

CONTAINER FOR RETICLE

BACKGROUND OF INVENTION

1. FIELD OF INVENTION

The present invention relates to a container for a reticle and, more particularly, to a container for containing a reticle and allowing air circulation to remove hazardous substances that could otherwise damage the reticle.

2. RELATED PRIOR ART

The sizes of electronic products are getting smaller, the operative frequencies higher, and the performance better. Accordingly, the sizes of chips used in the electronic products are getting smaller, and the performance better. The wiring in the chips is getting finer to include more circuits and elements. The width of the wiring has been reduced to 90 to 45 nanometers from 0.25 micrometers. Photolithography is the key to the success in minimizing the width of the wiring and the making of wafers. In the photolithography, a scanner and reticles are used. The throughput would severely be affected should there be particles or moisture on the surfaces of the reticles or wafers. The photolithography must therefore be executed in a white room.

To further protect the reticles or wafers from the particles or moisture, there have been devised containers such as those disclosed in US Patent Nos. 4532970 and 4534389.

It is however inevitable to use solvent during the washing, making, sputtering and/or photolithography of the reticles or wafers. The

1 containers also release hazardous substances. The hazardous substances
2 include sulfide such as SO_4^{2-} released from the containers, NH_4^+ left after
3 the lithograph or released from pattern materials of the reticles and
4 chemicals left after the washing of the reticles. When the reticles are
5 washed and stored for some time, there will be NH_4^+ and SO_4^{2-} for
6 example. When the reticles are later exposed to ultraviolet light in the
7 photolithography, the NH_4^+ will react with SO_4^{2-} , thus producing
8 $(\text{NH}_4)_2\text{SO}_4$.

9 The foregoing problems are often caused by inadequate air-tightness
10 of the containers. The particles and the moisture come into the
11 containers from the environment. The hazardous substances are
12 released from the containers or left after the making or washing of the
13 reticles or wafers. Therefore, the hazardous substances are attached to
14 the reticles or aluminum protective frames for the reticles. It is
15 inevitable that SO_4^{2-} is left on the aluminum protective frames.

16 To improve the air-tightness, there is provided an internal cover for
17 such a container. The internal cover is made of stainless steel. The
18 internal cover is not only used to prevent static discharge but also absorb
19 sulfide released from plastic. Furthermore, air is dispersed from the
20 containers by introducing inert gas into the containers. Examples of
21 such containers can be found in Taiwanese Patent Nos. TW223680 and
22 TWI262164. However, the containers are expensive for requiring
23 designs of venting systems, precise molding and complicated assembling.
24 Moreover, the inert gas vents from the containers eventually, and particles
25 and moisture eventually enters the containers.

26 The present invention is therefore intended to obviate or at least

1 alleviate the problems encountered in prior art.

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3 **SUMMARY OF INVENTION**

4 It is the primary objective of the present invention to provide a
5 container for containing a reticle and allowing air circulation to remove
6 hazardous substances that could otherwise damage the reticle.

7 To achieve the primary objective of the present invention, a container
8 includes a base for supporting a flat object, a covering device for covering
9 the flat object on the base, at least one air inlet unit in communication
10 with the container and at least one air outlet unit in communication with
11 the container. Thus, air can be pumped into the container via the air
12 inlet unit and drawn from the container via the air outlet unit.

13 Other objectives, advantages and features of the present invention
14 will become apparent from the following description referring to the
15 attached drawings.

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17 **BRIEF DESCRIPTION OF DRAWINGS**

18 The present invention will be described via detailed illustration of the
19 preferred embodiment referring to the drawings.

