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2,296,155

EVAPORATIVE AIR COOLER AND HUMIDIFIER

Filed Oct. 16, 1941

2 Sheets-Sheet 1

Fig. 1.

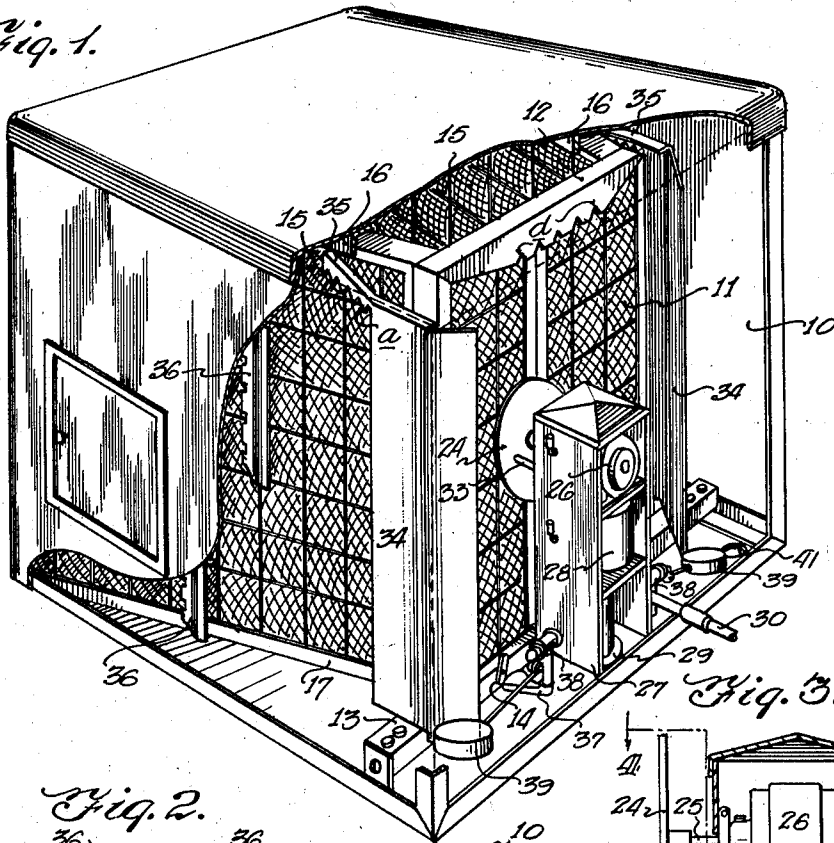


Fig. 2.

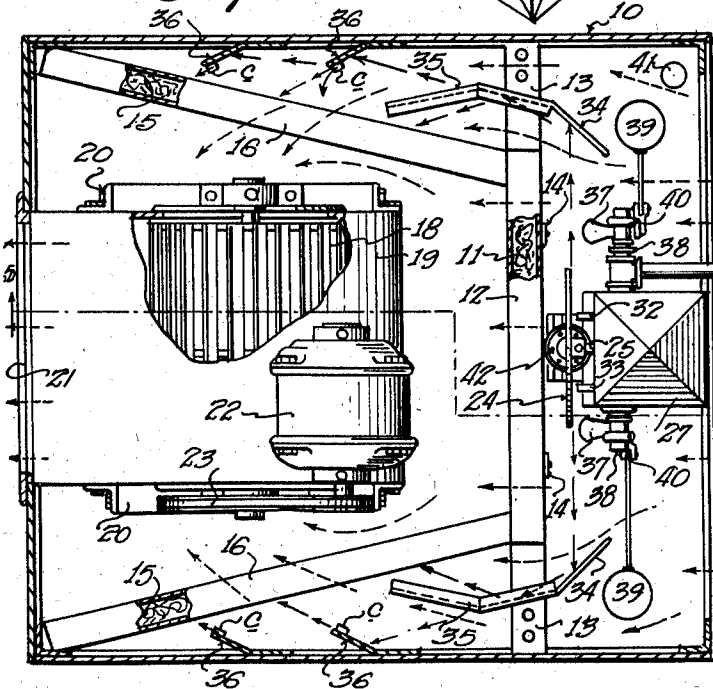


Fig. 3.

