Jan. 17, 1967 R. J. MOORE 3,298,676

AIR HUMIDIFIERS FOR FORCED AIR DUCTS

Filed July 28, 1965 4 Sheets-Sheet 1

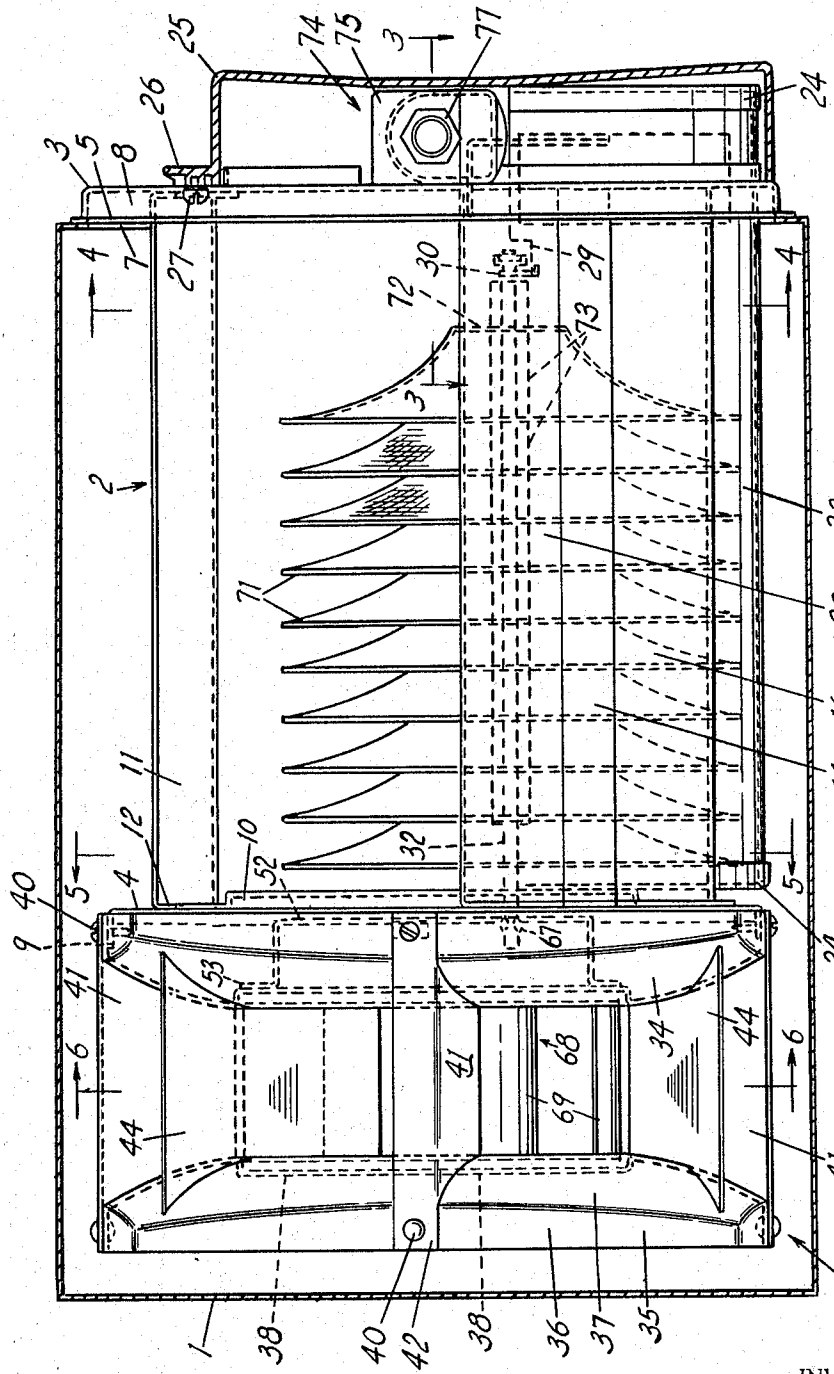


FIG. 1

INVENTOR.
Robert J. Moore
BY Earl D. Webb
ATTORNEYS

Jan. 17, 1967 R. J. MOORE 3,298,676

AIR HUMIDIFIERS FOR FORCED AIR DUCTS

Filed July 28, 1965 4 Sheets-Sheet 2

