May 7, 1940. F. J. KURTH 2,199,525

AIR DISTRIBUTING DEVICE

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Fig. 1

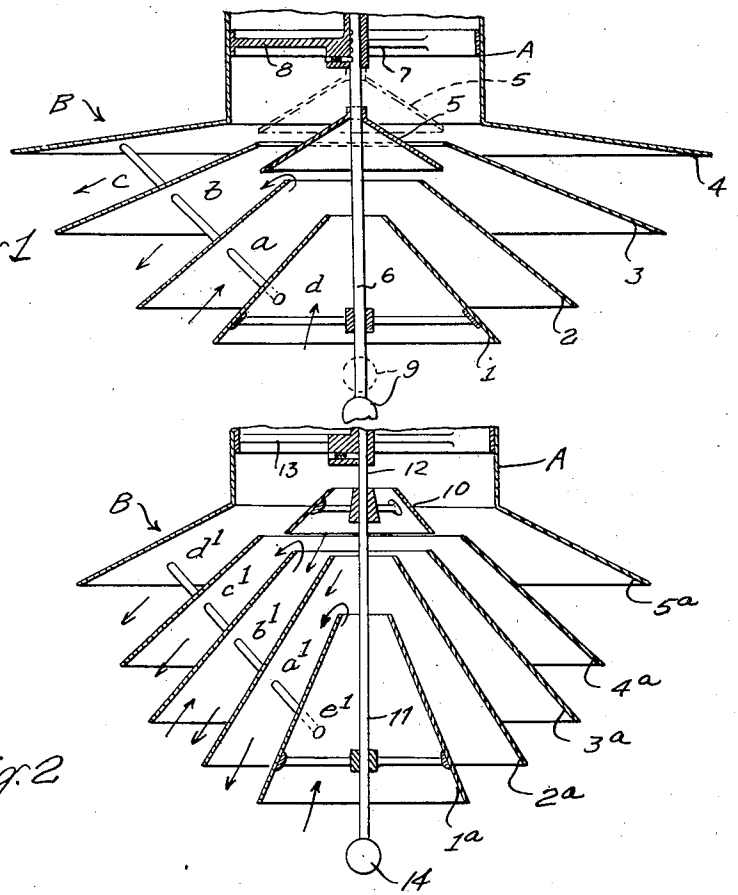

Fig. 2

Fig. 3

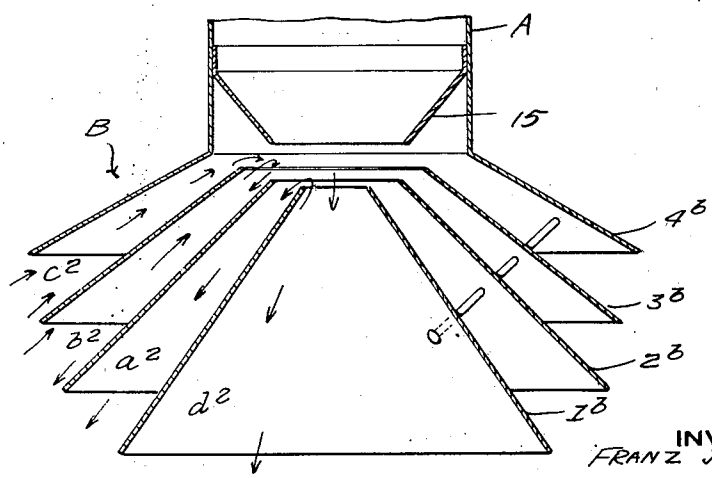

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Fig. 4.

