

Jan. 9, 1945.

C. DEMUTH

2,367,104

VARIABLE VOLUME AIR DISTRIBUTOR

Filed Feb. 6, 1943

*Fig. 1.*

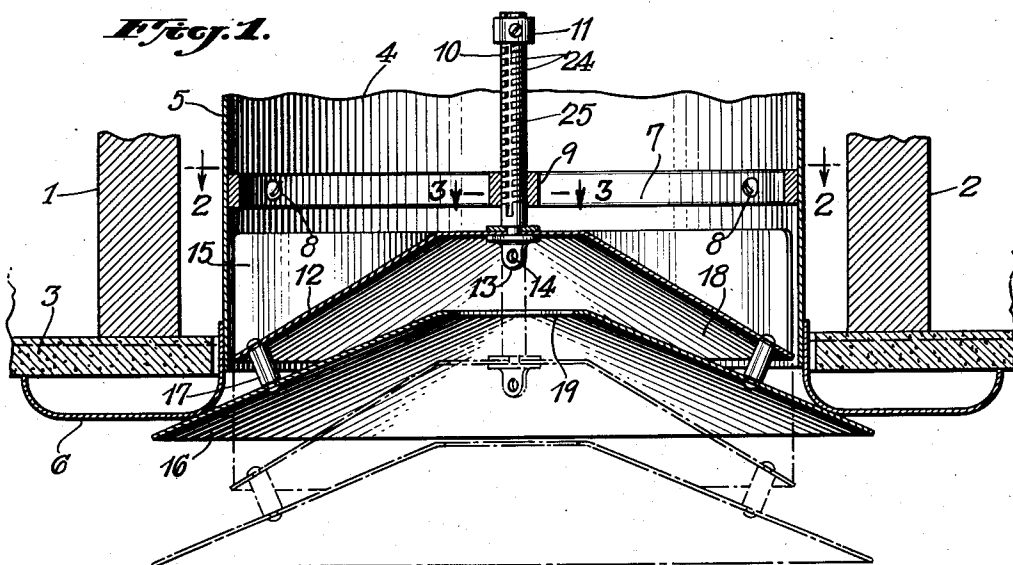


*Fig. 2.*

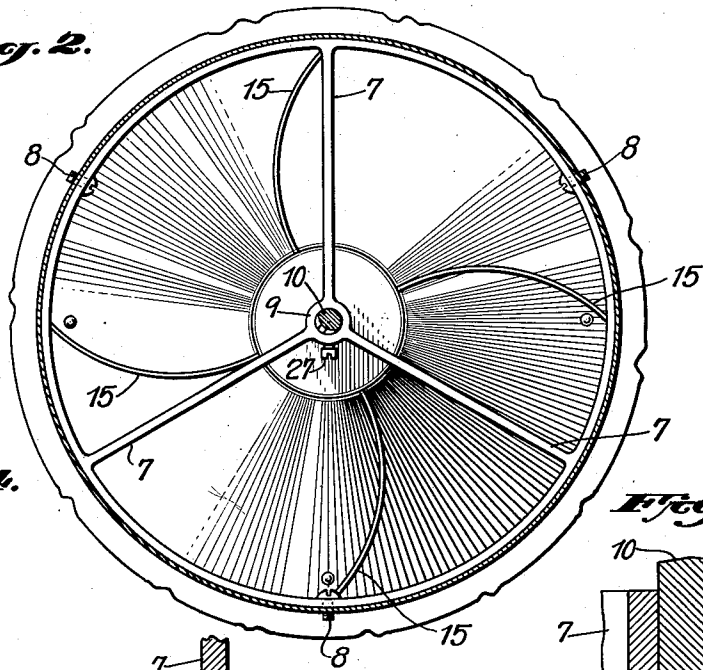


*Fig. 4.*

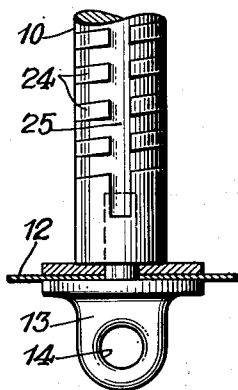


*Fig. 3.*

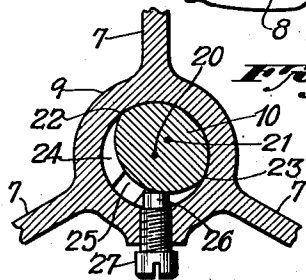
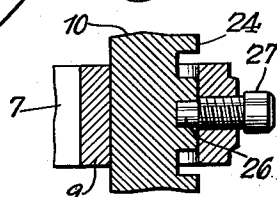


*Fig. 5.*



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## UNITED STATES PATENT OFFICE

2,367,104

## VARIABLE VOLUME AIR DISTRIBUTOR

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Application February 8, 1943, Serial No. 474,944

5 Claims. (Cl. 98—40)

This invention relates to variable volume air distributors. The invention is useful in air conditioning systems, such for example as disclosed in my prior Patent No. 2,190,937; but it is to be understood that it is not limited to such a system. In some respects, the present invention is in the nature of an improvement over certain features of my said Patent No. 2,190,937.

