July 8, 1958 A. J. GEEN 2,842,348

AUTOMATIC HUMIDIFIER

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Fig. 1

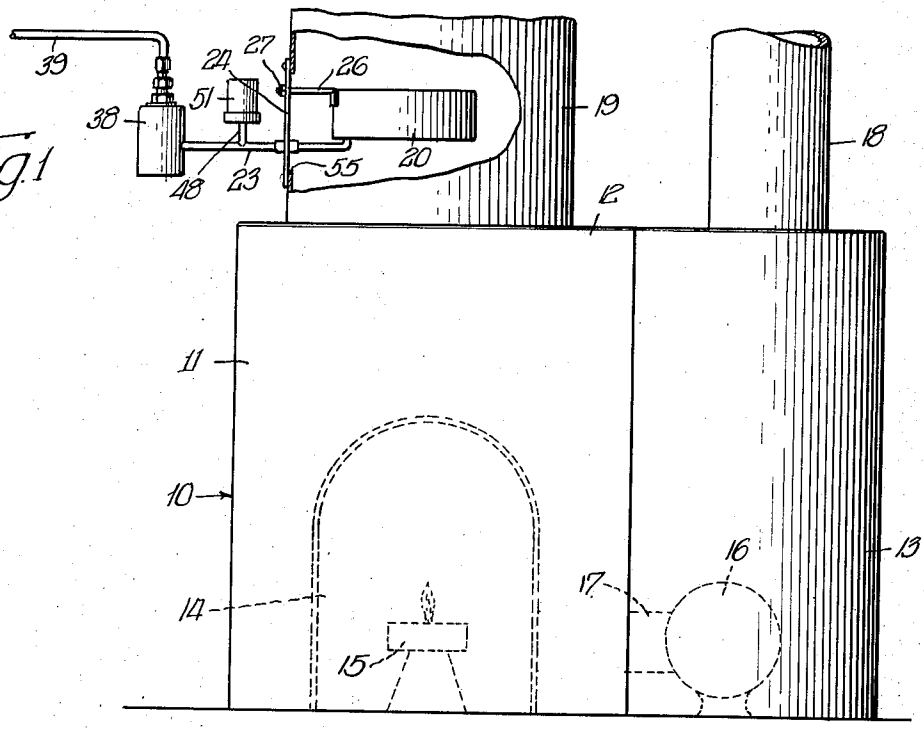


Fig. 6

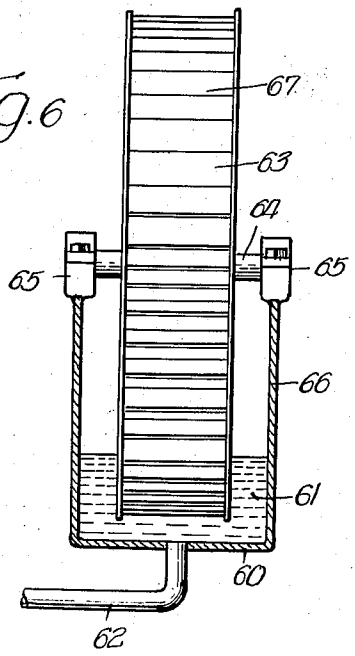
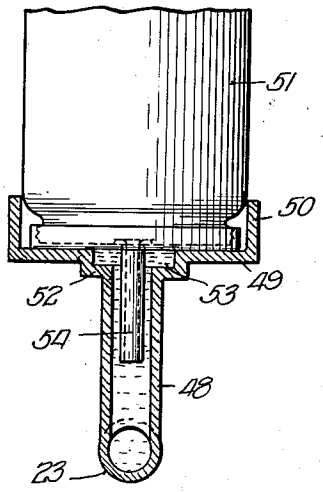


