

PROTECTIVE EQUIPMENT FOR A CLEAN ROOM OR SANITIZED
ENVIRONMENT

5 The present invention relates to the field of clean rooms, in particular to protective equipment for a clean room or sanitised environment, particularly to a garment for a clean room or sanitised environment and even more particularly to an overall for a clean room or sanitised environment. By extension, most of this protective equipment is also suitable for the medical and hospital environment.

10 The present invention also relates to a method for packaging protective equipment for a clean room or sanitised environment according to the present invention.

15 The present invention also relates to a dressing method for putting on protective equipment for a clean room or sanitised environment according to the present invention.

 The present invention relates more particularly to protective equipment for a clean room or sanitised environment comprising:

- an outer face intended to be contact with the surrounding environment,
- 20 • an inner face arranged to be in contact with or oriented towards an operator.

 Such protective equipment is used in clean room environments and in laboratories, for example to manufacture drugs or even biological, electronic and food materials in a sanitised or sterile environment.

25 Clean rooms are used in many fields such as electronics, micromechanics, optics, nanotechnologies and biotechnologies, pharmaceuticals, sterile compounding processes in pharmacy, medical equipment or even in the food industry.

30 To guarantee a sanitised and sterile environment in laboratories and more particularly in clean rooms, they must be constructed in compliance with very strict standards. For example, clean rooms must be supplied with large quantities of air filtered by high efficiency filters to dilute and remove particulates, bacteria and chemicals inside the room. Air is also used to pressurise the room and ensure that no contaminated air enters the clean room.

In addition, clean rooms must be constructed with materials chosen specifically because they do not generate contaminants, particulates or chemical fumes and the materials must also be easy to clean.

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Finally, the people, i.e. operators working inside clean rooms, must wear and carry specific garments, accessories, equipment and tools to minimise the dispersion of micro-organisms and the particulates that they in turn generate such as hair, skin particles and clothing fibres.

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For these reasons, in these types of room, the body of the operator must be isolated so as to prevent contamination of the environment they are working in or so as to prevent contamination of the product they are manufacturing or working on.

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The document WO2005065476 describes a protective or work overall used in dangerous conditions involving heat, fire, cold, etc. The overall comprises a pouch located on the chest area of the operator's body. This pouch comprises two openings: one upper opening and one lower opening. The sleeves of the overall become inverted inside the pouch when the operator passes their hands through, first, the lower opening and, second, the upper opening so the sleeves are pulled inside the pouch through the upper opening. The operator will then lift their legs into the pouch via the upper opening and the closed pouch.

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When an operator is working in such a sterile environment, they must, before entering a clean room, put on the various items of protective equipment for the clean room or sanitised environment, following a very specific protocol. Such procedures are painstaking and generally require the operator to perform unconventional and very specific gestures and movements. For example, the operator cannot touch any external face of protective equipment for a clean room or sanitised environment without risking contaminating this equipment and therefore having to undergo the dressing process again.

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Unfortunately, an overall as described in document WO2005065476 cannot be used in a clean room environment because it does not meet the criteria for clean rooms. It comprises a variety of materials. In addition, the dressing method is complicated. The operator will not be

able to put on the overall without touching any outer face of the protective equipment when removing it from the pouch to put it on.

In addition, existing protective equipment for a clean room or sanitised environment is therefore sterilised and supplied in packaging which must be sealed but which must also be able to withstand autoclaving. The equipment must also be both easy for the operator to open before entering the clean room and strong enough to prevent tearing, which could result in the protective equipment coming into contact with a contaminated environment and therefore contaminants being subsequently introduced into the clean room. In most cases, the operator will not be aware that this has happened, given the size of contaminants.

Protective equipment for a clean room or sanitised environment is typically packaged in packaging with a cover, which is sterilised and separate but disposable, in other words single-use, which is a significant source of waste. However, in a clean room or sanitised environment, everything that enters the room or environment must be removed and treated. The current trend, given current climate concerns, is to reduce disposable packaging and associated waste without compromising overall sterility.

There is therefore a real need to provide protective equipment for a clean room or sanitised environment with the required level of sterility, which retains its durability throughout the logistical stages and which takes into account cost and environmental limitations.

The aim of the present invention is to overcome the shortcomings of the state of the art by providing equipment for a clean room or sanitised environment whose sterility is maintained throughout the logistical stages while being less delicate and with the potential to limit the environmental impact and the costs associated with the logistics of protective equipment: decontamination, repackaging and storage.

To solve these problems, the present invention provides protective equipment for a clean room or sanitised environment as mentioned above, characterised in that said protective equipment is packaged in a reusable and sterilisable pouch preferably made of fabric, having an opening provided with closure means.

It transpired in a particularly unexpected manner that the protective equipment for a clean room or sanitised environment according to the present invention, being packaged in a reusable and sterilisable pouch, preferably made of fabric, provides protective equipment with improved direct protection throughout the logistics, storage and opening stages.

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It also transpired in a particularly unexpected and advantageous manner that the sterility of the protective equipment for a clean room or sanitised environment according to the present invention is improved and maintained throughout the various logistical stages.

10 Finally, the provision of protective equipment for a clean room or sanitised environment according to the present invention, packaged in a reusable and sterilisable pouch which has an opening provided with closure means makes it possible in a particularly advantageous manner to dispense with single-use packaging, plastic packaging and paper packaging, which is delicate, disposable, made from raw materials and therefore very
15 expensive, first due to the cost of the packaging itself, and second due to the fact that the equipment, being delicate, is more susceptible to an accident causing contamination and leading to the associated costs of cleaning and decontaminating the clean room.

The pouch according to the present invention forms a cavity with an opening.

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Preferably, the pouch comprises at least two walls joined over a majority of their ends to one another and the pouch comprises an opening, preferably a single opening, comprising at least one closure means.

25 Advantageously, the pouch comprises at least three walls joined over a majority of their ends to one another and the pouch comprises an opening, preferably a single opening comprising at least one closure means.

Preferably, the pouch may have, for example, a square, rectangular, hexagonal or even
30 semi-circular shape.

