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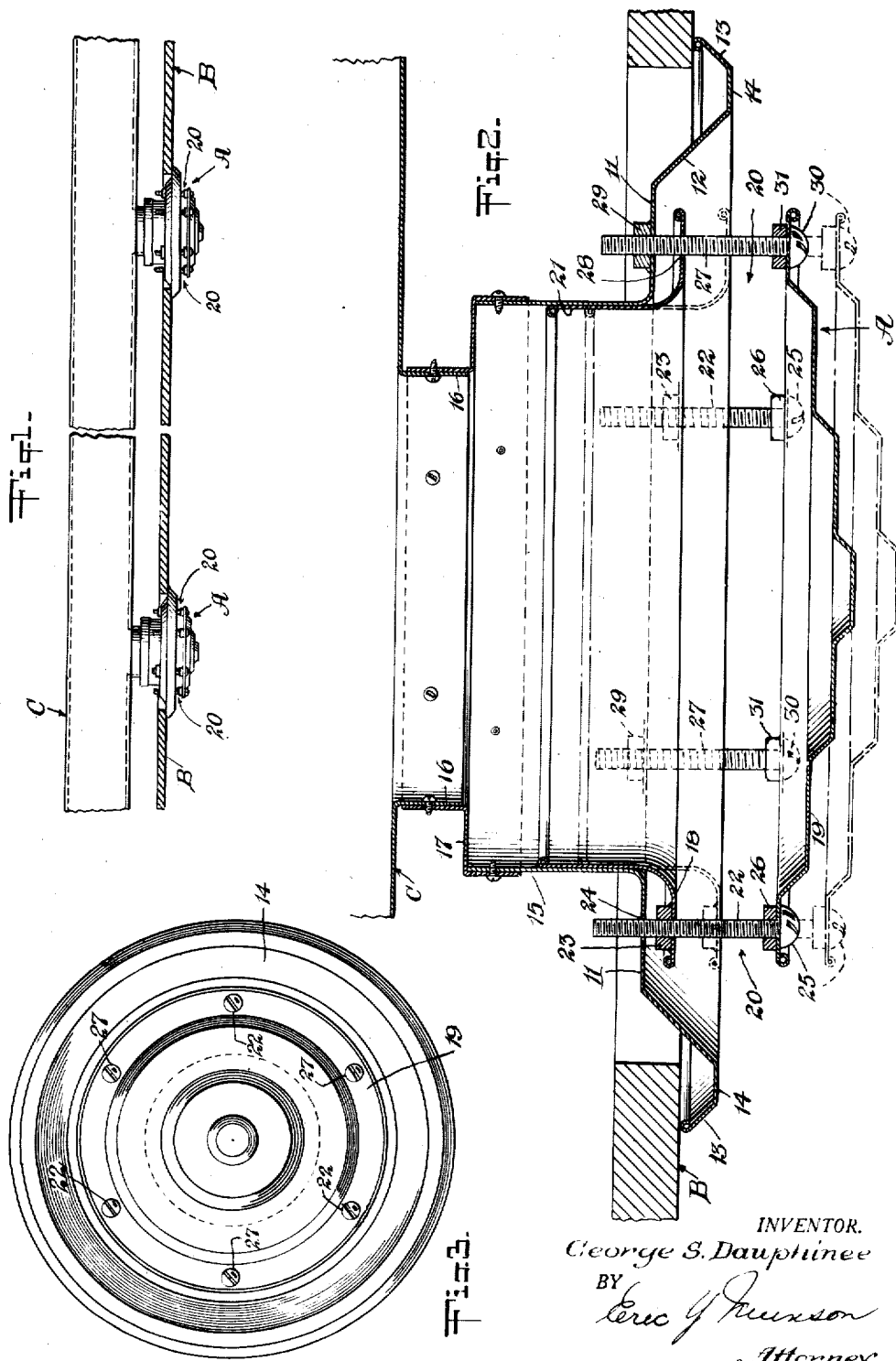
G. S. DAUPHINEE

