May 15, 1956 P. A. ARGENTIERI 2,745,509

NOISE REDUCTION DEVICE

Original Filed Sept. 22, 1950

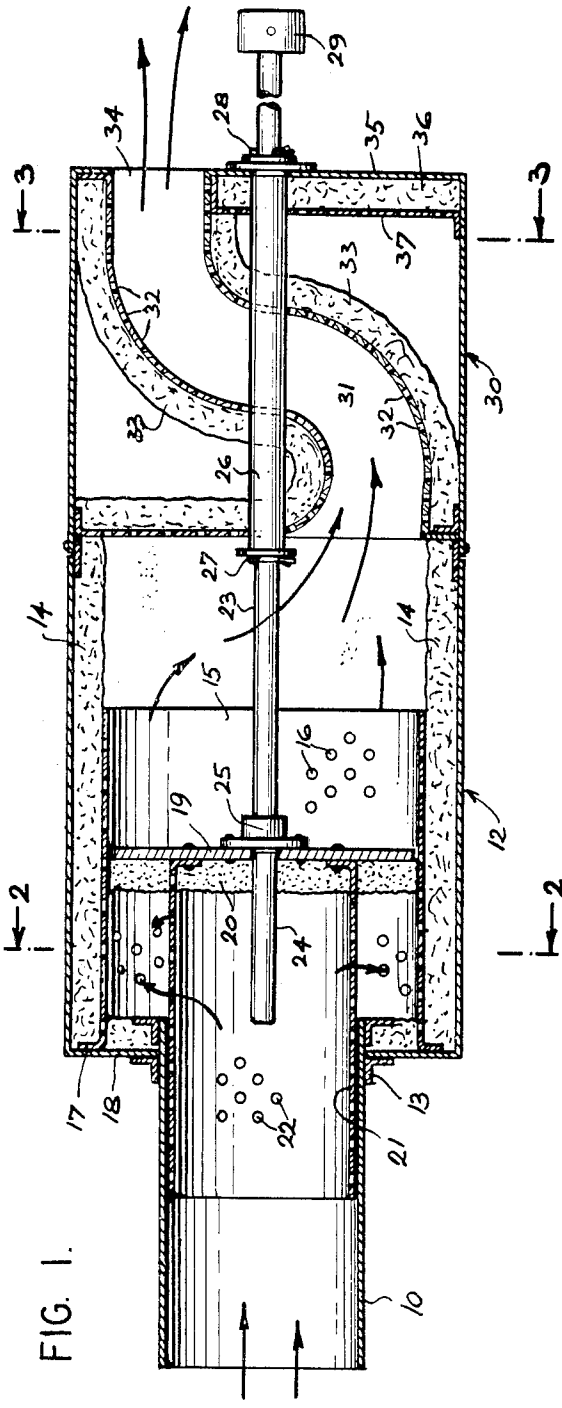


FIG. 1.

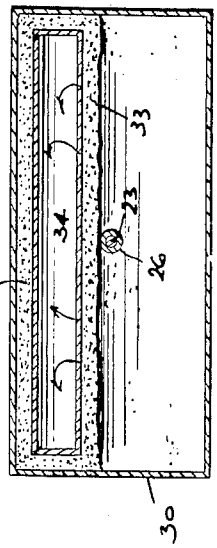


FIG. 3.

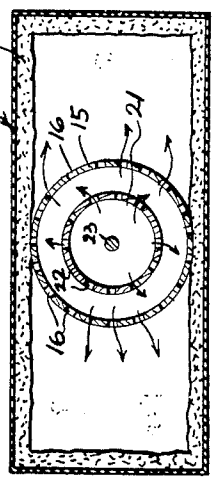


FIG. 2.

INVENTOR.
PETER A. ARGENTIERI
BY
Attorney

United States Patent Office

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NOISE REDUCTION DEVICE

Peter A. Argentieri, Danbury, Conn., assignor to Connor Engineering Corporation, a corporation of New York

Original application September 22, 1950, Serial No. 186,154. Divided and this application August 12, 1952, Serial No. 303,923

2 Claims. (Cl. 181—42)

This invention relates to improvements in an air outlet device or diffuser for air conditioning systems, an example of such device being found in co-pending application Serial No. 123,927, filed October 27, 1949 now Patent 2,644,389. This application is a division of my co-pending application Serial No. 186,154, filed September 22, 1950, now Patent 2,687,746.

