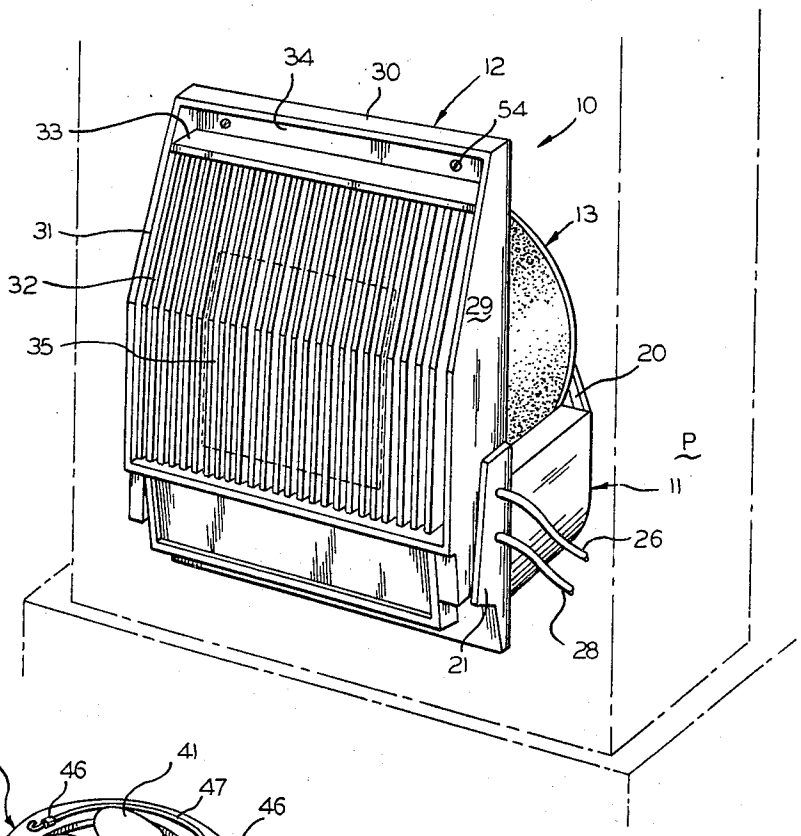
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FORCED AIR FURNACE HUMIDIFIER