2,369,119

VENTILATING SYSTEM

Filed Feb. 8, 1943

2 Sheets-Sheet 1



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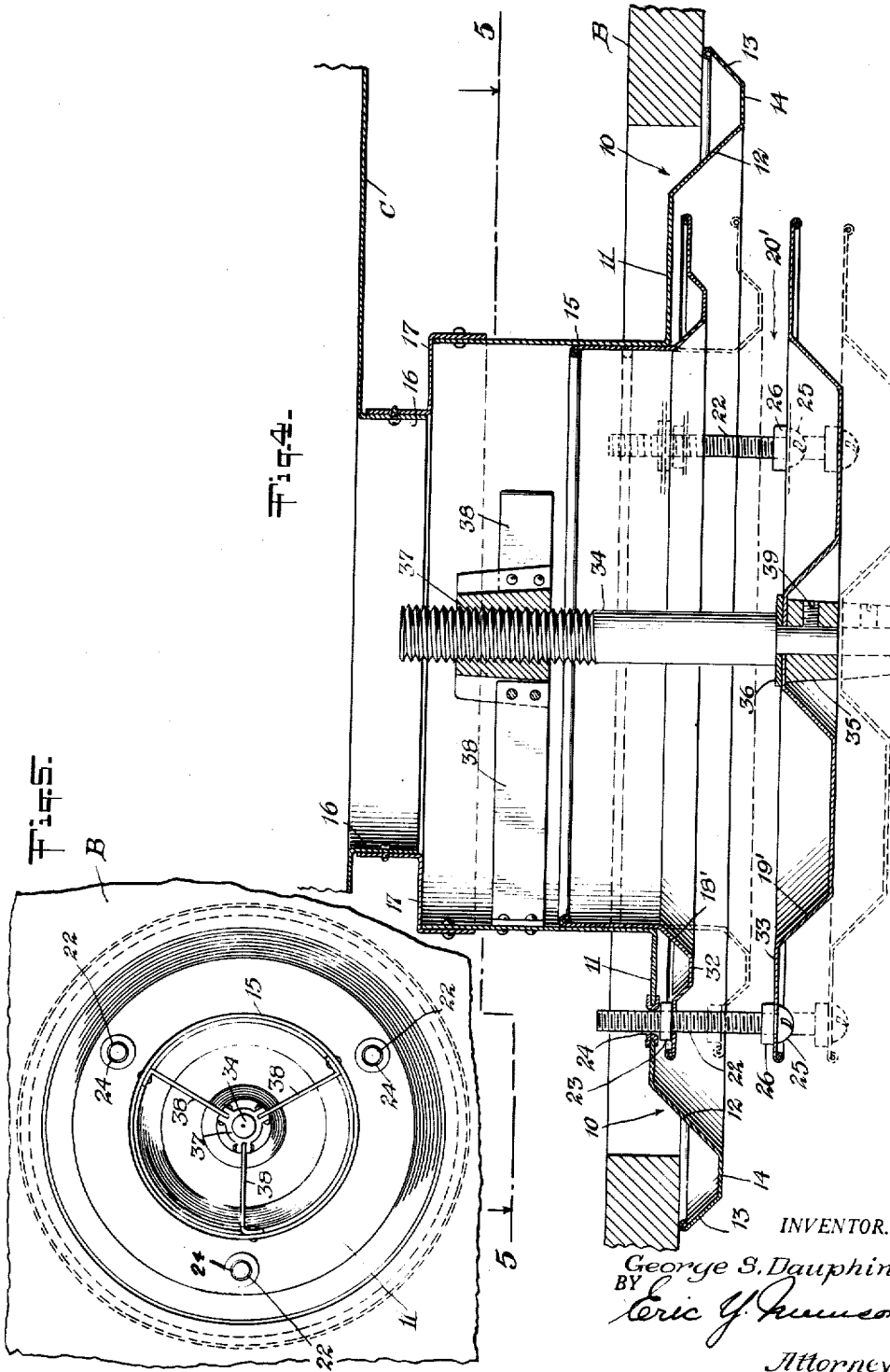
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VENTILATING SYSTEM

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6 Claims. (Cl. 98-40)

This invention relates to improvements in distributing devices or diffusers as applied to ventilating or air conditioning systems and more particularly to a mechanism for controlling the angle of deflection of the diffused medium in such systems and to means for adjusting the volume of the discharge opening to various neck opening sizes.

The distributing systems to which the invention is particularly applicable, comprise a series of diffusers arranged along the ceiling of the room. In the majority of systems, these diffusers are set into the ceiling and substantially flush with the undersurface thereof, but in some, they are suspended in space from the supply duct. Although these two systems possess different discharge characteristics, the object of the present invention is to make the improvement applicable to both of them with equal advantage. It will also be understood that the systems may be used for heating as well as for cooling purposes.

During the heating season, the natural tendency of the warm air or other medium discharged by the diffusers is to remain near the ceiling. This tendency is, of course, contrary to the desired action of diffusion or mixing, which has for its purpose to maintain a uniform temperature throughout the space served. In order to counteract this tendency of the warm air, the discharge must be adjusted so that it is deflected downward at a suitable angle, which is determined in accordance with the height of the ceiling from the floor and the temperature of the discharged air and with proper regard for draft conditions.

