A PLANT CULTIVATION SYSTEM USING HUMIDIFIER

Technical field

The present invention relates to agriculture and engineering, devices and method, in particular a humidifier cultivation apparatus and process.

Background

Humidity is an important factor for cultivating all kinds of plants during every step in the process of cultivation, especially in the trunk and leaves areas of a plant. When the humidity in the air is high, the plant will suffer from dehydration, and when the humidity in the air is low, the plant will dehydrate faster. The roots of the plant will grow well and tilt towards the area with water or humidity. In addition, each type of plant requires a different amount of humidity. Mushroom and moss are examples of plants that especially require humidity all of the time, so any humidifier system should take into account the possibility of different types of plants to help these different types of plant grow.

WIPO Publication No. CN204762524 describes the automation system to control humidity, temperature, carbon dioxide and ammonia gas concentration suitable for mushroom cultivation. However, the subject matter of WIPO Publication No. CN204762524 is only suitable for mushrooms. It is not suitable for other crops.

WIPO No. CN204350743 describes the invention of equipment and processes to control the environment in a closed system in which the humidity is increased by spraying water throughout the closed system. This patent does not specify the importance and characteristics of the humidifier. It only focuses on the overall system of closed plant cultivation.

The previous inventions add humidity to the cultivation system but fail to remove any water or solution that is released into the recycle system. This causes a waste of resources and a loss of energy in the industry. Recycling is important and is also a way to preserve the environment.

The issue of humidity (its generation and maintenance) is a major problem in the field of cultivation. Fans break down because moisture tends to stick to the fan blades, increasing their weight. Eventually, such fans stop working and collapse. The problem can be solved by using a waterproof fan. It can increase the fan life, but these too, eventually fail. Alternatively, one can simply accept this as a problem and simply use cheap replaceable fans. The problem can also be

addressed to some degree by using an on-off fan timer, for periodic cleaning and maintenance. However, this method is very difficult to use in the industry and extra labour is required for fan maintenance.

Summary of the Invention

According to the present invention, there is provided a humidifier cultivation apparatus comprising:
a storage tank (1),
a pump (2),
a first pipe,
a second pipe (6),
a growing chamber (5), the first pipe being connected to the growing chamber (5),
a drain tank (7), the second pipe (6) being connected to the drain tank (7),
a blower (4),
a humidifier (3), and
additional piping,
their arrangement being such that a fluid is able to be pumped around the apparatus via pump (2), from the storage tank (1) into the humidifier (3), whereupon it will be atomized into a mist, via blower (4), and drawn into the growing chamber (5), whereby it will subsequently condense and be collected as a solution able to be drawn into the drain tank (7) via pipe (6) wherein the pipe (6) is in the shape of the letter U, J, W or the letter J backwards.

The apparatus incorporates a humidifier system for cultivation by developing recycled resources and solves problems. Short-lived fan(s) or no fan(s) is / are required for this apparatus. This apparatus can be applied to a variety of crops, and is not specific to any kind of plants. The invention uses a blower instead of a fan. The fan has a pressure of less than 1000 mmH2O, or 9806.65 Pa while the blower has a pressure of 1000 mmH2O up to 10 mH2O or 9806.65 Pa to 98.0665 Pa which is higher than the fan pressure. The process of carrying the solution vapor from the humidifier back into the system involves a special hose to return the solution and / or solution vapor via the pipe.

Brief Description of The Drawings

An embodiment, incorporating all aspects of the invention, will now be described by way of example only with reference to the accompanying sheets of drawings in which

Figure 1 is a block diagram of the apparatus in accordance with an embodiment of the invention.

Figure 2 is a block diagram showing the humidifier system and apparatus.

Detailed Description

According to the present invention, crops are shown inside the growing chamber (5). The growing chamber (5) has a cavity allowing atomized mist and / or solution at least one passage and has plants or roots or both of them.

The definition of humidifier in the present invention refers to any device that creates or gives humidity to a system. The internal components work together by connecting at least one of the passages of the atomized mist and / or solution to at least four components, including storage tank (1), humidifier (3), growing chamber (5) and drain tank (7), which when welded together form a closed system, i.e. one where a single path connects the storage tank (1), humidifier (3), growing chamber (5), drain tank (7) together in the form of a loop.