Fig. 5



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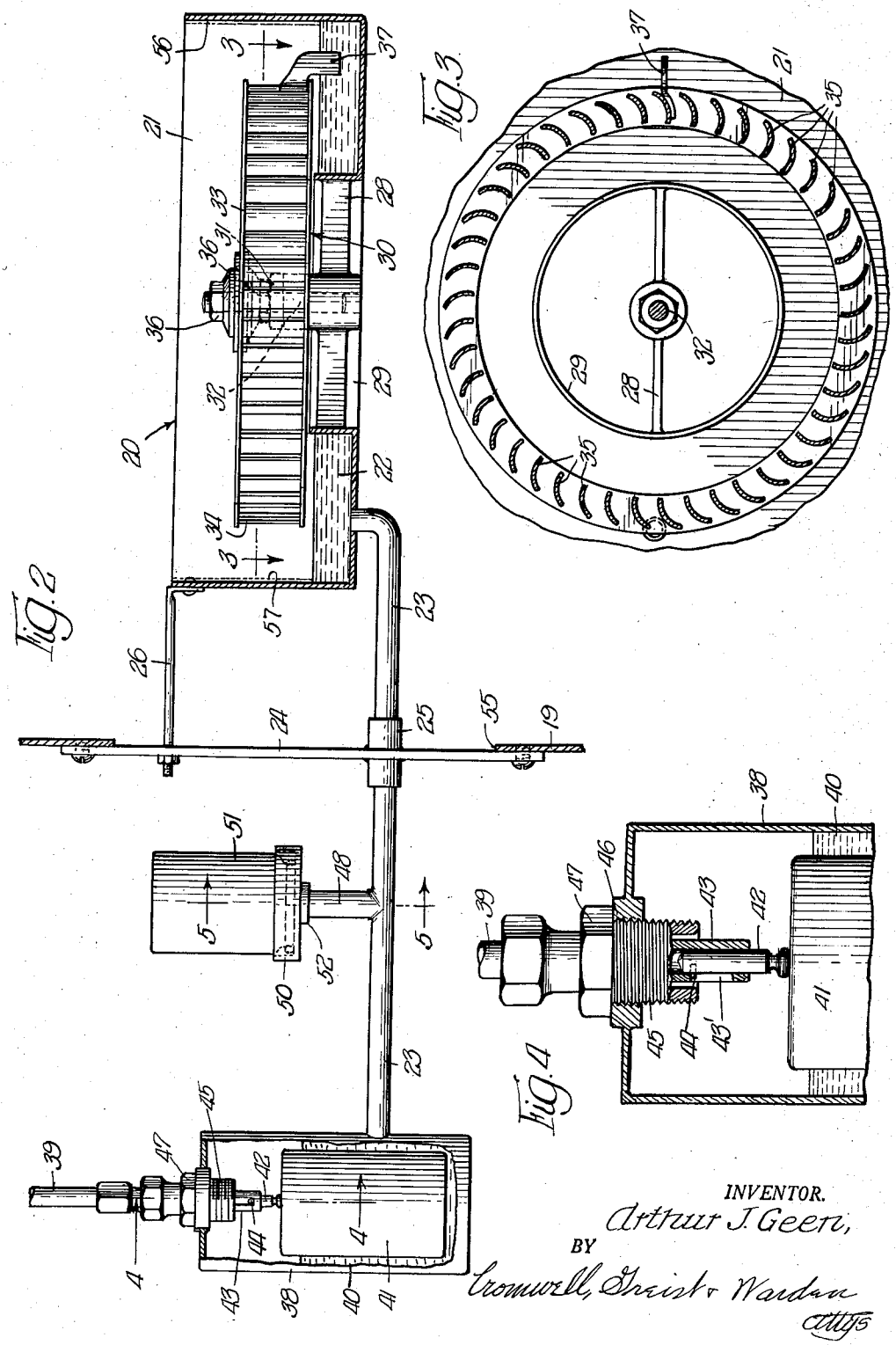


Fig. 2

Fig. 3

Fig. 4

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United States Patent Office 2,842,348 Patented July 8, 1958

2,842,348

AUTOMATIC HUMIDIFIER

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Application November 17, 1954, Serial No. 469,409

5 Claims. (Cl. 261—91)

This invention relates to heating systems and is more particularly concerned with improvements in a humidifier for use with a furnace in a warm air heating system.