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FIG.1



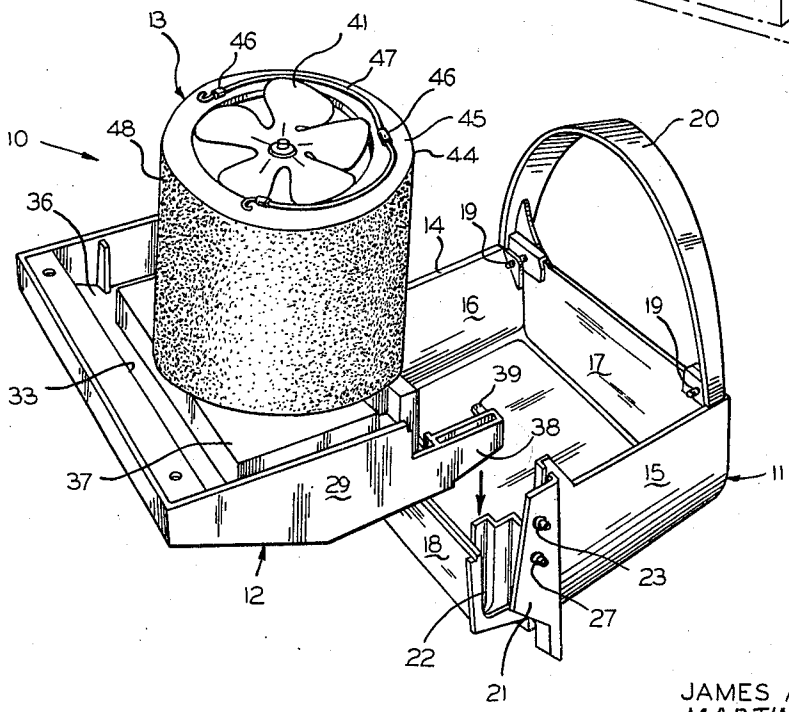




FIG.2

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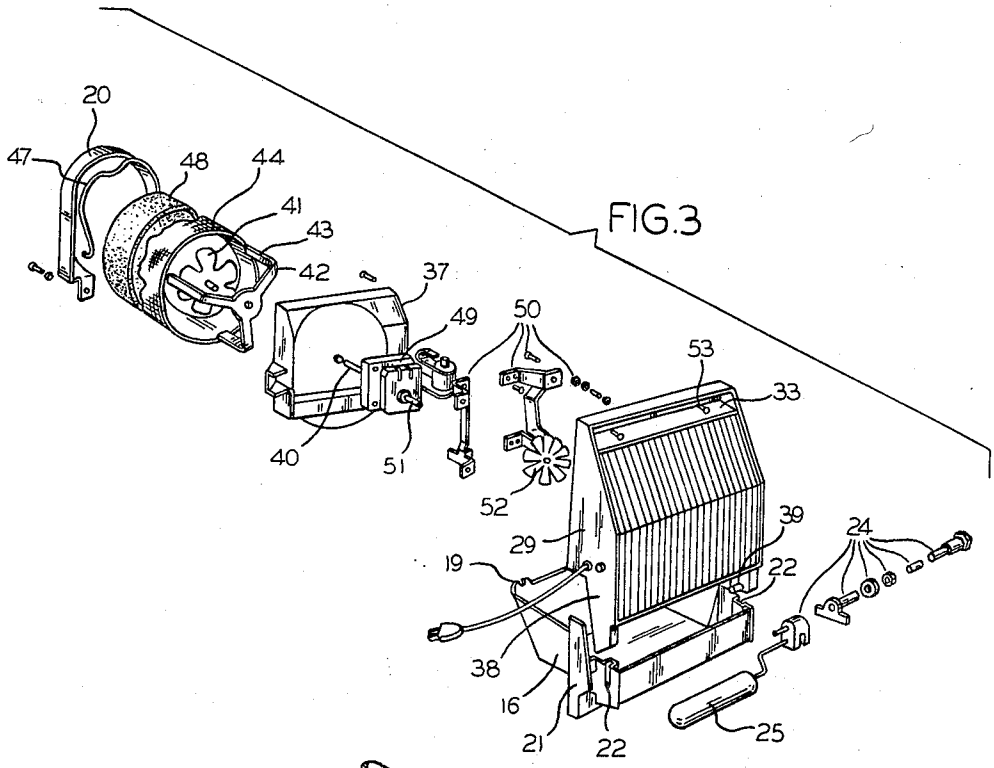



FIG.3

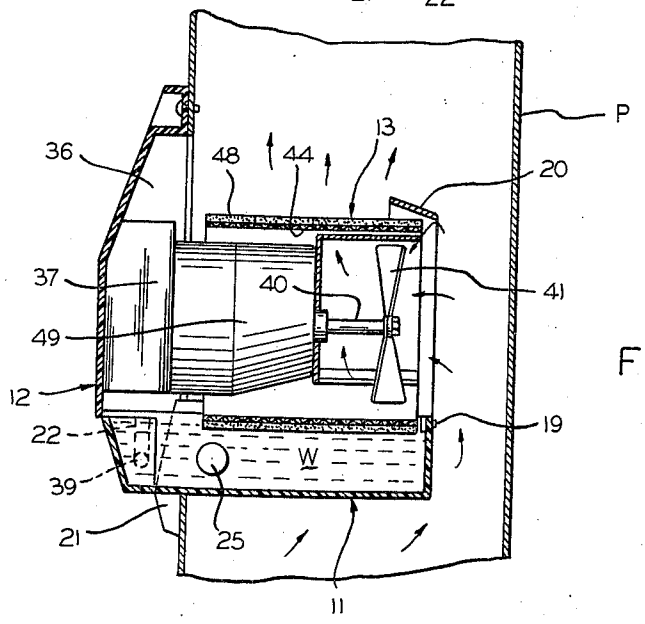



FIG. 4

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3,491,746

# FORCED AIR FURNACE HUMIDIFIER

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Int. Cl. F24f 3/14
U.S. Cl. 126—113 10 Claims

## ABSTRACT OF THE DISCLOSURE

A self-contained humidifier unit for installation in the plenum chamber of forced or hot air furnaces has a water pan with an automatic float-controlled valve, and an air deflector mounted on the inner end of said pan. A cover with a fan motor and evaporator assembly mounted thereon is pivotally and removably mounted on the outer end of the pan. Said evaporator assembly is normally positioned in said pan but tilts up and out with the cover as the cover is pivoted about its lower horizontal axis.