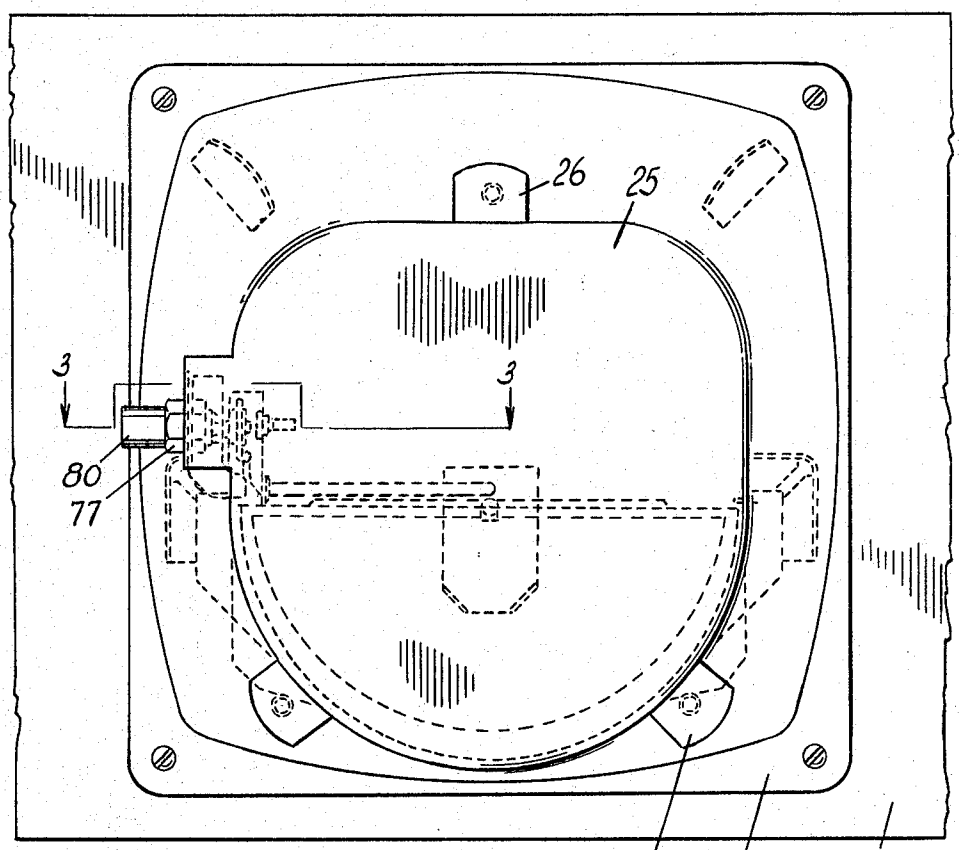


Fig. 2.

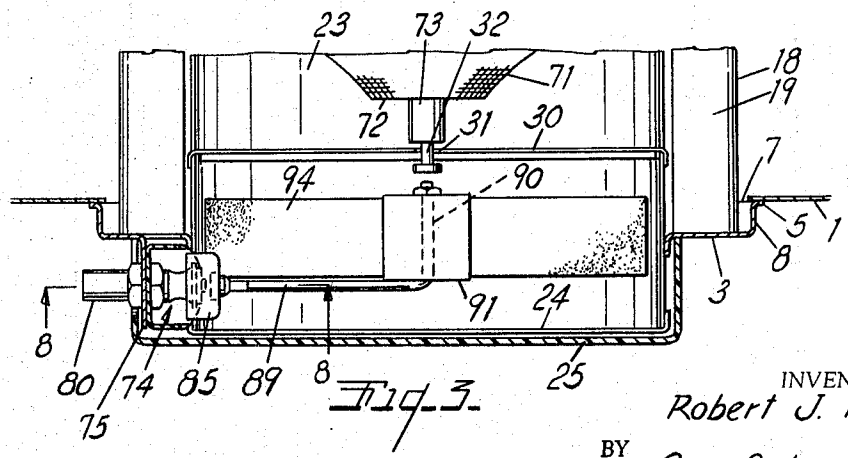


Fig. 3.

INVENTOR.
Robert J. Moore
BY
Earl F. Wolff
ATTORNEYS.

Jan. 17, 1967 R. J. MOORE 3,298,676

AIR HUMIDIFIERS FOR FORCED AIR DUCTS

Filed July 28, 1965 4 Sheets-Sheet 3

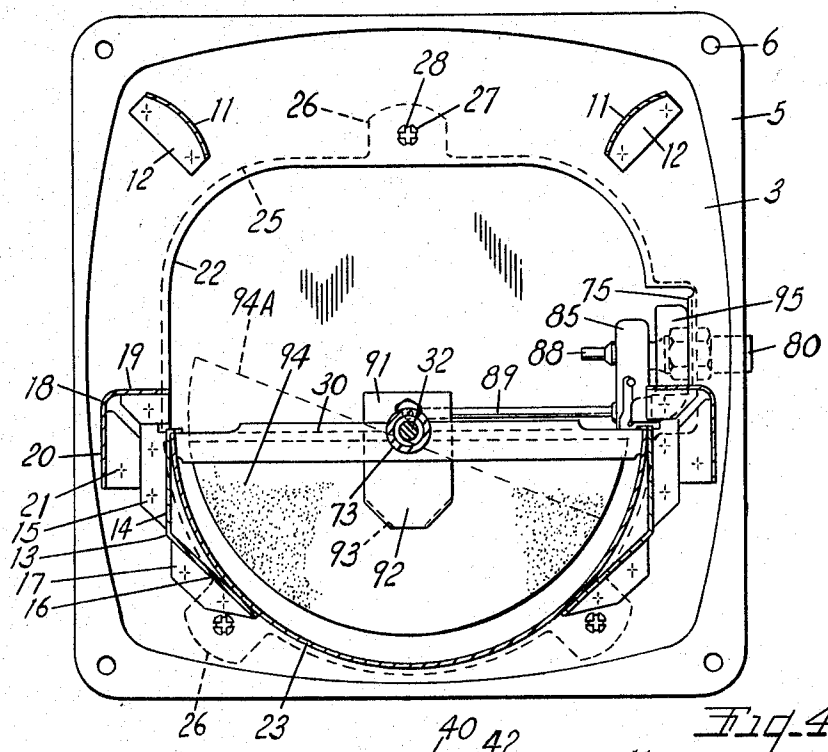


Fig. 4.