20 Fig. 1 is a perspective view of a container according to the preferred
21 embodiment of the present invention.

22 Fig. 2 is an exploded view of the container shown in Fig. 1.

23 Fig. 3 is another exploded view of the container shown in Fig. 2.

24 Fig. 4 is a cross-sectional view of the container shown in Fig. 1.

25 Fig. 5 is a perspective view of a machine and two containers as that
26 shown in Fig. 1.

1 Fig. 6 is a perspective partial view of the machine shown in Fig. 5.

2 Fig. 7 is a perspective view of the container shown in Fig. 1 located
3 on the machine shown in Fig. 6.

4 Fig. 8 is a cross-sectional view of the container and the machine
5 shown in Fig. 7.

6 Fig. 9 is a partial view of the container and the machine of Fig. 8.

7 Fig. 10 is another partial view of the container and the machine
8 shown in Fig. 8.

9 Fig. 11 is a cross-sectional view of the container and the machine in
10 another position than that shown in Fig. 8.

11 Fig. 12 is a partial view of the container and the machine shown in
12 Fig. 11.

13 Fig. 13 is another partial view of the container and the machine
14 shown in Fig. 11.

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16 **DETAILED DESCRIPTION OF PREFERRED EMBODIMENT**

17 Referring to Figs. 1 through 4, a reticle 50 can be disposed in a
18 container 1 according to the preferred embodiment of the present
19 invention. The container 1 includes a base 10, a covering device 2, an
20 air inlet unit 3 and an air outlet unit 4. Air can be circulated through the
21 air inlet unit 3 and the air outlet unit 4 to clean the container 1 of
22 hazardous substances that could otherwise damage the reticle 50.

23 The base 10 includes two lateral raised portions 15 formed thereon
24 and a middle raised portion 16 formed thereon between the lateral raised
25 portions 15. Each of the raised portions 15 and 16 is formed with two
26 tabs for restraining the reticle 50. Each of the lateral raised portions 15

1 includes a space defined therein and apertures 150 in communication with
2 the space. The base 10 includes at least one tube 11 extended from a
3 lower side and in communication with at least one of the lateral raised
4 portions 15. A nut 12 is embedded in the tube 11.

5 The air inlet unit 30 is a substantially a check valve unit including a
6 valve housing 30, a valve 32, a spring 35, a ring 36, a filter 37 and an
7 annular seal 37. The valve housing 30 includes a thread 303 formed on
8 an external side and an annular rib 300 formed on an internal side. The
9 thread 303 is engaged with the nut 12. The annular rib 300 divides the
10 valve housing 30 into a first section 301 and a second section 302.

11 The valve 32 includes a first section 33 and a second section 34 with
12 a smaller diameter than that of the first section 33. The valve 32 is
13 movably disposed in the valve housing 30. The first section 33 of the
14 valve 32 is disposed in the first section 301 of the valve housing 30 while
15 the second section 34 of the valve 32 is disposed in the second section
16 302 of the valve housing 30. The ring 36 is provided on the second
17 section 34 of the valve 32.

18 The spring 35 is disposed in the first section 301 of the valve housing
19 30 and compressed between the annular rib 300 and the first section 33 of
20 the valve 32. The spring 35 causes the second section 34 of the valve 32
21 to abut the annular rib 300 and therefore close the air inlet unit 3.

22 The annular seal 38 and the filter 37 are disposed in the second
23 section 302 of the valve housing 30.

24 The covering device 2 includes an external cover 20 and an internal
25 cover 25. The external cover 20 is made of plastic for example. A tube
26 23 is formed on the external cover 20. A nut 24 is embedded in the tube

1 23. The tube 23 is located near an end of a diagonal line while the tube
2 11 is located near an opposite end of the diagonal line. Thus, air can
3 travel for an adequate distance in the container 1 to remove an adequate
4 amount of the hazardous substances from the container 1. A recorder 22
5 of an infrared frequency identification ("RFID") system is attached to the
6 external cover 20.

7 The air outlet unit 4 is substantially a check valve unit including a
8 valve housing 40, a valve 42, a spring 45, a ring 46, a filter 47 and an
9 annular seal 48. The valve housing 40 includes a thread 403 formed on
10 an external side and an annular rib 400 formed on an internal side. The
11 thread 403 is engaged with the nut 24. The annular rib 400 divides the
12 valve housing 40 into a first section 401 and a second section 402.

13 The valve 44 includes a first section 43 and a second section 44 with
14 a smaller diameter than that of the first section 43. The valve 42 is
15 movably disposed in the valve housing 40. The first section 43 of the
16 valve 42 is disposed in the first section 401 of the valve housing 40 while
17 the second section 44 of the valve 42 is disposed in the second section
18 402 of the valve housing 40. The ring 46 is provided on the second
19 section 44 of the valve 42.

