

Contamination-Free, Flexible Closure System for Use on at least Partially Flexible Containers

Description

Especially in the pharmaceutical/biopharmaceutical industry, but also in the chemical and food industry, demands are increasing on the safe handling of powdered materials that are used and to be produced. On the one hand, employees are to be protected as much as possible from any influence by the product; on the other hand, the product is to be protected from any influence by the employee.

Split valves, as for example found in EP 1 083 137 A1, are increasingly being used with great success for the critical system part, that is, the docking site of mobile containers made of high-grade steel in the processing units which also consists of high-grade steel. This technology allows the containers to be docked almost completely contamination-free at the processing unit, subsequently the product is safely added and the container is likewise undocked contamination-free from the processing unit.

However, an increasing need for the use of disposable containers is presently discernible. The reason for this is the industrial approach of using these systems to produce different products for cost reasons, and not just to produce a single product. In this context, the issue of cross-contamination increasingly arises; that is, despite thoroughly cleaning the containers and the system, remaining traces of the previously produced product can contaminate the new products to be produced. Such cross-contamination can result in an entire production batch being useless and having to be destroyed, which can quickly reach a value of several hundred thousand euros.

By using disposable containers and optimally disposable liners as well in the processing units, this potential problem of cross-contamination can be entirely

circumvented.

Furthermore, the use of such disposable components can improve the life cycle assessment of the system operator.

In the conventional cleaning of the systems, the cleaning media which are used must be completely discarded, for example by burning. The energy which must be expended for cleaning and drying is enormous.

By omitting such cleaning when using disposable containers, the issue of cleaning is almost completely eliminated.

Disposable components must also be eliminated of by burning; however, this can be done expending significantly less energy given the considerably smaller volume. Furthermore, by using easily disposable materials such as PE, environmental considerations are again taken into account.

Flexible disposable components are, however, also subject to the same requirements that stainless steel components were previously. In this case as well, the docking, filling and undocking process must be designed to be contamination-free.

The subsequent response to this challenge can be found in disposable closure systems available on the market, such as in EP 1 441 953 B1.

The greatest flexibility in regard to possible uses with a simultaneously high cost/benefit ratio is arguably offered by profiled closure systems such as found in DE 10200400351 1 B4, DE 10 2009 018 565 B3 or EP 2 455 297 A1.

The systems having a divided slider which simultaneously opens the docked profiled closures while docking have proven to be technically infeasible.

The disadvantage of the system with separate sliders which offers the best

economical solution at present is that the complementary closures docked by the sliders are initially closed and must be opened in an additional manual step.

However, this additional step poses a large functional risk in practice since the closures can be entirely torn part if not correctly handled which constitutes an unacceptable weak point in view of the intended use.

Furthermore, the profiled closures, which can be docked together by the sliders, have a hooked profile that extends into the product area when in a docked and open state, that is, in the state of product transfer, which is associated with two significant disadvantages.

On the one hand, finely powdered material can easily enter the hooked profile grooves and entirely compromise subsequent functioning.

On the other hand with this design, the material of the profile per se comes into contact with the product since the tubular film of the container can only be attached below the hooking profile, which requires an additional validation, that is, of the profile material, when used in the pharmaceutical industry.

The underlying problem of the invention is hence to create an aforementioned profiled closure system with separate sliders that do not have the just-cited disadvantages.

This problem is solved according to the invention by a closure with two profiled strips having the features of claim 1 and a slider having the features of dependent claim 8.

Additional advantageous embodiments of the invention are indicated in the dependent claims.

The invention enables a first container to be connected to a second container in an environmentally sealed manner for conducting a flow in a flow direction through the

closure from the first container into the second container in an environmentally sealed manner in an open docking position.

The second container has an identical closure which faces the first container and which can be brought into engagement with the closure of the first container to achieve the open docking position. In the open docking position, the connected closures of the container define a first flow channel for the bulk good to flow in the direction of flow.

The closure has two profiled strips for closing the at least partially flexible container: One wide profiled strip and one narrow profiled strip.

The wide profiled strip extends in the direction of flow beyond the respective container and the first profiled strip arranged parallel to the first profiled strip.

The closure elements of the narrow profiled strip point out of the channel, and the closure element of the wide profile strip first points into the channel at the region extending beyond the narrow profiled strip.

This closure element of the wide profiled strip extending beyond the narrow profiled strip is folded 180° over the narrow profiled strip by means of a hinge, such that the two closure elements of the first and second profiled strip engage with each other and hence form a closed closure.

To connect and disconnect two complementary closures, a slide which can be removed from the closures is provided that can be shoved transverse to the direction of flow onto the closed closures for a connection.

The slide has an insertion side and an exit side which oppose each other and are aligned in the direction of flow. At the insertion side, the closures of two containers can be inserted in the direction of insertion. The insertion devices run transverse to the direction of flow and intersect at an acute angle. The closures can be inserted into the slide aligned relative to each other at that angle.

The closure elements of the two complementary closures are initially open in the slide, and the closure element of the wide profiled strip, which is folded over the narrow profiled strip, is positioned over 180°. Guide elements in the slide keep the closures closed.

