

[54] **HUMIDIFIER**

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3,355,155 11/1967 Heltzen.....261/142 X

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[57]

ABSTRACT

A humidifier including a water receptacle, and an electric heating unit extending across the open top of the water receptacle with a flat wick hung over the electric heater and having the ends thereof disposed in the water to cause water to become engaged and evaporated by the heating unit due to capillary action. A portion of the heating unit is left exposed to produce thermo-convection current which forces moisture to rise. The humidifier is adapted for general utility but is especially constructed for use in musical instruments such as pianos or the like having an enlarged cabinet-like structure which enables the humidifier to be mounted directly in the interior of the cabinet-like structure for maintaining proper humidity conditions therein when combined with a humidistat and dehumidifier.

9 Claims, 6 Drawing Figures

[56]

References Cited

UNITED STATES PATENTS

1,154,113	9/1915	Hadaway.....	261/142 UX
1,625,663	4/1927	Kelly.....	261/142 UX
2,715,056	8/1955	Wilson.....	237/78 X
2,884,088	4/1959	Rich.....	261/142
3,092,179	6/1963	Lauck.....	236/44 X
2,004,147	6/1935	Worrall.....	237/78 X

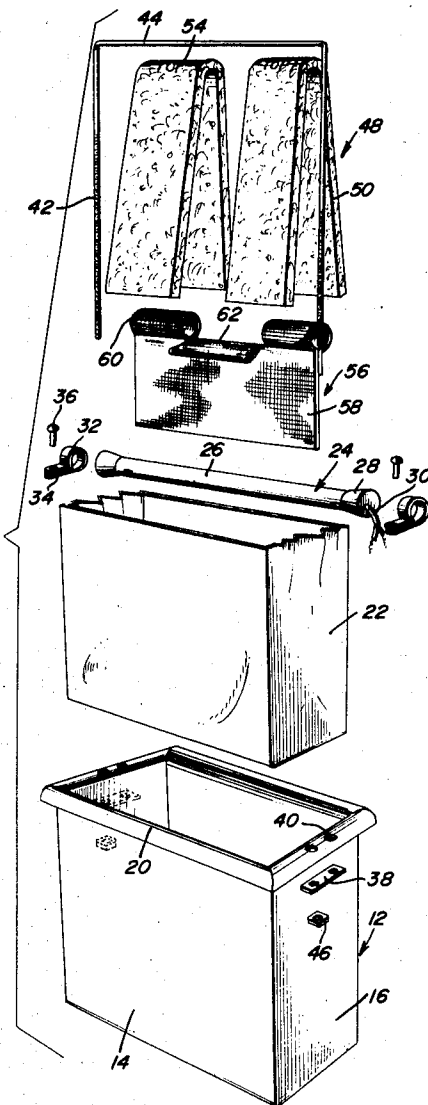


Fig. 1

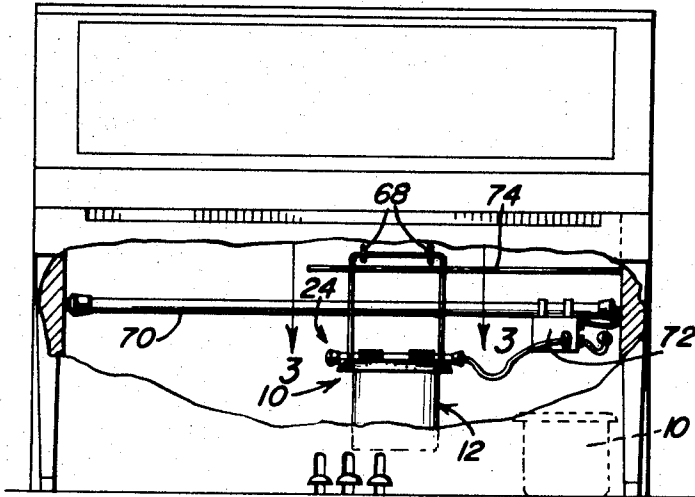


Fig. 2

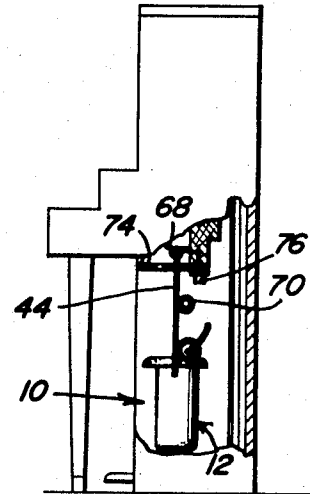


Fig. 3

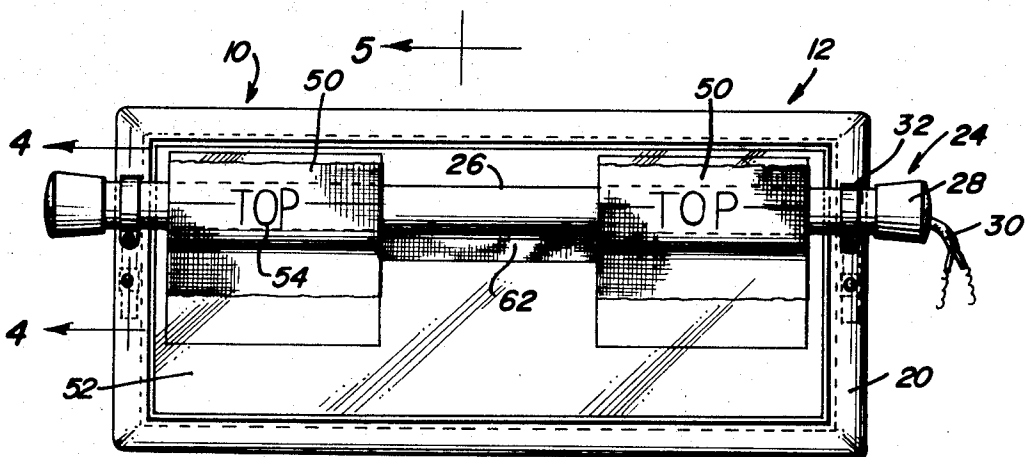
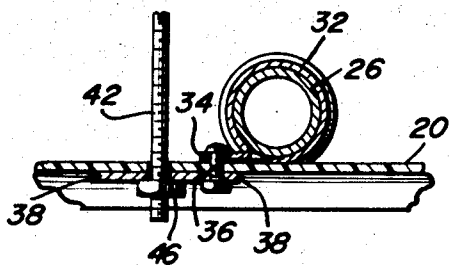
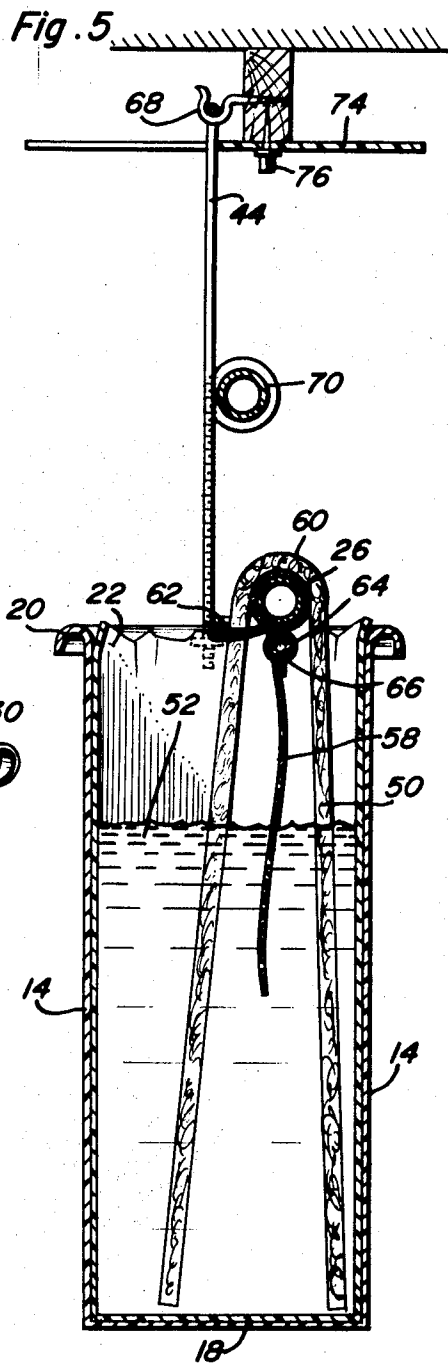
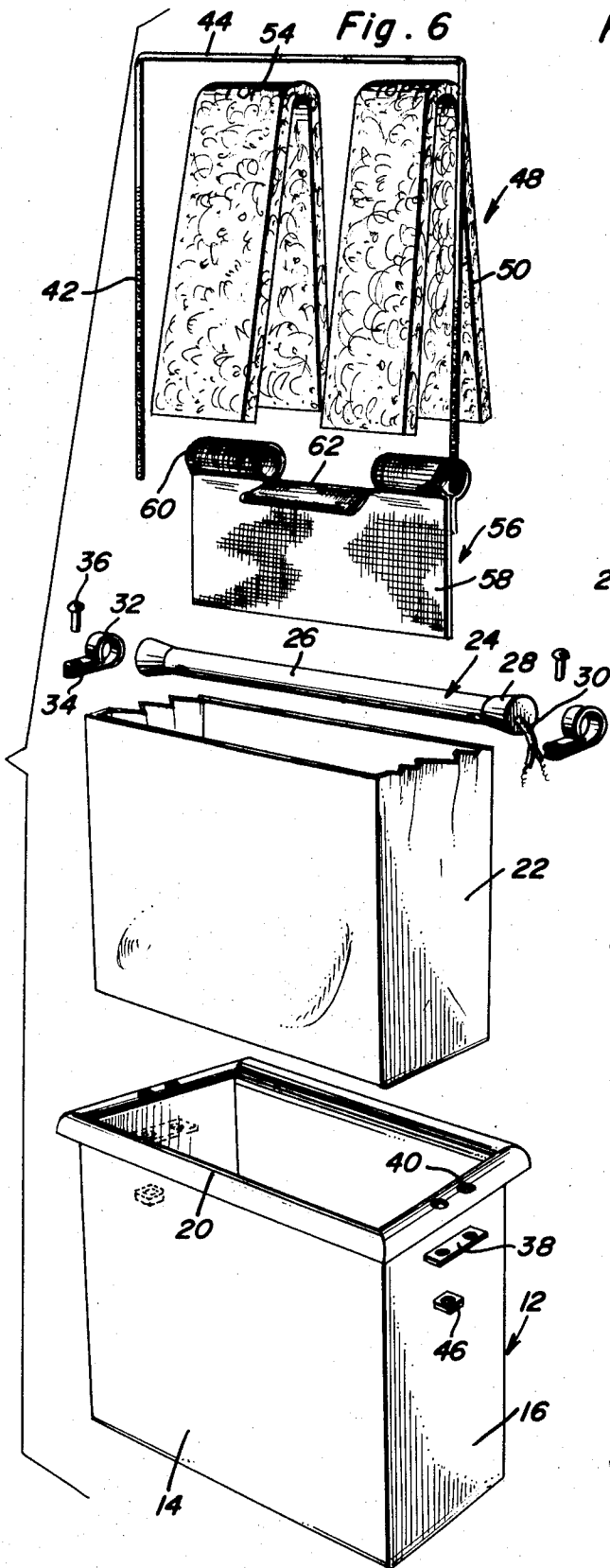


Fig. 4



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HUMIDIFIER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally relates to a humidifier having novel structural features which adapt it to be used in enclosed areas requiring additional moisture to maintain the relative humidity within the enclosed area at a predetermined level.

