Jan. 21, 1958 P. A. ARGENTIERI 2,820,406

NOISE REDUCTION MEANS FOR AIR OUTLET DEVICES

Filed May 14, 1954

FIG. 1.

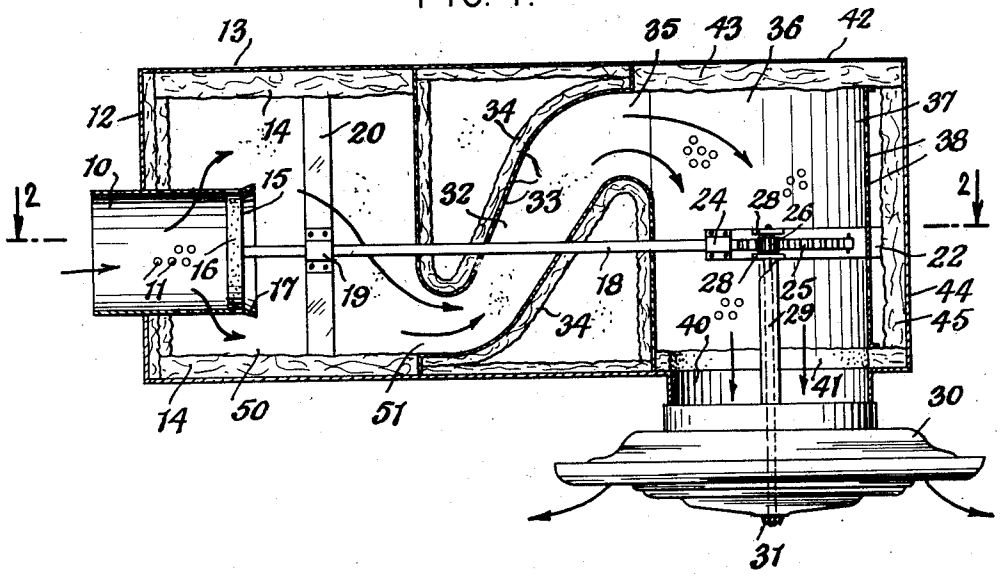
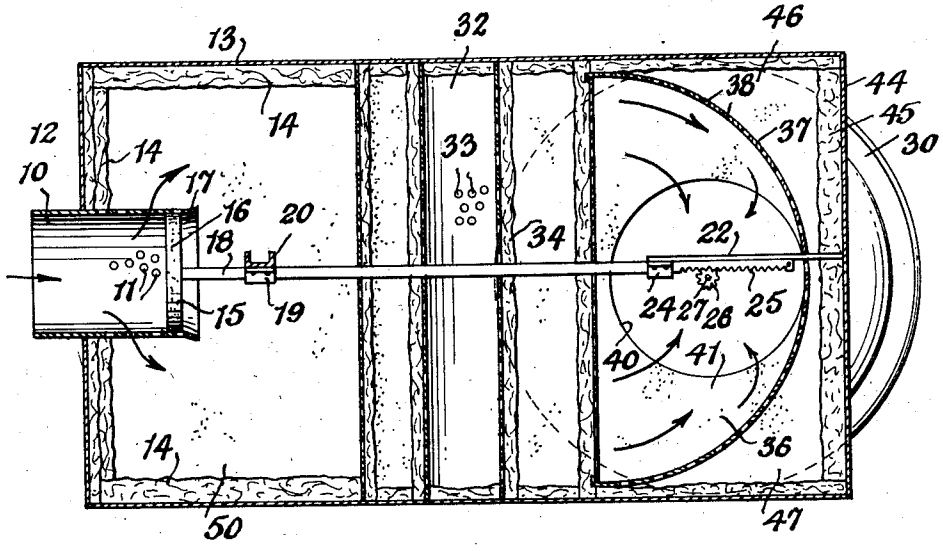


FIG. 2.



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United States Patent Office 2,820,406 Patented Jan. 21, 1958

2,820,406

NOISE REDUCTION MEANS FOR AIR OUTLET DEVICES

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Application May 14, 1954, Serial No. 429,947

4 Claims. (Cl. 98—40)

This invention relates to improvements in an air outlet device or diffuser for air-conditioning systems, an example of such device being found in my co-pending application Serial No. 303,923, filed August 12, 1952, now Patent No. 2,745,509.

