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[54] STORAGE BAG AND METHOD FOR MAKING A STORAGE BAG  
儲存袋以及製作儲存袋的方法

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[73] Proprietor 專利所有人  
W. L. Gore & Associates, Inc.  
555 Paper Mill Road  
Newark, DE 19711  
UNITED STATES/UNITED STATES OF AMERICA

[72] Inventor 發明人  
SNYDER, Bret, A.  
NASE, Basak, Irem  
BACINO, John, E.  
SHAMROCK, William

[74] Agent and / or address for service 代理人及/或送達地址  
UNITALEN ATTORNEYS AT LAW LIMITED  
RM 1201, 12/F,  
GOLDEN ERA PLAZA,  
39-55 SAI YEE ST, MONGKOK KLN  
HONG KONG

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**(54) STORAGE BAG AND METHOD FOR MAKING A STORAGE BAG**

**AUFBEWAHRUNGSTASCHE UND VERFAHREN ZUR HERSTELLUNG EINER AUFBEWAHRUNGSTASCHE**

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- **NASE, Basak, Irem**  
Newark, DE 19711 (US)
- **BACINO, John, E.**  
Newark, DE 19711 (US)
- **SHAMROCK, William**  
Newark, DE 19711 (US)

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(74) Representative: **HGF Limited**  
**8th Floor**  
**140 London Wall**  
**London EC2Y 5DN (GB)**

(73) Proprietor: **W. L. Gore & Associates, Inc.**  
**Newark, DE 19711 (US)**

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(72) Inventors:  
 • **SNYDER, Bret, A.**  
**Newark, DE 19711 (US)**

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## Description

### FIELD

**[0001]** The present disclosure relates to storage bags, and more particularly, to cryopreservation bags.

### BACKGROUND

**[0002]** Single-use flexible containers are used for transportation and storage of materials such as biologics. Such containers are flexible bags that are typically made out of plastic film. The bags may be used for storage and particularly in cryopreservation applications. The bags are typically disposable and intended to reduce risk of cross contamination and the need for cleaning validation.

**[0003]** In the cryopreservation application, biologic bulk drug substances are stored and transported frozen in the storage bags. This maintains protein stability over storage time. Current bags have certain drawbacks, including durability at freezing temperatures (which can be as low as  $\sim 80^{\circ}\text{C}$ ) and during warm-up and usage of the bags. There is also the risk of plastic extractables interacting with the drug substances in existing storage bags. Moreover, existing bags tend to have leakage problems, particularly at the ends and corners of the bags,

**[0004]** A storage bag particularly for cryogenic applications with improved durability with low extractables and reduced leakage is therefore desirable.

**[0005]** Document EP 0963326 A discloses a method of making a cryopreservation bag comprising the following steps:

- forming a composite tube having an inner surface comprising a higher melting polymer, an outer surface comprising a lower melting polymer, two ends, and a diameter;
- flattening said tube in a direction perpendicular to said diameter;
- providing a sheet;
- disposing said sheet onto the outer surface of the flattened tube;
- forming a joint between the sheet and the outer surface of the flattened tube at one of said two ends at a temperature between respective melting points of said higher melting polymer and said lower melting polymer.

### SUMMARY

**[0006]** In a first aspect, this disclosure provides a method of making a storage bag comprising the following steps performed in any order: (a) forming a composite tube having an inner surface comprising a higher melting polymer, an outer surface comprising a lower melting polymer, two ends, and a diameter; (b) flattening the tube in a direction perpendicular to the diameter; (c) forming a joint at one of the ends at a temperature between re-

spective melting points of the higher melting polymer and the lower melting polymer; (d) providing a composite sheet having a first side comprising a higher melting polymer and a second side comprising a lower melting polymer; and (e) disposing the composite sheet over the joint such that the first side comprising a Sower melting polymer engages the joint and forming a lap seam over the joint at a temperature between respective melting points of the higher melting polymer and the lower melting polymer. In alternative embodiments, the storage bag is a cryoprotective bag; the steps (c) through (e) are performed at the other of the two ends; step (e) further comprises disposing a composite sheet on a back side of the joint; step (e) comprises folding the composite sheet over one of the ends to form lap seam over front and back sides of the joint; the higher melting polymer is a non-melt-processible polymer; the higher melting polymer is polytetrafluoroethylene; the higher melting polymer is a polyimide such as Kapton®; the lower melting polymer is a melt-processible polymer; and the lower melting polymer is fluorinated ethylene propylene ("FEP").

**[0007]** In a particularly preferred embodiment, this disclosure provides a method of making a cryopreservation bag comprising the following steps performed in any order: (a) forming a composite tube having an inner surface comprising a non-melt-processible polymer, an outer surface comprising a melt-processible polymer, two ends, and a diameter dividing the tube into a first half and a second half; (b) providing, on at least one of the two ends of said tube, an extension of the first half of the tube; (c) flattening the tube in a direction perpendicular to the diameter; (e) dividing the extension into at least three sections having edges; (f) folding the three sections such that the edges engage the second half of the tube to form a joint; (g) providing a composite sheet having a first side comprising a non-melt-processible polymer and a second side comprising a melt-processible polymer; and (h) folding the composite sheet over the joint such that the second side comprising a melt-processible polymer engages the joint to form a lap seam over the joint.

**[0008]** In another aspect, this disclosure provides a storage bag having two edges and two ends comprising a first face and a second face integrally joined at the two edges of the bag and defining an inner surface and an outer surface of the bag; the inner surface comprising a higher melting polymer, and the outer surface comprising a lower melting polymer; a joint at one of the ends; a discrete composite sheet having a first side comprising a higher melting polymer and a second side comprising a lower melting polymer folded over the joint with the first side comprising a lower melting polymer engaging the joint to form a lap seam over the joint.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0009]** The accompanying drawings are included to provide a further understanding of the disclosure and are incorporated in and constitute a part of this specification,

illustrate embodiments, and together with the description serve to explain the principles of the disclosure.

FIG. 1 is a front view of a storage bag in accordance with an exemplary embodiment.

FIG. 2 is a perspective view of a component of a storage bag in accordance with an exemplary embodiment.

FIG. 3 is a partial front view of a component of a storage bag in accordance with an exemplary embodiment.

