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3,385,574

HUMIDIFIER

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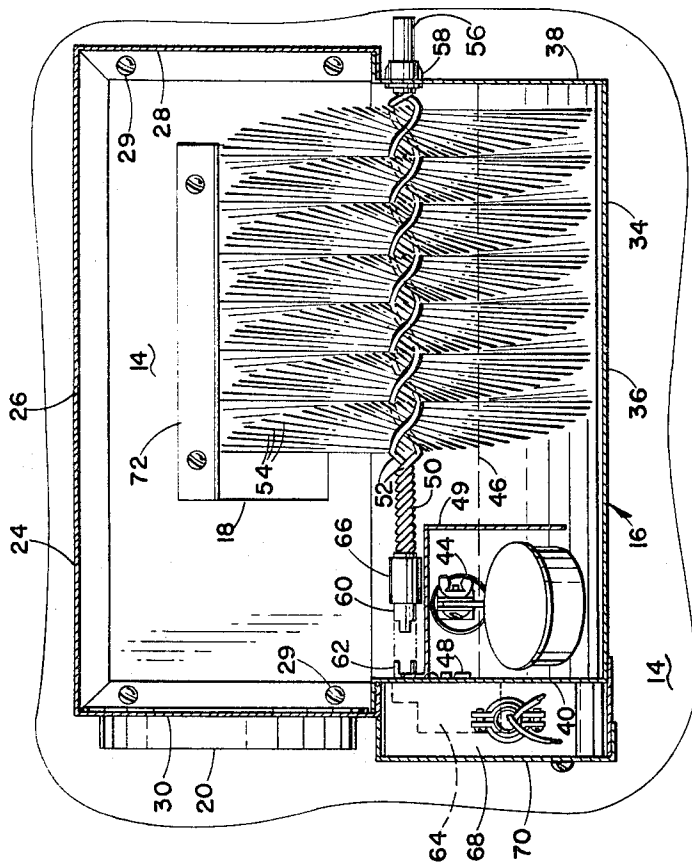


FIG. 3

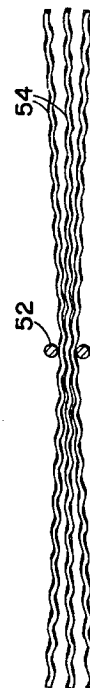


FIG. 4

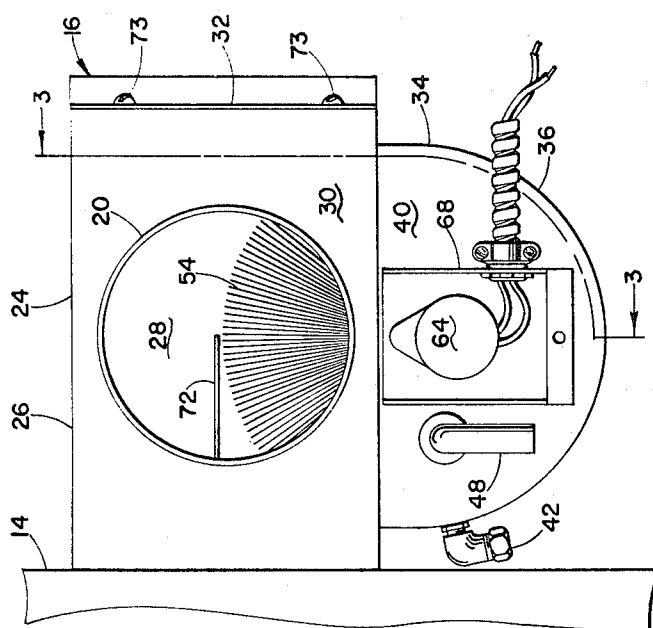


FIG. 2

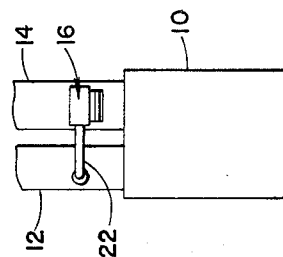


FIG. 1

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HUMIDIFIER

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ABSTRACT OF THE DISCLOSURE

An air humidifier including an element comprised of a core provided with spaced radially extending bristles which function as an evaporative surface upon being rotated between a water sump and a stream of air.