2. Description of Prior Art

Various humidifiers have been constructed in which a heating element is emersed in water or water is conveyed into the path of flowing air whereby moisture will be entrained in the air. Humidifiers of the presently available type are usually rather cumbersome and large and require frequent replacement of components due to the deleterious action of water on various moving components and the like.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a humidifier constructed with no moving components or rattles and materials that will not be subject to corrosive attack by water.

Another object of the invention is a humidifier constructed with a soft plastic receptacle for water together with a non-metallic liner for the receptacle, a heating element extending across the top of the receptacle which is open together with absorbent wick members hanging over the heating unit and having the lower ends disposed in the water for wickage capillary action to convey the water to the heating unit for evaporation thereof.

Still another object of the invention is to provide a humidifier in accordance with the preceding objects constructed with a supporting structure to enable it to be supported interiorly of a cabinet-like structure such as a piano or any other suitably enclosed area to enable effective orientation of the humidifier in the enclosed area where control of the humidity is desired.

Yet another important object of the present invention is to provide a humidifier in accordance with the preceding objects having a portion of the heating unit exposed to produce thermo-convection air currents to facilitate such relation of air and moisture to provide proper mixture of the moisture with the air in the enclosed area.

Yet another important feature of the present invention is to provide a humidifier which is quite simple in construction, easy to install, easy to control by controlling the supply of electrical energy to the heating unit with the humidifier being relatively inexpensive to operate and maintain.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view of an upright piano with portions of the cabinet structure broken away illustrating the installation of the humidifier, humidistat and dehumidifier within the interior of the piano.

FIG. 2 is an end elevational view of the structure of FIG. 1 illustrating the relationship of the humidifier to the piano.

FIG. 3 is a plan, sectional view taken substantially upon a plane passing along section line 3—3 of FIG. 1 illustrating in more detail the structure of the humidifier.

FIG. 4 is a detailed sectional view taken substantially upon a plane passing along section line 4—4 of FIG. 3 illustrating the manner in which the heating unit is attached to the water receptacle.

FIG. 5 is a transverse, sectional view taken substantially upon a plane passing along section line 5—5 of FIG. 3 illustrating further structural details of the humidifier.

FIG. 6 is an exploded group perspective view of the components of the humidifier in their relative position of assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now specifically to the drawings, the humidifier of the present invention is generally designated by the numeral 12 which includes side walls 14 and end walls 16 interconnected by a bottom wall 18 all of rectangular and continuous construction to provide a substantially rectangular receptacle having an open top defined by an outwardly extending and rounded flange 20 which has a substantially semi-cylindrical configuration.

Disposed within the container or receptacle 12 is a flexible liner 22 which corresponds in shape and configuration to the interior of the receptacle and prevents corrosion of the interior of the metallic or plastic receptacle by the water or enables the receptacle to be effectively cleaned by removing the liner and replacing it, and provides additional protection against leakage.

Supported transversely of the open top or upper end of the receptacle 12 is an electric heating unit generally designated by the numeral 24 and which includes a rigid exterior tubular member 26. The rigid tubular member 26 includes end cap 28 of plastic or other similar resilient material and an electric conductor 30 is connected to the heating unit and is provided with a male plug on the opposite end thereof for insertion into the power outlet of a humidistat for control of the electric heating unit. The heating unit 24 is similar to but smaller than those heating units disclosed in my prior U.S. Pat. Nos. 2,511,910 and 3,119,977.

The ends of the heating unit 24 extend slightly beyond the end walls 16 of the receptacle and are supported from the flange 20 by split clamps 32 having attaching lugs 34 secured to the flange by fastening screws 36 which extend through the flange 20 as illustrated in FIG. 4 and also as illustrated in FIG. 6 in which the flange 20 is provided with a pair of apertures 40 one of which receives the fastener 36, which securely but detachably retains the heating unit 24 in position across the top of the receptacle 12.

