

Oct. 24, 1967

N. LAING

3,348,828

AIR HUMIDIFIER DEVICES

Filed Jan. 3, 1966

8 Sheets-Sheet 1

Fig. 1.

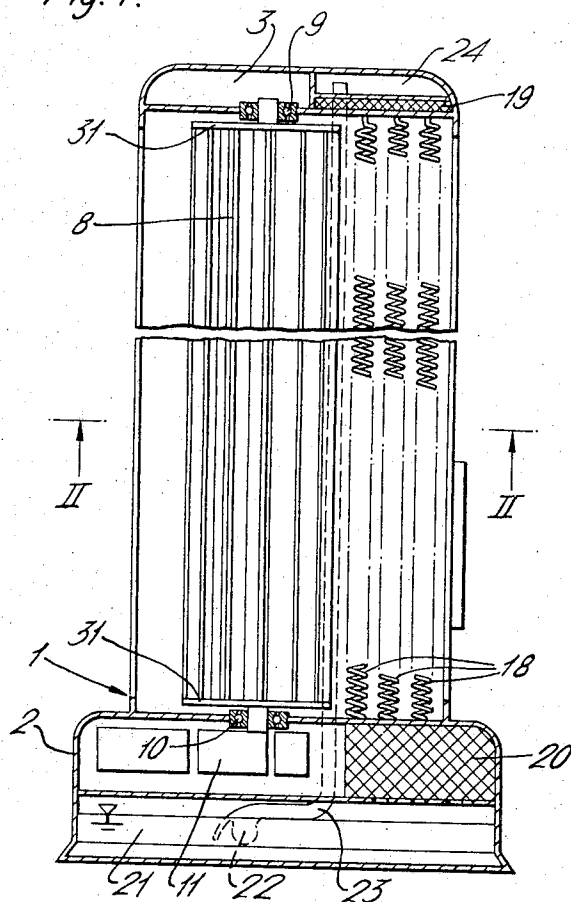
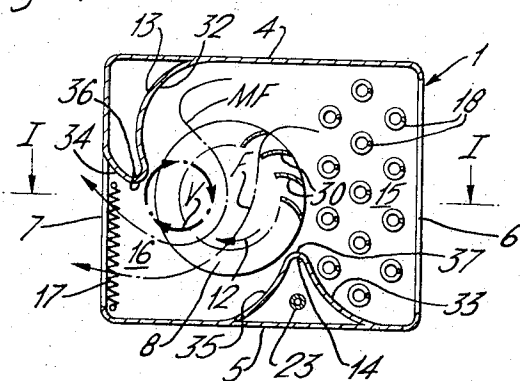


Fig. 2.



INVENTOR
Nikolaus Laing
BY *James E. ...*
Charles W. ...
& Associates
ATTORNEYS

Oct. 24, 1967

N. LAING

3,348,828

AIR HUMIDIFIER DEVICES

Filed Jan. 3, 1966

8 Sheets-Sheet 2

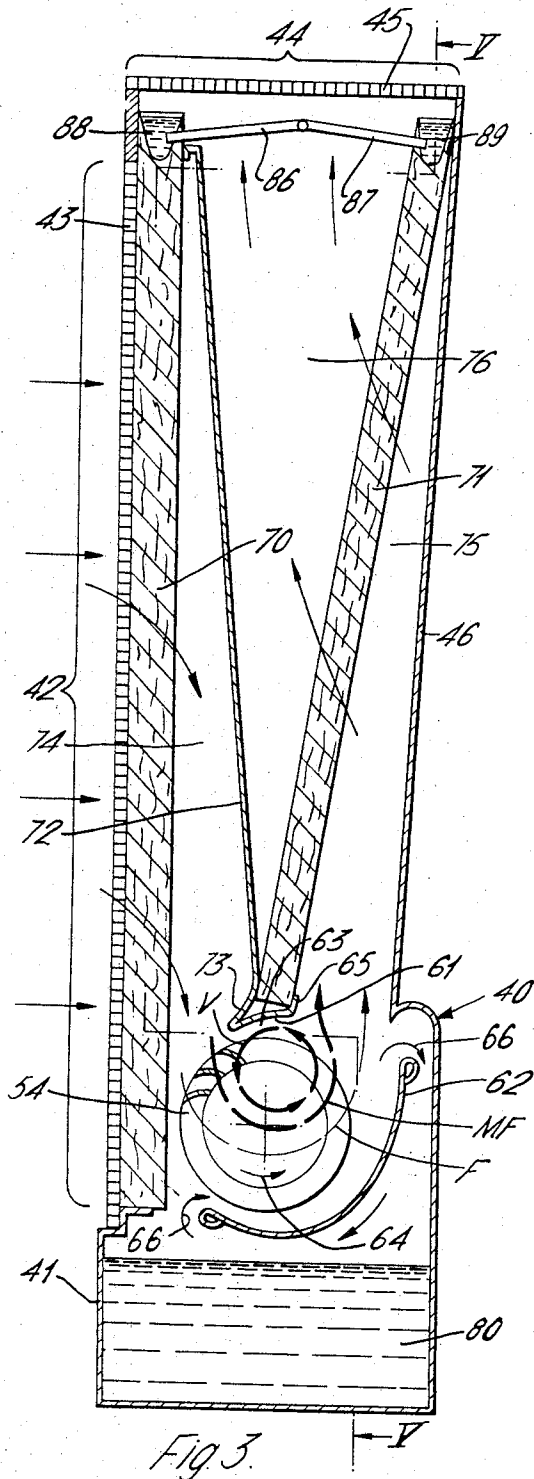


Fig. 3.