During the cooling season, the reverse condition prevails. The discharged air or other medium being colder than the room has a tendency to descend. Therefore, in this case the discharge should be projected upward along the ceiling or, generally, in a horizontal direction. Great care must be used in adjusting the diffuser to the proper directional discharge, particularly during the cooling season, as the occupants of the room are naturally more sensitive to the movement of cold air than warm air.

The broad feature of adjusting the angle of deflection to suit various temperature conditions is old in the art, but modern ventilating methods have put additional demands thereon. Thus, any standardized diffuser design should easily be adjustable not only to warm and cold discharge, but also to different types of installations, whether set into the ceiling or suspended in space from the supply duct. In addition,

they should possess a high degree of flexibility and simplicity in operation so that the adjustment requires a minimum of time and labor. The importance of the latter requirement becomes obvious from the great number of units generally used. In many large buildings, the air-conditioning systems comprise from two hundred to five hundred diffusers, the maintenance of which requires a special force and supervision.

Furthermore, in most of the air directing devices heretofore used in connection with ventilating systems, adjustment of the discharge direction is usually made at the expense of disturbing the throttling or balancing adjustments which results in loss of efficiency and performance.

It is, therefore, among the objects of this invention to provide a diffuser with improved means for adjusting the angle of deflection of the discharged medium rapidly and with a minimum of effort and without disturbance of the predetermined adjustment of the discharge opening or nozzle speed and volume of the flow.

Diffusers of modern design are usually provided also with throttling means so that the quantity of discharge of all of the diffusers in the system may be made uniform or so that their respective capacities may be varied to suit the different requirements in the space served. As already indicated, in the majority of systems the diffusers are set into the ceiling with the supply duct and outlet connections above the ceiling. It is obviously not convenient to equip these outlet connections with throttling devices or dampers due to the necessity of providing additional holes in the ceiling for the operating mechanisms, which would have to be accessible from below the ceiling.

The adjustment of the diffuser capacities to uniformity or to suit different requirements is referred to as balancing the system and such adjustment often forms part of the contract between the buyer and seller covering the installation. However, in most cases it is impractical to attempt to design the duct system with such a precision that it will meet all exigencies. For this reason, a damper is usually embodied in the diffuser for final balancing of the system.

In planning a ventilating system of the type to which the invention is applicable, the design engineer selects the capacity of the individual diffusers and the number of units according to the space conditions. The most important factors in the selection are the height, area and shape of the space to be served. Thus, his choice

of neck opening may vary from a diameter of four inches (4") to forty-eight inches (48"). In order to meet this demand diffuser manufacturers vie with one another in maintaining dies, chucks, gigs and fixtures for all possible sizes for purpose of prompt delivery. The great number of different sizes which must be kept in stock naturally imposes a heavy burden upon the industry which results in an unnecessarily high cost to the consumer.

It is, therefore, another object of the invention to incorporate in the diffuser improved means for easy and practical throttling of the volume of the discharge and for adjusting the ratio of the discharge opening to the neck area so that the unit may be employed in connection with neck openings of various sizes without changes in the design.

A further object is to provide a diffuser of simple and inexpensive design admitting of easy assembly to neck openings of various sizes and which permits easy and immediate adjustment of the angle of deflection of the discharge as well as independent adjustment of the cross-sectional area of the discharge opening.

Other objects and advantages inherent in the invention will become apparent from the following specification and accompanying drawings, which disclose by way of example a preferred embodiment together with a possible modification.

In the drawings:

Figure 1 is a schematic view of a series of diffusers according to the invention arranged along the ceiling and connected to a supply duct.

Figure 2 is a vertical section of a single diffuser embodying means for adjusting the direction of the discharge as well as means for adjusting the cross sectional area of the discharge opening.

Figure 3 is a bottom plan view.

Figure 4 is a vertical section of a modification, and

Figure 5 is a view taken along the line 5-5 of Figure 4.

Throughout the drawings the same reference characters are used to indicate the same or analogous parts.

Referring in greater detail to the drawings, a series of diffuser units generally indicated at A are set into the ceiling B and connected to the supply duct C.

Each diffuser unit comprises an outer dome or casing generally indicated at 10 having a shoulder portion 11, an annular or perimetrical deflector portion 12 and a dished rim portion 13. The latter engages the ceiling and thus spaces the lower edge or surface 14 from the under-surface of the ceiling. This latter arrangement protects the ceiling against smudge from the discharged air or other ventilating medium. The opposite end of the casing terminates in a neck or collar portion 15, which is connected to the neck opening 16 of the supply duct by means of the adaptor piece 17. It will be understood, however, that the adaptor piece may be dispensed with if the collar of the casing and the neck opening of the duct are of the same diameter.

