

CLAIMS

1. A coupler for aseptically coupling and controlling fluid communication between at least two components, the coupler comprising:

a first connector housing including two opposed side walls, two opposed end walls, a top section and an open bottom, the side walls, the end walls and the top section each having respective inner surfaces that, in combination, define an inner cavity, and wherein the inner surfaces of the top section and the side sections define, in combination, a concave surface that has a shape that defines a portion of a cylinder;

a first connector formed on or attached to and extending from the top section, the first connector adapted to connect to a first component of the at least two components;

a first connector conduit extending through the first connector and the top section of the first connector housing so as to define a fluid passageway from an outer opening at an upper end of the first connector to an inner opening on the inner surface of the top section of the first connector housing;

a rotary valve located within the inner cavity of the first connector housing and having a longitudinal axis, the rotary valve including at least two rotary valve segments, each rotary valve segment includes a valve segment outer surface and a valve segment inner surface, the valve segment outer surface having a curved surface that defines a portion of cylinder, and the valve segment inner surface having at least one inner planar surface, wherein the valve segment inner surface of one of the rotary valve segments is configured to contact the valve inner surface of an adjacent rotary valve segment, and wherein the curved outer surfaces of the rotary valve segments, in combination, define a cylindrical surface, and wherein the rotary valve segments are configured to rotate about the longitudinal axis within the cavity and against the concave inner surface of the first connector housing;

wherein at least one of the at least two rotary valve segments includes a fluid conduit extending through the at least one rotary valve segment from a first opening to a second opening, the first opening being positioned so that:

in a first rotational position of the at least one rotary valve segment relative to the first connector housing corresponding to the open state, the first opening aligns with the

inner opening of the first connector conduit in the connector housing and the second opening of the fluid conduit simultaneously aligns with an inner opening on a second connector conduit so as to provide a fluid path from the outer opening of the first connector conduit and into the second connector conduit, and

in a second rotational position of the at least one rotary valve segment relative to the first connector housing corresponding to the closed state, the first opening does not align with the inner opening of the first connector conduit in the connector housing, the second opening of the fluid conduit does not align with the inner opening on the second connector conduit, and the valve segment outer surface of one of the at least two rotary valve segments blocks the inner opening of the first connector housing and the valve segment outer surface of the other of the at least two rotary valve segments blocks the inner opening of the second connector conduit such that no fluid path is provided from the first connector conduit to the second connector conduit through either of the at least two rotary valve segments.

2. The aseptic coupler of claim 1, wherein the coupler includes a second connector housing adjacent to the first connect housing, the second connector housing have a second connector extending outward from a surface on the second connector housing, and wherein the second connector conduit extends through the second connector housing and the second connector, the second connector adapted to connect to a second component of the at least two components to thereby provide a fluid flow path between the first component and the second component.

3. The aseptic coupler of claim 2, wherein the second connector housing is a cap for a container and wherein the second component is the container configured to store a fluid.

4. The aseptic coupler of claim 2, wherein the second connector housing is a manifold, the manifold configured to receive multiple first connector housings.

5. The aseptic coupler of claim 2, wherein the second connector housing includes two opposed side walls, two opposed end walls, a top section and an open bottom, the side walls, the end walls and the top section each having respective inner surfaces that, in combination, define an inner cavity, and wherein the inner surfaces of the top section and the side sections define, in combination, a concave surface that has a shape that defines a portion of a cylinder; and wherein when the first and second connector housings are adjacent to one another the combination of the concave surfaces of the first and second connector housings form a substantially cylindrical shape.

6. The aseptic coupler of claim 1, wherein when the coupler is in the closed state, the first connector housing can be aseptically separated from a second connector housing so that the inner openings of the first and second connector conduits are not exposed to an ambient environment.

7. The aseptic coupler of claim 1, wherein when the coupler is in the closed state, at least one rotary valve segment is attached to the first connector housing such that the rotary valve segment cannot be readily removed from the first connector housing except by rotating the rotary valve segment relative to the first connector housing.

8. The aseptic coupler of claim 1, wherein each end wall of the first connector housing includes a protrusion extending into the cavity at a location radially inward from the side wall, each protrusion configured to mate with a corresponding recess formed in a longitudinal end of the corresponding rotary valve segment.

9. The aseptic coupler of claim 1, wherein there are three rotary valve segments, and further comprising a second connector and a third connector, each of the second connector and the third connector adapted to connect to one of the at least two components, and wherein two of the rotary valve segments include fluid conduits and the third rotary valve segment does not include any fluid conduit.

10. The aseptic coupler of claim 1, wherein the coupler includes at least three connector housings and the rotary valve includes at least three rotary valve segments.
11. The aseptic coupler of claim 1, further comprising a second connector and wherein the first and second connectors extend from the top of the first connector housing.
12. The aseptic coupler of claim 11, wherein the first and second connectors are hose barb connectors, each configured to connect with a separate hose that is coupled to an associated component of the at least two components.
13. The aseptic coupler of claim 2, wherein the second connector is a cap with threads that engage with a neck of a container.
14. The aseptic coupler of claim 1, wherein the coupler includes two rotary valve segments, wherein the valve segment outer surface of each rotary valve segment defines a semicylindrical surface, and the valve segment inner surface of each rotary valve segment is a planar surface.,
15. The aseptic coupler of claim 14, wherein the coupler includes a second connector housing adjacent to the first connect housing, the second connector housing has a second connector extending outward from a surface on the second connector housing, and wherein the second connector conduit extends through the second connector housing and the second connector, the second connector adapted to connect to a second component of the at least two components to thereby provide a fluid flow path between the first component and the second component.
16. The aseptic coupler of claim 1, wherein each rotary valve segment includes a tab that is attached to or formed integral with a longitudinal end of the rotary valve segment.

17. The aseptic coupler of claim 16, wherein the tab includes a neck portion which is smaller in cross-section than the rotary valve segment, the neck portion seating within a first notch in one of the end walls, the first notch providing support for and permitting rotation of the neck portion relative to the first connector housing.

18. The aseptic coupler of claim 17, wherein each rotary valve segment includes a protrusion extending axially out of a longitudinal end of the rotary valve segment on an opposite side from the tab, the protrusion seating within a second notch in the other end wall of the connector housing, the second notch providing support for and permitting rotation of the protrusion relative to the first connector housing.

19. The aseptic coupler of claim 18, the coupler further comprising an assembly enclosure including two side walls that are spaced apart from one another a sufficient distance to receive the first and second connector housings, the assembly enclosure having top and bottom walls that are also spaced apart a distance to receive the first connector housing and the second connector housing therebetween, the top and bottom walls each including a notch to permit the first and second connectors to extend out of the assembly enclosure, the assembly enclosure having a back wall with a hole formed through it with notches on opposed sides that are sized and positioned so to permit the tabs on the at least two rotary valve segments to pass through and extend out of the enclosure when the closure is in its closed state, wherein the hole is sized to receive the neck portions of the tabs and permit the neck portions to rotate freely relative to the enclosure, wherein when the closure is in its closed state, the notches and hole permit the enclosure to be slid on and off the first and second connector housings, wherein when the closure is in its open position, the tabs are rotated relative to the notches so that the tabs prevent removal of the assembly enclosure.