

## AN ATOMIZATION DEVICE FOR USE IN THE RESPIRATORY DEPARTMENT

### **Field of the Invention**

The present invention relates to the technical field of medical atomizers, and more particularly, to an atomization device for use in the respiratory department.

### **Background to the Invention**

In clinical treatment within the respiratory department, nebulized inhalation therapy is a commonly employed method. It utilizes high-speed oxygen airflow or specialized atomization devices to convert medicinal liquids into fine mist particles, which are then inhaled through the respiratory tract by the patient. This method aims to treat respiratory tract infections, eliminate inflammation, and humidify the airway. However, existing atomization devices generally suffer from certain shortcomings.

For example, Chinese Patent No. CN111569203A discloses an "Atomizer with a Conveniently Storable Air Duct." This patent includes an atomizer body, wherein a recessed platform penetrating the front end surface of the body is formed on the upper end surface of the body. A slot connected to the recessed platform is formed on the right side of the body, and two T-shaped winding posts are fixedly inserted on the bottom surface of the recessed platform. The above patent enables convenient placement of the atomization cup and air duct, allowing the atomization cup, air duct, and atomizer to be stored as an integrated unit, thereby facilitating use of the atomizer.

However, the above-mentioned atomizer lacks the capability to store the mist-conducting tube during use. It is unable to effectively manage the length and layout of the mist-conducting tube. When medical staff need to frequently check the patient's nebulization treatment status, excessively long and disorderly mist-conducting tubes not only hinder their work but may also result in unnecessary time wasted during movement or adjustment of the equipment.

## **Statement of Invention**

### **(I) Technical Problem to Be Solved**

In view of the shortcomings in the prior art, the present invention provides an atomization device for use in the respiratory department, which addresses the problems raised in the background section above.

### **(II) Technical Solution**

To achieve the above objective, the present invention adopts the following technical solution: An atomization device for use in the respiratory department, comprising a main body, a control component, a knob, a cup body, a water tank, a planetary block, a surrounding mechanism, and a clamping claw. The control component is disposed on the outer circumferential surface of the main body, and a plug is provided on the control component. The knob is rotatably mounted on the outer circumferential surface of the main body and is located on the side of the main body opposite to the control component. The cup body is fixedly arranged at the lower end of the main body, and an atomization outlet is fixedly provided at the lower end of the cup body. The atomization outlet is configured to cooperate with and fix the mist-conducting tube. The water tank is disposed on the upper side of the main body, and a storage groove is provided on the outer circumferential surface of the water tank.

Preferably, a revolution slide track is formed on the upper side of the main body, and the planetary block is arranged within the revolution slide track. The curvature of the planetary block matches the inner wall curvature of the revolution slide track. The surrounding mechanism is disposed between the water tank and the planetary block.

Preferably, a lifting chute is formed within the planetary block, and the clamping claw is arranged within the lifting chute. The clamping claw comprises a connecting portion and a fixing portion. The connecting portion is located within the lifting chute, while the fixing portion is provided at one end of the connecting portion extending to the outside of the planetary block. A clamping groove is formed in the fixing portion, and the opening direction of the clamping groove coincides with the radial direction of the planetary block. The inner diameter of the clamping groove matches the storage groove.

Preferably, the main body is provided with an annular array of bases. A worm gear is fixedly mounted at the upper ends of the bases and is configured to enable the surrounding

mechanism to drive the planetary block to move. The surrounding mechanism comprises a revolution component, a limiting component, and a supporting component.

Preferably, the revolution component comprises a worm shaft meshed with the worm gear, a motor mount, and a drive motor. The motor mount is fixedly arranged on the side of the planetary block near the worm gear. The drive motor is fixedly mounted on the motor mount, and the worm shaft is in power connection with the drive motor.

Preferably, the limiting component comprises a limiting ring and second rollers. The limiting ring is fixedly mounted on the planetary block and sleeved around the outer side of the water tank. A second roller chamber is formed within the limiting ring. The second rollers are rotatably arranged within the second roller chamber and disposed in an annular array.

Preferably, the supporting component comprises a mobile seat and first rollers. The mobile seat is embedded within the revolution slide track. A first roller cavity is formed within the mobile seat. The first rollers are rotatably connected between the inner wall of the first roller cavity, and arranged in an arcuate array along the curvature of the mobile seat.

Preferably, an electric push rod is fixedly installed within the lifting chute, and the upper end surface of the clamping claw is fixedly mounted to the power output end of the electric push rod.

Preferably, a telescopic groove is formed within the clamping claw, and a telescopic pressure block is slidably disposed within the telescopic groove. A concave surface is provided at the lower end of the telescopic pressure block and is configured to match the clamping groove. An elastic element is provided between the telescopic pressure block and the inner wall of the telescopic groove.

