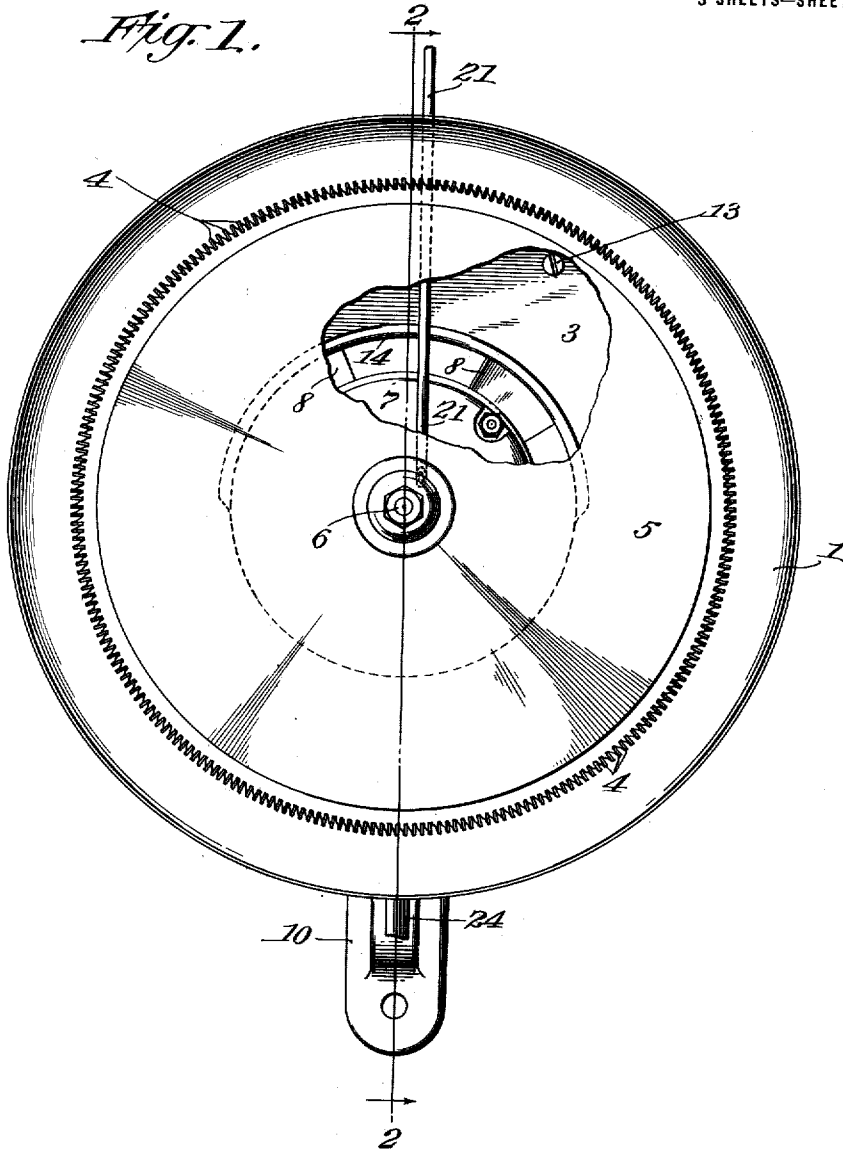


F. F. BAHNSON.
HUMIDIFIER.
APPLICATION FILED OCT. 31, 1917.

1,267,166.

Patented May 21, 1918.
3 SHEETS—SHEET 1.

Fig. 1.



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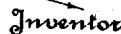
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Fig. 2.



