

## DESCRIPTION

### **TITLE: CLOTHING FOR CLEAN ROOM HAVING AN INTEGRATED POUCH, AND ASSOCIATED PACKAGING METHOD**

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The present invention relates to the field of protective clothing for cleanrooms.

“Cleanrooms” means rooms with a controlled atmosphere, aseptic and sterile.

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Cleanrooms are in particular used in numerous fields such as electronics, micromechanics, optics, nano and biotechnologies, pharmaceuticals, sterile preparations in pharmacy, medical equipment or in the agri-food industry.

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In this type of room, it is necessary to isolate the body of the staff working inside said rooms in order to minimise the dispersion of microorganisms and the particles that they generate themselves, and thus avoid any contamination of the cleanroom.

It is thus known to equip the staff intended to work in cleanrooms with protective clothing, in particular suits.

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Such protective clothing is sterile and provided in sealed packaging. The user must put on the piece of protective clothing without touching the outer face intended to be in contact with the sterile environment of the cleanroom.

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Reference can be made to document FR2809933 which describes a suit for cleanrooms intended to be put on by gripping it by the inside and thus avoiding any contamination external to the cleanroom.

Generally, the protective clothing is contained in a sterilised and individual but disposable packaging, in other words single use; this represents a considerable source of waste.

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However, such disposable packaging constitutes a significant quantity of inorganic waste. The current trend is to reduce single-use packaging and the associated waste.

Reference can be made to WO 2021/099631 which proposes a piece of protective equipment for a cleanroom packaged in a reusable and sterilisable pouch.

5 However, the opening of such a pouch does not allow to take out or to repackaging the piece of clothing easily.

Thus, there is a need to improve the protective clothing for cleanrooms with the goal of reducing their environmental and ecological impact, without having a negative effect on the sterility of the piece of clothing, and while simplifying the extraction and the repackaging of the piece of clothing.

Another goal is to limit the costs associated with the logistics of the piece of protective clothing in terms of decontamination, repackaging and storage.

15 The object of the invention is a piece of protective clothing for a cleanroom intended to be worn by a user and comprising an outer face provided to be in contact with the outside environment and an inner face arranged to be in contact with the user wearing said piece of clothing.

The piece of clothing comprises a reusable and sterilisable pouch for packaging the piece of clothing connected to the inner face of the piece of clothing by irreversible fastening means, such as sewing or welding.

20 The packaging pouch comprises a single wall connected by its contours to the inner face of the piece of clothing and comprising an outer face provided to be in contact with the outside environment once the piece of clothing has been packaged in the pouch and an inner face provided to be in contact with the user wearing said piece of clothing, the wall being defined by four corners and comprising an opening having a rounded shape extending between two diagonally opposite corners.

30 The rounded opening allows to facilitate the extraction of the piece of clothing from said pouch, as well as its repackaging.

In other words, the pouch is formed from a single wall defined by four corners forming a contour.

35 Said contour is connected to the inner face of the piece of clothing and defines a zone of the inner face of the piece of clothing facing the outer face of the wall.

The combination of said wall and the zone of the inner face of the piece of clothing facing the wall forms the pouch in which the piece of clothing is put away.

5 In the packaging position of the piece of clothing in the pouch, the outer face of the wall and the zone of the inner face of the piece of clothing are in contact with the outside environment.

The opening forms, preferably, a half-circle.

In the configuration of use of the piece of clothing by the user, the outer face of the pouch faces the inner face of the piece of clothing.

10 Thus, in the folded and packaged position, the inner face of the piece of clothing is connected to the inner face of the pouch so that only the outer face of the pouch is in contact with the outside environment.

Advantageously, the opening of the wall of the packaging pouch is closed by a zip fastener.

15 For example, the packaging pouch comprises a flap intended to cover the opening, in particular the zip fastener, in the packaged position of the piece of clothing in the packaging pouch.

The flap can, for example, be connected to the wall partly along two sides and mobile between a free position of the opening, in particular of the zip fastener, and a position covering said opening, in particular of the zip fastener.