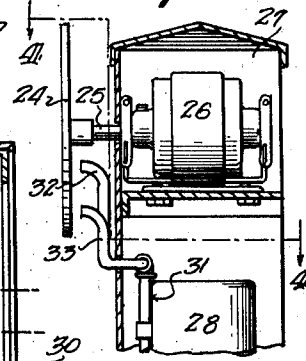
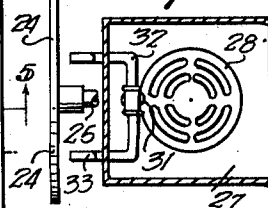


Fig. 4.



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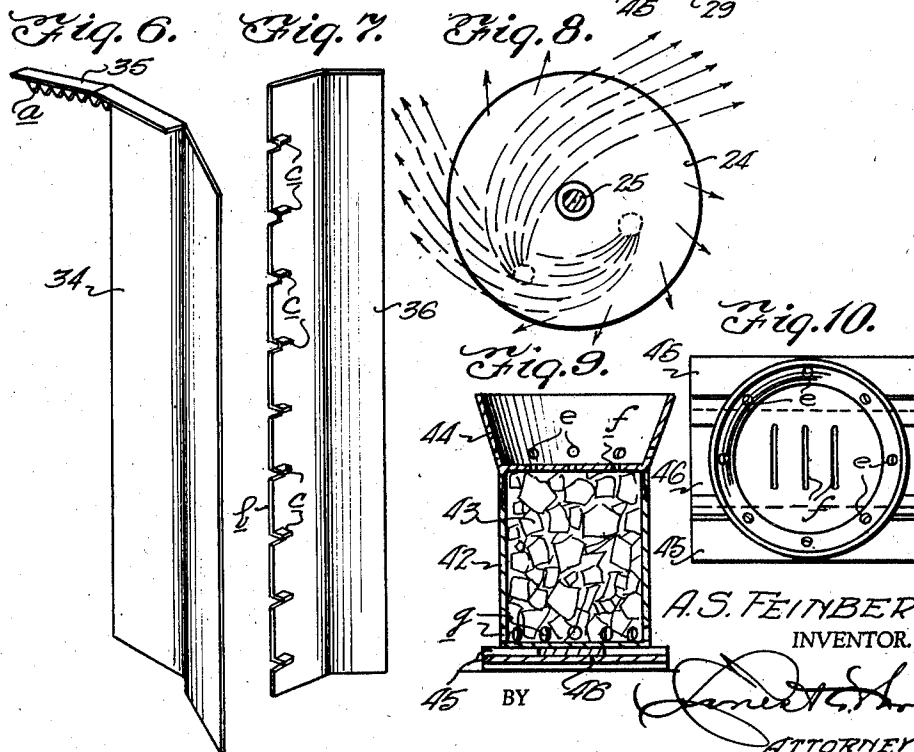
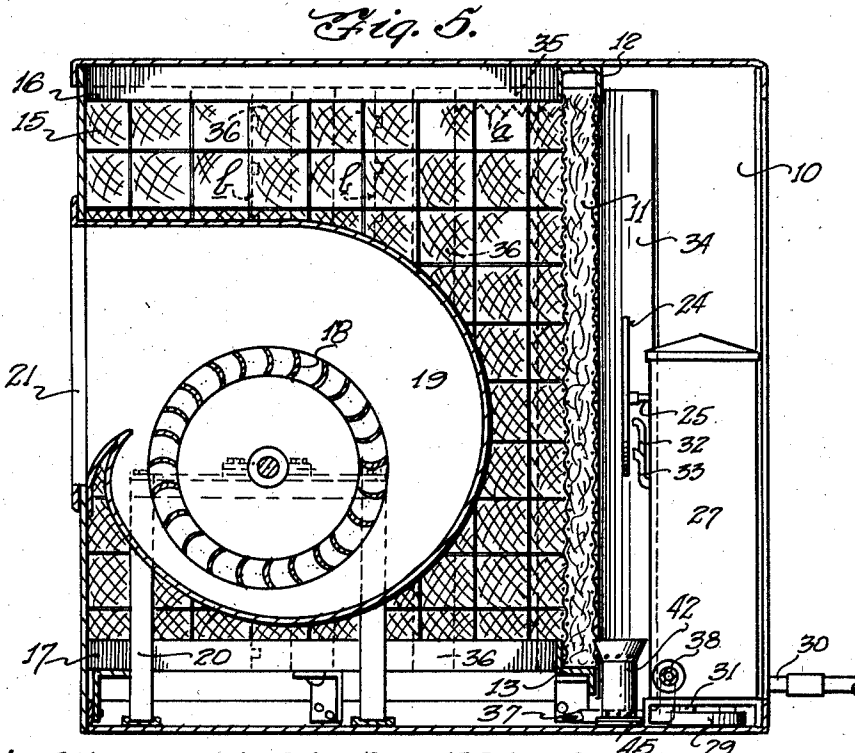
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,296,155

