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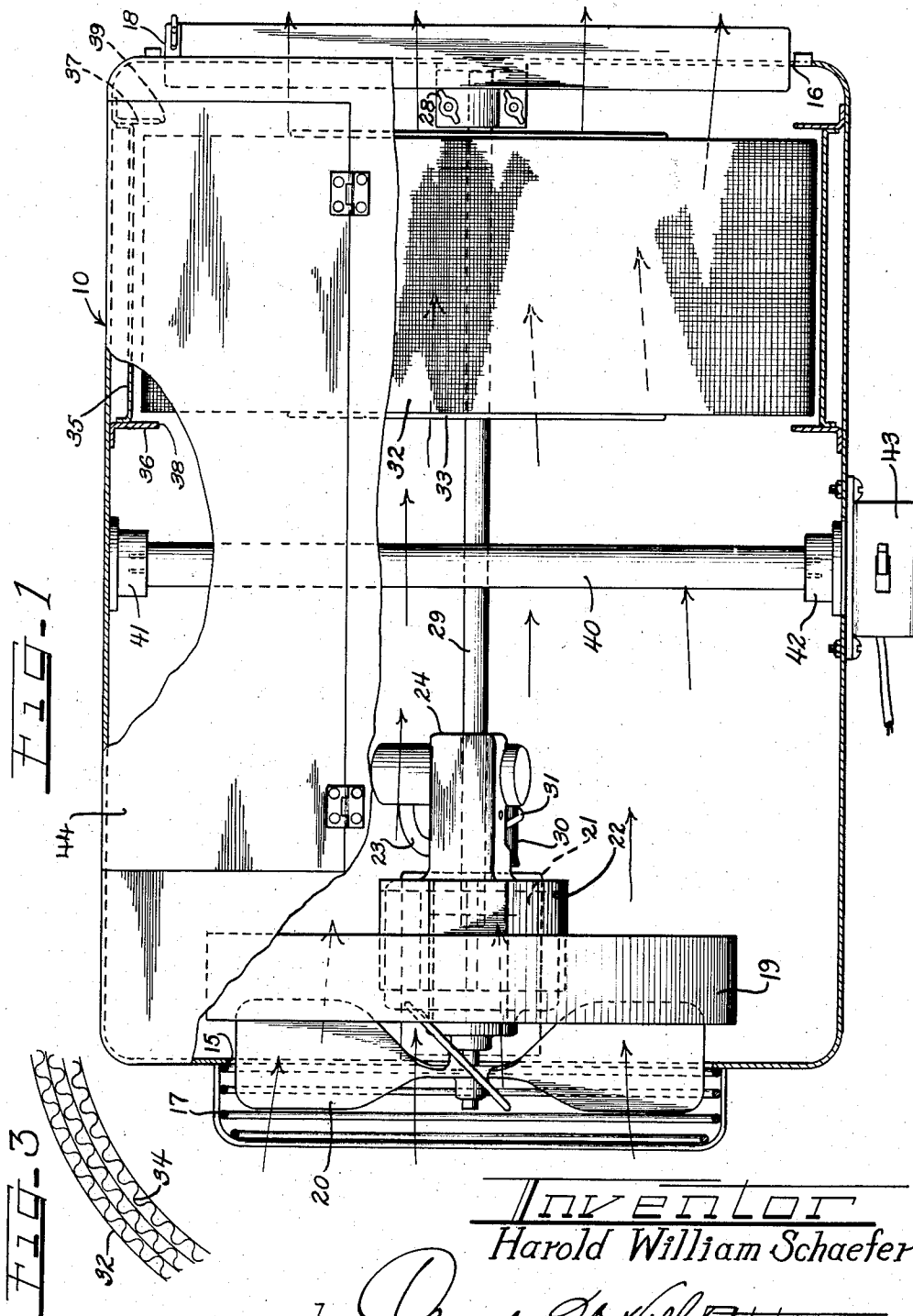
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AIR STERILIZER AND HUMIDIFIER

