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### AUTOMATIC CONNECTOR FOR SUPPLYING UTILITY

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#### Abstract

Proposed is an automatic coupler for supplying a utility. The automatic coupler includes a first coupling member provided on any one of a utility supplying end or a utility receiving end, and a first valve body provided in the first coupling member and provided with a first check ball elastically supported, a second coupling member provided on the other one of the utility supplying end or the utility receiving end and coupled to the first coupling member, and a second valve body provided in the second coupling member and provided with a second check ball elastically supported. The second valve body includes a main body, a first floating body, and a second floating body elastically supported to the first floating body, the second floating body elastically supporting the second check ball.

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## Background/Summary

### CROSS REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority to Korean Patent Application No. 10-2024-0024980, filed Feb. 21, 2024, the entire contents of which are incorporated herein for all purposes by this reference.

### BACKGROUND OF THE INVENTION

#### Field of the Invention

[0002] The present disclosure relates to an automatic coupler for connecting a pneumatic utility.

#### Description of the Related Art

[0003] Generally, various utilities such as air, nitrogen, vacuum, pure water (DW), power, and so on are required in a semiconductor manufacturing process, and it is very important to smoothly supply such utilities in the manufacturing process.

[0004] For example, in a packaging process of a semiconductor device, a unit semiconductor device is electrically tested after an assembly is completed by using a tester and a handler. The handler performs a mechanical operation by receiving an electrical signal, connects the semiconductor device to a contactor connected to the tester, and tests electrical characteristics of the semiconductor device. Furthermore, the handler classifies whether the semiconductor device is defective on the basis of the test result, and then unloads the semiconductor device to a semiconductor package carrier such as a tube or a tray.

### DOCUMENT OF RELATED ART

[0005] (Patent Document 1) Korean Patent Application Publication No. 10-2000-0015678 (published on Mar. 15, 2000)

### SUMMARY OF THE INVENTION

[0006] An objective of the present disclosure is to provide an automatic coupler for supplying a utility, the automatic coupler being configured such that a leak between a utility supplying end for supplying a utility and a utility receiving end is prevented from occurring and a pneumatic connection is capable of being stably realized.

[0007] In order to achieve the objective of the present disclosure, there is provided an automatic coupler for supplying a utility, the automatic coupler including: a first coupling member provided on any one of a utility supplying end or a utility receiving end; a first valve body provided in the first coupling member and provided with a first check ball elastically supported, to perform an opening and closing of a flow path by the first check ball; a second coupling member provided on the other one of the utility supplying end or the utility receiving end and configured to be coupled to the first coupling member; and a second valve body provided in the second coupling member and provided with a second check ball elastically supported, to perform an opening and closing of a flow path by the second check ball, wherein the second valve body includes: a main body; a first floating body elastically supported to the main body; and a second floating body elastically supported to the first floating body so that a portion of the second floating body protrudes outside the first floating body, the second floating body elastically supporting the second check ball so that a portion of the second check ball protrudes outside the first floating body.

[0008] Preferably, the second valve body may be provided such that the second floating body protrudes by a predetermined height with respect to a contact surface of the first floating body in contact with the first valve body, and the second check ball may be provided to protrude higher than the height of the second floating body.

[0009] Preferably, the automatic coupler may further include a sealing member provided on at least

one of two contact surfaces of the first valve body and the second valve body facing each other for maintaining airtightness.

[0010] Preferably, the automatic coupler may further include: a first elastic body elastically supporting the main body and the first floating body; a second elastic body elastically supporting the first floating body and the second floating body; and a third elastic body elastically supporting the second floating body and the second check ball, wherein an elastic modulus of the first elastic body may be larger than an elastic modulus of the second elastic body, and the elastic modulus of the second elastic body may be larger than an elastic modulus of the third elastic body.

[0011] Preferably, the second valve body may further include a valve stem fixed to the second floating body to support the third elastic body. In the automatic coupler for supplying the utility of the present disclosure, the automatic coupler includes: the first coupling member provided on any one of the utility supplying end or the utility receiving end; the first valve body provided in the first coupling member and provided with the first check ball elastically supported, to perform the opening and closing of the flow path by the first check ball; the second coupling member provided on the other one of the utility supplying end or the utility receiving end and coupled to the first coupling member; and the second valve body provided in the second coupling member and provided with the second check ball elastically supported, to perform the opening and closing of the flow path by the second check ball, wherein the second valve body includes: the main body; the first floating body elastically supported to the main body; and the second floating body elastically supported to the first floating body so that the portion of the second floating body protrudes outside the first floating body, the second floating body elastically supporting the second check ball so that the portion of the second check ball protrudes outside the first floating body. Therefore, there is an effect of maintaining a stable pneumatic connection state by minimizing the possibility of a leak that may occur when the two valve bodies are connected to each other.

