

Oct. 24, 1961

A. B. BRADLEY

3,005,591

ATOMIZING TYPE PORTABLE HUMIDIFIER

Filed June 28, 1961

4 Sheets-Sheet 1

Fig. 1.

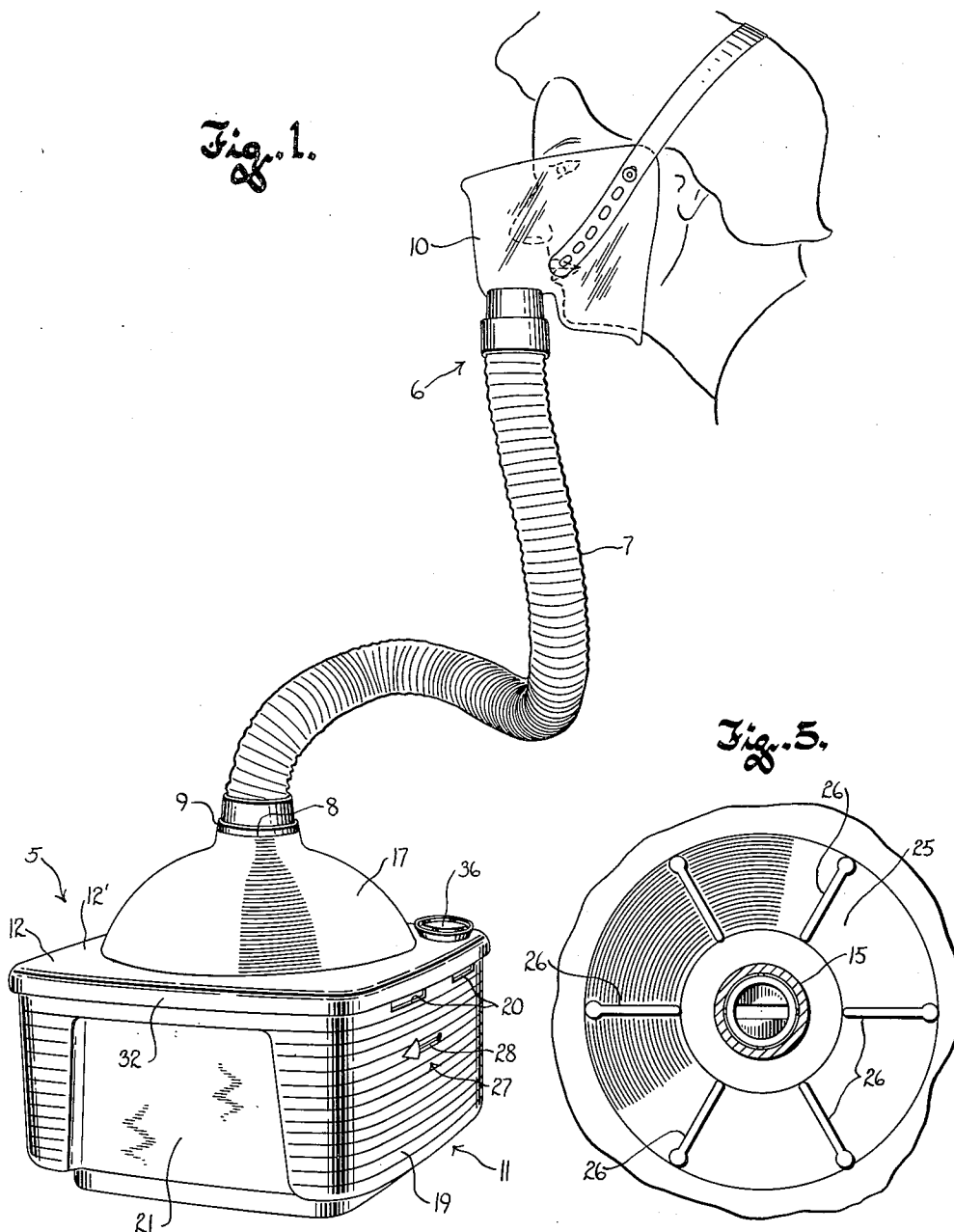
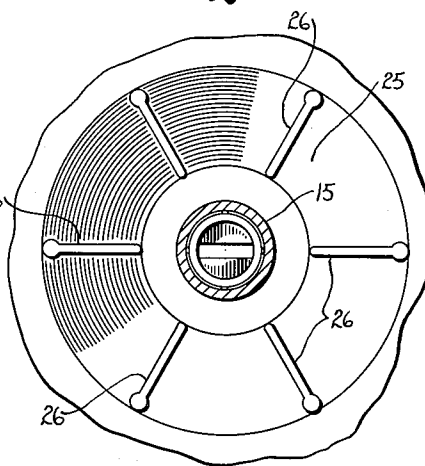


Fig. 5.



