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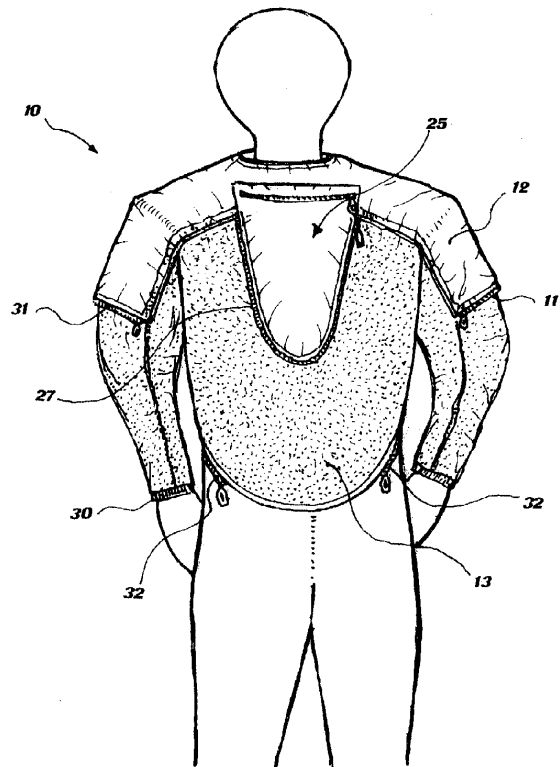
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**(54) Garment adapted to be associated with an inflatable protection element**

(57) The present disclosure refers to an under-garment (10, 110, 210) adapted to be associated with a garment (20), said under-garment (10, 110, 210) being configured to include or to be associated with an inflatable protection element (12, 112, 212) or airbag. The present disclosure also refers to a method for equipping a garment (20) with an inflatable protection element (12, 112, 212) or airbag. The method comprises the steps of associating the inflatable protection element (12, 112, 212) with an under-garment (10, 110, 210), and subsequently associating said under-garment (10, 110, 210) provided with said inflatable protection element (12, 112, 212) with said garment (20).



**Fig.1**

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## Description

**[0001]** The present disclosure refers to the personal protection field, i.e. to the field of protection of a person, for instance of a passenger, a motor vehicle driver, a skier, a horse-rider, or an alike user, from impacts and/or falls during a sporting and/or working activity.

**[0002]** In the last years, following constant research into safety during all sporting activities, but more generally all those dangerous activities practiced under extreme conditions or at high speeds, garments have been contrived which are associated in advance with a personal protection device for protecting a user. In particular, the motorcycling field is very attentive to such problems; in the last years, the offer of garments incorporating such a protection device allowing to carry out an effective and concomitantly comfortable protection of the motorcyclist or driver, or of a user in general, has increased.

**[0003]** In the motorcycling field, a solution is, for instance, that of including directly in the garment, e.g. in the suit, an inflatable element, like a bag of air-tight material, at body parts potentially concerned by impacts. In practice, the inflatable element is arranged deflated and folded underneath the suit so that the latter acts as direct cover surface for the inflatable element. At the instant of an impact, a slipping or a fall in general, the inflatable element is moreover set in fluid communication with a source of compressed gas, like a canister.

**[0004]** At the basis of the present disclosure, there is a recognition by the Inventor of the present patent application that an association a priori of an inflatable protection element with a garment restricts the choice of the garment by a user, and makes the garment less than versatile for use. In other words, the user can purchase the garment only in association with the inflatable protection element. Moreover, in case the inflatable protection element needs to be changed, a user has to insert the inflatable protection element in special pockets or housings of the garment. In these operations, a user can run into difficulties, as normally a garment for the practice of dynamic activities is made of a material offering protection, e.g. leather or leatherette, and has a rigid and therefore hardly practical consistency.

**[0005]** On the basis of said recognition, there is the solution idea by the Inventor of separating, as an optional accessory, the inflatable protection element from a garment, i.e. of considering the inflatable protection element as an optional accessory of a garment which may be associated at will with the garment by a user, according to needs and preference, at any time, even after the purchase by a user, and without, or with minimal, operative difficulties by a user.

**[0006]** Stemming from said solution idea, there are provided an under-garment including an inflatable protection element as defined in claim 1, a garment including said under-garment as defined in claim 12, and a method for equipping a garment according to claim 14. Secondary features of the subject of the present disclosure are de-

finied in the corresponding dependent claims thereof.

**[0007]** Within the scope of the present disclosure, the term "under-garment" signifies an article, structurally separated and individually manipulable with respect to a garment, and that may be placed underneath the garment, or incorporated in the garment or received in a pocket of the garment. In particular, the under-garment, according to the present disclosure, is an under-vest provided with inflatable protection element, and that may be associated with an external garment, according to needs and preference, or, when required, by a user.

**[0008]** In other words, according to an aspect of the present disclosure, an inflatable protection element is associated with a garment by means of an under-garment. Within the scope of the present disclosure, the term "garment" signifies an "outward" clothing item, i.e. an article that may face outward and exposed to an impact event or source.

**[0009]** The under-garment can be an article wearable per se, of light-weight and soft consistency, shaped like a T-shirt, a suit or other garment, for instance made of comfort material, e.g. of a material normally used for underwear and adapted to be placed underneath a protection garment, reducing to a minimum the encumbrance.