## BACKGROUND OF THE INVENTION

This invention relates to humidifiers and more particularly to a humidifier for use with forced or warm air furnaces. Specifically, the invention pertains to a humidifier which may be mounted in the plenum chamber of a furnace and is so designed and constructed that ready access is afforded to the essential parts thereof for cleaning and servicing purposes.

Heretofore, plenum mounted powered furnace humidifiers usually comprised a water pan positioned inside the plenum chamber with a humidifier drum which was rotatble so that at least a portion thereof passed through the water in the pan to replenish the supply of moisture on the drum. The evaporative area of the drum was exposed to the hot dry air stream in the plenum chamber so that the moisture from the drum was conveyed or imparted to the air stream for subsequent distribution to the room atmosphere of the building. A fan or similar air moving device was used to direct the air from the plenum chamber through the saturated evaporator.

Depending upon the mineral content of the water in the particular locality and other conditions, it was necessary to periodically clean out the water pan, evaporator drum and other parts of the humidifier. Likewise occasional servicing of the various elements and parts of the humidifier was required.

To gain access to the humidifier for the above-mentioned purposes, it was heretofore necessary to either disassemble at least a part of the humidifier or remove a portion thereof from its mounting in the chamber. This was objectionable since the ordinary home owner was either incapable of disassembling and reassembling the device or found the same inconvenient or too time consuming. Hence it was often necessary to employ the services of a professional service man to merely clean out the device.

The efficiency of the humidifier or the amount of moisture which is conveyed or imparted to the air depends or is directly affected by the total evaporative surface of the evaporator. Heretofore, the evaporative surface of the humidifiers were fixed so that once the unit was installed the evaporative surface could not be varied.

Another factor affecting the efficiency of the humidifier is the total amount or volume of air which is forced



through the evaporator assembly. Since the evaporator unit is usually positioned in the stream of air which passes through the plenum chamber, at least a portion of said air passes through the evaporator unit and is humidified. Additionally fans are usually employed to direct the hot dry air through the saturated evaporator. Heretofore, however, some of the air passing through the plenum chamber was not directed or channeled through the fan and therefore by-passed the humidifier with consequent lack of humidification.

## SUMMARY OF THE INVENTION

The humidifier unit of this invention affords a means for gaining ready access to all of the elements of the humidifier including the water pan, the evaporator drum assembly, the fan, fan motor and water control float valve. Access is afforded by mounting the evaporator unit fan, fan motor, etc., on the inside of the cover of the unit so that the same protrudes inwardly with the bottom portion thereof positioned in the water pan. The cover is pivotally mounted near the bottom thereof on a horizontal plane so that when the cover is pivoted to its open position the evaporator unit, etc. is tilted up and out of the pan to a readily accessible position. Means is provided so that the cover may be readily lifted out or disassembled from the water pan without necessitating the removal or loosening of any parts or the use of any tools. Further means is provided in the form of an air deflector to channel the hot plenum air to the fan. Additionally means is provided for boosting or increasing the evaporative area of the evaporator drum so as to increase the humidity output of the unit to accommodate varying atmospheric conditions or installations in larger homes where the amount of moisture or humidity required is greater than for smaller areas.

It is therefore a primary object of this invention to provide a humidifier which may be mounted in the plenum chamber of a forced air furnace and is so constructed and designed that access to the water pan and to all of the components and elements of the humidifier, including the evaporator assembly, is readily achieved by merely opening the cover.

An object relating to the foregoing is to construct and assemble the device with a cover which is pivotally mounted so that by merely opening or tilting the cover complete access to the interior is afforded.

Another important object is to mount all of the components including the evaporator assembly, the motor, the fan, etc., on the back of the cover so that when the cover is pivotally open all of said components tilt up and out of the pan to a position where they are readily accessible for cleaning and servicing.

A further object is to so construct and assemble the cover and the pan that if desired the cover may not only be readily tilted or opened but the entire cover with all of the assembled components thereon may be readily lifted out and separated from the pan without necessitating the disassembly or removal of any parts thereof.