Invention
Addison Ballard Bradley
By *Dr. William Jones*
Attorney

Oct. 24, 1961

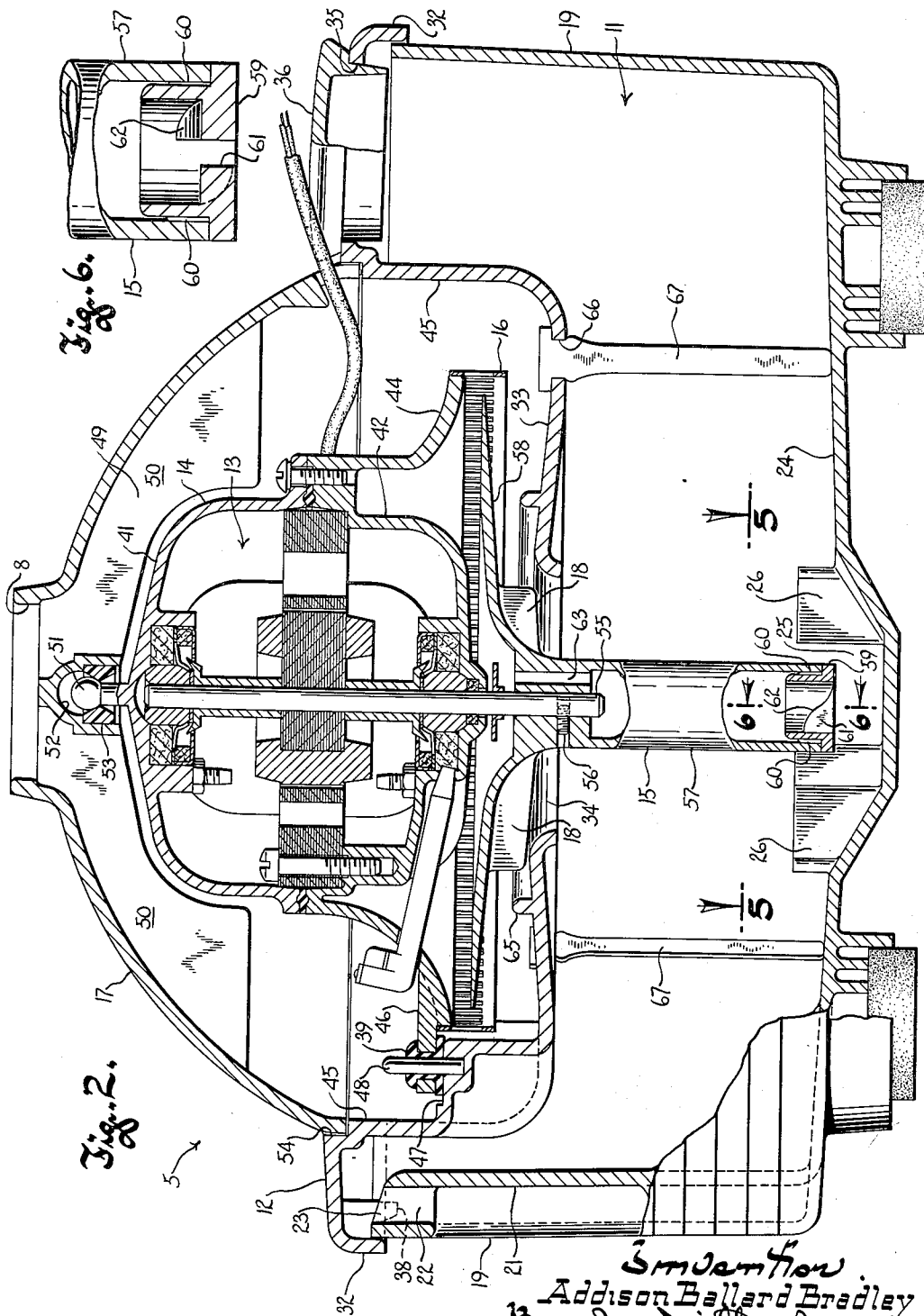
A. B. BRADLEY

3,005,591

ATOMIZING TYPE PORTABLE HUMIDIFIER

Filed June 28, 1961

4 Sheets-Sheet 2



