

July 12, 1938.

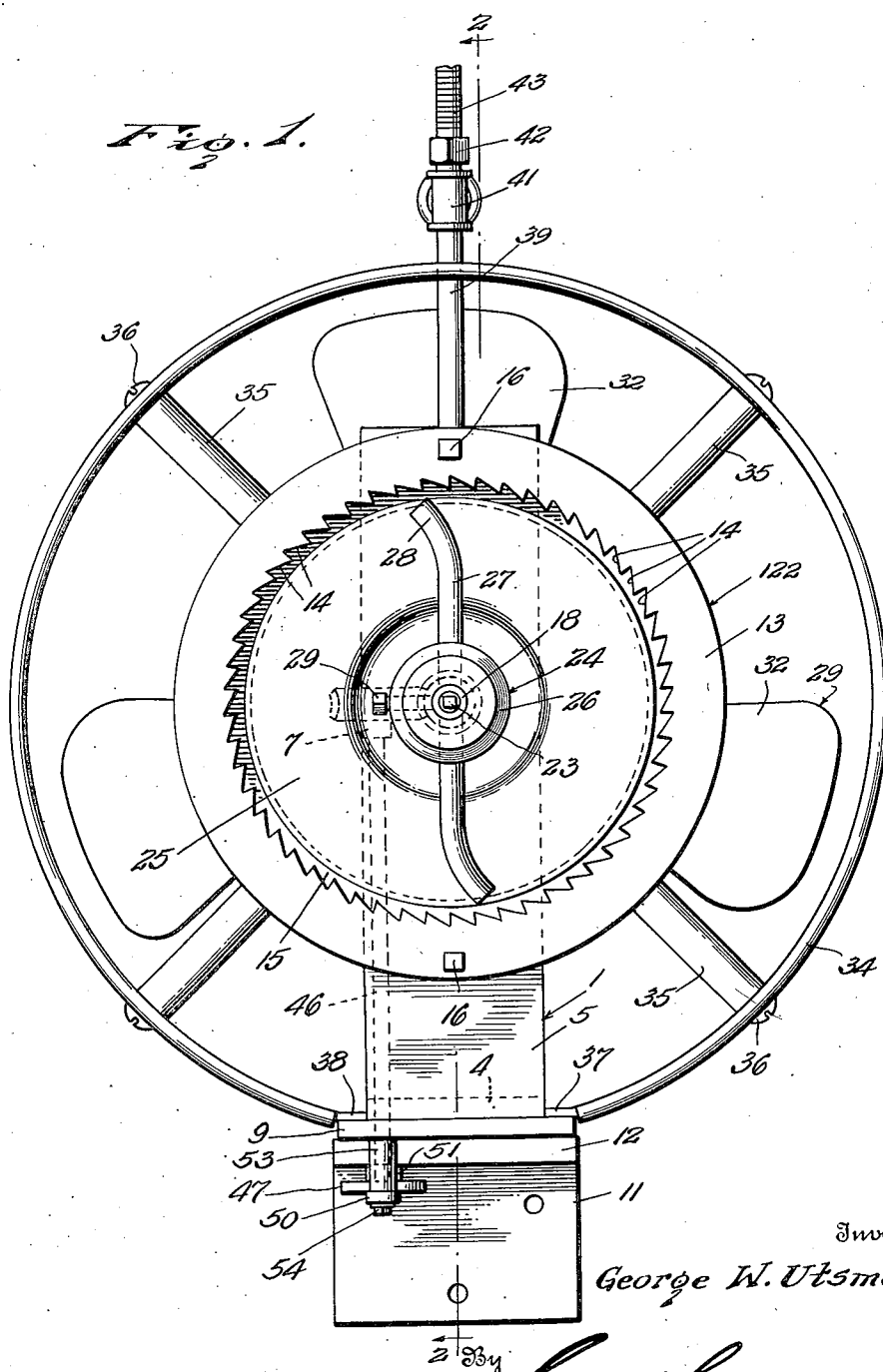
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HUMIDIFIER