This invention relates to gas and liquid contact apparatus and particularly air humidifier apparatus adapted for use with air heating systems. Specifically this invention pertains to an air humidifier of the type employing a vapor liquid contact member which is slowly rotated sequentially through a water sump where its surface is wetted to a vaporization chamber where an air stream vaporizes water retained on its surface. The instant invention is to be distinguished from the rotary type humidifier which slings or atomizes water into an air stream. This latter type of humidifier has the inherent disadvantage of passing the water entrained minerals to the air stream where they form a fine dust which has been found to be particularly undesirable. The instant invention relates to the former type of rotary humidifier which relies upon evaporation of water from a rotating wetted surface wherein the minerals entrained within the water are retained on such surface and prevented from contaminating the air. However, this type of air humidifier has presented two basic problems.

First, it has been difficult to obtain in such humidifier apparatus a rotating member which presents sufficient surface area to provide the necessary capacity for surface vaporization. Toward this end, many such humidifiers today utilize a rotating member comprised of an intricate porous screen or web material in the form of an annular cylinder or circular plates. The pores and intricate surface irregularities of such materials tend to clog up quickly with mineral deposits left from the evaporated water, thus substantially reducing the surface area and evaporating capacity.

The second problem which has been encountered with such humidifier devices is that of cleaning or removing from the evaporating surfaces the mineral deposits which have accumulated. In most instances it is difficult to mechanically remove such deposits from the evaporative surfaces, especially if the surface is porous or irregular as aforementioned. Many suppliers merely suggest replacement of the evaporative surfaces of their humidifier. This of course substantially increases operating costs for such devices.

The instant invention is directed toward a humidifier combination which has for its principal object the provision of a device which is high in surface area, extremely easy to clean, simple in construction, easy to manufacture, and low in cost.

Specifically the instant invention comprises in combination means defining a water sump, an elongated bristle supporting core having a generally horizontal axis, support means supporting said elongated core above the normal water level in said sump for rotation about said axis, a plurality of elongated bristles supported by and extending radially outward from said core, said bristles being spaced longitudinally along and circumferentially about a portion of said core, each of said bristles being

supported solely at its inner portion whereby the radially outer portion is permitted to flex, said support means being arranged with respect to said sump for movement of the radially outer portion of said bristles sequentially into and out of said water sump upon rotation of said core, motor means for rotating said core, and means for passing a stream of air over said bristles which are disposed out of said sump as said core is rotated whereby water adhering to said bristles is vaporized into said stream of air.

Other objects and advantages will become apparent as this specification proceeds to describe the invention with reference to the accompanying drawing in which:

FIGURE 1 shows my novel humidifier applied to a hot air furnace installation;

FIGURE 2 shows an enlarged end view of the humidifier in FIGURE 1 having an end cover removed for disclosure of details thereof;

FIGURE 3 is a sectional view taken at line 3—3 in FIGURE 2; and

FIGURE 4 is an enlarged axial section of the rotatable liquid-gas contact member of the humidifier of FIGURES 1—3.

Referring to the drawing, furnace 10 is provided with a cold air return duct 12 and a hot air supply duct 14. Humidifier 16 is mounted on duct 14 and receives warm air therefrom through an inlet opening 18 and discharges humidified air from an outlet opening 20 at one end thereof through a duct 22 into the return duct 12.

Humidifier 16 includes a rectangular vaporizing chamber or housing 24 having a top wall 26, a first end wall 28, a second end wall 30 defining outlet 20, and a removable front wall 32. The back side of chamber 24 is fastened by screws 29 to duct 14 and closed by the wall of duct 14 except for inlet opening 18. Depending from the bottom side of chamber 24 is a water receiving sump 34 having a semicylindrical pan portion 36 provided with first and second vertically extending end walls 38 and 40 respectively. Pan portion 36 is provided with a water supply inlet 42 adapted to be connected to a source of water. The water flow from inlet 42 is controlled by a float valve mechanism 44 to maintain a water level in sump 34 as indicated by dashed line 46. In the event the float valve mechanism 44 malfunctions for any reason, an overflow drain 48 is provided in end wall 40. In order to keep circulating air from venting through overflow 48, a protective baffle 49 has been provided extending horizontally from end wall 40, over float valve mechanism 44, and then downward below water level 46. This baffle also minimizes mineral deposits at the seat of the valve by reducing evaporation therefrom.

