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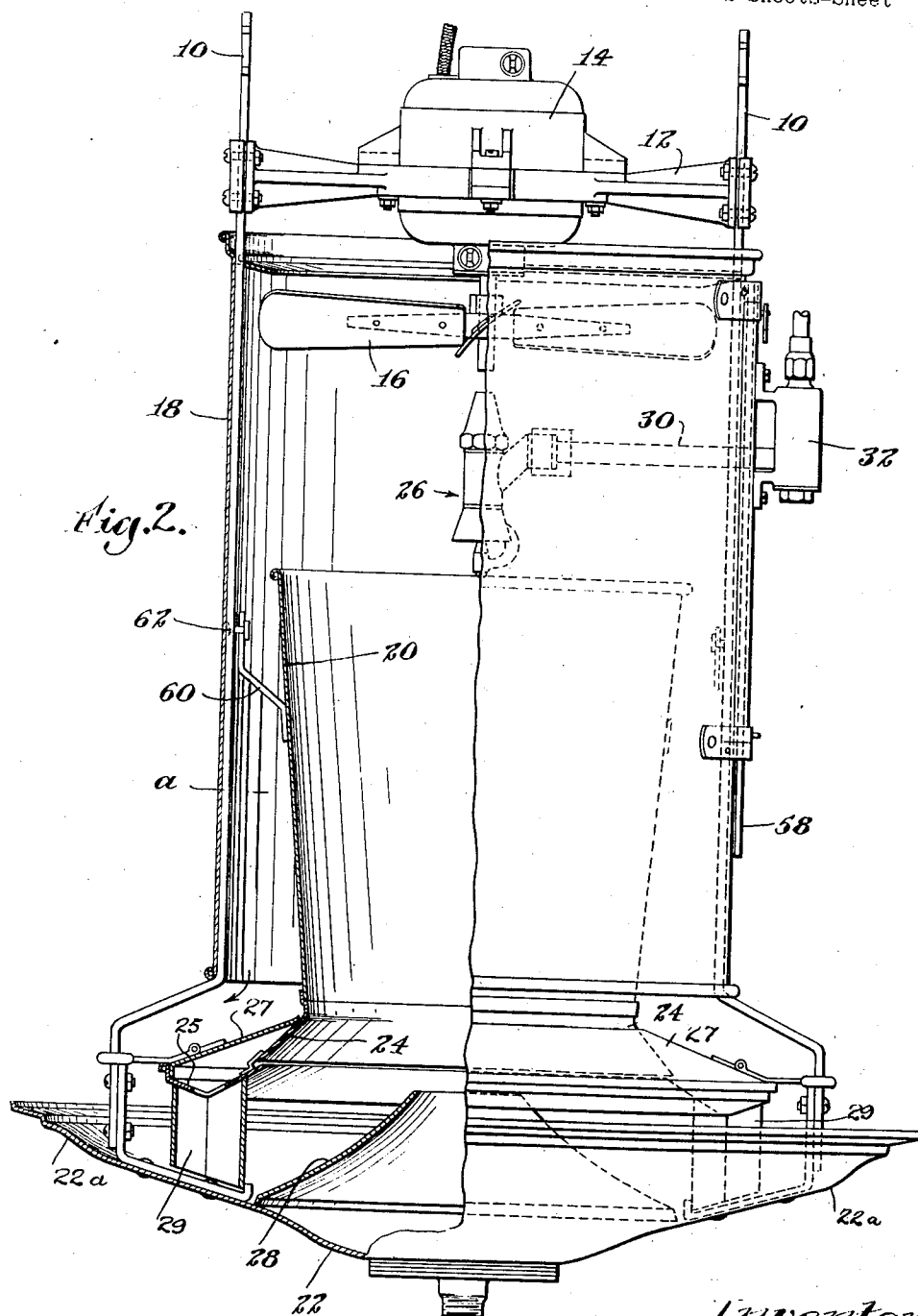
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ATOMIZING NOZZLE

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ATOMIZING NOZZLE

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This invention relates to improvements in atomizing nozzles.