For example, the flap is provided, at each opposite corner, with an opening in order to avoid the accumulation of particles at the zip fastener.

25 The flap is, advantageously, made of textile material.

The storage pouch is, advantageously, made of textile material.

According to one embodiment, the piece of protective clothing is a suit comprising a first and a second leg sections, a first sleeve, a second sleeve and a body part, the first sleeve, the second sleeve, the two leg sections each being connected to the body part to form a suit.

30 Advantageously, the wall of the packaging pouch is rigidly connected onto the inner face of the body part.

Alternatively, the piece of protective clothing could be trousers, a top, a balaclava, or any other type of protective clothing.

35 For example, the body part comprises a head passage section and an opening closed by closing means, for example a zip fastener.

According to another aspect the invention relates to a method for packaging a piece of protective clothing for a cleanroom in a

packaging pouch, said piece of clothing being intended to be worn by a user and comprising an outer face provided to be in contact with the outside environment and an inner face arranged to be in contact with the user wearing said piece of clothing.

5           Said pouch for packaging the piece of clothing is connected to the inner face of the piece of clothing by irreversible fastening means, such as sewing or welding, and comprises a single wall connected by its contours to the inner face of the piece of clothing and comprising an outer face provided to be in contact with the outside environment once  
10 the piece of clothing has been packaged in the pouch and an inner face provided to be in contact with the user wearing said piece of clothing, the wall being defined by four corners and comprising an opening having a rounded shape extending between two opposite corners.

According to the packaging method:

15           - the piece of clothing is folded so as to leave visible the inner face of the wall of the pouch; and  
          - the piece of clothing is gripped by the inside of the pouch and the piece of clothing is pulled on through the opening until the piece of clothing ends up inside said pouch.

20           Advantageously, once the piece of clothing has been placed inside the packaging pouch, the opening is closed by actuating a zip fastener and a flap provided on said pouch is then folded over until it covers the zip fastener.

25           The present invention will be better understood upon studying the detailed description of embodiments, taken as examples that are in no way limiting and illustrated by the appended drawings, in which:

[Fig 1] is a front view of the piece of clothing according to an embodiment of the invention, in which the piece of clothing is a suit;

[Fig 2],

30           [Fig 3] are front views of the packaging pouch of the piece of clothing of figure 1, in a configuration in which the piece of clothing is packaged in said pouch;

[Fig 4A],

[Fig 4B] are views of details of figure 3;

35           [Fig 5] is a front view of the piece of protective clothing according to an embodiment of the invention, in which the piece of clothing is a pair of trousers; and

[Fig 6A],

[Fig 6B],

[Fig 6C],

[Fig 6D],

[Fig 6E],

5 [Fig 6F] and

[Fig 6G] illustrate the steps of the method for packaging the piece of protective clothing in the packaging pouch of figure 1.

In the rest of the description, the expressions “outer” and “inner” refer to the use of the piece of clothing by a user, an inner surface being closer to the user than an outer surface under conditions  
10 of normal use of the piece of clothing.

A piece of protective clothing 1 for a cleanroom or asepticised environment is illustrated in figure 1.

The piece of protective clothing 1 is, here, a suit comprising a first and a second leg sections 2, 3.  
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Alternatively, the piece of protective clothing could be a pair of trousers 20 as illustrated in figure 5 in which the same elements carry the same references. The piece of protective clothing could also be a top, a balaclava, or any other type of piece of protective clothing.

20 The leg sections 2, 3 can, in a manner that is in no way limiting, be provided with closing means (not shown).

The piece of protective clothing 1 also comprises a first sleeve 4, a second sleeve 5 and a body part 6. The first sleeve 4, the second sleeve 5, the two leg sections 2, 3 are each connected to the body part 6  
25 to form a suit.

The body part 6 comprises a head passage section 7 and an opening 8 closed by closing means, for example a zip fastener.

