

# AN ASSEMBLY PRODUCTION EQUIPMENT FOR OXYGEN HUMIDIFICATION BOTTLES

## **Field of the Invention**

5 The present invention relates to the field of oxygen humidification bottle assembly, and specifically relates to an assembly production equipment for oxygen humidification bottles.

## **Background to the Invention**

10 The oxygen humidification bottle is a crucial auxiliary component in the process of medical oxygen delivery. Its structure typically includes components such as the bottle body, bottle stopper, humidification core, inlet connector, outlet connector, and sealing gasket. During the assembly process, it is necessary to ensure that all parts are tightly connected and have good sealing performance, otherwise it will affect the safety and stability of oxygen delivery. Currently, the assembly of oxygen humidification bottles relies heavily on manual  
15 operation, which presents the following issues.

When installing the bottle body and the bottle stopper, they are usually connected using threads, and a sealing component is placed at the connection point. During the connection process, workers typically grasp the bottle body with one hand and the upper structure of the bottle cap with the other, and then rotate and tighten them with force. In a short period  
20 of time, manual operation poses no problem. However, due to the long working hours and short rest periods, workers often experience wrist pain after a day's work, indicating a high labor intensity.

Therefore, there is a need for an assembly equipment that can effectively reduce the labor intensity of workers during prolonged work, while also being cost-effective.

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## **Statement of Invention**

To address the aforementioned issues, the present invention provides an assembly and production equipment for oxygen humidification bottles.

The present invention is realized through the following technical solutions:

An assembly production equipment for oxygen humidification bottles comprises a base. The base is equipped with a placement slot, and both inner walls of the placement slot are fixedly mounted with elastic pressing pieces, which are U-shaped. One side of the base is fixedly mounted with a bracket, which is also U-shaped. The bracket is fixedly mounted with a servo motor, and the output end of the servo motor is fixedly mounted with a turntable. The bottom end of the turntable is fixedly mounted with a spring cylinder, and the bottom end of the spring cylinder is mounted with a pressure cylinder. The turntable is mounted with a connecting rod, and the bottom end of the connecting rod is fixedly mounted with a limit plate. The bottom end of the limit plate is fixedly mounted with two limit rods, and the limit plate is provided with a limit slot.

Preferably, a spring is arranged inside the spring cylinder, and a T-shaped sliding rod is slidingly connected inside the spring cylinder. The bottom end of the T-shaped sliding rod penetrates through the spring cylinder and is slidingly connected to it. The bottom end of the T-shaped sliding rod is fixedly connected to the top end of the pressure cylinder, and a toggle lever is fixedly mounted on the side wall of the pressure cylinder.

Preferably, the bottom end of the turntable is provided with a dovetail groove, which is annular in shape. A dovetail block is slidingly connected within the dovetail groove, and the bottom end of the dovetail block is fixedly connected to the top end of the connecting rod.

Preferably, the bottom end of the limit rod is arranged at an angle, the side wall at the opening of the limit slot is arranged at an angle, and the bottom end of the limit plate and the outer wall of each limit rod are both attached with a rubber layer.

Preferably, a switch, a battery pack, and a PLC controller are fixedly mounted on the side wall of the bracket, and all of them are electrically connected through wires.

Preferably, a plurality of latch teeth are uniformly fixedly mounted in a ring shape at the top of the turntable. One side of the connecting rod is fixedly mounted with a connecting frame, which is L-shaped. One side of the connecting frame is fixedly mounted with a latch block, which is U-shaped. Both ends of the latch block extend into the corresponding

two latch teeth, respectively. Pressure sensors are fixedly mounted on both sides of the latch block, and each pressure sensor is arranged in close contact with the side wall of the corresponding latch tooth.

5 Compared with existing technologies, the beneficial effects of the present invention are as follows: by setting up a pressure sensor in conjunction with a PLC controller, the tightening degree of the bottle cap can be accurately detected. When the pressure sensor detects a pressure greater than a preset threshold, the PLC controller controls the servo motor to automatically stop, avoiding situations of overtightening or under-tightening, ensuring that the components are tightly connected and have good sealing performance,  
10 and improving the stability of assembly quality. The automated tightening and assembly of the bottle body and bottle stopper are achieved through mechanical structure. Workers only need to complete the placement of the bottle body and bottle cap and the removal of finished products, without the need for manual rotation and tightening, effectively avoiding wrist soreness caused by long-term repetitive movements and significantly reducing labor  
15 intensity. It is suitable for long-term continuous operation, with a simple structural design, no need for complex precision machining components, low manufacturing costs, and easy large-scale promotion and application.

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

20 Figure 1 is a first perspective view of the structure of the present invention;

Figure 2 is a perspective view of the structure of the present invention from a second perspective;

Figure 3 is an enlarged schematic diagram of A in the structural diagram 1 of the present invention;

25 Figure 4 is an enlarged schematic diagram of B in the structural diagram 2 of the present invention;

Figure 5 is an enlarged schematic diagram of C in structural diagram 2 of the present invention.

In the figure: base 1, placement slot 2, elastic pressing piece 3, bracket 4, servo motor 5, turntable 6, spring cylinder 7, pressing cylinder 8, spring 9, T-shaped sliding rod 10, latch 11, latch block 12, pressure sensor 13, connecting frame 14, connecting rod 15, limit slot 16, limit rod 17, limit plate 18, dovetail slot 19, dovetail block 20.