EVAPORATIVE AIR COOLER AND HUMIDIFIER

Archie S. Feinberg, Dallas, Tex.

Application October 16, 1941, Serial No. 415,171

9 Claims. (Cl. 261—90)

This invention relates to apparatus designed for washing and cooling air, generally known as air conditioning apparatus and it has particular reference to such an apparatus designed to improve upon present methods of treating air.

The principal object of the invention is to provide a unitary type of evaporative cooler, air conditioner and humidifier using a plurality of filter pads or mats disposed at a variety of relative angles and wetted by means of a single centrifugal spray disc instead of the conventional gravitational method of water distribution.

Another object of the invention is to provide a centrifugal spray disc which is more positive in the application of water to the pad surfaces; eliminates dry spot areas by avoiding water channelization and performs an air cleansing action on incoming air as well as a cleansing service by applying water to the outside of the pad surface.

Another object of the invention is to provide, by virtue of the multiple pad arrangement, a greater surface area and a lessening of the velocity resistance to enable the blower to operate more freely to deliver greater quantities of air with less horsepower consumption.

Another object of the invention is to provide a multiple pad cooler whose construction is such that the pads are completely enclosed in a cabinet instead of exposed to the elements as in conventional machines having a series of pads and further, the provisions herein for the uniform distribution of water on the collective pad surfaces with but a single centrifugal spray device.

Yet another object of the invention is to provide for the neutralization or elimination of odors originating in the filter pads due to the presence of algae or other products of stagnation, giving rise to foul odors.

Broadly, the invention provides an apparatus as designated, having a plurality of filters with but a single source of water distribution made possible through an arrangement of baffles; means to separate into drops, the water tending to collect on the baffle edges, to effect distribution thereof and means to apply a scouring action to the floor of the machine for cleansing purposes.

With the foregoing objects as paramount, the invention has certain novel features of accomplishment which will become manifest as the description proceeds, taken in connection with the accompanying drawings wherein:

Figure 1 is a perspective view of a machine

constructed according to the present invention.

Figure 2 is a plan view with the top removed.

Figure 3 is a detail view of the centrifugal spray with the operating motor and pump housing shown fragmentarily in vertical section.

Figure 4 is a view on line 4—4 on Figure 3.

Figure 5 is a side elevational view of the machine in vertical section taken on line 5—5 on Figure 2.

Figure 6 is a detail view in perspective of one of the baffles for diverting the discharge of the centrifugal spray disc.

Figure 7 is a detail perspective view of one of the baffles auxiliary to the baffle shown in Figure 6.

Figure 8 is a view of the operative face of the centrifugal spray disc, theoretically showing the discharge thereof.

Figure 9 is a vertical sectional view of a deodorant container, and

Figure 10 is a plan view thereof.

Continuing with a more detailed description of the drawings, reference is primarily made to Figure 1 wherein is shown a cabinet 10 which, it will be observed, is closed on either side and when in operation, is closed in front except for the air intake. It may be mentioned that in contrast to those multiple pad machines whose pads are exposed, the present machine presents a more pleasing appearance at all times due to the fact that the pads do not collect unsightly foreign matter and such deteriorations as may occur therein are not visible exteriorly.