It is a general object of the invention to provide a humidifier for use with a warm air furnace which is automatically operative upon delivery of warm air by the furnace and which will add a satisfactory percentage of moisture for circulation with the air.

It is another object of the invention to provide a humidifier for use with a warm air furnace which can be readily installed in the furnace and which, after initial installation and adjustment, will operate automatically upon operation of the furnace, with a minimum of attention.

It is a more specific object of the invention to provide apparatus for adding moisture to the warm air delivered by a furnace, which comprises a water trough adapted to be mounted in the moving current of air heated by the furnace, a water feed line connected to a water supply and having automatically controlled means for delivering water through the feed line to the trough and for maintaining the level thereof in the trough constant, and mechanism operated by movement of the heated air which forces at least some of the air delivered by the furnace into contact with the water delivered to the trough.

It is a still more more specific object of the invention to provide a humidifier for incorporation in a circulating air furnace which comprises a water trough supported within the path of the air delivered by the furnace, the trough being connected to a water supply and a device for maintaining the same at a constant level in the trough, an air driven fan and associated members for receiving a portion of the air through an aperture in the trough and for discharging the same adjacent the surface of the water therein, and a member associated with the fan for splashing the water into the path of the air as it is discharged therefrom.

It is a still further object of the invention to provide a humidifier for use with a warm air furnace which comprises a circular water trough adapted to be mounted in the air stream in the furnace, a line connecting the trough to a water supply and having associated therewith mechanism for supplying water to the trough at a constant level, a circular fan mounted for free rotation above the center of the trough and adapted to be rotated by passage of warm air through the center thereof, a baffle cooperating with the fan for directing the air outwardly thereof over the surface of the water in the trough, and an agitator device rotatable with the fan for splashing some of the water into the stream of air as it is discharged from the fan.

It is another object of the invention to provide a humidifier construction for use with a warm air furnace of the type described, wherein a sump is provided in the feed line which supplies water to the humidifier pan and a liquid supply device is associated with the sump for

commingling with the water a quantity of another liquid, such as a disinfectant, a deodorizer or an asthma treating chemical.

It is still another object of the invention to provide a humidifier for use with a warm air furnace which is inexpensive to manufacture, which may be readily combined wtih various types of furnaces, which is simple and positive in its action, and which requires a minimum of care and maintenance.

These and other objects and advantages of the invention will be apparent from a consideration of the apparatus which is shown by way of illustration in the accompanying drawings, wherein:

Fig. 1 is an elevation of a warm air furnace having incorporated therein a humidifier which embodies the principal features of the invention, portions of the furnace being shown schematically and certain portions thereof being broken away to show the location of certain parts of the humidifier;

Fig. 2 is an elevation of the humidifier to an enlarged scale with portions thereof being broken away;

Fig. 3 is a cross section on the line 3—3 of Fig. 2;

Fig. 4 is a cross section on the line 4—4 of Fig. 2, to an enlarged scale;

Fig. 5 is a cross section on the line 5—5 of Fig. 2, to an enlarged scale; and

Fig. 6 is an elevation, with portions broken away, of a modified form of the vaporizing portion of the humidifier apparatus.

Referring to Figs. 1 to 5 of the drawings, there is illustrated a warm air furnace 10 with which the humidifying apparatus is combined or on which the same is installed to provide a supply of water and to form it into a vapor or fine mist for mixing with the air which is heated by the furnace.