Advantageously, the protective equipment for a clean room or sanitised environment according to the present invention is selected from the group consisting of a garment, for example an overall, an apron, a tunic, a head covering for example a hairnet or hood, at least

one glove, at least one shoe cover, a shoe, a clog, a mask, goggles, sleeves, an undergarment, boots. Preferably, the pouch of the protective equipment according to the present invention is connected to the inner face or to the outer face via at least one fastening means allowing said pouch to be attached.

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Preferably, the pouch of the protective equipment according to the present invention is connected to the inner face of a garment via at least one fastening means allowing the pouch to be attached to the inner face of the garment.

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The pouch of the protective equipment according to the present invention, by being connected to the inner face of a garment and by being attached to this inner face via at least one fastening means, makes it possible in a particularly advantageous manner to isolate the pouch from the surrounding environment when the garment is being worn by the operator.

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Indeed, the pouch is initially in contact with the surrounding environment which is contaminated. The pouch, by being connected to the inner face of a garment packaged therein, makes it possible, when removing the garment from the pouch and unfolding the garment to be worn by the operator, to enclose the pouch in the garment, thus isolating it from the surrounding environment and consequently limiting the possibility of contamination of the clean room or the sanitised environment.

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Advantageously, the at least one fastening means of the protective equipment for a clean room or sanitised environment according to the present invention is a temporary fastening means, for example, a press stud or a series of press studs, a zip, hook-and-loop fastener means, optionally arranged on a flap.

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More advantageously, the at least one fastening means of the protective equipment for a clean room or sanitised environment according to the present invention is a seam or a weld.

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Other embodiments of the protective equipment for a clean room or sanitised environment according to the present invention are detailed in the attached claims.

The present invention also relates to a garment, and in particular to an overall for a clean room or sanitised environment.

When an operator is working in such a sterile environment, they must, before entering a clean room, put on garments, and in particular overalls, following a very specific protocol. Such procedures are very painstaking and usually require the operator to dress in a way that is
 5 completely contrary to what they are used to and contrary to how they would instinctively dress.

Existing overalls are therefore sterilised and supplied in sealed packaging, which must be both easy for the operator to open before entering the clean room and strong enough to avoid
 10 tearing, which could result in the overall coming into contact with a contaminated environment and therefore contaminants being subsequently introduced into the clean room. In most cases, the operator will not be aware that this has happened, given the size of contaminants.

It is therefore easy to understand first that the staff, the operators and the overalls they
 15 wear are the main sources of contamination in clean rooms or sanitised environments and second that contamination is absolutely to be avoided, because contamination would lead to a standstill in production, the sterilisation or even the destruction of the ingredients and materials present and lengthy and costly cleaning steps following a very specific protocol in order to re-establish a sterile and sanitised environment.

20 Thus, the operator must put on the garments, for example overalls, without touching the outer face intended to be in contact with the sterile environment and especially, without touching the outer face of the body portion, that is to say extending from the pelvis, up the operator's legs to their neck. A handling process therefore follows during which certain portions
 25 of the overall are folded, where the operator steps onto a bench, puts one leg in without it touching the ground, then puts the other leg in while ensuring they do not release or touch anything. It is easy to understand that this dressing method requires contortions requiring great skill and many years of training and practice since the risk of contaminating a clean room is to be avoided.

30 Document EP2303044 discloses equipment for a clean room or sanitised environment wherein said garment is a garment for a clean room or sanitised environment comprising:

- an outer face intended to be in contact with the surrounding environment,
- an inner face arranged to be in contact with an operator,

- a first and a second sleeve,
 - a body portion comprising a trunk portion and a leg portion, said first and second sleeves being connected to the body portion, preferably to the trunk portion via a linked end, said body portion comprising a head passage section,
- 5 • at least one gripping means in contact with said inner face in the body portion, preferably in the trunk portion.

Unfortunately, such a garment according to the prior art is packaged in sterilised wrapping or packaging to meet the requirements of clean rooms, not least given the stages of
10 packaging, transport, delivery, opening of packages and therefore individual garments for a clean room or sanitised environment. Shocks, tears and negligence may occur during any of these steps, resulting in contamination of the wrapping or packaging. Since this is not visible to the naked eye, it will only be detected when the operator undergoes checks or when the products from the clean room are analysed. Indeed, the sterilised wrapping or packaging for
15 this type of garment is single-use (and therefore disposable) wrapping or packaging made of plastic.

There is therefore a real need to provide a garment for a clean room or sanitised environment with improved and maintained sterility during the logistical stages and which
20 takes into account cost and environmental limitations.

The purpose of the present invention is to overcome the shortcomings of the state of the art by providing a garment for a clean room or sanitised environment whose direct protection is improved, whose sterility is maintained during the logistical stages and making it
25 possible to limit the costs associated with the garment itself and subsequently associated with the decontamination processes.

To solve these problems, the present invention provides a garment for a clean room or sanitised environment as indicated above, characterised in that said garment comprises said
30 pouch connected to said inner face of said garment via said fastening means and located on the inner face of said pouch, preferably opposite the opening of said pouch, allowing the attachment of the inner face of said pouch to said inner face of the body portion of said garment, preferably to the inner face of the trunk portion of said garment.

It transpired in a particularly unexpected manner that the garment for a clean room or sanitised environment according to the present invention, being packaged in a reusable and sterilisable pouch, preferably made of fabric, provides protective equipment with improved direct protection throughout the logistics, storage and opening stages.

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It also transpired in a particularly unexpected and advantageous manner that the sterility of the garment for a clean room or sanitised environment according to the present invention is improved and maintained throughout the various logistical stages.

10 Finally, the provision of a garment for a clean room or sanitised environment according to the present invention, comprising a reusable and sterilisable pouch for its packaging which has an opening provided with closure means makes it possible in a particularly advantageous manner to dispense with single-use packaging, plastic packaging and paper packaging, which is delicate, disposable, made from raw materials and which is therefore very expensive, first
15 due to the cost of the packaging itself, and second due to the fact that the equipment, being delicate, is more susceptible to an accident causing contamination and leading to the associated costs of cleaning and decontaminating the clean room.

