Jan. 14, 1941. F. J. KURTH 2,228,603

FLUID DISTRIBUTING DEVICE

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Fig. 1.

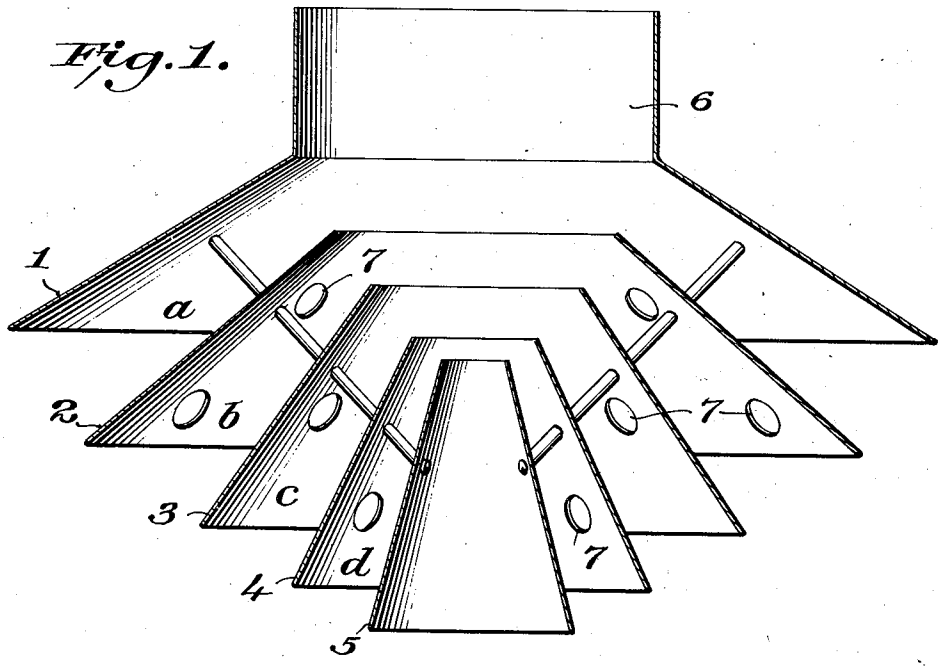
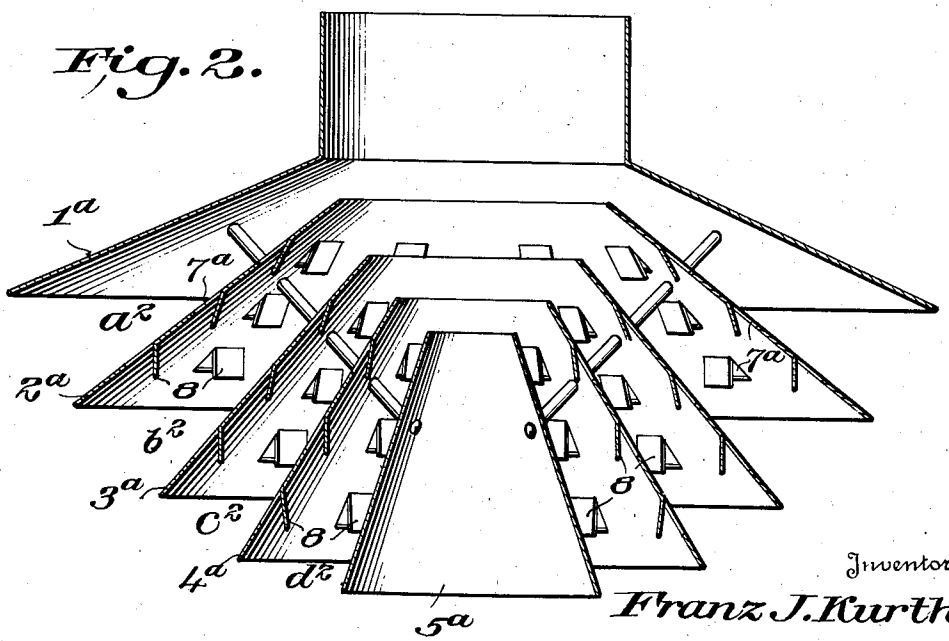


Fig. 2.



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Fig. 3.

