

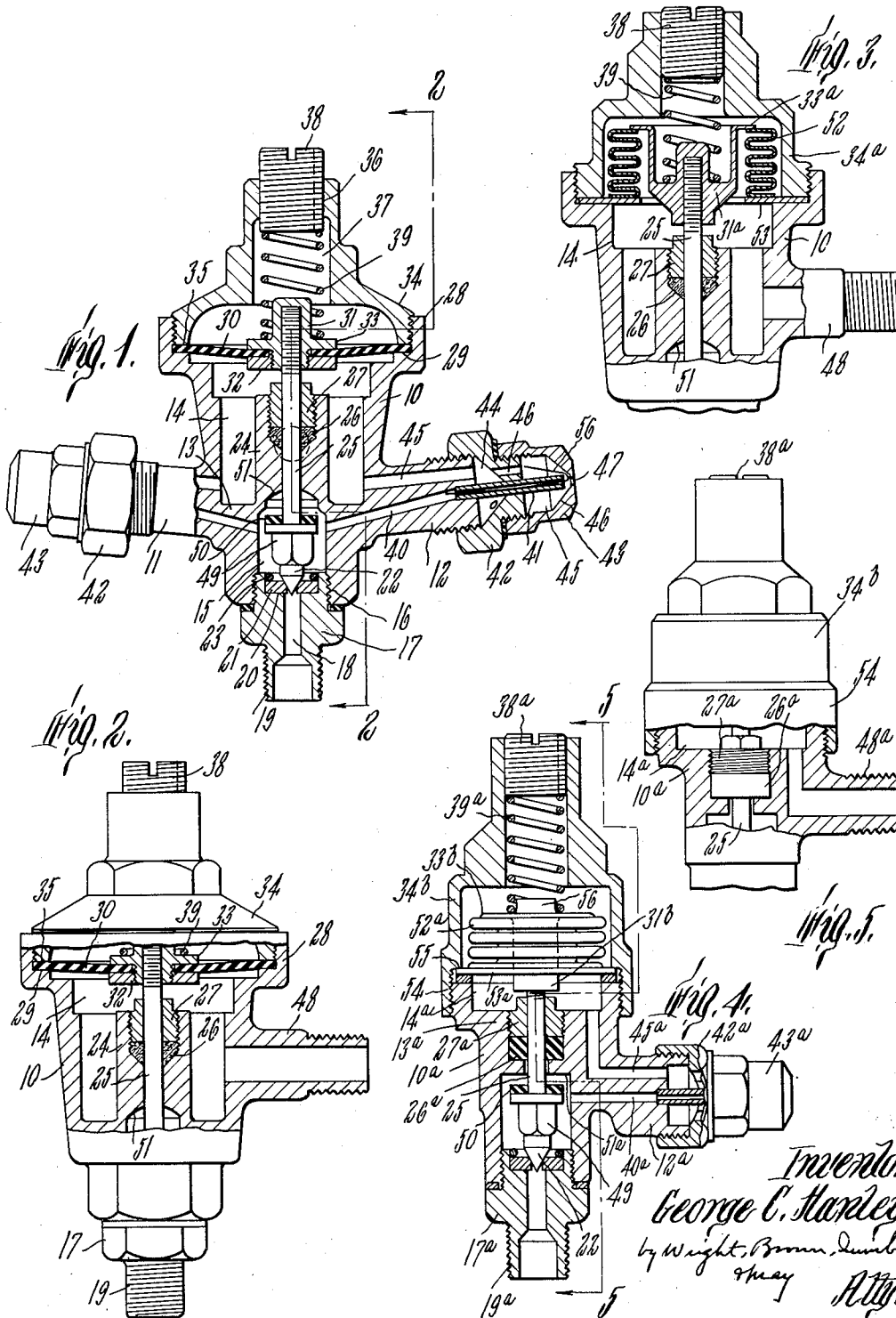
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HUMIDIFIER HEAD

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## HUMIDIFIER HEAD

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This invention relates to emission heads or atomizers for use in connection with humidifying systems to deliver into the atmosphere of a room water in finely divided and dispersed condition, similar to fog or a fine mist, which is quickly evaporated and absorbed by the surrounding air. Such humidifying systems are extensively used in the spinning and weaving rooms of textile mills, and other places. Air under pressure, and water, are supplied from separate sources to combining nozzles and discharged from the latter in a manner such that the rapidly escaping and expanding air breaks up the water into minute particles and delivers them in divergent paths into the surrounding atmosphere.

