may be varied to regulate the amount of air delivered through the device.

Ventilating air from any suitable source flows, of course, longitudinally through the air supply duct or plenum chamber 20. In this connection, in order to insure the delivery of substantially equal amounts of air through the device throughout its length, the valve plate or plates 15 is, or are, provided, at points spaced apart along its, or their, length, or lengths, with transverse, vertically disposed, upstanding tongues 24, each to intercept a portion of the air and to deflect it through an adjacent more or less aligned pair of the openings 14 and 16. To assist in insuring delivery of substantially equal amounts of air through the device throughout its length, the top wall 13 also may be provided, at points spaced apart along its length, with transverse, depending tongues 25.

As shown, the tongues 24 and 25 may appropriately be comprised by portions of the valve plate, or plates, 15 and the top wall 13, respectively, which are struck from said valve plate, or plates, and said top wall to provide the openings 16 and 14 therein. In this connection and if desired, the valve member 15 may underlie the top wall 13 instead of being superimposed thereon, in which event the tongues 24 will depend from said valve member and the tongues 25 will extend upwardly from said top wall.

In the lower portion of the device are a plurality of air deflector plates 26 which are inclined downwardly and outwardly, which extend preferably from end to end of the device and which are spaced from each other and from the inner and the outer side walls 10 and 11 of the device.

The widths of the openings 14 and 16 and the spacing of the tops of the plates 26 below the top wall 13 may be such that air will flow downwardly through the passageways *a, a* between the walls 10 and 11 and the innermost and the outermost of the plates 26, respectively, as well as downwardly through the passageways *b* between said plates 26. On the other hand, the widths of said openings 14 and 16 and the spacing of the top of the innermost and the outermost of the plates 26 below the top wall 13 may be such, as shown in Figs. 1 to 3 of the drawings, that air will flow downwardly only through the passageways *b* between said plates 26. In the latter event, air flowing downwardly through the passageways *b* obviously will create low pressure zones beneath the top wall 13 adjacent to the side walls 10 and

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11 with the result that enclosure air will be caused to flow upwardly through the passageways *a, a* to become intermixed with the downwardly flowing air and to be discharged with the latter. The supplied air thus will be tempered by the enclosure air within and in the immediate vicinity of the device.

While the plates 26 may be disposed parallel or in any other desired relationship to each other and to the wall 11 regardless of whether there is to be downward or upward flow of air through the passageways *a, a*, said plates 26 preferably will be disposed in downwardly diverging relationship to each other and to the walls 10 and 11 if there is to be downward flow of air through said passageways *a, a* so that the air may expand as it flows downwardly and be delivered from the device in diffused form. If, on the other hand, there is to be an upward or aspirating flow of air through either or both of the passageways *a, a*, the outermost of the plates 26 may be disposed as desired relative to the walls 10 and 11, but said plates preferably will diverge downwardly relative to each other to permit expansion of the air as it flows downwardly through the passageways *b*, whereby the air will be delivered from the device in diffused form.

Obviously, because of the design of the device as shown and described, the entire volume of the supplied air is deflected laterally outward from the device so that the device is particularly adapted for use in delivering air from centrally located, overhead ducts in railway passenger cars, buses and the like over passengers seated adjacent to the sides of the cars, buses or the like.

Any suitable means may be provided for sliding the valve plate, or plates, 15 longitudinally to vary the effective areas of the openings 14 and 16 and hence to regulate the amount of air delivered through the device. In this connection and as illustrated by way of example in the drawings, the valve plate, or plates, 15 may be provided with a tab, or tabs, 27 depending through one or more of the openings 14 in the top wall 13, as shown in Fig. 3, to be engaged by a suitable implement inserted from the bottom of the device between the plates 26 to shift the valve plate, or plates, 15 any desired amount in either direction.

Fig. 4 of the drawings illustrates that the top of the innermost plate 26', which corresponds to the innermost plate 26 of the Figs. 1 to 3 form of the invention, may be disposed considerably below the top wall 13' of the device, and that a deflector plate 28 may be fastened at its top to the inner side wall 10' of the device and may extend at a downward and outward inclination into overlying, spaced relationship to the top of said innermost plate 26' to prevent the supplied air from entering the passageway *a'* between the plate 26' and the inner side wall 10' of the device, whereby there is produced an aspirating flow of air through the passageway *a'* and consequent mixing of the enclosure air with the supplied air. This same arrangement obviously may be used at the outer side of the device if desired.

In the drawings, the side walls 10 and 11 and the plates 26 are shown as being provided at their ends with tabs 29 which extend through slots in the end walls 12 and are bent over against the outer faces of the latter whereby said side walls, end walls and plates are fastened together. However, said side and end walls and said plates

may be fastened together in any other suitable manner.

Any desired number of the devices may be employed in and to end relationship to each other to supply air to an enclosure of any given length, and the valve plate, or plates, of the different devices may be adjusted so that different amounts of air may be supplied to the enclosure at different points along its length.

From the foregoing description considered in connection with the accompanying drawings, it is believed that the construction and operation of the present air delivery devices will be clearly understood and their advantages appreciated. It is desired to point out, however, that while only specific structural embodiments of said devices have been illustrated and described, the same are readily capable of specifically different structural embodiments within the spirit and scope of the invention as defined in the appended claims.