Filed Dec. 11, 1936

2 Sheets-Sheet 1



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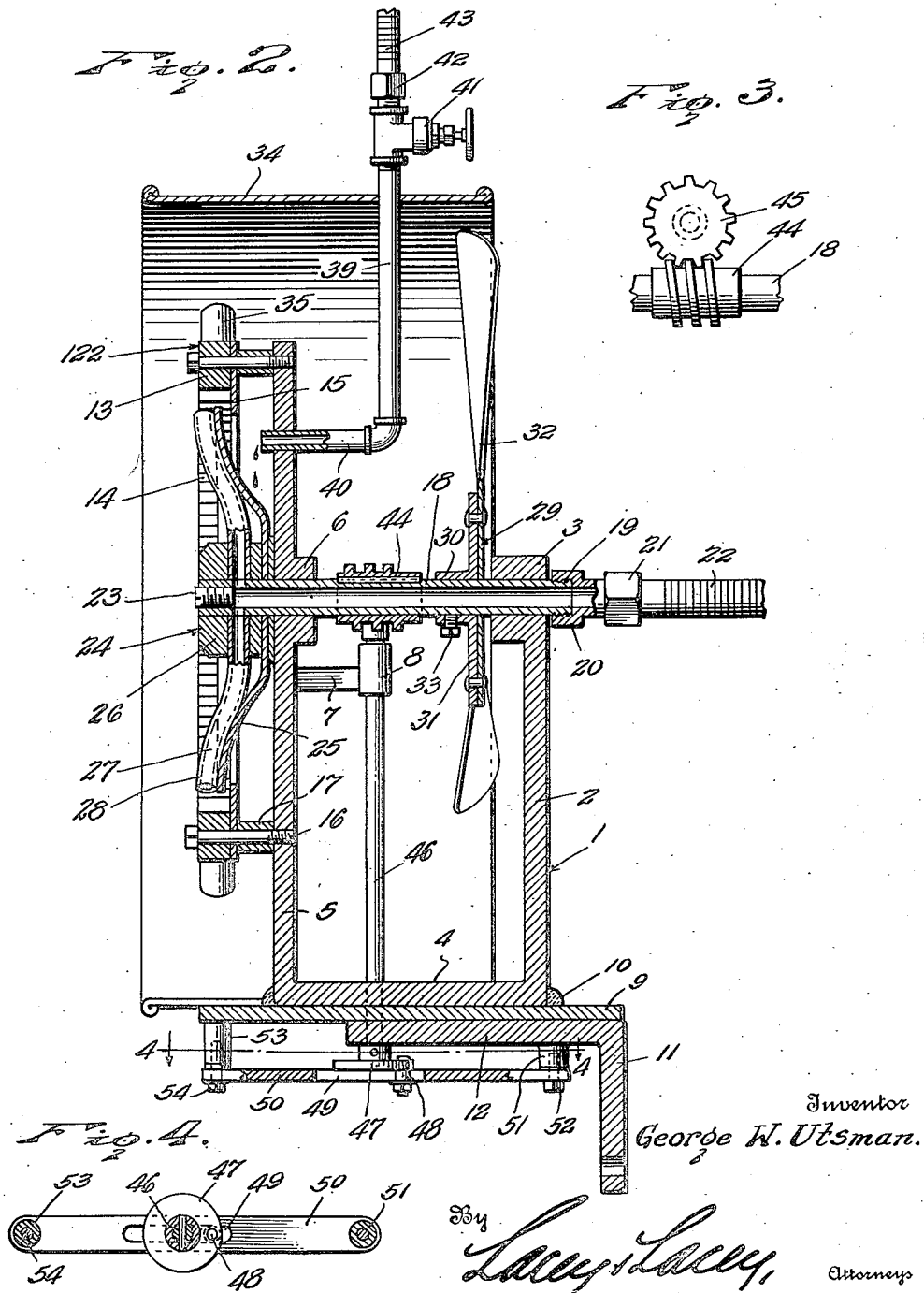
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UNITED STATES PATENT OFFICE

2,123,816

HUMIDIFIER

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Application December 11, 1936, Serial No. 115,418

9 Claims. (Cl. 261—88)

This invention relates to an improved humidifier which is more particularly intended for installation in mills, factories, and in such other places where air often becomes very dry and impure, so that it is unhealthful to breathe.