FIG. 4 is a partial front view of a storage bag in accordance with an exemplary embodiment.

FIG. 5 is a partial front view of a storage bag in accordance with an exemplary embodiment.

FIG. 6 is a partial front view of a storage bag in accordance with an exemplary embodiment.

FIG. 7 is a partial front view of a component of a storage bag in accordance with an exemplary embodiment.

FIG. 8 is a perspective view of a component of a storage bag in accordance with an exemplary embodiment.

FIG. 9 is a partial front view of a component of a storage bag in accordance with an exemplary embodiment.

FIG. 10 is a partial front view of a component of a storage bag in accordance with an exemplary embodiment.

FIG. 11 is a partial front view of a storage bag in accordance with an exemplary embodiment.

FIG. 12 is a partial front view of a storage bag in accordance with an exemplary embodiment.

FIG. 13 is a partial front view of a storage bag in accordance with an exemplary embodiment.

FIG. 14 is a partial front view of a storage bag in accordance with an exemplary embodiment.

FIG. 15 is a partial front view of a component of a storage bag in accordance with an exemplary embodiment.

FIG. 16 is a partial front view of a storage bag in accordance with an exemplary embodiment.

#### DETAILED DESCRIPTION

**[0010]** Persons skilled in the art will readily appreciate that various aspects of the present disclosure can be realized by any number of methods and apparatus configured to perform the intended functions. It should also be noted that the accompanying drawing figures referred to herein are not necessarily drawn to scale, but may be exaggerated to illustrate various aspects of the present disclosure, and in that regard, the drawing figures should not be construed as limiting.

**[0011]** Preferred embodiments of the disclosure will now be described in connection with the attached figures. In FIG. 1, an exemplary storage bag 10 is illustrated. Storage bag 10 is formed of a composite tube 11 having

ends 14a and 14b and a front side 70 and a back side 71. End 14a in this embodiment is a handle end. End 14b in this embodiment is a port end. Port end 14b has a clamp 3 and ports 2 formed thereon. Ports 2 may be formed by puncturing port end 14b. Specifically, before composite tube 11 is formed, holes are punctured therein and then a molded piece having ports 2 is attached to the outside of composite tube 11. The subsequent steps for forming the bag are then followed as described herein. In a preferred embodiment, a molded piece having ports 2 is provided and attached to the bag after formation of the composite tube 11. Handle end 14a in this embodiment has handle 4 formed therein.

**[0012]** At each end 14a and 14b, the composite tube 11 is folded to form a joint 15. Also at each end 14a and 14b, a discrete composite sheet 20 is disposed over joint 15 to form a lap seam over joint 15. As used herein, "joint" means an interface that includes two abutting edges, edges that are in near abutment, and edges that overlap; "lap seam" means a seam having edges that overlap one another; and "cryopreservation" means storage or preservation at cold temperatures below zero degrees C.

**[0013]** Composite tube 11 is preferably formed by creating a tube of a sheet of composite material as illustrated in FIG. 2. Composite tube 11 has inner surface 12, which preferably comprises a higher melting polymer. Composite tube 11 also has outer surface 13, which is preferably formed of a lower melting polymer. As used herein "higher melting polymer" means a polymer having a melting point at least 30°C, preferably 50°C above the "lower melting polymer," and "lower melting polymer" correspondingly means a polymer having a melting point at least 50°C below that of the higher melting polymer. Preferably, the higher melting polymer is a non-melt processible polymer such as polytetrafluoroethylene or a polyimide such as Kapton®, and the lower melting polymer is a melt processible such as fluorinated ethylene propylene ("FEP"). Composite tube 11 has a diameter D, dividing composite tube 11 into a first half and a second half. Composite tube 11 is flattened in a direction perpendicular to diameter D in order to form storage bag 10.

**[0014]** Using the preferred embodiments of the present disclosure provides the distinct advantages of enhanced leak protection at the ends and corners of a storage bag by covering joints with lap seams. A particularly preferred embodiment of this disclosure is illustrated in FIG. 3. FIG. 3 is a depiction of end 14a of composite tube 11. End 14a of composite tube 11 has an extension 18. Extension 18 is an extension of one-half of composite tube 11. Extension 18 is divided into three sections 19a, 19b, and 19c in this preferred embodiment illustrated. Sections 19a, 19b, and 19c have edges 30a, 30b, and 30c as illustrated, respectively. Each of the three sections 19a, 19b, and 19c are folded along fold line K, as illustrated in FIG's. 3 and 4, such that edges 30a, 30b, and 30c engage the other half of composite tube 11 to form a first joint 15.

**[0015]** With reference to FIG. 4, a separate composite

sheet 20 having a first side (not shown) formed of a higher melting polymer and a second side 21b formed of a lower melting polymer. Composite sheet 20 is disposed over joint 15 to form a lap seam between composite sheet 20 and composite tube 11 over joint 15. In a particularly preferred embodiment, composite sheet 20 is folded such that it also forms a lap seam on the opposite side of composite tube 11. FIG. 4 also illustrates edges 40a and 40b of composite tube 11 after it is flattened.

**[0016]** In an alternative embodiment, two separate composite sheets 20 may be used, one on each side of composite tube 11, rather than folding over one composite sheet 20. In any embodiment, the lower melting surface of composite sheet 20 bonds with the lower melting surface of composite tube 11 in order to create a lap seam over joint 15.

**[0017]** FIGS. 5-9 illustrate alternative embodiments. FIG. 5 shows an extension 58 of one half of the composite tube, and partial extensions 59 at the corners of the other half of the composite tube, all of which are folded over fold line B as shown in FIG. 6. FIG. 7 shows extension 78 of one half of the composite tube, which is folded over fold line C and covered with discrete composite sheet 20 as shown in FIG. 8. FIG. 9 shows extension 98 of a particular shape having tabs 99 thereon. Tabs 99 are folded along fold lines X, and extension 98 is folded around fold line E and covered with discrete composite sheet 20 as shown in FIGS. 10 and 11. FIG. 12 shows extension 128 of one-half of the composite tube and extension 128a of the other half of the composite tube, which together define corners 129. Corners 129 are folded over fold lines F, and the extensions are then folded over fold line G as shown in FIG. 14. FIG. 15 shows extension 158 of one-half of the composite tube shaped to define corners 159 of the other half of the composite tube. Corners 159 are folded around fold lines H, and the extension is folded over fold line J and covered with discrete composite sheet 20 as shown in FIG. 16.