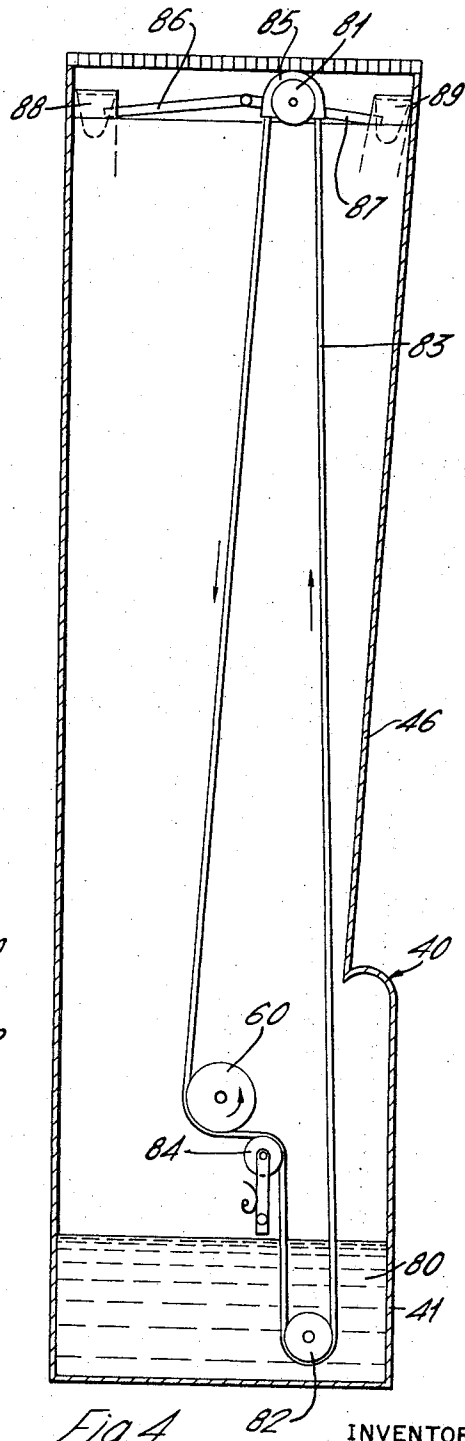


Fig. 4.

