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AIR FLOW INDUCTION AND DIFFUSING NOZZLE

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FIG. 2.

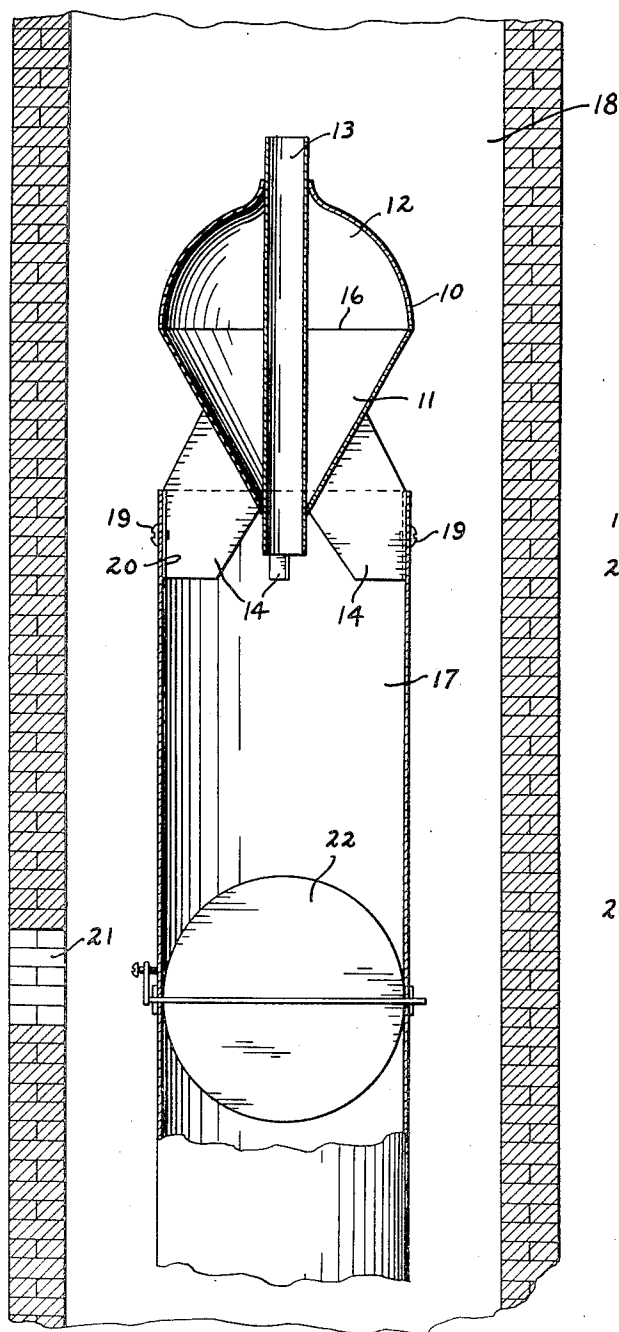


FIG. 1.

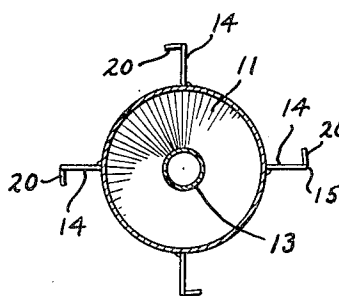
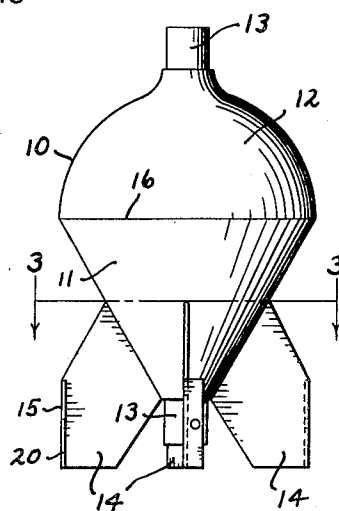


FIG. 3.

