

Description

The invention relates to a valve, for chemical containers, for withdrawing liquid or gaseous chemical products while at the same time supplying a protective gas, with a valve housing which has supply lines and withdrawal lines for the product and the gas, and with a movable valve body in a boring in the valve housing.

The substances required, for instance, for the manufacture of semiconductors are predominantly toxic and/or aggressive. Impurities in the containers used for the storage and transport of these liquids and/or in the connected doping and epitaxial plants would lead to considerable problems in the processing procedure and must therefore be excluded. For these applications valves of the type referred to are used. The protective gas supplied, such as an inert gas, is used to transport the liquid or gaseous product to be withdrawn and in most cases is also used for flushing the connected lines after a withdrawal.

In fibre optic technology acid chlorides are despatched and stored in glass containers or, particularly for silicon tetrachloride, stainless steel vessels. While steel ball valves are normally used for the stainless steel vessels, for glass vessels plug valves are used which certainly offer the possibility of flushing with a protective gas but which often do not achieve adequate sealing on account of the relatively low surface pressure at the valve. Other glass and/or PTFE valves are also used for applications of this type.

The object of the invention is to provide a valve of the type referred to at the outset which achieves complete sealing with a simple and compact construction.

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This object is achieved in accordance with the invention when the valve is a sliding valve with a cylindrical valve spool which can move axially in the boring in the valve housing, in that the valve spool has
10 a first annular groove which, in the open position of the valve, connects the product supply line to the product withdrawal line, in that the valve spool has a second annular groove which, in the open position of the valve, connects the gas supply line to the gas withdrawal line,
15 in that on the opposite side of the first annular groove to the second annular groove there is a third annular groove which is connected to the second annular groove by a central boring in the valve spool and is thus also supplied with inert gas with an overpressure equal to the
20 pressure within the annular groove handling the chemicals and encloses this against contamination from outside or to the outside, and in that all annular grooves (14, 15, 19) are sealed axially by sealing rings (20).

25 The arrangement, on either side of the annular groove handling the product to be withdrawn, of the two annular grooves to which protective gas is admitted positively prevents traces of the product from being able to escape or impurities from being able to penetrate from
30 outside into the ducts handling the product. The protective gas by means of which the product is conveyed out of the container remains at the same pressure as the product with the result that there is no internal overpressure at the sealing surfaces which isolate the
35 product which could cause the product to escape.

The construction of the movable valve body as a valve spool makes it possible to perform, in the smallest possible space next to each other, the valve control functions which are required on the one hand for withdrawal of the product from the container and on the other hand for simultaneous supply of the protective gas which is used at the same time to achieve a substantial improvement of the sealing effect.

In accordance with a preferred embodiment of the inventive concept it is arranged that in the closed position of the valve the third annular groove is connected to the product withdrawal line. This achieves a flushing facility in a manner which is structurally very simple, i.e. it makes it possible to flush the valve system. The protective gas supplied, preferably an inert gas, flows through the gas line into the second annular groove which is on one side of the first annular groove which handles the product, from there through the central boring of the valve spool into the third annular groove placed on the other side and from there into the product withdrawal line. Thus, in the closed position of the valve all these ducts are flushed by the protective gas.

Further advantageous arrangements of the inventive concept are subjects of further sub-claims. The invention is explained in greater detail below with the aid of an example of the design which is shown in the drawing in which

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Fig. 1 shows a side view of a valve for a chemical container,

Fig. 2 shows a section along line II - II in Fig. 1 in the open position of the valve, and

35 Fig. 3 shows a section along line II - II in Fig. 1 in the closed position of the valve.

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5 The valve 1 shown in the drawing is used for withdrawing chemically aggressive and highly pure chemicals in liquid form or in gaseous form from a container 2, which is only partially indicated in Fig. 1 by dash-and-dot lines. The valve 1 has a valve housing 3 with a central boring 4 in which is contained an axially-movable cylindrical valve spool 5.

10 On the under side of the valve housing 3 there is a connection branch 6 which has an external thread 7 carrying a union nut 8 which forms the connection with the container 2. The union nut 8 has an upper threaded section with a left-handed thread and a lower threaded section with a right-handed thread. The right-left screw coupling so formed makes it possible to position the valve-1
15 positively on the container 2.

20 A product supply line 9 and a gas withdrawal line 10, arranged axially adjacent to each other, terminate at the front face of the connection branch 6, each having a thread into which, as selected, can be screwed a dip tube 11, indicated in Fig. 1 only by dash-and-dot lines, which dips into the liquid contained in container 2.