Simon & Schuster
Addison Ballard Bradley
Inventor
James
H. Torrey

Oct. 24, 1961

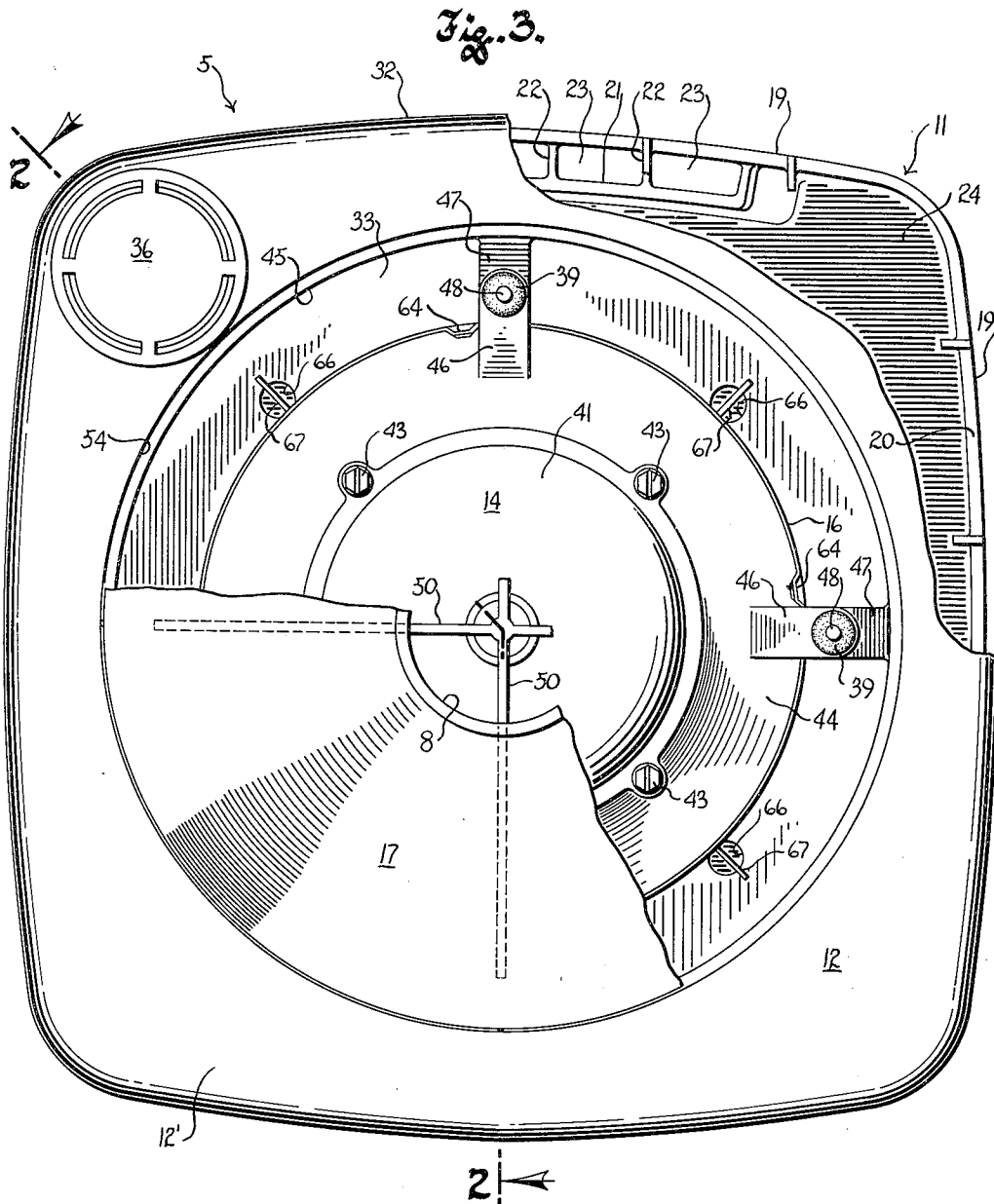
A. B. BRADLEY

3,005,591

ATOMIZING TYPE PORTABLE HUMIDIFIER

Filed June 28, 1961

4 Sheets-Sheet 3



Invention
