An improved high-pressure gas cylinder is provided, which includes a container and a plug. The container has an air passage which communicates an interior of the container with an exterior of the container. The plug includes a body and a sealing sheet, wherein the body is fixed in the air passage. The body has a hole which communicates with the interior of the container, and the sealing sheet covers the hole. The body and the sealing sheet are integral. Whereby, the plug is able to tightly seal the container to reduce the possibility of wasting gas; additionally, the manufacturing process would be less complicated and efficient with the simplified plug.
HIGH-PRESSURE GAS CYLINDER

BACKGROUND OF THE INVENTION

[0001] 1. Technical Field
[0002] The present invention relates generally to a gas cylinder with a fixed volume, and more particularly to an improved high-pressure gas cylinder.

[0003] 2. Description of Related Art
[0004] High-pressure gas cylinders are commonly used in inflators of air bags in vehicles. More specifically, when a car has a high-speed collision, a sealing sheet which seals a high-pressure gas cylinder installed in the car would be pierced by a piercing tube. Therefore, the high-pressure gas in the cylinder inflates an air bag instantly to ensure the safety of the driver or passengers.

[0005] A conventional high-pressure gas cylinder includes a sealing sheet and a plug, wherein the sealing sheet covers an opening of the cylinder, and is fixed by the plug. However, the sealing sheet and the plug are detachably connected to each other so that a gap tends to be formed therebetween, which may cause the high-pressure gas cylinder not to be tightly sealed, and the gas in the cylinder may subsequently escape through the gap.

[0006] Additionally, in the manufacturing process of a high-pressure gas cylinder, more components used to seal the cylinder take more steps in assembly. On the other hand, in an ideal manufacturing process, once the cylinder is filled with gas, sealing components should be able to seal the cylinder immediately to prevent the gas from escaping, and therefore to reduce waste of gas and the manufacturing cost. Accordingly, it is an important issue for manufacturers to simplify the components of a high-pressure gas cylinder, as well as to tightly seal the cylinder in the manufacturing process.

BRIEF SUMMARY OF THE INVENTION

[0007] In view of the above, the primary objective of the present invention is to provide an improved high-pressure gas cylinder, which includes an integral plug without separable components or any gaps between the components. In addition, in the manufacturing process, the plug seals the cylinder immediately upon the cylinder is filled with gas to avoid the gas from escaping.

[0008] The present invention provides an improved high-pressure gas cylinder, which includes a container and a plug, wherein the container has an air passage which communicates an interior of the container with an exterior of the container. The plug includes a body and a sealing sheet, wherein the body is fixed in the air passage. The body has a hole which communicates with the interior of the container, and the sealing sheet covers the hole. The body and the sealing sheet are integral.

[0009] Thereby, by using the integral plug, it not only reduces the possibility of wasting gas, but also simplifies the manufacturing process of the high-pressure gas cylinder.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0010] The present invention will be best understood by referring to the following detailed description of some illustrative embodiments in conjunction with the accompanying drawings, in which

[0011] FIG. 1 is a partial sectional view of a first preferred embodiment of the present invention, showing the improved high-pressure gas cylinder;

[0012] FIG. 2 is a schematic diagram of the manufacturing device for the high-pressure gas cylinder in FIG. 1;

[0013] FIG. 3 is a partial enlarged view of FIG. 2, showing the gas is poured into the container through the air chamber;

[0014] FIG. 4 is a partial enlarged view of FIG. 3, showing the plug seals the container, and the ring wall which surrounds the opening of the container is deformed to form the stop ring;

[0015] FIG. 5 is a partial sectional view of a second preferred embodiment of the present invention, showing the sealing sheet is provided at the bottom of the hole of the plug; and

[0016] FIG. 6 is a partial sectional view of a third preferred embodiment of the present invention, showing an inner sealing ring is embedded in the plug.

DETAILED DESCRIPTION OF THE INVENTION

[0017] As shown in FIG. 1, high-pressure gas cylinder 100 includes a container 10, a plug 20, and an outer sealing ring 30.