**[0018]** Although not specifically illustrated herein, port end 14b of storage bag 10 is provided with a lap seam over a joint in similar fashion as described above in connection with handle end 14a. In so doing, a slit is preferably formed in extension 18 on port end 14b in order to facilitate attachment of ports 2. Handle 4 and clamp 3 may be formed as known in the art.

**[0019]** The invention of this application has been described above both generically and with regard to specific embodiments. It will be apparent to those skilled in the art that various modifications and variations can be made in the embodiments without departing from the scope of the disclosure. Thus, it is intended that the embodiments cover the modifications and variations of this invention provided they come within the scope of the appended claims.

## Claims

1. A method of making a storage bag (10), preferably a cryopreservation bag, comprising the following steps performed in any order:
  - (a) forming a composite tube (11) having an inner surface comprising a higher melting polymer, an outer surface comprising a lower melting polymer, two ends, and a diameter;
  - (b) flattening said tube (11) in a direction perpendicular to said diameter;
  - (c) forming a joint (15) at one of said two ends (14a, 14b) at a temperature between respective melting points of said higher melting polymer and said lower melting polymer;
  - (d) providing a composite sheet (20) having a first side comprising a higher melting polymer and a second side comprising a lower melting polymer;
  - (e) disposing said composite sheet (20) over said joint (15) such that said second side comprising a lower melting polymer engages said joint (15) and forming a lap seam over said joint (15) at a temperature between respective melting points of said higher melting polymer and said lower melting polymer.
2. A method of making a storage bag (10) as defined in claim 1 further comprising performing steps (c) through (e) at the other of said two ends (14a, 14b).
3. A method of making a storage bag (10) as defined in claim 2 further comprising the steps of forming a handle (4) in said one of said ends (14a, 14b) and attaching ports (2) and a brace to said other of said two ends (14a, 14b).
4. A method of making a storage bag (10) as defined in claim 3 wherein the ports (2) are attached before the composite tube (11) is formed.
5. A method of making a storage bag (10) as defined in claim 3 wherein the ports (2) are attached after the composite tube (11) is formed.
6. A method of making a storage bag (10) as defined in claim 1 wherein step (e) further comprising disposing a composite sheet (20) on a back side of said joint (15).
7. A method of making a storage bag (10) as defined in claim 1 wherein step (e) comprises folding said composite sheet (20) over said one of said ends (14a, 14b) to form lap seam over front and back sides of said joint (15).
8. A method of making a storage bag (10) as defined

in claim 1 wherein said higher melting polymer is a non-melt-processible polymer, preferably polytetrafluoroethylene or polyimide; or wherein said lower melting polymer is a melt-processible polymer, preferably FEP.

9. A method of making a cryopreservation bag (10) comprising the following steps performed in any order:

(a) forming a composite tube (11) having an inner surface comprising a non-melt-processible polymer, an outer surface comprising a melt-processible polymer, two ends (14a, 14b), and a diameter dividing said tube into a first half and a second half;

(b) providing, on at least one of said two ends of said tube (11), an extension (18) of said first half of said tube (11);

(c) flattening said tube (11) in a direction perpendicular to said diameter;

(d) dividing said extension (18) into at least three sections (19a, 19b, 19c) having edges (30a, 30b, 30c);

(e) folding said three sections (19a, 19b, 19c) such that said edges (30a, 30b, 30c) engage said second half of said tube (11) to form a joint (15);

(f) providing a composite sheet (20) having a first side comprising a non-melt-processible polymer and a second side comprising a melt-processible polymer;

(g) folding said composite sheet (20) over said joint (15) such that said second side comprising a melt-processible polymer engages said joint (15) to form a lap seam over said joint (15).

10. A storage bag (10), preferably a cryopreservation bag, having two edges and two ends comprising:

(a) a first face and a second face integrally joined at said two edges of said bag (10) and defining an inner surface and an outer surface of said bag (10);

(b) said inner surface comprising a higher melting polymer, and said outer surface comprising a lower melting polymer;

(c) a joint (15) at one of said ends;

(d) a discrete composite sheet (20) having a first side comprising a higher melting polymer and a second side comprising a lower melting polymer folded over said joint (15) with said second side comprising a lower melting polymer engaging said joint (15) to form a lap seam over said joint (15).

11. A storage bag (10) as defined in claim 10 further comprising elements (c) and (d) at the other of said

two ends.

12. A storage bag (10) as defined in claim 11 further comprising a handle (4) in said one of said ends and ports (2) and a brace to said other of said two ends.

13. A storage bag (10) as defined in claim 10 further comprising a composite sheet (20) on a back side of said joint (15).

14. A storage bag (10) as defined in claim 13 said composite sheet (20) is folded over said one of said ends to form lap seam over front and back sides of said joint (15).

15. A storage bag (10) as defined in claim 10 wherein said higher melting polymer is a non-melt-processible polymer, preferably polytetrafluoroethylene or polyimide; or wherein said lower melting polymer is a melt-processible polymer, preferably FEP.

#### Patentansprüche

1. Verfahren zum Herstellen einer Aufbewahrungstasche (10), vorzugsweise einer Kryokonservierungstasche, das die folgenden Schritte umfasst, die in einer beliebigen Reihenfolge durchgeführt werden:

(a) Bilden eines Verbundrohrs (11) mit einer Innenfläche, die ein höher schmelzendes Polymer umfasst, einer Außenfläche, die ein niedriger schmelzendes Polymer umfasst, zwei Enden und einem Durchmesser;

(b) Abflachen des Rohrs (11) in eine Richtung, die senkrecht zu dem Durchmesser ist;

(c) Bilden einer Verbindung (15) an einem der zwei Enden (14a, 14b) bei einer Temperatur zwischen entsprechenden Schmelzpunkten des höher schmelzenden Polymers und des niedriger schmelzenden Polymers;

(d) Bereitstellen einer Verbundlage (20) mit einer ersten Seite, die ein höher schmelzendes Polymer umfasst, und einer zweiten Seite, die ein niedriger schmelzendes Polymer umfasst;

(e) Anordnen der Verbundlage (20) über der Verbindung (15), sodass die zweite Seite, die ein niedriger schmelzendes Polymer umfasst, mit der Verbindung (15) eingreift und Bilden einer Überlappnaht über der Verbindung (15) bei einer Temperatur zwischen entsprechenden Schmelzpunkten des höher schmelzenden Polymers und des niedriger schmelzenden Polymers.