The furnace 10 comprises a housing 11 consisting of a burner section 12 and a filter section 13. The burner section 12 is provided with a combustion chamber 14 having a conventional burner 15 mounted therein which heats the air delivered to the section 12 by the fan 16. The fan 16 is housed in the filter section 13 at the end of the passageway 17 which extends between the same and the burner section 12. Cold air is drawn into the filter section 13, by operation of the fan 16, through the cold air return conduit indicated at 18 which is connected to the cold air registers in the system. The burner section 12 of the furnace 10 is provided at the top with a bonnet 19 through which the air heated by the burner 15 passes and is distributed to the warm air registers throughout the system. The heated air rises from the combustion chamber 14 and passes through the plenum area immediately above the same and into the warm air bonnet 19.

The vaporizing unit 20 of the humidifier comprises a water pan or trough 21 which is adapted to be mounted in the bonnet 19 of the furnace section 12 or in the plenum area above the combustion chamber 14 where it is located in the upwardly moving heated air stream. The water pan 21 is channel-shaped in cross section and preferably in the form of a circular trough, as shown. It is supplied with a predetermined quantity of water 22 which is delivered through a feed line 23 which extends from the bottom of the pan 21 through the mounting plate or bracket 24 and is secured thereto at 25. The pan 21 is adjusted or leveled when installed in the furnace by means of an adjustable brace rod or bar 26 which is attached adjacent the top of the pan 21 and has a threaded end extending through the mounting plate 24 and receiving an adjusting nut 27.

A bearing supporting bar or bracket 28 is secured in the central opening 29 in the pan 21 and supports a

fan member 30 which is mounted in freely rotatable relation for movement by air moving upwardly through the opening 29. The bearing bracket 28 is provided with an anti-friction bearing 31 for receiving a pin or shaft 32 depending from a baffle plate 33 which forms a top wall for the fan 30. The baffle plate 33 extends to a peripheral side wall 34 which is provided with a plurality of circumferentially spaced curved fan blades 35. The baffle plate 33 and the blades 35 are arranged so that air moving upwardly into the center of the fan and striking the plate 33 is deflected outwardly and engages the blades 35, thereby causing the fan 30 to rotate on its pivot shaft 32. The height of the fan 30 relative to the level of the water 22 may be adjusted by means of adjusting nuts 36 which secure the threaded upper end of the pivot shaft 32 to the center of the plate 33. A paddle-like agitator or splash member 37 is mounted at one end adjacent the outer periphery of the fan 30 with its free end extending downwardly a sufficient distance to project into the water 22 in the pan.

The feed line 23 which supplies water to the pan 21 extends to a constant level valve mechanism 38 located outside the furnace which is in turn connected to a water supply line indicated at 39. The valve mechanism 38 (Figs. 2 and 4) comprises a tank 40 for containing a supply of water at a predetermined level and a float member 41 which is supported in the water with the top adapted to engage the depending operatnig pin 42 of the valve. The pin 42 is slidably received in a slotted end portion 43 of the water line and provides the outlet for the water. The valve pin 42 is adapted to be raised and lowered by the float 41 so that its upper end opens or closes the peripherally spaced axially extending outlet slots 43' as required, to maintain the water in the float tank 40 at a predetermined level and in turn to maintain the level of the water 22 in the pan 21 constant. The movement of the valve member 42 is limited by the stop pin 44 which extends into one of the slots 43'. The valve members are supported in an externally threaded housing 45 which is mounted in a threaded aperture 46 in the top of the tank 40 and provided with a nut-like top shoulder 47 so that the height of the valve member 43 may be adjusted relative to the tank 40 to vary the level of the water in the tank.

Preferably, the feed line 23 includes a relatively short upstanding branch line 48 (Figs. 2 and 5) which terminates in a top platform member 49 having upstanding peripheral side flanges 50 which are adapted to receive a bottle or other supply vessel 51 for containing a liquid deodorant, disinfectant, or the like. The platform 49 is provided at its center with a sump or pocket 52 which is in communication with the branch line 48 and in which a quantity of the liquid deodorant 53 or the like is maintained at a level approximately the same as the level of the water in the pan 21 and the valve tank 40. The liquid supply vessel 51 is provided with a discharge nozzle 54 which extends into the sump 52 and maintains the level of the liquid therein as small portions thereof are added to the water flowing through the line 23.

