This invention relates to improvements in distributing devices or diffusers for air, gas and the like and more particularly to a volume control mechanism or throttling damper for such a device.

One of the objects of the invention is to regulate the volume of the discharged air or gas without affecting the uniform diffusion and without reducing the peripheral velocity of the flow.

Another object is to provide a throttling damper of simple and inexpensive design admitting of easy assembly into the neck of the diffuser and which can be operated instantly to vary the area of the peripheral passages.

A further object is to provide a deflector assembly for a diffuser embodying the volume control mechanism or damper, which easily can be connected and disconnected as a unit.

Still another object is to provide a throttling damper which will offer a minimum of resistance to the air or gas stream when fully open.

A still further object is to provide a diffuser having means to throttle the peripheral discharge area and at the same time permit adjustment to narrow the angle of diffusion.

Other objects and advantages inherent in the invention will become apparent from the following specification and the accompanying drawings, which disclose by way of example an embodiment of the inventive concept.

In the drawings:

Figure 1 is a vertical section of a diffuser embodying a throttling damper according to the invention and of the adjacent portions of the supply duct and the ceiling.

Figure 2 is a bottom plan view with a portion broken away.

Figure 3 is a section taken along the line 3—3 of Figure 1.

Figure 4 is a schematic view of a series of diffusers arranged along the ceiling and connected to a supply duct.

Figure 5 is a fragmentary top plan view of one of the diffusers and adjacent portion of the supply duct shown in Figure 4.

Throughout the drawings the same reference characters indicate the same or analogous parts.

In a distributing system for air or gas comprising a number of diffusers arranged along the ceiling of the room, as shown in Figure 4, it is found invariably that some of these diffusers are favored with respect to its quota of air or gas, and thus will supply more than its allotted amount. Furthermore, the pressure drop increases progressively towards the end of the system with a consequent decrease in discharge velocity or nozzle speed.

For this reason it is desirable or almost necessary to combine a throttling damper with the diffuser. In some cases these dampers are required to effect not more than 30% shut-off for balancing the system, but in others the requirements call for a full shut-off when necessary.

In the majority of cases the diffusers are set into the ceiling and substantially flush with the undersurface thereof. For this reason the diffuser damper combination must admit easy access to the damper for inspection, repair or adjustments and render the operating mechanism readily accessible.

The tendency has been to incorporate such a throttling damper in the diffuser design to throttle the flow at its entrance into the neck of the diffuser or to throttle the flow during its passage through the neck.

The majority of dampers heretofore used are of the so-called poppet type. This type embodies a flat valve disc carried by an adjustable stem, which in open position rests above the diffuser neck to provide an entrance opening from the supply duct, and which may be closed against the neck opening to restrict the inlet.

Other dampers are of the drum type, which usually comprises a rotatable drum, which can be turned within a stationary drum, and both of which are provided with registering slots by means of which the entrance opening can be varied. These drums are generally, mounted above the diffuser neck.

Still others comprise a pair of superimposed, radially slotted discs mounted within the diffuser neck, and which can be turned with respect to one another to vary the area of the slot openings.

All of the aforesaid throttling means disregard the high essential constant peripheral outlet velocity or nozzle speed, which is the principal feature of this type of diffuser. In order to accomplish the intended purpose, the diffuser must be so designed that the air or gas will be discharged at substantially uniform velocity throughout the throttling range. Furthermore, the discharge velocity or nozzle speed must be sufficiently high to develop an aspirating effect that will cause the room air to be drawn upwardly to the diffuser and become mixed there with the primary stream.

The throttling effect of the aforementioned types of conventional dampers reduces the flow velocity of the peripheral passage. Thus the
aspirating effort of the discharge stream is seriously lessened.

It is, therefore, the particular purpose of the present invention to overcome the aforementioned objections. This can be done by providing a cylindrical skirt or ring damper within the neck portion of the diffuser, which damper can be lowered and raised to vary the area of the discharge openings between the spaced, flared deflecting members or cones. In greater detail to the drawings, the diffuser generally designated at A is set into the ceiling B and is connected to the supply duct C.

The diffuser element per se is of known type and comprises a neck portion 10, which is connected to a collar 11 defining the duct opening 12. The neck portion is secured to the collar by means of the screw 13. The hollow frusto-conical diffuser casing 14 extends from the neck portion and engages the underside of the ceiling. It is preferably provided with a shoulder 15 against which the air stream will impinge so as to be slightly deflected thereby, and thus the outward flow of the current will be spaced from the ceiling. In this manner ceiling damage is prevented.