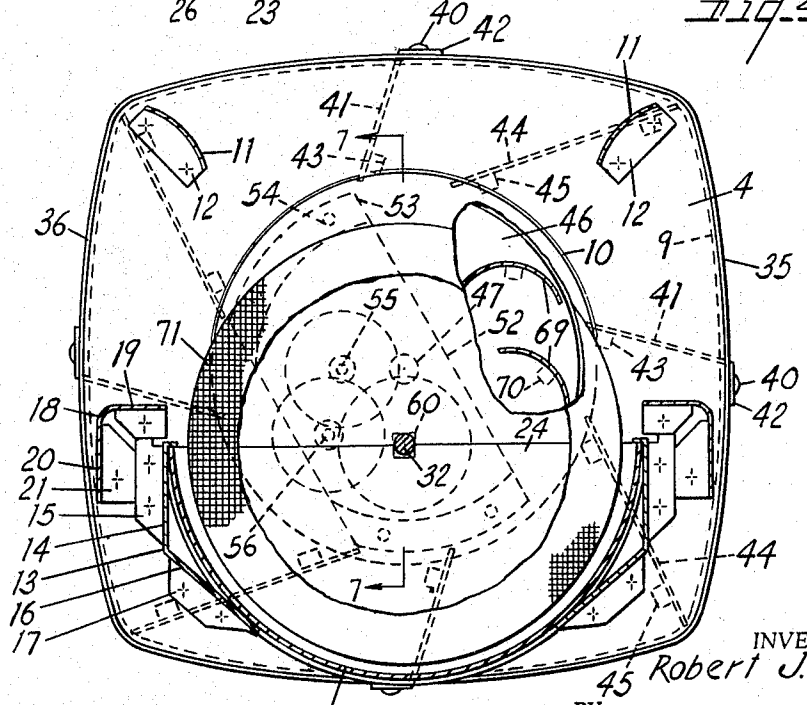


Fig. 5.

INVENTOR.
Robert J. Moore
BY
Earl & Webb
ATTORNEYS

Jan. 17, 1967 R. J. MOORE 3,298,676

AIR HUMIDIFIERS FOR FORCED AIR DUCTS

Filed July 28, 1965 4 Sheets-Sheet 4

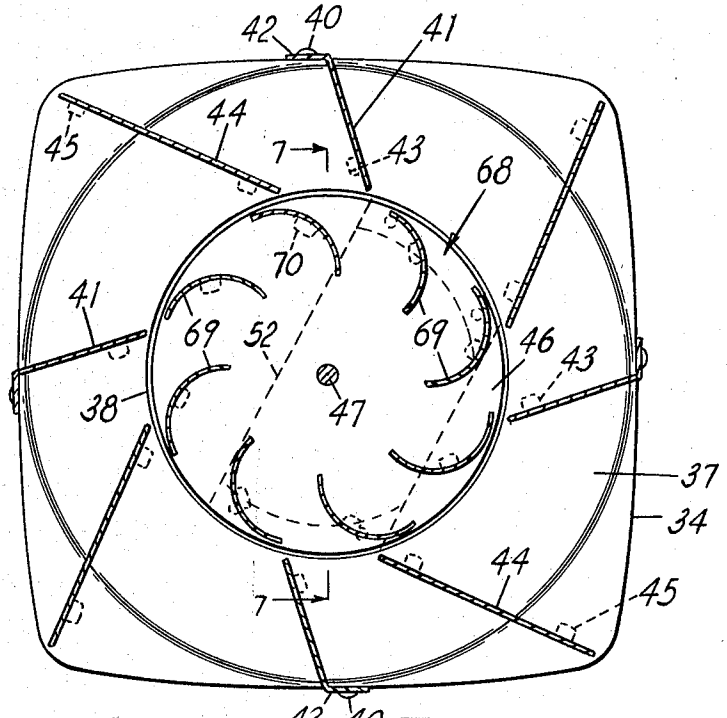


Fig. 6.

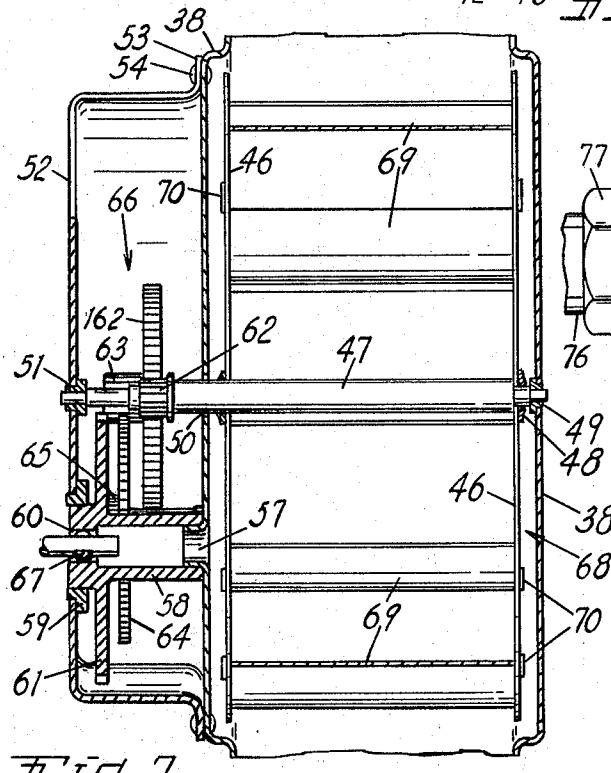


Fig. 7.