In addition, the garment for a clean room or sanitised environment according to the
20 present invention, on the one hand comprising the reusable, sterile pouch which has an opening provided with closure means and, on the other hand comprising at least one gripping means in contact with the inner face in the body portion, preferably in the trunk portion, of the garment makes it possible, in a particularly advantageous manner, to provide a garment whose sterility is maintained and to provide a garment whose handling during dressing is facilitated by means
25 of said at least one gripping means which is directly exposed to the operator.

The pouch of the garment for a clean room or sanitised environment according to the present invention, by being connected to the inner face of the garment and by being attached to this inner face via at least one fastening means, makes it possible in a particularly
30 advantageous manner to isolate the pouch from the surrounding environment when the garment is being worn by the operator.

Indeed, the pouch is initially in contact with the surrounding environment which is contaminated. The pouch, being connected to the inner face of the body portion of the garment

packaged therein, makes it possible, when removing the garment from the pouch and unfolding it to be worn by the operator following a simple protocol, to enclose the pouch in the overall, thus isolating it from the surrounding environment and consequently limiting the possibility of contamination of the clean room or the sanitised environment.

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In a preferred embodiment, the garment of said protective equipment for a clean room or sanitised environment according to the present invention is an overall, wherein said leg portion further comprises,

- 10 • a first and a second leg section, each leg section comprising a flank, two longitudinal edges on either side of said flank of the leg section and provided with mutual closure means arranged to form said substantially tubular leg section when the mutual closure means of each longitudinal edge are engaged together, said mutual engaged closure means of the first leg section facing said engaged closure means of the second leg
- 15 section and each preferably extending at least from a knee area to a crotch area and more preferably from a calf or ankle area to a crotch area,
- and wherein said first and second leg sections are connected via a linked end to said body portion, preferably to said trunk portion.

20 In a preferred embodiment, said pouch comprised in the overall according to the present invention is positioned in a body portion, preferably in a trunk portion, preferentially in a pelvic region portion of said overall.

Advantageously, the protective equipment for a clean room or sanitised environment

25 according to the present invention has:

- an unfolded position, wherein said outer face of the overall is in contact with the surrounding environment and said inner face is arranged to be in contact with an operator, and wherein a first inner face of the pouch is against said inner face of the overall and a second inner face of the pouch is arranged to be in contact with an
- 30 operator, said closure means preferably being in an open position,
- a folded position, wherein

- a. said mutual closure means of each leg section are in a predominantly open position, forming a crotch opening arranged to provide access to the inside of the body portion, and
 - b. the inner face of the first and second leg sections is exposed to the outside and said outer face of the first and second leg sections is exposed to the outer face of said body section,
 - c. said at least one gripping means exposed to the operator proximate to the closure means of said pouch,
- and wherein said overall is packaged in the folded position in said pouch.

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Preferably, the protective equipment for a clean room or sanitised environment according to the present invention has when in the folded position and packaged in said pouch:

- a first closed position, wherein said opening of said pouch is closed, and
- a second open position, wherein said opening of said pouch is open, and wherein said at least one gripping means is exposed to the operator.

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Advantageously, the protective equipment for a clean room or sanitised environment according to the present invention has, in the unfolded position, at least two gripping means in contact with said inner face, in the body portion, preferably located laterally, preferably in the body portion.

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Even more advantageously, the overall of the protective equipment for a clean room or sanitised environment according to the present invention, has in the folded position:

- a. said mutual closure means of each leg section which are in a predominantly open position, forming a crotch opening arranged to provide access to the inside of the body portion, and
- b. the inner face of the first and second leg sections is exposed to the outside and said outer face of the first and second leg sections is exposed to the outer face of said body section.

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Preferably, the closure means of the first leg section and the closure means of the second leg section of the protective equipment for a clean room or sanitised environment according to

the present invention, together form a continuous closure of an opening of the crotch, and preferably comprise a continuous zip for the first and second leg section.

Advantageously, the closure means of the pouch of the protective equipment for a clean
5 room or sanitised environment according to the present invention are selected from a zip, hook-and-loop fastener means, a series of press studs, a flap.

In a particular embodiment of the protective equipment for a clean room or sanitised environment according to the present invention:

- 10 • the first and/or second sleeve comprise self-tightening means at a free end, opposite said linked end, such as elastic fabric wrist cuffs, a press stud flap or hook-and-loop fastener means, and/or
- the first and/or second leg section comprise self-tightening means at a free end, opposite said linked end, such as elastic fabric ankle cuffs, a press stud flap or
15 hook-and-loop fastener means.

Preferably, the protective equipment for a clean room or sanitised environment according to the present invention has, in the folded position, the leg portion or the first and second leg sections folded longitudinally onto itself/themselves and transversely onto
20 itself/themselves in two or three portions.

In a preferred embodiment of the protective equipment for a clean room or sanitised environment according to the present invention, the fabric of the equipment and/or of the pouch comprises monofilament polyester.
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By comprising a monofilament polyester fabric, the protective equipment and/or the pouch has a high to very high particulate filtration capacity, as well as a strong bacteriological barrier.

30 Preferably, the fabric of the equipment and/or the pouch is made of monofilament polyester.

In another preferred embodiment of the protective equipment for a clean room or sanitised environment according to the present invention, the fabric of the equipment and/or of

the pouch comprises polyester and antistatic carbon thread, preferably between 90 and 99.5% polyester, preferentially between 92 and 99.5% polyester, advantageously between 97 and 99.5% polyester, particularly advantageously 99% polyester as well as antistatic carbon thread, between 10 and 0.5% of the fabric, preferably 8 and 0.5%, preferentially between 3 and 0.5%, particularly advantageously 1%. This lends the fabric a high to very high particulate filtration capacity as well as a strong bacteriological barrier.

In another embodiment of the protective equipment for a clean room or sanitised environment according to the present invention, the fabric of the equipment and/or of the pouch is a non-woven fabric. Advantageously, the fabric of the equipment and/or the pouch comprises high density polyethylene fibres arranged and compressed randomly. Preferably, the fabric of the equipment and/or of the pouch is a fabric comprising a prepreg comprising a thermosetting resin such as a polyester or a thermoplastic polymer impregnating a reinforcement, the reinforcement being a fabric, fibres, for example.

