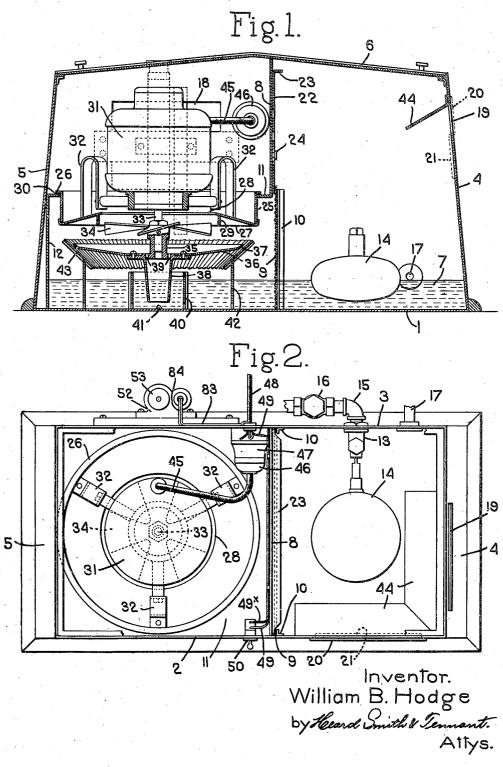
HUMIDIFIER

Filed June 22, 1932

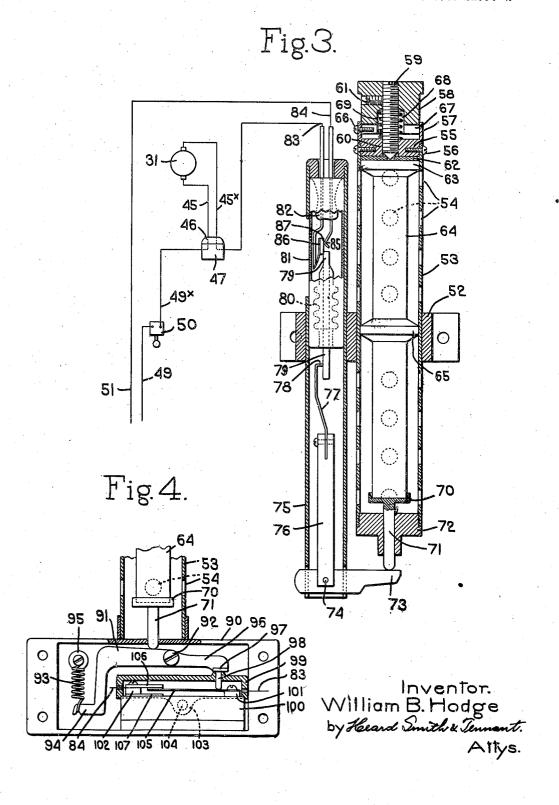
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HUMIDIFIER

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## UNITED STATES PATENT OFFICE

2,057,236

## HUMIDIFIER

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7 Claims. (Cl. 236-44)

This invention relates to an improved humidifler of the self-contained type especially adapted for use in dwellings, school-houses, offices, hospitals, and non-industrial service in general. The device is characterized by the simplicity of its elements, all of which are readily accessible for such attention as they may require.

It is the general object of the invention to 10 combine in one compact unit the means essential to the generation of a continuous current of air that passes through the interior of the unit in a predetermined path that includes a compartment containing spray-generating 15 means capable of atomizing water to a degree so fine that the air current may thus be charged not only with vapor produced by spray evaporation, but also with additional fine spray carried in mechanical suspension by the air current, and adapted immediately to evaporate upon distribution into the outside air. The presence of this fine spray or mist in the air current escaping from the device over and above the vapor with which the current is charged 25 effects a corresponding increase in the mechanical efficiency and evaporative capacity of the device with consequent advantage.

A further object of the invention is the provision of adjustable means for controlling the rate at which the current of air with its burden of moisture is discharged, thus adjustably controlling the evaporative capacity of the device.