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### **Detailed Description**

The present invention will be further described in detail below in conjunction with the accompanying drawings and specific embodiments:

As shown in Figures 1, 2, 3, 4, and 5, an assembly production equipment for oxygen humidification bottles comprises a base 1. The base 1 is equipped with a placement slot 2. Both inner walls of the placement slot 2 are fixedly mounted with elastic pressing pieces 3, which are U-shaped. One side of the base 1 is fixedly mounted with a bracket 4, which is also U-shaped. The bracket 4 is fixedly mounted with a servo motor 5. The output end of the servo motor 5 is fixedly mounted with a turntable 6. The bottom end of the turntable 6 is fixedly mounted with a spring cylinder 7. The bottom end of the spring cylinder 7 is mounted with a pressure cylinder 8. The turntable 6 is mounted with a connecting rod 15. The bottom end of the connecting rod 15 is fixedly mounted with a limit plate 18. The bottom end of the limit plate 18 is fixedly mounted with two limit rods 17. The limit plate 18 is provided with a limit slot 16.

Inside the spring cylinder 7, a spring 9 is arranged, and a T-shaped sliding rod 10 is slidingly connected. The bottom end of the T-shaped sliding rod 10 penetrates through the spring cylinder 7 and is slidingly connected to it. The bottom end of the T-shaped sliding rod 10 is fixedly connected to the top end of the pressure cylinder 8, and a toggle lever is fixedly mounted on the side wall of the pressure cylinder 8.

The bottom end of the turntable 6 is provided with a dovetail groove 19, which is annular in shape. A dovetail block 20 is slidingly connected within the dovetail groove 19, and the bottom end of the dovetail block 20 is fixedly connected to the top end of the connecting rod 15.

The bottom end of the limit rod 17 is arranged at an angle, the side wall at the opening of

the limit slot 16 is arranged at an angle, and the bottom end of the limit plate 18 and the outer wall of each limit rod 17 are both attached with a rubber layer.

A switch, a battery pack, and a PLC controller are fixedly installed on the side wall of bracket 4, and all of them are electrically connected through wires.

5 The top of turntable 6 is uniformly fixed with multiple latch teeth 11 in a circular manner. One side of the connecting rod 15 is fixedly mounted with a connecting frame 14, which is L-shaped. One side of the connecting frame 14 is fixedly mounted with a latch block 12, which is U-shaped. The two ends of the latch block 12 extend into the space between the corresponding two latch teeth 11, respectively. Both sides of the latch block 12 are fixedly  
10 mounted with pressure sensors 13, each of which is arranged in close contact with the side wall of the corresponding latch tooth 11.

U-shaped elastic pressing pieces 3 are fixedly installed on the inner walls on both sides of slot 2 to clamp and secure the bottle body. A spring 9 is housed inside the spring cylinder 7, and a T-shaped sliding rod 10 is slidingly connected to it. The bottom end of the T-  
15 shaped sliding rod 10 penetrates through the spring cylinder 7 and is fixedly connected to a pressure cylinder 8. A toggle lever 9 is fixed to the side wall of the pressure cylinder 8. The elastic force of the spring 9 allows the pressure cylinder 8 to always fit snugly against the top of the flowmeter housing mounted on the bottle cap, ensuring stable pressure transmission. The bottom end of the limit plate 18 is fixed with two obliquely arranged limit  
20 rods 17, and a limit slot 16 with an obliquely opened center is provided. Rubber layers are attached to the bottom end of the limit plate 18 and the outer walls of the limit rods 17, which not only facilitates the quick placement and positioning of the bottle cap but also prevents scratching of the component housings. All electrical components are electrically connected through wires to achieve automated control.

25 Working process: Firstly, insert the oxygen humidification bottle into the placement slot 2, and use the elastic force of the U-shaped elastic pressing piece 3 to clamp and fix the bottle. Next, align the bottle cap and its components with the limit slot 16, quickly place them through the inclined structure at the opening of the limit slot 16, and the limit rod 17 further positions the bottle cap. At the same time, the pressure cylinder 8 fits against the

top of the bottle cap under the elastic force of the spring 9;

The operator presses switch 21 to activate servo motor 5 through PLC controller 23.

5 Servo motor 5 drives turntable 6 to rotate, which, through connecting rod 15, drives limit plate 18 and the bottle cap to rotate synchronously. Meanwhile, pressure cylinder 8, under the pressure of spring 9, always presses the bottle cap tightly. During the rotation and tightening of the bottle cap, block 12 rotates synchronously with connecting rod 15, and pressure sensors 13 on both sides of block 12 generate pressure between them and latch 11. As the tightening degree increases, the pressure gradually increases;

10 When the pressure sensor 13 detects a pressure value greater than the preset threshold, it transmits a signal to the PLC controller 23, which then controls the servo motor 5 to stop working. The operator removes the assembled oxygen humidification bottle, and subsequently, the PLC controller 23 controls the servo motor 5 to automatically reset, completing one assembly process and enabling the next assembly operation.

15 The basic principles, main features, and advantages of the present invention are shown and described above. Those skilled in the art should understand that the present invention is not limited by the above embodiments. The embodiments and descriptions in the specification only illustrate the principles of the present invention. Without departing from the spirit and scope of the present invention, various changes and improvements can be made to the present invention, and these changes and improvements fall within the scope  
20 of the present invention as claimed. The scope of protection of the present invention is defined by the appended claims and their equivalents.