Other embodiments of the protective equipment for a clean room or sanitised environment according to the present invention are detailed in the attached claims.

The present invention also relates to a method for packaging protective equipment for a clean room or sanitised environment comprising:

- I. decontaminating said protective equipment in an area outside of a sanitised area, and transferring said decontaminated protective equipment to a sanitised area,
- II. decontaminating a reusable and sterilisable pouch in an area outside of a sanitised area and transferring said decontaminated protective equipment to a sanitised area
- III. opening said pouch in a sanitised area,
- IV. placing said protective equipment in said sanitised area in said pouch and operating said closure means to close said pouch in a sanitised area.
- V. optionally sterilising said protective equipment packaged in said pouch.

Indeed, to decontaminate the protective equipment, the protective equipment such as an apron, a gown, an overall, a boot is placed by staff into a washing machine in an area outside a sanitised area, such as a clean room. Protective equipment, once washed and therefore

decontaminated, is placed inside a sanitised area, such as a clean room. The same steps are carried out for the reusable and sterilisable pouch whether or not it is attached to the protective equipment, during the same wash or during separate washes from that of the protective equipment.

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As another part of this decontamination process, after washing and transferring the protective equipment and the reusable and sterilisable pouch in a sanitised area, the protective equipment and the reusable and sterilisable pouch are dried in a dryer located in the sanitised area.

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The protective equipment and the reusable and sterilisable pouch are then placed in an area where packaging is carried out in the sanitised area. The reusable and sterilisable pouch is opened and the protective equipment is placed inside the reusable and sterilisable pouch. Once this step has been performed, the reusable and sterilisable pouch remains closed in the sanitised area.

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Optionally, an additional step of sterilising the protective equipment packaged in the reusable and sterilisable pouch is carried out as a precaution.

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Preferably, the method of packaging protective equipment for a clean room or sanitised environment according to the present invention wherein said protective equipment is a garment, comprises:

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- an inner face arranged to be in contact with an operator,
- a first and a second sleeve,
- a body portion comprising a trunk portion and a leg portion, said first and second sleeves being connected to the body portion, preferably to the trunk portion via a linked end, said body portion comprising a head passage section,
- at least one gripping means in contact with said inner face in the body portion, preferably in the trunk portion

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and wherein a folding of the garment is provided between decontaminating the garment and placing it in said pouch, said folding comprising the steps of:

- exposing at least one gripping means to the outside by gripping it

- folding an outer face of a leg portion onto an outer face of a body portion, keeping at least said first gripping means exposed,
 - folding a side portion of said leg portion onto itself in a longitudinal direction of said leg portion, keeping at least said first gripping means exposed,
 - 5 • folding by folding said leg portion longitudinally in a transverse direction into several portions, keeping at least said first gripping means exposed,
- said placing of said garment into said pouch comprising inverting said pouch around said folded garment while holding said at least one first gripping means proximate to the opening of said pouch and closing said closure means of said pouch to package the garment and the
- 10 gripping means therein.

Advantageously, the method for packaging protective equipment for a clean room or sanitised environment according to the present invention wherein said garment is an overall wherein said leg portion comprises a first and a second leg section, each leg section comprising

15 a flank, two longitudinal edges on either side of said flank of the leg section and provided with mutual closure means arranged to form said substantially tubular leg section when the mutual closure means of each longitudinal edge are engaged together, said mutual engaged closure means of the first leg section facing said engaged closure means of the second leg section and each preferably extending at least from a knee area to a crotch area and more preferably from

20 a calf or ankle area to a crotch area and wherein said first and second leg sections are connected via a linked end to said body portion, preferably to said trunk portion, said method being characterised in that said folding of said side portion of said leg portion onto itself in a longitudinal direction of said leg portion is a folding of a side portion of a first leg section whose closure means are in an open position and a folding of a side portion of a second leg

25 section whose closure means are in an open position keeping said first gripping means exposed.

Other embodiments of the method for packaging protective equipment for a clean room or sanitised environment according to the present invention are detailed in the attached claims.

30 The present invention also relates to a dressing method for putting on protective equipment for a clean room or sanitised environment according to the invention, comprising the steps of

- opening said closure means of said pouch,

- gripping the protective equipment before optionally detaching the temporary fastening means of said pouch to said protective equipment and
- putting on said protective equipment.

5 Advantageously, the dressing method for putting on protective equipment for a clean room or sanitised environment according to the invention, wherein said protective equipment is a garment comprising:

- an outer face intended to be in contact with the surrounding environment,
- an inner face arranged to be in contact with an operator,
- 10 • a first and a second sleeve,
- a body portion comprising a trunk portion and a leg portion, said first and second sleeves being connected to the body portion, preferably to the trunk portion via a linked end, said body portion comprising a head passage section,
- at least one gripping means in contact with said inner face in the body portion,
- 15 preferably in the trunk portion,

the method according to the invention further comprising:

- gripping said first gripping means via a first hand of an operator,
- removing said garment from said pouch using said first gripping means and positioning said garment so that the body portion of said garment is accessible
- 20 via an opening formed by the periphery of the body portion, preferably the trunk portion,
- putting a second arm of the operator into a second sleeve and after releasing the first gripping means, putting a first arm of the operator into a first sleeve,
- passing the head of the operator into said opening of said body portion, and then
- 25 into the head passage section, and
- inverting the leg portion so that the outer face thereof is thus exposed to the outside and the inner face exposed to the legs of the operator

30 In a preferred embodiment of the dressing method for putting on protective equipment for a clean room or sanitised environment according to the present invention, wherein said garment is an overall wherein said leg portion comprises a first and a second leg section, each leg section comprising a flank, two longitudinal edges on either side of said flank of the leg section and provided with mutual closure means arranged to form said substantially tubular leg

section when the mutual closure means of each longitudinal edge are engaged together, said mutual engaged closure means of the first leg section facing said engaged closure means of the second leg section and each preferably extending at least from a knee area to a crotch area and more preferably from a calf or ankle area to a crotch area and wherein said first and second leg
5 sections are connected via a linked end to said body portion, preferably to said trunk portion, where said inverting step of said leg portion is an inversion of the leg sections, whose closure means are in an open position so that the outer face thereof is thus exposed to the outside and the inner face exposed to the legs of the operator.