2. Verfahren zum Herstellen einer Aufbewahrungstasche (10) nach Anspruch 1, das ferner ein Durchführen von Schritten (c) bis (e) an dem anderen der

- zwei Enden (14a, 14b) umfasst.
3. Verfahren zum Herstellen einer Aufbewahrungstasche (10) nach Anspruch 2, die ferner die Schritte des Bildens eines Griiffs (4) in dem einen der Enden (14a, 14b) und das Befestigen von Anschlussstücken (2) und einer Verstärkung an dem anderen der zwei Enden (14a, 14b) umfasst. 5
  4. Verfahren zum Herstellen einer Aufbewahrungstasche (10) nach Anspruch 3, wobei die Anschlussstücke (2) befestigt werden, bevor das Verbundrohr (11) gebildet wird. 10
  5. Verfahren zum Herstellen einer Aufbewahrungstasche (10) nach Anspruch 3, wobei die Anschlussstücke (2) befestigt werden, nachdem das Verbundrohr (11) gebildet ist. 15
  6. Verfahren zum Herstellen einer Aufbewahrungstasche (10) nach Anspruch 1, wobei Schritt (e) ferner ein Anordnen einer Verbundlage (20) auf einer Rückseite der Verbindung (15) umfasst. 20
  7. Verfahren zum Herstellen einer Aufbewahrungstasche (10) nach Anspruch 1, wobei Schritt (e) ein Falten der Verbundlage (20) über dem einen der Enden (14a, 14b) umfasst, um eine Überlappnaht über der Vorder- und Rückseite der Verbindung (15) zu bilden. 25  
30
  8. Verfahren zum Herstellen einer Aufbewahrungstasche (10) nach Anspruch 1, wobei das höher schmelzende Polymer ein nicht schmelzverarbeitbares Polymer, vorzugsweise Polytetrafluorethylen oder Polymid ist; oder wobei das niedriger schmelzende Polymer ein schmelzverarbeitbares Polymer, vorzugsweise FEP ist. 35
  9. Verfahren zum Herstellen einer Kryokonservierungstasche (10), das die folgenden Schritte umfasst, die in einer beliebigen Reihenfolge ausgeführt werden: 40
    - (a) Bilden eines Verbundrohrs (11) mit einer Innenfläche, die ein nicht schmelzverarbeitbares Polymer umfasst, einer Außenfläche, die ein schmelzverarbeitbares Polymer umfasst, zwei Enden (14a, 14b) und einem Durchmesser, der das Rohr in eine erste Hälfte und eine zweite Hälfte unterteilt; 45
    - (b) Bereitstellen einer Erweiterung (18) der ersten Hälfte des Rohrs (11) an mindestens einem der zwei Enden des Rohrs (11);
    - (c) Abflachen des Rohrs (11) in eine Richtung, die senkrecht zu dem Durchmesser ist; 50
    - (d) Unterteilen der Erweiterung (18) mit Rändern (30a, 30b, 30c) in mindestens drei Abschnitte 55
- (19a, 19b, 19c);  
 (e) Falten der drei Abschnitte (19a, 19b, 19c), sodass die Ränder (30a, 30b, 30c) mit der zweiten Hälfte des Rohrs (11) eingreifen, um eine Verbindung (15) zu bilden;  
 (f) Bereitstellen einer Verbundlage (20) mit einer ersten Seite, die ein nicht schmelzverarbeitbares Polymer umfasst, und einer zweiten Seite, die ein schmelzverarbeitbares Polymer umfasst;  
 (g) Falten der Verbundlage (20) über der Verbindung (15), sodass die zweite Seite, die ein schmelzverarbeitbares Polymer umfasst, mit der Verbindung (15) eingreift, um eine Überlappnaht über der Verbindung (15) zu bilden.
10. Aufbewahrungstasche (10), vorzugsweise eine Kryokonservierungstasche, die zwei Ränder und zwei Enden aufweist, die Folgendes umfasst:
    - (a) eine erste Fläche und eine zweite Fläche, die einteilig an den zwei Rändern der Tasche (10) verbunden sind und eine Innenfläche und eine Außenfläche der Tasche (10) definieren;
    - (b) wobei die Innenfläche ein höher schmelzendes Polymer umfasst und die Außenfläche ein niedriger schmelzendes Polymer umfasst;
    - (c) eine Verbindung (15) an einem der Enden;
    - (d) eine separate Verbundlage (20) mit einer ersten Seite, die ein höher schmelzendes Polymer umfasst, und einer zweiten Seite, die ein niedriger schmelzendes Polymer umfasst, die über die Verbindung (15) gefaltet ist, wobei die zweite Seite, die ein niedriger schmelzendes Polymer umfasst, mit der Verbindung (15) eingreift, um eine Überlappnaht über der Verbindung (15) zu bilden.
  11. Aufbewahrungstasche (10) nach Anspruch 10, die ferner Elemente (c) und (d) an dem anderen der zwei Enden umfasst.
  12. Aufbewahrungstasche (10) nach Anspruch 11, die ferner einen Griff (4) in dem einen der Enden und Anschlussstücke (2) und eine Verstärkung an dem anderen der zwei Enden umfasst.
  13. Aufbewahrungstasche (10) nach Anspruch 10, die ferner eine Verbundlage (20) auf einer Rückseite der Verbindung (15) umfasst.
  14. Aufbewahrungstasche (10) nach Anspruch 13, wobei die Verbundlage (20) über das eine der zwei Enden gefaltet wird, um eine Überlappnaht über der Vorder- und Rückseite der Verbindung (15) zu bilden.
  15. Aufbewahrungstasche (10) nach Anspruch 10, wo-

bei das höher schmelzende Polymer ein nicht schmelzverarbeitbares Polymer, vorzugsweise Polytetrafluorethylen oder Polymid ist; oder wobei das niedriger schmelzende Polymer ein schmelzverarbeitbares Polymer, vorzugsweise FEP ist.