A further object of the invention is to provide an automatic regulator that is sensitive to the humidity of the air external to the device and operable to limit the supply of moisture in response to humidity rising above a predetermined standard and to increase the delivery of moisture in response to humidity falling below said standard, the regulator itself being adapted for assembly with the device as a part of the unit structure.

A humidifier embodying the invention is il-45 lustrated in the accompanying drawings, in which.

Fig. 1 is a view, mainly in vertical longitudinal section, of a preferred form of humidifier;

Fig. 2 is a plan view of the same, the cover 50 being omitted;

Fig. 3 is a view, mainly in vertical section, of a regulator operable by a longitudinally expansible hygroscopic element for electrically controlling the operation of the humidifier; and,

Fig. 4 is a view, partly in section, of a modified

form of instantaneous switch mechanism operable by the longitudinal expansion of the hygroscopic element to control the operation of the humidifier.

The humidifler proper preferably consists of 5 a substantially rectangular casing having a bottom 1, side walls 2 and 3, and ends 4 and 5, composed of any suitable water-proof and non-corrosive material such as certain sheet metal alloys that have suitable properties. The casing is 10 provided with a removable cover 6, preferably composed of the same or similar materials as the main casing. The bottom, side and end walls of the casing constitute a water-tight tank suitable to contain a body of water 7.

Substantially midway between the end walls of the main casing is a transverse vertical partition connecting the two side walls and dividing the main casing into two compartments. The upper portion of this partition is preferably 20 composed of a sheet metal wall 8 extending from the top of the casing downwardly to a point substantially midway of the top and bottom. Below this point the partition comprises a screen 9, preferably of sheet metal or netting and preferably positioned in vertical guideways 10 attached to the side walls of the casing to provide for its convenient removal for cleaning.

One of the said two compartments, hereinafter called the "inlet compartment", comprises 30 an upper chamber hereinafter called the "motor chamber", and a lower chamber hereinafter called the "spray chamber", which are separated from each other by a horizontal partition or deck !!. The deck !! may be supported in 35 any suitable manner. As illustrated herein, it is of sheet metal integral with the upper wall 8 of the vertical partition and extends horizontally across the inlet compartment and is bent downwardly to provide a vertical supporting wall 40 12 which rests upon the bottom of the casing. Side walls may also desirably be bent down similarly to insure a rigid support for the deck. The deck is provided with a central annular opening to permit the insertion and removal of 45 mechanism for supporting a motor and mechanism operated thereby for producing a spray and generating a current of air operable to deliver the saturated air with fine particles of moisture suspended therein from the outlet 50 chamber in a manner which will hereinafter be more fully described.

A pipe fitting !3 is mounted in the wall of the outlet compartment near the bottom thereof and is provided with a ball float cock of the 55

usual type having a ball 14, and operable to maintain a body of water in the bottom of the casing at a substantially constant level in both the inlet and outlet chambers. An inlet pipe 5 15, preferably having a strainer 16 therein, and connected to a suitable source of water supply, serves to furnish a constant supply of water to the reservior within the casing.

Within the outlet compartment, and prefera-10 bly attached to and extending through the same

side wall thereof as the water supply fitting above described, is a fitting 17 located slightly above the water level to provide for the escape of water to waste in case of faulty operation of

15 the ball cock.

In the inlet compartment and preferably in the same side wall of the main casing with the water connections to the outlet compartment, is an inlet opening 18 communicating with the 20 motor compartment for the purpose of admitting air thereto from outside of the casing. In the upper portion of the side and end walls of the outlet chamber are one or more outlet openings 19 for the escape of air therefrom in such direction as may be preferred, and another outlet opening may also be provided, if desired, in the cover 6 of the casing immediately above the outlet compartment. Each of these openings desirably is provided with a removable 30 damper or gate 20 which may be formed of sheet metal having an offset tongue 21 adapted to be inserted through the opening and of such weight as to maintain the gate 20 closed when thus in. serted. Any one or all of said openings may be utilized for the escape of humidified air from the outlet compartment.