One object of the invention is to provide a humidifier which may be readily mounted on a wall of a room, in front of a window, or in any other suitable location, and which will be operable for forcing a flow of humidified air into the room so that living and working conditions within the room will be greatly improved.

Another object of the invention is to provide a device of this character which will effect the cleaning of the air of lint and other small particles.

A further object of the invention is to provide a humidifier employing a flow of compressed air which will serve the initial function of operating an air motor and the further function of aerating or humidifying water, said humidified water to be forced into the room by a fan carried by the device and driven by said air motor, so that only the flow of compressed air and a flow of water will be required for the proper operation of the humidifier.

The invention seeks, as a still further object to provide a humidifier of simple construction which will have few working parts.

Other and incidental objects of the invention, not specifically mentioned hereinabove, will become apparent during the course of the following description.

In the accompanying drawings:

Figure 1 is a front view of my improved humidifier.

Figure 2 is a vertical sectional view on the line 2—2 of Figure 1, looking in the direction indicated by the arrows.

Figure 3 is a detail plan view of the worm and driving gear employed.

Figure 4 is a detail sectional view on the line 4—4 of Figure 2, looking in the direction of the arrows.

Referring now more particularly to the drawings, wherein like numerals of reference will be seen to designate like parts throughout the several views, the numeral 1 indicates, in general, the frame of my improved humidifier. As best seen in Figure 1 of the drawings, the frame is substantially U-shape in formation and includes a relatively short upstanding arm 2 which terminates in an enlarged bearing 3. The frame is preferably formed of heavy cast metal or, if desired, the frame may be made of any other suitable material. The frame also includes a flat base or bight portion 4 and an upstanding relatively long arm 5 which is formed near its upper end portion with a bearing 6 adapted to confront the bearing 3 so that said bearings will be in hori-

zontal alinement. The frame is provided with an integral bracket 7 having a vertically disposed bearing 8. The purpose of the bracket 7 and bearing 8 will be described more fully hereinafter. In order to mount the frame, I employ a mounting plate 9 which is flat in shape and is relatively wide with respect to the base 4 of the frame. The mounting plate 9 is welded to the base 4, as indicated at 10, but, if desired, the plate 9 may be bolted to the frame or secured in any other preferred manner. A mounting bracket 11 serves to support the device on a wall and includes a relatively long normally horizontal arm 12 which is adapted to underlie the mounting plate 9 throughout substantially half its area.

Associated with the frame 1 is an air motor 122 including a stator which is shown generally at 13. The stator, as best seen in Figure 1, is circular in shape and is provided about its inner circumference with recesses or vanes 14. The stator is provided with a baffle 15 and said stator is mounted on the relatively long arm 5 of the bracket by means of bolts 16. Spacing sleeves 17 serve to space the stator from the arm 5 of the bracket and, as will be observed, the stator is so mounted that its axis will be in alinement with the bearings 3 and 6. The bolts 16 will serve not only to clamp the stator 13 to the arm 5 but also to clamp the baffle 15 between the spacing sleeve 17 and the inner face of the stator 13. The stator will thus be firmly mounted on the frame and the baffle will, of course, be effectually mounted in proper position on the stator.

