May 31, 1932. M. L. FOX 1,861,340

HUMIDIFIER

Filed July 30, 1928

Fig. 1.

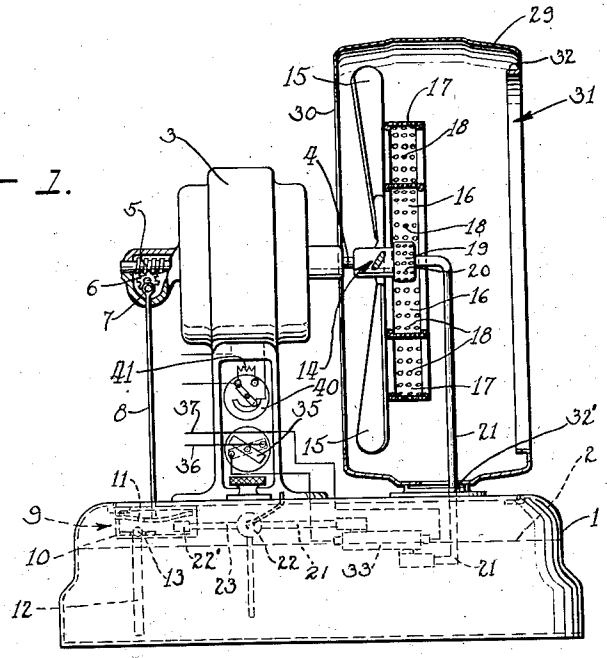


Fig. 4.

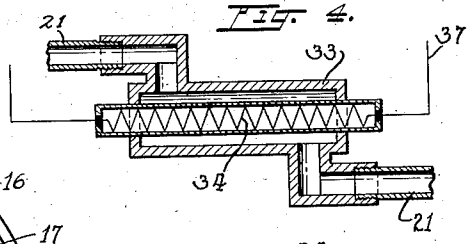


Fig. 2.

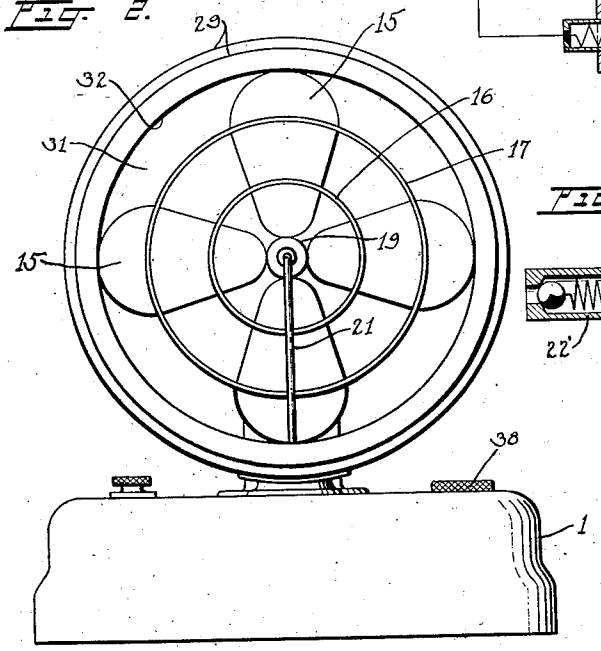
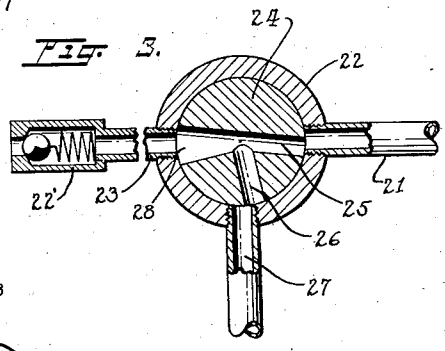


Fig. 3.



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Patented May 31, 1932

1,861,340

UNITED STATES PATENT OFFICE

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HUMIDIFIER

Application filed July 30, 1928. Serial No. 296,151.

My invention relates to improvements in humidifiers, and it consists in the combinations, constructions, and arrangements herein described and claimed.

