Fig. 2 is a view schematically illustrating an arrangement of a supply unit of the cleaning device.

(a) and (b) of Fig. 3 are each a flow chart depicting a method of cleaning by the cleaning device.

Fig. 4 is a view schematically illustrating an arrangement of a portion of a cleaning device in accordance with Embodiment 2 of the present invention.

Description of Embodiments

[0014]

The following description will discuss embodiments of the present invention. The present invention is, however, not limited to the embodiments below in details. Note that, for convenience of explanation, members having an identical function(s) in the following embodiments are given an identical reference sign, and a repeated description of those members is omitted as appropriate.

[0015]

Embodiment 1

The following will discuss Embodiment 1 of the present invention, with reference to Figs. 1 to 3. Fig. 1 is a view schematically illustrating an arrangement of a cleaning device 100 in accordance with Embodiment 1 of the present invention. Fig. 2 is a view schematically illustrating an arrangement of a supply unit 170 of the cleaning device 100.

each of the nozzle 112, is flexible as described above. This allows the flow path to avoid having a sharper curve, as compared with a flow path made of a fixed pipe. This consequently makes it possible to prevent a trouble due to erosion of the flow path of the cleaning liquid from the main shaft 140 to each of the nozzle 112. In addition, because the flow path of the cleaning liquid has flexibility, the distance between the wall surface and the nozzle 112 can be easily adjusted.

[0030]

(Second cleaning unit)

The second cleaning unit 120 is configured to clean the cylindrical-body lateral inner wall surface 504a. The second cleaning unit 120 includes the nozzle frame 121, nozzles 122, a nozzle header 123, and a nozzle hose 124.

[0031]

The nozzles 122 are fixed to the nozzle frame 121 so as to be located along a height direction of the cylindrical-body lateral inner wall surface 504a. It is only necessary to provide the nozzles 122 at different positions, respectively, in the height direction of the bell jar 500 which is fixed. For example, the nozzles 122 can be provided in a line along the shape in the height direction of the cylindrical-body lateral inner wall surface 504a. The nozzles 122 are caused to discharge the cleaning liquid at a discharge pressure at

the nozzle frames 111 and 121, and caused to rotate and move up and down by the driving section 160 (later described). This causes respective cleaning positions of the nozzles 112 and 122 to move via the nozzle frames 111 and 121.

[0041]

The main shaft 140 is a hollow shaft. The main shaft 140 contains therein a plurality of nozzle hoses 174 (nozzle hoses 114 and 124) each of which serves as the flow path of the cleaning liquid to each of the nozzles 112 and 122. The main shaft 140 includes a shaft cover (not illustrated). The shaft cover makes it possible to prevent the cleaning water from coming in contact with the surface of the main shaft 140 and also to prevent the cleaning liquid from flowing into the driving section 160 from the inside of the bell jar 500 during cleaning of the inner wall surface 502. Further, the shaft cover is separated into an upper part and a lower part. The upper part is formed so as to cover a portion of the lower part. The main shaft 140 is provided with a gland packing (not illustrated) between the upper part and the lower part. The gland packing prevents the cleaning liquid from flowing into the main shaft 140.

[0042]

Further, the cleaning device 100 can include a drier nozzle, which sends hot air or the like into the bell jar 500

move up and down via a speed reducer. The rotating motor 162 causes the main shaft 140 to rotate, by use of a speed reducer and a roller chain.

[0046]

(Supply unit)

The supply unit 170 is configured to supply, to each of the nozzles 112 and 122 via the nozzle headers 113 and 123, the cleaning water which has been delivered from the cleaning liquid tank 300 by the high pressure pump 200. The supply unit 170 includes a valve header support 171, a valve header 172, high pressure valves 173, and the nozzle hoses 174, as illustrated in Fig. 2.

[0047]

The valve header support 171 is a horizontally rotatable support stand, and rotates in synchronization with rotation of the main shaft 140. On the valve header support 171, the valve header 172 is provided. To the valve header 172, the high pressure valves 173 are attached. The valve header 172 switches a high pressure valve 173 to another high pressure valve 173, so that the cleaning water is supplied to predetermined nozzles 112 and 122.

[0048]

The nozzle hoses 174 (flow paths of cleaning liquid) are flexible. Since the nozzle hoses 174 are flexible, the nozzle hoses 174 can absorb rotation and up-and-down movement

the first state in which the first nozzles of the first cleaning unit are put close to the upper-part curved inner wall surface and (ii) the second state in which the second nozzles of the second cleaning unit are put close to the cylindrical-body lateral inner wall surface.

[0083]

In the above arrangement, the inner wall surface of the bell jar is cleaned by moving the bell jar, in at least one of the first state in which the first nozzles are put close to the inner wall surface and the second state in which the second nozzles are put close to the inner wall surface. This makes it possible to clean all over the inner wall surface while the nozzles are kept close to the inner wall surface. Therefore, it is possible to ensure a sufficient impingement pressure, at which the cleaning liquid impinges on the inner wall surface, even in a case where the discharge pressure of the cleaning liquid is kept suppressed.

Reference Signs List

[0084]

100 Cleaning device

110 First cleaning unit

120 Second cleaning unit

112, 122 Nozzle

114, 124 Nozzle hose (flow path of cleaning liquid)