Dec. 7, 1926. 1,609,841

J. J. SMITH

HUMIDIFYING OR AIR MOISTENING APPARATUS

Filed March 14, 1923

Fig. 1.

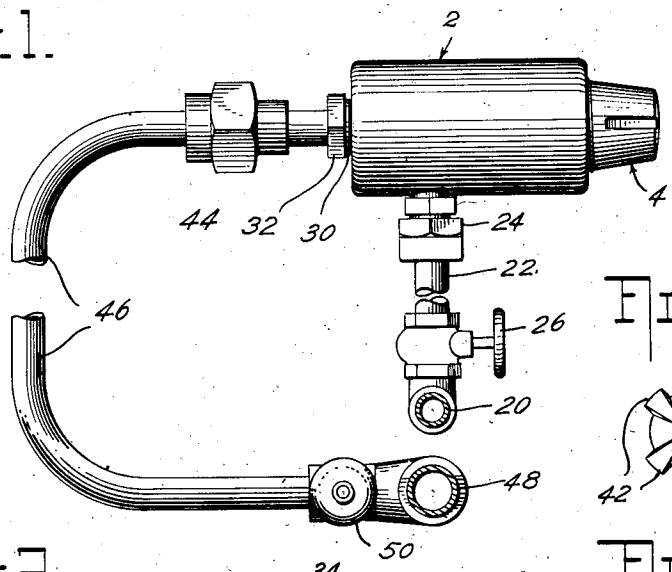


Fig. 3.

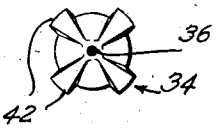


Fig. 2.

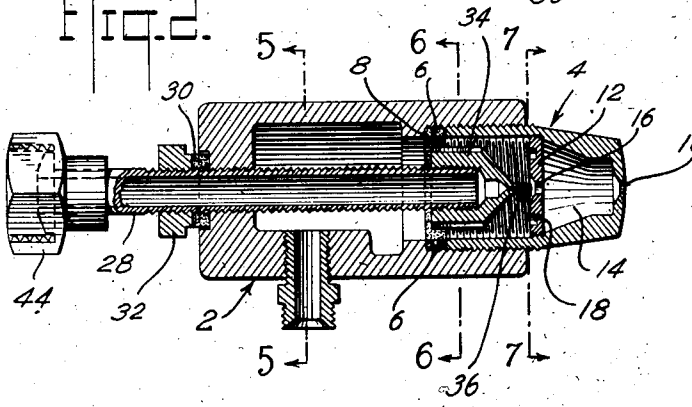


Fig. 4.

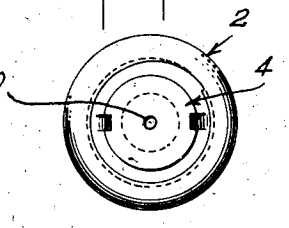


Fig. 5.

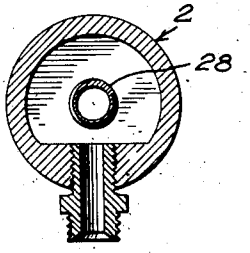


Fig. 6.

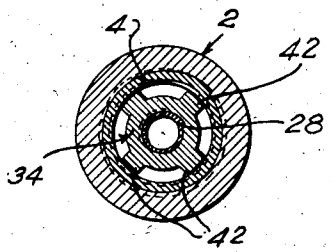
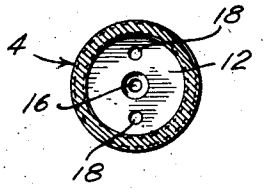


Fig. 7.



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UNITED STATES PATENT OFFICE.

JOSEPH J. SMITH, OF BOSTON, MASSACHUSETTS.

HUMIDIFYING OR AIR-MOISTENING APPARATUS.

Application filed March 14, 1923. Serial No. 625,170.

My invention relates to humidifying or air moistening apparatus, and has special reference to the nozzles of such apparatus.

An object of the invention is to provide a nozzle of this character which is simple in construction, and more economical and efficient in use than those heretofore provided.

Another object of the invention is to provide a nozzle of this character which may be easily assembled and taken apart, and in which the parts thereof may be easily adjusted to meet different conditions.

Another object of the invention is to provide novel and improved means for supporting the nozzle of humidifying or air moistening apparatus in such a manner as to enable it to be bodily adjusted as desired.

The following is a description of my invention, reference being had to the accompanying drawings, in which,—

Figure 1 is a sectional elevation of a portion of a humidifying or air moistening apparatus, with parts broken away to save space, embodying the features of the invention in their preferred form;

Fig. 2 is a detail longitudinal sectional view, partly in elevation, of the nozzle that may be used in the apparatus;

Fig. 3 is a detail end view of a component part of the nozzle;

Fig. 4 is a front end view of the nozzle; and

Figs. 5, 6 and 7 are transverse sectional views taken on the lines 5—5, 6—6 and 7—7, respectively, of Fig. 2.