20 The spring 45 is disposed in the first section 401 of the valve housing
21 40 and compressed between the annular rib 400 and the first section 43 of
22 the valve 42. The spring 45 causes the second section 44 of the valve 42
23 to abut the annular rib 400 and therefore close the air outlet unit 4.

24 The annular seal 48 and the filter 47 are disposed in the second
25 section 402 of the valve housing 40.

26 The internal cover 25 is made of metal for example and used as a

1 shield against static discharge. The internal cover 25 includes an
2 aperture 250 defined therein. The internal cover 25 is attached to the
3 external cover 20 so that a gap 28 is defined between them. Air can
4 travel into the gap 28 from the interior of the internal cover 25 through
5 the apertures 250.

6 Referring to Fig. 5, two containers 2 are located on a machine 6 that
7 may be a reticle closet, a reticle inflation closet, a reticle transportation
8 device or an loading or unloading unit of a processing device. The
9 machine 6 includes carriers 60 for supporting the containers 1 and air
10 circulators 70 for causing air to travel through the containers 2 and
11 remove some of the hazard substances from the containers 2.

12 Referring to Fig. 6, each of the carriers 60 includes a workbench 61
13 for supporting the containers 2, positioning elements 62 attached to the
14 workbench 61 for positioning a container 1, a detector 64 attached to the
15 workbench 61 for detecting the container 1 and a reader 63 of the RFID
16 system for reading information recorded in the recorder 22 attached to the
17 container 1.

18 Each of the air-circulating devices 70 includes an air-pumping unit 80
19 and an air-drawing unit 90. The air-pumping unit 80 is a substantially a
20 check valve unit including a valve housing 81, a valve 83, a spring 86 and
21 a ring 87. The valve housing 81 includes a thread on an external side
22 and an annular rib 810 on an internal side. The thread is driven in a
23 screw hole defined in the workbench 61. The annular rib 810 divides
24 the valve housing 81 into a first section 811 and a second section 812.

25 The valve 83 includes a first section 84, a second section 85 with a
26 smaller diameter than that of the first section 84 and a stem 88 extended

1 from the first section 84. The valve 83 is movably disposed in the valve
2 housing 81. The first section 84 of the valve 83 is disposed in the first
3 section 811 of the valve housing 81 while the second section 85 of the
4 valve 83 is disposed in the second section 812 of the valve housing 81.
5 The ring 87 is provided on the second section 85 of the valve 83.

6 The spring 86 is disposed in the first section 811 of the valve housing
7 81 and compressed between the annular rib 810 and the first section 84 of
8 the valve 83. The spring 86 causes the second section 85 of the valve 83
9 to abut the annular rib 810 and therefore close the air-pumping unit 80.

10 The air-drawing unit 90 is a substantially a check valve unit including
11 a valve housing 91, a valve 93, a spring 96 and a ring 97. The valve
12 housing 91 includes a thread on an external side and an annular rib 910
13 on an internal side. The thread of the valve housing 91 is driven in
14 another screw hole in the workbench 61. The annular rib 910 divides
15 the valve housing 91 into a first section 911 and a second section 912.

16 The valve 93 includes a first section 94, a second section 95 with a
17 smaller diameter than that of the first section 94 and a stem 98 extended
18 from the first section 94. The valve 93 is movably disposed in the valve
19 housing 91. The first section 94 of the valve 93 is disposed in the first
20 section 911 of the valve housing 91 while the second section 95 of the
21 valve 93 is disposed in the second section 912 of the valve housing 91.
22 The ring 97 is provided on the second section 95 of the valve 93.

23 The spring 96 is disposed in the first section 911 of the valve housing
24 91 and compressed between the annular rib 910 and the first section 94 of
25 the valve 93. The spring 96 causes the second section 95 of the valve 93
26 to abut the annular rib 910 and hence close the air-drawing unit 90.