## Revendications

1. Méthode de réalisation d'un sac de stockage (10), de préférence un sac pour la cryoconservation, comprenant les étapes suivantes, effectuées dans un ordre quelconque :

(a) formation d'un tube (11) composite possédant une surface interne comprenant un polymère de fusion supérieure, une surface extérieure comprenant un polymère de fusion inférieure, deux bouts, et un diamètre ;

(b) aplatissement dudit tube (11) dans une direction perpendiculaire audit diamètre ;

(c) formation d'un joint (15) à l'un desdits deux bouts (14a, 14b) à une température comprise entre les points de fusion respectifs dudit polymère de fusion supérieure et dudit polymère de fusion inférieure ;

(d) mise en place d'une feuille composite (20) possédant un premier côté comprenant un polymère de fusion supérieure et un deuxième côté comprenant un polymère de fusion inférieure ;

(e) pose de ladite feuille composite (20) sur ledit joint (15) de sorte que ledit deuxième côté comprenant un polymère de fusion inférieure engage ledit joint (15), et formation d'une soudure par recouvrement sur ledit joint (15) à une température comprise entre les points de fusion respectifs dudit polymère de fusion supérieure et dudit polymère de fusion inférieure.

2. Méthode de réalisation d'un sac de stockage (10) selon la définition dans la revendication 1, comprenant en outre l'exécution des étapes (c) à (e) à l'autre desdits deux bouts (14a, 14b).

3. Méthode de réalisation d'un sac de stockage (10) selon la définition dans la revendication 2, comprenant en outre les étapes de formation d'une poignée (4) dans ledit un desdits bouts (14a, 14b), et la fixation d'embouchures (2) et d'un renfort auxdits autres desdits deux bouts (14a, 14b).

4. Méthode de réalisation d'un sac de stockage (10) selon la définition dans la revendication 3, les embouchures (2) étant fixées préalablement à la formation du tube (11) composite.

5. Méthode de réalisation d'un sac de stockage (10) selon la définition dans la revendication 3, les em-

bouchures (2) étant fixées après la formation du tube (11) composite.

6. Méthode de réalisation d'un sac de stockage (10) selon la définition dans la revendication 1, l'étape (e) comprenant en outre la pose d'une feuille composite (20) sur un côté postérieur dudit joint (15).

7. Méthode de réalisation d'un sac de stockage (10) selon la définition dans la revendication 1, l'étape (e) comprenant le pliage de ladite feuille composite (20) sur ledit un desdits bouts (14a, 14b), afin de constituer une soudure par recouvrement sur les côtés antérieur et postérieur dudit joint (15).

8. Méthode de réalisation d'un sac de stockage (10) selon la définition dans la revendication 1, ledit polymère de fusion supérieure étant un polymère ne pouvant être traité à l'état fondu, de préférence du polytétrafluoroéthylène ou du polyimide ; ou ledit polymère de fusion inférieure étant un polymère pouvant être traité à l'état fondu, de préférence du FEP.

9. Méthode de réalisation d'un sac de stockage (10) pour la cryoconservation, comprenant les étapes suivantes, effectuées dans un ordre quelconque :

(a) formation d'un tube (11) composite possédant une surface interne comprenant un polymère ne pouvant être traité à l'état fondu, une surface extérieure comprenant un polymère pouvant être traité à l'état fondu, deux bouts (14a, 14b), et un diamètre divisant ledit tube en une première moitié et une deuxième moitié ;

(b) mise en place, sur au moins un desdits deux bouts dudit tube (11) d'une rallonge (18) de ladite première moitié dudit tube (11) ;

(c) aplatissement dudit tube (11) dans une direction perpendiculaire audit diamètre ;

(d) division de ladite rallonge (18) en au moins trois sections (19a, 19b, 19c) munies de bords (30a, 30b, 30c) ;

(e) pliage desdites trois sections (19a, 19b, 19c) de sorte que lesdits bords (30a, 30b, 30c) engagent ladite deuxième moitié dudit tube (11) pour former un joint (15) ;

(f) mise en place d'une feuille composite (20) munie d'un premier côté comprenant un polymère ne pouvant être traité à l'état fondu, et d'un deuxième côté comprenant un polymère pouvant être traité à l'état fondu ;

(g) pliage de ladite feuille composite (20) sur ledit joint (15) de sorte que ledit deuxième côté comprenant un polymère pouvant être traité à l'état fondu s'engage avec ledit joint (15) pour former une soudure à recouvrement sur ledit joint (15).

10. Sac de stockage (10), de préférence un sac pour la cryoconservation, possédant deux bords et deux bouts, comprenant :
- (a) une première face et une deuxième face jointes de façon intégrale auxdits deux bords dudit sac (10), et définissant une surface interne et une surface externe dudit sac (10) ;
  - (b) ladite surface interne comprenant un polymère de fusion supérieure et ladite surface externe comprenant un polymère de fusion inférieure ;
  - (c) un joint (15) à un desdits bouts ;
  - (d) une feuille composite (20) discrète possédant un premier côté comprenant un polymère de fusion supérieure et un deuxième côté comprenant un polymère de fusion inférieure plié sur ledit joint (15), ledit deuxième côté comprenant un polymère de fusion inférieure engageant ledit joint (15) de façon à former une soudure par recouvrement sur ledit joint (15).
11. Sac de stockage (10) défini selon la revendication 10, comprenant en outre des éléments (c) et (d) à l'autre desdits deux bouts.
12. Sac de stockage (10) défini selon la revendication 11, comprenant en outre une poignée (4) dans ledit un desdits bouts et embouchures (2), et un renfort sur ledit autre desdits deux bouts.
13. Sac de stockage (10) défini selon la revendication 10, comprenant en outre une feuille composite (20) sur un côté postérieur dudit joint (15).
14. Sac de stockage (10) défini selon la revendication 13, ladite feuille composite (20) étant pliée sur ledit un des deux bouts pour former une soudure par recouvrement sur les côtés antérieur et postérieur dudit joint (15).
15. Sac de stockage (10) défini selon la revendication 10, ledit polymère de fusion supérieure étant un polymère ne pouvant être traité à l'état fondu, de préférence du polytétrafluoroéthylène ou du polyimide ; ou ledit polymère de fusion inférieure étant un polymère pouvant être traité à l'état fondu, de préférence du FEP.