The inner assembly comprises a pair of deflector members 18 and 19, which normally are spaced from one another to define a discharge passage 20 therebetween. The member 18 is provided with a neck or tubular portion 21, which may be reciprocated within the collar portion 15 of the outer casing, and thus forms a continuous

conduit from the supply duct to the discharge opening.

The deflector members 18 and 19 are adjustably spaced from one another by means of the screw-threaded bolts 22 which are journaled in the rim of the deflector member 19 and pass through the nuts 23, which latter are fixed to the member 18. An opening 24 is provided in the shoulder 11 of the casing in order to accommodate the extension of the bolts 22. For sizes up to and including the standard 12" size, three bolts are preferred, which are spaced 120 degrees apart.

It will thus be seen that the cross sectional area of the discharge opening 20 can be varied as indicated in the dotted lines simply by turning the head 25 of the bolts 22. The lock nut 26 serves to maintain the members 18 and 19 in their adjusted position.

The cross sectional area of the discharge port should be such that the discharge velocity is not less than one thousand (1000) feet per minute. At this velocity the resistance of the discharge opening to the flow will be sufficient to cause substantially uniform distribution and velocity at all points. Naturally, the cross sectional area of the discharge opening must also have a certain ratio to the neck opening of the supply duct in order to produce the desired velocity. Therefore, when a unit is installed which has a neck or collar diameter different from that of the supply neck, the discharge opening must be adjusted accordingly, and the greater the range of adjustment, the greater will be the number of different neck sizes to which the unit may be adapted.

It will be noted that the adjustability or throttling in the invention is limited only by the thickness of the lock nut 26, and it has been found that the discharge opening may be throttled as much as 85% of full opening by using the embodiment shown in Figure 2. Because of the wide range in throttling, a unit according to the invention of a certain standard size can be installed practically and economically in a supply duct having neck openings of several other standard sizes.

The conventional diffuser units usually range in sizes from a 4" diameter neck to a 48", although the sizes 4", 5", 6", 7", 8", 9", 10", 11", 12", 14", 16", 18", 20", 22", and 24" are the most popular. By reason of the invention these fifteen standard sizes can be reduced to six at the most, and even to a lesser number, without sacrifice in performance and practicability. Thus, a 12" stock size unit can easily be adjusted to the requirements of the conventional 9", 10", 11" and 12". As a matter of fact, a larger diffuser opening than the neck opening of the duct has been found to produce greater uniformity of flow due to the reduced neck velocity and consequent pressure loss.

The inner assembly comprising the deflecting members 18 and 19 are movably mounted within the outer casing 10 by means of the screw-threaded bolts 27, which are journaled in the rim of the deflecting member 19. These bolts 27 equal in number the bolts 22, with which they alternate, and are spaced 120 degrees apart. They extend through the hole 28 in the rim of the member 18 and engage the nuts 29, which are fixed about the shoulder portion 11 of the outer casing 10.

It will be seen that the inner assembly defining the discharge opening 20 can be moved or reciprocated within the casing simply by turning

the head 30 of the bolts 27. The lock nut 31 serves to lock the assembly in its adjusted position.

When the inner assembly is adjusted in the position indicated in full lines in Figure 2, the discharged stream of air or other medium will impinge against the interior surface of the deflector portion 12 and, consequently, will be deflected at a downward angle. As the inner assembly is moved downward, the angle of deflection will decrease, and when the rim of the member 18 is in alignment with the surface 14 of the casing, the discharge direction will be substantially horizontal.

In the embodiment illustrated the deflector surface 12 has been proportioned with respect to the cross sectional area of the discharge passage 20 to give a normal angle of deflection of 25 to 30 degrees from the horizontal when the diffuser is installed flush with the ceiling. If suspended in space from the duct, the angle of deflection naturally would be somewhat different and which would require adjustment of the discharge passage with respect to the deflector surface. It will be understood, however, that the depth and contour of the deflector portion 12 may be varied so that the range of adjustment may extend from a substantially vertical discharge to a substantially horizontal one without departing from the spirit of the invention. Such extreme range of adjustment has been found advisable where great heights are involved, such as hangars and airplane assembly plants.

In the modification shown in Figures 4 and 5, the deflector member 18' is provided with an annular or perimetrical projection 32, which is adapted to contact the surface 33 of the deflector member 19'. This construction makes it possible to close the discharge passage 20' completely. Such complete closure is sometimes desirable as experience has shown that in laying out a system of diffusers there may be areas, which, due to possible future change in space requirements, may not require forced ventilation.