The apparatus is placed in operation by mounting the bracket or support plate 24 in a suitable aperture 55 in the bonnet 19 with the pan 21 and its associated fan mechanism positioned within the bonnet 19 in the upwardly moving stream of heated air so that at least some of the air passes through the bottom opening 29 and causes the fan 30 to rotate. The remainder of the apparatus including the valve 38 and the deodorant receptacle 51 are located exteriorly of the furnace and are supported by the bracket 24 and the connection with the water supply pipe 39. When the furnace is operating and air is delivered by the fan 16 to the heating section 12 of the furnace and thence to the bonnet 19 the passage of the air through the bottom aperture 29 of the water pan 21 rotates the fan 30 and the splash foot 37 agitates the water 22 sufficiently to splash a certain amount of the water up along the inside surface of the vertical wall 56 of the pan 21 where the air flowing outwardly of the fan 30 vaporizes the water or picks up the water particles and carries the same into the air stream which is delivered through the heating ducts. The water 22 is agitated sufficiently to carry through the feed line 23 to the float tank 40 and the liquid disinfectant sump 52 which keeps the apparatus free of accumulations of lime or other salts which are ordinarily deposited in an apparatus of this type. The agitation of the water is sufficient also to maintain a supply of the liquid 53 in the sump 52 and to keep the float valve clear and operating.

When the furnace in which it is desired to install the apparatus is of the downdraft type, the apparatus may be readily adapted for use in the same by merely reversing the supporting pin or shaft 32 on the fan 30 and inverting the fan so that the open side thereof is uppermost, the splash member 37 being relocated so that it will extend into the water 22 in the pan. The downward flow of air will then operate the fan with the air being discharged outwardly of the periphery thereof and up along the inner surface of the side wall 56, sufficient water being picked up by the air to provide the desired amount of moisture.

The fan 30 may be constructed so that a portion of the bottom will dip into the water 22 sufficiently to agitate the same without impeding the rotation of the fan and thereby cause the splashing of the water which will permit the splash member 37 to be omitted.

In order to retard the return or downward flow of the water which is splashed upwardly along the inside surface of the upright wall 56 of the pan 21, the inside surface of the side wall 56 may be treated, as indicated at 57 in Fig. 2, to roughen the same, or it may be given a coating of asphalt or other material which will retard the return flow of the water, or a screen or other similar element may be positioned adjacent the wall 56.

While the water tank 21 is illustrated as in a level position in the apparatus, it may be tilted or otherwise arranged so that the fan 30 operates in a plane at an angle to the level of the water 22. This may be accomplished by supporting the fan 30 in a bearing which is at an angle to the vertical and which will allow a portion of the fan to dip into the water at the bottom of its orbit and cause the agitation or upward splashing of the water which is required to render the apparatus most efficient.

Referring to Fig. 6, there is illustrated a modification of the water vaporizing portion of the apparatus which is particularly adapted for use in a furnace of a downdraft or similar type. In this form of the apparatus a pan 60 is mounted in the furnace and supplied with water 61 by a supply line 62, which extends from the bottom of the pan 60, and associated apparatus which may be identical with the apparatus illustrated in Fig. 2. The air driven fan 63 is mounted on a generally horizontal shaft 64 which is supported for free rotation in bearings 65 in the side walls 66 of the pan 60. The fan 63 and the water pan 60 are located so that a moving current of air will strike the fan at its periphery and through the blades 67 rotate the fan with the air being deflected outwardly of the fan and upwardly along the inner surfaces of the side walls 66. If required, a funnel or other air directing means may be employed to insure that a sufficient volume of air is directed against the blades to rotate the fan. The fan dips into the water 61 at the lower portion of its orbit and agitates the water sufficiently to splash the same up onto the side walls 66 where it is picked up by the moving body of air delivered from the fan.