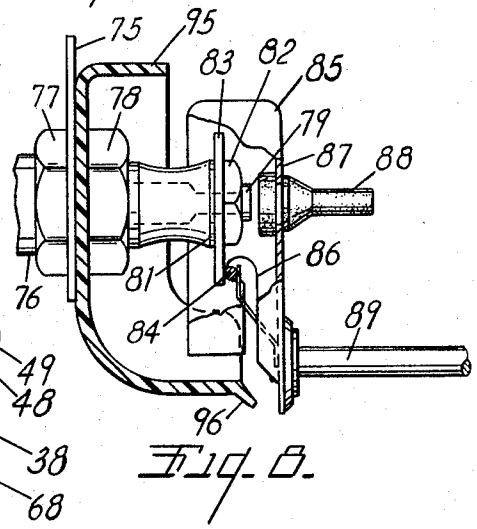


Fig. 8.

INVENTOR.
Robert J. Moore
BY Earl & Webb
ATTORNEYS.

United States Patent Office

3,298,676

Patented Jan. 17, 1967

3,298,676

AIR HUMIDIFIERS FOR FORCED AIR DUCTS

Robert J. Moore, Coopersville, Mich., assignor to Leigh Products, Inc., Coopersville, Mich.

Filed July 28, 1965, Ser. No. 475,503
7 Claims. (Cl. 261—35)

This invention relates to improvements in air humidifiers for forced air ducts.

The principal objects of this invention are:

First, to provide a humidifier insertable into a forced air duct and having an air driven turbine mounted on the inner end of an evaporator disk section that includes a tank and evaporator shaft with rotatable disks on the shaft, the shaft being connected through a speed reduction gear train to the rotor of the turbine, the front end of the tank having a float and float controlled valve mounted thereon and enclosed by a removable cover, the turbine being provided with air directing stator plates adapted to direct air from any direction into the rotor of the turbine and the tank and evaporator disks being supported and surrounded by spaced angled connecting bars arranged to direct air from any direction over the upper portions of the evaporator disks.

Second, to provide an evaporator of the type described in which the evaporator disks are generally conical members of wire mesh material to pick up water from the tank and carry it up into the path of air in a duct deflected across the evaporator disks by the connecting bars.

Third, to provide an evaporator having the advantages of rotatable disks dipping into a supply tank to elevate water into the flow of air passing thereacross without requiring the expense of an electric motor for rotating the disks.

Fourth, to provide an evaporator which utilizes a portion of the energy of the air in a forced air conduit to operate a rotating disk evaporator to humidify the air in the conduit.

Other objects and advantages of the invention will be apparent from a consideration of the following description and claims.

The drawings of which there are four sheets illustrate a highly practical form of the evaporator.

FIG. 1 is a side elevational view of the evaporator of the invention mounted in a forced air conduit, the conduit being conventionally illustrated in cross section.

FIG. 2 is a front end elevational view of the evaporator as mounted in a wall of a conduit.

FIG. 3 is a fragmentary horizontal cross sectional view through the water supply and float control valve of the evaporator taken along the plane of the broken line 3—3 in FIG. 2.

FIG. 4 is a transverse cross sectional view taken along the plane of the line 4—4 in FIG. 1 and looking in the direction of the arrows.

FIG. 5 is a transverse cross sectional view taken along the plane of the line 5—5 in FIG. 1 and looking in the direction of the arrows, portions of the structure being further broken away to better illustrate concealed parts.

FIG. 6 is a transverse cross sectional view through the air turbine of the evaporator taken along the plane of the line 6—6 in FIG. 1 and looking in the direction of the arrows.

FIG. 7 is a fragmentary vertical cross sectional view through the air turbine and gear train of the evaporator taken along the planes of the lines 7—7 in FIGS. 5 and 6 and looking in the direction of the arrows.

FIG. 8 is an enlarged fragmentary vertical cross sectional view through the water inlet conduit and float control valve taken along the plane of the line 8—8 in FIG. 3 and looking in the direction of the arrows.

The drawings illustrate a portion of a forced air conduit 1 in which the evaporator of the invention is mounted. The size of the conduit relative to the evaporator is unimportant and as will be pointed out the direction of air flow through the conduit is unimportant so long as the air flow is generally perpendicular to the longitudinal axis of the evaporator and the axis of rotation of the evaporator disks to be described.

The evaporator itself consists of a disk section generally indicated at 2 and having a front end plate or member 3 and an inner or rear end plate or member 4. The plates or end members are generally rectangular but the front member 3 has a projecting flange 5 with screw holes 6 in the corners thereof by means of which the evaporator may be supported within the conduit 1 after having been passed through an opening 7 in the wall of the conduit (see FIGS. 1 and 2). The front end member 3 has a rearwardly concave generally rectangular recess formed therein with a longitudinally extending flange 8 therearound. The rear end member 4 is a plate like stamping with a similar generally rectangular outline and a rearwardly facing flange or rim 9 around its edge. A forwardly convex circular portion 10 is formed in the center of the rear member.