A shaft 18 is journaled by the bearings 3 and 6 and is adapted to extend through said bearings across the frame and into the stator axially thereof. The shaft 18 is hollow and is provided with a threaded inner end portion 19 which is adapted to have screwed thereon a gland nut 20 forming a part of a flexible connection 21. A flexible pipe or tube 22 is connected to the connection 21 and is adapted to lead a flow of compressed air from a suitable source to the shaft 18 for a purpose to be described in more detail hereinafter. The shaft is closed at its outer or free end by a plug 23 and said shaft carries, at its free end portion, a rotor 24 which includes a concavo convex metal plate 25 and, forwardly of the plate, a hub 26, which is formed with oppositely extending lateral openings, in which openings are mounted relatively long curved rotor nozzles 27. As best seen in Figure 1 of the drawings, the rotor nozzles are curved at their outer ends, as shown at 28, and are adapted to confront the recesses 14 in close spaced relation thereto. A set bolt 29 extends through the hub at substantially right angles to the rotor nozzles and serves to connect the rotor with the shaft 18. It will be understood that

a flow of compressed air entering through the pipe 22 will pass through the hollow shaft 18, through the rotor nozzles 27 and through the curved ends 28 thereof to impinge in the recesses 14. In the manner of the well known turbine, the air flow, by engagement with the recesses of the stator, will cause the rotor to rotate at a high rate of speed.

Carried on the shaft 18 near the bearing 3, is a fan 29 which includes a hub portion 30 having a flange 31, and blades 32. The blades are of any suitable number, three being shown. The fan is connected to rotate with the shaft by means of a set screw 33 which extends through the hub 30 into engagement with the shaft 18.

A circular housing 34 surrounds the stator frame and fan and is formed, preferably, of a heavy grade of sheet metal. The housing is connected to the device by means of spacing sleeves 35 and bolts 36. The spacing sleeves are four in number, as shown in Figure 1, and are adapted to extend radially from the stator so that the housing 34 will be effectively spaced from the stator throughout its circumference. The housing has free end portions 37 and 38 which are adapted to overlie the plate 9. If desired, the end portions 37 and 38 may be secured to the plate 9 or said end portions may be allowed to remain disconnected therefrom.

A water inlet pipe is shown at 39 and has a lower end portion 40 extending laterally through the upper end portion of the arm 5 into overhanging relation to the concavo convex rotor plate 25. The pipe 39 extends upwardly through the housing 34 and is provided with a suitable flow controlling valve 41. A flexible connection 42 and a flexible pipe 43 serve to connect the pipe 39 to a suitable water supply.

There is mounted on the shaft 18, medially between the arms 2 and 5 of the frame, a worm 44 which is adapted to mesh with a drive gear 45 carried on a drive shaft 46. The drive shaft 46 has its upper end portion journaled by the bearing 8 and its lower end portion extending downwardly through the base 4 of the frame, the plate 9 and through the arm 12 of the bracket 11. Carried at the lower end of the shaft 46 is a drive disc 47 having a crank pin 48 thereon. The crank pin 48 is adapted to ride in a slot 49 formed in an oscillating link 50. The oscillating link 50 is swingingly mounted at its inner end on a stud 51 and is secured to said stud by a bolt 52, while the outer or free end of said oscillating link is swingingly connected to a relatively long stud 53 which is carried on the mounting plate 9. A bolt 54 serves to retain the free end of the oscillating link in proper relation to the stud 53.

In use, the device is mounted preferably in a window or other space in a room in a factory or in any other place where it is desired to humidify the atmosphere. The air pipe 22 is connected to a suitable supply of compressed air and the water pipe 43 is, of course, connected to a suitable water supply. When the flow of compressed air is turned on, said flow will pass through the hollow shaft 18 and through the rotor nozzles 27 and into the recesses 14 of the stator 13. The rotor will, as previously explained, be caused to rotate at a high rate of speed, and will of course, cause the fan 32 to rotate within the housing 34. The fan will direct a strong blast of air through the housing and into the room. When the valve 41 is opened, a flow of water will be permitted

to fall on the inner surface of the plate 25 and, as the rotor is rotated at a high rate of speed, the water will soon cover the plate and will, by centrifugal force, be caused to spread or flow from the free edge of the plate into contact with the stator and into a position where air flowing under high pressure from the nozzles 27 will come into contact therewith and will vaporize or aerate the water, which aerated water will be driven into the room by the fan 32.