In the art of humidification, it has been common practice to employ a constantly open nozzle to create a so-called cone jet of water within a casing and to pass air through this jet to be moistened. In some cases the current of air is induced by the jet alone, but more often a fan is provided which drives the air past the nozzle and through the water spray. In all such apparatus, the humidifying action is controlled by regulating the water supply, and where the humidifiers are controlled automatically the shutting off and turning on of the water occurs frequently. With the induced draft type this on-and-off action of the water causes no particular difficulty because with the cessation of water flow the air current also stops. But in humidifiers having a fan there has been much trouble due to the very undesirable precipitation of water outside the apparatus at the times when the jet is changing following the shutting off or turning on of the water.

When the nozzle is discharging under normal operating pressure, the jet impinges upon the wall of the humidifier casing and the excess of water is entrapped and carried away in such manner as to prevent any outside discharge of water particles too heavy to be entrained by the air and finally evaporated in the surrounding atmosphere. But as the water pressure falls when the supply is cut off, the jet gradually contracts, strikes the casing wall at lower and lower levels, and ultimately the pan, and then when the pressure is finally down the water drips from the nozzle to the bottom where it splashes and spatters. As a result during contraction of the jet and the drip on the humidifier bottom relatively large particles of water are caught in the air current and thrown out into the atmosphere where they fall upon whatever is below. A like result occurs when the water supply is turned on and the jet begins to form. Such precipitation of water particles is quite undesirable and in some instances, as where delicate fabrics are in process of manufacture, the falling of a single drop of water may cause considerable damage. The avoid-

ance of this evil has been the subject of much consideration by inventors, yet modern apparatus sometimes is faulty in this respect.

Nozzles as heretofore used have also been troublesome because of their tendency to become clogged. The opening of spray nozzles is rather small and it is important that it be kept entirely clean because the presence of any foreign matter in the opening deflects the water and causes it to strike the anvil of the nozzle in such manner as to materially affect the formation of the spray jet. Filters are of course employed in the supply lines, but these are not capable of catching the fine lint and dust that is present in the room of many manufactories and which is drawn into the humidifiers and picked up by water that eventually finds its way back through the supply to the nozzle.

The present invention has a two-fold object, in that it is intended to keep a spray nozzle clean and to close it when the supply pressure falls below a predetermined point and to keep it closed until the pressure is restored to the said point, when it opens automatically. It is a feature that the cleaning and closing occur simultaneously, and since both take place frequently, the nozzle opening is always free from any foreign matter. The improved nozzle of the invention is simple, inexpensive and can be readily installed in humidifiers as at present commonly constructed.

These ends are gained by providing within the nozzle casing a plunger stem whose lower end is adapted to enter the nozzle opening with sufficient tightness of fit to thoroughly clean it. At the opposite end of the stem is a spring tending constantly to force it into the nozzle opening. When the water supply is turned on the water pressure overcomes the force of the spring and holds the stem retracted, but when the supply is shut off and the pressure drops the spring acts to push the end of the plunger into the nozzle opening thereby cleaning it and closing it. By selecting a spring of proper power, the opening and closing of the nozzle can be effected at that particular pressure whereat the jet reaches the wall of

the casing. Both by stopping the flow as this particular pressure is reached after the supply is cut off, and by holding the nozzle closed until this particular pressure is again established, there is no misformation of the jet and no drip. Moreover whatever water is present in the pipe line between the control valve and the nozzle is retained therein thereby enabling the subsequent discharge to be started much sooner than if this water had drained out through the nozzle as heretofore. In consequence the invention provides a self-cleaning nozzle which automatically opens and closes at such times as to insure a desirable jet discharge.

It is intended that the patent shall cover by suitable expression in the appended claims whatever features of patentable novelty exist in the invention disclosed.

In the accompanying drawings:

Figure 1 is an elevation, in medial section, through a nozzle embodying the invention; and

Figure 2 is an elevation of a humidifier employing such a nozzle, the left half of the casings being in section.