Desirably means are provided for adjusting the effective area of the screened opening through which the humidified air and mist is 40 delivered from the spray chamber. In the preferred construction illustrated a sheet metal gate 22 is mounted to slide in front of the screen 9 and is provided at its upper end with a laterally extending flange 23 by means of which it may 45 be raised and lowered. In order to hold the screen in adjusted positions it is provided centrally with a series of holes adapted to engage a headed stud 24 projecting from the partition By suitable vertical adjustment of the gate 50 22 the rate at which the current of air with its burden of moisture is discharged may be controlled.

Supported on the deck 11, which separates the motor chamber from the spray chamber, and 55 within the annular opening in the deck, is provided an annular partition or hatch having a cylindrical wall 25 provided at its upper end with an annular flange 26 adapted to rest upon the deck 11, and having at its lower end an 60 upwardly inclined bottom 27 with a circular opening 28 therein providing an air intake to a fan. An annular vertical wall 29 extends downwardly from the bottom 27 in proximity to the plane of the lower edge of said opening prefer-65 ably to the lower plane of said bottom. The diameter of the cylindrical wall of the hatch is slightly less than the diameter of the annular opening in the deck to permit the removal of the hatch and the mechanism supported there-70 by, and a rubber or fibrous cushion 30 preferably is interposed between the flange 26 and the deck II to prevent the transmission of audible vibration to the walls.

An electric motor 31 is mounted axially above 75 and concentric with the annular opening in the

hatch and preferably is supported upon the bottom of the hatch by three equally spaced inverted U-shaped flexible supports 32 which bear upon the bottom of the hatch and desirably are riveted thereto. The shaft 33 of the motor extends vertically downwardly through and concentric with the opening in the hatch and has fixedly attached to it below and in proximity to the opening a horizontal fan 34 having a diameter slightly less than that of said opening. 10

The motor shaft has secured to it below the fan a hub 35 which supports a circular sprayproducing disk 36 which preferably is inclined slightly upwardly and has at its periphery a more steeply inclined flange 37. The disk pref- 15 erably is composed of soft non-corrosive sheet metal, or of any suitable thin material adapted to be relatively noiseless when in operation through the absence of resonance. A hollow truncated conical member 38 extends down- 20 wardly from the hub or disk into the body of water in the lower portion of the casing, and a series of apertures 39, extending through the hub or disk and located adjacent the inner wall of the conical member, provide means by which 25 water will be carried by centrifugal action when the disk and conical member are in rotation to the upper surface of the disk.

Resting upon and attached to the bottom of the spray compartment is a cylindrical collar 40, 30 preferably composed of corrugated sheet metal and extending above, outside of and concentric with the lower end of the conical member. The collar is provided with one or more openings 41, preferably in its lower edge, to permit free 35passage of water therethrough. The arrangement is such that when the motor is in operation the proximity of the corrugated surface of the collar tends to prevent the formation of a large whirlpool and consequent retreat of the 40 water level from contact with the lower end of the cone. Under operative conditions the presence of the stationary body of water outside the collar and its static head maintains contact between the water within the collar and the mov-  $^{45}$ ing lower end of the cone.

Supported on the bottom of the spray compartment by another and larger concentric collar 42 is an inverted conoidal annulus 43 composed of corrugated metal flaring upwardly and out- 50wardly with its circular periphery slightly above and outside the peripheral flange 37 of the centrifugal disk 36. In the bottom of the collar which supports said annulus are one or more openings adapted to permit the free pas- 55sage of water therethrough, thus providing for the maintenance of the water level throughout the bottom of the spray chamber.