I claim:

1. A device for delivery of air from an air supply duct into an enclosure, said device being open at its bottom for flow of air therethrough and comprising a top wall, an inner side wall, an outer side wall inclined downwardly and outwardly relative to said inner side wall, downwardly and outwardly inclined plates in the lower portion of said device spaced from each other and from the side walls of the device to divide air flowing downwardly through the device into a plurality of separate streams and to deflect the streams laterally outward from the device, said top wall having therein at points spaced apart along its length openings for inlet of air to the device, a valve plate disposed against said top wall and slidable longitudinally with respect thereto and having therein at points spaced apart along its length openings for alinement and disalinement with and from the openings in said top wall to regulate the amount of air flowing through the device, and tongues extending upwardly and transversely relative to said top wall to cause air supplied to the device to be distributed substantially uniformly along the length of the device.

2. A device for delivery of air from an air supply duct into an enclosure, said device being open at its bottom and comprising a top wall, an inner side wall, an outer side wall inclined downwardly and outwardly relative to said inner side wall, downwardly and outwardly inclined plates in the lower portion of said device spaced from each other and from the side walls of the device to divide air flowing downwardly through the device into a plurality of separate streams and to deflect the streams laterally outward from the device, said top wall having therein at points spaced apart along its length openings for inlet of air to the device, a valve member disposed against said top wall and slidable longitudinally with respect thereto and having therein at points spaced apart along its length openings for alinement and disalinement with and from the openings in said top wall to regulate the amount of air flowing through the device, and tongues extending upwardly and downwardly and transversely relative to said top wall to cause air supplied to the device to be distributed substantially uniformly along the length of the device.

3. A device for delivery of air from an air supply duct into an enclosure, said device having a top opening for inlet of air thereto and being open at its bottom for outlet of air there-

from and comprising an inner side wall, an outer side wall inclined downwardly and outwardly relative to said inner side wall, downwardly and outwardly inclined plates in the lower portion of said device spaced from each other and from the side walls of the device to divide air flowing downwardly through the device into a plurality of separate streams and to deflect the streams laterally outward from the device, and another plate in the lower portion of said device fastened to one of the side walls of said device and extending in downwardly diverging relationship to the side wall to which it is fastened into overlying spaced relationship to the top of the one of said first mentioned plates which is disposed nearest to said side wall, whereby air supplied downwardly through the device is deflected across the top of the space between said side wall and the said one of said first mentioned plates so as to produce an upward flow of enclosure air through said space and intermixture of the latter air with the air supplied downwardly through the device.

4. A device for delivery of air from an air supply duct into an enclosure, said device being open at its bottom for flow of air therethrough and comprising a top wall, an inner side wall, an outer side wall inclined downwardly and outwardly relative to said inner side wall, downwardly and outwardly inclined plates in the lower portion of said device spaced from each other and from the side walls of the device to divide air flowing downwardly through the device into a plurality of separate streams and to deflect the streams laterally outward from the device, said top wall having therein at points spaced apart along its length openings for inlet of air to the device, a valve plate superimposed upon said top wall and slidable longitudinally with respect thereto and having therein at points spaced apart along its length openings for alinement and disalinement with and from the openings in said top wall to regulate the amount of air flowing through the device, tongues extending upwardly from and transversely relative to said valve plate at points spaced therealong and other tongues extending downwardly from and transversely relative to said top wall at points spaced along the latter to cause air supplied to the device to be distributed substantially uniformly along the length of the device.

5. A narrow elongated device of substantially uniform cross section throughout its length for delivery of air from an air supply duct into an enclosure, said device being open at its bottom for flow of air therefrom and comprising a top wall, an inner side wall, an outer side wall inclined downwardly and outwardly relative to said inner side wall, downwardly and outwardly inclined plates in the lower portion of said device spaced from each other and from the side walls of the device to divide air flowing downwardly through the device into a plurality of separate streams and to deflect the streams laterally outward from the device, said top wall having therein at points spaced apart along and substantially throughout its length openings for inlet of air to the device, a valve plate substantially coextensive in length with said top wall superimposed upon said top wall and slidable longitudinally with respect thereto and having therein at points spaced apart along its length openings for alinement and disalinement with and from the openings in said top wall to regulate the amount of air flowing through the

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device, and an element depending from said valve plate between said side walls for effecting sliding adjustments of said valve plate.

6. A narrow elongated device for delivery of air from an air supply duct into an enclosure, said device having a top opening for supply of air thereto and being open at its bottom for outlet of air therefrom and comprising an inner side wall, an outer side wall inclined downwardly and outwardly relative to said inner side wall, downwardly and outwardly inclined plates between said side walls spaced from the latter and from each other to divide air flowing downwardly through the device into a plurality of separate streams and to deflect the streams laterally outward from the device, and an air baffle plate in said device disposed at least in part between said top opening and the top of one of said plates next adjacent to one of said side walls to prevent air supplied to the device through said top opening from entering the space between the said one of said side walls and the plate next adjacent thereto, said air baffle plate being spaced from the top of the said one of said plates which is next adjacent to said one of said side walls whereby air flowing downwardly through the device produces a suction effect in said space and an upward flow of enclosure air therethrough for intermixture with the air supplied through said top opening.

7. A narrow elongated device of substantially uniform cross section throughout its length for delivery of air from an air supply duct into an enclosure, said device being open at its bottom

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for flow of air therefrom and comprising a top wall, an inner side wall, an outer side wall inclined downwardly and outwardly relative to said inner side wall, downwardly and outwardly inclined plates in the lower portion of said device spaced from each other and from the side walls of the device to divide air flowing downwardly through the device into a plurality of separate streams and to deflect the streams laterally outward from the device, said top wall having therein at points spaced apart along and substantially throughout its length openings for inlet of air to the device, and a valve plate substantially coextensive in length with said top wall superimposed upon said top wall and slidable longitudinally with respect thereto and having therein at points spaced apart along its length openings for alinement and disalignment with and from the openings in said top wall to regulate the amount of air flowing through the device.

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