INVENTOR
Nikolaus Laing
BY *James E. ...*
Charles H. ...
Salmon
ATTORNEYS

Oct. 24, 1967

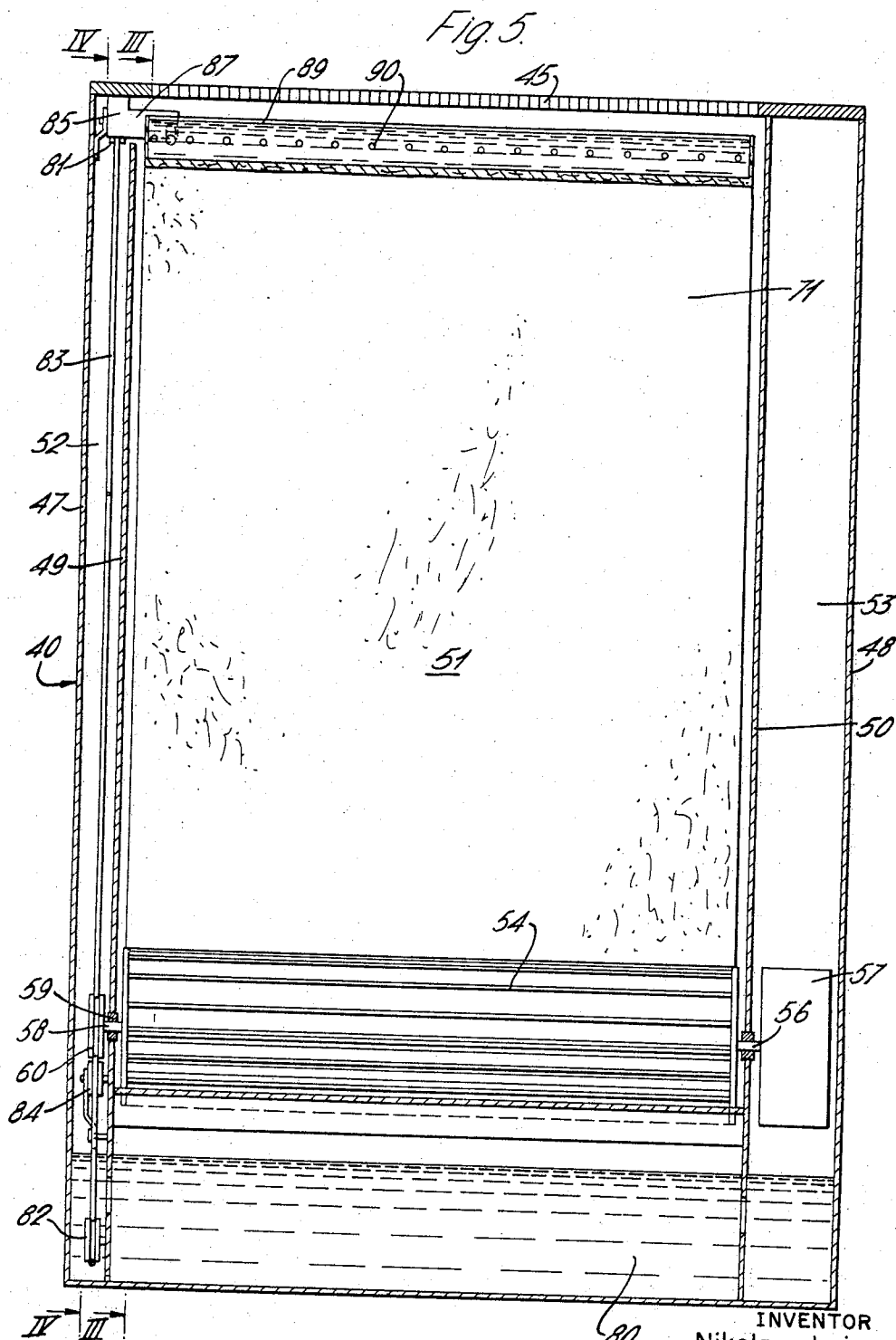
N. LAING

3,348,828

AIR HUMIDIFIER DEVICES

Filed Jan. 3, 1966

8 Sheets-Sheet 3



INVENTOR
Nikolaus Laing
BY *Bennie*
Elmwood, Morton, Taylor
X Adams ATTORNEYS

Oct. 24, 1967

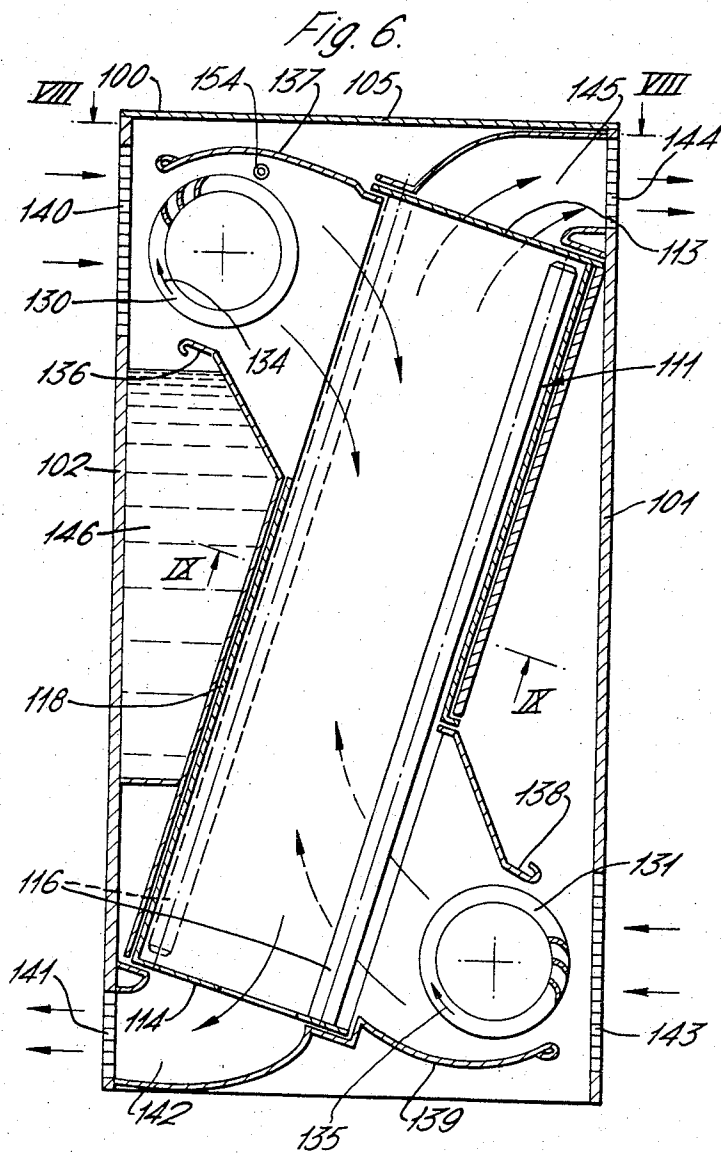
N. LAING

3,348,828

AIR HUMIDIFIER DEVICES

Filed Jan. 3, 1966

8 Sheets-Sheet 4



INVENTOR
Nikolaus Laing
BY *Dennis E. ...*
Morton, Taylor & Adams
ATTORNEYS

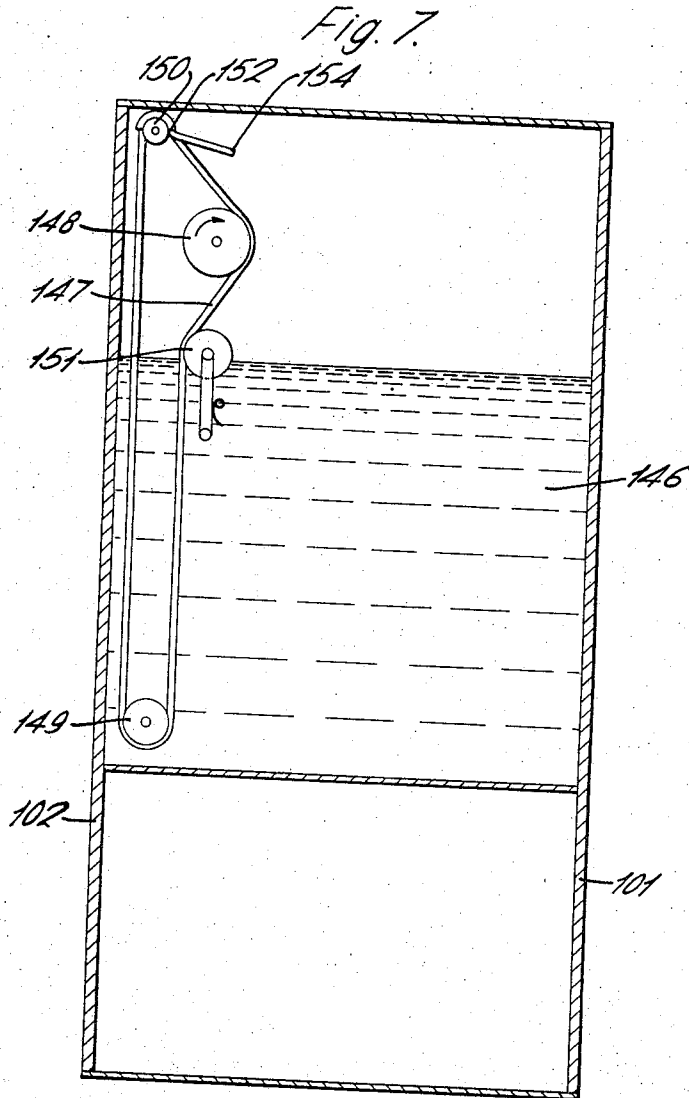
Oct. 24, 1967

N. LAING
AIR HUMIDIFIER DEVICES

3,348,828

Filed Jan. 3, 1966

8 Sheets-Sheet 5



INVENTOR
Nikolaus Laing
BY *Benjamin, Morton, Taylor*
Elmendorf & Adams
ATTORNEYS