The process by which humidity is controlled for cultivation is shown in figure 1, which shows a solution in storage tank (1) flowing through pump (2) to a humidifier (3), where the solution is volatilized to form an atomized mist which enters blower (4). The blower (4) sucks the atomized mist and blows the mist through the passage which in the present invention is two pipes. The first pipe is connected to the growing chamber (5) containing the plant (8). The entire plant (8) or just part of the plant (8) can be in the growing chamber. After the atomized mist has provided the humidity in the growing chamber (5), the atomized mist condenses to liquid. The liquid flows through the pipe back into the humidifier (3), enabling the recycling of the solution.

The second pipe of the blower (4) is connected to the drain tank (7) through a specially designed pipe (6), which serves to keep the atomized mist. The atomized mist flows through growing chamber (5) and sticks to the electronic blower, eventually causing damage and its collapse. Even if the blower has water-resistant characteristics, it cannot prevent all water from sticking to the blower and causing damage. The atomized mist condenses to a solution which sticks to the blower, causing the weight of the blower to increase and more power is needed to rotate the blower. The inner components burn and eventually collapse. Hence, a path or a passage or pipe is created for carrying the solution and the specific solution to the drain tank (7). The drain tank (7) acts as the solution storage that limits the volume of solution. When the solution and atomized mist enter the drain tank (7), they accumulate to the required level, and the

switches (701) and (702) transmit a signal to drain the solution in the drain tank (7) when the solution level in the drain tank (7) is at the maximum level. The switch (701) sends the signal to the pump (703) which carries the solution via a pipe back to the storage tank (1) again. As a result, the recycling of the atomized mist and the solution can take place. When the solution level of the drain tank (7) decreases to the lowest level, the switch (702) transmits a signal to the pump (703) to stop working.

Pipe (6) can have many designs, wherein the pipe (6) is curved and can have a shape of letters such as the letter U, letter J, letter W and at least one hole, designed to accumulate some of the atomized mist and some of the solution. By constructing the specific pipe such that the pressure in the pipe at the blower (4) and in the drain tank (7) are not equal, the atomized mist and solution is pushed from the area with higher pressure to the area with lower pressure.

There are several ways to keep the pressure differential in the pipe. Appropriate methods include:

1. Reducing the pipe diameter. This eliminates the flow path by using pipe joints which are of a different diameter from the pipe. This will make some of the atomized mist and some of the solution flow out of the system. However, as a result, the other electrical components in the system are damaged by humidity.

2. Installing an open valve and close valve which changes the fluid direction.

3. Installing the flux meter of the solution with pressure monitoring (Diaphragm type) which will lose pressure from the flux measurement sheet.

4. Bending the pipe. The best way is to bend the pipe because it reduces the installation equipment needed and reduces its energy.

The bending of the pipe in the present invention is the preferred design of pipe (6) with the above characteristics. The pressure inside the two pipes must be considered and experiments were conducted by the Applicant, regarding the positioning of the storage tank relative to the blower and the results of which are summarised in the following table.

To compare pressure at nearby pipe	Incident

Storage tank much higher than blower	Blower collapsed
Storage tank higher than blower	Blower collapsed
Storage tank equal to blower	Blower collapsed
Storage tank lower than blower	Solution flow in the pipe through storage tank
Storage tank much lower than blower	Solution and atomized mist flow out

How to make an appropriate pipe (6), that is, to set the pressure of the drain tank (7) lower than and much lower than the blower will now be described. The implementation of pipe (6) is to arrange the pressure of the drain tank (7) to be lower than the pressure in the blower by a little. To push the solution to the drain tank (7) by using a pipe shaped like the letter U with unequal tail pipe, for example, the pipe may have a characteristic / shape like the letter J and / or the letter J backward. The pipe at the blower is higher than the drain tank (7). If a pipe at the blower is higher than the drain tank (7), the atomized mist and / or solution will flow out to the growing chamber (5). If the position of pipe at the storage tank is higher than the blower, the solution will drain to the bending pipe and flow back to the blower. The blower will collapse eventually.

The humidifier apparatus (3) is shown in greater detail in figure 2. The pipe carries the solution from the storage tank (1) which flows through the pump (2) and to the humidifier (3) connected to the solenoid valve (305). The solution then flows into the tank (302) of the humidifier (3) which stores the solution with maximum and minimum scales for the volume of solution in the tank. When the solution enters the tank (302) of the humidifier (3), the humidity generator (301) works by evaporating the solution to form a vapor or atomized mist that subsequently flows in a pipe connected to the blower (4).