An object of the invention is to provide an air distributor of simplified form and readily accessible adjustment means for varying the volume of air passing therethrough.

Another object is to provide an adjustable device embodying improved means of adjustment.

Further objects and advantages of the invention will more fully appear from the following description taken in connection with the accompanying drawing which shows, by way of example the present preferred embodiment of the invention.

The invention consists of the novel feature, arrangement and combination of parts embodied by way of example in the structure hereinafter described as illustrating a present preferred form of the invention, and the invention will be more particularly pointed out in the appended claims.

Referring to the drawing:

Fig. 1 is a sectional view showing the device in elevation;

Fig. 2 is a cross-sectional view taken at the line 2—2 of Fig. 1;

Fig. 3 is a cross-sectional view taken at 3—3 of Fig. 1 and showing certain details of the adjustment mechanism;

Fig. 4 is a somewhat enlarged detail of a part of the device shown in Fig. 1; and

Fig. 5 is a somewhat enlarged segmental view of the device shown in Fig. 1 illustrating further details of construction.

In the present embodiment, the device is shown as being mounted between the joists 1, 2 to a ceiling 3 as representative of a wall of a chamber in which distribution of air is to be effected. A housing or air duct designated generally as 4 is suitably secured in position relative to the ceiling 3 and the air duct 4 comprises a neck portion 5 and a lower flange portion 6 which preferably forms a finishing bead disposed against the ceiling 3. It is understood that the air duct or housing 4 is normally attached at its upper end to a suitable conduit supplying conditioning air.

A suitable support, such as a spider 7, is disposed within the neck 5 to which it is suitably secured as by means of screws 8 so as to rigidly hold it in position. The spider is provided with a central hub 9 having a bore through which is slidably disposed a shaft 10 which is preferably provided with a stop, such as a collar 11, to limit the downward movement of the shaft 10. The lower end of the shaft 10 carries rigidly secured

thereto and supported thereby a frusto-conical deflector 12. In the present embodiment, the deflector cone 12 is secured to the shaft 10 by means of an eye-bolt 13 screwed into the lower end of the shaft 10 and providing an eye 14. The deflector cone 12 has an external diameter slightly smaller than the internal diameter of the flange 6 forming the mouth of the duct 4, so as to permit the deflector cone to be moved up into the duct in the manner and for the purposes to be hereinafter pointed out. Secured to the upper or convex surfaces of the deflector cone 12 are a plurality of curved deflector vanes 15 for causing a circumferential movement of air as it passes over the cone 12, in the manner more particularly pointed out in my said prior patent. The vanes 15 are arranged so that their circumscribed external diameter is less than the internal diameter of the neck 5, so as to permit the vanes to be moved upwardly within the duct. A secondary or supplemental deflector cone 16 is suspended in fixed spaced relationship below the cone 12 by suitable means such as the spacing studs 17 so as to provide between the two cones a fixed space, designated 18, providing an injection nozzle with an annular orifice defined between the perimeter of the cone 12 and the adjacent surface of the cone 16. The diameter of the cone 16 is substantially greater than that of the cone 12 and is adapted to extend over the flange portion 6 so as to close the duct opening when the parts are moved to closed position. The lower cone 16 is provided with a central opening 19 to provide for passage of air upwardly through the cone 16 into the cone 12 and thence outwardly through the injection nozzle due to the incoming air passing through the variable area nozzle provided between the cone 12 and the mouth of the duct or housing 4.

The shaft 10 is provided with a series of transversely extending projecting portions which are preferably formed as screw-thread teeth whose form and disposition can be best described with reference to the manner of making the same. Referring to Fig. 3, the center of the shaft is designated as 20 and the shaft is set up in a lathe about an offset center 21 and a screw thread of relatively square or rectangular contour is cut along the circumferential portion of the shaft between the points designated as 22 and 23; the formation of the thread being further illustrated in Figs. 4 and 5. It will therefore be seen that screw-thread teeth, such as 24, are provided whose outer diameter is concentric to the shaft center 20 and whose root diameter is eccentric to the shaft center 20; so that the spaces intervening the respective teeth are provided with a gradually tapering surface which will be referred to as a cam surface. A groove 25 (Figs. 3 and 4) is cut through the screw-thread teeth so as to

provide relative vertical movement lengthwise of the shaft of a detent or pin 26 which is formed on the inner end of a screw 27 passing through the wall of hub 9 so as to be rigidly secured thereto.