Addison Ballard Bradley
by *Dr. William Jones*
Attorney

Oct. 24, 1961

A. B. BRADLEY

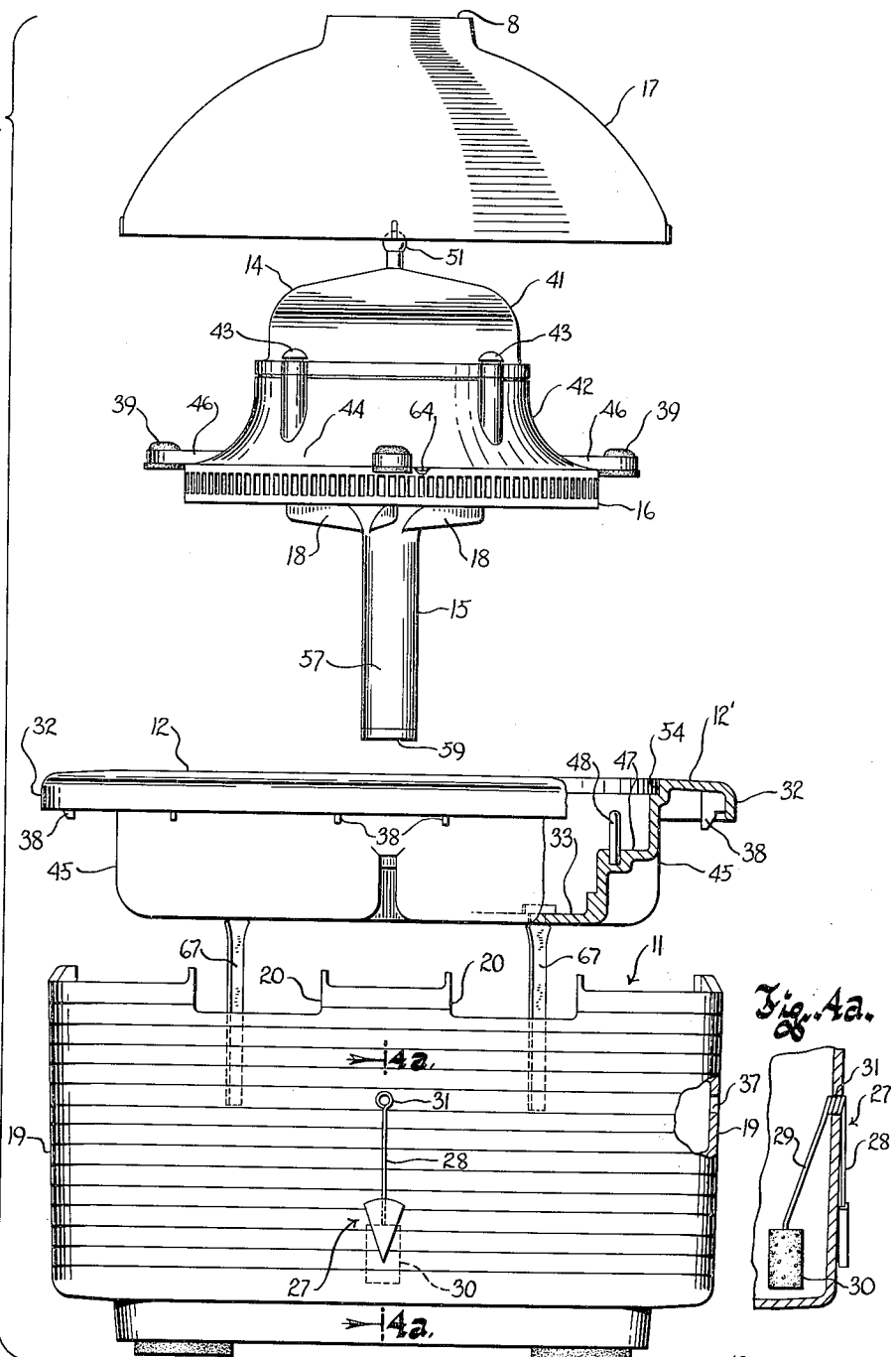
3,005,591

ATOMIZING TYPE PORTABLE HUMIDIFIER

Filed June 28, 1961

4 Sheets-Sheet 4

Fig. 4.