It is therefore another important object of this invention to provide a humidifier in which the evaporative surface of the evaporator unit or assembly may be varied in accordance with the requirement of the installation. Thus a single unit may be used and adapted to installations of various sizes or capacities, such as a smaller or larger house or building. An object relating thereto is to provide removable means for the evaporator drum by means of which the total evaporative surface may be increased.

It is therefore still a further object of this invention to afford means in the humidifier for channeling the hot plenum air to the fan of the unit. An object relating thereto is to afford an air deflector so designed and positioned that a substantial portion of the hot plenum air is channeled to the fan.

With the foregoing and other objects in view which will appear as the description proceeds, the invention consists of certain novel features of construction, arrangement and a combination of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportion, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

For the purpose of facilitating an understanding of our invention, we have illustrated in the accompanying drawings a preferred embodiment thereof, from an inspection of which, when considered in connection with the following description, our invention, its mode of construction, assembly and operation, and many of its advantages should be readily understood and appreciated.

Referring to the drawings in which the same characters of reference are employed to indicate corresponding or similar parts throughout the several figures of the drawings:

FIG. 1 is a perspective view of the humidifier in operative position with the plenum chamber shown in dotted outline;

FIG. 2 is a perspective view showing the cover with the attached components and evaporator unit tilted out in open position and with the same removed from the water pan;

FIG. 3 is an exploded view in perspective showing the various elements and components of the humidifier; and

FIG. 4 is a longitudinal sectional view of the humidifier and the plenum chamber in which it is mounted.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the several figures of the drawings, reference numeral **10** indicates generally the humidifier unit comprising the subject matter of this invention mounted in the plenum chamber P of a forced or hot air furnace, as shown in FIGS. 1 and 4 of the drawings. The humidifier comprises two sub-assemblies; one a water pan assembly indicated generally by reference numeral **11** and a cover assembly indicated generally by reference numeral **12**. An evaporator assembly indicated generally by reference numeral **13** is mounted to the inside of the cover **12** so that when the cover is in the closed position the evaporator assembly **13** extends in a horizontal plane with a portion of the same immersed in the water W of the water pan **11** (see FIG. 4). When the cover **12** is in the open position the evaporator assembly is tilted out of the water pan and positioned in a substantially vertical plane, as shown in FIG. 2 of the drawings. The importance of the foregoing will become apparent as the description proceeds.

Water pan assembly **11** comprises a substantially rectangular open-top vessel or pan **14** having side walls **15** and **16**, an inner wall **17** and a front wall **18**. The inner wall **17** is formed with means **19** for removably securing thereto an air deflector **20** the purpose of which will become apparent as the description proceeds.

The side walls **15** and **16** are each formed with an offset flange member **21** (the purpose of which will be disclosed as the description proceeds) and an inset groove **22** the purpose of which will likewise be disclosed as the description proceeds.

Mounted through the offset flange **21** is a float valve stud **23** (FIG. 2), the inner end of which communicates with a valve assembly **24** which is controlled by a float **25**. To the outer end of the stud **23** may be affixed a length of tubing **26** which in turn may be attached to a water source such as a cold water pipe. Positioned just below the float valve stud **23** may be an overflow fitting **27** to which may be attached an overflow hose **28** the other end of which may be connected to any convenient drain.

The entire water pan **11** may be made from any suitable material, although the preferred embodiment here illustrated is molded from a high impact phenolic-type plastic. Similarly the air deflector **20** and the cover **12** which will now be described may likewise be molded from the same type of plastic.

The cover **12** is designed to fit over or cover the hole cut into the wall of the plenum chamber P and may be of any suitable design such as that shown in FIG. 4 of the drawings. In the embodiment chosen for illustration, the cover is formed with side walls **29** the upper portion of which is tapered as shown in FIGS. 1 and 2 of the drawings, a top wall **30** and a fluted or ribbed front wall **31**. The ribs **32** of the front wall extend vertically and are terminated by a horizontal strip **33** in spaced relationship with the top wall **30**. This affords a transversely extending recess **34** which affords a finger-gripping space for use in grasping the cover for purposes which will be disclosed as the description proceeds.