Situated within the cabinet is a foremost filter pad or mat 11 in transverse relation to the air stream through the machine. This pad is divided into two vertical sections, as shown, to facilitate its installation in and removal from the cabinet. The upper ends of the sections are received in an inverted channel 12 across the upper portion of the cabinet and the lower ends thereof rest on a Z bar 13, parallel with the channel 12 at the bottom of the cabinet. A pair of pivoted members 14 retain the mat sections 11 in place at the bottom.

Extending rearwardly at angles in the cabinet, with their forward edges abutting the side edges of the first mat are the mats 15. The upper ends of these mats are retained in channels 16 while the lower ends thereof are supported in channels 17. They are installed and removed by sliding them from the forward end after the front mat has been removed.

The space defined by the arrangement of pads or mats 11 and 15 is occupied by a conventional

blower 18, the housing 19 of which is supported upon the frame 20 with its discharge in register with the air discharge 21 at the front of the cabinet. A motor 22 (Fig. 2) drives the blower 18 by means of a belt 23. It is apparent therefore that the action of the blower will cause air to penetrate the mats 11 and 15 in equal volume.

Accordingly, the invention consists in applying water to the surfaces of the mats 11 and 15, to uniformly wet the same and this with a single spray device.

The spray device is comprised of a flat disc 24, mounted on a shaft 25 which is the armature shaft of a motor 26. The motor 26 is enclosed in the top of a housing 27, situated midway between the sides of the cabinet and rising to approximately halfway of the front mat 11 in order that the disc 24 will operate at the center of the mat. Mounted also in the housing 27 is a pump motor 28 which operates a small centrifugal pump 29 (Fig. 5) in the bottom of the housing and whose intake is submerged below the level of water maintained in the bottom of the cabinet by means of the pipe 31 of the pump in the housing 27 and has a T thereon at its top to provide a connection for two discharge pipes 32 and 33. These pipes are extended through openings in the housing 27 and terminate in spaced relation from the rear face of the spray disc 24.

The positions of these pipes with respect to the surface of the disc have considerable effect upon the manner in which the water forced through the pipes, is discharged off the face of the disc centrifugally. An example of this action is theoretically illustrated in Figure 8. The pipes function as jets and when the water therefrom impinges the surface of the rapidly revolving disc, the resultant swirling effect is to fling the water off at a tangent, with the optimum results as shown. The object is to discharge the water in greater volume upward at an angle of approximately 45° in opposite directions to strike against the side baffles 34 near their upper ends, and by virtue of which, the water thus discharged by the disc, is diverted and projected along the outer surfaces of the angularly disposed mats 15. Arrows in solid lines in Figure 2 indicate the dispersion of water when it is broken up into a heavy mist by the disc, while the arrows in broken lines indicate air currents set in motion by the blower.

Experiments have disclosed that a certain amount of water propelled against the baffles 34 by the spray disc is inclined to deflect upwardly. The water so projected is interrupted in its course by minor baffles 35 extending from the upper ends of each of the baffles 34 toward the front of the cabinet, and which are bent slightly inward toward the mats 15. These minor baffles are right angular in transverse section, the water impinging the horizontal flange, the surplus water dripping from the vertical flange of the baffle. As a medium to break up into drops the stream of surplus water collecting on the vertical flange of this minor baffle 35, this flange is serrated along its edge *a*, as shown. The water then precipitating in drops from the points of the serrations *a* is readily thrust, by the entering air currents, against the surfaces of pads 15 to become effective rather than falling into the sump, as it would otherwise do.