Filed Feb. 23, 1940

2 Sheets-Sheet 1



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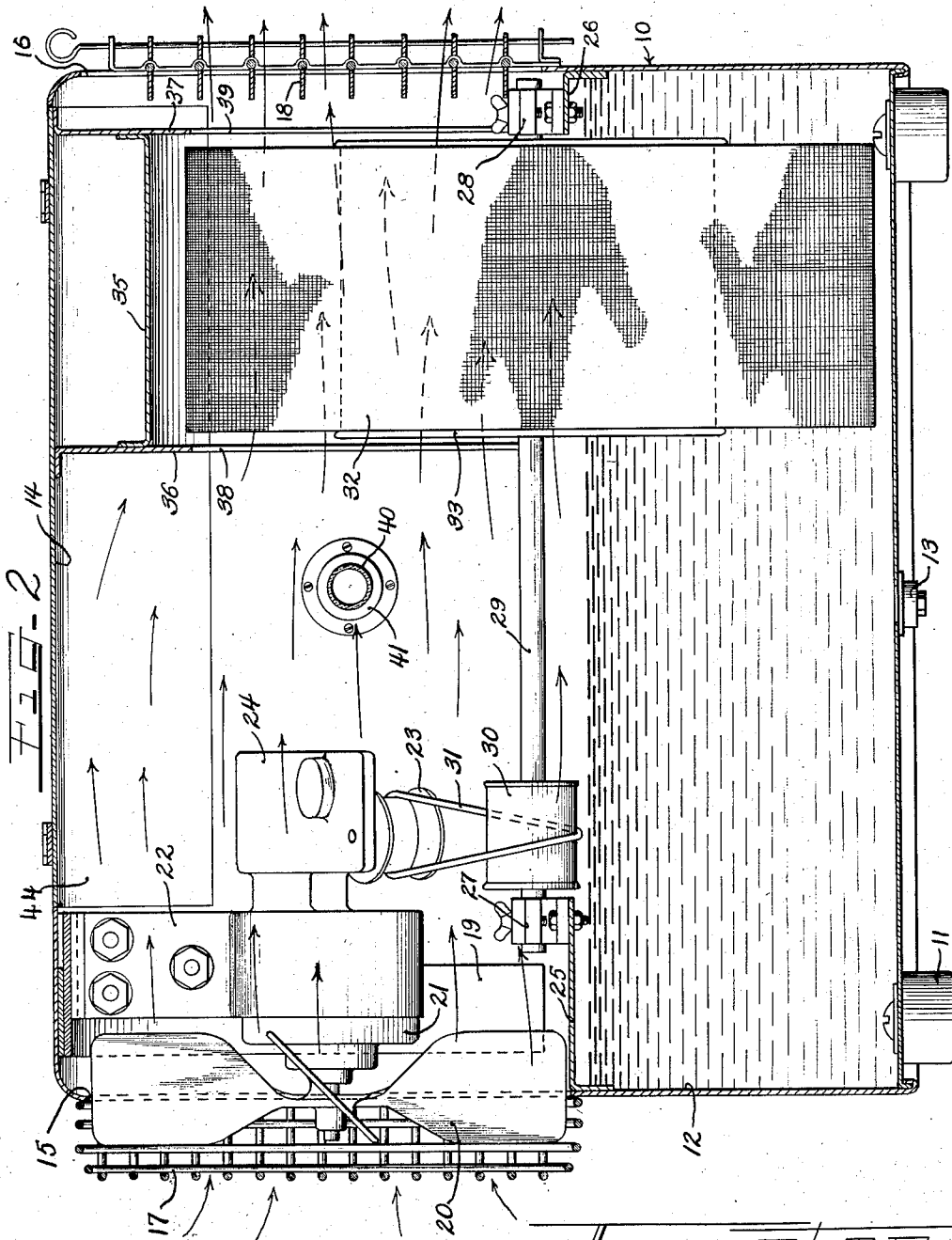
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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AIR STERILIZER AND HUMIDIFIER

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2 Claims. (Cl. 261—30)

The present invention relates in general to fluid conditioning and disseminating apparatus and is more particularly concerned with improved apparatus of such character, which is so arranged as to enable variation and control of the characteristics of the fluid being disseminated, and which is more specifically arranged to permit irradiation of not only the fluid being conditioned and disseminated, but also the medium utilized for conditioning the fluid.