10 Advantageously, the dressing method for a clean room or sanitised environment according to the present invention further comprises gripping a second gripping means via a second hand of the operator to position the overall so that the body portion of the overall is accessible via the opening of the body portion or a crotch section.

15 Preferably, the dressing method for a clean room or sanitised environment according to the present invention further comprises closing said opening in said crotch area.

Other embodiments of the dressing method for putting on an overall for a clean room or sanitised environment according to the present invention are detailed in the attached claims.

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Other characteristics, details and advantages of the invention will emerge from the detailed description given below, not being limited thereto and with reference to the attached drawings.

25 Figure 1 is a front view of the protective equipment according to the invention wherein the garment is an overall.

Figure 2A is a top view of the protective equipment according to the invention wherein the garment is an overall in the partially folded position.

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Figure 2B is a top view of a variant of the protective equipment according to the invention wherein the garment is an overall in the partially folded position.

Figure 3 is a top view of the protective equipment according to the invention wherein the garment is an overall in the partially folded position, wherein longitudinal folding has taken place.

5 Figure 4 is a top view of the pouch according to the invention wherein the protective equipment is packaged.

Figure 5 is a side view of clogs for a clean room or sanitised environment according to the invention.

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Figure 6 is a front view of protective boots for a clean room or sanitised environment according to the invention.

15 Figure 7 is a view of multiple items of protective equipment for a clean room or sanitised environment according to the invention.

Figure 8 is a front view of trouser-type protective equipment for a clean room or sanitised environment according to the invention.

20 In the figures, identical or similar elements bear the same references.

Figure 1 shows protective equipment 1 for a clean room or sanitised environment according to the invention and more particularly an overall 7 for a clean room or sanitised environment comprising an outer face 2 intended to be in contact with the surrounding
25 environment and an inner face 3 arranged to be in contact with a user or operator.

The overall 7 comprises a first 9 and a second 10 leg section, each of which comprises a flank and two longitudinal edges on either side of the flank of the leg section, each of which is also provided with mutual closure means which are arranged to form the substantially tubular
30 leg section when the mutual closure means of each longitudinal edge are engaged together. In addition, the mutually engaged closure means of the first leg section face the mutually engaged closure means of the second leg section, and the mutual closure means each preferably extends at least from a knee area to a crotch area (not shown) and more preferably from a calf or ankle area to a crotch area (not shown).

Although not shown in the figures described, the closure means of the first leg section and the closure means of the second leg section together form a continuous closure of the opening of the crotch. The closure means are selected from a zip, hook-and-loop fastener means, press studs, a flap or other equivalent or similar means.

The overall 7 also comprises a first sleeve 12, a second sleeve 13 and a body portion 14. The first sleeve 12 is connected to the body portion 14 via a linked end 12a, the second sleeve 13 is also connected to the body portion 14 via a linked end 13a. The first leg section 9 and the second leg section 10 are connected to the body portion 14 via a linked end 9a and 10a respectively. Finally, the body portion 14 of the overall 7 includes a head passage section 15.

In the embodiment as shown in Figure 1, the overall 7 comprises a hood provided with an opening for the eyes above or below which a mask or goggles for example can be placed.

The overall 7 according to the present invention and as shown in Figure 1 comprises a pouch 4 which is connected to the inner face 3 of the overall 7 via fastening means 8. The fastening means 8 are located on the inner face of the pouch 4 and preferably opposite the opening 5 of the pouch 4. This advantageously allows the inner face of the pouch 4 to be attached to the inner face 3 of the body portion 14 of the overall 7.

Thus, in the folded and packaged position, the inner face 3 of the overall 7 is connected to the inner face of the pouch 4 so that only the outer face of the pouch 4 is in contact with the surrounding environment such as shown in Figure 4. When the operator is to put on the overall 7, before doing so they will open the closure means 6 of the opening 5 of the pouch 4, remove the overall 7 from the pouch 4 using the gripping means 16. After this step has been carried out, when the overall 7 is taken out of the pouch 4, a reversal, an inversion of the faces of the pouch 4 will take place.

Particularly advantageously, first the outer face of the pouch 4, which was exposed to the surrounding environment, will become the inner face of the pouch 4. Second, the pouch 4, being connected to the inner face 3 of the overall 7, will therefore end up inside the overall 7 when the latter is worn by the operator.

Consequently, the pouch 4 of the protective equipment 1 and more particularly of the overall 7 according to the present invention makes it possible to achieve double isolation of possible contaminants. Isolation is first achieved by the inversion of the outer face of the pouch 4 which ends up inside the pouch 4, with the contaminants therefore being contained in the pouch 4. Containment is also achieved by the containment of the pouch 4 inside the overall 7.

In the embodiment of figure 1, the first sleeve 12 comprises self-tightening means 17 at a free end, opposite the linked end 12a, in the form of an elastic fabric wrist cuff. The second sleeve 13 also comprises at the free end, opposite the linked end 13a, self-tightening means 17, in the form of an elastic fabric wrist cuff. The elastic fabric wrist cuffs as shown in Figure 1 can also be replaced by a press stud flap, or hook-and-loop fastener means, or other conventional tightening means.

In addition, according to the embodiment of the protective equipment 1 and more particularly of the overall 7 of Figure 1, the overall 7 has, in the unfolded position, wherein the outer face 2 of the overall 7 is in contact with the surrounding environment and the inner face 3 is arranged to be in contact with an operator. The first inner face of the pouch 4 is against the inner face 3 of the overall and the second inner face of the pouch 4 is arranged to be in contact with or oriented towards an operator. The closure means 6 of the opening 5 of the pouch 4 are preferably in the open position. It is obviously possible for the closure means 6 to be in the closed position, in particular to isolate the outer faces of the pouch 4, inside the pouch 4 when the overall 7 is in the unfolded position.