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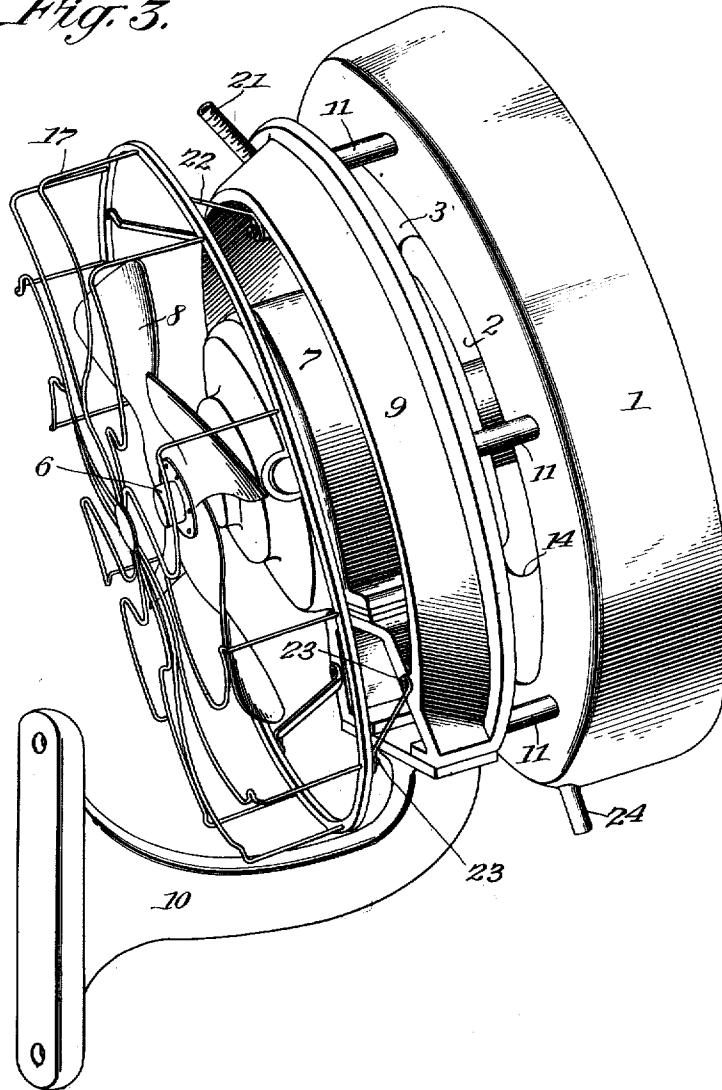
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3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

FREDERIC F. BAHNSON, OF WINSTON-SALEM, NORTH CAROLINA.

HUMIDIFIER.

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Specification of Letters Patent.

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Application filed October 31, 1917. Serial No. 199,556.

To all whom it may concern:

Be it known that I, FREDERIC F. BAHNSON, a citizen of the United States, residing at Winston-Salem, in the county of Forsyth and State of North Carolina, have invented certain new and useful Improvements in Humidifiers, of which the following is a specification.

The present invention relates to humidifiers comprising a rapidly revolving disk upon which the liquid is delivered and an annular row of obstructing blades surrounding the disk by which the film of liquid driven outward from the revolving disk by centrifugal force is converted into vapor. The invention is intended as an improvement of the type of humidifier disclosed in the Patent 947,300 dated January 25, 1910.

I have found by observation and experience that when the water from the rotating disk strikes the teeth surrounding it and vapor is formed at the point of impact, the minute particles of the water which compose the vapor are projected in all directions. However, in the device disclosed in Patent 947,300 only a comparatively small portion of this vapor is utilized. The air current set up by the fan passes around the casing of the humidifier and thereby creates a zone of negative pressure or draft which causes the vapors formed to commingle with the air current passing. Obviously the rate of commingling and therefore of the absorption of the vapors by the air is proportional to the quantity of air passing per unit of time. It is equally obvious that of this air current only the inner zone immediately surrounding the humidifier is really effective in drawing away the vapor. The capacity of absorption of a device of this kind is therefore relatively small and reaches its practical limit with the mechanical limits of the fan.

It is well understood that it is not desirable or advisable to run the fan at too high a speed, because on the one hand the power consumption of the motor driving the fan increases at a much greater rate than the rate of air propagation, especially at the upper limits, and would be out of proportion to the increase in effect, and on the other

hand the noise incident to the increase of speed would be tremendous and the wear would be prohibitive. As a matter of fact, in order to produce the desired effects, the speed of the motor is high in practice and the operation of the device noisy for that reason.

It is the object of the invention to eliminate these various draw backs and increase all around the efficiency of devices of the class referred to. It is the particular object to increase their evaporative efficiency, to reduce the noise occasioned by the operation, lower the consumption of power and minimize the wear.

I accomplish these objects by bringing the air in such quantities and under such conditions in contact with the vapor formed at the point of impact that a large percentage of the vapor is carried away in stable suspension. In mechanically carrying out this idea I have been guided principally by the fact that the rate of absorption depends to a great extent upon the time element during which the vapor is allowed to react on the air or vice versa.

The invention comprises principally the provision of suitable air passages leading into the zone of evaporation. Through these air passages a current of air may be passed of such quantity and rate of flow that a large percentage of the vapor is carried away as fast as it is formed and that this vapor is held by the air in stable suspension.

