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(54) **Method and system for maintenance of an air-condition unit**

(57) It is provided a system for cleaning a blower (11) and an air inlet filter (16) of an air condition unit (3) using condensed water. The system includes a reservoir (1) for condensed water, a first sub-system for facilitating flowing pressurized liquid in a duct (4) having spraying outlets (6), and a second sub-system for removal of sprayed liquid out of the air condition unit. The cleaning liquid includes condensed water and a cleaning additive. The air inlet filter may rotate on a pair of pulleys (17a, 17b), and the filter is exposed to the sprayed liquid by rotating a pulley while spraying. The system includes bar-

riers (8) disposable in a separating position between the cleaned parts and other objects. The system also includes a manipulating handle (45) or an electric motor (7), for placing the barrier. Electrical circuitry (47) may automatically initiate cleaning the parts on turning-of the air condition unit. The system include a chamber (10) for a cleaning additive and a mixing mechanism for mixing the cleaning additive with the condensed water. The sub-system for removal of sprayed liquid out of the air condition unit includes a drain tray (12), a used water chamber (2) and a drain pipe (48).

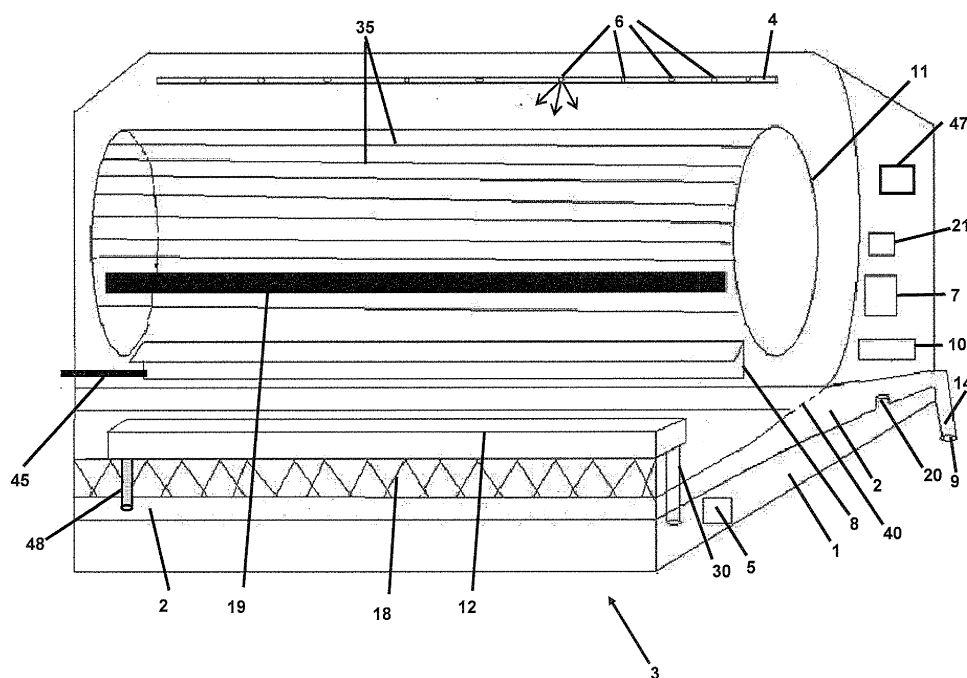


Fig. 1

Description

CROSS REFERENCE TO OTHER PATENT APPLICATIONS

[0001] The present application claims the priority of provisional US patent application number 61/091,739 titled "METHOD AND SYSTEM FOR MAINTENANCE OF AN AIR-CONDITION UNIT" by the present inventor, filed August 26, 2008.

BACKGROUND OF THE INVENTION

Field of the invention

[0002] The invention is in the field of air condition. In special the invention deals with the cleaning of a blower and an air inlet filter in a domestic air condition unit using condensed water.

Description of related art

[0003] The blower is a rotating fan having a plurality of small vans which produce directional airflow while being rotated. It pumps hot air from the room through an air inlet filter and a cooling radiator and directs the cooled air through an air outlet aperture into the room. As dust and dirt accumulate inside the blower, the blower works at lower efficiency, and thus should be cleaned from time to time. However, blower cleaning is a technical task done by a professional technician rather than by the air condition unit owner.

[0004] It would be advantageous to provide a system and a method for automatic blower cleaning, so that blower cleaning may be done automatically or with slight intervention of the owner as frequent as needed for continuous efficient operation, thus lengthening unit lifetime and saving expensive professional maintenance.

BRIEF SUMMARY OF THE INVENTION

[0005] It is provided according to certain implementations of the invention, a system for cleaning one or more parts of an air condition unit using water condensed by the air condition unit. The system includes a reservoir for condensed water, a first sub-system for facilitating flowing pressurized liquid in a duct having spraying outlets, and a second sub-system for removal of sprayed liquid out of the air condition unit. The liquid includes some collected condensed water. The cleaned parts are a blower, an air inlet filter, and/or a cooling radiator. The air inlet filter may rotate on a pair of pulleys, and the filter is exposed to the sprayed liquid by rotating a pulley while spraying.