An object of my invention is to provide a humidifier in which the air within a room or the like may be passed through a spray or mist of water, whereby the air will become effectively humidified.

A further object of my invention is to provide a device of the type described which has novel means for circulating water therethrough.

A further object of my invention is to provide a device of the type described which has a heating unit for heating the water as it is circulated therethrough.

A further object of my invention is to provide a device of the type described which washes the air that is forced therefrom.

Other objects and advantages will appear in the following specification, and the novel features of the invention will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings, forming part of this application, in which

Figure 1 is a side elevation of my device, a portion thereof being shown in section,

Figure 2 is a front elevation of my device,

Figure 3 is a detail view of a portion of my device, and

Figure 4 is a detail view of my heating device.

In carrying out my invention, I provide a base 1 which is in the form of a receptacle adapted to receive and contain water indicated at 2. A motor 3 is mounted upon the base and is provided with a motor shaft 4. A worm 5 is carried by one end of the shaft 4 and is in mesh with a worm gear 6. The worm gear 6 is operatively connected to a crank 7 which has one end of a connecting rod 8 pivotally secured thereto.

A pumping unit 9 is disposed in the base or receptacle 1, see Figure 1. The pumping unit 9 may be of any desired construction but in the present instance I have shown a casing 10 in which a diaphragm 11 is disposed and has its outer edges secured to the inner wall of the casing. The free end of the connecting rod 8 is secured to the center of the diaphragm 11. An inlet tube 12 communicates with the casing 10 and extends to a point substantially adjacent the bottom of the receptacle 1. A ball valve 13 is disposed in the casing 10 and arranged to close the inlet tube when force is applied thereagainst, as will be hereinafter described.

A fan 14 is mounted upon the shaft 4 and is provided with fan blades 15. An inner diffusing member 16 is secured to the fan blades 15 concentric with the shaft 4. An outer diffusing member 17 is secured to the fan blades 15 concentric with the inner diffusing member 16. The members 16 and 17 are provided with a multiplicity of relatively fine openings 18. A receiving cup 19 having a plurality of openings 20 in the peripheral surface thereof is carried by the central portion of the fan 14. A delivery pipe 21 has one end in communication with the receiving cup 19 and the other end extending into the receptacle 1 and in communication with a regulating valve 22. A tube 23 has one end communicating with the regulating valve 22 and the other end in communication with the pump casing 10. A suitable check valve 22′ is provided for the outlet tube 23.

The valve 22 is provided with a rotatable core 24 which has a passageway 25 therethrough adapted to provide communication between the tubes 23 and 21. A branch passageway 26 communicates with the passageway 25 and is adapted to be brought into communication with an outlet 27. The passageway 25 adjacent the pipe 23 is provided with an enlarged portion 28.

A hood 29 is mounted upon the base 1 and extends around the fan 14. The hood 29 is provided with a relatively large inlet opening 30 and a relatively large outlet opening 31. An annular flange 32 extends inwardly from the outer edge of the hood and around the outlet opening 31. Communication is provided at 32′ between the hood 29 and the receptacle 1.

A suitable heating device 33, having a heating element 34, is disposed within the receptacle 1. A suitable switch 35 is provided

for electrically connecting the heating element 34 with a source of current through the conductors 36 and 37. A suitable filling plug 38 is provided for the receptacle or base 1.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood. Let us assume that the receptacle 1 is filled with water and that the motor 3 is set in motion. The actuation of the motor will cause rotation of the shaft 4, together with the fan 14, the receiving cup 19, and the diffusing members 16 and 17. Rotation of the shaft 4 will cause rotation of the crank 7 due to its connection through the worm gear to the worm 5. Rotation of the crank 7 will cause a reciprocatory movement of the connecting rod 8, thus causing movement of the diaphragm 11.

As the diaphragm 11 moves upwardly, water will be drawn through the inlet tube 12, past the ball valve 13, and into the pump casing 10. Downward movement of the diaphragm 11 will force the portion of the water in the casing 10 through the tube 23. The ball valve 13 prevents the water from passing back into the receptacle through the tube 12.