1 Referring to Figs. 7 through 10, a container is about to be located on
2 a carrier 60. The rod 88 is away from the valve 32 so that both of the
3 air-pumping unit 80 and the air inlet unit 3 are closed because of the
4 springs 35 and 86, respectively. The rod 98 is away from the valve 42
5 so that both of the air-drawing unit 90 and the air outlet unit 4 are closed
6 by the springs 45 and 96, respectively.

7 Referring to Figs. 11 through 13, the container is located on the
8 carrier 60. The rod 88 abuts the valve 32 so that both of the air-pumping
9 unit 80 and the air inlet unit 3 are open. Thus, air can be pumped into
10 the container 1. The air travels in the container 1 and carries some of
11 the hazardous substances. The rod 98 abuts the valve 42 so that both of
12 the air-drawing unit 90 and the air outlet unit 4 are open. Thus, the air
13 can be drawn from the container 1. The air removes the hazardous
14 substances from the container 1.

15 The present invention has been described via the detailed illustration
16 of the preferred embodiment. Those skilled in the art can derive
17 variations from the preferred embodiment without departing from the
18 scope of the present invention. Therefore, the preferred embodiment
19 shall not limit the scope of the present invention defined in the claims.

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CLAIMS

1. A container comprising:

a base for supporting a flat object;

a covering device for covering the flat object on the base;

at least one air inlet unit in communication with the container so that air can be pumped into the container via the air inlet unit; and

at least one air outlet unit in communication with the container so that the air can be drawn from the container via the air outlet unit.

2. The container according to claim 1, wherein the air inlet unit comprises a check valve.

3. The container according to claim 2, wherein the check valve comprises:

a valve housing attached to one of the base and covering device;

a valve movably disposed in the valve housing; and

a spring for biasing the valve to shut the valve housing.

4. The container according to claim 3, wherein the valve housing comprises an annular rib formed on an internal side to divide the housing into a first section and a second section, and the valve comprises a first section disposed in the first section of the valve housing and a second section disposed in the second section of the valve housing, and the spring is compressed between the annular rib of the valve housing and the first section of the valve to cause the second section of the valve to abut the annular rib.

5. The container according to claim 4, wherein the check valve comprises a ring provided on the second section of the valve for abutting the annular rib of the valve housing in a sealing manner.

- 1 6. The container according to claim 3, wherein the check valve
2 comprises a filter provided between the base and the second section
3 of the valve housing.
- 4 7. The container according to claim 6, wherein the check valve
5 comprises a seal provided between the filter and the second section of
6 the valve housing.
- 7 8. The container according to claim 3, wherein the base comprises a tube
8 for receiving the valve housing.
- 9 9. The container according to claim 8 comprising a nut embedded in the
10 tube, wherein the valve housing comprises a thread formed thereon
11 and engaged with the nut.
- 12 10. The container according to claim 1, wherein the air outlet unit
13 comprises a check valve.
- 14 11. The container according to claim 10, wherein the check valve
15 comprises:
16 a valve housing attached to one of the base and covering device;
17 a valve movably disposed in the valve housing; and
18 a spring for biasing the valve to shut the valve housing.
- 19 12. The container according to claim 11, wherein the valve housing
20 comprises an annular rib formed on an internal side to divide the
21 housing into a first section and a second section, and the valve
22 comprises a first section disposed in the first section of the valve
23 housing and a second section disposed in the second section of the
24 valve housing, and the spring is compressed between the annular rib
25 of the valve housing and the first section of the valve to cause the
26 second section of the valve to abut the annular rib.

- 1 13. The container according to claim 12, wherein the check valve
2 comprises a ring provided on the second section of the valve for
3 abutting the annular rib of the valve housing in a sealing manner.
- 4 14. The container according to claim 11, wherein the check valve
5 comprises a filter provided between the base and the second section
6 of the valve housing.
- 7 15. The container according to claim 14, wherein the check valve
8 comprises a seal provided between the filter and the second section of
9 the valve housing.
- 10 16. The container according to claim 11, wherein the base comprises a
11 tube for receiving the valve housing of the check valve.
- 12 17. The container according to claim 16 comprising a nut embedded in
13 the tube, wherein the valve housing comprises a thread formed
14 thereon and engaged with the nut.

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