[0006] In some embodiments, the system includes barriers disposable in a separating position between the cleaned parts and other objects. The system also includes a means for changing position of the barrier, ma-

nipulating handle or an electric motor, for example. Electrical circuitry may automatically initiate cleaning the parts on turning-of the air condition unit.

[0007] The system may include a chamber for a cleaning additive and a mixing mechanism for mixing the cleaning additive with some of the collected water. The sub-system for removal of sprayed liquid out of the air condition unit includes a drain tray, a used water chamber and a drain pipe. The system may include a connection to a local water system.

[0008] In some embodiments, the system includes a sub-system for collecting and importing water condensed by the air-condition unit operating in a warming mode, to enable air humidification and cleaning in winter time.

[0009] It is provided according to certain implementations of the invention, a method for cleaning parts of an air condition unit. The method includes facilitating collection of condensed water, and spraying liquid which includes some collected condensed water on the parts. The cleaning may be initiated automatically, triggered by turnings-of the air condition unit. Then, barriers may be placed between the cleaned parts and other objects by manipulating a handle or turning-on an electric motor.

[0010] In some embodiments, the method includes the step of mixing at least some of the collected water with a cleaning additive, and the step of removing the sprayed liquid out of the air condition unit. The sprayed liquid removal may include the actions of facilitating collection of the sprayed liquid and providing an outlet for draining the sprayed liquid out of the air condition unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The subject matter regarded as the invention is particularly pointed out and distinctly claimed in the concluding portion of the specification. The invention, however, both as to system organization and method of operation, together with features and advantages thereof, may best be understood by reference to the following detailed description when read with the accompanied drawings in which:

- Fig. 1 illustrates an air condition unit having a system for cleaning a blower using condensed water.
- Fig. 2 illustrates an air condition unit having a system for cleaning the blower and an air inlet filter.
- Fig. 3 is a flow chart of the condensed water in the air condition unit.
- Fig. 4 is an exploded view of a centrifugal blower with axial air inlets and a longitudinal air outlet, having barrier for insulation during cleaning.
- Fig. 5 shows a drain pipe with a nozzle for cleaning.
- Fig. 6 is a flow chart of a method for keeping parts of an air condition unit clean from dust.

DETAILED DESCRIPTION OF THE INVENTION

[0012] The present invention will now be described in

terms of specific example embodiments. It is to be understood that the invention is not limited to the example embodiments disclosed. It should also be understood that not every feature of the methods and systems handling the described system is necessary to implement the invention as claimed in any particular one of the appended claims. Various elements and features of device are described to fully enable the invention. It should also be understood that throughout this disclosure, where a method is shown or described, the steps of the method may be performed in any order or simultaneously, unless it is clear from the context that one step depends on another being performed first.

[0013] Before explaining several embodiments of the invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments or of being practiced or carried out in various ways. Also, it is to be understood that the phraseology and terminology employed herein is for the purpose of description and should not be regarded as limiting.

[0014] Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. The systems, methods, and examples provided herein are illustrative only and not intended to be limiting.

[0015] In the description and claims of the present application, each of the verbs "comprise", "include" and "have", and conjugates thereof, are used to indicate that the object or objects of the verb are not necessarily a complete listing of members, components, elements or parts of the subject or subjects of the verb.

[0016] Before referring to the present invention, Fig. 1 and 2 are used to describe the cooling operation of an exemplary air condition 3. Note that a similar unit may be used for air dehumidification or drying. Evaporator coil or cooling radiator 13 is a part of a cooling cycle which includes also a condensing coil, expansion valve, and a compressor (not shown). Note that both the condensing coil and the evaporator coil 13 are heat exchangers, configured for allowing a substance in the internal side to exchange heat with the environment in the external side. This cycle takes advantage of the way phase changes work, where latent heat is absorbed at a constant temperature during a liquid to gas phase change. An electric motor is used to drive a compressor. Since evaporation occurs when heat is absorbed, and condensation occurs when heat is released, air conditioners use a compressor to cause pressure changes between an evaporator coil and a condenser coil, condensing and pumping a refrigerant around. A refrigerant is pumped into the evaporator coil, where the low pressure causes the refrigerant to evaporate into a vapor, taking heat with it. In the condenser coil, the refrigerant vapor is compressed and forced through the condensing coil, condensing into a

liquid, rejecting the heat previously absorbed from the cooled space. As blower 11 rotates, it pumps air from the room through air inlet filter 16 and coil evaporator 13 and throws cooled air back to the room through air outlet 18.