The suit 1 comprises an outer face 1a provided to be in contact with the outside environment and an inner face 1b arranged to be in contact with the user wearing said suit.  
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The suit 1 comprises a packaging pouch 10 comprising a single wall 11 connected by its contours to the inner face 1b of the suit by irreversible fastening means 12, such as welding or sewing.

The wall 11 of the packaging pouch 10 comprises an outer face 11a visible in figures 2 and 3 provided to be in contact with the outside environment once the piece of clothing has been packaged in the pouch  
35 10.

The wall 11 of the packaging pouch 10 comprises an inner face 11b provided to be in contact with the user wearing said suit.

In the configuration of use of the suit by the user, the outer face 11b of the pouch 10 faces the inner face 1b of the body part 6 of the suit 1.

Thus, in the folded and packaged position, the inner face 1b of the suit 1 is connected to the inner face of the wall in such a way that only the outer face of the pouch is in contact with the outside environment, as illustrated in figures 2 and 3.

The wall 11 of the packaging pouch 10 has, here, a parallelepipedic shape comprising four corners 13a, 13b, 13c, 13d.

The wall 11 of the packaging pouch 10 further comprises an opening 14 extending between two diagonally opposite corners 13c, 13b, as visible in figure 2.

The opening 14 has, here, a rounded shape in order to facilitate the extraction of the piece of clothing from said pouch, as well as its repackaging.

The opening forms, here, a half-circle.

The opening 14 comprises a zip fastener 15 intended to close said opening 14.

In a manner that is in no way limiting, the wall 11 of the packaging pouch 10 also comprises a flap 16 intended to cover the zip fastener 15 in the packaged position of the piece of clothing 1 in the packaging pouch 10.

Alternatively, the packaging pouch could not have a flap.

The flap 16 is connected to the wall 11 partly along two sides in order to be able to switch from a free position of the zip fastener 15, visible in figure 2, towards a covered position of said zip fastener 15, visible in figure 3.

The flap 16 is made of textile material.

The flap 16 allows to reduce the entry of the particles by the zip fastener 15 which is thus covered by a protection.

The flap 16 is provided, at each opposite corner, with an opening 16a, 16b in order to avoid the accumulation of particles at the zip fastener 15.

The repackaging of the piece of clothing 1 inside the pouch 10 is carried out as follows, in reference to figures 6A to 6G.

During the first step of the method for repackaging the piece of clothing, the user folds the suit 1 so as to leave visible the inner face 11b of the pouch 10, as illustrated in figure 6A.

5 Once the suit has been folded, the user grips the suit 1, in particular its inner surface 1b, by the inside of the pouch 10, as visible in figure 6B and pulls on the suit 1 through the opening 14 until the suit 1 ends up inside the pouch 1 as visible in figures 6C and 6D.

10 Once the suit 1 has been placed inside the pouch 10, as visible in figure 6E, the user closes the opening 14 by actuating the zip fastener 15, as visible in figure 6F.

The user then folds over the flap 16 and in particular until it covers the zip fastener 15, as visible in figure 6G.

The suit 1 thus packaged in the pouch 10 can be sterilised, for example, in an autoclave.

15 When the user puts on the suit 1 again, they open the means 15 for closing the opening 14 of the pouch 1, remove the suit 1 from the pouch by pulling on it by its inner face 1b.

20 Via the invention, a piece of protective clothing for a cleanroom that is easy to package and to unfold is obtained, while reducing the environmental and ecological impact, without having a negative effect on the sterility of the environment.

## CLAIMS

1. Piece of protective clothing (1, 20) for a cleanroom intended to be worn by a user and comprising an outer face (1a) provided to be in contact with the outside environment and an inner face (1b) arranged to be in contact with the user wearing said piece of clothing (1, 20), the piece of clothing (1, 20) comprising a pouch (10) for packaging the piece of clothing and connected to the inner face (1b) of the piece of clothing by irreversible fastening means (12), characterised in that the packaging pouch (10) comprises a single wall (11) defined by four corners (13a, 13b, 13c, 13d) forming a contour connected to the inner face (1b) of the piece of clothing (1, 20) and comprising an outer face (11a) facing the inner face (1b) of the piece of clothing and provided to be in contact with the outside environment once the piece of clothing has been packaged in the pouch (10) and an inner face (11b) provided to be in contact with the user wearing said piece of clothing, the wall (11) comprising an opening (14) having a rounded shape extending between two diagonally opposite corners (13c, 13b).