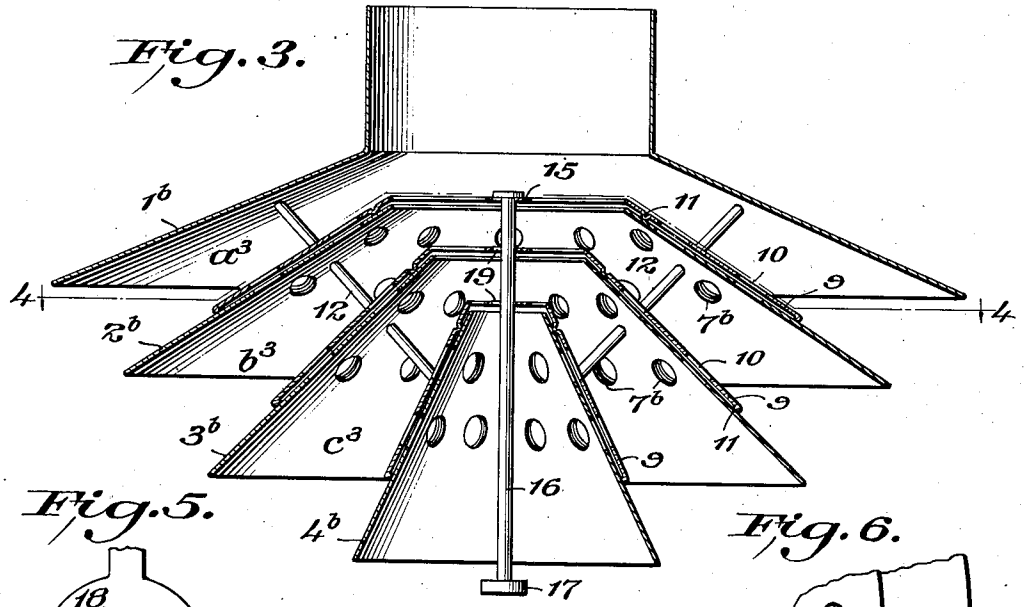


Fig. 5.

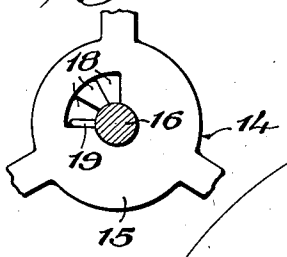
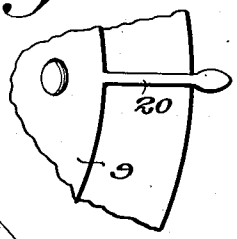


Fig. 6.



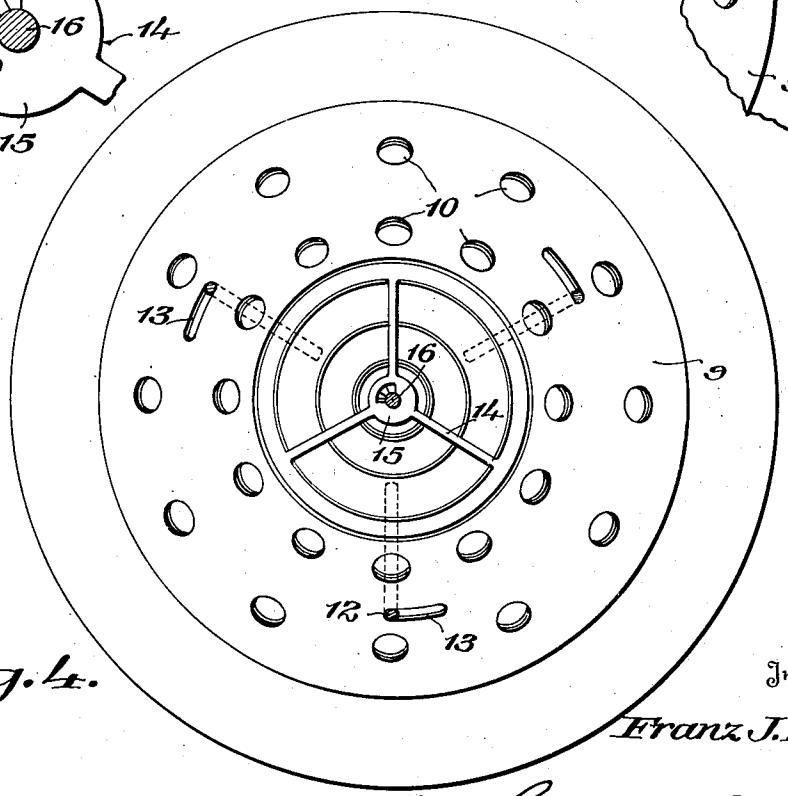


Fig. 4.