Thanks to the light-weight and soft consistency, the inflatable protection element can be associated in an easy way and without difficulties with the under-garment, e.g. received in special pockets of the under-garment, or sewn to the under-garment, i.e., joined in a permanent manner.

**[0010]** The garment can be a motorcyclist suit or a driver suit in general, a motorcyclist or driver jacket or trousers, or another garment suitable for carrying out dynamic activities, and for protecting the user during the practice of said dynamic activities. By the under-garment of the present disclosure, a user can customize at will the garment he/she intends to wear, associating or not associating with the garment the under-garment provided with the inflatable protection element.

**[0011]** The under-garment according to the present disclosure fosters also connection of the inflatable protection element with the external garment. In fact, as mentioned, it has to be considered that a garment employed during a dynamic activity is usually a garment of abrasion-resistant material, such as for example leather or leatherette, of rigid consistency. The employ of an under-garment fosters coupling with the garment, thanks to the fact that a user can at first wear the under-garment provided with the inflatable protection element, and subsequently wear the external protection garment, such as, for example, the leather suit, wearing it over the under-garment. Alternatively, at first, the under-garment provided with inflatable protection element is associated with the garment so as to line the external garment, and, subsequently, the group including the external protection garment and the under-garment is worn in a single step by a user.

**[0012]** According to other aspects of the present dis-

closure, the garment is configured for receiving the under-garment; such configuration can be made already at a production step; for instance, the garment is provided with appropriate coupling or fastening elements, suitable for a removable connection of the under-garment to the external garment.

**[0013]** Further advantages, characteristic features and the modes of use of the subject of the present disclosure will become clear from the following detailed description of embodiments thereof, provided by way of a non-limiting example.

**[0014]** It is evident, however, how each embodiment of the subject of the present disclosure may entail one or more of the advantages listed above; in any case, it is not required for each embodiment to concurrently entail all of the advantages listed. Reference will be made to the figures of the annexed drawings, wherein:

- Figure 1 shows a rear view of an under-garment according to an embodiment of the present disclosure;
- Figure 2 shows a front view of an under-garment according to an embodiment of the present disclosure;
- Figure 3 shows a rear view of an under-garment according to a further embodiment of the present disclosure;
- Figure 4 shows a front view of an under-garment according to a further embodiment of the present disclosure;
- Figure 5 shows a further rear view of an under-garment according to an embodiment of the present disclosure;
- Figure 6 shows a partially sectional front view of a garment including an under-garment according to an embodiment of the present disclosure;
- Figure 7 shows a partially sectional rear view of a garment including an under-garment according to an embodiment of the present disclosure;
- Figure 8 shows a rear view of an under-garment according to a further embodiment of the present disclosure;
- Figure 9 shows a front view of an under-garment according to a further embodiment of the present disclosure;
- Figure 10 shows a front view of a garment including an under-garment according to an embodiment of the present disclosure;
- Figure 11 shows a partially sectional rear view of a garment including an under-garment according to an embodiment of the present disclosure.

**[0015]** Hereinafter in the present detailed description, an under-garment according to respective embodiments of the present disclosure is denoted by reference numbers 10, 110, 210.

**[0016]** In all embodiments illustrated herein, the under-garment 10, 110, 210 includes a vest 13, 213, for example shaped like a T-shirt, a suit or other so-called "underwear"

garment, for instance of comfort material, that is worn close-fitting underneath an external garment 20 for protection, such as, for example, a driver's or a motorcyclist's suit or jacket, or in general of a suitable garment 20 that is worn during a dynamic activity.

**[0017]** Even more particularly, in all embodiments illustrated herein, the under-garment 10, 110, 210 includes a vest 13, 213 made of Lycra fabric or alike soft and light-weight, nearly impalpable material, that can be worn by a user underneath the external garment 20, and that can remain underneath such an external garment 20, without creating excessive discomfort or encumbrance for a user.

**[0018]** For example, it is a vest that is partially elastic and that may be worn close-fitting by a user.

**[0019]** In particular, it is observed that the under-garment 10, 110 illustrated in Figures 1-7 is a vest that includes a pocket 11, 111 and an inflatable element 12, 112 which is housed in the pocket 11. In the figures the pocket 11, 111 is drawn transparent in order to show the inflatable element 12, 112. The under-garment 10 of Figures 1-2 differs from the under-garment 110 of Figure 3-4 in the shape of the inflatable element 12, 112, and accordingly in the shape of the respective pocket 11, 111. Even more particularly, the inflatable element 12 associated with the under-garment 10 of the embodiment of Figure 1 and Figure 2 is shaped to protect a user's neck, spine and shoulders. The inflatable element 112 associated with the under-garment 110 of the embodiment of Figure 3 and of Figure 4 is shaped to protect a user's neck, shoulders and thorax. It is understood that the shape of the inflatable element 12, 112 and relative association with the under-garment 10, 110 are exemplary and non-limiting within the scope of the present disclosure and can be made according to modes and shapes known to a technician in the field.

**[0020]** Moreover, in the illustrated embodiments, the under-garment 10, 110 includes a pocket 25 placed at the back of the user, which is intended to receive a rigid plate shaped as a "hump" 26. The plate shaped as a "hump" 26 is in turn intended to house a source of pressurized gas and a electronic unit for activating the inflatable element 12, 112, which are not illustrated in the drawings.