25 A gas supply line 12 and a product withdrawal line 13 terminate horizontally in the boring 4 of the valve housing 3, one on each side of the terminations of the product supply line 9 and the gas withdrawal line 10. The valve spool 5 has a first annular groove 14 which,
30 in the open position of the valve 1 (Fig. 2), connects the product supply line 9 to the product withdrawal line 13. On one side of the first annular groove 14 there is a second annular groove 15 which, in the open position of the valve 1 (Fig. 2), connects the gas supply
35 line 12 to the gas withdrawal line 10 discharging into the container 2. In the example shown the dip tube 11 is screwed into the product withdrawal line 9 so, displaced by the inert gas or other protective gas supplied, the

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liquid product rises in the dip tube 11 and passes into the product withdrawal line 13. If, on the other hand, the dip tube 11 were screwed into the gas supply line 10 the bubbles of the gas supplied would then rise up in the liquid product and the gaseous or vapour-state product would pass out into the product withdrawal line 13 through the product withdrawal line 9. This withdrawal process is referred to as "bubbling".

10 A third annular groove 19, which is on the opposite side of the first annular groove 14 to the second annular groove 15, is linked to the second annular groove 15 by a central boring 16 and short, radial borings 17, 18. The two annular grooves 15, 19 placed on either side of the annular groove 14 which handles the product, are therefore supplied with protective gas and prevent sideways escape of the product.

20 All the annular grooves 14, 15 and 19 are sealed axially by sealing rings 20 which for preference are in the form of O-rings. In the region of each of the discharge points of the supply and withdrawal lines 9, 10, 12 and 13 the boring 4 of the valve housing 3 has a shallow circumferential groove 21. This reduces the friction of the sealing rings 20 during the movement of the valve spool 5 between its two end positions.

30 The end of the valve spool 5 has an external thread 22 which is engaged in the internal thread 23 of an actuating nut 24 which is fixed in the valve housing 3 so that it can be rotated but not moved axially. For this purpose a shoulder of the actuating nut 24 has a circumferential groove 25 which engages the pegs 26 which are inserted into the valve housing 3.

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A tranverse peg 27, which is positioned in the valve housing 3, projects through an elongated slot 28 in the

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valve spool 5. This prevents the valve spool 5 from rotating. The length of the elongated slot 28 limits the axial movement of the valve spool 5.

5 By rotating the actuating nut 24 the valve
spool 5 is brought into the closed position of the valve
shown in Fig. 3. In this closed position of the valve
the first annular groove 14 overlaps the product supply
line 9 and the gas withdrawal line 10, i.e. the two
10 lines 9 and 10 connected to the container 2 are joined
together, but are isolated from the outside. In this
position the third annular groove 19 is above the product
withdrawal line 20 making a direct gas connection from
the gas supply line 12 via the annular groove 15, the
15 central boring 16, the annular groove 19 and the product
withdrawal line 13. In this way these channels can be
flushed with the protective gas.

Just as in the open position of the valve, the
20 valve spaces on both sides of the discharge points of
lines 9 and 10 are also supplied with protective gas in
the closed position of the valve and are thus enclosed
against contamination from the outside or to the outside.
This function of the valve is ensured during both the
25 withdrawal of liquid and the withdrawal of gas or vapour
by the alternative placement of the dip tube 11 on the
line 9 or 10.

For preference all the valve components are
30 made from chemically-resistant synthetic materials such
as PTFE and/or PVDF.

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Patent claims

1. Valve for chemical containers for withdrawing liquid or gaseous chemical products while at the same time supplying a protective gas, with a valve housing which has supply lines and withdrawal lines for the product and the gas, and with a movable valve body in a boring in the valve housing, characterized in that it is a sliding valve with a cylindrical valve spool (5) which can move axially in the boring (4) in the valve housing (3), in that the valve spool (5) has a first annular groove (14) which, in the open position of the valve, connects the product supply line (9) to the product withdrawal line (13), in that the valve spool (5) has a second annular groove (15) which, in the open position of the valve, connects the gas supply line (12) to the gas withdrawal line (10), in that on the opposite side of the first annular groove (14) to the second annular groove (15) there is a third annular groove (19) which is connected to the second annular groove (15) by a central boring (16) in the valve spool (5), and in that all annular grooves (14, 15, 19) are sealed axially by sealing rings (20).
2. Valve according to Claim 1, characterized in that in the closed position of the valve the third annular groove (19) is connected to the product withdrawal line (13).

3. Valve according to Claim 1, characterized in that the gas withdrawal line (10) and the product supply line (9) are arranged axially adjacent to each other and terminate in a common container connection branch (6), each having a thread for the connection, as selected, of a dip tube (11).
4. Valve according to Claim 1, characterized in that in the region of each of the supply and withdrawal lines (9, 10, 12, 13) the boring (4) of the valve housing (3) has a shallow circumferential groove (21).
5. Valve according to Claim 1, characterized in that the valve spool (5) is fixed in the valve housing (3) so that it cannot be rotated and has at one end an external thread (22) which is engaged in an internal thread (23) of an actuating nut (24) which is fixed in the valve housing (3) so that it can be rotated but not moved axially.
6. Valve according to Claim 1, characterized in that all valve components are made from chemically-resistant synthetic materials.
7. Valve according to Claim 1, characterized in that the sealing rings (20) are O-rings.