The tank (302) of humidifier (3) has a pipe that is connected to the growing chamber (5), and the blower (4) pulls the atomized mist to the growing chamber (5). The path which has no blower is to carry the solution in the growing chamber (5) back to the tank (302) of humidifier (3). When the solution in the tank (302) of the humidifier (3) is up to the maximum value set, the

switch (303) acts to signal the solenoid valve (305) to close. The solution from the storage tank (1) thus stops flowing. When the solution in the tank (302) of humidifier (3) decreases to the minimum scale, the switch (304) activates the solenoid valve (305) to open, which causes the solution from the storage tank (1) to flow into the tank (302) of humidifier (3).

In addition, solenoid valves (305), switches (701) and (702) act as transmitters associated with the solution level according to the present invention. These can be replaced by any system that sends a signal to control the volume of solution.

The humidifier cultivation apparatus includes,

i. a pipe (6) to enable the passage or path of the atomized mist and / or solution to the drain tank (7) and a blower (4);

and / or,

ii. a closed path, such that the way for the atomized mist and /or the solution and the closed path consists of at least 4 vertexes: the storage tank (1), the humidifier (3), the growing chamber (5) and the drain tank (7).

The humidifier apparatus has special characteristics that are suitable for the process of conveying the atomised mist, comprising:

1. Pipe (6) is curved and can have a shape similar to the letters U, J, W and a backwards letter J. The most suitable design is either the letter J or a backwards letter J.

2. Pipe (6) shall provide the pressure for both the pipe in the vicinity of the blower (4) and the pipe near the drain tank (7), whereby the pressure in the drain tank (7) is lower than the pressure in the blower (4) area.

3. The pipe (6) in use will be connected to the blower (4), either at both the entry and exit ports of the blower (4) directly, to form the atomized mist path from the humidifier (3), or indirectly to the blower (4) by being connected to the blower installation. Both forms of connection will bring the atomized mist and / or the solution that condenses onto the blower (4), including the atomized mist and / or solution in the boundary to the pipe which has the pipe (6).

4. The pipe (6) is also a component of the passage of the atomized mist and / or solution between the drain tank (7) and the growing chamber (5).

5. The process of humidity control for cultivation involves a closed path which includes the storage tank (1), the humidifier (3), the growing chamber (5) and the drain tank (7). The closed path can be added to any existing devices by connecting each path among the storage tank (1), the humidifier (3), the growing chamber (5) and the drain tank (7) to the existing device and the atomized mist and / or solution can be passed and circulated along the new closed path.

6. The blower (4) acts to absorb the humidity from the humidifier (3) and blow the atomized mist into the pipe to the growing chamber (5). The suitable blower has a pressure of 1000 mmH2O to 10 mH2O, or 9806.65 Pa to 98.0665 Pa and the blower fan can be either waterproof or non-waterproof, preferably waterproof.

7. The tank (302) of the humidifier (3) needs to be strong, durable, and resistant to the force of the blower (4), so that the tank does not collapse or change shape, and needs to be easy to clean and resistant to corrosion The suitable materials are polyvinyl chloride, polyethylene, stainless steel 316L, with the most suitable material to fabricate the tank from, being stainless steel 316L.

8. The humidity generator (301) serves to change the state of the solution in the tank (302) of humidifier (3) into the atomized mist. The suitable equipment to carry out this task is an ultrasonic humidifier with an ultrasonic head, which generates higher frequencies than sound frequencies. The solution can be evaporated into atomized mist without heat. The optimum length of frequency is 0.5-8 MHz, and the most optimum frequency is 1-7 MHz. The size of atomized mist size is 2-8 microns, which is the ideal size for growing plants. The optimum size of atomized mist for planting is 3-7 microns, and the optimum size of atomized mist for mushroom and moss growing size is 2-8 microns.

9. The characteristic of the pipe is to form a path for the atomized mist and / or solution that is easy to clean, is resistant to corrosion and is suitable for internal temperature. The suitable material is polyvinyl chloride, polyethylene, stainless steel 316L, stainless steel 304 and stainless steel 308, with the most suitable material being polyvinyl chloride, as it is corrosion-resistant, lightweight, and cheap.

10. The closed path includes some path of the atomized mist and / or solution for connecting the humidifier (3) and the growing chamber (5) and at least one path through the blower (4). At least 2 paths or more in the closed path must be connected to the humidifier (3) and the growing chamber (5), wherein at least one path is connected via the blower (4).

11. Blower (4) can be integrated into the internal component of the humidifier (3).

Cultivation of plants in this invention includes moss mushroom as well.