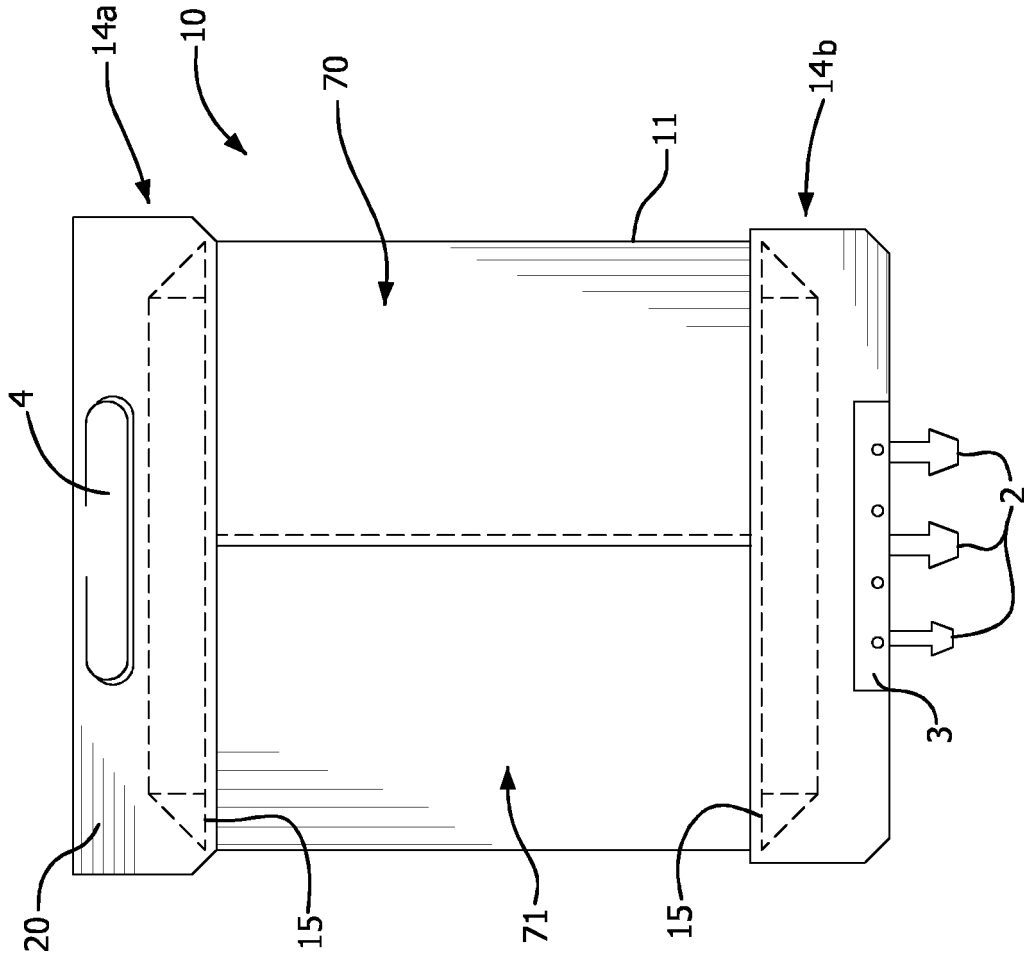


FIG. 1

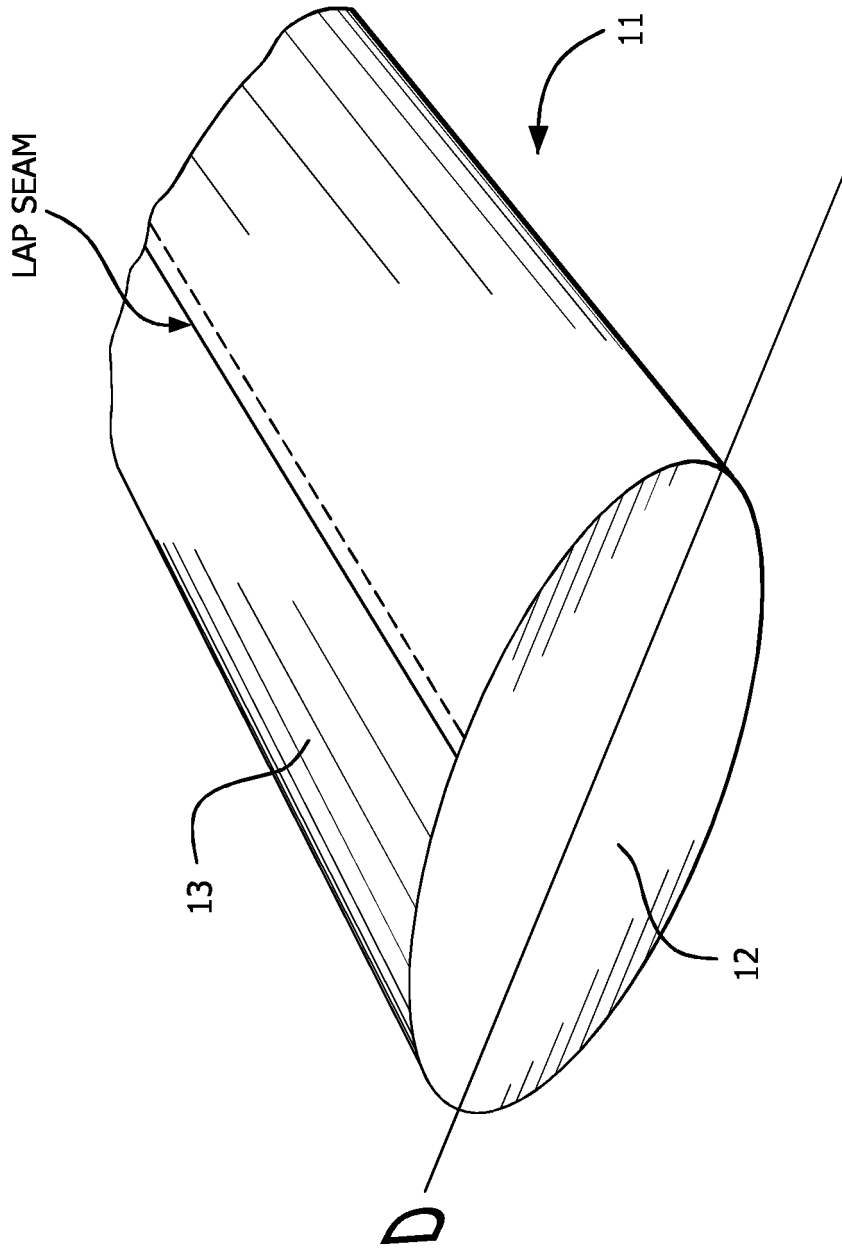


FIG. 2

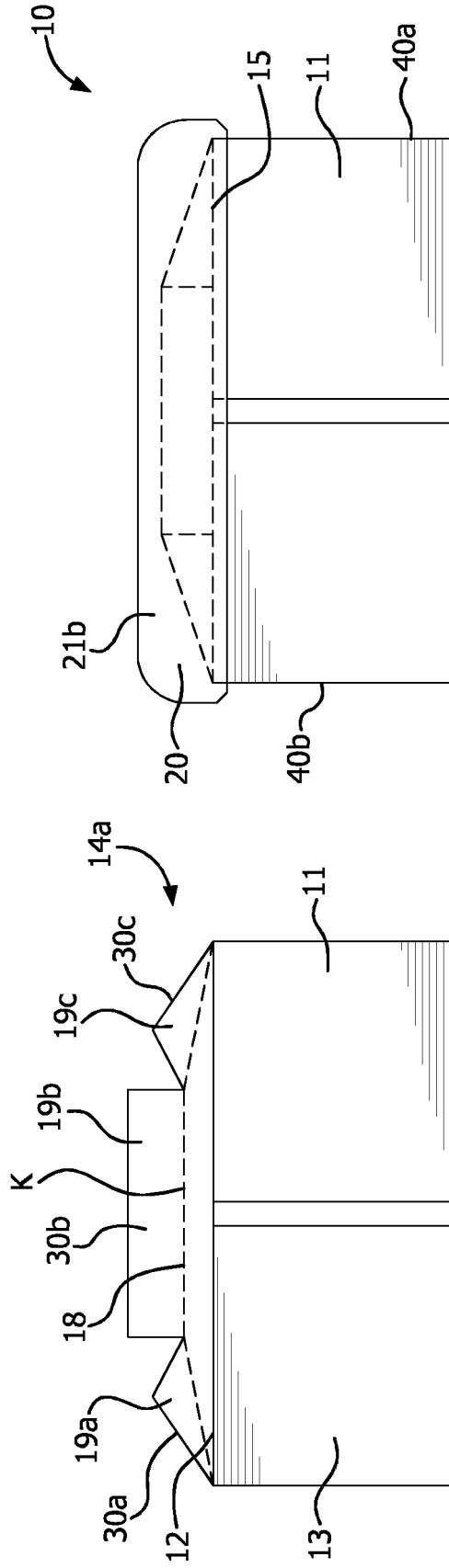


FIG. 4

FIG. 3

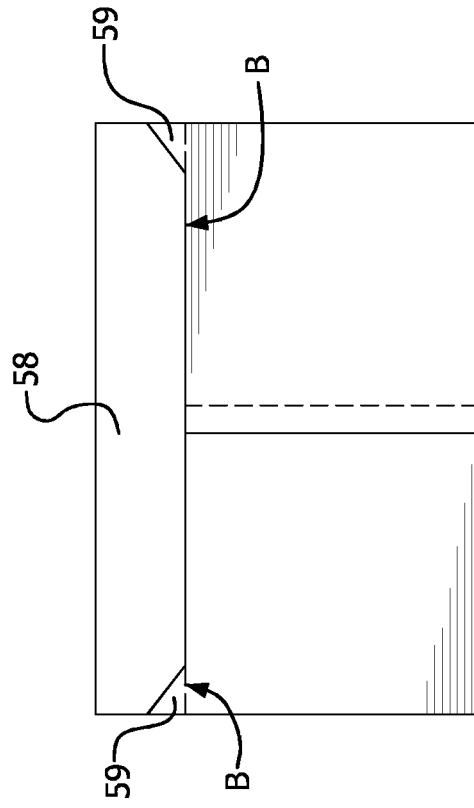


FIG. 5