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## Description

### BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The above and other objectives, features, and other advantages of the present disclosure will be more clearly understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

[0013] FIG. 1A and FIG. 1B are perspective views respectively illustrating a separated state and a connected state of an automatic coupler for supplying a utility according to an embodiment of the present disclosure;

[0014] FIG. 2 is a cross-sectional view illustrating the automatic coupler for supplying the utility according to an embodiment of the present disclosure; and

[0015] FIG. 3 to FIG. 6 are cross-sectional views illustrating a connection process of the automatic coupler for supplying the utility according to an embodiment of the present disclosure.

### DETAILED DESCRIPTION OF THE INVENTION

[0016] Specific structures and functions stated in the following embodiments of the present disclosure are exemplified to illustrate embodiments according to the spirit of the present disclosure and the embodiments according to the spirit of the present disclosure can be achieved in various ways. Furthermore, the present disclosure should not be construed as being limited to the following embodiments and should be construed as including all changes, equivalents, and replacements included in the spirit and scope of the present disclosure. Hereinafter, the present disclosure will be described in detail with reference to the accompanying drawings.

[0017] FIG. 1A and FIG. 1B are perspective views respectively illustrating a separated state and a connected state of an automatic coupler for supplying a utility according to an embodiment of the present disclosure.

[0018] Referring to FIG. 1A and FIG. 1B, an automatic coupler **1** for supplying a utility according to an embodiment of the present disclosure includes a first coupling member **110**, a first valve body **120**, a second coupling member **210**, and a second valve body **220**.

[0019] The first coupling member **110** and the second coupling member **210** are respectively provided at a utility receiving end and a utility supplying end, and may include respective coupling guide members in female and male forms. In the present embodiment, as the coupling guide members, a guide arm **211** that protrudes in a coupling direction from the second coupling member **210** and a guide groove **111** which is formed in the first coupling member **110** corresponding to the guide arm **211** and into which the guide arm **211** is inserted are illustrated. Such coupling guide members may be modified in various forms within a range in which the first coupling member **110** and the second coupling member **210** are capable of being coupled to each other. Meanwhile, although not illustrated, a separate locking member capable of mechanically fixing or releasing a coupling state of the first coupling member **110** and the second coupling member **210** may be added.

[0020] The first valve body **120** is provided in a first flow path **112** of the first coupling member **110**, is provided with a first check ball **121** that is elastically supported, and the first flow path **112** is opened and closed by the first check ball **121**. Preferably, the first check ball **121** is elastically supported within the first valve body **120** such that at least a portion of the first check ball **121** protrudes outside the first valve body **120**.

[0021] The second valve body **220** is provided in a second flow path **212** of the second coupling member **210**, is provided with a second check ball **221** that is elastically supported, and the second flow path **212** is opened and closed by the second check ball **221**. Preferably, the second check ball **221** is elastically supported within the second valve body **210** such that at least a portion of the second check ball **221** protrudes outside the second valve body **220**.

[0022] When the first coupling member **110** and the second coupling member **210** are in a state in which the first valve body **120** and the second valve body **220** are separated from each other, an air pressure is blocked by the check balls **121** and **221** of each of the first and second valve bodies **120** and **220**. Meanwhile, when the first coupling member **110** and the second coupling member **210** are coupled to each other, the check balls **121** and **221** of each of the first and second valve bodies **120** and **220** are pushed inward, and the utility (air pressure) supplying end and the utility (air pressure) receiving end are connected to each other.

[0023] Particularly, in the present disclosure, since a contact process of the first valve body **120** and the second valve body **220** has two stages, so that the possibility of a leak that may occur when the first valve body **120** and the second valve body **220** are connected to each other may be minimized.

[0024] Hereinafter, a configuration of each valve body that is a main component of the present disclosure will be described in detail with reference to the drawings. FIG. 2 is a cross-sectional view illustrating the automatic coupler for supplying the utility according to an embodiment of the present disclosure.

[0025] Referring to FIG. 2, the second valve body **220** includes the second check ball **221**, a main body **222**, a first floating body **223**, and a second floating body **224**.