Disposed above water line 46 is an elongated bristle supporting core 50 having a generally horizontal axis. Core 50 may be constructed by twisting two wire elements 52 to form a pair of coextensive coaxial helicoids of substantially equal diameter. During a portion of the twisting operation semirigid elongated bristles 54 may be interposed between the wire elements. These bristles are best shown in FIGURE 4. They are preferably made of monofilament water impervious nylon fiber and are crimped at intervals to improve water pickup and to increase the evaporative surface area. The bristles extend radially outward from the core in a plane normal to the longitudinal axis thereof.

One end of core 50 is provided with a journal 56 disposed in a plastic bearing 58 carried in end wall 38 above water level 46. The other end of core 50 is provided with a coupling member 60 adapted to be connected to the drive member 62 of electric motor 64 which is mounted on the exterior side of wall 40.

FIGURE 3 shows core 50 disconnected from drive

member 62. Coupling of elements 60 and 62 is accomplished by sliding core 50 to the left (FIG. 3) so that the tongue of coupling member 60 is disposed within the groove of drive member 62. A cylindrical retainer 66 is then slid from the position shown to a position over both members 60 and 62 thereby holding core 50 in co-axial driving relation with drive member 62.

Drive member 62 and bearing 58 are arranged so that the axis of core 50 is generally horizontal. The bristles 54 are of sufficient length to extend below water level 46 when in the downwardly extending position and into the vaporizing chamber when in the upwardly extending position. Electric motor 64 is selected to rotate core 50 between about .5 to about 10 revolutions per minute. Motor 64 may be provided with a junction box 68 for suitable electrical connection to a source of electric power. An end cover 70 which has been removed in FIGURE 2 may be provided to cover junction box 68 and overflow drain 48 and improve general appearance.

Inlet opening 18 is rectangular in shape and positioned to direct hot unsaturated air from the furnace directly over the bristles which extend upward into the vaporizing chamber. A generally horizontal baffle 72 extends from duct 14 over inlet opening 18 to a point directly above core 50 adjacent to uppermost ends of bristles 54 thereby deflecting a major portion of the air passing inlet 18 over bristles 54.

In operating my novel humidifier device, calcium compounds and other deposits may accumulate on the bristles as they are rotated by core 50. This tends to increase the effective diameter of the bristle surface and actually improves the evaporating capacity of the device.

When the accumulation of such deposits on bristles 54 has become excessive, front wall 32 is removed as by screws 73, and the core and bristle unit disconnected from drive member 62. Bearing 58 is made with sufficient clearance to permit journal 56 to be slid axially and angled upward to permit the removal of the core and bristle unit from the humidifier through the front side of chamber 24.

The accumulated deposits are easily removed from the bristles by a wiping action with the hand or other object. These deposits, which are generally brittle, crack off as the bristles are flexed by such motion. Further, since the bristles are free at their ends, unencumbered by an interlacing fiber, some deposits will easily slide off the free ends of the bristles. The removal of deposits from this novel bristle carrying core has been found to be a particularly desirable attribute of my invention.

Although I have described in detail the preferred embodiment of my invention, I contemplate that many changes may be made without departing from the scope or spirit of my invention and I desire to be limited only by the claims.

I claim:

1. An air humidifier apparatus comprising: a housing defining a water sump in the lower portion thereof; means for admitting a solution of water and minerals to said sump; and means separating substantially all of said minerals from said water and passing said resulting mineral free water into a stream of air including: an elongated bristle supporting core having a generally horizontal longitudinal axis; support means connected to said housing supporting said elongated core for rotation about said axis; surface means for evaporating water therefrom comprising a plurality of elongated bristles supported by and extending substantially radially outward from said core; said bristles being arranged longitudinally along and circumferentially about a portion of said core; said bristles having a length greater than the diameter of said portion of said core and each of said bristles being supported solely at its radially inner portion whereby the radially outer portion is permitted to flex for loosening and removing inflexible scale deposits formed by the evaporation of mineral containing water therefrom;

means for maintaining a normal water level in said sump sufficiently high that a major portion of the length of said bristles extending downwardly from said core is immersed in the water of said sump; means for passing a stream of unsaturated air over the exposed bristles which are disposed out of said sump; and means for evaporating from the surface of said exposed bristles substantially all of the water to be vaporized by said bristles by alternately slowly dipping said bristles deeply into the water in said sump and exposing said bristles to said air stream; said last means including a motor means connected to said core to rotate said core for slowly rotating said bristles alternately between said water sump and said stream of air.

