May 2, 1939. M. O. SNEDIKER 2,157,025

VELOCITY CONTROL DAMPER

Filed Aug. 7, 1937

FIG. 1.

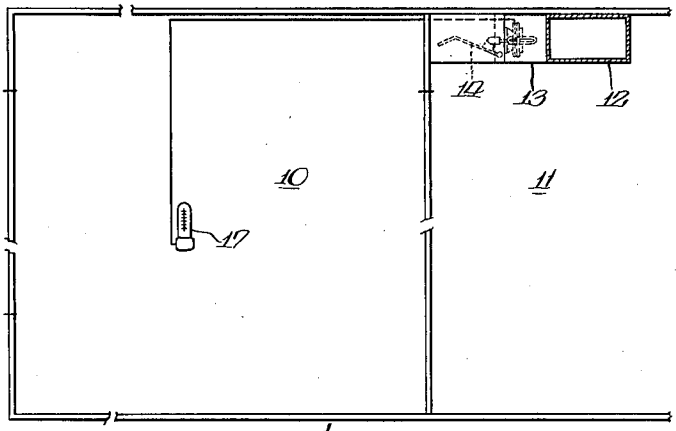


FIG. 2.

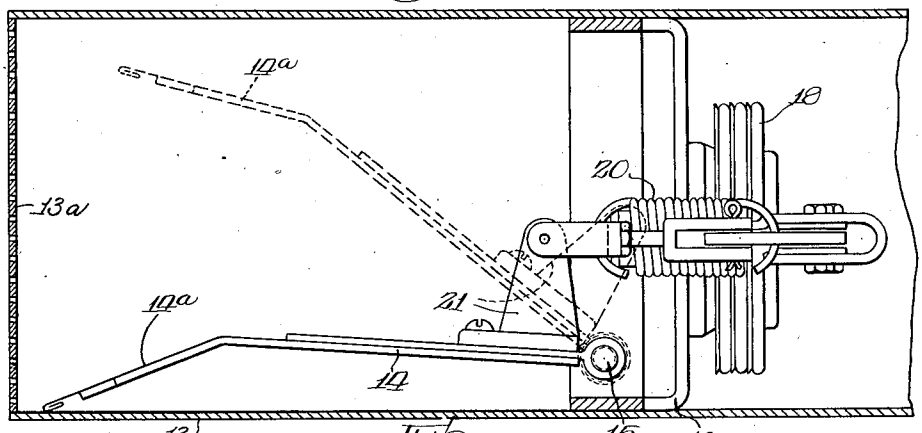
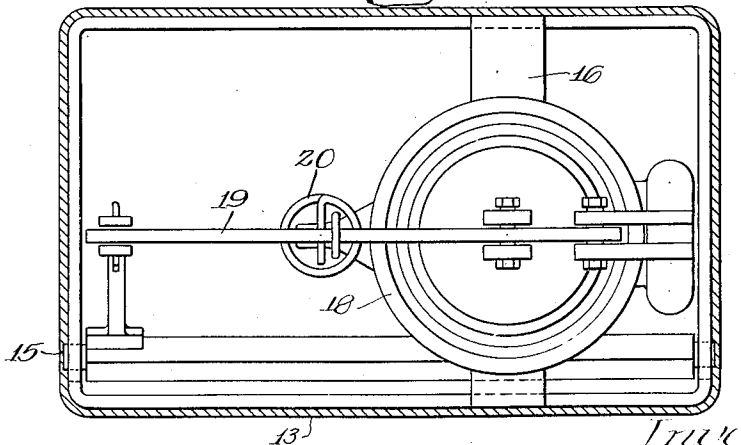


FIG. 3.



Inventor:—
Morton O Snediker
By Thomas & Thomas Attys.

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VELOCITY CONTROL DAMPER

Morton O. Snediker, Chicago, Ill., assignor to The Powers Regulator Company, Chicago, Ill.

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5 Claims. (Cl. 98—37)

My invention relates to a novel form of a damper for use in controlling the delivery of ventilating air to rooms.

In air conditioning, it is customary in hotels, office buildings and similar structures, to provide a main duct extending parallel to the rooms of the building and to provide branch outlets near the ceiling to the respective rooms. In such cases, the delivery of air to the respective rooms is controlled by a damper at or near the outlet from the branch duct into the room, the damper being positioned through the medium of a thermostat in the room.

Inasmuch as space is limited, it is necessary to use a relatively small duct, and, in order to insure the delivery of the necessary volume of air, a relatively high velocity of the air current is necessary. These basic characteristics develop at least two problems that are solved in the arrangement here proposed.

First, due to the relatively high velocity of the entering air, there is a tendency toward drafts that are objectionable to the occupant; and second, there is a decided noise or whistle developed at the damper when it is partly or nearly closed.

As to the first problem I have found that by delivering the air stream into the room at a point directly along the ceiling, the circulation is improved and objectionable drafts are avoided. This result is accomplished by locating the duct at the ceiling in the usual manner and so placing the damper that the outlet is substantially at the ceiling whether it is partly open—which is its normal position—or nearly closed. In other words, by mounting the damper blade on a pivot extending transversely of the duct and located at the bottom thereof and with the blade extending toward the delivery outlet, the air is not only delivered at a point near to the ceiling, but is, due to the inclination of the blade, parallel to the ceiling.

As to the second problem, it has been found that when such dampers are nearly closed, the rush of air through the restricted opening results in a continuous whistle, the intensity and tone of which is dependent on the relative pressures and the size of the aperture through which the air is being delivered. This, of course, only occurs where gradual acting dampers are employed; it would not occur where dampers are fully opened or fully closed at each actuation by the thermostat.