[0026] The main body **222** is formed in a hollow shape, forms the main external appearance of the second valve body **220**, and is assembled with the second coupling member **210**. The main body **222** is provided with a first elastic body **S1** that elastically supports the first floating body **223**, a first locking step **222a** that is bent in an inner diameter direction is provided at the lower end of the main body **222**, and the first floating body **223** which is inserted into the main body **222** and which is elastically supported on the first elastic body **S1** has the lower end portion supported on the first locking body **222a**. In the present embodiment, the second flow path **212** is provided inside the first floating body **223**.

[0027] The second floating body **224** is inserted into the first floating body **223** and is elastically supported by a second elastic body **S2**, a second locking step **222a** supporting the second check

ball **221** is provided on the opening end outside the flow path, and the diameter of an opening portion on which the second locking step **222a** is formed is smaller than the diameter of the second check ball **221**.

[0028] Such a second floating body **224** is provided such that the second floating body **224** is elastically supported on the first floating body **223** by the second elastic body **S2** so that a portion of the second floating body **224** protrudes by a predetermined height **d1** outside the first floating body **223**. Furthermore, the second floating body **224** is provided with a third elastic body **S3** such that the second check ball **221** is elastically supported so that a portion of the second check ball **221** protrudes outside the first floating body **223**.

[0029] Preferably, the second floating body **224** further includes a first sealing member **225** for maintaining airtightness on a contact surface which faces and which is in contact with the first valve body **120**. For example, such a first sealing member **225** may be provided as a well-known O-ring. Meanwhile, in the present embodiment, it is exemplified that the first sealing member **225** is provided in the second floating body **224**, but the first sealing member **225** may be provided around the opening end of the first floating body **223** and may realize airtightness with the first valve body **120**.

[0030] In such a second valve body **220**, the first floating body **223** protrudes by the predetermined height **d1** on the basis of the contact surface of the first floating body **223** in contact with the first valve body **120**. In addition, the second check ball **221** protrudes by a predetermined height **d2** that is higher than the protrusion height **d1** of the first floating body **223** ( $d1 < d2$ ).

[0031] Preferably, the second valve body **220** further includes a first valve stem **226** which is fixed to the first floating body **223** and which is disposed on the flow path so as to support a third elastic body **S3**, and further includes a first guide stem **226a** which extends from the first valve stem **226** and which is inserted into a portion of the third elastic body **S3**.

[0032] Preferably, the first elastic body **S1** has an elastic modulus larger than the elastic modulus of the second elastic body **S2**, and the second elastic body **S2** has an elastic modulus larger than the elastic modulus of the third elastic body **S3**. Therefore, when the second valve body **220** and the first valve body **120** are brought into contact with each other, the third elastic body **S3**, the second elastic body **S2**, and the second check ball **221** is inserted inside the second floating body **224** (compression of the third elastic body), and then the first floating body **223** is inserted inside the main body **222** (compression of the second elastic body and the third elastic body).

[0033] The first valve body **120** is formed in a hollow shape, configures the main external appearance of the first valve body **120**, and is assembled with the first coupling member **110**. Preferably, the first valve body **120** may be provided with a second sealing member **126** for maintaining airtightness of the first coupling member **110**. In the first valve body **120**, a second locking step **120a** that support the first check ball **121** is provided on the opening end outside the flow path, and the diameter of the opening end on which the second locking step **120a** is formed is smaller than the diameter of the first check ball **121**. The first valve body **120** further includes a second valve stem **124** supporting a fourth elastic body **S4**, and may further include a second guide stem **124a** which extends from the second valve stem **124** and which is inserted into a portion of the fourth elastic body **S4**.

[0034] Such a first valve body **120** is provided such that a portion of the first check ball **121** protrudes outside by a predetermined height **d3** with respect to a contact surface with the second valve body **220**.

[0035] Preferably, the first valve body **120** further includes a valve body head **122** which is coupled to the first coupling member **110** and which protrudes outward, and the outer diameter **D1** of the valve body head **122** is smaller than the inner diameter **D2** of the opening end of the main body **222**.

[0036] FIG. 3 to FIG. 6 are cross-sectional views illustrating a connection process of the automatic coupler for supplying the utility according to an embodiment of the present disclosure.