[0017] Despite air filtering in inlet filter 16, dust and dirt are accumulated in vans 35 of blower 11. Also, dust accumulates on inlet filter 16, mainly on its external side, but some dust may also stick to the internal side. The accumulated dust blocks air flow to some extent, and causes a decrease in the efficiency of air condition unit 3. In the prior art, cleaning the blower 11 and/or air filter 16 of the dirt and dust is done manually from time to time. While cleaning flat air filters may be done by an owner two to four times a year, cleaning the blower is done by technician only, and therefore it is done much less frequently, allowing the efficiency of unit 3 to deteriorate in between.

[0018] The air entering the interior part of the air condition unit 3 from the room is relatively humid, and as it flows over evaporator coil 13, water vapor condenses and falls down into a drain tray 12. In the prior art, a drain pipe is connected to drain tray 12, leading the condensed water outside the building or to a building sewage system.

[0019] Referring now to the disclosed cleaning system, the condensed water flow in entirely different channels. During normal operation of air condition unit 3, condensed water falls down to a drain tray 12, and is funneled through funnel 30 into reservoir 1, where the condensed water is kept until being used for cleaning. Once reservoir 1 becomes full, water flow out through one-way aperture 20 to chamber 2.

[0020] The cleaning of blower 11 may be initiated once the air condition is turned off. The initiation is done by an electrical circuitry 47 either manually by pressing an appropriate button, or automatically on turning-off air-condition unit 3. Rather than being initiated automatically every turning-off, the cleaning system is initiated once in a while, once in a week, once in a month, or each tenth turning off, for example.

[0021] On initializing the cleaning system, a barrier 8 is displaced from a rest location, shown in Fig. 1, to a separating position between blower 11 and air outlet 18, as shown in Fig. 2. Barrier 8 is displaced either manually using a manipulating handle 45 or electrically by pressing a button for operating an electric motor 7, or as part of the automatic cleaning initiation. Pump 5 pumps the collected water from reservoir 1, mixes the pumped water with a cleaning additive kept in chamber 10 to get cleaning liquid, and enforces the liquid into duct 4 residing above blower 11. Duct 4 has a plurality of nozzles or sprinklers 6, which spray the liquid into the interior part of unit 3. Blower 11 is set into a slow rotation motion, allowing the sprayed liquid to wash blower 11 all around. The sprayed liquid, carrying the dust and dirt with it, is collected through slot 40 into rinsing water chamber 2. From chamber 2 the rinsing liquid flows through drain pipe 14 to outlet 9 out of the building or to the building sewage system. For the sake of clarity, the water/liquid

flow is reproduced in Fig. 3.

[0022] Referring now to Fig. 2, air inlet filter 16 is disposed around evaporator coil 13, and pulleys 17a and 17b. The cleaning liquid is sprayed on air inlet filter 16 and on evaporator coil 13 while filter 16 is rotated by pulley 17b, which is driven by motor 15. After several rotations, filter 16 is clean, and has to be dried. For that sake, the cleaning system includes a plate 19, shown in Fig. 1 at rest position normal to ground. In the rest position, plate 19 does not block the space between blower 11 and filter 16. For drying, a motor 21 rotates plate 19 from the normal position to an horizontal position, shown in Fig. 2. In horizontal position, plate 19 does block the space between blower 11 and filter 16. Therefore, once blower 11 is applied, it pumps air flow in through the upper part of filter 16 and throws air out through the lower part of filter 16, thus drying filter 16 of the cleaning liquid.

[0023] Regarding liquid flow, the rinsing liquid of the cooling radiator 13 and air inlet filter 16 fall down to the drain tray. To prevent their flow into condensing water reservoir 1, a drain pipe 48 connects the drain tray 12 with rinsing water chamber 2. While cleaning, drain pipe 30 which leads to reservoir 1 is closed and drain pipe 48 is open such that the rinsing liquid flows to the chamber 2 and out.

[0024] In mild cold weather, above water freezing temperature, air condition units 3 are used for warming the interior of buildings. For that sake, the cooling cycle works in a reversed mode, warming the air inside the building, while cooling the air outside the building, and letting water to condense outside the building. In other words, the two heat exchanger replace roles, and radiator 13 functions as a warming heat exchanger. For the warming mode of operation, the system may include a sub-system for collecting water condensed outside the building in a warming mode and importing it to the internal section of the air condition unit to enable cleaning as described above.

[0025] Also, in addition to warming, the air condition warming operation dries room air down to an inconveniently low humidity level. Thus, rather than cleaning, the same water flow system may use the condensed water, without mixing them with cleaning additive, in order to increase air humidity up to a convenient level.

[0026] Referring now to Fig. 4, a centrifugal blower 70 is shown with two side air filters, such that air flows 74 enter the blower axially, and air flows 76 get out of blower 70 longitudinally. Two side barriers 80 and longitudinal barrier 8 are used to separate blower 70 from other objects while it is being washed by sprayed water from sprinklers 6 which are located in a duct 4 within the case of blower 70. Electrical motors 7 and 82, respectively, are used to place barriers 80 and 8. By displacing barrier 8 after cleaning, rinsed water flow to rinsed water chamber 2.