The humidifying or air moistening apparatus illustrated in the drawings is provided with a nozzle having a cylindrical casing 2 which has its front end open and its rear end closed. A nipple 4 is screw-threaded into the forward end of the casing against a washer 6 that abuts against a shoulder 8 formed on the interior of the cylindrical wall of the casing. The rear end of the nipple 4 is open and its front end wall is provided with a central orifice 10 of relatively small diameter. A disk-like plug 12 is screw-threaded into the rear portion of the nipple 4 to a position substantially midway between the ends of the nipple. The plug 12 forms a partition which, together with the wall of the projecting forward portion of the nipple 4, provides a chamber 14. The inner peripheral wall of the chamber 14 is contracted toward its forward end and the rear portion of the orifice 10 is countersunk. The partition 12 is provided with a central orifice 16 which is in axial alinement with the orifice 10 and is of slightly greater diameter than the latter orifice, the rear portion of this orifice being countersunk. The partition 12 is provided with sockets 18 to enable a socket wrench to be used in screwing it into and out of position. The interior of the casing 2 is in communication with a main compressed air supply pipe 20 through a branch pipe 22 which is provided with a union 24, the outer member of which is screw-threaded into an aperture in the under side of the cylindrical wall of the casing. The branch pipe 22 is also provided with a hand-controlled valve 26.

The rear end wall of the casing 2 is provided with a central aperture through which is screw-threaded a tube 28, the screw-threaded joint between the tube and casing being maintained air tight by means of a packing material 30 and a packing nut 32 screw-threaded on the tube. The forward end of the tube 28 is spaced a distance from the partition 12 and a cap-like nipple 34 is screw-threaded on the end of the tube. This nipple 34 is provided with an orifice 36 which is in axial alinement with the orifices 16 and 10 and is of much smaller diameter than the orifice 16. The outer peripheral surface of the forward portion of the wall of the orifice 36 is cylindrical and of smaller diameter than the orifice 16, and said wall extends up to the rear end of the orifice 16. The portion of the wall of the nipple 34 that surrounds the tube 28 is cylindrical and the portion of the wall between this cylindrical portion and the reduced cylindrical wall of the orifice 36 is tapering. The cylindrical portion of the nipple surrounding the tube 28 is provided with longitudinally extending equally spaced ribs 42 which substantially fit the inner wall of the nipple 4 and taper downwardly from their forward ends toward the cylindrical wall of the orifice in the nipple. The rear end of the tube 28 is connected by a union 44 with a curved U-shaped pipe 46 that leads from a main liquid supply pipe 48 arranged in juxtaposition below and parallel with the air supply pipe 20, the pipe 46 having a hand-controlled valve 50.

When water and air are directed under

suitable pressures into the nozzle through the pipes 46 and 22, respectively, it will be apparent that a fine thread of water will be directed by the nipple 34 centrally through the orifice 16 and that this jet of water will be surrounded by a jet of compressed air as it passes through the orifice which, immediately upon its release in the chamber 14, expands sufficiently to completely fill the chamber and to cause the water and air to mix thoroughly and the water to become more or less vaporized, a turbulent action being set up in the chamber. As the orifice 10 is slightly smaller than the orifice 16, this mixture of air and water is forced through the orifice 10 under considerable pressure with the result that the air in the mixture, expanding with great force immediately upon its release from the nozzle, vaporizes the water to such a fine degree that the atmosphere absorbs every particle without any precipitation or condensation at any temperature experienced where artificial humidification is needed or required.

It has been found that with the use of this nozzle, the maximum degree of vaporization is secured at a minimum degree of pressures of the water and air and hence the device is more economical in use than those heretofore provided. By turning on the air before turning on the water, and shutting off the water before shutting off the air, it will be apparent that no spitting or dripping of the nozzle takes place.

The ribs 42 serve as spacing ribs to insure that the orifice 36 in the nipple 34 shall be in alinement with the orifices 16 and 10, and also as these ribs are equally spaced apart they insure that the compressed air shall be directed uniformly around the fine jet of water as it emerges from the orifice in the nipple 34 and passes through the orifice in the partition 12. The screw-threaded mounting of the nipple 34, the partition 12, the tube 28, and the nipple 4 enables these parts to be minutely adjusted to meet different conditions, the ribs 42 enabling a suitable wrench to be employed to adjust the nipple 34. The screw-threaded mounting and arrangement of the parts of the nozzle enables the nozzle to be easily assembled and taken apart.

In humidifying apparatus of the type of the one described a series of nozzles are usually employed that are connected up and supported by the main air and water supply pipes. When a series of nozzles are thus employed it is of great importance that they shall be capable of being bodily adjusted to different positions so as to secure the maximum efficiency in conditioning the atmosphere of the room in which they are located. Heretofore, the adjustable mounting for the nozzles on the supply pipes has usually consisted of an arrangement of universal joints but, on account of the complication of construction involved and the danger of leakage, such mounting has been found to be objectionable. In the present construction, however, by making the branch pipes 22 and 46 of flexible copper tubes and arranging the under pipe 22 vertically and curving the pipe 46 from the tube 28 at the rear end of the nozzle to the main water supply pipe as shown in Fig. 1, it will be apparent that the nozzle is rigidly supported and may be easily adjusted to any position desired by bending the pipes 22 and 46, the arrangement of these pipes being such that the desired positioning of the nozzle may be accomplished with the minimum degree of bending of the pipes.