Preferably, the elastic element is a telescopic spring.

### **(III) Beneficial Effects**

The present invention provides an atomization device for use in the respiratory department, which offers the following beneficial effects:

1. In this solution, the clamping claw is driven to move synchronously along the storage groove, thereby guiding the mist-conducting tube to descend into the storage groove provided on the water tank. Once an appropriate length is reached, the movement of the clamping claw is halted, thereby completing the storage of the mist-conducting tube. This prevents an excessively long tube from obstructing medical staff during caregiving,

reduces visual clutter, optimizes the ward environment, provides patients with a more aesthetically pleasing and comfortable treatment space, and helps alleviate anxiety and unease.

2. In this solution, the concave surface of the telescopic pressure block is designed to match the clamping groove. This configuration prevents the mist-conducting tube from becoming blocked due to excessive clamping pressure, which could otherwise increase respiratory resistance, cause breathing difficulty, or result in patient discomfort. It ensures that the medicinal mist is released at a stable rate, improves treatment efficiency, enhances safety during the therapeutic process, and reduces the likelihood of potential risks or unexpected incidents.

3. In this solution, the mist-conducting tube is guided into the storage groove on the water tank, which saves space in the ward, reduces visual clutter, and contributes to a more organized and optimized medical environment.

### **Brief Description of the Drawings**

Figure 1 is a front view schematic diagram of the present invention;

Figure 2 is an exploded view schematic diagram of the present invention;

Figure 3 is a front view schematic diagram of the surrounding mechanism of the present invention;

Figure 4 is an enlarged view of section A in Figure 3;

Figure 5 is a front view schematic diagram of the revolution component and the limiting component of the present invention;

Figure 6 is an enlarged view of section B in Figure 5;

Figure 7 is a front view schematic diagram of the clamping claw of the present invention.

In the drawings: 11 - Main Body; 12 - Control Component; 13 - Plug; 14 - Knob; 15 - Cup Body; 16 - Atomization Outlet; 17 - Water Tank; 18 - Storage Groove; 20 - Base; 21 - Worm Gear; 22 - Planetary Block; 23 - Motor Mount; 24 - Drive Motor; 25 - Worm Shaft; 26 - Revolution Slide Track; 30 - Mobile Seat; 31 - First Roller Cavity; 32 - First Roller; 33 - Limiting Ring; 34 - Second Roller Chamber; 35 - Second Roller; 40 - Lifting Chute; 41 - Electric Push Rod; 42 - Clamping Claw; 43 - Clamping Groove; 44 - Telescopic Groove; 45

- Telescopic Pressure Block; 46 - Telescopic Spring.

### **Detailed Description**

5 An embodiment of the present invention provides an atomization device for use in the respiratory department. As shown in Figures 1 to 7, the device comprises a main body 11, a control component 12, a knob 14, a cup body 15, a water tank 17, a planetary block 22, a surrounding mechanism, and a clamping claw 42. The structure of the main body 11 is consistent with the prior art and includes an atomization assembly, a circuit board, a circuit switch, and a connecting channel. The control component 12 is disposed on the outer

10 circumferential surface of the main body 11, and a plug 13 is provided on the control component 12. The knob 14 is rotatably mounted on the outer circumferential surface of the main body 11 and is located on the side opposite the control component 12. The cup body 15 is fixedly arranged at the lower end of the main body 11, and an atomization outlet 16 is fixedly provided at the lower end of the cup body 15. The atomization outlet 16 is

15 configured to cooperate with and fix the mist-conducting tube. The water tank 17 is disposed on the upper side of the main body 11. As shown in Figure 2, a storage groove 18 is formed on the outer circumferential surface of the water tank 17.

A revolution slide track 26 is formed on the upper side of the main body 11, and the planetary block 22 is arranged within the revolution slide track 26. The curvature of the

20 planetary block 22 matches the inner wall curvature of the revolution slide track 26. The surrounding mechanism is arranged between the water tank 17 and the planetary block 22. A lifting chute 40 is formed within the planetary block 22, and the clamping claw 42 is disposed in the lifting chute 40. The clamping claw 42 comprises a connecting portion and a fixing portion. The connecting portion of the clamping claw 42 is located within the lifting

25 chute 40, while the fixing portion of the clamping claw 42 is provided at one end of the connecting portion extending to the outside of the planetary block 22. A clamping groove 43 is formed in the fixing portion of the clamping claw 42. The opening direction of the clamping groove 43 coincides with the radial direction of the planetary block 22. The inner diameter of the clamping groove 43 matches the storage groove 18.