FIG. 6

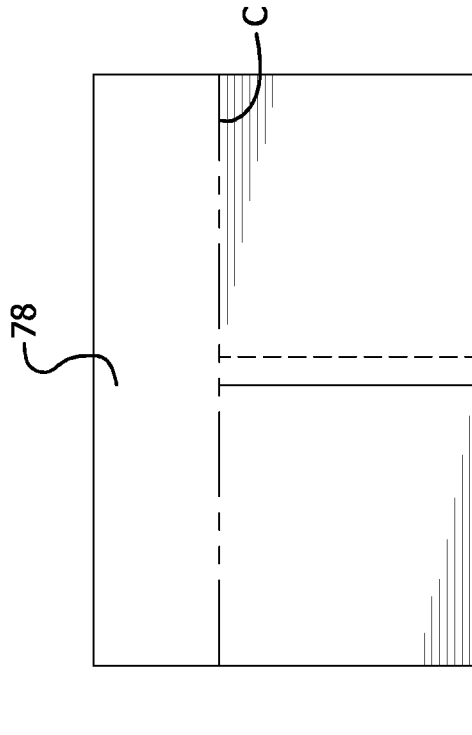


FIG. 7

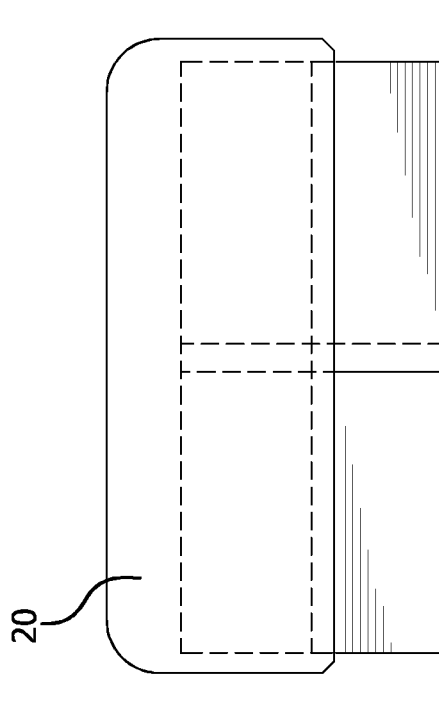


FIG. 8

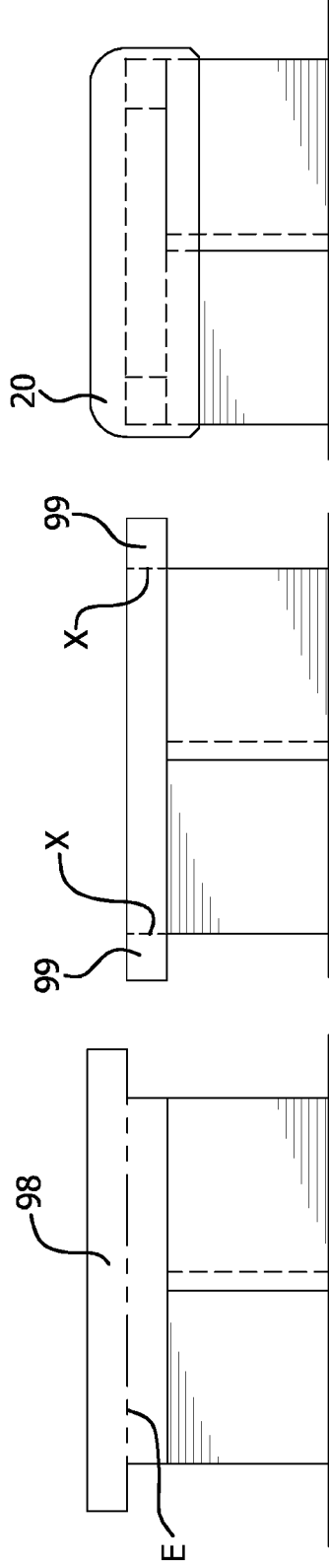


FIG. 9

FIG. 10

FIG. 11

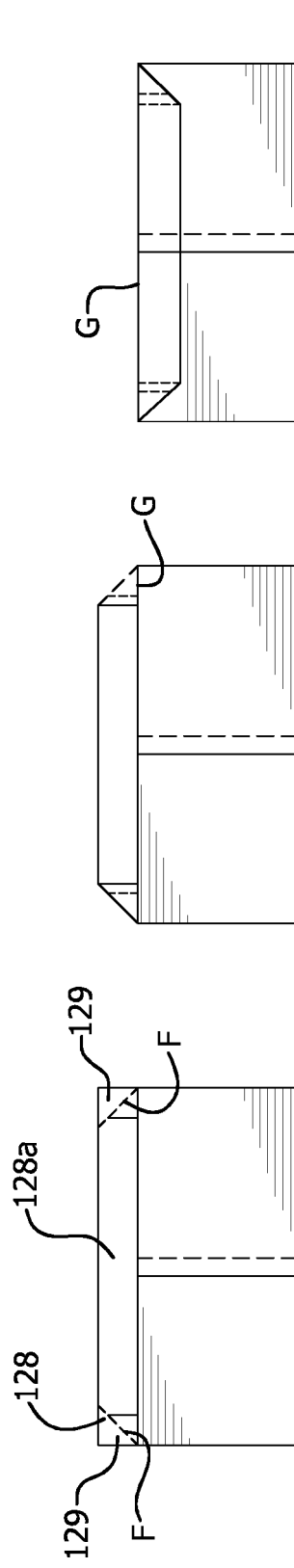