As the shaft 18 rotates, the worm 44 will rotate and will drive the gear 45 and the shaft 46. As the shaft 46 rotates, the disc 47 will be rotated for rotating the crank pin 48 and shift from side to side the oscillating link 50 which, as described, is swingingly connected at its inner end to the bracket 11 and pivotally connected at its outer end to the mounting plate 9. The mounting plate will thus be caused to swing laterally for causing the humidifier to oscillate from side to side as the shaft 46 rotates. A flow of humidified air may thus be directed to all portions of the room. If it is desired that the humidifier direct the flow of humidified air in one direction only, it is only necessary to remove the oscillating link 50 or the disc 47, or disconnect the oscillating mechanism in any other suitable manner.

Attention is particularly directed to the fact that the flow of compressed air serves a dual function. That is to say, the flow of compressed air serves not only to drive the rotor of the compressed air motor but also to aerate a screen of water which is thrown outwardly by centrifugal force into contact with the stator at points near the outlets of the nozzles. Water will be effectively aerated by this process. The device is simple in construction and capable of manufacture at a reasonable figure so that it may be purchased in quantity for installation in factories and places where normal working conditions are lowered by the presence of extremely dry or impure air.

From the foregoing, it is believed that the construction and operation of my improved humidifier will be clearly understood.

Having thus described the invention, what I claim is:

1. A humidifier including a frame, an air motor carried by the frame and having a rotor and a stator, a hollow shaft carried by the frame and rotatably mounting said rotor, said rotor having rotor nozzles, a housing carried by the stator, said stator having recesses adapted to be confronted by said rotor nozzles, said rotor being adapted to be rotated by an air flow passing through the shaft and through the rotor nozzles into engagement within the recesses and said fluid flow being adapted to aerate water flowing against and distributed by the rotor, and means rotatable on the shaft for projecting the aerated water exteriorly of the humidifier.

2. In a humidifier, a frame having arms, a hollow shaft carried by the arms, an air motor carried by the frame and including a stator mounted on one of said arms, said stator having recesses, a rotor carried on said shaft and having a rotor plate and rotor nozzles, said rotor nozzles having end portions disposed to confront the recesses of the stator, said rotor being rotatable by an air flow passing through the shaft and through said rotor nozzles to flow into the recesses, means for projecting a liquid stream against the rotor plate for distribution by rotary movement of said plate from the periphery thereof into proximity of the air flow whereby said

liquid will be aerated by said air flow, and a fan rotatable with the shaft for projecting aerated liquid exteriorly of the humidifier.

3. In a humidifier, a frame having arms, a hollow shaft carried by the arms, an air motor carried by the frame and including a stator mounted on one of said arms, said stator having recesses, a rotor carried on said shaft and having a rotor plate and rotor nozzles, said rotor nozzles having end portions disposed to confront the recesses of the stator, said rotor being rotatable by a fluid flow passing through the shaft and through said rotor nozzles to flow into the recesses, means for projecting a liquid stream against the rotor plate for distribution by rotary movement of said plate from the periphery thereof into proximity of the fluid flow whereby said liquid will be permeated by said fluid flow, a fan rotatable with the shaft for projecting fluid permeated liquid exteriorly of the humidifier, and a housing carried by the stator and surrounding the frame and fan and aiding in the projection of the fluid permeated liquid exteriorly of the humidifier.

4. In a humidifier, a frame having arms, a hollow shaft carried by the arms, an air motor carried by the frame and including a stator mounted on one of said arms, said stator having recesses, a rotor carried on said shaft and having a rotor plate and rotor nozzles, said rotor nozzles having end portions disposed to confront the recesses of the stator, said rotor being rotatable by an air flow passing through the shaft and through said rotor nozzles to flow into the recesses, means for projecting a liquid stream against the rotor plate for distribution by rotary movement of said plate from the periphery thereof into proximity of the air flow whereby said liquid will be aerated by said air flow, a fan rotatable with the shaft for projecting aerated liquid exteriorly of the humidifier, a housing carried by the stator and surrounding the frame and fan and aiding in the projection of the aerated liquid exteriorly of the humidifier, and means for permitting the mounting of the frame.