30 An annular array of bases 20 is arranged on the main body 11, and a worm gear 21 is

commonly fixed at the upper ends of the bases 20. The worm gear 21 is configured to enable the surrounding mechanism to drive the planetary block 22 to move. The surrounding mechanism comprises a revolution component, a limiting component, and a support component.

5 As shown in Figure 3, the limiting component comprises a limiting ring 33 and second rollers 35. As shown in Figures 5 and 6, the revolution component comprises a worm shaft 25 meshed with the worm gear 21, a motor mount 23, and a drive motor 24. The support component comprises a mobile seat 30 and first rollers 32. The motor mount 23 is fixedly mounted on the side of the planetary block 22 near the worm gear 21. The drive motor 24 is fixedly mounted on the motor mount 23. The worm shaft 25 is in power connection with the drive motor 24. The limiting ring 33 is fixedly arranged on the planetary block 22 and is sleeved around the outer side of the water tank 17. A second roller chamber 34 is formed within the limiting ring 33. The second rollers 35 are rotatably disposed within the second roller chamber 34 and are arranged in an annular array. The mobile seat 30 is embedded within the revolution slide track 26. A first roller cavity 31 is formed within the mobile seat 30. The first rollers 32 are rotatably connected between the inner wall of the first roller cavity 31 and are arranged in an arcuate array along the curvature of the mobile seat 30. When the drive motor 24 is activated, it drives the worm shaft 25 to rotate. Since the worm shaft 25 is meshed with the worm gear 21, the worm gear 21 reacts by causing the worm shaft 25 to move circumferentially. The worm shaft 25, via the motor mount 23, drives the planetary block 22 to move in the circumferential direction. The planetary block 22, in turn, drives the limiting ring 33 located on the upper side to move circumferentially around the water tank 17. Due to friction, the limiting ring 33 simultaneously drives the second rollers 35 to revolve and rotate. The planetary block 22, through the mobile seat 30, drives the first rollers 32 located on the lower side to move circumferentially. The mobile seat 30, being within the revolution slide track 26, moves in the circumferential direction and causes the first rollers 32 to roll along the track.

As shown in Figure 4, an electric push rod 41 is fixedly installed within the lifting chute 40. The upper end surface of the clamping claw 42 is fixedly mounted to the power output end of the electric push rod 41. The electric push rod 41 adopts a structure consistent with that of the prior art and drives the clamping claw 42 to move up and down by changing its

internal pressure. The lifting speed of the clamping claw 42 driven by the electric push rod 41 matches the descending speed of the helical section of the storage groove 18.

As shown in Figure 7, a telescopic groove 44 is formed within the clamping claw 42. A telescopic pressure block 45 is slidably arranged within the telescopic groove 44. A concave surface is provided at the lower end of the telescopic pressure block 45. The concave surface of the telescopic pressure block 45 is configured to match the clamping groove 43. An elastic element is disposed between the telescopic pressure block 45 and the inner wall of the telescopic groove 44.

The elastic element is a telescopic spring 46. The telescopic spring 46 utilizes its own elastic force to drive the telescopic pressure block 45 to clamp the mist-conducting tube. The concave surface at the lower end of the telescopic pressure block 45, together with the clamping groove 43, prevents the mist-conducting tube from becoming blocked due to excessive clamping, which would otherwise affect the atomization flow rate.

In operation, the medical staff inserts the main body 11 into a ward socket via the plug 13. By rotating the knob 14, they check that the device is securely and properly connected.

One end of the mist-conducting tube is sleeved onto the lower end of the atomization outlet 16. The tube is then embedded between the concave surface at the lower end of the telescopic pressure block 45 and the inner wall of the clamping groove 43. After reserving an appropriate length between the connected end and the embedded end of the mist-conducting tube, the drive motor 24 is activated, which causes the planetary block 22 to rotate circumferentially. Simultaneously, the electric push rod 41 is started, and together with the planetary block 22, it drives the clamping claw 42 to move synchronously in both the circumferential direction and the axial direction of the planetary block 22, thereby enabling the clamping claw 42 to move along the storage groove 18. During this process, the medical staff holds the mist-conducting tube with one hand and feeds the tube with the other hand, allowing the clamping claw 42 to guide the mist-conducting tube into the storage groove 18. Once the desired length is reached, the movement of the clamping claw 42 is stopped. At this point, the friction between the inner wall of the storage groove 18 and the outer surface of the mist-conducting tube prevents the tube from falling out of the storage groove 18, thus completing the tube storage operation. The other end of the mist-conducting tube can then be connected to a face mask for use.

Although the embodiments of the present invention have been illustrated and described, it should be understood by those skilled in the art that various changes, modifications, substitutions, and alterations can be made without departing from the principles and spirit of the invention. The scope of the present invention shall be defined by the appended claims and their equivalents.