Claims

What is claimed is:

1. An aseptic low-temperature coupling assembly, comprising:

a first connector including a first fluid passage extending through the first connector, the first fluid passage including an opening;

a second connector including a second fluid passage extending through the second connector, the second fluid passage including an opening, the first connector and the second connector each including a first retaining feature and a second retaining feature, disposed on opposite sides of the opening in the respective one of the first connector and the second connector, wherein the first retaining feature and the second retaining feature have complementary shapes, and

a first gasket disposed in one of the first connector and the second connector,

wherein the first connector and the second connector are configured to be coupled together by the first and second retaining features of the first connector engaging with the first and second retaining features of the second connector, in which the opening of the first fluid passage aligns with the opening of the second fluid passage, and

the first gasket is formed to have no substantial deformation after being cooled to at least -50°C then heated to ambient temperature, wherein the first connector and the second connector are configured to couple so as to be disposable within a bag holder along with a bag, the first connector configured to be fluidly connected to the bag.

2. The aseptic low-temperature coupling assembly of claim 1, wherein the coupling of the first connector and the second connector compresses the first gasket between the first connector and the second connector, in which the first gasket is disposed between the opening of the first fluid passage and the opening of the second fluid passage.

3. The aseptic low-temperature coupling assembly of claim 1, further comprising:

a first removable film disposed over and sealing the opening of the first fluid passage; and

a second removable film disposed over and sealing the opening of the second fluid passage.

4. The aseptic low-temperature coupling assembly of claim 3, wherein

in the coupling of the first connector and the second connector, the first removable film and the second removable film are compressed between the first connector and the second connector, and

the first removable film and the second removable film are configured to be removable while compressed between the first connector and the second connector.

5. The aseptic low-temperature coupling assembly of claim 1, further comprising:

a second gasket disposed in the second connector, the first gasket being disposed in the first connector, wherein the coupling of the first connector and the second connector pushes the first gasket against the second gasket and compresses both the first gasket and the second gasket between the first connector and the second connector.

6. The aseptic low-temperature coupling assembly of claim 1, wherein the first retaining features include a first retaining projection and a second retaining projection, the second retaining features include a first retaining slot and a second retaining slot, the first retaining projection being inserted into the first retaining slot and the second retaining projection being inserted into the second retaining slot to couple the first connector and the second connector.

7. The aseptic low-temperature coupling assembly of claim 6, wherein the first connector includes the first retaining projection and the first retaining slot, and the second connector includes the second retaining projection and the second retaining slot.

8. The aseptic low-temperature coupling assembly of claim 6, wherein the first retaining projection and the second retaining projection have a same shape.

9. The aseptic low-temperature coupling assembly of claim 1, wherein the first connector is formed of a polymer material that does not have substantial deformation after being cooled to at least -50°C then heated back to the ambient temperature.

10. The aseptic low-temperature coupling assembly of claim 1, wherein the first connector is formed of a polymer material that does not exhibit cracking and maintains a seal after being cooled to at least -190°C then heated back to the ambient temperature.

11. The aseptic low-temperature coupling assembly of claim 1, wherein the first connector, the second connector, and the first gasket are configured to provide a sealed fluid connection after being cooled to at least -50°C then heated back to the ambient temperature.

12. The aseptic low-temperature coupling assembly of claim 1, wherein the first connector comprises fluoropolymer.

13. The aseptic low-temperature coupling assembly of claim 1, wherein the first gasket comprises one or more of silicone and ethylene-vinyl acetate (EVA).

14. The aseptic low-temperature coupling assembly of claim 1, wherein the first gasket does not exhibit abnormalities when tested at -190°C according to method B of ISO Standard 28702.

15. A method of aseptically connecting a low-temperature fluid storage container, the method comprising:

coupling a first connector to a second connector via first retaining features and second retaining features, a first fluid passage extending through the first connector and a second fluid passage extending through the second connector, the first fluid passage and the second fluid passage each including an opening, wherein coupling the first connector to the second connector includes:

engaging the first retaining features with the second retaining features, the first connector and the second connector each including one of the first retaining features and one of the second retaining features disposed on opposite sides of the opening in the respective one of the first connector and the second connector,

compressing a first gasket between the first connector and the second connector, the first gasket disposed in one of the first connector and the second connector, and

aligning the opening of the first fluid passage with the opening of the second fluid passage, wherein

the first gasket is formed to have no substantial deformation after being heated to ambient temperature from a temperature of at least -50°C, wherein the low-temperature fluid storage container comprises a bag within a bag holder, wherein the first connector and the

second connector are configured to couple so as to be disposable within the bag holder along with the bag, the first connector configured to be fluidly connected to the bag.

16. The method of claim 15, further comprising:

compressing, between the first connector and the second connector, each of a first pull film disposed over the opening of the first fluid passage and a second pull film disposed over the opening of the second fluid passage,

simultaneously removing the first pull film and the second pull film compressed between the first connector and the second connector by simultaneously pulling the first pull film and the second pull film in a transverse direction.

17. The method of claim 16, further comprising:

compressing a second gasket between the first connector and the second connector, the first gasket disposed in the first connector, and the second gasket disposed in the second connector, wherein

prior to removal, the first pull film is disposed over and seals the first passageway and the first gasket.