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UNITED STATES PATENT OFFICE

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FLUID DISTRIBUTING DEVICE

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Application January 23, 1939, Serial No. 252,482

9 Claims. (Cl. 98—40)

This invention relates to fluid distributing devices, and has particular reference to fluid distributing devices of the type comprising a series of successively smaller, open-ended, hollow flaring members spaced successively inwardly of one another to provide therebetween a series of flaring passageways through which the supplied fluid flows. Thereby, the supplied fluid is divided into separate streams of reduced velocity as compared with the velocity of the fluid entering the device and is desirably delivered from the device in diffused form. Ordinarily, such devices are used for the delivery of ventilating air in diffused form from air supply ducts into rooms and other enclosures, but they may be used for distributing liquids and gases other than air.

When, in a device of the type mentioned, the flaring members are imperforate, as ordinarily is the case, the flow of fluid through the device is primarily along the inner side portions of the passageways, which results in producing comparatively low pressure zones and suction effects in the outer side portions of the passageways. As a consequence, instead of there being a forward flow of fluid through the outer side portions of the passageways, there is actually a rearward flow of fluid through the outer side portions of the passageways, which means that there takes place within said passageways and in advance of the forward ends thereof, a mixing of the supplied fluid with the fluid into which it is delivered. In most cases this is highly desirable, but in other cases its avoidance is equally highly desirable, as, for example, in industrial plants where dust accumulates in the air and where explosions may occur because of such dust accumulations. In such cases it is, of course, desirable to have air flow only from the passageways and to avoid any suction action in the passageways, thereby to avoid the drawing of dust-laden air into the device and the accumulation and settling of dust within the device.

Accordingly, the general object of the invention is to provide a device of the type mentioned embodying a construction to equalize, or substantially equalize, the pressure in the inner and outer side portions of the passageways thereof, thereby to insure that there shall be only a forward flow of fluid from the device and that any suction action in the passageways with its undesirable consequences shall be avoided. Essentially this is accomplished by providing openings in the flaring members separating the passageways through which the supplied fluid flows, as disclosed in my prior application, Serial No. 97,570, filed August 24, 1936 (now Patent No. 2,144,631). Accordingly, the present application is a continuation in part of said prior application and, in part, represents a carrying forward of the invention therein disclosed.

Since the supplied fluid may be delivered to the device at different velocities, openings of fixed sizes in the flaring members might not be effective under all conditions to effect equalization of pressure in the inner and outer side portions of the passageways. Accordingly, another object of the invention is to provide simple, practical means whereby the effective sizes of the openings in the flaring members may be varied.

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 a device of the type mentioned 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 related views:

Figure 1 is a central, longitudinal section through a device constructed in accordance with one practical embodiment of the invention.

Figure 2 is a view similar to Fig. 1 illustrating another practical embodiment of the invention.

Figure 3 is a view similar to Fig. 1 illustrating another practical embodiment of the invention.

Figure 4 is a section on the line 4—4 of Fig. 3.

Figure 5 is an enlarged detail view of part of the Fig. 3 form of the invention, and

Figure 6 is a detail view illustrating an alternative form of the inventon.

Referring to the drawings in detail, first with particular reference to Fig. 1, it will be observed that the device comprises a series of successively smaller, open-ended, hollow, flaring members, designated as 1, 2, 3, 4 and 5, respectively, which are spaced successively inwardly of one another to provide therebetween a series of successively smaller, successively inwardly disposed, flaring passageways, designated as *a*, *b*, *c*, and *d*, respectively, having progressively decreasing amounts of flare. It will further be observed that a neck 6 extends from the rearmost or larger member 1 for the supply of fluid through the opening in the rear end of said member into the device, and that the rear, open ends of the successively inwardly disposed members are successively smaller. Accordingly, fluid supplied to the device

through the neck 6 is divided into a plurality of separate streams which flow at reduced velocities through the passageways *a*, *b*, *c* and *d* and, in some cases through the smaller member 5, if it has an opening of sufficiently large size in its rear end. Thereby, the supplied fluid is delivered from the device in diffused form.