Invention
Addison Ballard Bradley
by *Dr. Milton Jones*
Attorney

1

3,005,591

ATOMIZING TYPE PORTABLE HUMIDIFIER
Addison Ballard Bradley, Racine, Wis., assignor to John
Oster Manufacturing Co., Milwaukee, Wis., a corpora-
tion of Wisconsin

Filed June 28, 1961, Ser. No. 120,338

9 Claims. (Cl. 239-216)

This invention relates to portable humidifiers of the type which mechanically atomize water, and the invention has as its general object the provision of an improved portable humidifier of this type.

More specifically it is an object of the present invention to provide a humidifier of the character described, all of the principal components of which are adapted to be molded of plastic to thus minimize manufacturing costs and provide a humidifier of very attractive appearance, suitable for use in any indoor location.

Another object of this invention is to provide a humidifier of the type that effects mechanical atomization of water, which is suitable for use with a respirator to enable an individual patient to directly inhale the vapor output of the machine, and which is also suitable for use as a general room humidifier, without a respirator.

It is a further object of this invention to provide a humidifier of the character described which is unusually attractive in appearance and quiet in operation, and which, moreover, combines these advantages with low cost and high efficiency.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate one complete example of the physical embodiment of the invention, constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

FIGURE 1 is a perspective view of the humidifier of this invention, in use with a respirator attachment;

FIGURE 2 is a vertical sectional view of the humidifier taken on the plane of the line 2-2 in FIGURE 3;

FIGURE 3 is a top view of the humidifier, with portions broken away;

FIGURE 4 is a side elevational view of the main components of the humidifier, shown in disassembled relationship, with portions shown broken away;

FIGURE 4a is a fragmentary sectional view taken on the plane of the line 4a-4a in FIGURE 4;

FIGURE 5 is a fragmentary sectional view taken on the plane of the line 5-5 in FIGURE 2; and

FIGURE 6 is a fragmentary sectional view taken on the plane of the line 6-6 in FIGURE 2.

Referring now to the accompanying drawings, the numeral 5 designates generally the humidifier of this invention, which is adapted for use either with or without a respirator 6 by which humid air produced by the device can be conducted directly to a patient. The respirator comprises a flexible hose 7, one end of which is connected to a moist air outlet 8 at the top of the machine by means of an adapter 9, and to the other end of which is connected a suitable mask 10. It will be understood that the adapter 9 provides for ready detachment of the hose 7 to permit the humidifier to be used without the respirator.

In general the humidifier comprises a vessel 11 which provides a reservoir for a supply of water to be atom-

2

ized, an inner cover member 12 which closes the vessel and provides a support for a motor 13 that is enclosed within a housing 14, a rotor 15 driven by the motor and by which water is brought up from the vessel and centrifuged through a screen 16 on the motor housing to effect atomization of such water, and a dome-like outer cover member 17 having the humid air outlet 8 at its top. The rotor also has thereon a number of air impeller vanes 18 by which air is drawn into the housing and expelled upwardly and outwardly through the outlet 8 to carry atomized water out of the machine.

The vessel or reservoir 11 is preferably molded of plastic, in one piece, and has a generally square outline as viewed from above (see FIGURE 3), its corners, however, being rounded and its upright side walls 19 being curved outwardly along their lengths to improve its appearance. Notches 20 opening to the rim of the vessel at one pair of opposite sides thereof provide inlet ports for air entering the vessel, and at the other pair of opposite sides the medial portion of each side wall is inwardly recessed below the rim thereof, as at 21, and is connected to the unrecessed rim portion of the wall by means of fins or ribs 22 to define additional air inlet ports 23. As will be seen from FIGURE 1, the recesses 21 in the side walls also serve to enhance the appearance of the vessel.