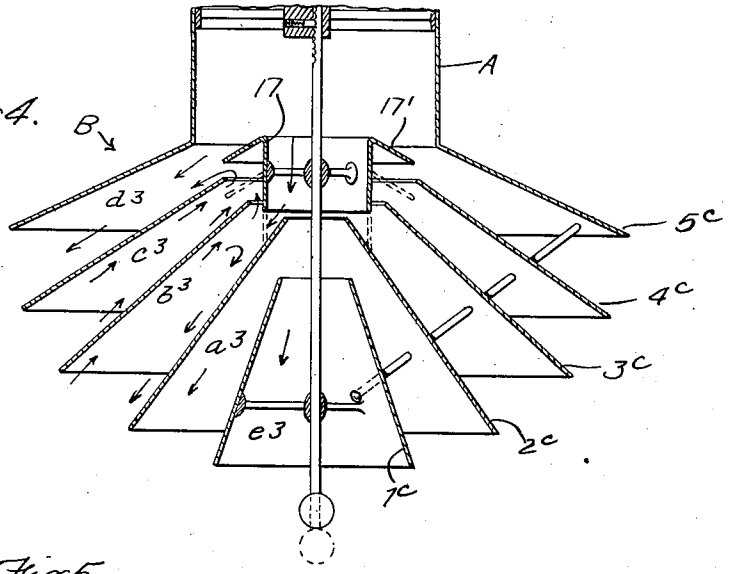


Fig. 5.

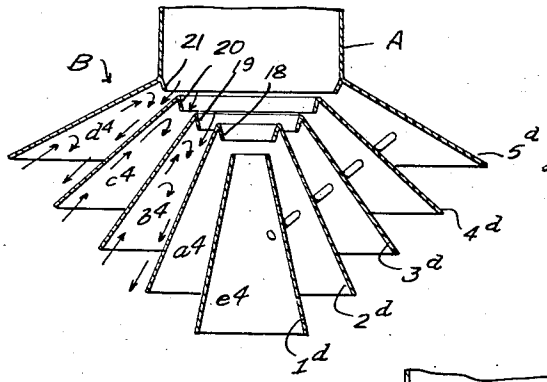
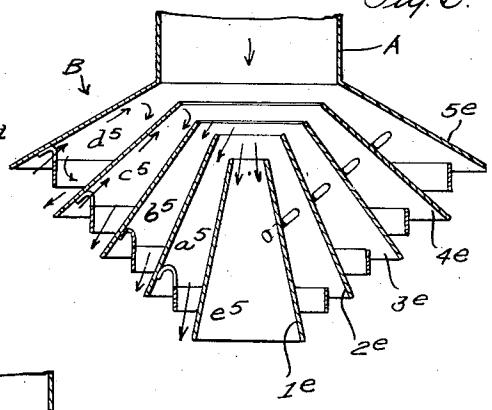


Fig. 6.



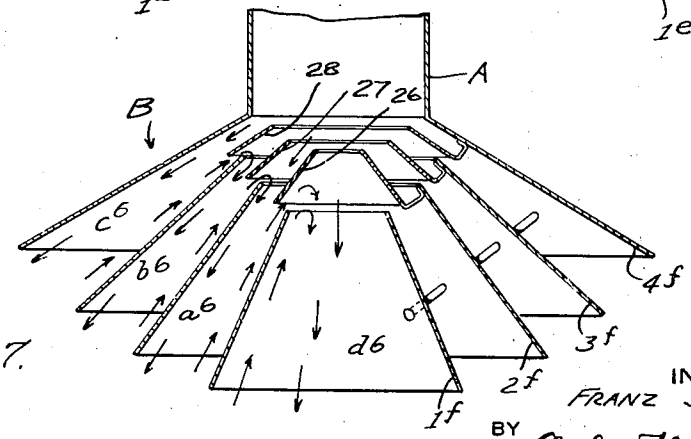


Fig. 7.

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2,199,525

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AIR DISTRIBUTING DEVICE

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Application February 24, 1937, Serial No. 127,341

8 Claims. (Cl. 98—40)

My invention relates to air distributing and ventilating devices of the type, in which the air is conducted through a series of flaring passage-ways formed by a series of successively larger open-ended hollow flaring members disposed in mutually spaced relationship, the smaller ends of said passage-ways facing the air-inlet end of the device.