I have heretofore designed and extensively marketed a humidifier head of this type which is shown in my Patent 1,982,137, dated November 27, 1934. The present invention embodies improvements over the device shown in said patent, the principal object of which is to accomplish an equally good, or better, atomization and distribution of water with the use of smaller quantities of compressed air. In other words, the principal object of the invention is to obtain economy in the use of air, and thereby effect savings in investment for air compressing equipment and in the use of power for operating such equipment.

This object is accomplished by the cooperation of a number of factors which include improved constructions and arrangements of water controlling valves and the operating means therefor, improved emission nozzles, and other things, all of which are fully described in the following specification with reference to the accompanying drawing. The invention consists in the novel combinations and details of construction so described, and in all equivalent variations thereof embodying the same principles.

In the accompanying drawing—

Fig. 1 is a vertical sectional view of a two nozzle humidifier head embodying the invention;

Fig. 2 is a part elevation and part section of the same taken on line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 2 showing an alternative form of pressure responsive valve operating diaphragm;

Fig. 4 is a view similar to Fig. 1 showing a single nozzle head like in principle to that shown in Figs. 1 and 2 but containing modifications in detail;

Fig. 5 is a partial elevation and partial section of the single nozzle head taken on line 5—5 of Fig. 4;

Like reference characters designate the same parts wherever they occur in all the figures.

The humidifier head shown in Figs. 1 and 2 comprises a body 10 having two nipples 11 and 12 projecting from opposite sides of its lower portion. A transverse partition 13 in the lower part of the body divides its interior into an air chamber 14 and a water chamber 15, the former being of larger diameter than the latter. Both ends of the body are open. The wall surrounding the lower open end is internally threaded at 16 to receive the complementally threaded end of a plug 17 which serves both as the outer wall of the water chamber 15 and as a conduit for leading water into said chamber. It has a passage 18 leading through it from end to end and its outer end portion 19 is threaded for connection with a water supply pipe. Between its ends, the plug is suitably formed to be engaged by a wrench whereby it may be screwed into water tight connection with the body. Its inner end is provided with a chamber or pocket 20 in which is placed a valve seat disk 21 having a passage aligned with the passage 17 and a seating portion cooperating with a water valve 22. A divided spring ring 23 is crowded into the end of the socket 20 in pressure contact with the seating disk and in spring pressure frictional engagement with the socket walls to prevent the seating disk from following the valve when the latter is raised.

A tubular stem 24 rises from the partition 13 in the center of the air chamber 14 and is centrally drilled and counterbored, in alignment with the passage 18, to provide a guideway for the valve stem 25 and a stuffing box containing a packing 26 and a gland 27 surrounding the valve stem.

The upper end of the body 10 is enlarged and formed with an annular, internally threaded flange 28, adjacent to which is an annular seat 29. A diaphragm 30 bears at its circumference on seat 29 and is secured at its center to the valve stem 25 by means of a flanged head 31 screwed on the stem and a nut 32 screwed on to a threaded part of the head 31 which passes through a central opening in the diaphragm. The part of the diaphragm surrounding this hole is clamped between nut 32 and the flange 33 of head 31.

A bonnet 34 having external threads on its circumference is screwed into the flange 28. Its annular end face 35 cooperates with the seat 29 in gripping the peripheral zone of the diaphragm.

The bonnet is extended axially and is formed with an internally threaded opening 36 in its out-

er end and with a spring containing chamber 37 adjacent to the threaded end. An abutment screw 38 is contained in the passage 36, and a spring 39 is confined between the flange 33 and abutment screw 38, being arranged to press the valve 22 against the seating disk 21 except when the diaphragm is flexed upwardly by air pressure exceeding the force of the spring. The latter may be adjusted by means of the abutment screw.

A water passage 40 leads from the water chamber 15 through each nipple 11 and 12, terminating in an orifice at the center of the nipple. A tube 41 is set into the outer end portion of the nipple is coaxial extension thereof, and its bore provides an extension of passage 40. This tube is the water supplying element of the combining nozzle.