[0037] The connection process of the automatic coupler for supplying the utility of the present disclosure as described above will be described with reference to FIG. 3 to FIG. 6. Furthermore, in order to facilitate understanding, it is described that the first valve body **120** is fixed and the second valve body **220** is moved so that the first valve body **120** and the second valve body **220** are connected to each other. As illustrated in FIG. 3 and FIG. 4, the second valve body **220** is moved downward so that the first check ball **121** and the second check ball **221** are in contact with each other and the first check ball **121** and the second check ball **221** are pushed (see FIG. 3).

Furthermore, as the second elastic body **S2** and the fourth elastic body **S4** are compressed, the first check ball **121** and the second check ball **221** are respectively inserted inside the first valve body **120** and the second floating body **224**, and the flow path of the first valve body **120** and the flow path of the second valve body **220** are started to be connected to each other (see FIG. 4).

Meanwhile, in a state in which the first check ball **121** and the second check ball **221** are fully inserted inside the first valve body **120** and the second floating body **224**, the upper surface of the valve body head **122** and the lower surface of the second floating body **224** are in close contact with each other.

[0038] Next, as illustrated in FIG. 5 and FIG. 6, as the second valve body **220** continues to move downward, the first elastic body **S1** is compressed, the second floating body **224** is inserted inside the first floating body **223**, and the first floating body **223** is inserted inside the main body **222**, so that the flow path of the first valve body **120** and the flow path of the second valve body **220** are fully connected to each other. Meanwhile, in a state in which the flow path of the first valve body **120** and the flow path of the second valve body **220** are connected to each other, the airtightness effect may be increased by the first sealing member **225** provided between the contact surface of the first valve body **120** and the first floating body **223**.

[0039] The disconnection of the first valve body **120** and the second valve body **220** is performed in the reverse order of the connection process. As the first valve body **120** and the second valve body **220** are spaced apart from each other, each of the check balls **121** and **221** is pulled outward, so that the flow paths of each of the valve bodies **120** and **220** are blocked.

[0040] Meanwhile, in the present embodiment, it is described that the first coupling member **110** having the first valve body **120** and the second coupling member **210** having the second valve body **220** are respectively provided at the utility receiving end and the utility supplying end. However, the first coupling member **110** and the second coupling member **210** are capable of being respectively disposed at the utility supplying end and the utility receiving end. Furthermore, the first valve body **120** and the second valve body **210** are capable of being connected to each other by fixing any one of the first coupling member **110** and the second coupling member **210** and moving other one of the first coupling member **110** and the second coupling member **210**, or the first valve body **120** and the second valve body **210** are capable of being connected to each other by moving the first coupling member **110** and the second coupling member **210** together.

[0041] The specific embodiment of the present disclosure is described in detail above. However, the present disclosure is not limited to the specific embodiment. It would be apparent to a person of ordinary skill in the art that various modifications to the present disclosure are possible within the scope of the technical idea of the present disclosure.

## Claims

1. An automatic coupler for supplying a utility, the automatic coupler comprising: a first coupling member provided on any one of a utility supplying end or a utility receiving end; a first valve body provided in the first coupling member and provided with a first check ball elastically supported, to perform an opening and closing of a flow path by the first check ball; a second coupling member provided on the other one of the utility supplying end or the utility receiving end and configured to be coupled to the first coupling member; and a second valve body provided in the second coupling

member and provided with a second check ball elastically supported, to perform an opening and closing of a flow path by the second check ball, wherein the second valve body comprises: a main body; a first floating body elastically supported to the main body; and a second floating body elastically supported to the first floating body so that a portion of the second floating body protrudes outside the first floating body, the second floating body elastically supporting the second check ball so that a portion of the second check ball protrudes outside the first floating body.

2. The automatic coupler of claim 1, wherein the second valve body is provided such that the second floating body protrudes by a predetermined height with respect to a contact surface of the first floating body in contact with the first valve body, and the second check ball is provided to protrude higher than the height of the second floating body.

3. The automatic coupler of claim 1, further comprising a sealing member provided on at least one of two contact surfaces of the first valve body and the second valve body facing each other for maintaining airtightness.

4. The automatic coupler of claim 1, further comprising: a first elastic body elastically supporting the main body and the first floating body; a second elastic body elastically supporting the first floating body and the second floating body; and a third elastic body elastically supporting the second floating body and the second check ball, wherein an elastic modulus of the first elastic body is larger than an elastic modulus of the second elastic body, and the elastic modulus of the second elastic body is larger than an elastic modulus of the third elastic body.

5. The automatic coupler of claim 4, wherein the second valve body further comprises a valve stem fixed to the second floating body to support the third elastic body.

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