**[0021]** In an embodiment, like that illustrated in Figures 1-7, the garment 20 and the under-garment 10, 110 are duly provided to be connected and fastened to each other when the under-garment 10, 110 is worn by a user together with the garment 20. For example, the under-garment 10, 110 is adapted to be fastened to the respective garment 20 by a removable-type connection, such as for example Velcro® and zip. In particular, the under-garment 10, 110 includes a zip-shaped connecting portion 27 which surrounds the pocket 25 and is intended to be connected with a corresponding zip-shaped connecting portion (not visible in the drawings) associated with the inside of the garment 20.

**[0022]** The under-garment 10, 110 may include other

connection areas at the wrists, between the shoulders and elbows, and moreover a connection area for the thorax. In particular, in the embodiments illustrated by way of an indicative and non-limiting example in Figures 1-7, it is provided a first mutual connection area 30 at the wrists, including Velcro®. A second mutual connection area 31, interposed between the shoulders and elbows, includes a zip fastener portion.

**[0023]** A connection area for the thorax 32 further includes two zip fastener portions which start at the chest and diverge outward, to the respective side areas of the user's pelvis, and then rearward.

**[0024]** It is to be noted, as it will be highlighted hereinafter, that such connection areas are selected to foster a practical connection of the under-garment 10, 110 with the garment 20. However, there may also be provided other systems and connection areas allowing to removably join the under-garment 10, 110 to the garment 20.

**[0025]** As anticipated above and according to an aspect of the present disclosure, the under-garment 10, 110 can be associated with the garment 20, according to needs and when required, in order to equip the garment 20 with an inflatable protection element 12, 112. For instance, the garment 20 can first be worn without the under-garment 10, 110 or in general without the inflatable element 12, 112, and subsequently, according to the dangerousness of an activity carried out, with the under-garment 10, 110 provided with the inflatable protection element 12, 112, when the use of the inflatable protection element 12, 112 becomes necessary.

**[0026]** To this end, the under-garment 10, 110, provided in advance with the inflatable element 12, 112, and with the abovementioned plate shaped like a "hump" 26 with a source of pressurized gas and a electronic activation unit, is connected to the garment 20.

**[0027]** To connect the under-garment 10, 110 to the garment 20, in an exemplary embodiment of the present disclosure, it is envisaged to follow a predefined operation sequence.

**[0028]** In particular, first the zip-shaped portion 27 surrounding the pocket 25 is fastened to the corresponding zip-shaped portion of the garment 20. The connection first of the plate shaped as a "hump" 26 is compelled by the fact that the plate shaped as a "hump" 26 is relatively heavy with respect to the under-garment 10 (which, as mentioned, is made of light-weight fabric) and might cause an undesired movement of the entire under-garment 10 at the time of connection with the garment 20.

**[0029]** In other words, the fastening first of the plate shaped as a "hump" 26 allows to center and stably secure the under-garment 10, 110 to the garment 20 and to then proceed with the remaining connections of the sleeves and of the front area.

**[0030]** In fact, subsequently the sleeves of the under-garment 10, 110 are fitted, which are initially connected to the wrists by the abovementioned Velcro® of the first connection area 30, and then fastened between the shoulders and the elbows by the respective zip-shaped

portions in the second connection area 31.

**[0031]** In a final step, to complete the connection, after having fastened the sleeves, the zip-shaped portions of the connection zone for the thorax 32 are joined.

**[0032]** It follows that, with few operation steps, thanks to the under-garment 10, 110 a user can fasten and connect at will an inflatable protection element 12, 112 to the respective garment 20, and subsequently wear a garment 20 already provided with said accessory/under-garment 10, 110.

**[0033]** It can be noted that thanks to the under-garment 10, 110 it is possible to indirectly connect the inflatable protection element 12, 112 to the garment 20, avoiding or reducing difficult steps of direct association of an inflatable element 12, 112 with the garment 20.

**[0034]** Referring to Figures 8-11, an under-garment 210 in accordance with a further embodiment is illustrated. In particular, according to this alternative embodiment, the under-garment includes a T-shirt or an alike vest, which can be worn in advance by a user before wearing the external garment 20. For instance, the under-garment 210 includes a T-shirt of soft material, adapted to be placed underneath a skier, horse-rider, motorcyclist or driver's suit, and a protection clothing item in general.

**[0035]** An inflatable protection element 212 is fastened, for example by seams, on an external layer of the T-shirt 210.

**[0036]** In this embodiment as well, the under-garment 210 can be associated with a garment 20, at will by a user, according to needs and when required, in order to equip the garment 20 with the inflatable protection element 212. For instance, the garment 20 can be first worn without the under-garment 210, and, subsequently, with the under-garment 210, e.g. when a use of the inflatable protection element 212 is required.

**[0037]** The under-garment 210 may be provided with different inflatable protection elements, depending on the use and the dynamic activity that is carried out.

**[0038]** It follows that an assortment of under-garments 210 different the one from the other can be envisaged, each provided with an inflatable protection element of determined shape.

**[0039]** In this embodiment as well, the inflatable element 212 may be joined to the under-garment 210, by a special pocket or by other form of connection.