[0027] Dirt may be accumulated in pipes 14, 30 and 48, and should be removed from time to time. For that sake, nozzles 54 may be placed close to the pipe aperture, as shown in Fig. 5 for pipe 30. Nozzle 54 is con-

nected to water reservoir 1 through duct 52 and pump 5. To clean pipe 30, condensed water is pumped into nozzle 54, which in turn emits a jet of water and removes the dirt from pipe 30. A special mechanism may bring nozzle 54 closer to the aperture of pipe 30 to prevent a decrease of the pressure in the emitted jet.

[0028] It is provided according to certain implementations of the invention, a method 200 for cleaning parts 11 and 16 of an air condition unit 3, as illustrated in the flow chart of Fig. 6. Method 200 includes step 210 of facilitating collection of condensed water, and step 260 of spraying liquid which includes some collected condensed water on parts 11 and 16. Method 200 may include step 220 of automatically initiating the cleaning, triggered by turnings-of the air condition unit, and step 230 of placing barriers between the cleaned parts and other objects by manipulating a handle 45 or turning-on an electric motor 7.

[0029] In some embodiments, method 200 includes step 240 of mixing at least some of the collected water with a cleaning additive, step 250 of pumping liquid into duct 4, and step 270 of removing the sprayed liquid out of the air condition unit. The sprayed liquid removal may include the actions of facilitating collection of the sprayed liquid and providing an outlet 9 for draining the sprayed liquid out of the air condition unit.

[0030] Although the invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art. Accordingly, it is intended to embrace all such alternatives, modifications and variations that fall within the spirit and broad scope of the appended claims. In particular, the present invention is not limited in any way by the examples described.