[0018] The container 10 has an air passage 12 which communicates an interior of the container with an exterior of the container 10. The air passage 12 has a first air passage 121 and a second air passage 122 which communicates with the first air passage 121, wherein the first air passage 121 communicates with the exterior of the container 10 and the second air passage 122 communicates with the interior of the container 10. An internal diameter of the first air passage 121 is greater than that of the second air passage 122, and a top surface 12a is formed between the first air passage 121 and the second air passage 122.

[0019] The plug 20 is located in the first air passage 121, and has a top surface 20a and a bottom surface 20b, wherein the top surface 20a faces the exterior of the container 10 and the bottom surface 20b faces the interior of the container 10. In addition, the plug 20 includes a body 22 and a sealing sheet 24. The body 22 has a first section 221 and a second section 222 connected to the first section 221, wherein the bottom surface 20b of the plug 20 is formed on the first section 221. The bottom surface 20b of the plug 20 contacts the stop surface 12a of the container 10. An external diameter of the second section 222 is smaller than that of the first section 221, wherein the top surface 20a of the plug 20 is formed on the second section 222, and a shoulder 223 is formed between the first section 221 and the second section 222.

[0020] The body 22 has a hole 22a thereof which communicates with the interior of the container 10. The sealing sheet 24 and the body 22 are integral, more specifically, the sealing sheet 24 and the body 22 are formed as an integral and non-detachable piece. The sealing sheet 24 is a metal sheet in the first preferred embodiment, and is provided inside the hole 22a to cover the hole 22a. The sealing sheet 24 in the first preferred embodiment is provided at a top of the hole 22a, wherein the top of the hole 22a is close to the exterior of the container 10. With such design, the top surface 20a of the plug 20 is formed on both the sealing sheet 24 and the second section 222. Thereby, by using the abovementioned integral plug 20, the waste of gas due to gas escaping from gaps between components would be reduced. Additionally, the plug 20 could be fixed in the air passage 12 of the container 10, for the problem of loose components no longer exists.
The plug 20 is connected to the container 10 through the manufacturing method and device illustrated in FIG. 2 to FIG. 4. The manufacturing device 1 for the high-pressure gas cylinder 100 includes an upper push rod 2 and a lower push rod 3, which are able to be forced to move toward opposite directions respectively. The upper push rod 2 is connected to a holding member 4, and the lower push rod 3 is connected to a pressing member 5, wherein the plug 20 is clutched by the pressing member 5, and is drivable to move by the pressing member 5. On the other hand, the connecting 4 is fixed between the holding member 4 and the plug 20.

As shown in FIG. 3, the manufacturing device 1 further has an air chamber 6 and two intake pipes 7. The air chamber 6 is a space formed between the container 10 and the plug 20, and communicates with the interior of the container 10. The two intake pipes 7 are used to pour gas into the air chamber 6, and afterwards into the interior of the container 10. Once the container 10 is filled with gas, both the upper push rod 2 and the lower push rod 3 are moved toward the container 10, and the plug 20 is accordingly pushed into the first air passage 121 of the container 10 by the pressing member 5. On the other side, the bottom of the container 10 is held by the holding member 4 to avoid moving upwards by the push of the pressing member 5.

As depicted in FIG. 4, the plug 20 is pushed to abut against the stop surface 12a of the container 10 with the bottom surface 20b thereof. At the same time, a ring wall which surrounds an opening of the container 10 is deformed to form a bend-shaped stop ring 14, which abuts against the shoulder 223 of the body 22. Whereby, the body 22 is fixed into the first air passage 121 through abutting against the stop surface 12a as well as the stop ring 14 of the container 10.

Therefore, with the integral plug 20, the container 10 is able to be sealed through a single pressing process. Such manufacturing process is not only simplified but also time-saving.

In addition, the body 22 in the first preferred embodiment further has an outer circular groove 221a formed on an outer wall of the first section 221a, wherein the outer sealing ring 30 is embedded in the outer circular groove 221a, and the outer sealing ring 30 abuts against a passage wall of the air passage 12 of the container 10, which is shown in FIG. 1. In this way, the outer sealing ring 30 is able to prevent gas from escaping through the first air passage 121, which reduces the possibility of wasting gas.