For a fuller understanding of the invention reference is had to the appended drawings in which:—

Figure 1 is a face view of the device, a part being broken away to show some detail;

Fig. 2 is a section along the line 2—2 of Fig. 1; and

Fig. 3 is a perspective view of a device like that shown in Figs. 1 and 2, but differing as to some details.

In the drawings, 1 is a fixed circular case open at its front and having a relatively large opening 2 in its rear surface. 3 is a stationary ring having its outer edge provided with a series of blades 4. 5 is a cone-shaped disk within the casing mounted for rotation upon a shaft 6 and held thereon by

a nut 6'. The shaft 6 is rotated by an electric motor 7 which also drives the fan 8. To support all these parts I use an annular casting 9 mounted on a wall bracket 10 or in any other suitable way. Studs 11 support case 1 upon the frame 9 and studs 12 support the ring or grid 3 on case 1. In practice I find it convenient to use male threads on both ends of studs 11, female threads on one end of studs 12, and male threads on the other end, 13 being a round nut with a slot. The ring 3 is preferably provided with a central opening 14. Adjacent the openings 2 and 14 are provided gutters 15 and 16 respectively. These gutters may be conveniently formed by crimping the material from which the case 1 and the ring 3 are made, as shown.

The fan guard 17 is shown in Fig. 2 as mounted on studs 18 extending from the annular casting or frame 9 and in practice the connection is made by screws 19 extending into the studs 18. The motor 7 may be supported on the casting 9 in any desired manner, but I prefer to interpose between it and the casting a pad of rubber 20, cork or other material, as shown in Figs. 2 and 3, to deaden the sound as much as possible. The pipe 21 for supplying the liquid extends through the frame 9 into close proximity to the disk 5. 24 is a pipe to carry away such water as may be condensed on the various surfaces of case 1, ring 3, teeth 4, etc.

In Fig. 3 the fan guard 17 is shown connected to the frame 9 by means of arms 22 attached to the frame and the guard by screws 23. The material points in the construction and operation of the device are the following:

As the disk 5 is rotated and the liquid driven in a thin film outwardly against the teeth 4 the air entering through the opening 2 passes to the greater extent through the circular passageway defined by the case 1 and the ring 3 past the outer side of the teeth. Another smaller portion of the air passes through the opening 14 through the passageway defined by the ring 3 and the disk 5 through the teeth 4. The teeth 4 are made longer than in the old form of device and spaced a distance apart sufficient to prevent the formation of drops, *i. e.* the distance between adjacent teeth is made greater than the diameter of a water drop. As the air plays all around the teeth and passes between the teeth, substantially all the atomized particles which have assumed the form of vapor are promptly carried away in the air current. Some of the vapor is necessarily condensed again and settles on the teeth or the inside of case 1 in the form of thin film areas. The device is tilted backwardly a slight angle of about 15°. The teeth, which are parallel with the

shaft of the motor, assume therefore a slight angle toward the horizontal. The condensed vapor in running in thin films down the teeth and the inside of the case is continuously exposed to the action of the air. That which does not evaporate again under this influence drains to the base of the inclined teeth 4, or to the back of case 1, whence by the aid of gutters 15 and 16 it is led to the lowest point of case 1 where drain pipe 24 is provided for its disposal.

The velocity of the air currents past the nascent vapor particles must be such as to carry off the greatest possible proportion of the atomized water without picking up objectionably large particles or drops. Adjustment to that end is effected by fan design and properly fixing the distance between the case 1 and the teeth, between the rear wall of the case 1 and the ring 3, the length of the teeth and the distance between the teeth.

While the air current passing through opening 14 contributes in a large measure to the success of the device, it is not absolutely necessary to pass part of the air current through this passageway. Entirely satisfactory results are obtained when the element 3 is imperforate and the air is passed only around element 3. The length and shape of the teeth permit the air to flow along both sides and the outer edge of the teeth.

Part of the air is of course free to pass, as in the old form of device, around the case 1 and mingles with the vapor charged air current passing out through the device. At this stage the vapors will readily expand and mix freely without any possibility or probability of immediate condensation.

The rate of flow of the air passing through the said passage-ways and the peripheral speed of the disk may be lower than in the old form. This leads to considerable reduction of the noise. However, the greatest reduction of noise is brought about by guiding the air currents instead of baffling them.

Aside from the reduction of the noise, the present arrangement results in a considerable saving of power as is obvious and in a reduction of wear.

By suitably mounting the motor, as by the interposition of rubber, cork or other sound-deadening pads as indicated, it is possible to almost entirely eliminate noise.