**[0040]** Moreover, it is pointed out that to make the inflation of the inflatable element 12, 112, 212, in case of fall and/or sliding and/or unforeseen impact by a user or by a vehicle on which he/she moves, such inflatable element 12, 112, 212 is adapted to cooperate with special activation means operatively connected to inflation means, such as, as mentioned, the abovementioned source of compressed gas. Alternatively, such inflation means may comprise gas generators of the pyrotechnic or hybrid type or other types known according to the present art. Said inflation means is operated by a control unit by means of sensing of the state of the vehicle/user system; for example, said control unit may implement a

fall prediction system allowing a timely identification of the fall event and a reliable prediction thereof by means of accelerometric sensors integral to the vehicle (or to the driver) and a processing unit of the signals produced by the sensors themselves.

**[0041]** It is to be noted that the abovementioned activation and inflation means can be integrated in the under-garment according to the present invention or placed outside the same.

**[0042]** It is also to be noted that, even if the activation modes are an aspect of particular relevance for an effective protection, they will not be described hereinafter in greater details, being methods essentially already known to a technician in the field of protection of an individual from unforeseen impacts.

**[0043]** The subject of the present disclosure has been hereto described with reference to preferred embodiments thereof. It is understood that other embodiments might exist, all falling within the concept of the same invention, and all comprised within the protective scope of the claims hereinafter.

#### Claims

1. Under-garment (10, 110, 210) adapted to be associated with a garment (20), said under-garment (10, 110, 210) being configured to include, or to be associated with, an inflatable protection element (12, 112, 212) or airbag.
2. Under-garment (10, 110, 210) according to claim 1, including a clothing item of soft material.
3. Under-garment (10, 110, 210) according to any one of the preceding claims, including a housing (11, 111) for receiving said inflatable protection element (12, 112, 212) or airbag.
4. Under-garment (10, 110, 210) according to any one of the preceding claims, further including connecting elements (27, 30, 31, 32) adapted to be connected to connection counter-elements of the garment (20).
5. Under-garment (10, 110, 210) according to claim 4, wherein said connecting elements (27, 30, 31, 32) are adapted to create a removable connection with said garment (20).
6. Under-garment (10, 110, 210) according to any one of the preceding claims, including a pocket (25) adapted to be placed at the back of the user and a rigid plate shaped as a "hump" (26), said pocket (25) receiving said rigid plate shaped as a "hump" (26).
7. Under-garment (10, 110, 210) according to claim 6, wherein said rigid plate shaped as a "hump" (26) is associated with a source of pressurized gas and a
  8. Under-garment (10, 110, 210) according to claim 7, including a connecting portion (27) disposed around the pocket (25) and intended to be connected with a corresponding connecting portion of the garment (20).
  9. Under-garment (10, 110, 210) according to any one of the preceding claims, including a first connection area (30) at the wrists, a second connection area (31) between the shoulders and elbows, and/or a third connection area for the thorax (32) between the chest and a side area of the pelvis.
  10. Under-garment (10, 110, 210) according to any one of the preceding claims, including said inflatable protection element (12, 112, 212) or airbag.
  11. Under-garment (10, 110, 210) according to any one of the preceding claims, wherein said under-garment (10, 110, 210) is a wearable article.
  12. Garment (20) including an under-garment (10, 110, 210) according to any one of the preceding claims.
  13. Garment according to claim 12, including connection areas intended for connection to corresponding connection areas of the under-garment (10, 110, 210).
  14. Method for equipping a garment (20) with an inflatable protection element (12, 112, 212) or airbag, comprising the steps of
    - a) associating said inflatable protection element (12, 112, 212) with an under-garment (10, 110, 210);
    - b) associating said under-garment (10, 110, 210) provided with said inflatable protection element (12, 112, 212) with said garment (20).
  15. Method according to claim 14, wherein said step b) occurs after said step a).
  16. Method according to claim 14 or 15, wherein the under-garment (10, 110, 210) includes a pocket (25) arranged at the back of the user and a rigid plate shaped as a "hump" (26), said pocket (25) receiving said rigid plate shaped as a "hump" (26), and wherein said under-garment is connected to said garment by connecting first said pocket (25).
  17. Method according to claim 16, wherein after connecting the pocket (25), sleeves of said under-garment are connected to corresponding sleeves of the garment (20).

18. Method according to any one of the claims 14 to 17, wherein said under-garment (10, 110, 210) provided with said inflatable protection element (12, 112, 212) is first associated with said garment (20), and the group including said under-garment (10, 110, 210) and said garment (20) is then worn by a user. 5

19. Method according to claim 14, wherein said under-garment (10, 110, 210) provided with said inflatable protection element (12, 112, 212) is first worn by said user, and subsequently said garment (20) is worn by said user over said under-garment (10, 110, 210). 10