Oct. 24, 1967

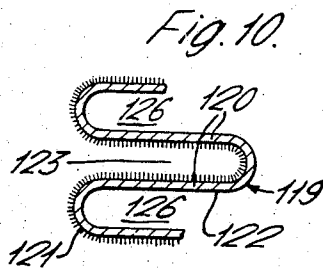
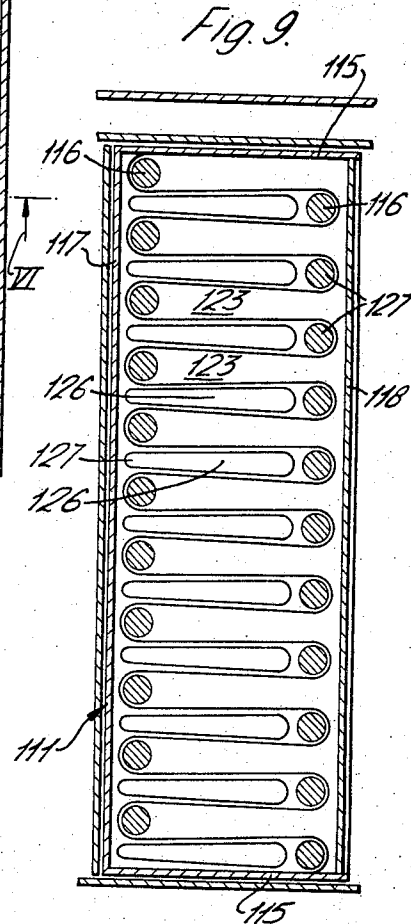
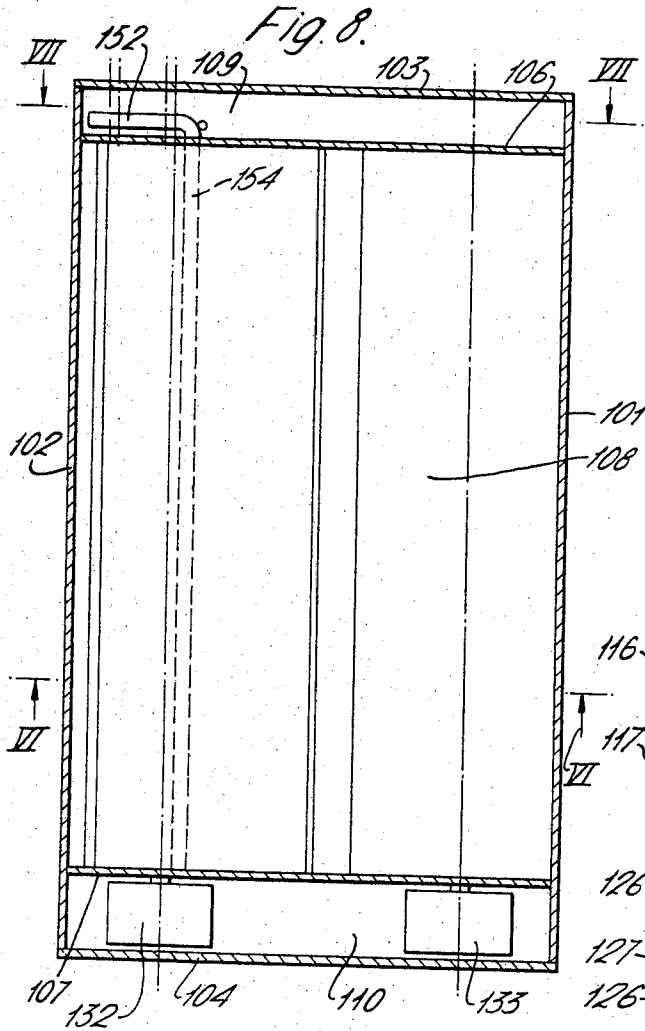
N. LAING

3,348,828

AIR HUMIDIFIER DEVICES

Filed Jan. 3, 1966

8 Sheets-Sheet 6



INVENTOR
Nikolaus Laing
BY *James E. Edwards*
Morton, Taylor & Adams
ATTORNEYS

Oct. 24, 1967

N. LAING

3,348,828

AIR HUMIDIFIER DEVICES

Filed Jan. 3, 1966

8 Sheets-Sheet 8

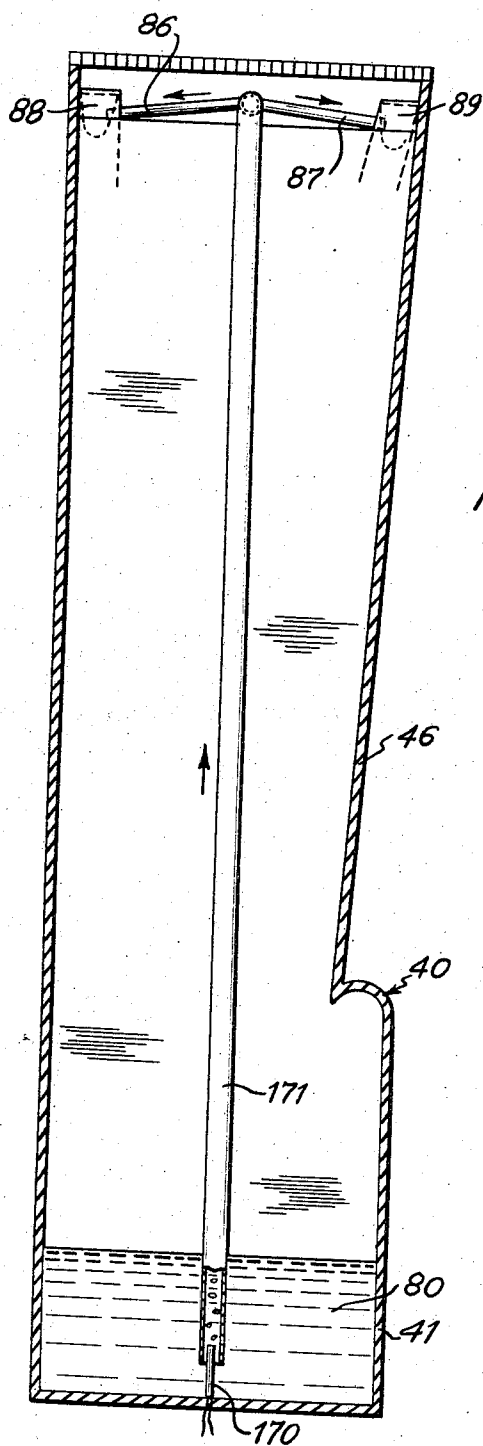


Fig. 12

INVENTOR.

Nikolaus Laing

BY

*Deane, Edmunds,
Morton, Taylor & Adams*

ATTORNEYS

1

3,348,828

AIR HUMIDIFIER DEVICES

Nikolaus Laing, 35 Hofener Weg, 7141 Aldingen,
near Stuttgart, Germany

Filed Jan. 3, 1966, Ser. No. 518,340

Claims priority, application Austria, Aug. 6, 1965,
A 7,305/65

16 Claims. (Cl. 261-142)

ABSTRACT OF THE DISCLOSURE

Air humidifying device having an air inlet and air outlet with a cross flow type blower for moving air through the device and having a pump for moving water from a liquid reservoir into the path of the air flow through the device.