In certain cases it may be desirable to mix with the fresh or treated outside air supplied to a room or enclosure a greater or smaller amount of the room or enclosure air. In the art of air conditioning, for instance, where there is a material difference in temperature between the fresh or treated outside air supplied to a room and the room air, a sensation of draft may be felt by the occupants of the room, which sensation of draft is practically avoided, if with the supply of fresh or treated outside air a certain amount of the room air is mixed either prior to the fresh or treated outside air entering the room or substantially simultaneously with the delivery of the fresh or treated outside air into the room.

The particular object of the present invention, therefore, is to provide in air distributing devices of the type above referred to means, whereby is caused a mixing of a greater or smaller portion of the room or enclosure air with the fresh or treated outside air supplied to the room or enclosure, either prior to or substantially simultaneously with the delivery of the fresh or treated outside air to the room or enclosure. In this way, any sensation of draft which might otherwise be experienced by the occupants of the room because of difference in temperature is thus practically avoided, and neither will the introduction of the fresh or treated outside air produce any noticeable agitation of the room air.

The said object is accomplished in that means, separate from the open-ended hollow flaring members forming between them the flaring passageways, are provided in such cooperative relationship to certain of said members as to deflect the incoming fresh or treated outside air from certain of said passageways into certain other of said passageways, whereby the outward flow of air through these latter passageways produces a suction effect and consequently an inward flow of room air through those passage-ways, or portions thereof, from which passage-ways the incoming outside air has been deflected. In this way, a highly efficient mixing of fresh or treated outside air with the room air is effected, so that, wherever desired, the fresh or treated outside air may be delivered to the air distributing device at considerably greater velocities than would otherwise be possible. Also, because of the highly efficient mixing effect in a device embodying the present invention, there may be a considerable temperature differential between the fresh or treated outside air and the room air without any sensation of draft being produced. Consequently, a smaller volume of fresh or treated outside air will suffice to produce and maintain in a room or other enclosure a given temperature, which means that not only smaller and less expensive air conduits but also smaller and less expensive fans or blowers and motors therefor may be used, than would otherwise be practical.

Below follows a particular description of the present invention with reference to the appended drawings, in which several embodiments of this invention are shown. In these drawings,

Fig. 1 is a central longitudinal section through an air distributing device embodying the present invention. Figs. 2–7 are views similar to Fig. 1 illustrating modifications.

In all the figures of the drawings, the conduit for supplying the fresh air or treated outside air is designated by A, whereas B generally designates the air distributing device which as shown is located at the outlet end of the air supply conduit A.

As shown in Fig. 1, the air distributing device comprises a plurality of open-ended successively larger hollow flaring members 1, 2, 3, 4, disposed in mutually spaced relationship with their smaller inner ends directed toward the outlet end of the conduit A, so as to provide between them separate flaring passageways *a*, *b*, *c*, and in addition a passageway *d* through the innermost member 1 for the flow of separate air currents therethrough.

At 5 in Fig. 1 is shown a cone-shaped member, which may either be mounted in fixed position or preferably, as shown in Fig. 1, is adjustably mounted. To this end, the said cone-shaped member 5 is carried by a spindle shown at 6 and having a screw-threaded portion engaging a nut 7 provided in the center of a spider 8 in the air-supply conduit A. At its lower end, the said spindle 6 is provided with a knob 9, whereby the spindle may be easily turned so as to either lower or raise the said cone-shaped member 5. In the full-line position of the latter shown in Fig. 1, the cone-shaped member 5 is in front of the open inner ends of the hollow flaring members 1 and 2 so that while air supplied through the conduit A is free to enter the open inner ends

of the hollow members 3 and 4 and to flow outwardly through the flaring passageways *b* and *c*, it is prevented by the cone-shaped member 5 from entering the open inner ends of the hollow members 1 and 2 and flowing outwardly through the passageway *a* and the passageway *d* of the inner member 1, the air being deflected across these passageways by the cone-shaped member 5. The air in rushing outwards through the flaring passageways *b* and *c* will produce a comparatively strong suction effect in the passageways *a* and *d* with the result that depending on the velocity of the air flow through the passageways *b* and *c* larger or smaller volumes of room or enclosure air are being drawn into and through the passageways *a* and *d* to become mixed within the device B with the fresh or treated outside air supplied through the air conduit A and flowing outwardly through the passageways *b* and *c*.