The bottom wall 24 of the vessel, which is of course integral with its upright side walls, has a depressed central portion 25 which provides a sump into which the bottom portion of the rotor 15 extends. A plurality of upright fins or vanes 26, integral with the bottom wall, extend radially outwardly from points near the rotor to prevent water in the vessel from swirling as the rotor revolves.

To afford an indication of the level of water in the vessel a simple float gage 27 is mounted in one side wall thereof, and comprises a U-shaped wire float lever, one leg 28 of which overlies the outer surface of the side wall to serve as a pointer and the other leg 29 of which is inside the vessel and has a cork 30 or similar float secured to its free end. The bight portion 31 of the float lever is formed of several closely adjacent coaxial coils which have a smoothly rotating fit in a hole in the vessel side wall.

The inner cover member 12, by which the top of the vessel 11 is closed, can be made as a one-piece plastic molding. It has a substantially flat top wall 12' of a shape corresponding to the generally square shape of the vessel, but slightly larger so as to extend laterally beyond the rim of the vessel around the entire periphery of the latter and thus prevent the entry of dirt and foreign matter into the vessel. To further guard against entry of dirt into the vessel, and to enhance the appearance of the machine, the inner cover member has a downwardly projecting rim 32 around its entire periphery. The central portion of the inner cover member is formed to provide a substantially cylindrical bowl 33, the bottom wall of which has a central aperture 34 through which the rotor 15 projects.

In one corner of the inner cover member, radially outwardly of its central bowl 33 is a filler hole 35 through which water can be poured into the vessel 11 and which is normally closed by a readily removable cap 36. Hence it is not necessary to lift the inner cover member to fill the vessel. Although the float indicator will show the level of the water in the vessel, an overflow port 37 is preferably provided in one wall of the vessel substantially at the level of the hole in which the float indicator is journaled.

The inner cover member is, of course, readily removable from the vessel, being held in place by its own

weight and that of the motor 13 which it supports, and to properly locate it on the vessel 11 downwardly projecting peripheral spaced apart locating lugs 38 are formed integrally with the cover to engage the rim of the vessel 11.

The motor housing 14 comprises an upper inverted cup shaped section 41 and a lower cup shaped housing section 42 secured together by screws 43, to define an enclosure in which the motor 13 is mounted by having its stator core seated upon and secured to a ledge formed in the lower section 42. Each of the motor housing sections is a one piece die casting, and projecting radially outwardly and downwardly from the rim of the lower section 42 is a circumferential flange or skirt 44 by which the motor housing is supported on the inner cover member 13. This skirt is substantially smaller in diameter than the bowl 33 so that it may be received in the bowl with its periphery spaced a substantial distance from the side wall 45 of the bowl. To support the skirt and hence the motor housing in this position the skirt has integral radially outwardly projecting arms 46 which rest upon bosses 47 on the side wall 45 and are held against displacement therefrom by dowel pins 48 fixed in the bosses 47. Preferably the arms 45 have rubber grommets 39 secured thereto to provide cushioned sockets for the dowel pins and a vibration damping connection between the motor housing and the rest of the inner cover 12. Silent vibration-free operation of the machine is thus assured.

The dome-shaped outer cover member 17, which can be formed of plastic as a one piece molding, cooperates with that portion of the motor housing 14 which is above the skirt 44 to define an annular outlet passage 49 leading to the air outlet 8 at the top of the dome. At the underside of the outer cover member and formed integrally therewith, are vertically disposed vanes 50 which extend diametrically across the outlet 8 and prevent moist air from swirling as it leaves the outlet. These vanes extend a substantial distance downwardly towards the lower edge or rim of the dome shaped cover and have their lower edges shaped to closely embrace the upper portion of the motor housing.

The rim of the dome shaped cover snugly fits into the top of the bowl 33, preferably being seated in a counter-bore 54 at the mouth of the bowl. It is securely though removably held in this position by a snap fastener connection comprising a ball-headed projection 51 on the top of the motor housing and a socket 52 at the intersection of the vanes 50 beneath the outlet 8 in the dome. A resilient ring 53 at the mouth of the socket, having a diameter slightly smaller than that of the ball head on the projection 51, provides for detent like engagement of the snap fastener.