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AIR FLOW INDUCTION AND DIFFUSING
NOZZLE

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3 Claims. (Cl. 230-96)

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This invention relates to a nozzle having for its primary purpose the creation by flow of air from a pipe into a flue of an increased draft in that flue together with an intermixing of the incoming air with the air already in the flue and which air is drawn into the flue through some lower opening therein. The invention is to be applied to a heating and ventilating system wherein there is normally supplied to that system a flow of warm air through a duct, and that warm air is entered into a natural draft flue, the flue taking in air from an opening near the floor of the room and discharging the air from another opening above the nozzle which is entered into the flue to induce the flow of air upwardly through the flue and also to intermix the warm air with the flue air as above indicated.

Another primary object of the invention is to provide an extremely simplified structure which may be inserted and fixed in the end of the warm air conduit within the flue itself. A further important advantage of the invention resides in the fact that there are no moving parts required, but to the contrary all parts are stationary.

These and many other objects and advantages of the invention will become apparent to those versed in the art in the following description of one particular form of the invention, as illustrated in the accompanying drawing, in which

Fig. 1 is a view in side elevation of a structure embodying the invention;

Fig. 2 is a view in vertical section through a flue within which the invention is applied; and

Fig. 3 is a horizontal transverse section on the line 3-3 in Fig. 1.

Referring to the drawing, in which like characters of reference indicate like parts in the several views, I form a head generally designated by the numeral 10 to have a lower section which is substantially an inverted conical or conoidal shape. This section is designated by the numeral 11. Then there is an upper section designated by the numeral 12 which is substantially spherical or possibly spheroidal, the under side of which represents the diametrical plane through the sphere form and which coincides in diameter with the upper end of the section 11. That is the section 12 extends upwardly from the section 11.

The two sections 11 and 12 are axially aligned one with the other, and there is a central tube 13 which extends in axial alignment through both the sections 11 and 12, the upper and lower ends of those sections being sealed off against the tube 13. This tube 13 has a length projecting

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downwardly from the section 11, externally thereof, and also has a length extending upwardly externally of the upper section 12.

The lower section 11 has secured thereto a plurality of mounting fins indicated by the number 14, there being four of such fins in the present showing. The external vertical edges 15 of these fins 14 lie within a circle, the diameter of which is equal to or less than the diameter of the juncture circle 16 which is between the upper and lower sections 11 and 12 respectively.

The fins 14 are inserted within the open end of a warm air pipe 17, Fig. 2. This pipe 17 is herein shown as being entered centrally within a ventilating flue 18. The fins 14 are secured to the pipe 17 by any suitable means, herein shown as by screws 19 passed through the wall of the pipe 17 and through flanges 20 provided on the outer ends of the fins 14.

As indicated in Fig. 2, when the structure above defined is secured to the end of the pipe 17, the lower end of the tube 13 will be down within the opening of the pipe 17. The diameter at the line 16 of the head 10 will be substantially equal to the internal diameter of the pipe 17.

Assuming warm air to be flowing vertically upwardly in the pipe 17, that air will discharge outwardly around the surface of the head section 11 to be deflected toward the wall of the flue 18. From thence the air will eddy and flow inwardly and upwardly to be mixed with air in the flue. The flow of the air from the end of the pipe 17 upwardly around the section 11 and over the top section 12 will tend to induce an increased upward flow of air within the flue 18 from below the open end of the pipe 17. This air may be that which is taken from the room to be ventilated and heated, or it may be pulled from some outside source all as may be predetermined. In the form herein shown, there is an opening 21 provided in the wall of the flue 18 primarily for the purpose of adjusting a flow control damper 22 within the pipe 17 in order to control the flow of air upwardly from the head 10 through the flue 18. Air may come through this opening 21, or it may be closed off if desired.

In the flow of air upwardly from the end of the pipe 17 to discharge into the flue 18, a part of the air coming up in that pipe 17 will travel vertically upwardly through the central tube 13 without having been deflected laterally. This central directed flow of air is quite important in securing the proper mixture as well as induced flow of air within the flue 18 from the head 10 and upwardly. After the air starts to

flow past the plane defined by the line 16, the air may assume an increasing volume, which would tend to slow down the flow. However this flow is further induced to continue upwardly by reason of the upwardly flow of air leaving the top end of the tube 13.