Now, if by the rotation of the spindle 6 by means of the knob 9 the cone-shaped member 5 is moved upwards from its full-line position to the broken-line position, it will thereby be displaced so as to be in front of the open inner ends of the hollow flaring members 1, 2 and 3 so that air supplied through the air-supply conduit A will be deflected by the member 5 across the open inner ends of said hollow flaring members 1, 2 and 3, and the air will be free to flow outwards only through the passageway *c*, whereas by this outward flow of air a suction effect will be produced in the passageways *a*, *b* and *d* with the result that room or enclosure air will be drawn in through these passageways so as to be mixed with the fresh or treated outside air supplied through the conduit A and flowing outwards through the passageway *c*.

In the embodiment of the invention shown in Fig. 2, the mutually spaced hollow flaring members constituting the air distributing device B are shown at 1^a, 2^a, 3^a, 4^a and 5^a, while the passageways formed between said members are designated by *a'*, *b'*, *c'*, *d'* with the additional passageway *e'* through the innermost flaring member 1^a.

In place of a conical member as shown at 5 in Fig. 1, a truncated hollow annular member shown at 10 is provided in front of the open inner ends of the assembly of hollow flaring members. The said annular member 10 may be mounted in a fixed position, but preferably, as shown in Fig. 2 is similar to the cone-shaped member 5 in Fig. 1 carried on a spindle shown at 11, which spindle is provided with a threaded portion engaging the female threads of a nut 12 provided in the center of a spider 13 inside the air conduit A, so that by a corresponding turn of the spindle 11 by means of a knob 14 provided at the inner end of said spindle the said hollow annular member 10 may be displaced upwards or downwards. In the full-line position of the annular member 10 shown in Fig. 2, it will be seen that air supplied through conduit A will be deflected across the open inner ends of the passageway *b'* and also across the narrow open inner end of the innermost hollow flaring member 1^a forming the passage-way *e'*, whereas the air is free to enter the open inner ends of the hollow flaring members 2^a, 4^a and 5^a to flow outwards through the passageways *a'*, *c'* and *d'*. By the outward rush of these air-flows a suction effect is produced in the passageway *b'* and the passageway *e'* through the innermost hollow flaring member 1^a with the result that room or enclosure air is drawn into these passageways to become mixed with the currents of outside or treated air flowing outwards through the passageways *a'*, *c'* and *d'*.

If the hollow annular member 10, by a corresponding rotation of the spindle 11 is upwardly displaced to assume the broken-line position shown in Fig. 2, it will be seen that the incoming air will be deflected across the open inner end of the hollow flaring member 4^a, but will be free to enter the open inner ends of the hollow flaring members 2^a and 3^a while being deflected across the narrow open inner end of the innermost hollow flaring member 1^a.

In Fig. 3, the air distributing device B is composed of the mutually spaced hollow flaring members 1^b, 2^b, 3^b and 4^b, the flaring passageways between said members being indicated at a^2, b^2, and c^2, with the additional passageway d^2 through the innermost member 1^b.

Inside the air conduit A there is mounted an inverted truncated hollow annular member indicated at 15. In the position of the said annular member 15 as shown, air supplied through the conduit A will be deflected across the open inner end of the hollow flaring member 3^b and also across the open inner end of the hollow flaring member 4^b, whereas air will be free to flow outwardly through the passageway a^2 formed between the hollow flaring members 1^b and 2^b and through the innermost member 1^b. By the outwardly flowing air currents through these passageways a suction effect will be produced causing room air to be drawn in through the passageway b^2 and c^2, which room air becomes mixed with the air supplied through conduit A and flowing outwards through the passageway a^2 and the innermost member d^2.