The other aperture 40 in the flange 20 receives the lower screw-threaded end 42 of a generally U-shaped supporting handle or bail 44. The lower ends of the threaded portions 42 of the bail 44 receives adjustment nuts 46 to vary the effective length of the pushed downwardly so that the horizontal top portion thereof may be disposed alongside of the open top of the receptacle 12 if desired. A second nut may be provided on threaded portions 42 to engage the top surface of the flange 20 thus locking the handle 44 in upright position.

Supported in straddling relation to the heating unit 24 is a pair of wicks each generally designated by numeral 48 and each of which includes an elongated absorbent strip 50. The strip 50 has the terminal lower ends thereof disposed adjacent the bottom of the receptacle and emersed into the water 52 therein whereby water will be conveyed to the heating unit 24 by capillary action. Indicia 54 is provided on the strip 50 in the center thereof to indicate the portion of the strip 50 which should straddle the heating unit 24, and the absorbent cotton or other material forming the wick is provided with a nylon mesh cover to hold it assembled.

Positioned between the wicks and the heating unit 24 is a spacing device generally designated by the numeral 56 and which includes a mesh panel 58 of non-metallic plastic material such as fiberglass screening or the like. At the upper edge of the panel 58, a segmental sleeve or hem 62 is formed with the two end portions 60 of the sleeve being disposed in encircling relation to the outer tube 26 of the heating unit 24 with the mesh thus being disposed between the tube 26 and the absorbent strip 50. The central portion of the sleeve designated by numeral 62 does not encircle the tube 26 but rather extends laterally of the tube 26 in a manner that it extends between the adjacent opposing edges of the absorbent strips 50 thus retaining them in spaced relation so that a portion of the outer tube 26 of the heating unit 24 will remain exposed as illustrated in FIGS. 3 to heat the air in that area so that a thermo-convection air current will be provided for entraining moisture

therein. Below the hems or sleeves 60 and 62, a smaller hem 64 is provided which is continuous from end to end and provided with a tubular reinforcement 66 to retain the panel 58 substantially in a straight condition. The mesh panel 58 depends between the free end portions of the absorbent strip 50 and serves to retain them from intimate contacting association.

FIG. 5 illustrates the humidifier supported by a pair of hooks 68 and this arrangement is also illustrated in FIGS. 1 and 2 with FIG. 1 illustrating an optional position of the humidifier at the lower corner of the cabinet as illustrated in dotted line.

By making the screen separator 56 of plastic covered fiberglass mesh material, a heat sealing operation may be employed to form the sleeves and hems. Also, the mesh material will prevent splashing of the water when refilling the reservoir or receptacle and the tubular reinforcement 66 serves as a high water indicator so that when the water approaches the hem or sleeve 64, the person refilling the reservoir will be aware that the reservoir is substantially full.

The dehumidifier 70 is installed between opposing walls in the piano and the humidistat 72 is mounted on the humidifier 68 in the manner more specifically disclosed in my copending application Ser. No. 63,484, filed Aug. 12, 1970 entitled Combination Humidistat and Heater. A plastic sheet or panel 74 approximately 4 inches wide and 2 feet long which is fastened directly above the humidifier to help baffle the moist air rising and diverted it more evenly throughout the piano. Two small map pins 76 may be employed to hold the plastic sheet in place against the wood directly above the humidifier. Also, the humidifier may be placed in a grand piano in which the dehumidifier is fastened underneath the soundboard of the grand piano with the humidifier hanging on the screw hooks about 2 inches below the dehumidifier to provide moisture to the entire soundboard area and to be easily removed for refilling. This will also employ the use of a baffle sheet 74. In an upright piano, the screw hooks 68 are supported from the keyboard by being screwed vertically into the bottom of the keyboard which eliminates contact of the receptacle with the soundboard of the piano and raises it above the rocker arms or bars operated by the foot pedals.