The frusto-conical diffuser casing 14 is also provided with a shoulder 16, the purpose of which will hereinafter be explained.

The inner assembly or deflector assembly comprises a pair of hollow frusto-conical members 17 and 18, which are suspended in spaced, nested relationship from the diffuser casing 14 by means of the hooked suspension arms 19, which are carried by the member 17 and engage the suspension bolts 20. These bolts are mounted in the aforementioned shoulder 16 of the diffuser casing by means of the nut 21. The suspension arm 19 is secured to the bolt 20 between the lock nuts 23 and the bolt head 22. Thus the entire deflector assembly can be disengaged as a unit simply by loosening the lock nuts 23 sufficiently to permit the arms 19 to be disengaged from the bolts 20.

It will be understood that by turning the suspension bolts 20 the entire deflector assembly can be raised or lowered with respect to the diffuser casing. Thus by raising the deflector assembly the deflection of impingement against the shoulder 15 will be increased which will result in an increased tendency to deflect the discharge downwardly. This downward deflection is desirable when warm air is discharged and the opposite is true when cold air is discharged.

The innermost member 18 is connected in spaced nested relationship to the member 17 by means of the bolt 24 and the spacer ring 25.

Thus, the outer diffuser casing 14, together with the deflector members 17 and 18 defines the discharge passages 26 and 27. It will be understood, however, that the invention is not necessarily limited to two deflecting members. They may be reduced to only one, or, on the other hand, increased to a greater number than two.

The member 18 has a flat surface, which is provided with a bearing defined by the abutment 29 and the washer 30 in which the spindle 31 is journaled. The spindle may be turned by means of the knob 32 located within the member 18 and below the washer 30.

The spindle 32 is engaged by the hub 33 having arms 34. The hub is preferably of cast metal, and in the arms of which grooves are formed during the casting operation for anchoring the insert pieces 35. These latter pieces serve as attachments for the equalizing baffles 36, which at the other end are welded or otherwise secured to the inside surface of the cylindrical damper 35, as for example, by means of the brackets 37. The insert pieces are necessary because of the fact that the equalizing baffles 36 are preferably of iron and, therefore, cannot be welded directly to the cast metal hub. Thus, the equalizing baffles 36 together with the insert pieces 35 and the brackets 37 serve as spacers for the damper cylinder 38.

The cylindrical damper 38 has a flaring portion 39, which is substantially parallel to the deflecting surface of the casing 14, and which normally is in registry with the shoulder 16. This flaring portion serves as an additional deflecting surface for the air stream.

A second damper cylinder 40 may be suspended from the equalizing baffles by means of the straps 41. This second damper cylinder has a slightly shorter diameter than the interior opening of the passage 27. It will be understood, however, that this second damper cylinder is not a necessary element of the invention, except in cases when it is required to provide complete closure of the deflector outlet.

The damper cylinder 38 is restrained from rotary movement by means of a guide yoke comprising a pair of bars 42, one on each side of one of the equalizing baffles 36. These bars are spot welded or otherwise secured to the member 17, and are interconnected by means of the bolt 43 and the nut 44, which also serves as a step for limiting the upward movement of the equalizing baffles and the damper cylinder.

The upper portion of the damper cylinder 38 may be provided with a groove 45, defined at the upper edge by the bead 46, into which may be inserted the packing ring 47 if desired.

In order to provide complete closure of the discharge passages, the damper cylinder may be provided with slots 48 which register with the suspension arms 19 so as to permit full travel across the opening.

It will be understood from the foregoing description that the air or gas volume can be accurately and instantly regulated and the discharge passages proportionately throttled so as to maintain a sufficiently high discharge velocity simply by turning the knob 32 and the spindle 31. This operation moves the cylinder damper in the discharge opening to vary the area thereof from fully open to fully closed.

It will be understood that the invention has been described by way of example and not by way of limitation. On the other hand, it may lend itself to a variety of expressions within the scope of the appended claims.

What is claimed is:

1. In a diffuser having a neck portion for connection to a supply duct and a series of hollow frusto-conical deflecting members connected to said neck portion in spaced, nested relationship to define discharge passages, throttling means comprising a cylinder damper having imperforate side walls telescopically engaging the walls of said neck portion and movable within said frusto-conical members to vary the area of the openings of said discharge passages, and means for moving-said damper.