Both nozzles are alike, and the description now being given of the right hand nozzle shown in Fig. 1 applies equally to the other. In addition to the water tube 1, the combining nozzle includes a centering member 42 and an air tube 43. The centering member 42 is screwed on the threaded outer end of the nipple and has a central passage which is fitted closely to the water tube 41 at a distance from the outer end of the nipple, and serves to maintain the tube, which is small in diameter and has no great stiffness, in axial alinement with the air tube 43. Within the member 42 is a chamber 44 which communicates with the air chamber 14 by means of an air passage 45 extending through the nipple. Air passages 46 are provided in the member 42 leading from the chamber 44 to the outer end of said member.

The air tube 43 which may, because of its proportions here shown, be called a shell, is screwed on the outer externally threaded end of the centering member 42. It has a large interior space 45 of much greater diameter than the tube 41, and an end wall having a tapered internal surface 46. A central orifice 47 leads through said end wall. This orifice is alined with the bore of tube 41, and the conical wall 46 is spaced apart from the end of tube 41 far enough to permit outflow of air.

Air is admitted to the chamber 14 of the body 10 through a nipple 48 at one side of the body intermediate the nozzle nipples 11 and 12. Nipple 48 is externally threaded for connection with an air supply pipe.

The valve 22 is provided with a head 49 adapted to be engaged with a wrench whereby the threaded end of its stem 25 may be screwed into the coupling head 31 which connects it with the diaphragm. A yieldable washer 50 surrounds the valve stem above the head 49 and is arranged to bear against a valve seat 51 in, or on, the partition 13, whereby to prevent flow of water past the valve stem into the air chamber when the valve is open. The washer 50 is in effect a leakage preventing valve. The stuffing box packing 26 cooperates with this valve to the same end. They prevent any more water being discharged from the nozzles than that which is supplied by the water tubes 41, thus guarding against the emission of particles of water large enough to fall.

When the humidifier head is installed for use, it is connected with a supply of water under pressure sufficient at least to raise the water to the nozzle outlets. Generally, however, a considerably greater pressure is used such that, if not prevented, the water would issue in a stream from the nozzle. Compressed air is provided

under a pressure slightly greater than the water pressure. Ordinarily a number of heads are connected to one air pipe line, controlled by a single valve, and to one water pipe line. So long as the air supply valve is closed, the water valve 22 of the humidifier head is closed. When the air is turned on, pressure builds up in the air chamber 14 and combining nozzles and acts on diaphragm 30 to open the water valve. The air pressure created in the nozzles before the water valve is opened prevents water from issuing in a stream, or in any other manner than in finely divided condition in the restricted stream of air passing the nozzle orifice 47. When the air is shut off, the valve is closed by the pressure of spring 39.

The diaphragm shown in Figs. 1 and 2 is of the flexible disk type and may be made of rubber or of textile fabric and rubber construction. Other pressure transmitting means equivalent to such diaphragms may be used however, one of which is shown in Fig. 3. Here a circular bellows 52 of deeply corrugated thin metal tubing is connected in air tight union at one end with a ring 53, which is clamped between the body 10 and the rim of the bonnet 34a; and the opposite end of the bellows is similarly connected to the flange 33a of a recessed head 31a, which is screwed on the valve stem 25. Except for the features last described, and a difference in dimensions of the bonnet to accommodate this bellows, the head shown in Fig. 3 is identical with that shown in Figs. 1 and 2.

Another form of humidifier head, having a single nozzle, is shown in Figs. 4 and 5. In principle it is identical with the forms previously described, and the differences are mainly in minor details of construction. Therefore corresponding parts are designated by the same reference numerals used in the preceding description with the addition of modifying exponents. The principal differences from the form first described, apart from the omission of one nozzle, are the following. The partition 13a between the air and water chambers is made thick or deep enough to receive the packing 26a and gland 27a of a stuffing box, and the tube 24 is omitted. The seat 51a for the leakage prevention valve is provided on the under side of this partition. The bonnet 34b is provided with an internally threaded end flange 54 which embraces the externally threaded adjacent end of the body 10a, and has an internal shoulder 55 to clamp the rim of a diaphragm or equivalent bellows flange. It will be noted that here the bellows type of pressure transmitter is used, a bellows 52a being secured to a disk or flange 53a at one end and to the flange 33b of a coupling head 31b at the other end. This coupling head, instead of being recessed like the head 31a to receive the valve closing spring, is solid and has a central boss 56 rising from the flange 33b, which is embraced and gripped by the lower end of the helical spring. It is to be understood that a diaphragm like that shown in Fig. 1 may be used with this single nozzle construction instead of the bellows, and may be coupled with the valve as there shown, or in any other suitable way.