The conditioning of fluids such as air and the like in homes, buildings, etc., and in the carrying out of many industrial processes, is becoming of increased importance and new applications are rapidly being developed. Of particular importance is the control and conditioning of air in spaces to be occupied by human beings, especially with reference to the control of humidity or moisture of the air. Various types of humidifying devices have been suggested, these devices in the main comprising a casing having a duct for the circulation of the air to be conditioned, this casing housing means whereby the air may be subjected to a liquid as water in such a way that moisture will be absorbed by the air and its humidity thereby varied during the passage of the air through the duct.

In many of the present arrangements, particularly in the portable types of air conditioners, it has been found desirable for reasons of economy to re-circulate the air. One chief objection, however, to this re-circulation of air is that its germ and bacteria content may continue to increase as a result of its being breathed, even though the conditioning apparatus may be provided with means for washing and cleaning of the re-circulated air.

Where water is provided in a reservoir of the apparatus for use in humidifying the air, it has also been determined that where the apparatus is not used for a period of time or the apparatus is infrequently used, the water in the reservoir may become rancid and, in fact, this water has been known to develop germ cultures. As a consequence, it becomes highly desirable to provide suitable means not only for eliminating the germs and bacteria in the air being conditioned, but also to purify the water being utilized for humidifying the air.

Accordingly, therefore, the present invention seeks to provide improved apparatus wherein the air is not only conditioned with reference to its temperature and moisture content, but also is irradiated with short-wave length light such as ultra-violet radiations, which effectively kills the

bacteria and germs carried by the air, and at the same time utilize these radiations for purifying the water which is used for humidifying the air, and so prevent rancidity of the water.

5 It is a further object of the herein described invention to provide a compact fluid conditioning apparatus, wherein improved means are embodied for irradiating the fluid that is to be conditioned, and also the medium which is dispersed
10 into the fluid during the conditioning operation.

A still further object of the invention is to provide, in apparatus of such character, novel means for agitating the conditioning medium while it is being irradiated, and for dispersing the conditioning medium into the fluid that is being conditioned.

Another object of the invention is to provide in such apparatus improved irradiating means that are so located as to enable the apparatus
20 to be selectively operated to humidify only the air being conditioned, irradiate the air only, secure a combination of the above, and which may also be utilized to effect different ozone characteristics in the air leaving the apparatus.

25 A still further object is to provide an improved method of disseminating an irradiated medium and carrying it to a position of use.

Other objects and features of the invention will more fully appear from the following detailed description taken in connection with the accom-
30 panying drawings which illustrate a single embodiment thereof, and in which:

Figure 1 is a plan view of apparatus embodying the features of the present invention, portions being cut away and shown in section to indicate the cooperative relationship and constructional features of the various parts of the apparatus;

Figure 2 is a longitudinal section of the same,
40 taken substantially on line II—II of Figure 1; and

Figure 3 is a detailed view showing the appearance of a portion of the evaporator wheel of the apparatus, when looking towards one end thereof.

As shown on the drawings:

45 In the illustrated embodiment of the present invention, the apparatus is disclosed as comprising a casing or housing as generally indicated at 10, which may be supported on suitable feet 11 of cushioning material secured to the bottom of the housing.

The bottom portion of this housing is made water-tight and forms a reservoir or compartment 12 for an air conditioning medium, in this case water, to be utilized for varying the hu-

midity of the air. The bottom of the casing, if desired, may be provided with a suitable drain plug 13.

This casing in its upper portion above the uppermost level of the water cooperates with the upper surface of the water to define a longitudinally extending air duct or chamber 14. This duct communicates at one end with an inlet opening 15 at one end of the casing, and an outlet opening 16 at the opposite end of the casing, these openings being disposed above the uppermost surface of the water and axially aligned.

The inlet opening is preferably provided with a projecting protective grille 17, and the outlet opening 16 is provided with control louvers, as generally shown 18, by which the amount and direction of air issuing from the duct may be controlled externally of the casing.

Adjacent the inlet opening 15, there is provided an inverted U-shaped shield member 19, which is slightly larger in diameter than the inlet opening and is supported in axial alignment therewith from the top of the casing. This shield member acts to direct the inlet air through the duct in the proper direction, but since it is open towards the water in the lower portion of the casing, the entering air may contact the uppermost surface of the water and cause turbulence or agitation thereof.