This invention relates to means for humidifying the air by evaporation of water and this application is a continuation-in-part of my prior application Ser. No. 221,621 filed Sept. 5, 1962, now Patent No. 3,232,522, which is itself a continuation-in-part of application 671,114, filed July 5, 1957, the latter application being now abandoned.

The invention has for its main object to provide a compact, simple and efficient form of air humidifying apparatus.

The invention makes use of a cross flow fan, herein defined as one comprising a cylindrical bladed rotor mounted for rotation about its axis in a predetermined direction and defining an interior space, and guide means defining with the rotor an entry region and a discharge region, the guide means and rotor co-operating on rotation of the latter in said predetermined direction to induce a flow of air from the entry region through the path of the rotating blades of the rotor to said interior space and thence again through the path of said rotating blades to the discharge region. Preferably according to the invention the guide means and rotor co-operate to set up a vortex of Rankine character having a core region eccentric of the rotor axis and a field region which guides the fluid so that flow through the rotor is strongly curved about the vortex core.

The apparatus according to the invention comprises, in its broad aspect, a cross flow fan mounted within a housing and producing in operation a flow of air between an inlet and an outlet, and humidifying means extending over the length of the rotor and parallel to the axis thereof, said humidifying means including elements to carry water into the path of said flow and means to supply water to said elements. This combination can be designed to combine a large effective area of water-carrying elements with a substantially even flow of air past or across this area, thus simultaneously obtaining both a compact construction with operating efficiency. The water carrying elements can most effectively, compactly and cheaply be provided over a rectangular area. The main types of prior art fan are axial and centrifugal. The axial fan produces a flow which has essentially an annular cross section, and is not therefore adapted to produce an even flow of air over a rectangle. The centrifugal fan is limited in that the rotor cannot usefully have a length exceeding 0.6 or 1.2 multiplied by its diameter, depending on whether air enters from one or both ends of the rotor. Thus the area over which an even flow can be produced is restricted; moreover the fan is bulky in relation to its throughput. It will be appreciated therefore that the invention provides a combination capable of advantages which could not be achieved with these prior art fans.

The water conducting elements may comprise a plu-

2

ality of vertically suspended wire coils; in this case the rotor is preferably also vertical, and can be of a considerable length. The humidifying means can alternatively be provided by fibrous material, wool fibres for example, either in the form of a readily air-permeable large-area filter or in a form such that the air flows over one side of the area. The water conducting elements can, if fibrous, take up water by capillary action but in all cases it is preferred to have a water tank in said housing and a pump to circulate water from said tank in a closed circuit including said water-carrying elements. The pump may comprise an endless fibrous cord dipping into the tank and mounted on pulley wheels driven by said motor and including an upper wheel above said tank, and means associated with the upper pulley wheel to collect water raised from the tank by the cord and thrown off the cord as the latter passes over the pulley.

The humidified air flow will be cooled by evaporation, and may be used without further treatment. The air flow may however be heated if desired. If it is desired to have an air flow which is cooled but not humidified, the humidifying means may take the form of a large-area member having water-conducting fibres on one side but being impervious at the other side, and means may be provided to set up a second flow of air against said other side of the humidifying member. The humidifying member is cooled by evaporation due to the first flow of air over it, and cools the second air flow without imparting moisture to it.

Important subsidiary features of the invention relates to the arrangement of the fan and large-area humidifying means within a housing of relatively thin slab-like form.

Further features and advantages of the invention will become apparent from the following description of various embodiments thereof given by way of example with reference to the accompanying drawings, in which:

FIGURE 1 is a vertical sectional view of a first form of air humidifier having a cross flow fan with a vertical rotor;

FIGURE 2 is a horizontal section of the air humidifier of FIGURE 1, taken on the line II-II of that figure and showing at I-I the section line of FIGURE 1;

FIGURES 3 and 4 are vertical sectional views of the second form of air humidifier having a cross flow fan with a horizontal rotor, the sections being taken transverse to the rotor axis;

FIGURE 5 is a vertical sectional view of the apparatus of FIGURES 3 and 4 taken longitudinally of the rotor on the line V-V of FIGURE 3, FIGURE 5 showing also at III-III and IV-IV the section lines for FIGURES 3 and 4;

FIGURES 6 and 7 are vertical sectional views of a third form of apparatus wherein a first air flow effects cooling of a humidifying member by evaporation and a second air flow is cooled by said member without picking up moisture therefrom both flows being produced by cross flow fans having parallel rotors, the sections being taken transverse to the axes of the fan rotors;

FIGURE 8 is a sectional plan view of the apparatus of FIGURES 6 and 7, taken on the line VIII-VIII in FIGURE 6 and showing at VI-VI and VII-VII the section lines of FIGURES 6 and 7;

FIGURE 9 is a sectional view of a humidifying member in the apparatus of FIGURES 6 to 8;

FIGURE 10 is an enlarged section of a portion of the humidifying member;

FIGURE 11 is a diagrammatic perspective view of the humidifying member; and

FIGURE 12 is a vertical sectional view of a form of air humidifier similar to that shown in FIGURE 4.

Referring to FIGURES 1 and 2 of the drawings, the air humidifier there shown comprises a housing designated generally 1 and having a base 2, a top 3 and spaced side walls 4, 5 extending vertically between the base and the top and defining an inlet 6 and an outlet 7. A long bladed cylindrical rotor 8 is mounted for rotation about a vertical axis by means of bearings 9, 10 in the top 3 and base 2 respectively. A motor 11 within the base directly drives the rotor so as to rotate it in the direction indicated by the arrow 12. The housing side walls 4, 5 carry guide walls 13, 14 extending inwardly towards the rotor 8 and co-operating therewith as will be described below. The side walls 4, 5 and guide walls 13, 14 define within the housing an entry region 15 and a discharge region 16. In the discharge region 16 there may be provided an electric heater element as shown diagrammatically at 17. Humidifying means are provided comprising a plurality of vertically suspended wire coils 18 extending between the top 3 of the housing and the base 2, and communicating with absorbent pads 19, 20 in top and base. A water tank 21 is provided within the base 2 and a pump 22 is located therein which causes a small flow of water up a pipe 23 to a header tank 24 in the top 3 of the housing which communicates with the pad 19 therein. The pump 22 may comprise a small electric heater (not shown) which produces water-entraining bubbles. In operation water flows in a closed circuit from the tank 21 in the base, up pipe 23 to the header tank 24; water flows thence to the pad 19 and down the wire coils 18 in the form of a film and is collected in the pad 20 from which it falls into the tank 21.