As printed

Claims

1. Valve for chemical containers for withdrawing liquid or gaseous chemical products while at the same time supplying a protective gas, with a valve housing which has supply lines and withdrawal lines for the product and the gas, and with a movable valve body in a boring in the valve housing, characterized in that it is a sliding valve with a cylindrical valve spool (5) which can move axially in the boring (4) in the valve housing (3), in that the valve spool (5) has a first annular groove (14) which, in the open position of the valve, connects the product supply line (9) to the product withdrawal line (13), in that the valve spool (5) has a second annular groove (15) which, in the open position of the valve, connects the gas supply line (12) to the gas withdrawal line (10), in that on the opposite side of the first annular groove (14) to the second annular groove (15) there is a third annular groove (19) which is connected to the second annular groove (15) by a central boring (16) in the valve spool (5), and in that all annular grooves (14, 15, 19) are sealed axially by sealing rings (20).

2. Valve according to claim 1, characterized in that in the closed position of the valve the third annular groove (19) is connected to the product withdrawal line (13).

3. Valve according to claim 1, characterized in that the gas withdrawal line (10) and the product supply line (9) are arranged axially adjacent to each other and terminate in a common container connection branch (6), each having a thread for the connection, as selected, of a dip tube (11).

4. Valve according to claim 1, characterized in that in the region of each of the supply and withdrawal lines (9, 10, 12, 13) the boring (4) of the valve housing (3) has a shallow circumferential groove (21).

5. Valve according to claim 1, characterized in that the valve spool (5) is fixed in the valve housing (3) so that it cannot be rotated and has at one end an external thread (22) which is engaged in an internal thread (23) of an actuating nut (24) which is fixed in the valve housing (3) so that it can be rotated but not moved axially.

6. Valve according to claim 1, characterized in that all valve components are made from chemically-resistant synthetic materials.

7. Valve according to claim 1, characterized in that the sealing ring (20) are O-rings.



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Revendications

1. Vanne pour récipients de produits chimiques, destinée au prélèvement de produits chimiques liquides ou gazeux avec introduction simultanée d'un gaz protecteur, comprenant un corps de vanne qui présente lui-même des conduits d'arrivée et de départ pour le produit et pour le gaz, et un élément obturateur de vanne qui peut se déplacer dans un perçage du corps de la vanne, caractérisée en ce qu'elle est constituée par une vanne à tiroir comprenant un tiroir de vanne (5) cylindrique, mobile dans la direction axiale dans le perçage (4) du corps (3) de la vanne, en ce que le tiroir (5) de la vanne présente une première gorge annulaire (14) qui, dans la position d'ouverture de la vanne, relie la conduite (9) d'arrivée du produit à la conduite (13) de départ du produit, en ce que le tiroir (5) de la vanne présente une deuxième gorge annulaire (15) qui, dans la position d'ouverture de la vanne, relie la conduite d'arrivée du gaz (12) à la conduite de départ du gaz (10), en ce que, sur le côté de la première gorge annulaire (14) qui est à l'opposé de la deuxième gorge (15), est prévue une troisième gorge annulaire (19) qui est reliée à la deuxième gorge annulaire (15) par un perçage central (16) formé dans le tiroir (5) de la vanne et en ce que toutes les gorges annulaires (14, 15, 19) sont fermées à joint étanche dans la direction axiale par des bagues d'étanchéité (20).

2. Vanne selon la revendication 1, caractérisée en ce que la troisième gorge annulaire (19) est reliée à la conduite de départ du produit (13) dans la position fermée de la vanne.

3. Vanne selon la revendication 1, caractérisée en ce que la conduite de départ du gaz (10) et la conduite d'arrivée du produit (9) sont disposées l'une à côté de l'autre à un certain espacement axial, débouchent dans une tubulure commune (6) de raccordement au récipient et présentent chacune un filetage permettant d'y raccorder facultativement un tube plongeur (11).

4. Vanne selon la revendication 1, caractérisée en ce que le perçage (4) du corps (3) de la vanne présente une gorge circonférentielle plate (21) dans la région de chaque conduite d'arrivée ou de départ (9, 10, 12, 13).

5. Vanne selon la revendication 1, caractérisée en ce que le tiroir (5) est guidé le corps (3) de la vanne de façon à être immobilisé en rotation et présente à une extrémité un filetage extérieur (22) qui est en prise avec le filetage intérieur (23) d'un écrou de manoeuvre (24) qui est monté sur le corps (3) de la vanne libre en rotation mais immobilisé en translation axiale.

6. Vanne selon la revendication 1, caractérisée en ce que tous les composants de la vanne sont faits de matières plastiques résistantes aux produits chimiques.

7. Vanne selon la revendication 1, caractérisée en ce que les bagues d'étanchéité (20) sont des bagues toriques.