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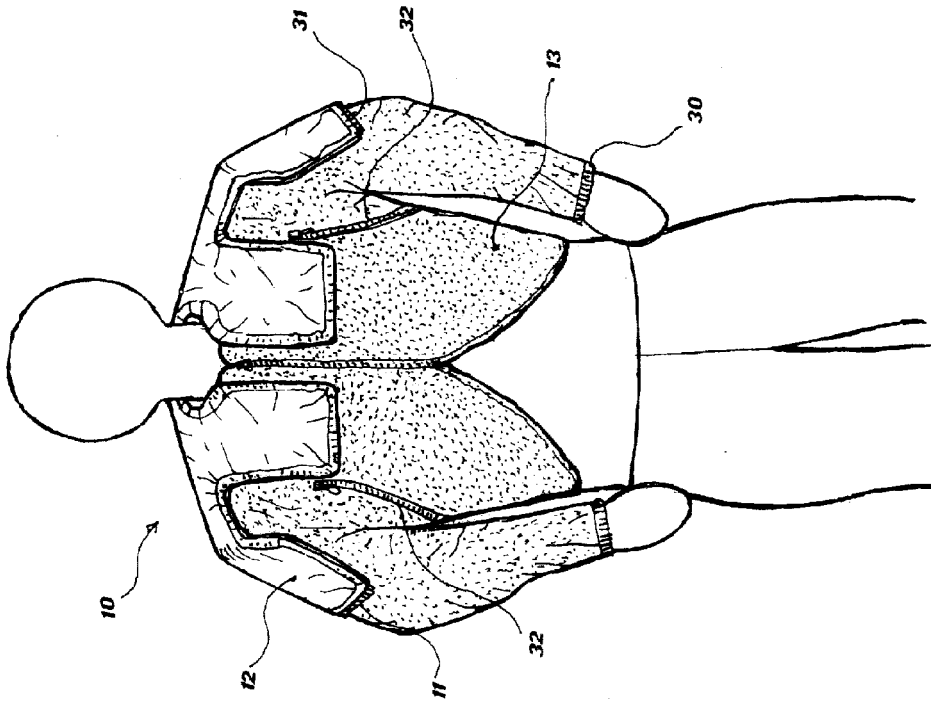