The arrangement as a whole is such that water admitted to the casing by the ball cock 60 is maintained at the same level in both the inlet and outlet compartments, but will remain slightly higher than the foot of the lifting cone 38 when the motor is in operation. When the motor is energized the rotation of the motor shaft causes water to be lifted by centrifugal force along the inner wall of the cone and through the apertures 39 to the upper surface of the disk. Under further action of centrifugal force the water adhering to the surface of the 70 disk spreads outwardly in a thin film to its peripheral edge from which it is discharged outwardly and separated into fine particles of spray that are hurled in a direction tangential to the edge of the disk against the surface of the cor- 75

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rugated annulus surrounding the disk, so that the force of impact results in further and finer atomization of the major portion of the water.

The angle of incidence at which the particles of spray strike the annulus is such that the lighter and more finely atomized particles pass upwardly and outwardly over the edge of the corrugated annulus, while such heavier particles as adhere to the corrugated surface of the an-10 nulus collect and flow downwardly into the body of water at the bottom of the chamber.

The rotation of the motor causes the fan to generate a strong current of air which follows a predetermined path through the space within 15 the spray chamber with the exception of that portion lying between the surface of the water and the under surface of the spray disk within the annulus and its supporting collar. The air current is directed downward by the fan against 20 the face of the disk whence it is deflected outward over the peripheral edges of the disk and annulus thus passing directly through the annular area in which the spray is generated and delivered and so insuring an especially thorough 25 and intimate initial admixture of the spray and air that stimulates rapid evaporation of the spray and saturation of the air.

Passing outwardly through the space between the bottom of the hatch and the upper periphery of the annulus the air current then traverses the outer space within the spray chamber escaping through the screen into the lower part of the outlet chamber and thence through the outlets therefrom into the outer air.

During the time that elapses between the delivery of the spray into the air current and its escape to the outer air, the air becomes saturated with water vapor by the natural evaporation of spray. Owing to the rapidly changing direction 40 of the air current while traversing the spray chamber any particles of heavy spray that may be present are extracted either by deposition upon the side walls and screen surfaces or by settling upon the water surface in one or the 45 other compartment by the action of gravity. At the moment of its escape into the outer air, the air current therefore contains only such minute particles of the finest spray as have so little mass that they are capable of floating in the 50 air current in mechanical suspension and are thus carried upward from the lower portions of the outlet compartment to the outlets in its upper portion.

A deflector 44 is secured to the inner surface 55 of the outlet chamber above each of the outlets 19 extending downwardly and inwardly from the upper edge thereof. These deflectors serve to impart an upward direction to the air current escaping from the outlets 19 and they also serve to divert drops of moisture that may collect as the result of condensation above the outlets and prevent particles of such moisture from being blown outward with the air current as might otherwise occur.

The motor 31 preferably is provided with flexible electric conductors 45, 45x, of relatively short length terminating in a plug 46 of the usual type which is removably connected to a complementary socket 47 preferably attached to 70 the interior surface of one of the walls of the motor compartment. An electric current is supplied to the motor 31 through a cable 48, one of the conductors 49 of which is connected to a switch 50 from which a conductor 49x leads to 75 one of the terminals of the socket \$7. The other conductor 51 of the cable 48 may lead directly to the other terminal of the socket 47, but preferably leads thereto through an automatic regulator which is operable by variations in the condition of the humidity of the air, as will herein- 5 after be more fully described.

By reason of the fact that the motor and the fan and centrifugal distributing disk carried by its shaft are all supported upon the removable hatch, this entire mechanism can be conven- 10 iently lifted out of the casing upon detachment of the plug 46, thereby rendering all the running gear of the assembly conveniently accessible for such care as they may require, and at the same time rendering all parts of the interior of 15 the casing itself accessible for cleaning, or such other care as may be required.

The humidifier is adapted for either temporary or permanent mounting on a radiator or on any convenient support and may be either tem- 20 porarily or permanently connected with any available source of water supply and waste that is convenient.