In a device of the present type the supplied fluid flows primarily along the inner side portions of the flaring passageways. Therefore, if the flaring members should be imperforate, such flow of the supplied fluid would produce comparatively low or negative pressures and suction effects in the outer side portions of the passageways, with the result that fluid would be drawn from in front of the device into the outer side portions of said passageways, becoming intermixed therein with the supplied fluid. Ordinarily, this is quite desirable, but in some cases, as in the case of an industrial plant where the device is employed to supply fresh or treated air to a room or other enclosure wherein there may be an accumulation of dust which might cause an explosion, flow of the dust laden room or enclosure air toward the device is highly undesirable, as thereby the dust would be maintained in suspension in the air to an extraordinary extent with intensification of the danger of an explosion. Accordingly, some or at least one of the flaring members of the present device is provided with openings 7 of suitable size, shape and number to properly vent the outer side portion of the passageway in advance thereof, thereby to equalize the low pressure in said passageway. Thus, fluid flows only forwardly through the passageway, and only away from the device, with the result that, in the case of the supply of air to a room or other enclosure wherein the air is dust laden, the dust is not maintained in suspension in the air by the supplied air, and accumulation and settling of dust within the device is avoided. As is apparent, because of venting of the outer side portion of any given passageway by the openings 7, the air flowing forwardly through the inner side portion of the same passageway is permitted to expand outwardly so that it also flows forwardly through the outer side portion of such passageway. Moreover, any tendency of the fluid flowing through the inner side portion of any given passageway to produce a low pressure and a suction effect in the outer side portion of the same passageway, is counteracted by the suction action through the openings 7 produced by the forward flow of fluid through the forward or laterally inwardly disposed portion of the next adjacent outwardly disposed passageway.

According to the form of the invention illustrated in Fig. 2, wherein the flaring members are designated as 1^a, 2^a, 3^a, 4^a and 5^a and the flaring passageways therebetween are designated as a^2, b^2, c^2 and d^2, the construction is substantially the same as illustrated in Fig. 1, except that tongues 8 extend from the rear ends of the openings 7^a in the flaring members, diagonally forwardly relative to the members into the outer side portions of the passageways. These tongues, by acting to deflect across the openings 7^a the fluid flowing forwardly through the passageways into which said tongues extend, thereby serve to assist pressure equalizing flow of air through said openings 7^a. In this connection, since the pressures in the passageways decrease toward the outlet ends of said passageways due to the flaring form of the latter, the angularity of the tongues 8 relative to the flaring members from which they extend, preferably increases with disposition of the openings 7^a and said tongues nearer to the outlet ends of the passageways. Thus, in any given passageway the more forwardly disposed tongues baffle or deflect more fluid than the relatively rearwardly disposed tongues and there is obtained substantially equalized pressure between the inner and the outer side portions of the passageway at any point along its length.

In cases where the volume of the supplied fluid is known and does not vary, the proper number and size of the openings 7 or 7^a, as the case may be, in order to obtain equalization of pressure in the passageways of the device, may be predetermined and it is not necessary to provide for varying the effective sizes of said openings. On the other hand, where a device is to be used for distributing different volumes of fluid at different times, it is desirable to provide means for varying the effective sizes of the openings in the flaring members to maintain the efficiency of the device while insuring equalization of pressure in the inner and outer side portions of the passageways. Moreover, it is desirable to provide means for varying the effective sizes of the openings so that any given device may be used in different installations where the volumes of the supplied fluid differ. In other words, it is desirable to provide a device which is adjustable for more or less universal use.

A device of the present type embodying means for varying the effective sizes of the openings in the flaring members thereof is illustrated in Figs. 3 to 5 of the drawings. According to Figs. 3 to 5 the device comprises a series of flaring members, designated as 1^b, 2^b, 3^b and 4^b constructed and arranged as heretofore described in connection with the Figs. 1 and 2 forms of the invention to provide therebetween a series of flaring passageways designated as a^3, b^3 and c^3, respectively. In one or more of the flaring members are openings 7^b for the same purpose as set forth in connection with the openings 7 and 7^a of the Figs. 1 and 2 forms of the invention. In addition, there is associated with each flaring member having openings 7^b therein, a relatively rotatable, companion flaring member 9 having openings 10 therein for alinement with and disalinement from the openings 7^b by rotation of the member 9. Thus, by rotatably adjusting any member 9 relative to its associated flaring member, the effective sizes of the openings 7^b in the associated flaring member may be varied for the purpose stated.

The members 9 may be disposed either inwardly or outwardly of their associated flaring members and may be rotatably mounted in any desired manner. In the present instance said members 9 are disposed outwardly of their associated flaring members and are rotatably supported by the latter, being provided, preferably, with spaced annular beads 11 which engage the associated flaring members to provide for their free and easy rotation.