For inducing forced flow of air through the casing, there is provided a suitable fan having blades 20 disposed in the inlet opening 15, with their leading edges disposed exteriorly of the casing and protected by the grille 17, the trailing edges of the blades being disposed within the member 19.

This fan is driven by a suitable motor 21 which is supported from the top of the casing by an appropriate bracket 22.

The driving shaft of the motor 21 is oppositely extended from the side on which the fan is disposed and connects with a driving pulley 23, which is driven at reduced speed through suitable speed reducing mechanism 24 which may be in the form of a worm and gear.

At the opposite ends of the casing below the inlet and outlet openings therein, there are provided angular brackets 25 and 26 for respectively supporting bearings 27 and 28, in which an elongate shaft 29 is mounted for rotation. This shaft is provided with a pulley 30 which is operatively connected with the pulley 23 by means of a suitable belt 31.

The shaft 29 and pulley 30 are thus supported above the upper level of the water in the bottom of the casing, and adjacent the outlet opening 16 the shaft 29 carries a wheel 32 forming an evaporator element.

The wheel 32 is arranged to dip into the liquid in the bottom of the casing and to carry liquid into the stream of fluid being conditioned as it passes from the inlet opening to the outlet opening of the casing. While this wheel may be of any suitable construction, it is preferred to provide a construction as shown which embodies a central hub portion 33 surrounded by a rim made up of alternate plain and undulated strips of foraminous material such as screening. In this construction, as shown in Figure 3, the assembled strips provide transversely extending corrugations 34 between the uncorrugated strips, which effect channels through the rim portion of the wheel for the passage of air in its movement to the outlet opening of the cas-

ing. Surface tension of the liquid picked up from the bottom of the casing by the wheel causes the formation of liquid films in the screen interstices thus affording ideal conditions for rapid evaporation. Thus, the humidifying and cooling effect is greatly enhanced and carried out with increased efficiency.

The upper portion of the wheel lying within the air duct is shielded by an arcuate baffle plate 35 which is laterally connected to side wall portions 36 and 37, these side wall portions being respectively provided with openings 38 and 39 which are in alignment and act to guide the air through the rim portion of the evaporator wheel.

The upper part of the casing is provided with a hinged door 44 permitting access to the interior of the casing and through which the liquid in the bottom of the casing may be replenished from time to time.

The apparatus thus far described constitutes an air conditioner or humidifier which may be disposed in a room or building for circulating and humidifying the air therein. Since the arrangement for reasons of economy is arranged to re-circulate the air in the space where it is installed, it will readily be apparent that if this space is occupied by human beings who are breathing and exhaling the air, this air may become filled with germs and bacteria. Moreover, it has been found, in connection with such apparatus, that if it is only used occasionally or at rather long intervals, and water in the lower portion of the casing is permitted to stand without being agitated, germ cultures and living organisms may be formed therein which would make it unfit for use in the humidifier.

In order to effectively purify not only the air which is being circulated, as well as the water in the casing, the present invention makes use of an ultra-violet light generator which has the property of killing the germs and bacteria.

In the present instance, this generator is in the form of an elongate lamp 40 which is supported at its ends in suitable terminal sockets 41 and 42, these sockets being supported on the side walls of the casing and in such position that the lamp will extend across the air duct above the surface of the liquid in the bottom of the casing. Moreover, the lamp is preferably arranged ahead of the evaporator wheel, but in such position that the radiation from the lamp will fall upon the foraminous strips composing its rim portion. Due to the formation of liquid film in this portion of the wheel the liquid is most readily treated by the radiation from the lamp and rendered sterile. Also, as the wheel rotates, sterilized portions on the wheel will be carried into the liquid in the bottom of the casing.