In this state, the two complementary closures are docked on each other such that the closure element of the wide profiled strip of the first closure is engaged with the closure element of the narrow profiled strip of the second closure and vice versa.

At the exit side, the closures connected to each other by means of slides can be removed from the slide in a common sliding direction, wherein the respective closure, considered individually, is already open.

To the inside of the channel, there is no longer a hooked profile which could become clogged with finely-powered materials during the product transfer.

When the tubular films of the container are advantageously attached to the inside of the closures, a docking of the tubular film of the first container with the tubular film of the second container can be established which, in regard to validation, has the significant advantage that the profiled material per se does not have to be validated.

If the closures are separated from each other after the product is transferred, the closure elements of the long profiled strips folded over the narrow profiled strip then possess the function of a protective strip in addition to the sealing function which additionally shields the closure elements, which are already protected from contacting the product, from potentially contacting the surroundings.

The invention will be explained with reference to the following figures. In the figures:

Fig. 1

shows a section of a closed closure (10, 20) which is not docked

Fig. 2

shows a section of a non-docked, closed closure (10, 20) in a docking position briefly before being inserted into the slider (30)

Fig. 3

shows a section of the docked and opened closures (10, 20) after leaving the exit side of the slider

Fig. 4

shows a perspective view of two completely docked and opened containers (1, 2) with slides (30) being used

List of Reference Signs

- 1 First container
- 2 Second container
- 3 Flow channel
- 10 First closure
- 11 First narrow profiled strip
- 12 First wide profiled strip
- 13 First closure element pointing out of the channel
- 14 First projecting closure element pointing into the channel
- 15 First film hinge
- 20 Second film hinge
- 21 Second narrow profiled strip
- 22 Second wide profiled strip
- 23 Second closure element pointing out of the channel
- 24 Second projecting closure element pointing into the channel
- 25 Second film hinge
- 30 Slide
- 31 Insertion side
- 32 Exit side
- A Insertion direction
- B Continued insertion direction
- C Sliding direction
- D Direction of flow

CLAIMS

1. A closure (10, 20) having two profiled strips (11, 12; 21, 22) for an at least partially flexible container (1, 2) for connecting a first container (1) to a second container (2) in an environmentally sealed manner, and for conducting a flow in a flow direction (D) through the closure (10, 20) from the first container (1) into the second container (2) in an environmentally sealed manner, wherein the second container (2) has an identical closure (10, 20) which faces the first container (1) and which, in the open docking position, is in engagement with the closure (10, 20) of the first container (1) and, together with the closure (10, 20) of the first container, (1) defines a flow channel (3) for the flow in the flow direction (D), wherein the profiled strips (11, 12; 21, 22) arranged opposite each other close the respective container (1, 2), and when the closures (10, 20) are in a separated state, a projecting and pivotable closure element (14, 24) pointing into the channel is in engagement with the closure element (13, 23) of the same closure (10, 20) pointing out of the channel and thereby closes the respective closure (10, 20), and wherein, when the closures (10, 20) are in a docked state, a projecting closure element (14, 24) pointing into the channel is in engagement with a closure element (13, 23) of the complementary closure (10, 20) pointing out of the channel and thereby connects the closures (10, 20) with each other.
2. The closure according to claim 1, characterized in that both profiled strips (11,12; 21,22) have closure elements which are aligned exclusively transverse to the direction of flow (D).
3. The closure according to one of the aforementioned claims, characterized in that the two profiled strips (11, 12; 21, 22) each have only one closure element.
4. The closure according to one of the aforementioned claims, characterized in that the narrow profiled strip (11, 21) has a closure element pointing out of the

channel, and the wide profiled strip (12, 22) has a closure element pointing into the channel, when in an extended state.

5. The closure according to one of the aforementioned claims, characterized in that all the closure elements (13, 14; 23, 24) satisfy a dual function and are engaged with a complementary closure element both in a disconnected state and in a docked, open state.
6. The closure according to one of the aforementioned claims, characterized in that the closure elements (13, 14; 23, 24) are intended to engage with each other in the manner of an at least easily operating hooked connection.
7. The closure according to one of the aforementioned claims, characterized in that the wide profiled strip (12, 22) has a film hinge (15, 25) and thereby enables the closure element (14, 24) to swing.
8. A slider (30) for connecting and separating two closures (10, 20) according to claim 1, of which a first closure (10) of a first container (1) and a second closure (20) of a second container (2) are each composed of two profiled strips (11, 12; 21, 22) aligned parallel with each other, transverse to the direction of flow (D), and connected to each other when in a state closing the respective container (1, 2), of which one wide profiled strip (12; 22), in each case, extends over a narrow profiled strip (11; 21) in the direction of flow (D) with at least one closure element (13; 23), and wherein the closures (10, 20) are suitable for connecting and sealing the containers (1, 2) with each other to allow passage in the direction of flow (D) having: An insertion side (31) on which the closures (10, 20) can be inserted into the slider (30) in insertion directions (A, B), which form an acute angle, and an exit side (32) opposite the insertion side (31), on which the closures (10, 20), which are connected to each other and are open, can be guided out of the slider (30) in a common slide direction (C).