The present invention includes the application to keep up the root cuttings and in the growing chamber (5), is the boundary of the present invention.

Claims

1. Humidifier cultivation apparatus, comprising:
a storage tank (1),
a pump (2),
a first pipe,
a second pipe (6),
a growing chamber (5), the first pipe being connected to the growing chamber (5),
a drain tank (7), the second pipe (6) being connected to the drain tank (7),
a blower (4),
a humidifier (3), and
additional piping,
their arrangement being such that a fluid is able to be pumped around the apparatus via pump (2), from the storage tank (1) into the humidifier (3), whereupon it will be atomized into a mist, via blower (4), and drawn into the growing chamber (5), whereby it will subsequently condense and be collected as a solution able to be drawn into the drain tank (7) via pipe (6) wherein the pipe (6) is in the shape of the letter U, J, W or the letter J backwards.

2. The apparatus in accordance with claim 1, wherein the pipe (6) is sufficient for the pressure in the vicinity of the blower (4) and near the drain tank (7), the suitable pressure in the drain tank (7) being less than the pressure in the blower (4) area.

3. The apparatus in accordance with claim 1, wherein the pipe (6) is also a component of the passage for the flow of the atomized mist and / or solution between the drain tank (7) and the growing chamber (5).

4. The apparatus in accordance with claim 1, wherein a solution in the storage tank (1) is adapted to flow through the pump (2) to the humidifier (3) and the solution is adapted to volatilize to form an atomized mist which enters the blower (4), the blower (4) being adapted to draw the atomized mist and blow it through the passage and wherein the passage has two pipes, the first pipe being connected to the growing chamber (5), the atomized mist providing the humidity in the growing chamber (5), the condensation of the atomized mist becoming a solution, which flows through the pipe back into the humidifier (3) again, to enable the recycling of the solution to occur; and the second pipe of the blower (4) being connected to the drain tank (7) through the

pipe (6), the drain tank (7) acting to store the solution when the solution enters the drain tank (7), the apparatus being such that when the solution reaches a required level, a switch (701) and (702) is activated to transmit a signal to drain the solution, in the drain tank (7) when the required level is the maximum level, the switch (701) sending the signal to a pump (703), which is adapted to carry the solution via a pipe through to the storage tank (1) again, to be recycled, and when the solution level of the drain tank (7) decreases to the lowest level, the switch (702) is adapted to transmit a signal to the pump (703) to stop working.

5. The apparatus in accordance with claim 1 wherein the pipe is adapted to carry the solution from the storage tank (1) through the pump (2) and to the humidifier (3) connected to a solenoid valve (305), before the solution goes into the tank (302) of humidifier (3) that stores the solution with maximum and minimum scales for the volume of solution in the tank, the humidifier being adapted to evaporate the solution to form the atomized mist that flows in the pipe connected to the blower (4) which is installed outside the humidifier (3), the tank (302) of the humidifier (3) having a pipe that is connected to the growing chamber (5) adapted to draw the atomized mist to the growing chamber (5), and this pipe has no blower to carry the solution in the growing chamber (5) back to the tank (302) of the humidifier (3).

6. The apparatus in accordance with any one of claims 1, 2, 3, 4 and 5, wherein the pressure of blower (4) is 1000 mmH2O to 10 mH2O or 9806.65 Pa to 98.0665 Pa where the blower fan is either waterproof or non-waterproof.

7. The apparatus in accordance with claim 5 wherein the tank (302) of the humidifier (3) is resistant to corrosion, and is made from polyvinyl chloride, polyethylene or stainless steel 316L.

8. The apparatus in accordance with claim 5 or claim 7, wherein a humidity generator (301) which serves to change the state of the solution in the tank (302) of humidifier (3) into the atomized mist is an ultrasonic humidifier or ultrasonic head.

9. The apparatus in accordance with claim 8 wherein the humidity generator (301) has the optimum length of frequency is 0.5-8 MHz and optimum length of the atomized mist size is 2-8 microns.

10. The apparatus in accordance with claim 1 or claim 2, wherein the pipe (6) contains an open valve and close valve which change the direction current and also comprises a flux meter for pressure monitoring.

11. The apparatus in accordance with claim 4 or claim 5, wherein the solenoid valve (305) of claim 5 or the switch (701) and (702) of claim 4 act as transmitters associated with the solution level.

12. The apparatus in accordance with any one of claims 1-7, wherein the blower (4) is integrated into the internal component of the humidifier (3).