Significant features of the humidifier are the elimination of all moving parts, the plastic reservoir or receptacle will not cause rattles and will adapt itself to portions of the piano which may protrude where the reservoir must be placed. The waterproof plastic liner provides double protection against any possible leakage and also is easy to remove for cleaning rather than having to remove the entire reservoir. The cotton pads are easily replaceable and the fiberglass screen keeps the cotton pads from sticking to the tubing due to chemicals in the water. Even if the reservoir runs dry, the small heat added to the interior of the piano will not be detrimental. Also, the device may be employed for various other uses in which the humidity has to be increased.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A humidifier comprising:

an open top receptacle containing a quantity of water therein, said receptacle having an outwardly extending flange defining the open top thereof,

an electrical heating unit positioned within a rigid outer tube and mounted transversely of said receptacle to said

flanges by clamp members encircling the ends of said outer tube, and

a plurality of wick means spaced from each other engaging said heating unit, said wick means having their free ends immersed in said water to a depth adjacent the bottom portion of said receptacle and conveying to said heating unit by capillary action a quantity of water for evaporation, said heater having exposed portions between said wick means whereby the surrounding air is heated and moistened by thermo-convection air currents moving through and around said wick means.

2. The apparatus of claim 1 and further comprising:

a dehumidifier for maintaining a predetermined relative humidity in an enclosed area, said dehumidifier including an elongated tubular member,

a humidistat responsive to the relative humidity within said enclosed area for controlling the operation of said humidifier and said dehumidifier within predetermined limits, said humidistat being supported on said dehumidifier and said humidifier being disposed in sufficiently spaced relation to said dehumidifier to prevent said dehumidifier from evaporating water from said receptacle.

3. The structure as defined in claim 1 wherein said receptacle includes a liner of plastic material, and support means connected to said receptacle and extending above the receptacle.

4. The structure as defined in claim 1 wherein said wick means includes a pair of elongated absorbent strips having the central portion resting over said heating unit and the free ends terminating adjacent the bottom of the receptacle.

5. The structure as defined in claim 4 together with means supported from the heating unit to retain the central portion of the strips spaced from each other along the heating unit.

6. The structure as defined in claim 5 wherein said spacing means includes a sleeve of mesh material disposed between the heating unit and strips, said sleeve including a central portion free of the heating unit and extending laterally thereof between the strips.

7. The structure as defined in claim 6 wherein said sleeve of mesh material includes a depending panel of mesh material depending into the receptacle between the free ends of the strips to retain the free ends thereof spaced apart.

8. In combination with a musical instrument provided with an enclosed space such as a piano having opposed surfaces disposed below a structural component, a dehumidifier in the form of an elongated rigid tubular heating unit mounted between the opposing surfaces, a humidifier supported below the structural component and below the dehumidifier, and a humidistat mounted on the dehumidifier and controlling the humidifier and dehumidifier to maintain a desired relative humidity within the instrument, said humidifier including an open-topped receptacle disposed vertically below the dehumidifier, a heating unit extending across the top of the receptacle and being rigidly supported therefrom, said receptacle and heating unit mounted thereon having a length substantially less than the dehumidifier, wick members supported from the heating unit on the receptacle and depending into the receptacle, said receptacle including a quantity of water therein engaging the lower ends of the wick members, means on said heating unit on the receptacle to space the wick members apart to expose a substantial portion of the heating unit.

9. The combination as defined in claim 8 together with a generally flat baffle panel disposed vertically above the dehumidifier and humidifier for diverting moist air around the periphery thereof, means adjustably connected to said receptacle for supporting it adjustably in suspended relation to the structural component, said receptacle including a removable plastic liner to enable replacement thereof to eliminate sediment build up in the receptacle.

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