The overall 7 according to the present invention comprises at least one gripping means 16 in contact with the inner face 3 in the body portion 14, preferably located laterally. In the variant shown in Figure 2a, the overall 7 according to the invention comprises two gripping means 16 in contact with the inner face 3 in the body portion 14, located laterally, on either side of the opening 11. In the other variant shown in Figure 2b, the overall 7 according to the invention comprises a gripping means 16 in contact with the inner face 3 in the body portion 14.

Figures 2A and 2B show two embodiments of the overall 7 according to the present invention in the partially folded position. The inner face 3 of the first leg section 9 and the second leg section 10 are exposed to the outside, to the surrounding environment. The outer

face 2 of the first leg section 9 and the second leg section 10 are exposed to the outer face 2 of the body portion 14. This particular arrangement according to the present invention forms an opening 19 which is itself arranged to provide access to the inside of the body portion 14 and preferably to the inside of the trunk portion of the overall 7.

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In this way, the at least one gripping means 16 is exposed to the operator.

In the embodiment of Figure 2A, the overall 7 according to the invention comprises two gripping means 16 exposed to the operator.

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In the embodiment of Figure 2B, the overall 7 according to the invention comprises a gripping means 16 exposed to the operator.

In yet another embodiment not shown, the gripping means 16 of the overall 7 according to the present invention can be parts of material of the inner face 3 of the overall 7 and therefore exposed to the operator. Furthermore, the different parts of material of the inner face 3 of the overall 7 or of the protective equipment 1 for a clean room or sanitised environment can be of different colours, textures or patterns to allow the operator to identify them as being the gripping means 16.

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Indeed, the gripping means 16 according to Figures 2A and 2B are present on the inner face 3 of the overall 7 and the act of partially inverting the leg sections on the body section makes it possible to expose them to the outside and therefore to the operator.

It is therefore easy to understand from the overall 7 according to the present invention that the steps of the folding method must be followed in order to maintain the sterility of the overall 7, in particular following removal of the overall 7 by the operator and its cleaning, decontamination and subsequent repackaging.

Particularly advantageously, the overall 7 according to the present invention comprising the pouch 4 makes it possible to dispense with single-use packaging and for it to be cleaned and repackaged directly in its protective pouch 4, which can itself be cleaned, sterilised and reused.

During this folding step, the operator folds down the outer face of a first 9 and a second 10 leg section by passing an open crotch section over an outer face of a body portion 14 while keeping the at least one gripping means 16 exposed.

5 The second step of the folding method is as shown in Figure 3. In this step, the first leg section 9 is folded longitudinally onto itself and the second leg section 10 is also folded longitudinally onto itself while leaving the two gripping means (16) exposed to the operator. In addition, the last step of folding the overall according to the invention is shown using arrows in Figure 3. Indeed, the overall 7 according to the invention thus folded will then be folded
10 transversely onto itself in two or three portions or even more if necessary, depending on the size of the overall. The overall 7 thus folded is then packaged in the pouch 4 accessible in the body portion 14 of the overall 7. Once folded and packaged, the pouch 4 containing the overall 7 as shown in figure 4 can for example be sterilised, for example, in an autoclave.

15 Before putting on an overall 7 according to the invention, the user opens the closure means 6 of the opening 5 of the pouch 4, grips the first gripping means 16 with a first hand and the second gripping means 17 with the second hand and removes the overall 7.

In this way, an overall 7 in the partially folded position is obtained as shown in Figure
20 2A. The overall 7 is positioned so that the body portion 14 is accessible via the opening of the crotch 19 of the overall, via the waist section. The operator then puts, after having released the second gripping means 16 their second arm, into a second sleeve 13 and, after having released the first gripping means 16, they put their first arm into the first sleeve 12. They then pass their head through an opening in the body portion 14 via the waist section and then through the head
25 passage section 15 until their head reaches the hood.

They then invert the leg sections 9, 10 so that the outer face of the first leg section 9 and the second leg section 10 are exposed to the outside and so that the inner face of the first leg section 9 and the second leg section 10 are exposed to the legs of the operator. Then, the
30 operator places their foot in the foot passage section which comprises the pre-engaged zip and closes said opening 19 in order to completely isolate their body from the external environment.

Figure 5 shows clogs as protective equipment for a clean room or sanitised environment according to the present invention. The clogs as shown comprise a series of press studs 8 where

a first portion of the male stud is located on the clogs and a second portion of the female stud is located on the pouch 4, the reverse obviously being possible. Thus the clogs can be attached to the pouch 4, and positioned inside the pouch 4 so that during removal, the clogs will be removed and the pouch 4 will be inverted on itself as explained above so as to isolate
5 contaminants inside the pouch 4.

Figure 6 shows protective boots as protective equipment for a clean room or sanitised environment according to the present invention. The protective boots as shown comprise a series of press studs 8 where a first portion of the male stud is located on the boots and a second
10 portion of the female stud is located on the pouch 4, the reverse obviously being possible. Thus the protective boots can be attached to the pouch 4 and positioned inside the pouch 4, so that during removal, the protective boots will be removed and the pouch 4 will be inverted on itself as explained above so as to isolate contaminants inside the pouch 4.

Figure 7 shows gloves, overshoes, a hairnet and a hood as protective equipment for a clean room or sanitised environment according to the present invention. The protective equipment as shown may comprise a means for being fastened 8 to the pouch 4, such as a press stud. Thus it can be attached to the pouch 4, and placed inside the pouch 4 so that during removal, the protective equipment will be removed and the pouch 4 will be inverted on itself
20 as explained above so as to isolate contaminants inside the pouch 4.

Figure 8 shows trousers according to the present invention comprising a first 9 leg section and a second 10 leg section. The trousers as shown comprise an inner face 3 and an outer face 2, and also comprise the pouch 4 according to the present invention.

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Thus the operator can put on the trousers and the pouch 4 as described above, and being located inside the trousers makes it possible to isolate the contaminants, first in the pouch 4 and second in the inner portion of the trousers which is isolated from the surrounding environment.

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It is understood that the present invention is in no way limited to the embodiments described above and that many modifications can be made thereto without departing from the scope of the attached claims.