While specific details of construction have been referred to in describing the illustrated forms of the invention, it will be understood that variations in structural

details may be resorted to within the spirit of the invention.

I claim:

1. An automatic humidifier for use in a warm air circulating system, comprising a receptacle having upstanding side walls adapted to be supported in the furnace plenum casing or the like where it is in the moving current of heated air, a feed line connecting the receptacle to a water supply line, means for controlling the flow of water in said feed line to maintain a quantity of water at a constant level in said receptacle, a member mounted for free rotation on a vertical axis and in proximity to the water level in said receptacle, said member extending adjacent to the side walls of the receptacle and having blades arranged to rotate the same when air is directed against their surfaces, means for directing at least some of the heated air into the member and against the surfaces of the blades to rotate the same, said member having means to deflect the air outwardly and cause it to pass over exposed portions of the inner side wall surfaces of the receptacle as it leaves the member, and an agitator device mounted on said member and extending into the water for splashing some of the water onto said portions of the receptacle inner side wall surfaces and into the deflected air.

2. An automatic humidifier as recited in claim 1 and said receptacle having means on its inner side wall surfaces to retard the flow of the water splashed thereon by said agitator device.

3. A humidifier for use with a circulating warm air furnace, comprising a water pan having upstanding walls, which pan is adapted to be positioned in the furnace where it is in the upwardly moving current of air heated by the furnace, means for supplying said pan with water at a constant level therein, an air driven cylindrical member rotatably mounted on a vertical axis above the water level in said pan, said cylindrical member having a central passage for the air and peripherally spaced blades extending adjacent to the side walls of the pan and arranged for rotating the member when a stream of air is directed against the same, an opening in said pan beneath said air driven member providing a passageway for directing a rising stream of heated air to said air driven member, said air driven member having means to deflect the stream of air outwardly to the blades and through the periphery thereof, and means on said air driven member extending into the water in the pan to agitate the water and cause particles of the water to be carried upwardly out of the pan by said deflected stream of air.

4. A humidifier for use with a circulating warm air furnace, comprising an open top water pan having upwardly directed side walls and adapted to be positioned in the furnace where it is in a current of warm air provided by the furnace, means for supplying said pan with water at a constant level therein, a baffle member mounted in spaced relation above the water in said pan

for deflecting the air outwardly of the center of the pan and over the upper surface of the water, said pan having an opening beneath said baffle member providing a passageway for directing a stream of air upwardly therethrough to said baffle member, and a rotatable member mounted on a vertical axis between the pan and the baffle member, said rotatable member having blades which extend to adjacent the side walls of the water pan and which are arranged to be engaged by the stream of air which is deflected outwardly by said baffle member thereby to rotate said member and pass the air outwardly of the periphery of said member and a paddle depending from said rotatable member and extending below the surface of the water to agitate the water in the pan and cause particles of the water to be carried upwardly out of the pan by said deflected stream of air.

5. An automatic humidifier for use in a warm air furnace or the like, comprising a relatively shallow open top receptacle having peripheral side walls and adapted to be supported in the furnace where it is in a moving current of air heated by the furnace, a water feed line connecting the receptacle to a water supply line, means for controlling the flow of water in said feed line to maintain a quantity of water at a constant level in said receptacle, a rotor mounted on a vertical axis for free rotation immediately above the water level in said receptacle, said rotor extending to adjacent the side walls of the receptacle and having peripherally spaced blade members arranged to cause rotation of the rotor when air is directed outwardly of the axis of rotation and against the surfaces thereof, a passageway for directing at least some of the air heated by the furnace into the rotor to rotate the same, said rotor having an upper wall forming a baffle arranged in opposed relation to the discharge end of said air passageway to deflect the air outwardly through the periphery of the rotor and cause it to pass over the surface of the water as it leaves the rotor, and means on the rotor which extends into the water and splashes portions of the water onto the inner surfaces of said side walls upon movement of the rotor.

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