What is shown and described is what I consider now a preferred embodiment of the invention. It is, of course, possible to make various changes in the structural details within the scope of the disclosure.

I claim:—

1. In a humidifier, the combination of a rotatable disk, an annular row of obstructions surrounding the disk, a passage-way

leading to both sides of said row of obstructions, means for passing a fluid through said passageway and means for delivering a liquid to the disk.

2. In a humidifier, the combination of a rotatable disk, an annular row of obstructions surrounding the disk, a passage-way leading past the said row of obstructions at both sides thereof, means for passing a fluid through said passage-way and means for delivering a liquid to the disk.

3. In a humidifier, the combination of a case open at its front, a disk rotatably mounted in the case, a row of obstructions between the edge of the disk and the wall of the case, a passage-way opening into the space between the row of obstructions and the wall of the case, means for passing a fluid through said passage-way and means for delivering a liquid to the disk.

4. In a humidifier, the combination of a case open at its front, a disk rotatably mounted in the case, a row of obstructions between the edge of the disk and the wall of the case, a support therefor, a passage-way defined by the wall of the case and the said support, means for passing a fluid through said passage-way and means for delivering a liquid to the disk.

5. In a humidifier, the combination of a case open at its front, a disk rotatably mounted in the case, a row of obstructions between the edge of the disk and the wall of the case, a disk-like support therefor, a passage-way defined by the wall of the case and the said support, means for passing a fluid through said passage-way and means for delivering a liquid to the disk.

6. In a humidifier, the combination of a case open at its front, a disk rotatably mounted in the case, a row of obstructions between the edge of the disk and the wall of the case, a disk-like support therefor, a passage-way defined by the wall of the case and the said support, a passage-way extending through the support, means for passing a fluid through said passage-ways and means for delivering a liquid to the disk.

7. In a humidifier, the combination of a case open at its front and having a rear wall, a disk rotatably mounted in the case, a row of obstructions between the edge of the disk and the wall of the case, a disk-like support therefor, the said disk-like support and the rear wall of the case being constructed and arranged to define a passage-way leading into the space between the wall of the case, the said obstructions and means for passing a fluid through said passage-way and means for delivering a liquid to the disk.

8. In a humidifier, the combination of a case open at its front and having a rear wall, a disk rotatably mounted in the case,

a row of obstructions between the edge of the disk and the wall of the case, a disk like support therefor, the said disk-like support and the rear wall of the case being constructed and arranged to define a passage-way leading into the space between the wall of the case and the said obstructions, a passage-way extending through said disk-like body, means for passing a fluid through said passage-ways and means for delivering a liquid to the disk.

9. In a humidifier, the combination of a case open at its front, a disk rotatably mounted in the case, a row of obstructions between the edge of the disk and the wall of the case, a disk-like support therefor, a passage-way defined by the wall of the case and said support, means for passing a fluid through said passage-way, means extending through said support for rotating the disk and means for delivering a liquid to the disk.

10. In a humidifier, the combination of a case open at its front and having a rear wall, a disk rotatably mounted in the case, a row of obstructions between the edge of the disk and the wall of the case, a disk-like support therefor, the said disk-like support and the rear wall of the case being constructed and arranged to define a passage-way leading into the space between the wall of the case and said obstructions, a central opening through the disk-like support, means extending through the said rear wall and said opening for rotating the disk, means for passing a fluid through the said rear wall into the case and means for delivering a liquid to the disk.

11. In a humidifier, the combination of a case open at its front and having a rear wall, a disk rotatably mounted in the case, a row of obstructions between the edge of the disk and the wall of the case, a disk-like support therefor, the said disk-like support and the rear wall of the case being constructed and arranged to define a passage-way leading into the space between the wall of the case and the said obstructions, a central opening through the disk-like support, a central opening through the said rear wall, means extending through said openings for rotating the disk, means for passing a fluid through said openings into the case and means for delivering a liquid to the disk.

12. In a humidifier, the combination of a case open at its front and having a rear wall, a disk rotatably mounted in the case, a row of obstructions between the edge of the disk and the wall of the case, a disk-like support therefor, the said disk-like support and the rear wall of the case being constructed and arranged to define a passage-way leading into the space between the wall

of the case and the said obstructions, a central opening through the disk-like support, a central opening through the said rear wall, a shaft extending through the said openings and connected with the disk, a circular frame connected to the case and the said support, motor means mounted in said frame, a fan driven by the motor means to force air through said openings into the case and means for delivering a liquid to the disk. 10

In testimony whereof, I affix my signature.

FREDERIC F. BAHNSON.