The shaft 55 of the motor projects downwardly from the motor housing and has the rotor 15 coaxially secured to its lower portion, as by means of a cross pin or set screw 56. The rotor comprises a tubular lower portion 57 and an integral coaxial disc-like centrifuging head 58. The air impeller vanes 18 project down from the underside of the centrifuging head and are integral with it.

The tubular lower portion of the rotor has an insert 59 press-fitted into it, which, like most of the component parts of the humidifier, is a plastic molding. This insert is essentially cup-shaped and for ease of assembly its side wall has several circumferentially spaced longitudinal ridges 60 which bite into the wall of the rotor as the insert is assembled with the rotor. A slot 61 extends diametrically through the bottom of the insert, and a pair of helical surfaces 62 lead from the bottom of the slot to pump water up into the rotor as it revolves, providing, of course, that the level of the water in the vessel 11 is above the bottom of the rotor. The vanes or fins 26 in the bottom of the vessel 11 prevent the water from swirling as the rotor rotates, so that the helical

surfaces 62 in the rotor can more effectively exert their lifting action.

Water thus driven upwardly through the tubular lower portion 57 of the rotor issues from the top of the rotor through one or more holes 63 therein, to be forcefully thrown outwardly by centrifugal force across the upper surface of the centrifuging head 58 in a relatively thin sheet which impinges upon the screen 16 by which it is broken up into very fine droplets. The screen is mounted on the skirt 44 to which it is assembled by simply telescoping it over the edge of the skirt and against the underside of the arms 46, and then deforming it into small recesses or notches in the skirt, as at 64. It will be seen that with the screen thus mounted on the skirt the underside of the skirt forms a flared water guiding surface which coats with the disc-like centrifuging head to direct the water issuing from the latter against the screen.

The screen 16 comprises a narrow strip of relatively thin metal having closely spaced transverse slots stamped into it. Since the slots in the screen are punched out the metal segments between the slots will have small burrs facing one side of the screen. No effort is made to remove these burrs. Instead they are used to advantage. It has been found that if the screen is so disposed that the burrs face inward, a most effective atomization is obtained. Apparently the relatively rough edges left by the punching operation promote turbulence as the water and air flows through the screen which is very effective in producing atomization. Preferably, too, the centrifuging head tapers radially outwardly to a sharp edge, to promote a clean flow of water outwardly therefrom and to discourage any tendency for water to flow downwardly around the edge of the centrifuging head.

To further encourage a turbulent flow through the screen the bottom wall of the bowl 33 has an upwardly projecting annular ridge 65 spaced a short distance radially outwardly of the tips of the air impeller vanes 18. Air thrown outwardly by the impeller thus is deflected upwardly in turbulent flow by this ridge, to afford good mixing action with the water issuing from the edge of the centrifuging head and to direct such water through the screen, rather than letting it run down onto the bottom of the bowl 33. The ridge 65 also serves as a dam that prevents any water accumulated in the bottom of the bowl 33 from falling noisily through the aperture 34, into the vessel, under the influence of any recirculated air deflected radially inwardly and downwardly by the side wall 45.

From the screen 16 the mixed water droplets and air of course move upwardly around the skirt 44 of the motor housing and along the underside of the dome-like cover, where the vanes 50 tend to straighten the flow of moist air before it passes out of the outlet 8.

Inevitably a certain amount of water drips downwardly off of the centrifuging head 58 and the screen 16, onto the bottom of the bowl 33, and for this reason the bottom of the bowl is inclined downwardly and radially outwardly from its ridge 65 so that its lowest portion is an annular area adjacent to the side wall of the bowl. In this area there are a number of circumferentially spaced apart drain holes 66, in each of which there is suspended a substantially T-shaped drip leader 67, preferably of thin plastic material. The head of each drip leader is larger than the diameter of the hole so as to supportingly engage the edge of the hole, and the stem of the leader hangs down substantially to the bottom wall 24 of the vessel 11.

Water flowing through the drain holes 66 silently follows the drip leaders down into the vessel, rather than splashing unchecked from the drain holes.

From the foregoing description taken together with the accompanying drawings it will be apparent that this invention provides an inexpensive but very attractive

5

atomizer type portable humidifier which is substantially noiseless in operation but nevertheless very efficient, and which is capable of use either with or without a respirator by which moist air can be directly conducted to an individual patient.