It has also been found that a portion of the water deflected by the baffles 34 continues rear-

wardly on a plane parallel with the mats 15 and unless otherwise directed, will strike the walls of the cabinet and flow down the same into the sump. It is desirable to maintain the walls in as dry a condition as possible first, to avoid deterioration thereof and second, to utilize as much of the water as possible for effective performance. Accordingly, auxiliary baffles 36 are provided and arranged vertically on the interior wall surfaces of the cabinet in parallel relationship with each other and with the baffles 34. In being so disposed, the baffles 36 intercept the vagrant discharge of the baffles 34 and direct it into the mats 15 for effective use. As in the case of the minor baffles 35, surplus water is inclined to adhere to the vertical edges of the baffles 36 and flow in streams back into the sump. In order to break up the water so collecting, the effective edge *b* (Fig. 7) of each baffle 36 is notched at vertically spaced intervals and the notched portion bent outward at right angles to form tabs or protuberances *c*. Water collecting on these tabs is caught up in the air currents and whipped into the adjacent mats.

Returning to the centrifugal spray disc 24 and its operation, it will be noted in Figure 8 that while the maximum discharge thereof is upward at angles, as described earlier, a certain amount of the discharge emerges from the disc entirely around its periphery. This water is sufficient to amply wet the foremost pad. A number of factors enter into the control of the discharge of the disc. These include the pressure of water discharged against the disc; the speed of the disc and the positioning of the jets relative to the surface of the disc. The latter factor is considered the easiest to change in order to obtain optimum results but once the desired result is obtained, the jets are fixed.

In wetting the mat 11, it has been discovered that insufficient water is directed against the central portion thereof. This deficiency has been overcome by notching or serrating the outer flange of the channel 12 at *d* (Fig. 1). These serrations have the effect of causing a limited accumulation of water at this point, which precipitates downwardly along the outer surface of mat 11, to be drawn therethrough by suction of the blower 18.

It is quite common for users of machines of this character to allow the sump thereof to collect foreign matter in the absence of adequate means for cleaning. Such accumulations give off unpleasant odors and to minimize this condition, the invention provides nozzles 37 which are directed across the bottom of the sump or floor of the cabinet. Water is supplied, under municipal pressure, through the pipe 30, connected to pipes 38, which are conventional equipment and to which the nozzles 37 are connected. Also conventional are floats 39 which actuate the valves 40, controlling the water supply. Being of common usage, it is not considered necessary to describe the operation thereof. However, it is pointed out that when the sump is drained by means of the drain opening 41, the machine is stopped and water pressure is supplied through the nozzles 37 which scour the bottom of the sump releasing accumulations of foreign matter clinging thereto. Such matter is floated off through the drain 41 and when operation is resumed, the air is free from foul odors.

In event there remains a trace of unpleasant odor in the air discharged from the machine, due possibly to foreign matter retained in the mats

themselves, a deodorizer 42 (Figs. 9 and 10) is provided. This deodorizer consists of a receptacle 42 adapted to contain copper sulphate 43 in crystal form or any other suitable substance. A flared top 44 is removably mounted on the receptacle 42 and has a series of overflow ports *e* therein as well as slots or other apertures *f* which permit water to enter the receptacle 42 and slowly dissolve the crystals, the solution flowing out of the receptacle through bottom apertures *g*, to merge with the water in the sump of the cooler. This water, with the solution, in being recirculated, neutralizes or obviates the odor prevalent in the mats, resulting in a freshening of the air discharged from the apparatus.

In Figures 2 and 5 is shown the position of the deodorizer in the machine. A pair of flanged plates 45 are affixed to the bottom of the sump immediately below and in alignment with the circular discharge of the spray disc. A plate 46 is secured to the bottom of the receptacle 42 and its edges slid under the flanges of the plates so that the mouth 44 of the receptacle will receive a portion of the discharge. Being flanged slightly, reception of the discharge will be facilitated.

It is believed that since much of the operation of the apparatus has been merged with the explanation of structure, further and more detailed description of operation will be unnecessary.

Manifestly, the construction as shown and described is capable of some modification and such modification as may be construed to fall within the scope and meaning of the appended claims is also considered to be within the spirit and intent of the invention.