I have discovered that by providing a damper in the branch duct, mounted for oscillation on a pivot transverse to the duct and arranged with its free end toward the delivery side, I am able to avoid the objectionable noises referred to, by bending the free end of the damper so that a substantial portion,—approximately one-third of the length of the damper,—is deflected backwardly or downwardly from the plane of the remainder of the damper. Thus, when the damper is practically closed, as shown in Fig. 2 in dotted lines, the damper serves to provide two converging spaces, the smaller or upper of the two spaces converging at a less abrupt angle than the larger space.

My understanding of the reason why the desirable result is accomplished is this; as the body of moving air is caused to change its direction by the first inclined plane of the damper, there is a consequent turbulence as the diagonal stream of air meets the straight moving stream and this turbulence is neutralized in the more gradually restricted space at the outer end of the damper with the result that as the air emerges from the orifice, the entire body of air is moving in substantially parallel lines, without excessive turbulence. It is, therefore, discharged over the lip of the damper without setting up vibrations or pulsations of high frequency that become audible.

I believe it to be unimportant whether the bent end of the damper lies substantially parallel with the upper wall of the duct when substantially closed, or at an angle thereto, as in the form illustrated; the important element is believed to be the provision of a section of the damper in which the angularity of the blade with respect to the wall of the duct is lessened, in order to provide an area within which the turbulence of the air currents is neutralized.

My invention will be more readily understood by reference to the accompanying drawing, in which:

Fig. 1 is a diagrammatic view showing the manner of installing the regulating device of my invention;

Fig. 2 is a side elevation thereof, with the duct in section, showing the damper blade in fully opened position and in dotted lines in nearly closed position, and;

Fig. 3 is an end elevation.

In the drawing I have illustrated a room 10 and a space 11 adjacent to the room, such as a hall or other passageway. Within the space 11 I provide a duct 12 which may correspond to a manifold with a branch 13 extending from the duct into the room at a point near the ceiling thereof.

Within the branch 13 I provide the damper and

operating mechanism thereof. The damper blade 14 is mounted on a transverse horizontal pivot pin 15 seated in a frame 16 and located at a point near the lower wall of the branch. The damper blade 14 is constructed in two planes, the outer end 14a being bent to lie at an obtuse angle to the main portion, substantially one-third of the length of the blade constituting the offset portion. I have found that by so shaping the blade and by mounting the damper with its free end extending toward the delivery of the branch duct, I am able to avoid the whistling noises that have been found to occur where plain flat dampers are used. The desirable result is believed to follow, because when nearly closed, as shown in dotted lines in Fig. 2, the air is caused to change direction rather abruptly and then before being discharged through the restricted space, the air currents are in effect, straightened out, thereby overcoming the turbulence that would be inherent in the use of a damper of the ordinary shape.

This has a further advantage in that the air which in warm weather will be colder than that within the room, will be caused to travel in a straight line along the ceiling of the room for a considerable distance. Where there is turbulence and disturbance at the discharge point, the forward travel of the air is decreased and there is a tendency for cold air to immediately drop, thus causing drafts within the room.

A common form of operating means for the damper consists in a thermostat 17 within the room, suitably connected to a motor 18 mounted on the frame 16 and connected by means of a lever 19 acting against a spring 20 to a bracket 21 on the damper. Temperature conditions in the room are reflected in the operation of the thermostat and the consequent adjustment of the damper blade to admit more or less of the temperature modifying air.

I consider it unimportant whether the damper blade is formed in planes as shown, the only essential being that in nearly closed position the angularity of the blade relative to the top wall of the conduit shall be lessened. It is, of course, desirable that the lip at the discharge edge of the damper be rounded and that other parts of the mechanism that will be contacted by the air be suitably rounded.

I claim:

1. In ventilation apparatus, the combination of means providing a duct terminating at a point adjacent to the ceiling of a room and arranged to deliver air horizontally into the room, a damper in the duct, said damper being mounted to swing on a pivot extending horizontally transverse of the duct and with the free end of the damper extending toward the outlet, and gradually-acting thermostatic means for positioning said damper.

2. In combination, means providing a duct arranged to enter a room adjacent to the ceiling thereof, a damper in the duct near its point of discharge into the room, the damper blade being mounted on a horizontal transverse pivot located at the bottom of the duct and with its free end extending toward the duct outlet and a gradually-acting thermostat for positioning the damper.

3. In combination, means providing a duct arranged to enter a room adjacent to the ceiling thereof, a damper in the duct near its point of discharge into the room, the damper blade being mounted on a horizontal transverse pivot located at the bottom of the duct and with its free end extending toward the duct outlet, a substantial portion of the end of the blade being deflected to lie at a less abrupt angle to the upper wall of the duct than the remainder of the blade when the damper is in partly closed position and a gradually-acting thermostat for positioning the damper.

4. In combination, means providing a duct arranged to enter a room adjacent to the ceiling thereof, a damper in the duct near its point of discharge into the room, the damper blade being mounted on a horizontal transverse pivot located at the bottom of the duct and with its free end extending toward the duct outlet, a substantial portion of the outer end of the blade being deflected downwardly to lie at a less angle to the top wall of the duct than the remainder of the blade when the damper is in partly closed position, and a gradually-acting thermostat for positioning the damper.

5. In combination, means providing a duct arranged to enter a room adjacent to the ceiling thereof, a damper in the duct near its point of discharge into the room, the damper blade being mounted on a horizontal transverse pivot located at the bottom of the duct and with its free end extending toward the duct outlet, the blade being shaped to lie in two planes whereby as the damper closes the air stream will enter the room at the top of the duct in a line substantially parallel with the ceiling.

MORTON O. SNEDIKER.