The flaring members 1^b, 2^b, 3^b and 4^b of the device are connected together in spaced relationship by struts 12 which, in the present instance, extend through circumferential slots 13 in the members 9, whereby rotation of the members 9 is permitted, the said struts 12, by cooperation with the walls defining the ends of the slots 13, serving, at the same time, as stops to limit rotatable adjustment of the members 9. However, the struts 12 may connect the members 1^b, 2^b, 3^b and 4^b forwardly of the members 9. In that case, slotting of the members 9 to accommodate the struts is, of course, unnecessary.

Carried by the rear end portion of each member 9 is a spider 14 having a central, apertured portion 15 which rotatably accommodates a rod 16 for rotatably adjusting said members 9. The rod 16 extends axially of the device through the smaller or innermost member 4b and at its forward end is provided with a suitable handle 17 for effecting its rotation.

In the central portion 15 of each spider 14 is a segmental recess 18 which opens into the rod accommodating aperture in the portion 15 and in which is disposed a related pin 19 extending laterally from the rod 16. The recesses 18 are longer, circumferentially of the central spider portions 15, than the width of the pins 19, and, moreover, are of different lengths. Accordingly, by rotating the rod 16 first in one direction and then in the other direction, practically any desired rotative adjustment of any one of the members 9 may be obtained. In this connection, the arrangement of the recesses 18 preferably is such that when all of the pins 19 are disposed at corresponding ends thereof and the members 9 are at their limits of rotation in one direction, as determined by the struts 12 or any equivalent stop means, the openings 10 either are fully alined with or entirely disalined from the openings 7b. Accordingly, by rotating the rod 16 to its limit in one direction, there may be assured either a completely alined or an entirely disalined relationship, as the case may be, between the openings 10 and the openings 7b of all of the associated pairs of flaring members, thus to obtain a known starting point for facility in adjusting the members 9.

Instead of providing a common actuator, such as the rod 16, for adjusting the members 9, said members may each be provided with a small forwardly extending handle 20, as shown in Fig. 6. Thus, each member 9 may readily be adjusted entirely independently of each other member 9.

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. A fluid distributing device comprising a series of successively smaller, open ended, hollow, flaring members spaced successively inwardly of one another to provide a series of flaring passageways therebetween, at least one of the members separating adjacent passageways having openings therein to provide for equalization of pressure between the forward and the rear portions of at least one of the passageways.

2. A fluid distributing device as set forth in claim 1 including tongues carried by the flaring member having the openings therein and extending from the rear ends of said openings diagonally forwardly relative to the flaring member.

3. A fluid distributing device comprising a series of successively smaller, open ended, hollow, flaring members spaced successively inwardly of one another to provide a series of flaring passageways therebetween, at least one of the members separating adjacent passageways having openings therein to provide for equalization of pressure between the inner and the outer side portions of at least one of the passageways, and means for varying the effective sizes of said openings.

4. A fluid distributing device comprising a series of successively smaller, open ended, hollow, flaring members spaced successively inwardly of one another to provide a series of flaring passageways therebetween, at least one of the members separating adjacent passageways having openings therein to provide for equalization of pressure between the inner and the outer side portions of at least one of the passageways, and a companion relatively rotatable flaring member having openings therein for alinement with and disalinement from the openings in said first mentioned flaring member, thereby to vary the effective sizes of the openings in said first mentioned flaring member.

5. A fluid distributing device comprising a series of successively smaller, open ended, hollow, flaring members spaced successively inwardly of one another to provide a series of passageways therebetween, a plurality of said members separating adjacent passageways having openings therein to provide for equalization of pressure between inner and outer side portions of said passageways, and an element associated with and rotatable relative to each flaring member having openings therein to vary the effective sizes of the openings.

6. A fluid distributing device as set forth in claim 5 including a common actuator for the rotatable elements.

7. A fluid distributing device as set forth in claim 5 including a common actuator for the rotatable elements, and means whereby said actuator is effective to rotatably adjust said rotatable elements individually.

8. A fluid distributing device comprising a series of successively smaller, open ended, hollow, flaring members spaced successively inwardly of one another to provide a series of passageways therebetween, a plurality of said members separating adjacent passageways having openings therein to provide for equalization of pressure between inner and outer side portions of said passageways, a companion flaring member associated with and rotatable relative to each flaring member having openings therein, each companion flaring member having openings therein for alinement with and disalinement from the openings in its related flaring member to vary the effective sizes of the openings in its related flaring member, and a rod extending axially of the device through the innermost flaring member and operatively connected with the rotatable flaring members for effecting their rotative adjustment.

9. A fluid distributing device as set forth in claim 8 including lost motion operative connections between the rod and the rotatable flaring members whereby the rod is effective to rotatably adjust said members individually.

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