The front end member 3 and the rear end member 4 are connected in spaced relationship at their upper corners by air deflecting connecting bars 11 that are upwardly convex and laterally outwardly and downwardly concave with flanges 12 welded to the opposed surfaces of the end members. The lower sections of the end members are connected by tank supporting bars 13 having upright sections 14 and flanges 15 welded to the end members and downwardly and inwardly converging arms or flanges 16 with connecting flanges 17 also welded to the end members. Spaced laterally outwardly and upwardly from the tank support bars are side air deflecting bars 18 having inwardly turned upper flanges 19 and upright flanges 20. Connecting ears or flanges 21 are welded to the end members. The outer end member 3 defines a hole or opening 22 that is generally rectangular at the top and semi-circular at the bottom. A semi-cylindrical tank 23 is supported by the inwardly directed flanges 16 of the tank support bars and projects through the opening 22 through the front of the front end member 3. The tank 23 consists of a semi-cylindrical plate with half round end members 24 sealed to the semi-cylindrical body and forming a water tight tank. When in use the opening 22 is closed on the front side of the front member 3 over the front end of the tank by a rearwardly concave plastic cover 25 having an outturned peripheral flange 26 with integral studs 27 on its back side engaged through holes provided therefor in the front member as at 28.

Near the front member 3 the upper edges of the semi-cylindrical tank are notched as at 29 (see FIG. 1) to receive a disk shaft support bar 30 arranged laterally or transversely across the end of the tank. The cross bar 30 has a central notch 31 freely rotatably supporting the front end of a disk support shaft 32. The rear end of the shaft 32 projects through an opening provided therefor in the rear member 4 of the evaporator section.

Secured to the rear member 4 of the evaporator section and supported entirely thereby is an air turbine indicated generally by the numeral 33. The air turbine consists of symmetrical front and rear stator plates 34 and 35 respectively. The stator plates are generally rectangular in cross section conforming generally to the outline of the rear member 4 of the evaporator section 2 and having peripheral flanges 36. Inwardly of the flanges the stator plates 34 and 35 are oppositely inwardly convex as at 37 to central cylindrical recesses 38 which are pressed axially upwardly of the stator plates. The for-

wardly turned flange 36 of the front stator plate overlies a rearwardly turned flange 9 on the rear member of the evaporator assembly and is connected thereto by screws 40 positioned in the center of the sides of the two members. The stator plates 34 and 35 are connected by top, bottom and side stator vanes 41. The vanes 41 have tabs 42 on their radially outer edges and ends which are secured to the flanges 36. The end edges of the stator vanes are curved to fit the concave sides of the stator plates and have ears 43 at the radially inner sides of their ends which are passed through slits provided therefor in the stator end plates and turned over to clamp the stator end plates together. The stator plates or vanes 41 are inclined angularly around the stator plates relative to the central axis of the turbine section.

Disposed at the corners of the stator end plates between the vanes 41 are corner stator vanes 44 having lugs 45 on their ends passed through slits provided therefor in the stator end plates and further clamping the stator plates together. The stator plates 44 are also disposed in angular relation to radii of the axis of the turbine so that air directed against the turbine from any direction around the stator plates will be directed inwardly to the center of the turbine.

The cylindrical recessed portions 38 of the stator end plates housed circular rotor plates 46 that are mounted on a rotor shaft 47 and secured in place by press nuts or grippers 48 (see FIG. 7). The rear end of the shaft 47 is supported in a nylon or other bearing 49 in the rear stator plate while the shaft extends forwardly through a hole 50 in the front stator end plate to a bearing 51 mounted in a motor or gear train support plate or bracket 52. The plate or bracket 52 is generally U-shaped and has upwardly turned flanges 53 that are secured to the front side of the front stator plate as by rivets shown at 54 in FIG. 5.

The motor support plate or bracket 52 and the central portion of the front stator plate 34 also supports jack shafts 55 and 56 in suitable bearings and disposed as shown in FIG. 5. The front stator plate has a forwardly extruded ring 57 forming a bearing for a tubular plastic shaft 58 having its forward end rotatably received in a bearing 59 and defining a non-circular central opening 60 in its forward end. Formed on the shaft 58 is a final driven gear 61 of the gear train of the turbine motor. The rotor shaft 47 of the turbine has a pinion 62 formed or cut thereon which meshes with a large gear 162 on the jack shaft 55. The gear 162 has an integral small pinion 63 drivingly engaged with a large gear 64 mounted on the jack shaft 56 and the gear 64 has a small pinion 65 drivingly engaged with the final drive gear 61. The gear train indicated in its entirety by the numeral 66 thus drives the evaporator shaft from the turbine rotor shaft by means of projecting ears or lugs 67 struck from the rear end of the evaporator shaft and drivingly engaged in the noncircular opening 60. The turbine rotor 68 consists of the previously described end plates 46 and a plurality of arcuate rotor vanes 69 arranged in oppositely inclined relation to the stator vanes 44 and having lugs or ears 70 passed through slots provided therefor in the rotor end plates and bent over to hold the end plates of the rotor together.

Returning now to the evaporator section 2 and FIGS. 1, 3 and 5 it will be noted that the evaporator shaft 32 carries a plurality of curved conical evaporator disks 71 which are circular in outline and formed of wire mesh desirably of the order of eight wires or mesh to the inch formed of .018 wire covered with a protective galvanized dip coating. The radially inner ends of the evaporator disks have flat sections 72 that are held in spaced relationship on the evaporator shaft by tubular spacers 73 formed of plastic or other suitable material. The rims of the disks 71 project downwardly well into the semi-cylindrical tank 23 and the open mesh of the disks pick up water from the tank and elevate it into the stream of air directed across the evaporator section by the connecting bars 11 and 18 where the water is evaporated to humidify the air.