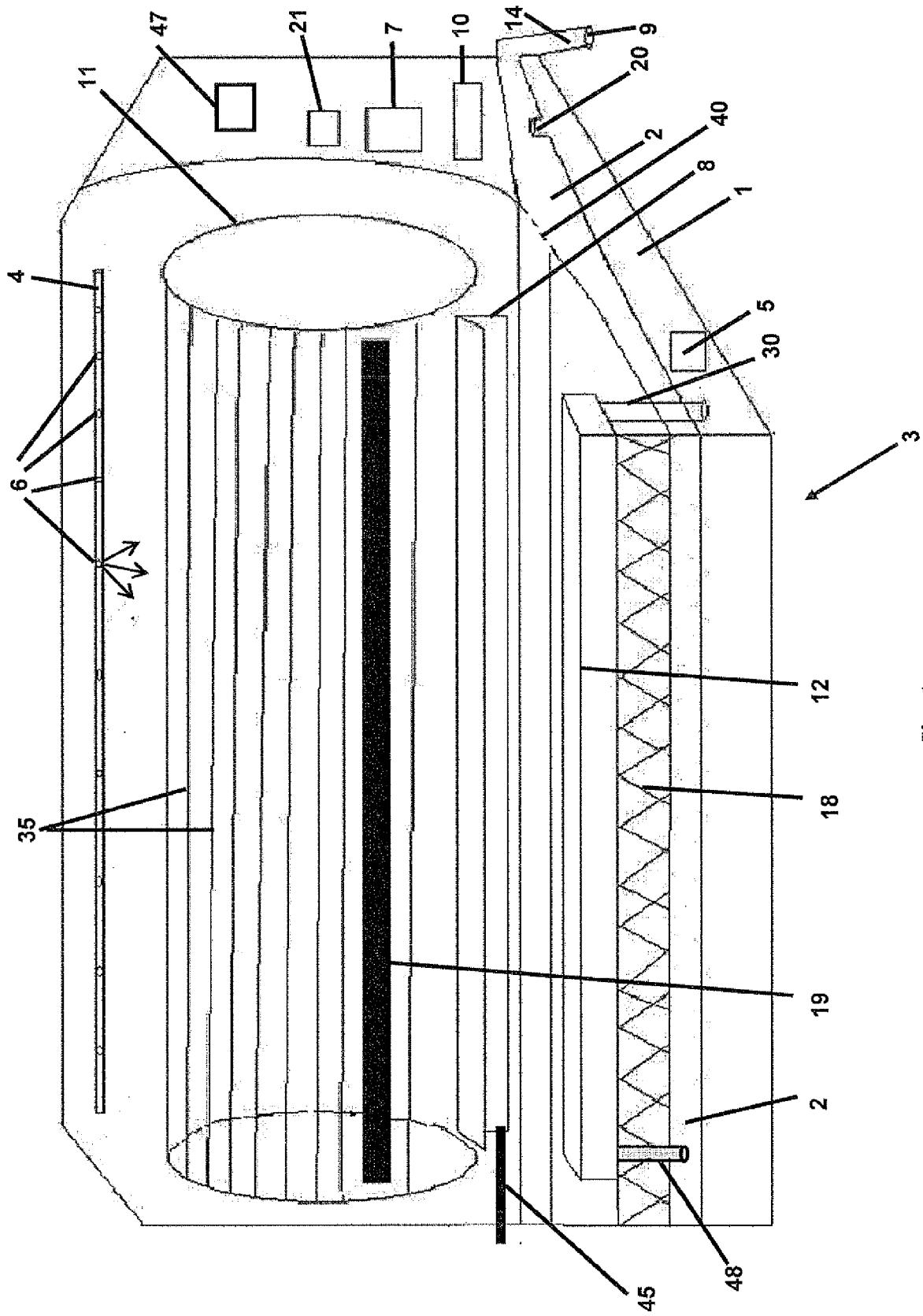
Claims

1. A system for cleaning one or more parts of an air condition unit using water condensed by the air condition, the system comprising:
 - (a) a reservoir for condensed water;
 - (b) a first sub-system for facilitating flowing pressurized liquid including at least some water of the collected condensed water in a duct having one or more spraying outlets;
 - (c) a second sub-system for removal of sprayed liquid out of the air condition unit.
2. The system of claim 1 wherein the system further includes at least one barrier disposable in a separating position between the one or more parts and one or more objects.
3. The system of claim 2 wherein the system further includes a means for changing position of said at

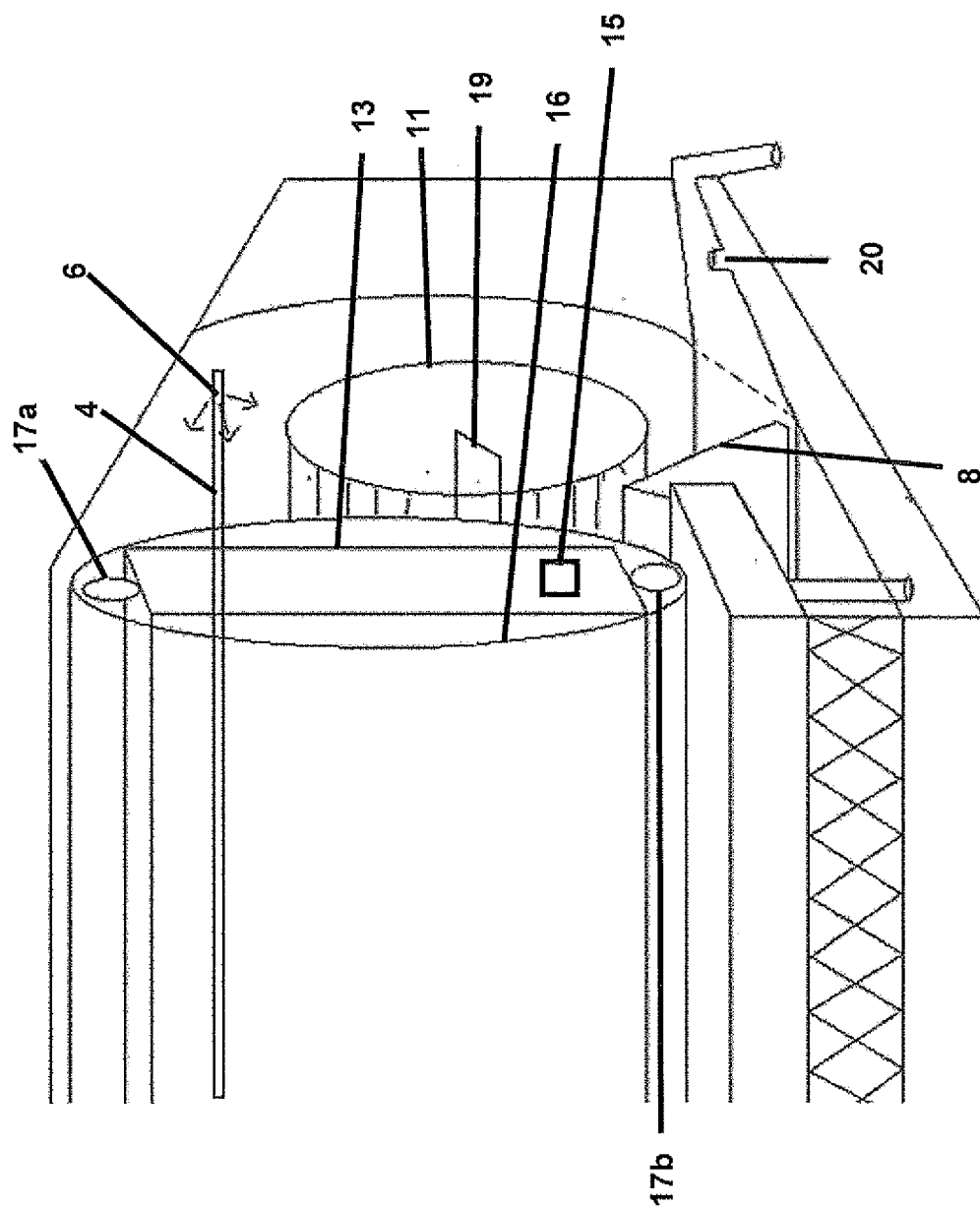
least one barrier, said means is at least one of manipulating handle and an electric motor.