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 one 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 a device for connection to the outlet of an air duct, which device shall be in the form of a casing or housing defining an air passage of sinuous form, said passage having an outlet arranged at an angle to the air flow through the sinuous passage, and adjacent to and partly extending around the outlet is arranged a vertical, arcuate baffle plate or wall of foraminous construction behind which is placed a sound-proofing material. By a construction as above described, 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, and

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

An efficient air outlet device should be provided with a throttling or controlling means for the air volume, and the present invention includes a perforated cylinder into which the air enters and in which a closure disc or diaphragm is axially adjustable for variable throttling effects. Referring to the drawing, **10** indicates said perforated cylinder having a plurality of perforations **11**, thus rendering the air distributing area of the cylinder foraminous. This cylinder may be either fixedly attached in the end wall **12** of the housing **13**, or it might be axially adjustable through said wall if found desirable. The cylinder **10** is connected in the end of an air inlet duct so that the air passing through such duct will flow through the cylinder **10** and out through the perforations therein to enter the chamber **50** in the housing. The air-distributing duct

in which the cylinder **10** is fitted is of conventional construction, generally located between the walls or in a suitable ceiling space. The housing **13**, 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. It will be observed that while the sound-absorbing material **14** surrounds the cylinder **10** it is spaced therefrom.

Mounted for adjustment within the cylinder **10** is a closure disk or diaphragm **15** 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. The diaphragm **15** is closely, but slidably fitted within the cylinder **10** and is provided with a sealing member **16**. The outlet end of the cylinder **10** may be flared slightly as indicated at **17**. The diaphragm is adjustable axially within the cylinder **10** to secure the desired throttling effects, by means of the rod or shaft **18** attached at one end to the diaphragm **15**, and slidably guided through a sleeve **19** secured on a strut or post **20** extending across the housing **13**. A bar **22**, extending inwardly from the end wall **44** of the housing **13**, is provided with a guide sleeve **24** through which the rod or shaft **18** is also slidable. At one end, the rod or shaft **18** is provided with a toothed rack **25** in mesh with a pinion **26** on the end of a vertical shaft **27**, rotative in lugs **28** provided on the bar **22**. The shaft **27** extends downwardly through a guide sleeve **29** and through the diffuser **30** and terminates in a knob **31** at the lower end of the diffuser and by which the shaft **27** is manually rotated to thereby move the rod **18** longitudinally and thus arrange the position of the disc or diaphragm **15** within the sleeve **10**.

Contained within the housing **13** is a serpentine or sinuous air passage **32** provided in its wall with a plurality of perforations **33** so that the wall of said passage is in fact foraminous. Said foraminous wall has its outer surface covered by sound-absorbing material **34**. The outlet for the passage **32** is indicated at **35** and the passage and said outlet is contracted or is of slot-like formation as best seen in Fig. 2. The inlet end **51** of the sinuous passage is located in the chamber **50**, and said inlet may be slightly flared as shown in Fig. 1.

The outlet end **35** of the sinuous passage **32** communicates with a chamber **36** which is defined by a vertical, arcuately curved, semi-cylindrical baffle or deflecting wall **37** which is perforated as indicated at **38**, or is foraminous. One of the walls of the chamber **36** is provided with the outlet opening **40** to which the diffuser **30** of known construction is connected, as clearly seen in Fig. 1. Said wall is lined around the opening **40** with sound-absorbing material **41**. The opposite wall **42** of the chamber **36** is also lined with sound-absorbing material as indicated at **45**. The latter lining of sound-absorbing material is spaced from the curved wall or baffle **37** so that the pockets **46** and **47** (Fig. 2) are provided between the curved wall or baffle **37** and the walls of the housing behind the same. The pockets **46** and **47** are lined with the sound-absorbing material **14**. As an alternative, the sound-absorbing material might be directly attached to the outer face of the arcuate wall or baffle **37** rather than being spaced therefrom.

From the foregoing, the operation of the device will be apparent. Air entering through the perforated cylinder **10** will flow laterally through the holes in the same and enter into the chamber **50** of the housing. The air will then flow through the sinuous passage **32** passing through the outlet end **35** thereof and entering into the chamber **36**. Upon entering the chamber **36**, the air will strike against the semi-circular or arcuate baffle or wall

37 and will be funnelled or directed thereby as indicated by the arrows into the outlet 40 to thereupon flow out through the diffuser 30 and into the room. The baffle or deflecting wall 37 limits the turbulence of the air stream and materially reduces the noise level of the device. By the employment of a perforated semi-circular wall or baffle, a substantially similar channeling action is attained for the air flow as would be secured by an imperforate plate, but by the use of a perforated wall or baffle, the sound waves are permitted to pass through such wall or baffle and become absorbed by the sound-absorbing material located behind the baffle.