The spaces between the ribs **32** are closed except for the area **35** shown in FIG. 1 of the drawings. In this area the spaces between the ribs open into a rearwardly opening recess **36** in the back of the cover defined by the side walls **29** and the inner surface of the horizontal strip **33**. Within this rear recess **36** may be mounted a molded motor housing **37** which will be subsequently described in greater detail as the description proceeds.

The lower end of the side walls **29** are formed with downwardly extending leg portions **38**, to the inner surfaces of which are formed or molded cylindrical pivot trunnions **39**. These trunnions are adapted to be slidingly received within the grooves **22** formed in the side walls **15** of the water pan **11**. Thus it will be readily perceived that the cover **12** may be easily assembled in pivotal relationship with the pan **11** by merely locating the cover so that the trunnions **39** are aligned with the grooves **22** and then merely lowering the same until the trunnions abut the bottom of the grooves. Similarly the cover together with the evaporator assembly **13** mounted thereon may be readily disassembled and removed by merely lifting the cover until the trunnions **39** clear the top of the grooves **22**.

The evaporator assembly **13** will now be described with particular reference to FIGS. 2, 3 and 4 of the drawings. Protruding from the outer end of the motor casing **37** is a fan shaft **40** on the outer end of which is mounted a fan blade **41**. Likewise mounted on and secured to the shaft **40** is a bracket assembly **42** having arms **43** the function of which will be disclosed as the description proceeds.

A squirrel cage-type cylindrical evaporator screen **44** having an outer annular ferrule **45** is adapted to fit over bracket arms **43** as shown in FIGS. 3 and 4 of the drawings. The outer ends of the arms **43** may be formed with hook-like members **46** which extend through complementary openings formed in the ferrule **45**. A suitably shaped retaining spring **47** may then be inserted in the hooks **46** to retain the entire evaporator screen **44** in operative position as shown in FIG. 2 of the drawings.

The evaporator screen **44** is formed of expanded stainless steel mesh which as it rotates through the water of the pan picks up water which is retained in the spaces of the mesh so that it may be transferred to the hot dry air which is blown through it. However, when it is desired to increase the evaporative surface and thereby the amount of water which is picked up by the evaporator assembly for distribution to the hot air in the plenum

chamber, an evaporator booster comprising a sleeve **48** made of polyurethane foam plastic may be mounted over the evaporator screen **44** as shown in FIGS. 2, 3 and 4 of the drawings.

Within the motor housing **37** may be mounted a motor assembly **49** which comprises a fan motor for driving the fan blade **41** and a reduction motor for rotating the evaporator drum **44**. These are all assembled and secured by suitable brackets and fastening means **50**, as shown in FIG. 3 of the drawings. Protruding in a direction opposite to the fan shaft **40** is a small stub shaft **51** on the outer end of which may be mounted a small fan blade **52**. The latter fan may be used to draw air through the open spaces **35** of the front cover for cooling the motor itself.

To secure the humidifier assembly in the plenum chamber a pair of sheet metal screws such as **53** positioned through suitable threaded openings **54** may be employed.

Referring now to FIG. 4 of the drawings, the operation of the humidifier will be described. It will be noted that the evaporator assembly **13** is positioned so that a portion of the evaporator screen **44** and the booster sleeve **48** is positioned in the water W of the pan. The fan **41** draws air into the evaporator assembly as the hot dry air moves upwardly in the plenum chamber. The air deflector **20** channels the air to the fan. The air moves up and out through the sleeve picking up the moisture retained in the mesh of the screen and the spaces of the polyurethane foam booster sleeve **48**. The moisture in the sleeve and booster is constantly replenished as the sleeve is rotated through the water. The float control valve **24** controls and maintains the supply of water W in the pan.

When it becomes necessary or desirable to clean out the accumulation of mineral or other deposits in the water pan and/or to service the evaporator assembly **13**, the sheet metal screws **53** are loosened and the cover pivoted outwardly; if desired the entire cover is removed by merely lifting the same upwardly to the position shown in FIG. 2 of the drawings.