A further object of the invention, as above stated, is to provide automatic regulating means 25 sensitive to the humidity of the air and operable alternatively to interrupt or resume the operation of the humidifier in response to humidity rising above or falling below a predetermined value. Desirably the regulator is attached to 30 the outside of the wall of the humidifier casing adjacent to the inlet opening 18 in such manner that the sensitive member of the regulator will be located in the direct path of the current of air approaching and flowing into the motor com- 35 partment. The sensitive member of the regulator may be composed of any hygroscopic material that will respond to changes in the humidity of the surrounding atmosphere with elongation or contraction having sufficient force to actuate 40 a switch or other suitable means for controlling the supply of energy which motivates the humidifier.

The preferred constructions which are illustrated herein comprise a bracket 52 which is secured to the rear wall 3 of the intake compartment a short distance below the inlet 18 and supports a vertical tubular housing 53 having a plurality of apertures 54 therein adapted to permit the air to circulate freely within the housing. The housing 53 has at its upper end a head 55 which extends downwardly a short distance into the housing and is secured thereto by screws 56 and is provided with an upwardly extending cylindrical flange 57 preferably of the same diameter 55 as the housing. A cylindrical adjusting member 58 is rotatably mounted within the cylindrical flange of said head and has fixedly secured to it an adjusting screw 59 the lower end of which engages a screw threaded opening 60 in the 60 head, the screw being held against rotation relatively to the adjusting member 53 by a set screw 61. The lower end of the screw 60, which as illustrated herein is conical, extends into the central opening in a bushing 62 which is abutted 65 by the enlarged upper end 63 of a hygroscopic member sensitive to variations in humidity in the

The hygroscopic sensitive member shown in the present embodiment is a cylindrical body 70 composed of any suitable wood, such as bass wood, extending axially of the housing 53 and provided with a central enlargement 65 which. like the enlarged end 63, slidably fits within the housing 53 and may be adjusted downwardly by 75

rotation of the rotatable adjusting member 58 in a clockwise direction. Undue rotation of the adjusting member 58 is prevented by a screw 66 mounted in the wall of the casing and extending into a slot or recess formed by cutting away a desired portion, such, for example, as one-half of the lower end of the adjusting member 58, thereby providing shoulders 61 which will limit the rotative movement of the member 58. De-10 sirably the lower central portion of the adjusting member 58 is bored to provide a recess 68 and a spring 69, located in said recess and abutting at its lower end against said head and at its upper end against the end wall of the recess, 15 produces sufficient frictional resistance to insure retention of the adjusting member 58 in any desired position of adjustment.

The lower end of the hygroscopic member 64 is seated in the enlarged socket end 10 of a pin 71 20 which is slidably mounted in a lower head 72 fixedly secured to the housing 53. The lower end of the pin 11 engages the arm 13 of a lever which is operable to actuate a special switch adapted to instantly make or break a circuit of 25 the service current supplied to the motor.

Inasmuch as an electric current having a substantially high voltage of usually 110 volts is required to operate humidifiers of the character herein described, or to control the operation of 30 valves of humidifying systems, and inasmuch as the extent of movement of hygroscopic elements required to maintain a substantially uniform condition of humidity is very slight, it has heretofore been considered generally necessary to provide relay mechanism intermediate of the hygroscopic element and the switch controlling the service current to supply sufficient energy properly to actuate the switch which controls the service current.

One of the objects of the present invention is to provide a switch mechanism for the service current which will be directly operated by the expansion of the hygroscopic element to open the service current when the humidity reaches or ex-45 ceeds a predetermined degree, and which will close said switch promptly when the humidity falls below said predetermined degree.

A further object of the invention is to provide switch mechanism of this character which will 50 operate instantaneously and avoid any substantial sparking upon the breaking of the circuit.