As shown in FIG. 5, a high-pressure gas cylinder 300 includes not only the container 10 but also a plug 40. The plug 40 includes a body 42 and a sealing sheet 44, wherein the body 42 has a hole 42a communicating with the interior of the container 10, and the sealing sheet 44 covers the hole 42a. The difference between the plug 40 in the second preferred embodiment and the plug 20 in the first preferred embodiment is that, the sealing sheet 44 is provided at a bottom of the hole 42a, wherein the bottom of the hole 42a is close to the interior of the container 10. With such design, partial of a bottom surface of the plug 40 is formed on the sealing sheet 44. Whereby, a piercing tube (not shown) would pass through the hole 42a before piercing the sealing sheet 44, wherein the piercing tube would abut against the wall of the hole 42a. In this way, once the sealing sheet 44 is pierced by the piercing tube, gas in the container 10 could almost rush into the piercing tube without escaping from the hole 42a, which also reduces the waste of gas in the container 10.

A high-pressure gas cylinder 300 illustrated in FIG. 6 also includes a container 10, and further includes a plug 50 and an inner sealing ring 60. The plug 50 includes a body 52 and a sealing sheet 54, wherein the body 52 includes a first section 521 which is close to the interior of the container 10, and a second section 522 which is close to the exterior of the container 10. Similar to the body 42, the body 52 has a hole 52a communicating with the interior of the container 10, wherein the sealing sheet 54 is provided at a bottom of the hole 52a, wherein the bottom of the hole 52a is close to the interior of the container 10.

Especially, the body 52 has an inner circular groove 521a formed on a wall surrounding the hole 52a, and the inner sealing ring 60 is embedded in the inner circular groove 521a. An internal diameter of the inner sealing ring 60 is slightly smaller than a diameter of the hole 52a, which makes an inner surface of the inner sealing ring 60 position into the hole 52a. With such design, the piercing tube would tightly abut against the inner surface of the inner sealing ring 60 once the piercing tube pierces the sealing sheet 54, which makes sure that gas from the container 10 would not escape from the hole 52a, and gas in the container 10 would be effectively used.

It must be pointed out that the embodiment described above is only a preferred embodiment of the present invention. All equivalent structures which employ the concepts disclosed in this specification and the appended claims should fall within the scope of the present invention.

What is claimed is:

1. A high-pressure gas cylinder comprising: a container having an air passage which communicates an interior of the container with an exterior of the container; and a plug comprising a body and a sealing sheet, wherein the body is located in the air passage; the body has a hole which communicates with the interior of the container, and the sealing sheet covers the hole; the body and the sealing sheet are integral.

2. The high-pressure gas cylinder of claim 1, wherein an outer circular groove is formed on an outer wall of the body; the high-pressure gas cylinder further has an outer sealing ring embedded in the outer circular groove, wherein the outer sealing ring abuts against a passage wall of the air passage with an outer surface thereof.

3. The high-pressure gas cylinder of claim 1, wherein an inner circular groove is formed on a wall surrounding the hole of the body; the high-pressure gas cylinder further has an inner sealing ring embedded in the inner circular groove.

4. The high-pressure gas cylinder of claim 2, wherein an inner circular groove is formed on a wall surrounding the hole of the body; the high-pressure gas cylinder further has an inner sealing ring embedded in the inner circular groove.

5. The high-pressure gas cylinder of claim 1, wherein the air passage of the container has a first air passage and a second air passage which communicates with the first air passage; the first air passage communicates with the exterior of the container, and the second air passage communicates with the interior of the container, wherein an internal diameter of the first air passage is greater than that of the second air passage, and a stop surface is formed between the first air passage and the second air passage; the plug is fixed in the first air passage, wherein a bottom surface of the plug contacts the stop surface of the container.

6. The high-pressure gas cylinder of claim 5, wherein the container has a stop ring surrounding an opening of the con-
tainer, and formed by bending; the body has a first section and a second section connected to the first section, wherein the bottom surface of the plug is formed on the first section; an external diameter of the second section is smaller than that of the first section, and a shoulder is formed between the first section and the second section; the stop ring of the container abuts against the shoulder of the body.

7. The high-pressure gas cylinder of claim 1, wherein the sealing sheet of the plug is provided at a top of the hole of the body: the top of the hole is close to the exterior of the container.

8. The high-pressure gas cylinder of claim 1, wherein the sealing sheet of the plug is provided at a bottom of the hole of the body: the bottom of the hole is close to the interior of the container.

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