CLAIMS

1. Protective equipment (1) for a clean room or sanitised environment comprising:
 - an outer face (2) intended to be in contact with the surrounding environment;
 - 5 • an inner face (3) arranged to be in contact with or oriented towards an operator, characterised in that said protective equipment (1) is packaged in a reusable and sterilisable pouch (4), preferably made of fabric, having an opening (5) provided with closure means (6).

- 10 2. Protective equipment (1) for a clean room or sanitised environment according to claim 1, which is selected from the group consisting of a garment, for example an overall (7), an apron, a head covering for example a hairnet or hood, at least one glove, at least one shoe cover, a shoe, a clog, a mask, goggles, sleeves, an undergarment, boots.

- 15 3. Protective equipment (1) for a clean room or sanitised environment according to claim 1 or 2, wherein said pouch (4) is connected to said inner face (3) or to said outer face (2) via at least one fastening means (8) allowing said pouch (4) to be attached.

- 20 4. Protective equipment (1) for a clean room or sanitised environment according to claim 3, wherein said pouch (4) is connected to said inner face (3) of a garment via at least one fastening means (8) allowing said pouch (4) to be attached to said inner face (3) of said garment.

- 25 5. Protective equipment (1) for a clean room or sanitised environment according to claims 1 to 4, wherein said at least one fastening means (8) is a temporary fastening means, for example, a press stud or a series of press studs, a zip, hook-and-loop fastener means, optionally arranged on a flap.

- 30 6. Protective equipment (1) for a clean room or sanitised environment according to any one of claims 1 to 4, wherein said at least one fastening means (8) is a seam or a weld.

7. Protective equipment (1) for a clean room or sanitised environment according to one of claims 2 to 6, wherein said garment is a garment for a clean room or sanitised environment comprising:
 - an outer face (2) intended to be in contact with the surrounding environment,

- an inner face (3) arranged to be in contact with an operator,
 - a first (12) and a second (13) sleeve,
 - a body portion (14) comprising a trunk portion and a leg portion, said first (12) and second (13) sleeves being connected to the body portion, preferably to the trunk portion via a linked end, said body portion (14) comprising a head passage section (15),
 - at least one gripping means (16) in contact with said inner face (3) in the body portion (14), preferably in the trunk portion,
- characterised in that said garment (7) comprises said pouch (4) connected to said inner face (3) of said garment (7) via said fastening means (8) located on the inner face of said pouch (4), preferably opposite the opening (5) of said pouch (4), allowing the inner face of said pouch (4) to be attached to said inner face (3) of the body portion (14) of said garment (7), preferably to the inner face of the trunk portion of said garment.

8. Protective equipment (1) for a clean room or sanitised environment according to claim 7, wherein said garment for a clean room or sanitised environment is an overall (7), wherein said leg portion further comprises:

- a first (9) and a second (10) leg section, each leg section comprising a flank, two longitudinal edges on either side of said flank of the leg section and provided with mutual closure means arranged to form said substantially tubular leg section when the mutual closure means of each longitudinal edge are engaged together, said mutual engaged closure means of the first leg section facing said engaged closure means of the second leg section and each preferably extending at least from a knee area to a crotch area and more preferably from a calf or ankle area to a crotch area,
- and wherein said first (9) and second (10) leg sections are connected via a linked end to said body portion (14), preferably to said trunk portion.

9. Protective equipment (1) for a clean room or sanitised environment according to claim 7 or 8, which has:

- an unfolded position wherein said outer face (2) of said garment (7) is in contact with the surrounding environment and said inner face (3) is arranged to be in contact with an operator and wherein a first inner face of the pouch (4) is against said inner face (3) of said garment (7) and a second inner face of the pouch (4) is arranged to be in contact with an operator, said closure means (6) preferably being in an open position,
- a folded position, wherein:

- a. the inner face (3) of the leg portion is exposed to the outside and the outer face (2) of the leg portion is exposed to the outside of said body section, preferably of said trunk portion, forming an opening (19) arranged to provide access to the inside of the body portion, preferably, the inside of the trunk portion,
 - 5 b. said at least one gripping means (16) exposed to the operator proximate to the closure means of said pouch,
and wherein said garment (7) is packaged in a folded position in said pouch (4).
- 10 10. Protective equipment (1) for a clean room or sanitised environment according to any one of claims 7 to 9, in a folded position and packaged in said pouch (4), said pouch (4) having:
 - a first closed position wherein said opening (5) of said pouch (4) is closed, and
 - a second open position wherein said opening (5) of said pouch (4) is open and wherein said at least one gripping means (16) is exposed to the operator.
 - 15 11. Protective equipment (1) for a clean room or sanitised environment according to one of claims 7 to 10, having, in the unfolded position, at least two gripping means (16) in contact with said inner face (3), in the body portion (14), preferably located laterally, preferably in the body portion (14).
 - 20 12. Protective equipment (1) for a clean room or sanitised environment according to any one of claims 8 to 11, wherein said overall in the folded position has
 - a. said mutual closure means of each leg section which are in a predominantly open position, forming a crotch opening arranged to provide access to the inside of the body portion, and
 - 25 b. the inner face (3) of the first (9) and second (10) leg sections is exposed to the outside and said outer face (2) of the first (9) and second (10) leg sections is exposed to the outer face (2) of said body section.
 - 30 13. Protective equipment (1) for a clean room or sanitised environment according to one of claims 8 to 12, wherein the closure means of the first leg section and the closure means of the second leg section together form a continuous closure of a crotch opening, and preferably comprise a continuous zip for the first and second leg sections.