From the foregoing description, it should be apparent that a humidifier assembly has been provided which may be readily mounted in the plenum chamber of a hot or forced air furnace and which assures a constant adequate humidification of the air passing through the plenum chamber from the furnace to the atmosphere of the rooms of the building. Means is afforded for insuring maximum channeling of the air in the plenum chamber to the fan of the humidifier and the humidifier is so constructed and designed that access for cleaning and servicing purposes is readily afforded to all of the elements and components of the device, by merely pivoting open the cover. If desired the entire cover with the evaporator assembly mounted thereon may be disassembled by merely lifting the same out of the water pan and plenum chamber.

It is believed that our invention, its mode of construction and assembly, and many of its advantages should be readily understood from the foregoing without further description, and it should also be manifest that while a preferred embodiment of the invention has been shown and described for illustrative purposes, the structural details are nevertheless capable of wide variation within the purview of our invention as defined in the appended claims.

What we claim and desire to secure by Letters Patent of the United States is:

**1.** A humidifier unit comprising:
- a water pan,
- a front cover associated with said pan and movable to both upstanding and prone positions,
- an evaporator assembly on said cover, said assembly including a fan and a drum and means for rotating said fan and said drum,
- said drum being rotatable through the water in said pan with said fan operating to draw air across the rotating drum for humidification of said air when said cover is in its upstanding position, and
- means pivotally and removably mounting said cover on said water pan to accommodate pivotal movement of said cover from said upstanding position to said prone position and thereafter to accommodate ready removal of said cover from said pan by hand.

**2.** The humidifier unit of claim **1** in which said cover includes side and rear and front walls, said mounting means including a pair of grooves respectively formed in said side walls adjacent the front thereof and including a pair of trunnions on said cover,
- each of said grooves having an opening at the top thereof and having a bearing surface at the bottom thereof,
- said trunnions being respectively disposed in said grooves
- and selectively pivotally movable on said bearing surfaces or removable through the openings in the top of said grooves.

**3.** The humidifier unit of claim **2** in which said grooves face outwardly and said trunnions face inwardly.

**4.** The humidifier unit of claim **2** in which said grooves are elongated and are vertically disposed in said side walls.

**5.** The humidifier unit of claim **1** in which said drum includes a metal screen defining a cylindrical surface, and further comprising an evaporator booster sleeve encircling said drum and made of expanded polyurethane foam plastic so as to afford a substantially greater evaporator surface than the screen of the evaporator drum.

**6.** The humidifier unit of claim **1** in which said evaporator assembly further includes a motor housing mounted on said cover, said rotating means including an electric motor positioned in said motor housing, said fan including a shaft prortuding from said motor housing, said drum being cylindrically shaped and supported by said shaft and encircling said fan and at least a portion of said motor housing, and means for removably securing said drum in an operative position.

**7.** The combination for use with a forced air furnace, comprising:
- a plenum having an opening therein and mounted on the associated furnace to receive air therefrom,
- a humidifier comprising a water pan mounted in the opening of said plenum, an evaporator assembly including a fan and a drum and means for rotating said fan and said drum,
- said drum being mounted in use to receive water from said water pan,
- said fan operating to draw air from said plenum across said drum for humidification of the air,
- and a cover pivotally and removably mounted on said water pan to accommodate pivotal movement of said cover from said open position to said closed position with respect to said plenum opening and thereafter to accommodate ready removal of said cover by hand.

**8.** The humidifier of claim **7** in which an air deflector strip is positioned in juxtaposed relationship with said evaporator assembly to channel air from the plenum thereto, and further comprising means formed on the rear wall of said pan for removably securing the ends of said deflector strip thereto.

**9.** The humidifier of claim **7** in which said cover is pivotally and removably mounted adjacent to the bottom thereof, and further comprising means removably connecting the top of said cover to said plenum to prevent movement of said cover.

**10.** A humidifier unit comprising:
- a water pan,
- a front cover movably mounted on said pan and movable to both upstanding and prone positions,
- a motor housing mounted on said cover,

an electric motor positioned in said motor having,

a fan including a shaft protruding from said motor housing,

a cylindrical evaporator drum supported by said shaft and encircling said fan and at least a portion of said motor housing, and

means for removably securing said drum in an operational position, said drum being rotatable through the water in said pan with said fan operating to draw air across said rotating drum for humidification of the air when said cover is in its upstanding position.



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EDWARD G. FAVORS, Primary Examiner

U.S. Cl. X.R.

261—92