The level of water in the tank 23 is automatically maintained by a valve generally indicated at 74 and mounted on a flange 75 bent forwardly from the front evaporator member 3. As is best shown in FIG. 8, the flange 75 supports a coupling conduit 76 that is passed through the flange and clamped in place by nuts 77 and 78. Desirably the sides of the coupling members 76 and the holes receiving the same in the flange 75 are flatted to keep the coupling member in the same angularly oriented position relative to the flange 75. The inner end of the coupling member 76 defines a discharge nozzle or orifice 79 that is adapted to discharge water into the tank 23. The outer end of the coupling member 80 is adapted to be connected to any suitable source of water. Secured against a shoulder 81 on the inner end of the coupling member by a nut 82 is a float support plate 83 having a pivot bar 84 secured to its lower edge. The pivot bar supports a float valve box member 85 by means of engagement in the end of a slot 86 formed in the side walls of the box, the box being open at its outer side and bottom. The inner wall 87 of the box carries a flexible closure valve 88 in coacting closing relation to the nozzle 79. Secured to the lower end of the front wall 87 of the valve box is a laterally inwardly projecting float rod 89 which has an axially rearwardly turned end 90 formed thereon (see FIG. 3) and passed through the opposite flanges of a downwardly opening yoke-like clamp member 91. The clamp member 91 is frictionally retained on the axially turned end 90 and can be angularly adjusted as will be described. The lower ends of the arms 92 of the float clamp are provided with oppositely turned prongs or lugs 93 which are pressed into the soft deformable sides of a semi-cylindrical float member 94 formed of expanded polystyrene or other suitable buoyant material. When the level of the water in the tank 23 rises to a predetermined point the buoyancy of the float raises the float arm 89 and tilts the valve box 85 until the valve element 88 closes the orifice 79 to stop the flow of water to the tank. In order to prevent spray or drip from the orifice 79 from escaping from the tank, the nut 78 secures a laterally inwardly concave baffle 95 to the supporting flange 75 and the baffle 95 has an inwardly directed lower lip 96 extending over the edge of the tank 23.

From the foregoing description it will apparent that when the evaporator is installed in a duct of a forced air system as illustrated and when the coupling 80 of the conduit coupling 76 is connected to a suitable source of water the float 94 will first fall by gravity opening the valve 88 from the orifice 79 and admitting water to a predetermined level in the tank thus wetting the lower portions of the evaporator disks 71. When the air in the duct 1 is caused to move as by turning on the blower of a forced air heating system part of the moving air will drive the rotor of the turbine which in turn acts through the gear train 66 to rotate the evaporator shaft 32 and the disks 31. Other air in the duct is deflected or directed across the upper portions of the disks to humidify the air. Should more or less humidification be desired the float 94 may be angularly adjusted on the axially turned end 90 of the float rod as indicated by the dotted lines at 94A in FIG. 4. This will vary the depth of water in the tank 23 required to move the float arm 89 and the valve box 85 to valve closing position and will correspondingly vary the depth to which the lower portions of the evaporator disks 71 are immersed. The float 94 as illustrated in FIG. 4 is adjusted for maximum buoyancy or minimum level of water in the tank for closing the valve 88 on the orifice 79.

Should it be necessary to inspect the evaporator disks or clean them of accumulated mineral deposits the cover 25 is easily removed from the front member 3 of the evaporator section permitting access to the interior of the conduit and the humidifier. The evaporator shaft 32

lifts easily from the front supporting notch in the cross member **30** and may be withdrawn from the noncircular socket **60** in the shaft **58** to clean or service the disks or the disk assembly. An air movement of **250** feet per minute in the air duct **1** is sufficient to overcome the inertia of the disks and the gear train and since most forced air heating or ventilating systems operate with a minimum of 350 feet per minute velocity the humidifier of the invention is immediately operative whenever the air flow is started in the duct or conduit **1**.

What is claimed as new is:

1. A humidifier for a forced air duct comprising:
an evaporator disk section having front and rear end members,
elongated upper connecting bars having transversely curved cross sections connected at their ends to said end members,
elongated tank support members of downwardly and inwardly angled section having their ends connected to lower portions of end members in laterally spaced relation,
side air deflector bars of laterally inwardly and downwardly angled section connecting the mid-sections of said end members with their inwardly turned portions disposed in upwardly spaced relation to the upper edges of said tank support members,
a semi-cylindrical tank supported on the inwardly directed portions of said tank support members,
a valve support flange bracket turned forwardly from said front member,
a water supply conduit connected to said bracket flange and having an inwardly directed orifice,
a valve pivot secured to said conduit,
a valve box pivotally supported on said pivot and having a valve closure member coacting with the orifice in said conduit,
a float arm connected to said valve box and projecting laterally inwardly of said front member,
a float clamp angularly adjustably connected to said arm and movable about a horizontal longitudinal axis generally parallel to said connecting bars,
a semi-cylindrical float of buoyant material connected to the lower side of said clamp,
said tank projecting through an opening provided therefor in said front member to receive said float,
an inwardly facing spray shield mounted on said conduit outwardly from the orifice thereof,
a rearwardly concave cover secured to the outer side of said front end member by yieldable prongs pressed through holes provided therefor in said front end member and surrounding the opening in said front end member and said valve box,
a support bar extending laterally between the sides of said tank inwardly of said float,
an evaporator disk shaft having one end supported by said support bar and having its other end projecting through said rear member,
a plurality of conical disks of wire mesh material supported on said disk shaft with spacer members therebetween,
an air turbine having front and rear plates with axially inwardly converging central portions and outwardly recessed circular center portions,
the front plate of said turbine being connected to the rear plate of said disk section,
stator vanes connecting said front and rear plates of said turbine and disposed around the central recessed portions of the plates in angular relation to radii of said circular portions,
a turbine shaft rotatably disposed centrally of said circular portions of said turbine plates and having turbine rotor disks connected thereto,
curved rotor vanes connected between said rotor disks and curved oppositely to the angle of said stator vanes,