In the broken-line position shown in Fig. 1, the parts are adjusted so that the device is in its open position, i. e., the emission nozzle between the flange 6 and the cone 12 is opened to its greatest extent as limited by the stop collar 11. When it is desired to reduce the cross-sectional area of the emission nozzle, the shaft 10 is rotated until the detent pin 26 is in register with the groove 25 (this may conveniently be done by inserting a hook in the eye 14); the shaft 10 is then elevated to the desired degree and, upon rotation to either the left or right, the detent pin 26 is moved between adjacent teeth (Fig. 5) and the detent pin moves along the cam surface of the intervening space (Fig. 3) thus wedging the shaft and causing it to become locked in the desired vertical position. The solid lines in Fig. 1 illustrate the completely closed position of the parts where both the emission nozzle and injection nozzle are closed. With the parts adjusted somewhat short of completely closed position, the emission nozzle may be substantially closed while leaving the injection nozzle open to provide for moderate circulation of air; and any desired position in between the two extremes may be similarly effected.

While the invention is useful in connection with any system where it is desired to vary the volume of air distributed; yet it is especially useful as a means of adjustment in systems employing a plurality of distributors, in respective of which distributors a difference in the rate of flow is desired.

Having thus described my invention with particularity with reference to a presently preferred form of the same, it will be obvious to those skilled in the art after understanding the invention, that various changes and modifications may be made therein without departing from the scope of the invention, and it is my intention to cover in the appended claims such changes as come within the scope of the invention.

What I claim is:

1. A variable volume air distributor comprising an air duct having an opening, a deflector cone adjustably disposed coaxially of said opening, and means for adjusting said cone axially of said duct comprising a first member extending longitudinally of said duct and provided with axially spaced engageable portions alternating with intervening recesses provided with camming surfaces whose cam contours are disposed laterally relative to said axial spacing, and a second member providing a detent portion relatively movable axially into selective register with said recesses and circumferentially of said first member for selective locking engagement with respective of said camming surfaces, one of said members being secured in fixed position relative to said duct and the other of said members being secured to and movable with said cone relative to said duct.
2. A variable volume air distributor comprising an air duct having an opening, a deflector cone adjustably disposed coaxially of said opening, and means for adjusting said cone axially of said duct comprising a shaft extending longitudinally of

said duct and provided with axially spaced engageable portions alternating with intervening recesses provided with camming surfaces whose cam contours are disposed laterally relative to said axial spacing, and a second member through which said shaft passes provided with a detent portion relatively movable axially for selective engagement with the engageable portions of said shaft and circumferentially of said first member for locking engagement with respective of said camming surfaces, said second member being secured in fixed position within said duct and said shaft being secured to and movable with said cone relative to said duct.

3. In an adjustable air distributor, the combination of a relatively fixed part, a relatively movable part, and means for adjustably securing said parts in spaced relation comprising a shaft provided with screw-thread teeth whose root diameter is eccentric to said shaft, said shaft being secured to one of said parts for movement therewith, and a detent secured to the other of said parts for relative movement longitudinally and transversely of said shaft, the teeth of said shaft having a groove provided therethrough for the passage of said detent longitudinally of said shaft, said detent having a portion engageable between said teeth for holding said parts in longitudinally adjusted position and a portion engageable against said eccentric root diameter upon relative transverse movement for locking said parts in adjusted position.

4. A variable volume air distributor comprising an air duct having an opening, a deflector cone adjustably disposed coaxially of said opening, and means for adjusting said cone axially of said duct comprising a first member extending longitudinally of said duct and provided with axially spaced engageable portions alternating with intervening recesses provided with camming surfaces whose cam contours are disposed laterally relative to said axial spacing, said cone being secured to and supported by the lower end of said first member, and a second member secured in fixed position within said duct and supporting said first member, said second member having a detent portion relatively movable axially into selective register with said recesses and circumferentially of said first member for selective locking engagement with respective of said camming surfaces.

5. A variable volume air distributor comprising a housing having an opening, a first deflector cone disposed substantially coaxially with said opening and movable relative to said housing to form therewith a variable orifice emission nozzle, deflector vanes movable with said cone and telescopically disposed within said housing, a second deflector cone substantially coaxial with said first cone and spaced therefrom to provide a fixed orifice injection nozzle, said second cone being provided with a central opening in communication with said injection nozzle to provide a path from the space immediately below the said second cone to the said injection nozzle, and vertically adjustable means for holding said cones in position, said adjustable means being accessible through said central opening of said second cone.

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