The rotor 8 comprises a series of similar forwardly curved longitudinally extending blades 30 arranged in a ring, supported on end closure discs 31; the blades define an interior space 32 clear of guides or obstructions. The guide walls 13, 14 have portions 32, 33 which guide flow in the entry region 15 to the rotor. The entry guide wall portions 32, 33 merge with discharge guide portions 34, 35 respectively at rounded noses 36, 37 which lie on opposite sides of the rotor 8 and are well spaced therefrom, preferably by at least half the radial depth of the blades. The discharge guide portion 34 is turned sharply away from the rotor 8, while the portion 35 diverges gradually therefrom to merge with the inner surface of the housing wall 5.

On rotation of the rotor 8 a vortex having a core region designated by the line V and approximating a Rankine vortex is formed wherein the core is positioned eccentrically with respect to the rotor axis and interpenetrating the path of the rotating blades of the rotor. The whole throughput of the machine will then flow twice through the blade envelope in a direction perpendicular to the rotor axis indicated by the flow lines F, MF.

Dust will be filtered from the air entering the rotor past the coils 18 while at the same time the air passing through the heater is moistened to raise the humidity and cooled by evaporation. The heater element 17 may be used to heat air leaving the rotor.

The device illustrated in FIGURES 1 and 2, considered as a heater, has an advantage over conventional heaters in that only filtered air passes over the heated coils. These coils may therefore be heated as much as desired without danger of combustion of dust particles adhering to the coils. The heater may be used either as a jet type heater or as a convector type heater.

Referring now to FIGURES 3 to 5, the apparatus there shown comprises a housing 40 of thin slab-like form having a base 41, an air inlet 42 over the greater part of the front side and defined by a grille 43, an air outlet 44 at the top defined by a grille 45, and rear and end walls 46, 47, 48. Transverse vertical partition walls 49, 50 define within the housing a central main compartment 51, aligned with the inlet 42 and outlet 44 and narrow pump and motor compartments 52, 53 at either end. A bladed cylindrical rotor 54 extends longitudinally through

the main compartment 51 just above the base and is mounted for rotation about a horizontal axis by having one end mounted on the shaft 56 of a motor 57 in the motor compartment 53 and the other carried on a stub shaft 58 extending through a bearing 59 in the partition wall 49 and mounting a pulley wheel 60 within the pump compartment 52.

Guide means co-operating with the rotor 54 comprise a first and second wall 61, 62 extending lengthwise of the rotor. The guide wall 61 is disposed above the rotor, subtends at the axis thereof an arc of less than 30° and defines with the outer envelope of the rotor blades a gap 63 which, in the present instance converges with the rotor in the direction of rotation indicated by the arrow 64; remote from the rotor the wall 61 terminates in an upturned lip 65. The wall 62 commences at a line of nearest approach to the rotor 54 about diametrically opposite the wall 61, and diverges steadily from the rotor going in the direction of rotation. The guide walls 61, 62 and rotor 54 co-operate in the general manner described with reference to FIGURE 2 to set up a vortex of Rankine type having a core region indicated at V which forms adjacent the guide wall 61, the vortex guiding flow through the rotor along lines indicated diagrammatically at MF, F, which are strongly curved about the vortex core. Wall 62 terminates short of the rear housing wall 46, to allow for a small amount of recirculating flow around the lower side of this wall as shown by the arrows 66; this assists in the generation of the required small static pressure.

Evaporative cooling elements 70, 71 of rectangular form are mounted one over the inlet 42 inside the grille 43 and the other extending slantwise from the wall 61 to adjacent the top of the rear housing wall 46. These elements 70, 71 have the form of large-area filters composed principally of absorbent material, such as wood fibres, and allowing free passage of air across their rectangular area. An interior wall 72 extends through the whole length of the main compartment 51 between the partition walls 49, 50 and slantwise from the top of the element 70 down to the guide wall 61, with which it forms a nose 73. The evaporative cooling elements 70, 71 define with the interior wall 72 and rear wall 46 respectively air circulation spaces 74, 75 which seen in transverse section (FIGURE 3) are of narrow triangular form, with the rotor 54 adjacent the lower edge of each element and opposite the apex of the triangle. The interior wall 72 and element 71 define an outlet space 76 of inverted-triangular form as seen in transverse section, with the apex adjacent the wall 61 and the outlet 44 forming the base of the triangle. On rotation of the rotor 54 air flow takes place through the inlet 42 and evaporative cooling element 70 to the air circulation space 74, thence through the rotor in paths which are strongly curved about the vortex core region V adjacent the wall 61, into the air circulation space 75, through the evaporative cooling element 71 and thence through the outlet space 76 and upwardly through the outlet.

The base 41 of the housing 40 is formed as a water tank 80 extending into the pump chamber 52. Within this chamber 52 pulley wheels 81, 82 are mounted one at the top of the housing 40 and the other within the tank 80, both pulley wheels being in alignment with the pulley 60 driven by the motor 57 through the rotor 54 and shaft 58. A fibrous water-absorbent cord or string 83 is trained over these pulley wheels 81, 82 and 60 and driven by the latter as shown by the arrows so as to pick up water from the tank 80 and convey it upwards; a spring-urged jockey pulley 84 is provided to tension the cord. A splash guard 85 around the pulley 81 collects water thrown off by the string as it passes around the pulley 81, and ducts 86, 87 lead the water to distributing grooves 88, 89 at the top of the evaporative cooling elements 70, 71 and having small holes 90 at intervals along their length. The water is soaked up by the fibres of these elements and evaporated

therefrom by the air flow, any surplus falling back into the tank 80.