The use of the semi-spherical upper member 10 is not by accident nor by whim, but it is employed to perform a very definite object in controlling the flows of two air currents. Normally one would expect to find the semi-spherical member 10 reversed in position in respect to the conical member 11 when considering air flows, because that reversal of positions would be that which would be expected. The minimum resistance to the flow of air upwardly would be had in that reversal of positions. However I am not concerned primarily with the effect of resistance to air flows. The concern is first with the introduction of a definite proportioning of fresh air into a definite volume of used air taken from a room, such as a school class room for example.

In addition to the proper mixing of the air, as well as the total volume discharged from the upper portion of the flue above the diffusing nozzle, there must be that primary factor present of a performance whereby there is silence rather than any noise or whistling action of the air.

The pipe 17 as has above been designated, is a warm air pipe, and conducts air upwardly within the flue 13 at a relatively low rate of speed, or what is known as a low velocity. Significantly, the upper end of the pipe 17 is not flared outwardly in any respect whatsoever, but has an open end of the same diameter as that of the pipe proper.

The rising air in the pipe 17, strikes the conical surface of the element 10 to be deflected outwardly around the outer wall of the flue 13 so that that air will fill in that space around the base of the semi-spherical member 12, and by reason of its upper direction and velocity, will pull air upwardly from the lower portion of the flue 13 along therewith. Now as is well known in the study of air flow over various surfaces, the air in flowing upwardly from the plane of the base of the semi-spherical member 12 designated by the numeral 16 will tend to continue outwardly therefrom, and in so doing will induce or rather create a partial vacuum around over that spherical surface of the member 12 between that plane 16 and the pipe 13 which extends centrally through the upper portion of that surface. In fact, there will be a considerable eddy effect around over this spherical surface all with the final result that some of the air will be pulled inwardly from that annular column tending to rise in the flue 13 from the diametrical portion 16, to not only insure more mixing of the two columns of air, but further to produce that vacuum which is desirable across the mouth of the upper end of the pipe 13. In other words a good ejector action is set up by the very presence of that spherical surface embodied over the end of the conical surface.

By reason of this peculiar construction, I am not only able to achieve that flow of air, but I am able to do so in the absence of any sound or noticeable vibration.

Thus it is to be seen that I have produced a very simple and novel head combining a diffusing and induction action within a vertical flue

whereby warm air may be mixed with cooler air and at the same time speed up flow in the flue itself. While I have herein shown the structure in the one particular form, it is obvious that structural variations may be employed without departing from the spirit of the invention, and I therefore do not desire to be limited to that precise form beyond the limitations which may be imposed by the following claims.

I claim:

1. In an air circulating system including a flue, and an air supply pipe extending into and substantially axially of the flue, a diffusing and ejector head comprising in combination a lower inverted substantially conical section; an upper, substantially semi-spherical section joined at its diametrical plane with the upper end of said conical section; a tube extending axially through both of said sections to have open ends respectively above and below said sections; and means for mounting said head to have the lower end of said tube within said pipe and the lower end of said conical section spaced from the pipe.

2. In an air circulating system including a flue, and an air supply pipe extending into and substantially axially of the flue, a diffusing and ejector head comprising in combination a lower inverted substantially conical section; an upper, substantially semi-spherical section joined at its diametrical plane with the upper end of said conical section; a tube extending axially through both of said sections to have open ends respectively above and below said sections; and means for mounting said head to have the lower end of said tube within said pipe and the lower end of said conical section spaced from the pipe; said mounting means comprising radial fins extending longitudinally of and interposed between said conical section and said pipe.

3. In an air circulating system including a flue, and an air supply pipe extending into and substantially axially of the flue, a diffusing and ejector head comprising in combination a lower inverted substantially conical section; an upper, substantially semi-spherical section joined at its diametrical plane with the upper end of said conical section; a tube extending axially through both of said sections to have open ends respectively above and below said sections; and means for mounting said head to have the lower end of said tube within said pipe and the lower end of said conical section spaced from the pipe; the major transverse diameter of said head not exceeding the internal diameter of said pipe.

BEN CONES.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
92,617	Lecky	July 13, 1869
254,146	Marks	Feb. 23, 1882
288,914	Bannister	Nov. 20, 1883
449,486	Lord	Mar. 31, 1891
574,369	Anderson	Jan. 5, 1897
1,516,047	Lewis	Nov. 18, 1924

FOREIGN PATENTS

Number	Country	Date
3,657	Great Britain	Mar. 1, 1899