4. The system of claim 2 wherein the method further includes electrical circuitry for automatic initiation of cleaning said one or more parts on turning-of the air condition unit. 5
5. The system of claim 1 wherein the system further includes a chamber for a cleaning additive and a mixing mechanism for mixing said cleaning additive with at least some of the collected water. 10
6. The system of claim 1 wherein said second sub-system includes a drain tray, a used water chamber and a drain pipe. 15
7. The system of claim 1 wherein said one or more parts of an air condition unit includes at least one of a blower, an air inlet filter, and heat exchanger. 20
8. The system of claim 1 wherein the system further includes a connection to a local water system.
9. The system of claim 1 wherein the system includes a third sub-system for collecting and importing water condensed a by the air-condition unit operating in a warming mode, whereby said third sub-system is used for air humidification and cleaning. 25
30
10. The system of claim 1 wherein the air condition unit is a device used for at least one of air cooling and air humidifying.
11. A method for cleaning one or more parts of an air condition unit, the method comprising: 35
 - (a) facilitating collection of condensed water; and
 - (b) spraying liquid including at least some water of the collected condensed water on said one or more parts; 40
12. The method of claim 11 wherein the method further includes the step of placing at least one barrier between the one or more parts and one or more objects. 45
13. The method of claim 12 wherein said placing said at least one barrier is done by at least one of manipulating a handle and turning-on an electric motor. 50
14. The method of claim 12 wherein the method further includes the step of automatically initiating said steps of placing at least one barrier and spraying liquid, whereby turning-of the air condition unit initiates cleaning of said one or more parts, as needed to keep the air condition unit highly efficient. 55

15. The method of claim 11 wherein the method further includes the step of mixing at least some of the collected water with a cleaning additive.