It is desirable to provide in devices of this character, and particularly when the air ducts employed are of relatively small diameter, means by which the noise conditions are materially reduced and to an extent where the noise is relatively negligible.

It is therefore the primary object of the present invention to provide an improved air outlet device of the character mentioned which is constructed and arranged in such a manner as to minimize the generation of objectionable noises upon the discharge of the air therethrough. A further object of the invention is the provision of an outlet device of the above mentioned character having an inexpensive and readily adjustable throttling means to prevent the formation of high-velocity jets of large mass within the device and consequently minimizing vortex and impingement noises.

It is another object of the invention to provide an extension for connection to the outlet of an air duct, which extension shall be in the form of a casing or housing defining an air passage of sinuous form, said passage having a relatively large entrance opening and having an outlet opening of contracted slot-like formation, with the walls of the passage perforated and covered by sound-proofing material. By means of such construction a noise-reduction means of maximum efficiency is provided.

With the objects above set forth in view, I have devised the arrangement of parts hereinafter set forth and more particularly pointed out in the claims appended hereto.

In the accompanying drawing, wherein an illustrative embodiment of the invention is shown,

Fig. 1 is a vertical sectional view through an air outlet device embodying the features of the invention;

Fig. 2 is a sectional view, taken on the line 2—2 of Fig. 1, looking in the direction of the arrows; and

Fig. 3 is a sectional view, taken on the line 3—3 of Fig. 1, looking in the direction of the arrows.

An efficient air outlet should be provided with throttling or controlling means for the air volume, and the present invention, and in the first stage through which the air passes, operates to prevent the formation of high velocity jets of large mass within the outlet device by having the air flow from the inlet duct into a plenum defined by a perforated cylinder within which a closure disc or diaphragm is axially adjustable for variable throttling effects. Secured to the disc or diaphragm and thus adjustable therewith is an inner perforated sleeve located concentrically to the perforated cylinder and of substantially less diameter than the same. This arrangement of concentric, perforated cylinders or sleeve provides uniformity of air flow; breaks the air stream down into a multiplicity of streams having small mass and before the merger of the

streams, which takes place in a second stage, there is a rapid reduction in velocity. The second stage wherein the above merger of the streams takes place, comprises a housing extension provided with a devious or sinuous passage serving to control the flow of air and materially reducing the noise.

Referring to the drawings, 10 indicates the connection tube defining the inlet of the device, said tube 10 being connected to an air duct of known kind not shown. The air-distributing duct in a conventional installation, is generally located between the walls or in a suitable ceiling space. The housing or casing of the first stage of the air outlet device is indicated at 12 and the same may be secured to the air-distributing duct 10 by means of a ring 13 to which it may be attached by screws, bolts or other equivalent fastening elements. The housing or casing 12, in the form shown, is of substantially rectangular shape, and the inner surfaces of its walls receive a layer of sound-absorbing material 14 to minimize noise and vibration due to air impact.

A perforated cylinder 15 having a plurality of perforations 16, thus rendering the entire area of the cylinder foraminous, is fixedly mounted within the housing 12 and located concentrically to and in axial alignment with the air duct 10. Said cylinder 15 may be secured in position by any desired means, such as by fastening elements entering through its radial flange 17 and attaching it to the end wall 18 of the housing 12.

Mounted for adjustment within the cylinder 15 is a closure disc or diaphragm 19 which is axially slidable within the cylinder to produce the desired throttling effect without generating high velocity solid streams and resultant erratic flow within the device. Diaphragm 19 closely, but slidably, fits within the cylinder 15 and is provided on one of its faces with sound absorbing material 20 which is also located within the closed end of a sleeve 21. Carried by the disc or diaphragm 19 is the perforated sleeve or small diameter cylinder 21 provided with perforations 22 throughout its area so that it is in fact foraminous in the manner of the cylinder 15. The sleeve 21 is of less diameter than the cylinder 15 so that it is spaced from the walls of the latter cylinder thus providing an annular chamber between the sleeve and cylinder, the length of said chamber being determined by the adjusted position of the throttling disc 19.