a gear support plate secured to the front turbine plate between the inwardly curved portion thereof and said rear member of said evaporator section,
a speed reduction gear train having shafts supported on the front plate of said turbine and said motor support plate with a driving gear connected to said rotor shaft and a driven gear having a releaseable socket driving connection to said evaporator shaft, and
laterally projecting flange means on the edge of said front member attachable to the wall of a conduit around an opening in the wall through which said turbine and said evaporator section may be passed.

2. A humidifier for a forced air duct comprising:
an evaporator disk section having front and rear end members,
elongated upper connecting bars having transversely curved cross sections connected at their ends to said end members,
elongated tank support members connected to lower portions of end members in laterally spaced relation,
side air deflector bars connecting the mid-sections of said end members disposed in upwardly spaced relation to the upper edges of said tank support members with upwardly and inwardly directed portions,
a tank supported on the inwardly directed portions of said tank support members,
a valve support extending forwardly from said front member,
a water supply conduit connected to said valve support and having an inwardly directed orifice,
a valve pivot secured to said conduit,
a valve box pivotally supported on said pivot and having a valve closure member coacting with the orifice in said conduit,
a float arm connected to said valve box and projecting laterally inwardly of said front member,
a float clamp angularly adjustably connected to said arm and movable about a horizontal longitudinal axis generally parallel to said connecting bars,
a semi-cylindrical float of bouyant material connected to the lower side of sail clamp,
said tank projecting through an opening provided therefor in said front member to receive said float,
an inwardly facing spray shield mounted on said conduit outwardly from the orifice thereof,
a rearwardly concave cover secured to the outer side of said front end member by yieldable prongs pressed through holes provided therefor in said front end member and surrounding the opening in said front end member and said valve box,
a support bar extending laterally between the sides of said tank inwardly of said float,
an evaporator disk shaft having one end supported by said support bar and having its other end projecting through said rear member,
a plurality of disks of wire mesh material supported on said disk shaft in spaced relation,
an air turbine having front and rear plates with axially inwardly converging central portions,
the front plate of said turbine being connected to the rear plate of said disk section,
stator vanes connecting said front and rear plates of said turbine and disposed around the central recessed portions of the plates in angular relation to radii of said circular portions,
a turbine shaft rotatably disposed centrally of said circular portions of said turbine plates and having turbine rotor disks connected thereto,
curved rotor vanes connected between said rotor disks and curved oppositely to the angle of said stator vanes,
a gear support plate secured to the front turbine plate between the inwardly curved portion thereof and said rear member of said evaporator section,

a speed reduction gear train having shafts supported on the front plate of said turbine and said motor support plate with a driving gear connected to said rotor shaft and a driven gear having a releasable socket driving connection to said evaporator shaft, and

laterally projecting means on the edge of said front member atachable to the wall of a conduit around an opening in the wall through which said turbine and said evaporator section may be passed.

3. A humidifier for a forced air duct comprising:

an evaporator disk section having front and rear end members,

elongated upper connecting bars connected at their ends to said end members near the upper corners thereof and disposed in laterally inwardly and downwardly air deflecting position,

elongated tank support members having their ends connected to lower portions of end members in laterally spaced relation,

a tank supported on said tank support bars,

side air deflector bars connecting the mid-sections of said end members and disposed in upwardly spaced relation to the upper edges of said tank in upwardly and laterally inwardly air deflecting relation thereto,

a valve support projecting longitudinally forwardly from said front member,

a water supply conduit connected to said bracket flange and having an inwardly directed orifice,

a float valve assembly pivotally supported on said conduit and having a valve closure member coacting with the orifice in said conduit and a float disposed in said tank,

said tank projecting through an opening provided therefor in said front member to receive said float,

a rearwardly concave cover secured to the outer side of said front end member and surrounding the opening in said front end member and said valve assembly,

a support bar extending laterally between the sides of said tank inwardly of said float,

an evaporator disk shaft having one end supported by said support bar and having its other end projecting through said rear member,

a plurality of conical disks having capillary water retaining openings supported on said disk shaft in spaced relation therealong,

an air turbine having a rotor and inwardly converging front and rear ends with circular center portions,

the front of said rotor being connected to the rear end member of said disk section,

stator vanes extending between said front and rear ends and disposed around and in angular relation to radii of said circular portions,

a turbine rotor shaft rotatably disposed between said circular portions and having turbine rotor disks connected thereto,

rotor vanes connected between said rotor disks on said rotor shaft and curved oppositely to the angle of said stator plates,

a gear support plate secured to the front of said turbine between the turbine and said rear member of said evaporator section,

a speed reduction gear train having shafts supported on the front of said turbine and said gear support plate with a driving gear connected to said rotor shaft and a driven gear having an axially disengageable driving connection to said evaporator shaft, and

means on the edge of said front member attachable to the wall of a conduit around an opening in the wall through which said turbine and said evaporator section may be passed.