Another modification is shown in Fig. 4, in which the air distributing device comprises an assembly of the mutually spaced hollow flaring members indicated at 1^c, 2^c, 3^c, 4^c and 5^c, the flaring passageways formed by said members being indicated by a^3, b^3, c^3 and d^3 with the additional passageway e^3 through the innermost hollow flaring member 1^c. In this embodiment, the means for deflecting the air supplied through the conduit A across the open inner ends of some of the hollow flaring members consists in a cylindrical member 17 having a shed-like projection 17'. This member is disposed in such a manner relative to the inner ends of the hollow flaring members, that, as will be clearly seen from Fig. 4, air supplied through the conduit A will be deflected by the shed-like projection 17' across the open inner end of the hollow flaring member 4^c so that the air is prevented from flowing outwards through the passageway c^3, while air delivered through conduit A is free to enter the open inner ends of the hollow flaring members 2^c, 3^c and 5^c, and the innermost hollow member 1^c. Due to the outward airflow through the air-passageways a^3, b^3 and d^3, a suction effect will be produced, causing room or enclosure air to be drawn into the passageway c^3 and the outer portion of passageway b^3 to become mixed with the outward currents of air.

As shown in Fig. 4, the member 17, 17' is mounted in such a way that it can be adjusted up and down.

The air distributing device B shown in the modification of Fig. 5 comprises the mutually spaced, open-ended hollow flaring members indicated at 1^d, 2^d, 3^d, 4^d and 5^d, the intermediate air passageways being indicated by a^4, b^4, c^4 and d^4, the passageway through the innermost hollow

flaring member 1^d being indicated by e^4. In this instance, there are provided at the open inner ends of the various hollow flaring members rings 18, 19, 20 and 21, to deflect air supplied through the air conduit A across some portions of the open inner ends of the hollow flaring members of the air-distributing device B. With the rings 18, 19, 20 and 21 occupying the positions shown in Fig. 5 it will be readily appreciated that air supplied through the conduit A is free to enter only through a portion of the open inner ends of the hollow flaring members and will flow outwardly along the inner sides of the passageways a^4, b^4, c^4 and d^4. In doing so, the flow of air will create a vacuum along the outer sides of said passageways causing room or enclosure air to enter the open outer ends of said passageways as shown by the arrows, said room or enclosure air thus becoming mixed with the air supplied through the conduit A. Depending on the velocity of the outward air-flows, a larger or smaller vacuum will be produced in the air passageways with the result of a correspondingly greater or smaller amount of room air being drawn into said passageways.

In the embodiment of the invention shown in Fig. 6, in which the mutually spaced hollow flaring members constituting the air-distributing device are indicated by 1^e, 2^e, 3^e, 4^e and 5^e and the passageways intermediate said members are indicated by a^5, b^5, c^5 and d^5, together with the passageway e^5 through the innermost hollow flaring member, the deflector rings, instead of being provided at the open inner ends of the hollow flaring members, are disposed at the open outer ends of said members, being shown at 22, 23, 24 and 25. Manifestly, in the position of the deflector rings shown in Fig. 6, the air on its outward flow will be deflected so that the air is free to flow outwards only through a portion of the outer open ends of said passageways, with the result, that an inward flow of room or enclosure air is produced in the other portion of said passageways, which thereby becomes mixed inside the passageways with the air supplied through the conduit A.