An optional feature, usable with any of the forms of head here described, is a reducing member for diminishing the output of water without reducing the water pressure. Such a volume reducer is shown in Fig. 1 in the form of a wire 56, smaller than the bore of the tube 41, which is

passed into the tube from its outer end, and bent over within the shell 43 so that its bent-over part, between the end of the tube and the adjacent end wall of the shell, prevents dislodgement. By removing the shell, other wires of larger or smaller diameter may be substituted as the water delivery shall be more or less reduced. This device enables some heads of a system to deliver more or less water than others while the pressure of the supply to all is the same.

What I claim and desire to secure by Letters Patent is:

1. A humidifier head comprising a body having an internal partition dividing its interior into a water chamber and an air chamber, the water chamber having an inlet and a surrounding seat, a valve located in the water chamber to cooperate with said valve seat for admission and exclusion of water and having a stem passing through the partition, a pressure responsive member connected to said valve stem and crossing the air chamber in exposure to the fluid pressure therein, said air chamber having a connection for admission of air under pressure, a nipple having water and air passages leading from the water and air chambers respectively, a combining nozzle mounted on the end of said nipple, and a valve element associated with said valve arranged to bear against an area of the partition surrounding the valve stem when the valve is opened whereby to prevent passage of water from the water chamber into the air chamber.

2. In a humidifier head, a body having a lateral nipple and an internal partition with a water space at one side and an air space at the other side, the water space being open at its outer end, a plug detachably secured across the outer end of said water space having an inlet passage, an annular valve seat disk secured to said plug in the inner end of said passage, a valve located in said water space arranged to cooperate with said valve seat disk having a stem extending through said partition, pressure responsive means connected to the valve stem extending across the air space in exposure to the fluid pressure therein, and means carried by the valve for engagement with the partition when the valve is open to prevent leakage of water around the valve stem.

3. In a device of the character described having a body, internal water and air chambers, and a partition separating one chamber from the other, a detachable plug forming the outer wall

of the water chamber opposite to the partition and having a through passage and a chamber or pocket in its inner end, a valve seat disk seated in said pocket having a passage aligned with the before named passage, a retainer holding the disk in the pocket, a valve in the water chamber arranged to seat against and withdraw from the disk across the passage therein and having a stem extending through the partition, a pressure responsive member secured to the valve stem across the air chamber, and a spring arranged to exert pressure on the valve stem toward the valve seat disk.

4. In a humidifier head, a body having interior water and air chambers connected to receive water and air respectively under pressure, a nipple having an interior water passage leading from said water chamber and an air passage leading from said air chamber, a water delivering tube extending from said water passage in flow connection therewith, a centering member secured detachably on the outer end of said nipple surrounding and supporting said tube, an air tube secured detachably to said centering member enclosing the outer portion of the water delivering tube, having an interior chamber surrounding said tube, and a delivery orifice spaced apart from the end of the water tube and in axial alinement therewith, the centering member having an interior space and passage arranged to conduct air from the before named air passage to the chamber within the air tube, and a wire of smaller diameter than the bore of the water tube contained therein and having a bent over end portion extending between the outer end of said tube and the adjacent portion of the air tube.

5. A humidifier head having interior chambers adapted to receive air and water respectively under pressure, a water delivery tube coupled to said head to receive water from the water chamber thereof, a shell coupled to the head to surround the tube, having an interior chamber in connection with the before named air chamber to receive pressure air therefrom and having an end wall provided with an emission orifice in alinement with and spaced apart from the outer end of said tube, a wire of smaller diameter than the bore of said tube contained therein and having a bent over end extending between the outer end of the tube and the end wall of the shell.

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