What is claimed as my invention is:

1. A humidifier of the type wherein water is mechanically atomized and then entrained in a current of air, comprising: a non-circular pan-like vessel; a cover over the top of the vessel having a substantially flat top wall coextensive in shape and size with the top of the vessel and a round depression at its center forming a bowl the sides of which are spaced from the sides of the vessel and the bottom of which has a hole at its center through which the interiors of the bowl and vessel are communicated; air inlet means at the upper edge portion of the vessel; a motor housing having an electric motor therein with its shaft protruding from the housing; a downwardly and outwardly directed skirt integral with the lower portion of the housing; a circular screen mounted on and depending from the peripheral edge portion of the skirt, the underside of the skirt forming a flared water guiding surface leading to the inner face of the screen; supporting arms projecting from the edge of the skirt above the screen and seated upon lugs on the side wall of the bowl to mount the motor housing and the screen in the bowl with the motor shaft projecting vertically downward coaxially of the hole in the bottom of the bowl and with the upper portion of the motor housing projecting out of the bowl; a combined pump and centrifugal impeller rotor fixed to the motor shaft to lift water from the vessel and throw the same against the screen and atomize it; fan means on said rotor contiguous to the edge of the hole in the bottom of the bowl to draw air from inside the vessel through said hole and then direct the same radially outward toward the screen where said air entrains the atomized water; and a dome-like cover having a central discharge port at its top through which the moisture laden air issues, the dome-like cover and the upper portion of the motor housing cooperating to define an annular air passage leading from the top of the bowl to the central discharge port.

2. The humidifier of claim 1 further characterized by the fact that the substantially flat top wall of the inner cover member has a filler port in one of its corners through which water may be poured into the vessel; and a removable cap for said filler port.

3. The humidifier of claim 1 wherein the bottom wall of the bowl is shaped to have its lowest portion remote from the central hole therein, said lowest portion of the bottom wall of the bowl having a drain hole through which water may drain from the bowl back to the vessel; and a drip leader supported in the drain hole with its lower end close to the bottom of the vessel to conduct water passing through the drain hole noiselessly back into the vessel.

6

4. The humidifier of claim 3, wherein said drip leader comprises a substantially T-shaped piece of flat plastic material having the head of the T inside the bowl and larger than the hole so that the head of the T pendently supports the drip leader.

5. The humidifier of claim 1, further characterized by means providing a readily releasable connection between the dome-like cover and the top of the motor housing, which connection comprises a spherical male element and resilient female means defining a socket having a mouth which is smaller in diameter than the male element.

6. The humidifier of claim 1, further characterized by a dowel pin fixed to and projecting upwardly from each of the lugs on the side wall of the bowl; and resilient grommets fixed in the supporting arms snugly receiving the dowel pins.

7. The humidifier of claim 1, further characterized by a substantially U-shaped float gage lever bent from a single length of wire, the bight portion of which is rotatably received in a closely fitting hole in an upright wall of the vessel and comprises a plurality of axially adjacent coils, and one arm of which comprises a pointer that flatwise overlies the outer surface of said upright vessel wall; and a buoyant float on the outer end of the other arm of said float gage lever.

8. The humidifier of claim 1, wherein the rotor comprises a disc-like centrifuging head, a tubular pump portion which projects coaxially downwardly from the centrifuging head and by which water is brought from the vessel to the upper surface of centrifuging head; and wherein said fan means comprises a plurality of air impeller vanes on the underside of the centrifuging head; and further characterized by an upwardly projecting coaxial annular ridge on the bottom wall of the bowl, radially spaced from the edge of the hole therein and adjacent to the radially outer ends of the air impeller vanes, by which turbulence is imparted to the air as it enters the bowl.

9. The humidifier of claim 1, wherein the screen comprises a ribbon of sheet metal having closely spaced transverse slots punched therein, and formed into a ring with the burrs which result from the punching operation facing inwardly so that the edges of the slots are sharp and ragged.

References Cited in the file of this patent

UNITED STATES PATENTS

1,864,797	Broemer	June 28, 1932
1,892,694	Carter	Jan. 3, 1933
2,607,571	Hession	Aug. 19, 1952
2,766,071	Flury	Oct. 9, 1956

FOREIGN PATENTS

1,062,188	Germany	July 23, 1959
-----------	---------	---------------