14. Protective equipment (1) for a clean room or sanitised environment according to one of claims 1 to 13, wherein said closure means (6) of said pouch (4) are selected from a zip, hook-and-loop fastener means, a series of press studs, a flap.
- 5 15. Protective equipment (1) for a clean room or sanitised environment according to one of claims 7 to 14, wherein:
- the first (12) and/or second (13) sleeve comprise self-tightening means (17) at a free end, opposite said linked end, such as elastic fabric wrist cuffs, a press stud flap or hook-and-loop fastener means, and/or
 - 10 • the first (9) and/or second (10) leg section, when present, comprise self-tightening means (18) at a free end, opposite said linked end, such as elastic fabric ankle cuffs, a press stud flap or hook-and-loop fastener means.
16. Protective equipment (1) for a clean room or sanitised environment according to one of
15 claims 8 to 15, having, in the folded position, the leg portion or the first (9) and second (10) leg sections folded longitudinally onto itself/themselves and transversely onto itself/themselves in two or three portions.
17. Method for packaging protective equipment for a clean room or sanitised environment
20 comprising:
- i. decontaminating said protective equipment in an area outside of a sanitised area, and transferring said decontaminated protective equipment to a sanitised area,
 - ii. decontaminating a reusable and sterilisable pouch in an area outside of a sanitised area and transferring said decontaminated protective equipment to a sanitised area
 - 25 iii. opening said pouch in a sanitised area,
 - iv. placing said protective equipment in said sanitised area in said pouch and operating said closure means to close said pouch in a sanitised area.
 - v. optionally, sterilising said protective equipment packaged in said pouch.
- 30 18. Method for packaging protective equipment (1) for a clean room or sanitised environment according to claim 17, wherein said protective element is a garment comprising:
- an inner face (3) arranged to be in contact with an operator,
 - a first (12) and a second (13) sleeve,

- a body portion (14) comprising a trunk portion and a leg portion, said first (12) and second (13) sleeves being connected to the body portion, preferably to the trunk portion via a linked end, said body portion (14) comprising a head passage section (15),
 - at least one gripping means (16) in contact with said inner face (3) in the body portion
5 (14), preferably in the trunk portion,
and wherein a folding of the garment is provided between decontaminating the garment and placing it in said pouch, said folding comprising the steps of:
 - exposing at least one gripping means (16) to the outside by gripping it,
 - folding an outer face (2) of a leg portion onto an outer face (2) of a body portion (14),
10 keeping at least said first gripping means (16) exposed,
 - folding a side portion of said leg portion onto itself in a longitudinal direction of said leg portion, keeping at least said first gripping means (16) exposed
 - folding by folding said leg portion longitudinally in a transverse direction into several portions, keeping at least said first gripping means (16) exposed,
15 said placing of said garment into said pouch comprising inverting said pouch around said folded garment while holding said at least one first gripping means proximate to the opening of said pouch and closing said closure means of said pouch to package the garment and the gripping means therein.
- 20 19. Method for packaging protective equipment (1) for a clean room or sanitised environment according to claim 18, wherein said garment is an overall (7) wherein said leg portion comprises a first (9) and a second (10) leg section, each leg section comprising a flank, two longitudinal edges on either side of said flank of the leg section and provided with mutual closure means arranged to form said substantially tubular leg section when the mutual closure
25 means of each longitudinal edge are engaged together, said mutual engaged closure means of the first leg section facing said engaged closure means of the second leg section and each preferably extending at least from a knee area to a crotch area and more preferably from a calf or ankle area to a crotch area, said first (9) and second (10) leg sections are connected via a linked end to said body portion (14), preferably to said trunk portion, said method being
30 characterised in that said folding of said side portion of the leg portion onto itself in a longitudinal direction of said leg portion is a folding of a side portion of a first leg section, whose closure means are in an open position and a folding of a side portion of a second leg section, whose closure means are in an open position, keeping said first gripping means (16) exposed.

20. Dressing method for putting on protective equipment (1) for a clean room or sanitised environment according to any one of claims 1 to 19, comprising the steps of:

- opening said closure means (6) of said pouch (4),
- 5 • gripping the protective equipment before optionally detaching the temporary fastening means of said pouch to said protective equipment and,
- putting on said protective equipment.

21. Dressing method for putting on protective equipment (1) for a clean room or sanitised environment according to claim 20, wherein said protective equipment is a garment comprising

- an outer face (2) provided to be contact with the surrounding environment,
- an inner face (3) arranged to be in contact with an operator,
- a first (12) and a second (13) sleeve,
- a body portion (14) comprising a trunk portion and a leg portion, said first (12) and
- 15 second (13) sleeves being connected to the body portion, preferably to the trunk portion via a linked end, said body portion (14) comprising a head passage section (15),
- at least one gripping means (16) in contact with said inner face (3) in the body portion (14), preferably in the trunk portion,
- said method comprising:

- 20 • gripping said first gripping means via a first hand of an operator,
- removing said garment (7) from said pouch (4) using said first gripping means (16) and positioning said garment (7) so that the body portion (14) of said garment (7) is accessible via an opening formed by the periphery of the body portion, preferably the trunk portion,
- putting a second arm of the operator into a second sleeve (13) and after releasing the
- 25 first gripping means (16), putting a first arm of the operator into a first sleeve (12),
- passing the head of the operator into said opening of said body portion (14), and then into the head passage section (15), and
- inverting the leg portion so that the outer face (2) thereof is thus exposed to the outside and the inner face (3) exposed to the legs of the operator.

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22. Dressing method for putting on protective equipment (1) for a clean room or sanitised environment according to claim 21, wherein said garment is an overall wherein said leg portion comprises a first (9) and a second (10) leg section, each leg section comprising a flank, two longitudinal edges on either side of said flank of the leg section and provided with mutual

closure means arranged to form said substantially tubular leg section when the mutual closure means of each longitudinal edge are engaged together, said mutual engaged closure means of the first leg section facing said engaged closure means of the second leg section and each preferably extending at least from a knee area to a crotch area and more preferably from a calf or ankle area to a crotch area and wherein said first (9) and second (10) leg sections are connected via a linked end to said body portion (14), preferably to said trunk portion, where said inverting step of said leg portion is an inversion of the leg sections (9, 10), whose closure means are in an open position so that the outer face (2) thereof is thus exposed to the outside and the inner face (3) exposed to the legs of the operator.

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23. Dressing method for a clean room or sanitised environment according to claim 21 or 22, further comprising gripping a second gripping means (16) via a second hand of the operator to position the overall (7) so that the body portion (14) of the overall (7) is accessible via an opening (11) of the body portion or a crotch section.

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24. Dressing method for a clean room or sanitised environment according any one of claims 22 and 23 where it depends on claim 22, further comprising closing said opening (11) in said crotch area.