What is claimed is:

1. An evaporative air cooler and humidifier including a cabinet having an air inlet and an air discharge opening, means to effect movement of air through said cabinet, an air filter mat disposed in transverse relation to the stream of air through said cabinet, analogous mats disposed on either side of said first mat in angular relation thereto and to said air stream, a spray disc confronting said first mat, means for rotating said disc, means for projecting streams of water onto the rear face of said disc under pressure to effect centrifugal discharge thereof off said disc and baffle means disposed on either side of said first mat and in the line of discharge of said disc to deflect said discharge onto said angularly disposed mats.

2. An evaporative cooler and humidifier including a cabinet having an air intake and an air outlet, means therein to effect movement of air therethrough, a primary and a pair of secondary filter mats, the latter being arranged in angular relation to said primary mat and to said air stream, a disc disposed to rotate centrally of said primary mat, means for directing water under pressure against the rear face of said disc in two streams at selected points thereon to effect dissemination and discharge of said water in pre-established directions in the same plane, means for rotating said disc and means located in the line of discharge of said disc for diverting a portion thereof onto said secondary mats to saturate the same.

3. An evaporative cooler and humidifier including a cabinet having an air inlet and an air outlet, pervious filter mats therein, one of which is transversely disposed in said cabinet, the others being disposed on either side of said first mat in angular relation thereto, means to effect move-

ment of air through said cabinet and through said mats, means for maintaining a predetermined level of water in said cabinet, a flat spray disc centrally disposed relative to said first mat, means for rotating said disc, a water pump, means connected to said pump and arranged relative to the rear face of said disc for directing streams of water thereagainst at two prearranged points whereby to effect diffusion of water but discharging the same in increased volume in two preestablished directions in the same plane and means in alinement with said discharge against which the water in increased volume is projected, to divert the same against said angularly disposed mats to saturate the same.

4. An evaporative cooler and humidifier comprising a cabinet having an air inlet and an air outlet, means to effect movement of air therethrough, a plurality of pervious filter mats disposed in cabinet in angular relationship and through which air is drawn, means disposed centrally of one of said mats to effect diffusive discharge of water in a plane parallel to said latter mat but with increased volume in two pre-established directions and means parallel to the vertical edges of said latter mat and in line of said discharge for diverting a portion of the same to effect saturation of the companion mats.

5. An apparatus of the character set forth, a cabinet having an air inlet and an air outlet, means in said cabinet for moving air therethrough, a primary air pervious filter mat arranged in said cabinet in transverse relation to the stream of air passing through said cabinet, a pair of side mats in oblique relation to said first mat, means to effect circular discharge of water in a plane parallel to said primary mat but in increased volume in two pre-established directions toward the upper corners of said primary mat and means in alinement with said discharge for diverging said directional discharge toward and onto said secondary mats to effect saturation thereof.

6. An apparatus of the character set forth, a cabinet having an air inlet and outlet, means to effect movement of air through said cabinet, air pervious filter mats disposed in said cabinet, one of which is arranged at right angles to the air stream through said cabinet, means disposed centrally of said latter mat for spraying water radially in a plane parallel thereto, a portion of which is drawn into said mat by said air stream, baffle means for directing the bulk of the spray of water in two pre-established directions, means for diverting the directed spray toward the surfaces of the companion mats, auxiliary baffle means cooperating with said first baffle means to constrain the discharge thereof to continue in the direction of said companion mats.

7. A structure as described in claim 6 in which the baffles are each provided with means along their effective edges for breaking up water condensation into drops for effective disposition by air.

8. In an apparatus of the character set forth, a cabinet having an air inlet and an air outlet, a blower in said cabinet, a series of mats arranged in said cabinet through which air is drawn, means in front of one of said mats for spraying water radially in a plane parallel to said mat, a portion of the discharge thereof being influenced into said mat by the suction of said blower, means on either side of said spraying means for diverting a portion of the discharge toward the companion mats, to be drawn therein by said air, means

carried by said diverting means to break up streams of water concentrating thereon to disperse the same for air distribution and means above the first mat to effect distribution and precipitation of water downward through the middle thereof.

9. A structure as set forth in claim 8 in which

the means for effecting distribution of water above the first mat is comprised of a retaining channel for said mat having a serrated flange confronting the origin of the spray whereby to separate the concentrated water into separate streams in spaced relationship.

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