2. The combination of a diffuser having a neck portion for connection to a supply duct and a deflecting casing extending from said neck portion; of a deflector assembly for
removable connection to said diffuser, said deflector assembly comprising at least one flaring deflecting member for arrangement in superposed relationship with respect to said discharge passage therebetween a passage having a communication with said supply duct, a spindle adjustably connected to said deflecting member, a cylinder having perforate side walls supported by said spindle telescopically engaging the walls of said neck portion to move within said discharge passage and for normal disposal within said neck portion, and means for adjusting said spindle to move said cylinder to vary the cross-sectional area of the opening of said discharge passage.

3. A diffuser for diffusing the conditioning medium from a supply duct comprising a tubular member for communication with said supply duct, a casing flaring outwardly from said tubular member, at least one outwardly flaring deflecting member suspended from said casing so as to define a flaring discharge passage between said casing and said deflecting member, said passage having a communication with said tubular member, and means for moving said tubular damper with respect to said discharge passage toward and away from said deflecting member to vary the cross sectional area of the opening of said discharge passage.

4. A diffuser comprising an outwardly flaring casing having a tubular neck portion for connection to a supply duct, at least one outwardly flaring deflecting member suspended from said casing so as to define a flaring discharge passage between said casing and said deflecting member, said casing having a communication with said neck portion, and means for moving said tubular damper with respect to said discharge passage toward and away from said neck portion to vary the cross sectional area of the opening of said discharge passage.

5. A diffuser for diffusing the conditioning medium from a supply duct comprising a tubular member for communication with said supply duct, a casing flaring outwardly from said tubular member, and means for moving said tubular damper with respect to said discharge passage toward or away from said member to vary the cross sectional area of the opening of said discharge passage.

6. A diffuser comprising an outwardly flaring casing having a tubular neck portion for connection to a supply duct, at least one outwardly flaring deflecting member suspended from said casing so as to define a flaring discharge passage between said casing and said deflecting member, said passage having a communication with said neck portion, and means for moving said tubular damper with respect to said discharge passage toward or away from said member to vary the cross sectional area of the opening of said discharge passage.

7. A diffuser for diffusing the conditioning medium from a supply duct comprising a tubular member for communication with said supply duct, a casing flaring outwardly from said tubular member, at least one outwardly flaring deflecting member suspended from said casing so as to define a flaring discharge passage between said casing and said deflecting member, said passage having a communication with said tubular member, and means for moving said tubular damper with respect to said discharge passage toward and away from said deflecting member to vary the cross sectional area of the opening of said discharge passage.

8. A diffuser for diffusing the conditioning medium from a supply duct comprising a tubular member for communication with said supply duct, a casing flaring outwardly from said tubular member, at least one outwardly flaring deflecting member suspended from said casing so as to define a flaring discharge passage between said casing and said deflecting member, said passage having a communication with said tubular member, and means for moving said tubular damper with respect to said discharge passage toward and away from said deflecting member to vary the cross sectional area of the opening of said discharge passage.

9. A diffuser for diffusing the conditioning medium from a supply duct comprising a tubular member for communication with said supply duct, a casing flaring outwardly from said tubular member, and means for moving said tubular damper with respect to said discharge passage toward and away from said deflecting member to vary the cross sectional area of the opening of said discharge passage.

10. The combination with a diffuser having a tubular port for communication with a supply duct and a casing flaring from said tubular port; of a deflector assembly for removable connection to said casing, said deflector assembly comprising at least one deflecting member operatively engaging said tubular member, said passage having a communication with said neck portion, and means for moving said tubular damper with respect to said discharge passage toward and away from said member to vary the cross sectional area of the opening of said discharge passage.
flecting member to vary the cross sectional area of the opening of said discharge passage.

11. The combination with a diffuser having a tubular portion for communication with a supply duct and a casing flaring from said tubular portion; of a deflector assembly for removable connection to said casing, said deflector assembly comprising at least one deflecting member for co-operating with said casing to define a passage therebetween, throttling means including a tu-

bular damper having imperforate side walls for telescopically engaging said tubular portion when said deflector assembly is connected, means for moving said damper with respect to said discharge passage toward and away from said deflecting member to vary the cross sectional area of the opening of said discharge, and means to provide relative movement between said casing and said deflecting member.

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