4. A humidifier for a forced air duct comprising:

an evaporator disk section having front and rear end members,

elongated upper connecting bars connected at their ends

to said end members near the upper corners thereof and disposed in laterally inwardly and downwardly air deflecting position,

elongated tank support members having their ends connected to lower portions of end members in laterally spaced relation,

a tank supported on said tank support bars,

side air deflector bars connecting the mid-sections of said end members and disposed in upwardly spaced relation to the upper edges of said tank in upwardly and laterally inwardly air deflecting relation thereto,

a valve support projecting longitudinally from said front member,

a water supply conduit connected to said bracket flange and having an inwardly directed orifice,

a float valve assembly pivotally supported on said conduit and having a valve closure member coacting with the orifice in said conduit and a float disposed in said tank,

cover secured to the outer side of said front end member and closing an opening in said front end,

an evaporator disk shaft supported longitudinally along the top of said tank,

a plurality of disks having capillary water retaining openings supported on said disk shaft in spaced relation therealong,

an air turbine having a rotor and inwardly converging front and rear ends with circular center portions,

the front of said rotor being connected to the rear end member of said disk section,

stator vanes extending between said front and rear ends and disposed around and in angular relation to radii of said circular portions,

a turbine rotor shaft rotatably disposed between said circular portions,

rotor vanes on said rotor shaft,

a speed reduction gear train having shafts supported on the front of said turbine and said gear support plate with a driving gear connected to said rotor shaft and a driven gear having an axially disengageable driving connection to said evaporator shaft, and

means on the edge of said front member attachable to the wall of a conduit around an opening in the wall through which said turbine and said evaporator section may be passed.

5. A humidifier for a forced air duct comprising:

an evaporator disk section having front and rear end members,

elongated connecting bars connected at their ends to said end members and disposed to deflect air laterally inwardly toward the longitudinal center of the disk section,

an elongated tank supported within said section with its top below the inwardly directed air flow from said bars,

a valve support on said front member,

a water supply conduit connected to said support,

a float valve assembly secured to said support and having a valve coacting with said conduit and a float positioned in said tank,

an evaporator shaft supported in longitudinally extending relation over said tank,

a plurality of evaporator elements having capillary water retaining openings and connected to said evaporator shaft in spaced relation for rotation with the shaft with the lower portions of the elements extending into said tank,

an air turbine connected to said rear member and having a plurality of stator vanes disposed to receive and direct air from a plurality of directions 360° around said turbine to angularly radially inwardly of the turbine,

a rotor having a turbine shaft rotatably supported centrally of said turbine and having rotor vanes connected thereto,

a speed reduction gear train with a driving gear connected to said rotor shaft and a driven gear having a releasable driving connection to said evaporator shaft, and

said front member attachable to the wall of a conduit around an opening in the wall through which said turbine and said evaporator section may be passed.

6. A humidifier for a forced air duct comprising:

an evaporator disk section having front and rear end members,

elongated connecting bars connected at their ends to said end members,

an elongated tank supported within said section with its top below the inwardly directed air flow from said bars,

a valve support on said front member,

a water supply conduit connected to said support,

a float valve assembly secured to said support and having a valve coacting with said conduit and a float positioned in said tank,

an evaporator shaft supported in longitudinally extending relation over said tank,

a plurality of evaporator elements connected to said disk shaft in spaced relation for rotation with the shaft with the lower portions of the elements extending into said tank,

an air turbine connected to said rear member and having a plurality of stator vanes disposed to receive and direct air from a plurality of directions around said turbine to angularly radially inwardly of the turbine,

a rotor having a turbine shaft rotatably supported centrally of said turbine and having rotor vanes connected thereto, and

a speed reduction gear train with a driving gear connected to said rotor shaft and a driven gear having a driving connection to said evaportaor shaft.

7. A humidifier for a forced air duct comprising:

an evaporator disk section having front and rear end members,

elongated connecting bars connected at their ends to said end members,

an elongated tank supported within said section with its top below the inwardly directed air flow from said bars,

a valve support on said front member,

a water supply conduit connected to said support,

a float valve assembly secured to said support and having a valve coacting with said conduit and a float positioned in said tank,

an evaporator shaft supported in longitudinally extending relation over said tank,

a plurality of evaporator elements having capillary water retaining openings and connected to said disk in spaced relation for rotation with the shaft with the lower portions of the elements extending into said tank,

an air turbine connected to said rear member and having a plurality of stator vanes disposed to receive and direct air from a plurality of directions 360° around said turbine to angularly radially inwardly of the turbine,

a rotor having a shaft rotatably supported centrally of said turbine and having rotor vanes connected thereto, and

a speed reduction gear train with a driving gear connected to said rotor shaft and a driven gear having a releasable driving connection to said evaporator shaft.

References Cited by the Examiner

UNITED STATES PATENTS

886,548	5/1908	Snee	253—134
1,036,128	8/1912	Mahoney	253—134
1,587,277	6/1926	Bolling	261—92
2,687,183	8/1954	Bennett	261—35 X
3,212,492	10/1965	Himmerich et al.	261—35 X

HARRY B. THORNTON, *Primary Examiner.*

T. R. MILES, *Assistant Examiner.*