The sleeve 21 is telescopic within the inlet opening 10 as clearly seen in Fig. 1, and the adjustment of the disc or diaphragm 19, carrying the sleeve 21, is had by rotative movement of a rod or shaft 23 provided with a screw thread 24 threadably received in the internal thread of a boss or nut 25 attached to the disc or diaphragm 19. The rod is guided by a supporting sleeve 26 supported by the housing and is maintained against axial shift by the cotter pins 27 and 28 while being readily manually rotatable by means of the knob 29 secured on its end on the outside of the housing or casing of the outlet device.

As will be noted from the arrows shown in Fig. 1, the air forced through the duct will enter through inlet 10 and then the perforated sleeve 21 and pass through the holes 22 thereof and enter the annular space between said sleeve and the perforated cylinder 15 to then flow laterally out through the holes 16 to enter the interior of the housing or casing 12.

The second stage of the outlet device includes a housing extension 30 attached to and forming a substantial continuation of the housing 12. Said second stage includes a devious or sinuous air passage 31 contained within the housing extension 30 and provided in its wall with a plurality of perforations 32, so that the wall of said passage 31 is in fact foraminous. Said foraminous wall has its outer surface covered by sound-absorbing material 33. The outlet for the passage 31 is indicated at 34 and

the passage and said outlet is contracted or is of slot-like formation as best seen in Fig. 3. The entrance to the sinuous passage is flared and is relatively large as compared to its slot-like outlet end. Moreover, it will be noted that the outlet end 34 of the sinuous passage is axially disaligned from the flared inlet end, which materially reduces the noise of the air flow. Below the outlet 34 is located the forward end wall 35 of the housing extension 30, said end wall being covered on its inner face by the sound-absorbing material 36 over which is mounted a perforated or foraminous plate 37.

From the foregoing, the operation of the device will be clear. As previously stated, air entering through the duct leading into the inlet 10 will pass through said inlet and will then flow laterally through the holes in the concentric cylinders 21 and 15 and enter the interior of the chamber defined by the housing or casing 12 as clearly indicated by the arrows in Fig. 2. The air will then enter the second stage, namely, the baffle passage 31 of contracting, devious or sinuous form, to pass out through the slot-like outlet opening 34.

After the dampening and baffling stages have been passed as above explained, the air may be caused to emanate from any one of various devices which might be placed at the outlet opening 34 in order to introduce the air in various ways into the occupied area. An example of an arrangement of this kind is shown in my co-pending application, Serial No. 186,154.

By the arrangement herein described, an effective control of noise is attained and without materially hampering the air flow.

Having described one embodiment of my invention, it is obvious that the same is not to be restricted thereto, but is broad enough to cover all structures coming within the scope of the annexed claims.

What I claim is:

1. A noise-reduction means for connection to the outlet of an air duct comprising, a chamber having a passage of sinuous, serpentine form extending through it, one end of said passage constituting the inlet end and being flared, the opposite end of the passage being the outlet end and being located completely to one side of the inlet end while having its axis parallel to the axis of the inlet end, the walls of the passage being perforated and covered by sound-absorbing material, the chamber being extended around and enclosing the passage, the chamber being secured to the passage only at the ends of the same, the walls of the passage being spaced from the wall of the chamber.

2. A noise-reduction means for connection to the outlet of an air duct comprising, a chamber having a passage of sinuous, serpentine form extending through it, one end of said passage constituting the inlet end and being flared, the opposite end of the passage being the outlet end and being axially disaligned from the inlet end and being smaller than the inlet end, the walls of the passage being perforated and covered by sound-absorbing material, the chamber being extended around and enclosing the passage, the chamber being secured to the passage only at the ends of the same, the walls of the passage being spaced from the walls of the chamber, the passage being of rectilinear, slot-like formation in cross-sectional shape, an air space being provided between the perforated walls of the passage and the walls of the chamber, the chamber being larger in cross-sectional size than the cross-sectional size of the passage, and a plate at the forward end of the chamber adjacent to the outlet end of the passage, said plate being backed by sound-absorbing material.

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