5. In a humidifier, a frame having arms, a hollow shaft carried by the arms, an air motor carried by the frame and including a stator mounted on one of said arms, said stator having recesses, a rotor carried on said shaft and having a rotor plate and rotor nozzles, said rotor nozzles having end portions disposed to confront the recesses of the stator, said rotor being rotatable by an air flow passing through the shaft and through said rotor nozzles to flow into the recesses, means for projecting a liquid stream against the rotor plate for distribution by rotary movement of said plate from the periphery thereof into proximity of the air flow whereby said liquid will be aerated by said air flow, a fan rotatable with the shaft for projecting aerated liquid exteriorly of the humidifier, a housing carried by the stator and surrounding the frame and fan and aiding in the projection of the aerated liquid exteriorly of the humidifier, a mounting plate carried by the frame, and a mounting bracket carried by the mounting plate and shiftably connected therewith, said mounting bracket being adapted for mounting the humidifier in an operative position.

6. In a humidifier, a frame, a shaft carried by the frame, an air motor carried by the frame and having a stator and a rotor carried by said shaft, a fan carried by the shaft to rotate therewith, a housing carried by the stator and surrounding

the air motor, frame and fan, means carried by the frame for projecting a liquid stream onto the rotor for distribution thereby into proximity of an air flow for aeration thereby, said air flow rotating the rotor and driving the fan, said fan projecting the aerated liquid exteriorly of the housing, a worm carried by the shaft, a drive shaft carried by the frame and having a drive gear meshing with the worm, a mounting plate carried by the frame, a mounting bracket carried by the frame, said drive shaft being adapted to project through said frame, mounting plate and mounting bracket, a drive disc carried by the drive shaft, a crank pin carried by the drive disc eccentrically thereon, and an oscillating link carried by the mounting plate and mounting bracket and having a slot shiftably receiving said crank pin, said worm rotating the drive gear at rotation of the shaft for rotating the drive shaft and the drive disc whereby the oscillating link will be shifted for oscillating the humidifier.

7. In a humidifier, a U-shaped frame having arms provided with bearings, a hollow shaft journaled by said bearings, an air motor carried by the frame and having a stator mounted on one of said arms with its axis in alinement with the shaft, a rotor carried by the shaft within the stator, a water inlet pipe carried by the frame and adapted to project a stream of water onto the rotor for distribution from the periphery thereof into proximity of a fluid flow on the rotor whereby said fluid flow will permeate the water as the rotor is rotated, said fluid flow serving to rotate the rotor, and means carried on the shaft for projecting the fluid flow permeated water exteriorly of the humidifier.

8. In a humidifier, a U-shaped frame having arms provided with bearings and having a flat base, a mounting plate for said base, a mounting bracket adapted for shiftably mounting said frame and mounting plate, a shaft carried by the arms and journaled by said bearings, an air motor carried by the frame and having a stator carried by one of said arms, a rotor mounted on the shaft and adapted to rotate within the stator, said stator being provided with a baffle disposed in close spaced relation to the rotor, means for projecting a liquid stream against the rotor for distribution from the periphery thereof within the stator for aeration by an air flow, said air flow serving to rotate the rotor, a housing, spacing sleeves mounting the housing on the stator, and a fan carried on the shaft and adapted to project aerated water exteriorly of the housing.

9. In a humidifier, a frame, an air motor carried by the frame and having a stator provided with a baffle, said air motor including a rotor having a concavo convex rotor plate and rotor nozzles, a hollow shaft carried by the frame and rotatably mounting the rotor, said hollow shaft being adapted to lead an air flow from a source of compressed air through the nozzles into engagement with the stator whereby the rotor will be rotated, said stator having recesses receiving said air flow, means for projecting a liquid stream against the concavo convex rotor plate for distribution from the periphery thereof between the baffle and said plate and adjacent the air flow, said air flow aerating the liquid as it leaves the periphery of said rotor plate, and means carried on the shaft to rotate therewith for projecting aerated liquid exteriorly of the humidifier.

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