In the construction illustrated in Fig. 3, the lever 73 is in the form of a bell crank lever pivotally mounted upon a stud 74 in the lower end 55 of a cylindrical housing 75 which is also mounted in the bracket 52. The other arm 76 of the bell crank lever, which is fixedly secured to the arm 73, is provided at its upper end with an offset flat spring 77 having an L-shaped end 78 60 which bears against a stem 79 of an integral glass bellows 89 of special shape and temper, which extends upwardly into an integral cylindrical container 81, the upper end of which is provided with an inwardly extending solid boss 65 82 through which conductor wires 83 and 84 extend. The cylindrical container 81 is highly evacuated. The end of the conductor 84, which extends through the boss, is reversely bent to provide an angular contact 85. The end of the 70 conductor 83 has secured to it a spring 86 provided with a contact block 87 adapted normally to engage the member 85. The block 87 is engaged by the upper end of the stem 79. The glass bellows 80, by reason of its shape and 75 temper, is highly elastic and a slight movement of the stem 79 produced by lateral pressure upon its lower end and transmitted from the hygroscopic member through the bell crank and spring 77, will cause the block 87 to separate from the contact 85. The spring 86 causes posi- 5 tive connection between the contacts when no pressure is applied to the stem 31.

Inasmuch as the switch members are in vacuum the separation of the contact members will not cause substantial sparking and there is, 10 therefore, no exposed spark or arc to induce a fire hazard when operating in an inflammable atmosphere. The construction is such that a movement of .02" at the upper end of the stem 71 will operate the enclosed contacts and such 15 making and breaking of the service current may be made with great frequency without injury. The action of the switch is instantaneous so that a very accurate control of the electric circuit and the operation of the motor, or other 20 electrical devices employed in the humidifying system, is highly efficient.

A diagrammatic illustration of an electric circuit is shown in Fig. 3 from which it will be seen that the electric current passes, when the circuit 25 is closed, through the conductor 49 of the cable 48 to the switch 50, thence through the conductor 49 and through one of the terminals of the socket 47 and conductor 45 to the motor 31. The current passes from the motor through the 30 conductor 45x, thence through the other terminal of the plug socket 47, the conductor 83, thence through the spring 86 and contact block 87 to the contact member 85 which are located in the vacuum chamber, and from the contact 35 member 85 to the conductor 84 which is connected to the other conductor 51 of the supply cable 48.

In Fig. 4 a different form of instantaneous switch is illustrated. In this construction a rec- 40 tangular casing 90 is secured to the lower end of the apertured housing 53, heretofore described, and the pin 71 at the lower end of the hygroscopic element engages the arm 91 of an L-shaped lever which is fulcrumed upon a stud 45 or screw 92 mounted in said housing. The arm 91 is held firmly in engagement with the pin 71 by a coiled spring 93, one end of which is connected to the offset end 94 of the lever arm 91, and the opposite end of which is secured to 50 a stud 95 upon said housing. The opposite arm 96 of the lever 91 is provided with an offset end portion 97 which engages a pin 98 which is slidably mounted in the cover 99 of an insulated container having a base 100 of insulating mate- 55 rial with binding posts 101 and 102 seated The opposite sides of the cover are therein. provided with downwardly extending ears 103 adapted to be secured to the base by suitable screws 104.

The service conductors 83 and 84 are electrically connected to the binding posts 101 and 102 respectively.

The switch proper comprises a resilient flexible member that is subject to an initial stress 65 which operates normally to maintain the switch in an open condition and also to close the switch instantaneously when pressure is applied to the flexible member by the pin 98 in value sufficient to overcome said stress; also to cause the switch instantaneously to reassume its normally open condition when the value of the applied pressure falls below that value which is sufficient to cause a closure. Preferably the switch comprises an initially warped or distorted spring 75

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plate 105 one end of which is fixedly secured to the binding post 101 and a complementary terminal 106 which is secured to the binding post 102 with which the free end of the flexible member contacts when in closed condition. The plate 107 of insulating material underlies the free end of the spring plate 105. The initial warp or distortional stress to which the flexible member 105 is subject is such as to maintain its free end in contact with the insulated plate 107 in the absence of pressure on the pin 11, thus establishing a condition of normal closure for the switch proper.