The arrangement described provides efficient humidification and consequent cooling of the air flow, since it utilizes large-area evaporative cooling elements through which the air flow is relatively uniform over their length. By reason of the arrangement of evaporative cooling elements and rotor to form narrow air circulation spaces, effective use is made of the space within the housing which accordingly can be narrow and compact. The apparatus is self-contained by reason of the water tank in the base of the housing and of the pump-induced circulation of water therefrom over the evaporative cooling elements. Among possible variations, the pump described could be replaced by a conventional gear pump or other type.

The apparatus of FIGURES 6 to 11 is intended for use when an air flow is to be cooled without humidification thereof at the same time. In this apparatus a first air flow, e.g. taken from outside a room to be cooled, is led over an evaporative cooling element to evaporate water from it and thereby cool it, while a second air flow, e.g. from the room to be cooled, is led past the element and thereby cooled, the arrangement keeping the two flows separate and preventing the second from taking up moisture.

The apparatus comprises a cubical housing designated generally 100 having front and rear walls 101, 102, end walls 103, 104 and a top wall 105. The housing 100 is subdivided by transverse vertical partition walls 106, 107 into a central main compartment 108 and narrow pump and motor compartments 109, 110 at either end. An evaporative cooling element of rectangular outline and designated generally 111 is arranged slantwise in the main housing compartment 108 from the bottom rear to the top front thereof. The element 111 comprises a frame 112 made up of top and bottom plates 113, 114 and end plates 115 and a series of rods 116 extending between the top and bottom plates in two parallel rows. An upper cover plate 117 extends over the top portion of the frame at the front, and a lower cover plate 118 extends over the bottom portion of the frame at the rear. A sheet-like member 119 is wound concertina-wise over the rods 116 to form a series of pleats 120, and extends over the whole area of the frame. This member 119 comprises (see especially FIGURE 10) an absorbent layer 121 on one side and an impervious non-absorbent layer 122 on the other. The layer 122 may be a plastics foil or a sheet of impregnated paper or fabric to which is secured a fibrous structure forming the layer 121. Alternating interspaces 123 between the pleats 120 have the absorbent layer 121 inward-facing. The first air flow passes into these interspaces 123 from the top rear of the element 111 and emerge through slots 124 in the bottom plate 114 thereof. Alternating interspaces 126 between the pleats 120 of the member 119 have the non-absorbent layer 122 facing inwards. The second air flow passes through these interspaces 126 from the bottom front of the element 111 and emerge through slots 127 in the top plate 113 thereof. The sheet-like member 119 lies snug against the plates 113, 114, 115 of the frame and against the cover plates 117, 118, so that the two air flows are kept separate, though flowing on opposite sides of the sheet like member 119 over substantially its total area.

Referring again to FIGURE 6, in the generally triangular spaces defined in the main housing compartment 108 by the evaporative cooling element 111 there are mounted cylindrical bladed rotors 130, 131 respectively which extend horizontally parallel and close to the adjacent longitudinal edge of the element, is directly driven by a separate motor 132, 133 in the motor compartment 110, the direction of rotation being shown respectively by the arrows 134, 135. Each rotor 130, 131 co-operates with guide walls 136, 137 and 138, 139: these walls are formed in the same general manner as the guide walls described with reference to FIGURE 3 and co-operate with the respective rotor in the manner described with

reference to FIGURES 1 and 2, flow being shown by the arrows. The first guide wall of each pair, 136, and 138, have extensions terminating adjacent the cover plates 118, 117 respectively of the evaporative cooling element 111, while the second guide wall of each pair 137, 139 terminates at the top and bottom plates 113, 114 respectively of the element.

An inlet 140 and an outlet 141 for the first flow are formed at top and bottom of the rear housing wall 102. The rotor 130 in operation receives air direct from the inlet; the first air flow then passes through the interspaces 123 and out through a short duct 142 to the outlet 141.

An air inlet 143 and an air outlet 144 for the second air flow are formed at the bottom and top of the front housing wall 101. The rotor 131 in operation receives air through the inlet 143 and passes it through the interspaces 126 and thence through a short duct 145 to the outlet 144.

The space below the rotor 130 is formed as a water tank 146 and as in the embodiment of the invention illustrated in FIGURES 3 to 5 a pump in the form of an endless absorbent cord or string 147 in the pump compartment 109 takes water from the tank and supplies it to the fibrous absorbent layer 121 of the evaporative cooling element 111. The rotor 130 drives a pulley wheel 148 which in turn drives the cord 147 around a lower pulley wheel 149 in the tank 146 and an upper pulley wheel 150 at the top of the housing, the cord being tensioned by means of a spring-urged jockey pulley 151. A splash guard 152 about the upper pulley wheel 150 takes water thrown off the cord 147 and leads it to an outlet pipe 154 extending along the rotor 130 and above it, whence it passes in the air stream on to the absorbent layer 121 of the evaporative cooling element 111.

It will be appreciated that the first air flow cools the sheet-like member 119 by evaporation of water from the absorbent layer 121 on one side thereof: the second air flow is cooled by flowing over the nonabsorbent layer at the other side of the member 119 but does not pick up water from it.

The evaporative cooling element 111 is made to be easily dismantled, for changing the member 119. The upper plate 113 is slidable within grooves 160 in the side plates 115 of the frame 112, and can be locked in position by the pin 161. Plate 113 is fitted into the grooves 160 by spreading the side plates 115 apart, inserting the plate 113 and then moving the side plates 115 towards each other such that the grooves 160 engage with the ends of plate 113. One row of rods 116 is secured to the top plate 113 and the other to the bottom plate 114.

An alternative pumping means is illustrated in FIGURE 12 for pumping water from the tank 80 up to the ducts 86 in a humidifying device similar to that shown in FIGURE 4. The pump means comprises an electric heating element 170 which extends into the bottom of a tube 171 which in turn connects the interior of the tank 80 with the ducts 86. As the water within the tube is heated, bubbles will form in the tube which will flow upward and carry water from the tank to the ducts 86.