The deflector members 18' and 19' are spaced apart from one another and the throttling is accomplished by the same means as those shown in Figures 2 and 3, but the means for varying the angle of deflection are different. The latter comprise a central screw-threaded spindle 34 which is journaled in member 19' by means of the knob 35 and the washer 36 and engages the screw-threaded hub 37. The latter in turn is held stationary in fixed position by means of the arms 38 forming a spider riveted or otherwise fixed to walls of the collar portion 15 of the outer casing 10. The knob 35 is keyed to the spindle by means of the set screw 39.

It will be seen that the angle of deflection of the discharge may be varied simply by turning the knob 35, which operation will move the inner assembly as indicated by the full lines and the broken lines, respectively, in Figure 4 of the drawings.

It should of course be understood that the foregoing description is not given by way of limitation. On the other hand, the invention may lend itself to a variety of expressions within the scope of the appended claims.

What is claimed is:

1. A diffuser for diffusing the conditioning medium from a supply duct comprising a tubular member communicating with said supply duct, a casing having an outwardly flaring deflector surface connected to said tubular member, a pair of deflecting members, means for suspending said deflecting members in spaced relationship from

said casing so as to define a discharge passage between said members, the innermost of said deflector members having a tubular portion telescopically engaging said tubular member, said suspension means being adjustable so as to move said deflecting members axially with respect to said deflector surface.

2. A diffuser for diffusing the conditioning medium from a supply duct comprising a tubular member communicating with said supply duct, a casing having an outwardly flaring deflector surface connected to said tubular member, a pair of deflecting members, means for suspending said deflecting members in spaced relationship from said casing so as to define a discharge passage between said members, the innermost of said deflector members having a tubular portion telescopically engaging said tubular member, said suspension means being adjustable so as to move said deflecting members axially with respect to said deflector surface and also being adjustable so as to provide relative movement between said deflecting members.

3. A diffuser for diffusing the conditioning medium from a supply duct comprising a tubular member communicating with said supply duct, a casing having an outwardly flaring deflector surface connected to said tubular member, a pair of deflecting members, means for suspending said deflecting members in spaced relationship from said casing so as to define a discharge passage between said members, the innermost of said deflector members having a tubular portion telescopically engaging said tubular member, and means for jointly moving said deflecting members axially with respect to said deflector surface.

4. A diffuser for diffusing the conditioning medium from a supply duct comprising a tubular member for communication with said supply duct, a casing having an outwardly flaring deflector surface connected to said tubular member, a pair of deflecting members, means for suspending said deflecting members in spaced relationship from said casing so as to define a discharge passage between said members for discharging the conditioning medium against said deflector surface and to be deflected thereby, the innermost of said deflector members having a tubular portion telescopically engaging said tubular member, said suspension means being adjustable so as to provide relative movement between said deflecting members whereby to vary the cross sectional area of said discharge passage.

5. A diffuser for diffusing the conditioning medium from a supply duct comprising a tubular member communicating with said supply duct, a casing having an outwardly flaring deflector surface connected to said tubular member, a pair of deflecting members, means for suspending said deflecting members in spaced relationship from said casing so as to define a discharge passage between said members, the innermost of said deflector members having a tubular portion telescopically engaging said tubular member, and means for jointly moving said deflecting members axially with respect to said deflector surface, said last mentioned means including a spindle journaled in the outermost of said deflecting members and extending through said tubular member, a hub for said spindle mounted in said tubular member.

6. A diffuser for diffusing the conditioning medium from a supply duct comprising a tubular member communicating with said supply duct, a casing having an outwardly flaring deflector sur-

face connected to said tubular member, a pair of deflecting members, means for suspending said deflecting members in spaced relationship from said casing so as to define a discharge passage between said members, the innermost of said deflector members having a tubular portion telescopically engaging said tubular member, means for jointly moving said deflecting members axially with respect to said deflector surface, said

last mentioned means including a spindle journaled in the outermost of said deflecting members and extending through said tubular member, a hub for said spindle mounted in said tubular member, said suspension means being adjustable so as to provide relative movement between said deflecting members whereby to vary the cross sectional area of said discharge passage.

GEORGE S. DAUPHINEE.

CERTIFICATE OF CORRECTION.

Patent No. 2,369,119.

February 13, 1945.

GEORGE S. DAUPHINEE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, first column, line 69, claim 1, for the words "diffuser of" read --diffuser for--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 7th day of August, A. D. 1945.

Leslie Frazer

(Seal)

Acting Commissioner of Patents.

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