Fig. 1

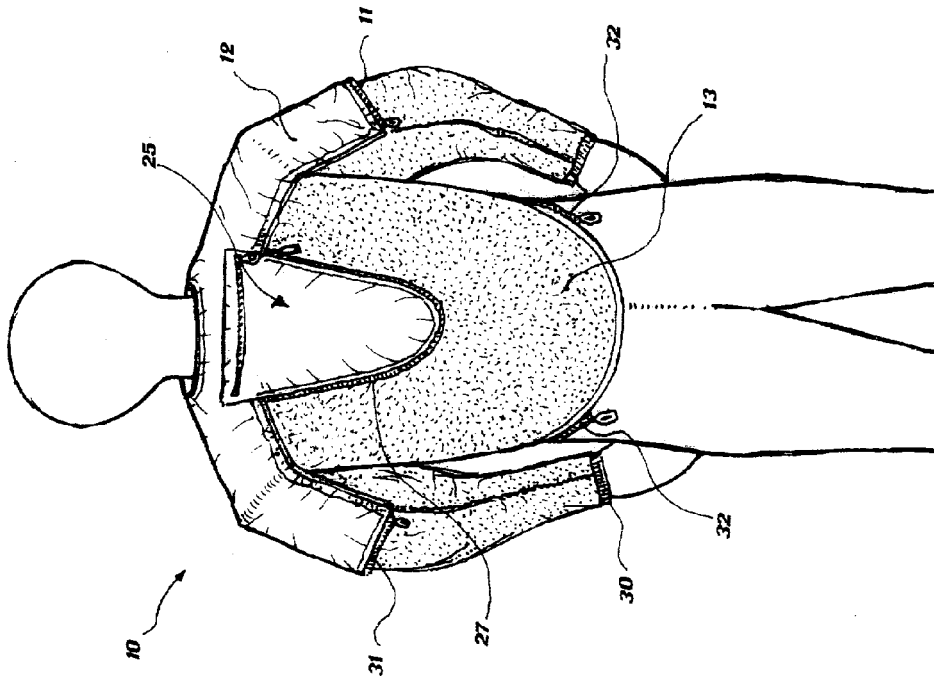


Fig. 2

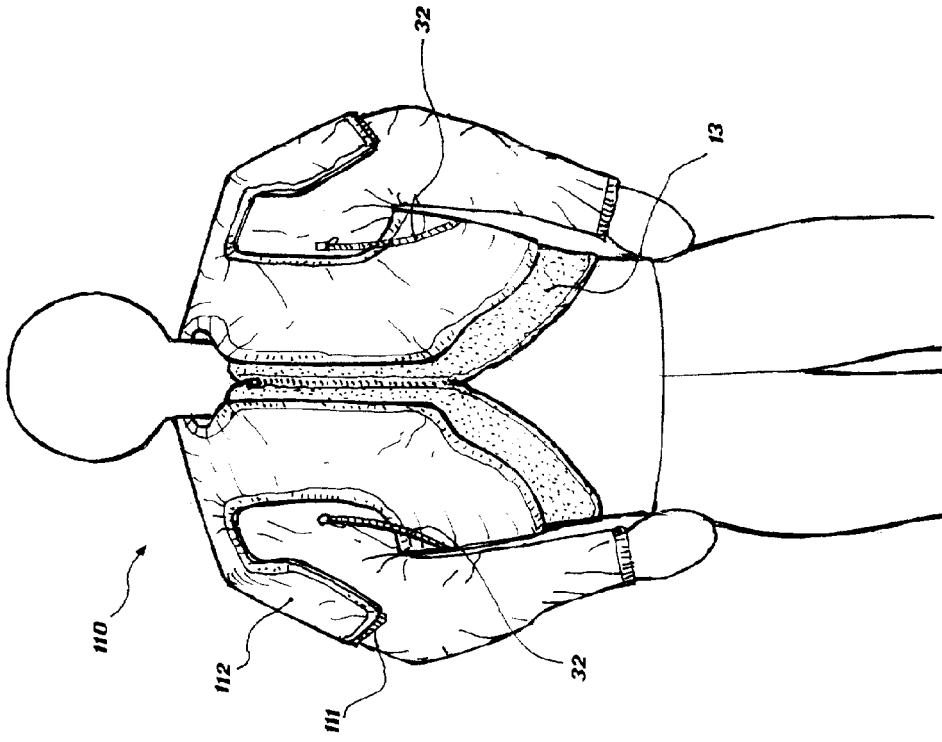


Fig.4

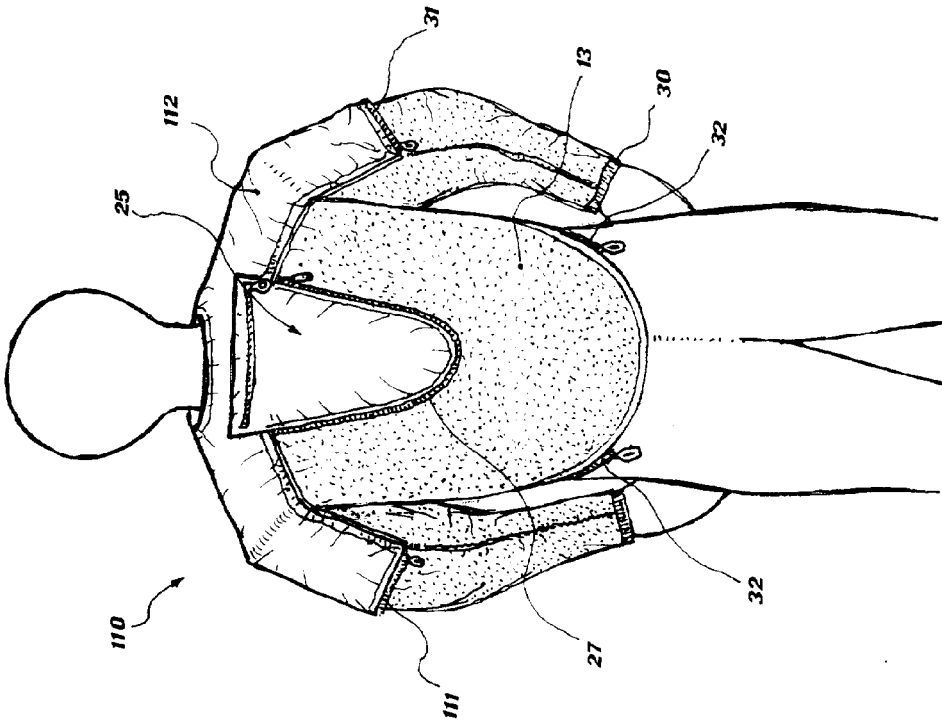