It will be appreciated that under ordinary conditions the penetrating powers of the radiations into the liquid in the bottom of the casing will be rapidly diminished as they pass into the liquid. In order to overcome this disadvantage, the rotation of the evaporator wheel is utilized to continually stir and move the particles of liquid, so that untreated portions are being continually presented at the uppermost surface of the liquid for treatment by the ultra-violet radiations. Moreover, the action of the fan blades in moving the air through the duct also acts on the surface of the liquid causing small ripples or turbulence in this portion which materially enhance the treatment of the liquid. Ultra-violet lamps of this character are available from a number of manu-

facturers. The lamp which is illustrated generates ultra-violet radiations or light by the ionization of a gas such as mercury vapor. Of course, the envelope of the lamp is constructed of appropriate material to permit the passage of the ultra-violet radiations efficiently, and, if desired, the interior of the casing surrounding the lamp may be coated with aluminum or some other suitable material which reflects, instead of absorbing, the ultra-violet radiations.

While only one generator or lamp has been disclosed, it will be appreciated that several of these lamps may be utilized if found necessary. The lamps are connected to a suitable source of energy, and, if desired, a suitable switch 43 may be provided for controlling these lamps. With the lamp installed as described above, the same source of ultra-violet light is utilized both for treating of the air and the liquid in the bottom of the casing, thus producing a very economical and efficient arrangement.

The apparatus embodying the present invention is very flexible in its operation. With the ultra-violet generator disconnected from its supply circuit, the air may be simply humidified, or with the belt 31 disconnected relative to either the pulley 23 or the pulley 30, the air may be simply circulated with or without purification by ultra-violet radiations from the lamp. On the other hand, any combination of the above may be obtained.

It will also be appreciated that by means of this apparatus it is possible to effect different ozone characteristics in the air being discharged from the apparatus.

It is thought that my improved method of disseminating an irradiated medium and carrying it to a position of use will be readily understood from the foregoing description, when it is considered that the irradiated liquid in the bottom of the casing is dispersed into the air and thus carried by the air to a position of use.

From the foregoing description, it will be apparent that the present invention provides an improved, compact apparatus for fluid conditioning, wherein novel means are provided for irradiating the fluid that is to be conditioned, and also the medium which is dispersed into the fluid during the conditioning operation; which includes a novel arrangement of parts for agitating the conditioning medium while it is being irradiated, and which is also utilized for dispersing the conditioning medium into the fluid that is being conditioned; which is selectively operable to effect different desirable characteristics in the conditioned medium in accordance with the requirements of the place where the apparatus is installed; and which embodies an improved

method of disseminating an irradiated medium and carrying it to a position of use.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention, and it is therefore not the purpose to limit the patent granted hereon otherwise than necessitated by the scope and spirit of the appended claims.

I claim as my invention:

1. Apparatus of the character described comprising an elongated casing having a lower portion defining a reservoir for liquid, and having end walls provided with means defining inlet and outlet openings, respectively, said casing having an upper wall cooperable with the surface of the liquid in the reservoir to define an air duct, a motor on said upper wall and depending into the air duct, said motor having a first shaft, fan blades on said first shaft and positioned adjacent the inlet opening, a second shaft positioned below said first shaft and extending longitudinally of said casing, bracket means on said end walls, bearings on said brackets supporting said second shaft for rotation, gear means connecting said second shaft with said first shaft, revolvable means on said second shaft and adjacent the outlet opening movable through the liquid to carry films of liquid across the air duct for the commingling of air and liquid, and means in said air duct and positioned intermediate said motor and said revolvable means to emit sterilizing rays to sterilize the liquid in the reservoir and to sterilize air in the air duct.

2. Apparatus of the character described comprising an elongated casing having a lower portion defining a reservoir for liquid, and having end walls provided with means defining inlet and outlet openings, respectively, said casing having an upper wall cooperable with the surface of the liquid in the reservoir to define an air duct, a motor on said upper wall and depending into the air duct, said motor having a first shaft, fan blades on said first shaft and positioned adjacent the inlet opening, a second shaft positioned below said first shaft and extending longitudinally of said casing, bearing means supporting said shaft for rotation, means connecting said second shaft in driving connection with said first shaft, revolvable means on said second shaft and adjacent the outlet opening movable through the liquid to carry films of liquid across the air duct for the commingling of air and liquid, and means in said air duct and positioned intermediate said motor and said revolvable means to emit sterilizing rays to sterilize the liquid in the reservoir and to sterilize air in the air duct.

HAROLD WILLIAM SCHAEFER.