2. Piece of clothing (1, 20) according to claim 1, wherein the opening (14) of the wall (11) of the packaging pouch (10) is closed by a zip fastener (15).

3. Piece of clothing (1, 20) according to claim 1 or 2, wherein the packaging pouch (10) comprises a flap (16) intended to cover the opening (14) in the packaged position of the piece of clothing (1, 20) in the packaging pouch (10).

4. Piece of clothing (1, 20) according to claim 3, wherein the flap (16) is connected to the wall (11) partly along two sides and mobile between a free position of the opening (14), in particular of the zip fastener, towards a position covering said opening (14), in particular of the zip fastener.

5. Piece of clothing (1) according to claim 4, wherein the flap (16) is provided, at each opposite corner, with an opening (16a, 16b).

6. Piece of clothing (1, 20) according to any one of claims 3 to 5, wherein the flap (16) is made of textile material.

7. Piece of clothing (1, 20) according to any one of the preceding claims, wherein the wall of the packaging pouch (10) is made of textile material.

5 8. Piece of clothing (1) according to any one of the preceding claims, wherein the piece of protective clothing (1) is a suit comprising a first and a second leg sections (2, 3), a first sleeve (4), a second sleeve (5) and a body part (6), the first sleeve (4), the second sleeve (5), the two leg sections (2, 3) each being connected to the body part (6) to form a suit.

10 9. Piece of clothing (1) according to claim 8, wherein the wall (11) of the packaging pouch (10) is rigidly connected onto the inner face of the body part (6).

15 10. Piece of clothing (1) according to any one of the preceding claims, wherein the contour of the wall (11) is connected to the inner face (1b) of the piece of clothing and defines a zone of the inner face (1b) of said piece of clothing facing the outer face (11a) of the wall (11), and wherein in the packaging position of the piece of clothing in the pouch (10), the outer face (11a) of the wall (11) and the zone of the inner face (1b) of the piece of clothing are in contact with the outside  
20 environment.

25 11. Method for packaging a piece of protective clothing (1, 20) for a cleanroom in a packaging pouch (10), said piece of clothing being intended to be worn by a user and comprising an outer face (1a) provided to be in contact with the outside environment and an inner face (1b) arranged to be in contact with the user wearing said piece of clothing (1, 20), said packaging pouch (10) of the piece of clothing comprising a single wall (11) defined by four corners (13a, 13b, 13c, 13d) forming a contour connected to the inner face (1b) of the piece of clothing (1, 20) by irreversible fastening means (12), said wall (11) comprising an  
30 outer face (11a) facing the inner face (1b) of the piece of clothing and provided to be in contact with the outside environment once the piece of clothing has been packaged in the pouch (10) and an inner face (11b) provided to be in contact with the user wearing said piece of clothing, the wall (11) comprising an opening (14) having a rounded shape

extending between two diagonally opposite corners (13c, 13b), according to the packaging method:

- the piece of clothing (1, 20) is folded so as to leave visible the inner face (11b) of the wall (11) of the pouch (10); and
- 5 - the piece of clothing (1, 20) is gripped by the inside of the pouch (10) and the piece of clothing (1, 20) is pulled on through the opening (14) until the piece of clothing (1, 20) ends up inside said pouch (10).

12. Method according to claim 10, wherein once the piece of clothing (1, 20) has been placed inside the packaging pouch (10), the opening (14) is closed by actuating a zip fastener (15) and a flap (16) provided on said pouch (10) is then folded over until it covers the zip fastener (15).

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