Fig.3



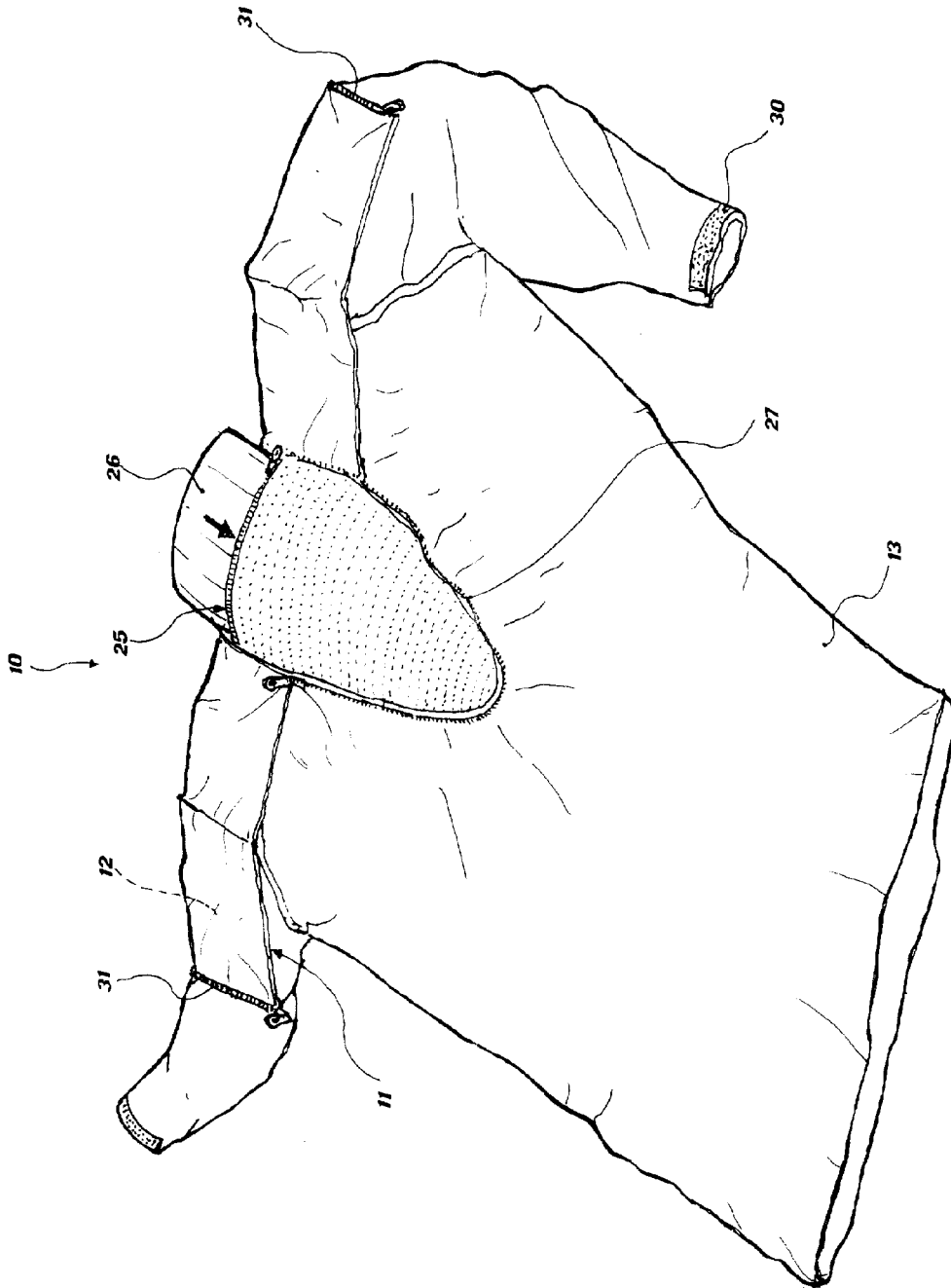


Fig.5

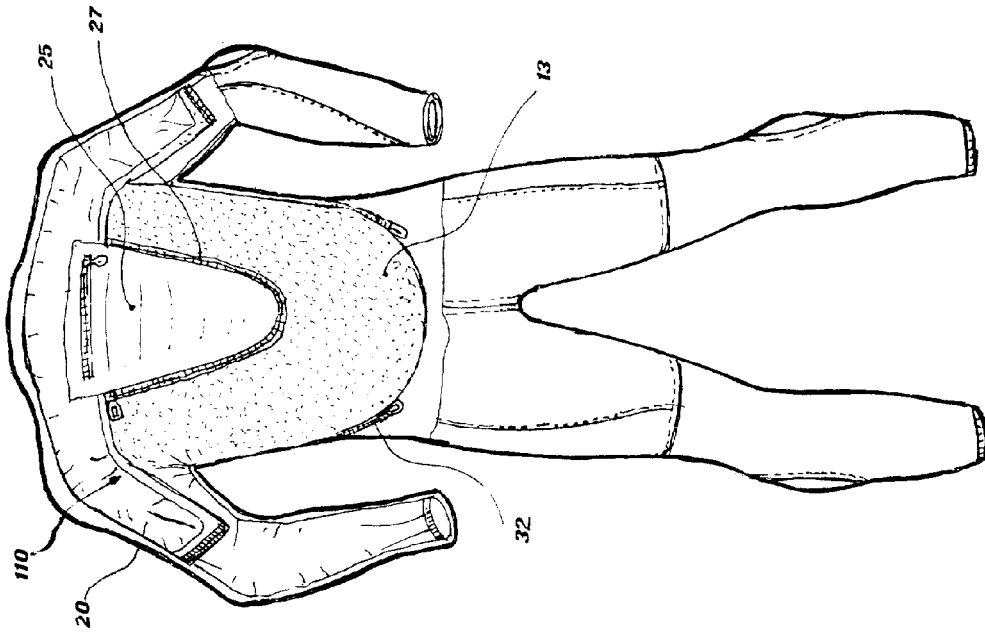


Fig.7