As will be evident to those skilled in the art my invention permits of various modifications without departing from the spirit thereof or the scope of the appended claims.

What I claim is:

1. A nozzle of the class described having, in combination, a casing having its rear end closed and its front end open, a liquid supply tube extending through an aperture in the rear end wall of the casing, spaced from the inner wall of the casing and having its inner end spaced from the front end of the casing, a nipple mounted on the inner end of the tube having its orifice of relatively small diameter and having longitudinally extending ribs spaced about its peripheral surface, a second nipple mounted in the front end of the casing having its inner end open and its front end closed, having an orifice in its front end wall in alinement with the orifice in the first mentioned nipple and having a portion of its inner wall substantially fitting said ribs, a partition in the second mentioned nipple and spaced from the front end wall thereof so as to form a chamber in the front end portion of said second mentioned nipple, said partition having an orifice in alinement with the orifices in said first and second mentioned nipples and in communication with the spaces between the ribs on said first mentioned nipple, and an air supply conduit leading into said space between the liquid supply tube and the inner wall of the casing.

2. A nozzle of the class described having, in combination, a casing having a rear end wall and having its forward end open, a nipple mounted for longitudinal adjustment on the forward end of said casing and having an orifice in its outer end wall, a transverse partition mounted within said nipple, adjustable longitudinally thereof, spaced a distance from the outer end wall thereof, and having an orifice therein in communication with the interior of the casing, a liquid supply pipe extending through an aperture in said rear wall of the casing, both of said orifices being of relatively small diameter,

a second nipple mounted on the forward end of said supply pipe having its orifice of smaller diameter than the orifice in said partition and arranged to direct the liquid from the supply pipe through the latter orifice, and a conduit for supplying air under pressure to the interior of said casing.

3. A nozzle of the class described having, in combination, a nipple having an orifice in its outer end wall, a partition within said nipple mounted for adjustment longitudinally thereof, spaced from the outer end thereof and having an orifice therein, said partition and outer end wall of said nipple defining the ends of a closed mixing chamber and both of said orifices being of relatively small diameter, a second nipple having its orifice of smaller diameter than the orifice in said partition and arranged to direct a jet of liquid through the latter orifice and into the space between said partition and the outer end wall of the first mentioned nipple, a conduit for directing liquid through said second mentioned nipple, and means for directing air through the orifice in said partition so as to surround the liquid passing therethrough.

4. A nozzle of the class described having, in combination, a chamber having front and rear end walls each having an orifice of relatively small diameter the two orifices being in alinement and the orifice in said front wall being of less diameter than the other orifice, and means for directing a jet of liquid centrally through the orifice in the rear wall of said chamber and for directing air under pressure through the same orifice and about the jet of liquid, the air and jet of liquid being in intimate contact during their passage through the orifice in said rear wall.

5. A nozzle of the class described having, in combination, a chamber having front and rear walls with orifices in said walls of relatively small diameter the orifice in the front wall being smaller in diameter than the other arranged in axial alinement and having the interior of its longitudinal wall contracted toward its forward end, and means for directing a jet of liquid centrally through the orifice in the rear wall of said chamber and for directing air under pressure through the same orifice and about the liquid passing therethrough, the liquid and air being in intimate contact during their passage through the orifice in said rear wall.

6. A nozzle of the class described having, in combination, a nipple having its front end wall provided with an orifice of relatively small diameter, a partition within said nipple, spaced from the ends thereof and having an orifice slightly larger than the orifice in said front end wall and substantially in axial alinement therewith, a second nipple having an orifice in its forward wall of less diameter than and arranged adjacent to the orifice in said partition and in axial alinement therewith, said second mentioned nipple extending into the first mentioned nipple back of said partition, having longitudinally extending ribs spaced about the rear portion of its outer peripheral surface and arranged substantially adjacent the interior wall of the first mentioned nipple, and having the forward portion of its outer peripheral surface contracted toward its orifice so that the spaces between said ribs are in communication with the orifice in said partition, a conduit for supplying liquid to the second mentioned nipple, and means for directing air through the space between said ribs on the second mentioned nipple.

7. A nozzle of the class described having, in combination, a chamber having front and rear end walls each having an orifice of relatively small diameter, the orifice in said front wall being of less diameter than the other orifice, a nipple having its orifice in alinement with and of less diameter than the orifice in said rear end wall and having its forward end spaced a distance back of the forward end of the orifice in said rear end wall, means for supplying liquid to said nipple whereby it is directed by the orifice therein centrally through the orifice in said rear end wall, and means for directing air under pressure through the orifice in said rear wall and about said jet of liquid.

JOSEPH J. SMITH.