2. The device as defined by claim 1 wherein said motor means rotates said core between about .5 to about 10 revolutions per minute.

3. An air humidifier apparatus comprising: a housing defining a water sump in the lower portion thereof; an elongated bristle supporting core having a generally horizontal axis; support means connected to said housing for rotatably supporting said elongated core about said axis above the normal water level in said sump; surface means for evaporating water therefrom comprising a plurality of elongated bristles supported by and extending radially outward from said core; said bristles being spaced longitudinally along and circumferentially about a portion of said core; each of said bristles being supported solely at its radially inner portion whereby the radially outer portion is permitted to flex for loosening and removing inflexible scale deposits formed by the evaporation of mineral containing water therefrom; float valve means disposed within said water sump for maintaining a normal water level in said sump sufficiently high that said bristles extending downwardly from said core are deeply immersed in the water of said sump; means for passing a stream of air over said bristles disposed out of said sump; means for evaporating from the surface of said bristles a major portion of the water to be vaporized by said humidifier by alternately slowly dipping said bristles deeply into the water in said sump and exposing said bristles to said air stream; said last means including a motor means connected to said core for slowly rotating said bristles alternately between said water sump and said stream of air; a baffle means substantially isolating said float valve means from said stream of air thereby minimizing the formation of mineral deposits at said float valve means; and a disconnectable drive coupling connecting said motor means to said core and disposed vertically above said baffle means.

4. An air humidifier apparatus comprising: a housing defining a water sump in the lower portion thereof; means for admitting a solution of water and minerals to said sump; and means separating substantially all of said minerals from said water and passing said resulting mineral free water into a stream of air including: an elongated bristle supporting core having a generally horizontal longitudinal axis; said core comprising a pair of elongated wire members shaped in the form of a pair of coextensive coaxial helicoids of substantially equal diameter, a plurality of bristles extending substantially radially outwardly from said core, the radially inner portions of said bristles being clinched between adjacent convolutions of said pair of helicoids; said bristles comprising surface means for evaporating water therefrom, said bristles being supported by and extending substantially radially outward from said core; said bristles being arranged longitudinally along and circumferentially about a portion of said core; said bristles having a length greater than the diameter of said portion of said core and each of said bristles being supported solely at its radially inner portion whereby the radially outer portion is permitted to flex for loosening and removing inflexible scale deposits formed by the evaporation of mineral containing water

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therefrom; support means connected to said housing supporting said elongated core for rotation about said axis; means for maintaining a normal water level in said sump sufficiently high that a major portion of the length of said bristles extending downwardly from said core is immersed in the water of said sump; means for passing a stream of unsaturated air over the exposed bristles which are disposed out of said sump; and means for evaporating from the surface of said exposed bristles substantially all of the water to be vaporized by said bristles by alternately slowly dipping said bristles deeply into the water in said sump and exposing said bristles to said air stream; said last means including a motor means connected to said core to rotate said core for slowly rotating said bristles alternately between said water sump and said stream of air.

5. An air humidifier apparatus comprising: a housing defining a water sump in the lower portion thereof; means for admitting a solution of water and minerals to said sump; and means separating substantially all of said minerals from said water and passing said resulting mineral free water into a stream of air including: an elongated bristle supporting core having a generally horizontal longitudinal axis; support means connected to said housing supporting said elongated core for rotation about said axis; surface means for evaporating water therefrom comprising a plurality of elongated bristles supported by and extending substantially radially outward from said core; said bristles being arranged longitudinally along and circumferentially about a portion of said core; said bristles having a length greater than the diameter of said portion of said core and each of said bristles being supported solely at its radially inner portion whereby the radially outer portion is permitted to flex for loosening and removing inflexible scale deposits formed by the

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evaporation of mineral containing water therefrom; each of said bristles comprising an elongated monofilament synthetic fiber which has been crimped at intervals to improve water pickup and to increase evaporative surface; means for maintaining a normal water level in said sump sufficiently high that a major portion of the length of said bristles extending downwardly from said core is immersed in the water of said sump; means for passing a stream of unsaturated air over the exposed bristles which are disposed out of said sump; and means for evaporating from the surface of said exposed bristles substantially all of the water to be vaporized by said bristles by alternately slowly dipping said bristles deeply into the water in said sump and exposing said bristles to said air stream; said last means including a motor means connected to said core to rotate said core for slowly rotating said bristles alternately between said water sump and said stream of air.

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