Referring to the drawings and more particularly to Figure 2, a well known type of humidifier of double air current type is seen, adapted to be hung from overhead by a pair of hanger straps 10 to which is attached a spider 12 supporting the motor 14 and fan 16. The usual outer and inner cylindrical casings are indicated at 18, 20 respectively, the inner extending down within the outer from mid-height of the outer to a level slightly below the lower end of the outer, where, at 24, the inner casing flares abruptly outward under the outer casing with its bottom edge overlying a V-shaped trough 25. The fan is disposed so as to draw air in at the top of the outer casing and drive it downward, some passing through the inner casing 20 and some through the annular passage *a* between the two casings and against a cover 27 which is set over the circular trough 25 and serves to deflect this air outward.

A spray nozzle 26, constructed in accordance with the present invention, is set on the axis in position for its sprayed discharge to make a conical jet downward toward the walls of the inner casing. The water impinging on the wall of casing 20 drains down into the trough 25 and thence to the pan 22 by way of several depending ducts 29 placed at intervals along the trough. Air from the fan above, passing down through the inner casing, entrains moisture as it goes through the spray. At the bottom this air is turned horizontally outward in all directions by the central deflector 28 which there stands up from the drip pan 22, and then is turned somewhat upward by the flaring of the drip pan's edge 22*a* and is thus thrown together with the dry air currents which have come down from the

fan through the annular passage *a* between the two casings. In normal operation this construction is sufficient to clear the air of all globules of entrained water which are too large to be absorbed by air in the room; but I have found trouble to arise when the jet is being stopped or started. As humidifiers of this type often operate under automatic control with frequent startings and stoppings, this condition occurs many times during a day. Such a throwing of water may be serious and may disqualify the apparatus for certain kinds of workrooms.

By the invention I provide measures to prevent large drops of the spray from reaching that region where the outgoing air has undergone its deflection from vertical to horizontal direction and is about to pass out into the atmosphere, accomplishing this prevention by providing means within the nozzle, and responsive to the pressure conditions therein, for shutting off flow from the nozzle before the pressure falls too low to drive the jet against the wall of the inner casing 20.

The nozzle 26 has a body casing 26*a* (see Figure 1) with inlet 26*b* adapted to be connected to pipe 30 leading from the strainer 32. Screwing into the lower end of this casing is a base 34 having a curved arm 34*a* which carries the anvil 36, here shown as a threaded stem passing through the arm and set close by the outlet opening 34*b* in the base. The approach to this opening is through a tubular extension 34*c* of the base which extends well up into the body casing 26*a*. The lower end of this passageway is a curved tapered surface 34*d* terminating in the short straight walled opening 34*e*.

This upward extension 34*c* of the base has a double purpose. It provides a sort of trap in the body casing 26*a* which serves to catch any particles of foreign matter that may have slipped past the strainer 32 and which are too heavy to float in the water. The extension also provides a relatively long uniform approach to the nozzle opening 34*e*, thus making sure that the discharge from the latter will be smooth and unchanging.

Above this opening, when the nozzle is discharging, stands the reduced end 38*a* of a stem 38 which extends up through the base and body casing into the top 40. The latter screws into the casing and is hollow. In the upper portion of this hollow is housed a coiled spring 42 which seats on the top and also upon a metal washer 44 carried by the stem 38. Below this metal washer is preferably a hard rubber or vulcanite disk 46 and next below this is another metal washer 48. Between the latter and a similar washer 50 is a leather washer or disk 52 of any other material such as sheet packing which enables its edge 52*a* to be turned downward in cup-shape to make yielding contact with the cylindrical wall 40*a* of the top. These several washers and disks

are clamped tightly together by nuts 54, threaded on stem 38.

When the supply pressure is on it acts against the washers and disks on stem 38 causing the latter to stand in its uppermost position with the hard rubber disk 46 seated against a shoulder 40b of the top. This seating of this disk, combined with the tight fit of the cupped edge 52a of the yielding washer or disk 52 against the wall 40a prevents any leakage upward into the spring chamber. Accordingly the full force of the pressure is effective to drive the water out the opening 34b.