In a regulator of the type disclosed in the present embodiment, it is desirable to make provision such that the hygroscopic element may expand or contract freely in response to changing humidity without being subjected to any materially greater strain or resistance than is imposed upon it by the load required to produce actuation, thus avoiding such injury to the element as might otherwise occur.

In the embodiment of the invention illustrated in Fig. 4 the lever \$1-96 is therefore inter25 posed between the hygroscopic element 64 and the switch pin 98 and the spring 93 is attached to the lever under tension in an arrangement such as to maintain the switch in a closed position by applying pressure to the flexible member 105 which is transmitted by the lever \$1-96 through the pin 98, this condition of the lever and switch being maintained so long as the lever is affected only by the tension of the spring \$3. Hygroscopic elements of other material than wood may be employed in a similar organization for the purpose of and within the scope of the invention.

During periods when the switch is closed the completion of the circuit through the motor 40 actuates the humidifier to produce and saturate a spray-laden current of air as heretofore described and the resulting increase in the humidity of the surrounding air ultimately causes elongation of the hygroscopic member 64 caus-46 ing the pin 71 at its end to press downwardly upon the arm 91 of the lever thereby raising its opposite arm 96 and relieving the pressure imposed upon the pin 98 which instantly permits the warped plate 125 by reason of its resilience to snap out of contact with the terminal 106 into engagement with the supporting insulated member 107, thereby instantly breaking the circuit. The spring action of the warped plate is practically instantaneous and by reason of the 55 relatively large area of contact between the plate 105 and the terminal 106 and the instantaneous separation of the plate from the terminal, arcing is effectively prevented. Moreover, by reason of the fact that the switch members are wholly enclosed within the insulated container 100 there is no possibility of an exposed spark or arc which would induce or constitute a fire hazard.

Opening of the switch having thus been accomplished and delivery of moisture by the humidifier having thus been interrupted, the humidity of the surrounding air will gradually fall in response to which the hygroscopic member \$4 will contract, the lever arm \$4 which is in contact with it meanwhile rising as a result of the tension of spring \$3 depressing the lever arm \$6 and applying pressure through the pin \$8 upon the switch member \$195 which when attaining the corresponding value will cause in-

stantaneous closure of the switch and resumption of the delivery of moisture.

It is to be noted that during periods when the hygroscopic member 64 is expanding in response to increasing humidity it encounters no resistance other than the elastic resistance due to the tension of the spring, which is an important characteristic of the type of regulator herein disclosed.

It will thus be apparent that by reason of 10 the present invention a very effective control for the humidifier is provided and that by reason of the fact that the hygroscopic element is positioned directly in the path of the air entering the humidifier casing, an exceedingly acturate control of humidification of the air of the enclosure is secured.

It will be apparent that a controller of the type disclosed may be applied to electrically motivated humidifying means in a variety of 20 circumstances within the scope of the invention.

It will also be understood that the particular embodiment of the invention disclosed herein is of an illustrative character and that various changes in form, construction, and arrangement 25 of parts may be made within the spirit and scope of the following claims.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent. is:

1. Humidifying apparatus comprising humidifying means controlled by a commercial electric circuit having a safety switch construction comprising an apertured tubular housing having a rigid hygroscopic element subject to elongation 35 and contraction in response to increase and decrease in the humidity of the air mounted in said tubular housing and having centrally of its length an enlarged guiding portion slidably fitting within said housing to insure accurate 40 movement thereof in the direction of the axis of said housing, a casing rigidly connected to said housing having therein a closed insulated container, a non-sparking switch within said insulated container having cooperating fixed and 45 resilient metal contact members connected in said circuit, and means operable upon elongation of said hygroscopic element to actuate said switch.