The regulating valve 22 is adapted to allow any desired amount of the water forced from the casing 10 to pass through the delivery tube 21 and into the receiving cup 19. As illustrated in Figure 3, the passageway 25 is not in direct alignment with the tubes 23 and 21. Furthermore, the passageway 26 is not in direct communication with the outlet 27. Therefore, a certain portion of the water passing through the tube 23 will pass through the tube 21 and the remaining portion will pass through the outlet 27 and back to the receptacle. The more the core 24 of the valve 22 is rotated to bring the passageway 26 into alignment with the outlet opening 27, the less will be the amount of water allowed to pass through the passageway 25 and into the tube 21 due to the fact that the passageway 25 is being moved away from the tube 21.

The water passing through the tube 21 to the revolving receiving cup 19 is discharged by centrifugal force through openings 20 in the receiving cup in the form of small droplets and in paths which are approximately tangential to the periphery of the cylindrical face of the receiving cup. These droplets impinge against the revolving diffusing member 16 whose peripheral velocity is higher than that of the receiving cup and are cut or chopped by this action and thus reduced in size. Upon passing through the diffusing member, the direction of travel of the droplets is also changed to a path approximately tangential to the periphery of the diffusing member. This action is repeated at the second diffusing member 17, the droplet being chopped into smaller ones, the velocity of travel increased and the direction of their paths altered so as to be tangential to the cylindrical surface of the diffusing member 17. This action is repeated at each successive diffusing member; it not being the intention that the humidifier be limited to but two diffusing members.

During the rotation of the diffusing members, it will be seen that air will be drawn inwardly in the direction of the fan 14 through the opening 30, passed through the mist or spray discharged by the diffusing members, and outwardly through the opening 31. It will thus be seen that I have provided a device by means of which the air passing through the hood 29 will become effectively humidified largely by the contact with the droplets of water and to a lesser degree by a contact with the wetted surfaces. The mist or spray in collecting upon the inner side of the hood 29 will pass downwardly by the action of gravity and through the outlet 32′ of the hood 29 and into the receptacle 1.

The size of the droplets of the liquid passing from the receiving cup 19 and the members 16 and 17 may be varied by changing the speed of the fan. Changing the speed of the fan may be accomplished by actuating a multi-point switch 40 indicated diagrammatically in Figure 1. The switch 40 is associated with the motor 3, whereby various speeds of the rotating members may be attained. The flange 32 will prevent the water collected upon the inner surface of the hood from being swept along the surface of the collecting hood 29 by the air and passing to the exterior of the hood through the opening 31.

Should it be desired to increase the amount of water evaporated by the air passing through the hood, or should it be desired to humidify the air without lowering its temperature at the outlet of the hood, the switch 35 may be actuated for closing the circuit through the heating element 34, whereby only that liquid passing through the heating device 33 will become heated.

I claim:

1. A humidifier comprising a liquid-containing receptacle, a source of power, a hood associated with said receptacle and having communication with the interior of the latter, a fan operatively connected with said source of power and being disposed within the hood, spray-forming means associated with said fan, a pumping device operatively connected with said source of power and arranged for moving liquid from the receptacle to said spray-forming device, liquid-conveying means connecting said pumping device with the spray-forming device, and heating means operatively connected with said conveying means for heating liquid passing from the receptacle to said spray-forming device.

2. A humidifier comprising a liquid-con-

taining receptacle, a source of power, a hood associated with said receptacle and having communication with the interior of the latter, a fan operatively connected with said source of power and being disposed within the hood, spray-forming means associated with said fan, a pumping device operatively connected with said source of power and arranged for moving liquid from the receptacle to said spray-forming device, liquid-conveying means connecting said pumping device with the spray-forming device, heating means operatively connected with said conveying means for heating liquid passing from the receptacle to said spray-forming device, and means for varying the amount of liquid conveyed to the spray-forming device.

Signed at Chicago, in the county of Cook and State of Illinois, this 23rd day of July, A. D. 1928.

MERRITT L. FOX.