If the water supply is turned off, either manually or automatically, the discharge pressure at once falls and if the outlet 34b were to remain open the water would soon strike the anvil 36 with such little force that the jet, instead of reaching the wall of the inner casing, would gradually contract and fall onto the central deflector 28, thereby causing large globules to spatter into the air stream with likelihood of their being blown out into the surrounding atmosphere and then precipitated upon whatever is below. But the present invention prevents this, by means of the stem 38 and spring 42. The latter is selected so that its strength will overcome the water pressure (and the frictional resistance offered by the cupped disk 52) when the pressure has fallen to that point where the jet is just about to contract. When this point is reached the spring forces the stem downward, causing its reduced end to pass into the opening 34b and thoroughly clean it by pushing out any lint or other foreign matter that may have been caught therein. The shoulder 38b on the stem seats on the curved surface 34d of the outlet's approach and immediately cuts off the discharge. There is thus a sudden and complete cessation of flow from the outlet, and consequently there is no opportunity for a slow contraction of the jet with consequent danger heretofore experienced when such deformation of the jet has occurred. There is likewise no dripping or slow drainage of the water through the outlet, on the contrary all the water in the pipe line at the time the control valve is closed and the stem 38 seated, is retained in the pipe and nozzle casing ready for immediate discharge whenever the supply is again turned on.

When this takes place, pressure is rapidly built up in the nozzle and soon overcomes the force of spring 42. Thereupon the stem and associated parts move upward rapidly, again seating the disk 46 on the shoulder 40b of the top. During this upward movement the cupped disk 52 offers little resistance due to the direction of curvature of its edge 52a.

A vent 40c from the spring chamber to atmosphere prevents the formation of any resisting pressure in this chamber. As the

lower end of the stem moves upward the water spurts out the opening 34b against the anvil. If any dirt has been pushed downward out of the opening 34b it may have lodged on the top of anvil 36, in which case the water striking the dirt may be momentarily deflected upward so as to pass over the inner casing 20. In the particular humidifier illustrated herein, the front half of the outer casing 18 can be swung about the axle rod 58 so that the inner casing 20 can also be swung outward for cleaning. In fact this inner casing can be entirely removed by unhooking its supporting brackets 60 from the stub bearings 62, and because of this desirable arrangement the nozzle 26 is located almost above the inner casing 20. During ordinary discharge the cone jet strikes the inner casing below its upper rim but, as suggested above, if any foreign matter happens to remain on the anvil, the water may tend to fly over this rim.

To prevent anything of the sort occurring a guard 64 is provided which clamps between the base 34 and body casing 26a (there being also suitable gaskets 66 at this connection as well as between the casing and the top 40). The skirt of this guard hangs down below the level of the anvil and prevents any undue discharge from flying upward and out of the inner casing. Of course, the dirt on the anvil is almost instantly removed and so it may be said that the moment the stem moves upward the cone jet is formed extending clear to the wall of the inner casing.

I claim:

1. An atomizing nozzle having, in combination, a casing; an inlet thereinto; an outlet therefrom having a conical wall merging into a cylindrical wall; an anvil arranged adjacent said outlet to deflect the discharge therefrom in the form of spray; a chamber within said casing between said inlet and said outlet; and means housed in said chamber and actuated by the pressure therein comprising a stem constructed and arranged to enter said outlet to clean and close it simultaneously, the said stem having a cylindrical portion arranged to make sliding fit with the cylindrical wall of said outlet and having a circular shoulder arranged to seat on the conical wall of said outlet.

2. An atomizing nozzle having, in combination, a body casing with chamber therein having a side inlet and bottom and top openings; a base closing said bottom opening and having a discharge passage with a cylindrical walled portion and a conical walled portion; means carried by said base and arranged adjacent the outlet end of said passage to deflect the discharge therefrom in the form of spray; a top closing the top opening having a hollow constituting a cylinder; a piston in said cylinder having a stem extending into said discharge passage and arranged

to close its outlet, said stem having a cylindrical plunger arranged to make sliding contact with the cylindrical walled portion of the outlet and having a circular shoulder arranged to seat on said conical walled portion; there being means in said top arranged to exert pressure on said piston in opposition to the pressure in said chamber, whereby upon the latter pressure falling below a predetermined degree, the said means will move said piston and stem to close said outlet.

Signed at Providence, Rhode Island, this 6th day of January, 1930.

JOSEPH ARMSTRONG.

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