FIG. 12

FIG. 13

FIG. 14

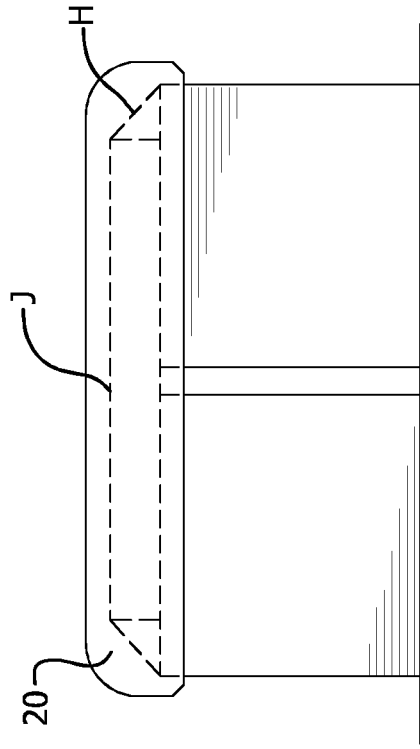


FIG. 15

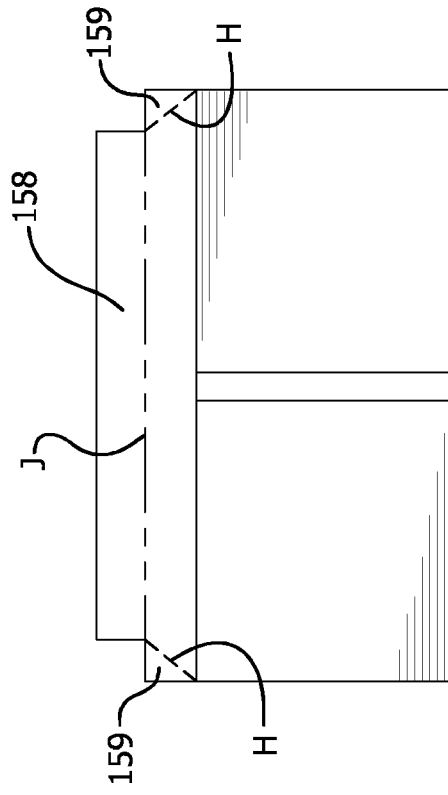


FIG. 16

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- EP 0963326 A [0005]