Finally, in the embodiment of the invention shown in Fig. 7, the deflection of air across the open inner ends of the hollow flaring members or a portion thereof is produced by a set of open-ended hollow flaring members similar to the open-ended hollow flaring members constituting the air distributing device B and which are indicated by 1^f, 2^f, 3^f, etc., forming the intermediate passageways a^6, b^6, c^6, etc. The open-ended auxiliary hollow flaring members provided to deflect the air supplied through the conduit A across some portions of the open inner ends of the hollow flaring members constituting the air-distributing device are shown at 26, 27 and 28 in such angular relation to the inner ends of the main hollow flaring members, that, as will be easily perceived from a view of Fig. 7, air supplied through the conduit A will be deflected from a portion of the passageways formed between said main hollow flaring members, with the result that by the outward air-flows through portions of said passageways, a vacuum will be produced in other portions of said passageways resulting in room or enclosure air being drawn into said last named portions of the passageways therein to become mixed with the air supplied through conduit A.

While certain specific embodiments of the invention have been described and shown, it is obvious that the invention is capable of still other embodiments without a departure from the essence of the present invention.

I claim:

1. An air distributing and aspirating device comprising a plurality of successively smaller, open-ended, hollow, flaring members having their smaller ends facing the rear or air supply end of the device, said members being spaced successively forwardly of one another to provide a series of flaring passageways therebetween, the rear ends of said members being successively smaller and being spaced successively laterally inwardly of one another, and air deflector means separate from said members disposed rearwardly of the rear ends of certain of said members and effective to direct air supplied to the device into a portion of one of said passageways and to prevent the supplied air from entering another portion of the same passageway and also from entering at least a portion of an adjacent passageway, whereby the supplied air flowing forwardly through one portion of the first mentioned passageway produces a rearward flow of air in at least a portion of the adjacent passageway, said air deflector means being constructed and arranged to permit flow of air supplied to the device into at least one of the passageways that is disposed forwardly of said first mentioned passageway.

2. An air distributing and aspirating device as set forth in claim 1 in which the air deflector means comprises an open-ended, hollow, flaring member.

3. An air distributing and aspirating device as set forth in claim 1 including means for adjusting the air deflector means forwardly and rearwardly to regulate flow of supplied air through the first mentioned passageway and rearward flow of air through the adjacent portion of the adjacent passageway.

4. An air distributing and aspirating device as set forth in claim 1 in which the air deflector means comprises a plurality of members each effective to direct air supplied to the device into a portion of a related passageway and to prevent the supplied air from entering an adjacent portion of an adjacent passageway.

5. An air distributing and aspirating device as set forth in claim 1 in which the air deflector means comprises an open-ended, hollow, flaring member, and means for adjusting said member forwardly and rearwardly.

6. An air distributing and aspirating device as set forth in claim 1 in which the air deflector means comprises a plurality of successively smaller, successively forwardly spaced open-ended, hollow, flaring members respectively related to successively forwardly disposed hollow, flaring members forming the flaring passageways.

7. In an air distributing device for supplying air to a room or enclosure, the combination with an air supply conduit, of a plurality of successively larger open-ended mutually spaced hollow flaring members providing between them a plurality of flaring air-passageways and having their smaller ends facing the outlet end of said air supply conduit, and an inverted truncated annular hollow member in spaced relation to the inner ends of said hollow flaring members so as to deflect air supplied through said air supply conduit across the inner ends of certain of said passageways into the inner ends of certain other of said passageways, whereby the outward flow of air through the latter passageways produces a

suction effect causing room or enclosure air to flow into and through the first mentioned passageways to thereby become mixed with the air supplied through said air-supply conduit.

8. In an air distributing device for supplying air to a room or enclosure, the combination with an air supply conduit, of a plurality of successively larger open-ended mutually spaced hollow flaring members providing between them a plurality of flaring air-passageways and having their smaller ends facing the outlet end of said air supply conduit, and a plurality of secondary hollow flaring members provided in front of the inner open ends of the said hollow flaring members in overlapping relationship and angularly disposed relative thereto so as to deflect air supplied through said air supply conduit across a portion of the inner ends of said passageways into another portion of said passageways, the outward flow of air through the latter portion of said passageways producing a vacuum in said first mentioned portion causing room or enclosure air to be drawn into said first mentioned portion to thereby become mixed with the air supplied through said air-supply conduit.

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