Having described one embodiment of the 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 housing lined with sound-absorbing material, said housing having an inlet chamber into which air enters, a sinuous passage leading from said chamber, a second chamber within the housing and spaced from the first chamber, the second chamber having side walls, end walls and top and bottom walls the sinuous passage being located in the space between the chambers and having its outlet end in communication with the second chamber, the bottom of the second chamber being provided with an outlet opening, a curved, perforated baffle wall extending from one side wall to the opposite side wall and from the bottom wall to the top wall of the second chamber and arranged in the second chamber around the outlet opening, said wall being spaced from the outlet end of the sinuous passage, sound-absorbing material in the housing behind the perforated wall, a perforated cylinder leading into the first chamber, a disc slidable within said cylinder and serving as a throttle, a shaft attached to the disc, a rod extending vertically through the outlet opening in the second chamber and a coupling between said rod and the shaft whereby longitudinal movement of the shaft occurs when the rod is rotated to thereby shift the position of the disc within the cylinder, the sound-absorbent material behind the curved perforated baffle wall being spaced from said wall whereby a pocket is formed between said wall and said sound-absorbent material.

2. A noise reduction means for connection to the outlet of an air duct comprising, a housing divided into three chambers, one of said chambers being located at one end of the housing and having a wall through which a perforated cylinder extends, said cylinder establishing communication between said end chamber and the air duct outlet, a second chamber at the opposite end of the housing having an outlet opening in one of its walls disposed at right angles to the wall through which the perforated cylinder extends, a diffuser connected to said outlet opening, the third chamber being located between the two end chambers and containing a sinuous passage opening at one end into the end chamber into which the perforated cylinder enters and having its opposite end entering into the end chamber provided with the outlet opening, one of the ends of the sinuous passage being located adjacent to the lower wall of one of the end chambers and having its opposite end opening adjacent to the upper end of the second end chamber, the chamber in which the outlet is located having side walls and top and bottom walls and being provided with a semi-circular perforated wall extending from one side wall to the opposite side wall and from the top wall to the bottom wall of the second chamber and arranged around and spaced from the outlet opening in said chamber and partially encircling said outlet opening, said perforated wall being backed by sound-absorbing material contained within the housing.

3. A noise-reduction means for connection to the outlet of an air duct comprising, a housing having a bottom wall, a top wall, end walls and side walls, said housing containing an inlet chamber at one end thereof, a perforated cylinder extending through one of the end walls and entering said chamber, an outlet chamber at the opposite end of the housing, said outlet chamber having an outlet opening in the bottom wall, a diffuser in said outlet opening, an intermediate chamber located between the inlet and outlet chambers and containing a sinuous passage communicating at one end with the inlet chamber and communicating at its other end with the outlet chamber, the entrance opening to said passage being located in the inlet chamber and being arranged closely adjacent to the bottom wall of the housing, the outlet opening from said passage being located in the outlet chamber and being situated closely adjacent to the top wall of the housing, the outlet chamber having a perforated arcuate wall partly surrounding the outlet in said chamber, said arcuate wall extending from one side wall to the opposite side wall and from the top wall to the bottom wall of the outlet chamber and the housing being lined with sound-absorbent material in all the chambers thereof.

4. A noise-reduction means for connection to the outlet of an air duct comprising, a housing having an end wall, a perforated cylinder passing through said end wall and having an outlet end entering into the housing, a first chamber at one end of the housing and in which the outlet end of the cylinder is located, a second chamber at the opposite end of the housing and spaced from the first chamber, said second chamber having side walls, end walls, and a top and bottom wall, one of said walls of the second chamber being provided with an outlet, a sinuous passage in the portion of the housing that is located between and connecting the chambers, said passage having an inlet end in communication with the second chamber, said inlet and outlet ends of the sinuous passage being disaligned with respect to the horizontal axis of the passage, the second chamber being provided with a semi-circular, perforated baffle wall having its concave side facing the outlet of the sinuous passage, said perforated baffle wall extending from one side wall to the opposite side wall and from the bottom wall to the top wall of the second chamber and being arranged around and spaced from the outlet of the sinuous passage and partly encircling the outlet in the wall of the second chamber, said perforated baffle wall being spaced from one of the end walls of the second chamber, and being backed by sound-absorbing material contained within the housing, the baffle wall being on the down stream side of the outlet in the wall of the second chamber.

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