I claim:

1. An air humidifier comprising a housing having an inlet and an outlet, a bladed cylindrical rotor mounted for rotation in said housing, a motor for rotating said rotor in a predetermined direction, guide means co-operating with the rotor whereby on rotation of the rotor to set up a flow of air in a direction perpendicular to the axis of the rotor from the inlet through the path of the rotating blades to the interior of the rotor and thence again through the path of the rotating blades to the outlet, and humidifying means extending over the length of the rotor and parallel to the axis thereof, said humidifying means including elements to carrying water into the path of said flow and means to supply water to said elements.

2. An air humidifier as claimed in claim 1, wherein the water supply means comprises a water tank in said

housing and a pump to circulate water from said tank in a closed circuit including said water-carrying elements.

3. An air humidifier as claimed in claim 2, wherein the pump comprises a heater in the tank to produce water-entraining bubbles.

4. An air humidifier as claimed in claim 2, wherein the pump comprises an endless fibrous cord dipping into the tank and mounted on pulley wheels driven by said motor and including an upper wheel above said tank, and means associated with the upper pulley wheel to collect water raised from the tank by the cord and thrown off the cord as the latter passes over the pulley.

5. An air humidifier as claimed in claim 2, wherein said rotor axis is vertical and said water-carrying elements comprise a plurality of vertically suspended wire coils.

6. An air humidifier as claimed in claim 1, wherein said humidifying means is on the inlet side of the rotor and a heating element is located at the outlet side thereof.

7. An air humidifier as claimed in claim 1, wherein the humidifying means comprises a large-area fibrous filter member of rectangular outline which is readily permeable to air flow through said rectangle, the fibres of said filter member providing said water-conductive elements.

8. An air humidifier as claimed in claim 7, wherein the rotor is located close to one edge of said rectangle, said housing defining a circulation space of narrow triangular cross section wherein the rotor is opposite the apex of the triangle.

9. An air humidifier as claimed in claim 7, wherein the humidifying means comprises a water tank in said housing and a pump to supply water from the tank to the filter, the pump leading water to a location upstream of the filter for transport onto the filter in the air flow.

10. An air humidifier as claimed in claim 7, wherein the humidifying means comprises a large-area member of rectangular outline having at one side fibres providing said water-conductive elements and being substantially impervious to air through said rectangle, and means to set up a second flow of air against the other side of the humidifying member so as to be cooled thereby due to evaporation of water into the first flow.

11. Air cooling apparatus comprising a housing having an inlet and an outlet, an air-permeable evaporative cooling member of rectangular area mounted within the housing and having water conducting fibres over said area, means to supply water to said fibres, wall means defining with said member a triangular section air circulation space of small apical angle, bladed cylindrical rotor means rotatably mounted in said circulation space opposite the apex thereof and adjacent and parallel to one edge of the rectangle with said edge and said rotor means being of substantially the same length, a motor to rotate the rotor means in predetermined direction and guide means co-operating with the rotor means whereby on rotation thereof to set up a flow of air from the inlet through the path of the rotating blades of the rotor means to the interior thereof and thence again through the path of the rotating blades to the outlet, said flow taking place traversing said circulation space and the evaporative cooling member whereby to evaporate water therefrom and thereby cool said air flow.

12. Apparatus as claimed in claim 11, comprising a second evaporative cooling member of rectangular area within said housing and having water conductive fibres over said area receiving water from said supply means, second wall means defining with said second cooling member a second air circulation space of small apical angle,

said first and said second air circulation spaces being side by side in said housing (as seen in vertical section perpendicular to the rotor means axis), the rotor means being horizontally mounted at the bottom of both spaces and opposite the apex of each and co-operating with the guide means to form a vortex of Rankine type having a core region eccentric of the rotor axis and above it, said air flow taking place from the inlet through one air circulation space and thence through the rotor means in a curved path around said vortex core region and through the second air circulation space to the outlet.

13. Apparatus as claimed in claim 12, wherein the inlet is at one side of the housing, the first evaporative cooling member extends thereover, the outlet is at the top of the casing and communicates with a triangular section outlet space which is defined by the wall means of the first air circulation space and the second evaporative cooling member and which has its apex downward.

14. Air cooling apparatus comprising a housing, a large-area evaporative cooling member in said housing having a rectangular outline and having at one side water conductive fibres and being substantially impervious to air flow at the other side, means to supply water to said fibres, two cylindrical bladed rotor means mounted for rotation within said housing and being parallel to and adjacent opposite long sides of said evaporative cooling member, motor means to rotate the rotor means in predetermined directions, guide means for each rotor means co-operating therewith on rotation thereof to induce an air flow from an entry side of the respective rotor means through the path of the rotating blades thereof to the interior thereof and thence again through the path of the rotating blades to a discharge side of the rotor, said air flows of the respective rotor means being separate and one passing over the fibres of the evaporative cooling member to evaporate water from and thereby cool said member and the other passing over the other side of the member so as to be cooled thereby without picking up any substantial amount of water therefrom.

15. Apparatus according to claim 14, wherein the evaporative cooling member comprises a sheet like element which has a fibrous surface on said one side and an impervious surface on said other side and which is supported concertina-wise on a series of spaced parallel rods to form a series of pleats, one of said flows passing longitudinally through the alternating interspaces formed by said pleats which have the fibrous surface facing inward the other flow passing longitudinally through the alternating interspaces formed by said pleats which have the impervious surface facing inward.

16. Apparatus according to claim 15, wherein the evaporative cooling member is mounted diagonally in the housing, the respective flows entering inlets at opposite sides of the housing and each flow leaving through an outlet on the same side as the respective inlet, the outlets communicating with opposite end edges of the evaporative cooling member.

References Cited

UNITED STATES PATENTS

1,920,952	8/1933	Anderson	230—125
2,014,773	9/1935	Matteson	261—29
2,778,203	1/1957	Griffith	261—30 XR
2,942,773	6/1960	Eck	230—125
3,035,760	5/1962	Simmons	230—125
3,126,428	3/1964	Ash	261—29 XR

HARRY B. THORNTON, *Primary Examiner.*

R. R. WEAVER, *Assistant Examiner.*

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,348,828

October 24, 1967

Nikolaus Laing

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the heading to the printed specification, line 7,
after "A 7,305/65" insert -- ; Germany, Dec. 31, 1956,
L 26,542 --.

Signed and sealed this 25th day of February 1969.

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

EDWARD J. BRENNER

Commissioner of Patents