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2
b6
b7C
b7D

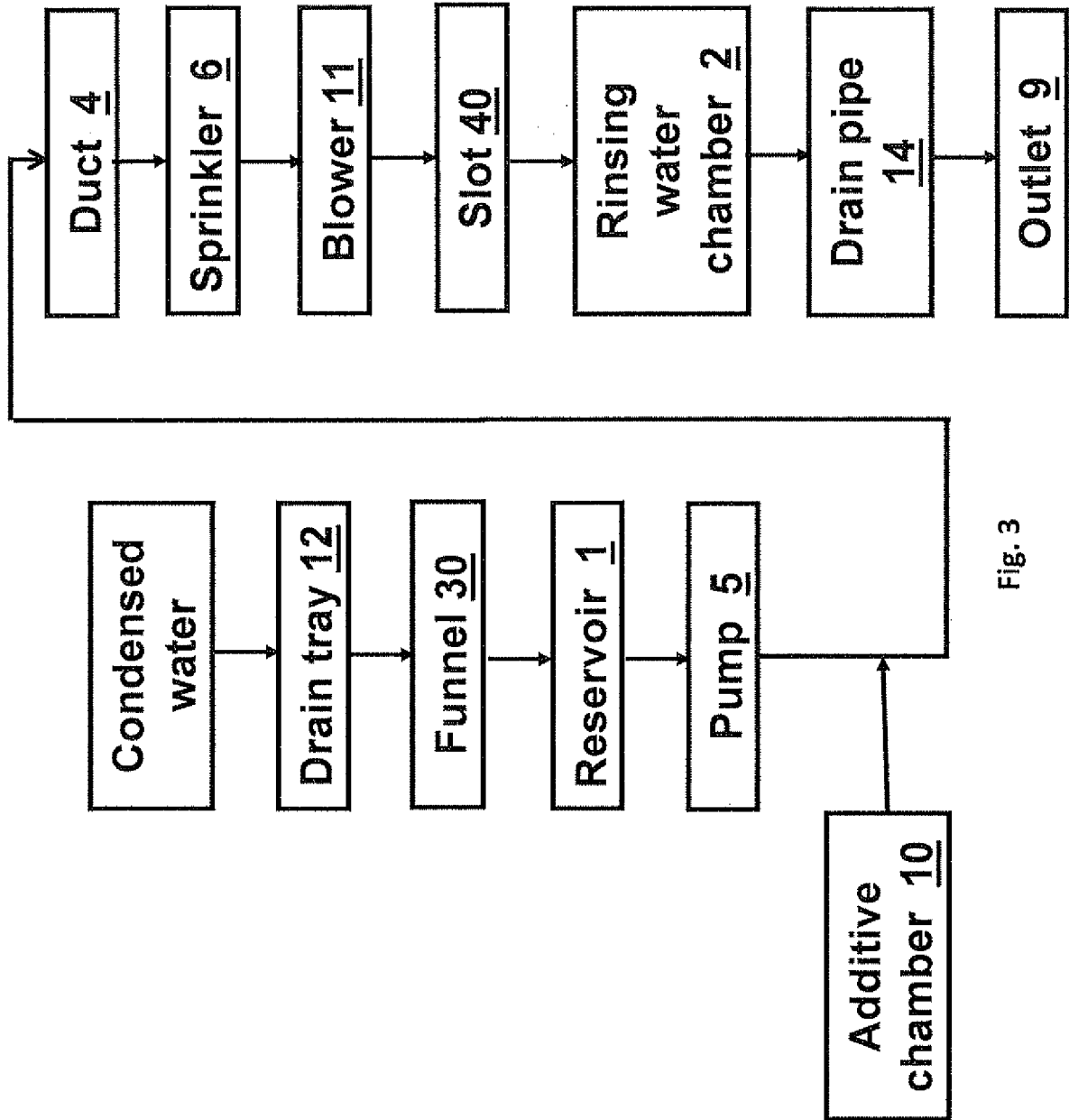


Fig. 3

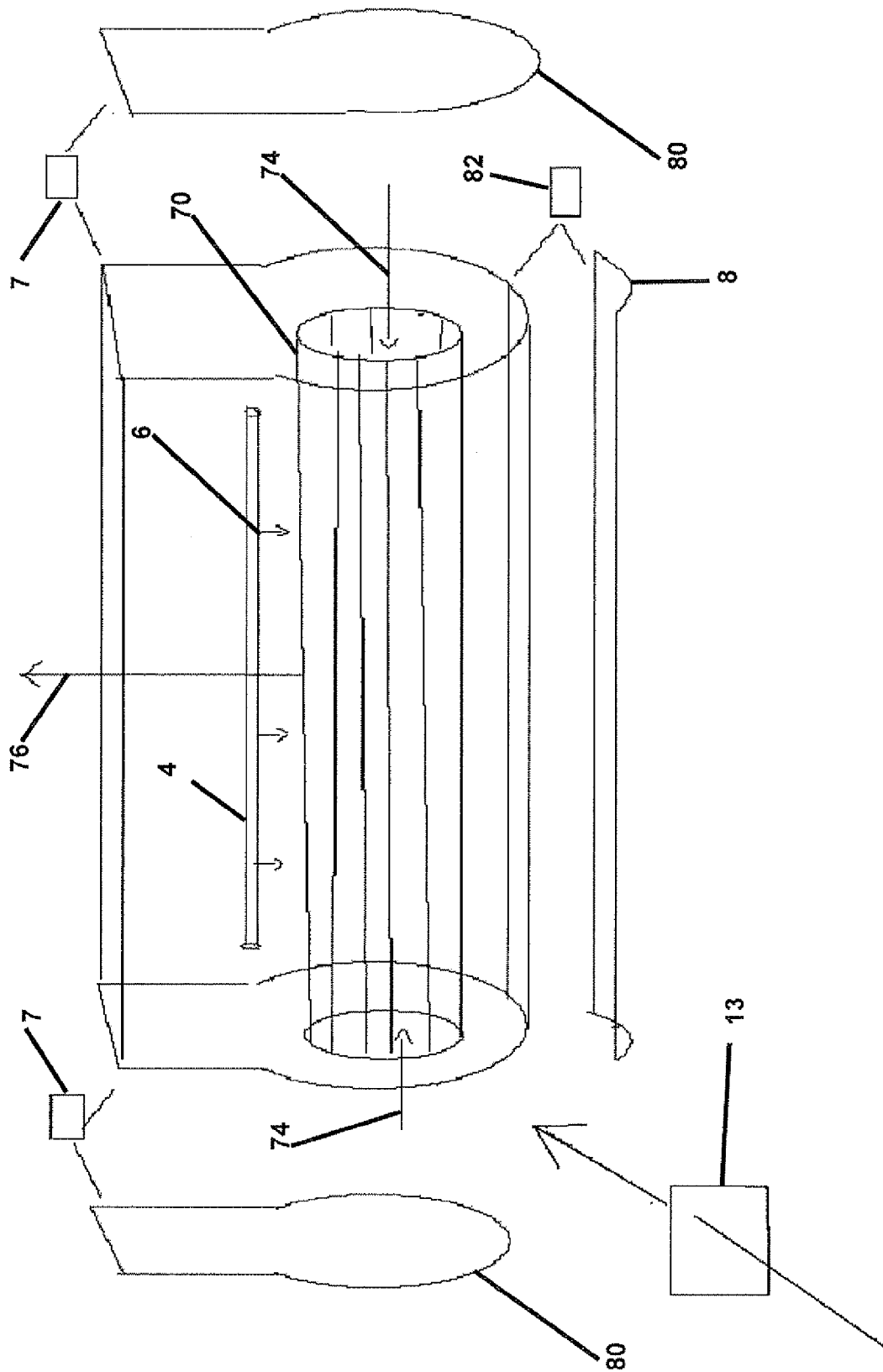


Fig. 4

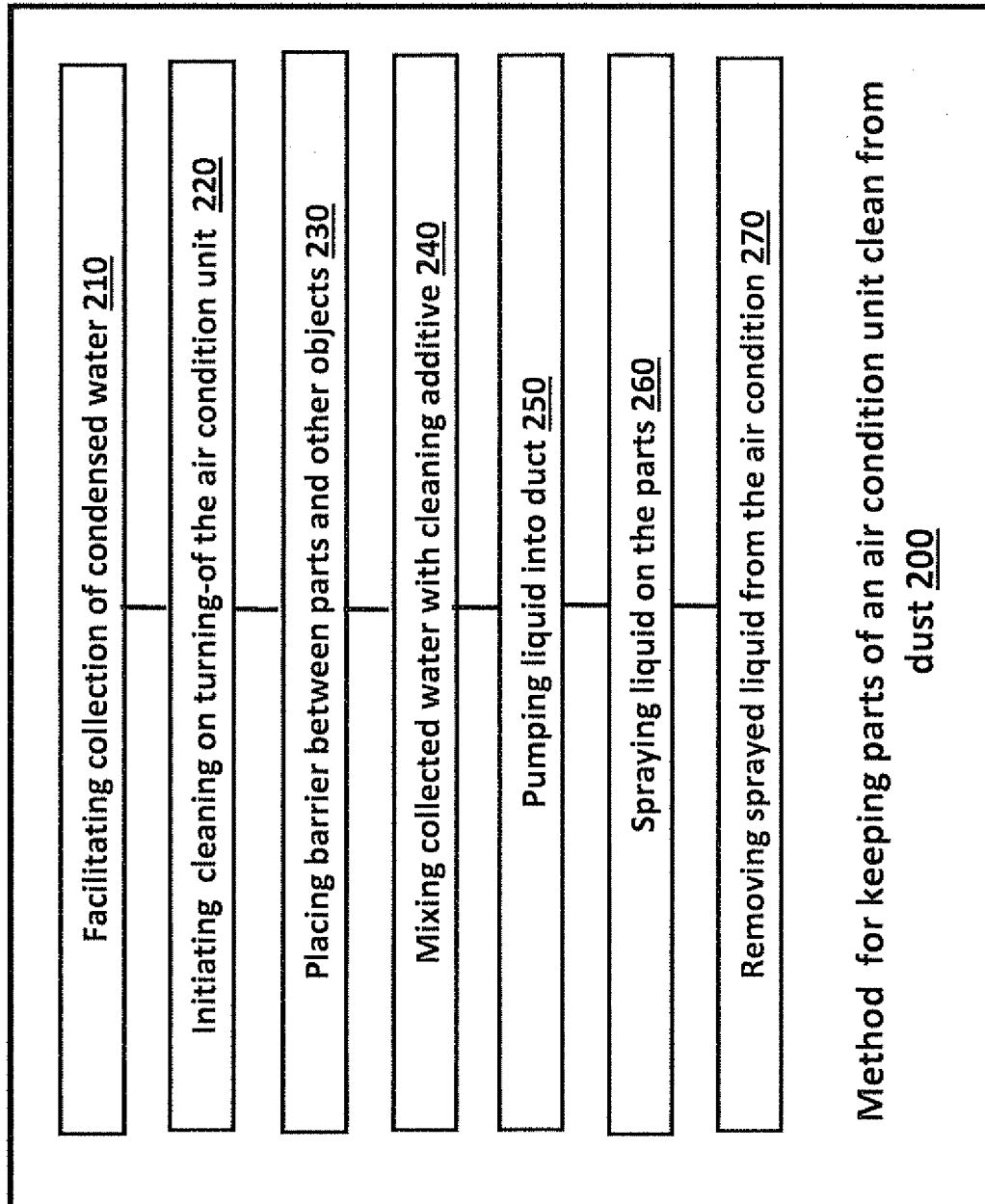


Fig. 6

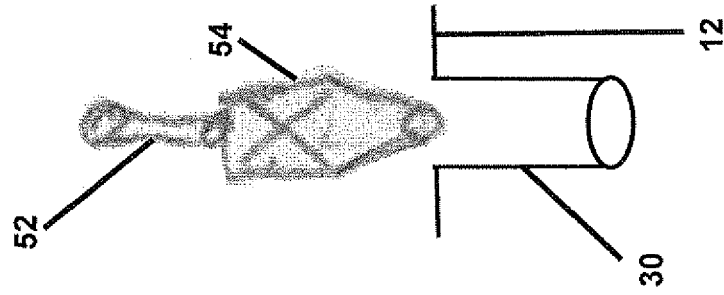


Fig. 5



EUROPEAN SEARCH REPORT

Application Number
EP 09 16 8439

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			TECHNICAL FIELDS SEARCHED (IPC)
			F24F F28G B08B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 October 2010	Examiner Devilers, Erick
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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14-10-2010

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