2. Humidifying apparatus comprising humidi- 50 fying means controlled by a commercial electric circuit having a safety switch construction comprising an apertured vertical cylindrical housing having a hygroscopic element subject to elongation and contraction in response to increase and 55 decrease in the humidity of the air mounted in said cylindrical housing, means connected to the lower end of said hygroscopic member and guided by said housing to move in the direction of the axis of said housing, a casing rigidly con- 60 nected to said housing having therein a nonsparking switch in said electric circuit enclosed in an insulated container, and means operable by the means connected to the lower end of said hygroscopic member operable upon elonga- 65 tion of said hygroscopic member to actuate said switch.

3. Humidifying apparatus comprising humidifying means controlled by a commercial electric circuit having a safety switch construction comprising an apertured vertical cylindrical housing having a hygroscopic element subject to elongation and contraction in response to increase and decrease in the humidity of the air mounted in said cylindrical housing, a pin connected to the 75

lower end of said hygroscopic member, means guiding the same in the direction of the axis of said housing, a casing of insulating material rigidly connected to said housing having therein a non-sparking switch in said electric circuit comprising cooperating fixed and resilient metal contact members, and a lever operable by said pin upon elongation of said hygroscopic element to cause the actuation of said switch.

4. Humidifying apparatus comprising humidifying means controlled by a commercial electric circuit having a safety switch construction comprising an apertured vertical cylindrical housing having a hygroscopic element subject to elonga-15 tion and contraction in response to increase and decrease in the humidity of the air mounted in said cylindrical housing, a closed casing of insulating material rigidly connected to said housing, a non-sparking snap-switch in said electric 20 circuit enclosed within said insulating casing, and means including a pin connected to the lower end of said hygroscopic element and movable axially of said housing operable upon elongation of said hygroscopic element to actuate 25 said switch.

5. Humidifying apparatus comprising humidifying means controlled by a commercial electric circuit having a safety switch construction comprising a vertical tubular apertured housing 30 having a head fixedly secured therein, a hygroscopic element subject to elongation and contraction in response to increase and decrease in the humidity of the air mounted in said tubular housing, a pin connected to the lower end of 35 said hygroscopic element, means for guiding said pin in the direction of the axis of said housing upon elongation of said hygroscopic element, means including a member having screw threaded engagement with said head for adjusting the 40 position of said hygroscopic member in said housing, and a non-sparking switch having cooperating fixed and resilient metal contact members in said electric circuit, a closed casing of insulating material enclosing said switch, and

means operable by the pin which is connected to the lower end of said hygroscopic member to actuate said switch upon elongation of said hygroscopic element.

6. Humidifying apparatus comprising humidi- 5 fying means controlled by a commercial electric circuit having a safety switch construction comprising an apertured vertical cylindrical housing having a hygroscopic element subject to elongation and contraction in response to increase and 10 decrease in the humidity of the air mounted therein, a casing rigidly connected to the lower end of said housing, a snap switch in said electric circuit enclosed within said casing having a flexible resilient member subject to distortional 15 stress normally acting to close said switch, means connected to the lower end of said hygroscopic element operable upon elongation of said hygroscopic element so to vary said distortional stress as to cause the resilience of said flexible 20 switch member instantly to open said switch.

7. Humidifying apparatus comprising humidifying means controlled by a commercial electric circuit having a safety switch construction comprising a vertical, cylindrical apertured housing 25 having an adjusting screw mounted in the upper end thereof, a hygroscopic element composed of a rigid material subject to elongation and contraction in response to increase and decrease in the humidity of the air mounted in said cylin- 30 drical tubular housing to abut at its lower end against a member movable in the direction of the axis of said housing by elongation of said hygroscopic element and to abut at its upper end against said adjusting screw, a non-sparking 35 switch in said electric circuit, and means operable by the member abutting the lower end of said hygroscopic element to actuate said switch upon elongation of said hygroscopic element in organization suitable for the adjustable posi- 40 tioning of said hygroscopic element with respect to said switch.

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