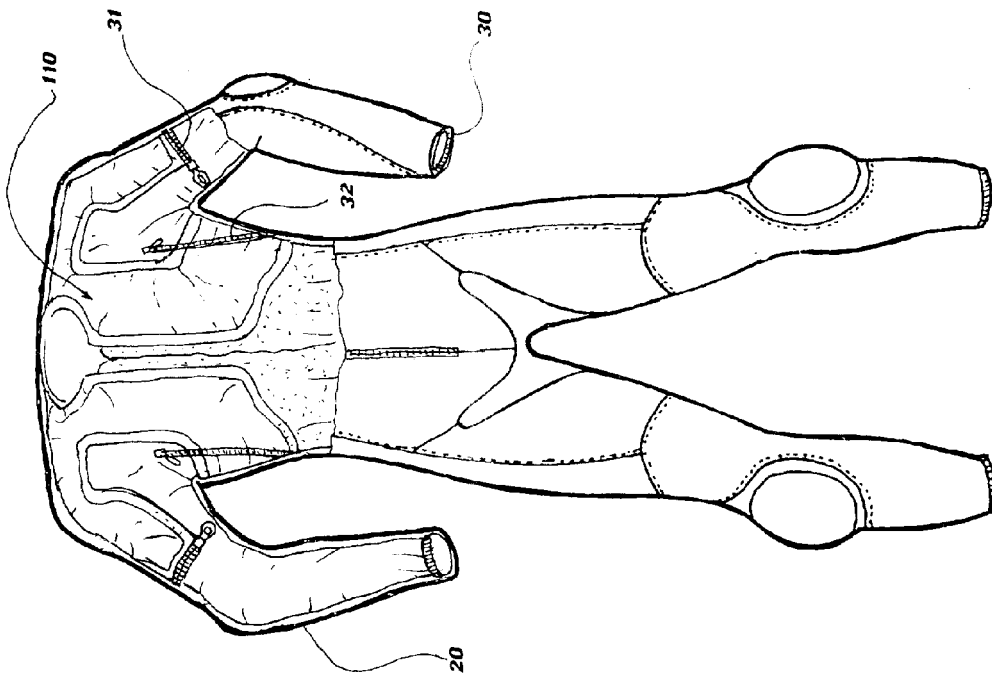


Fig.6

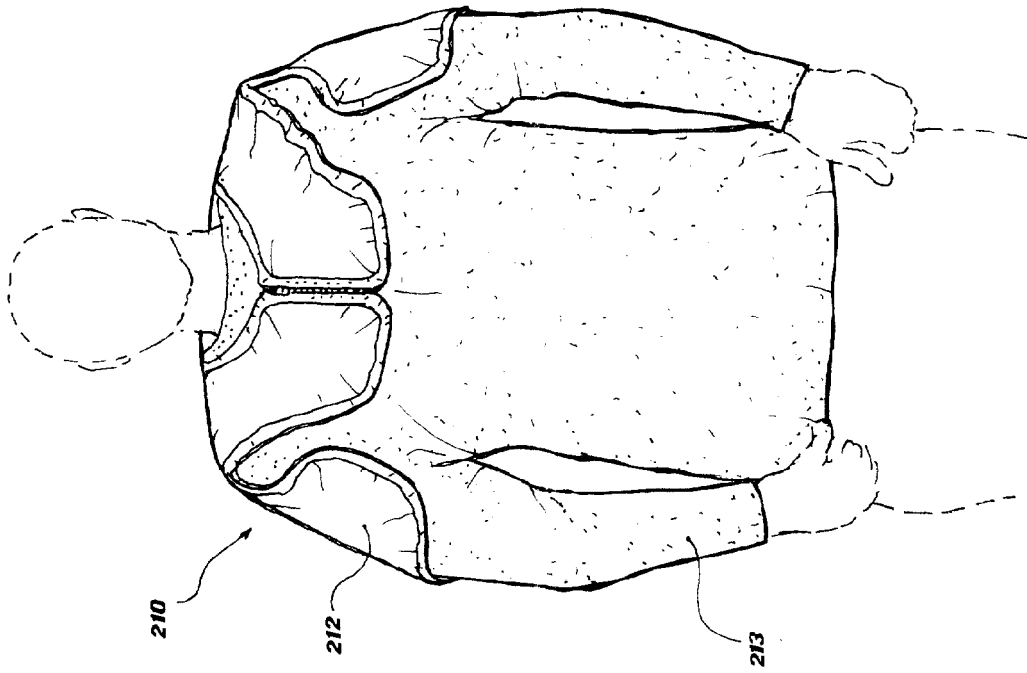


Fig.9

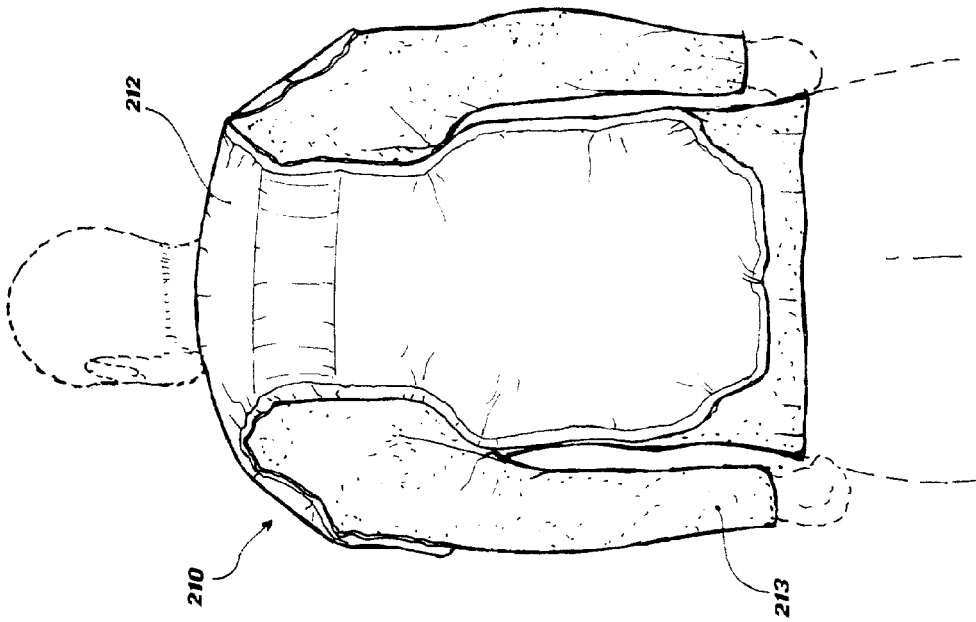


Fig.8

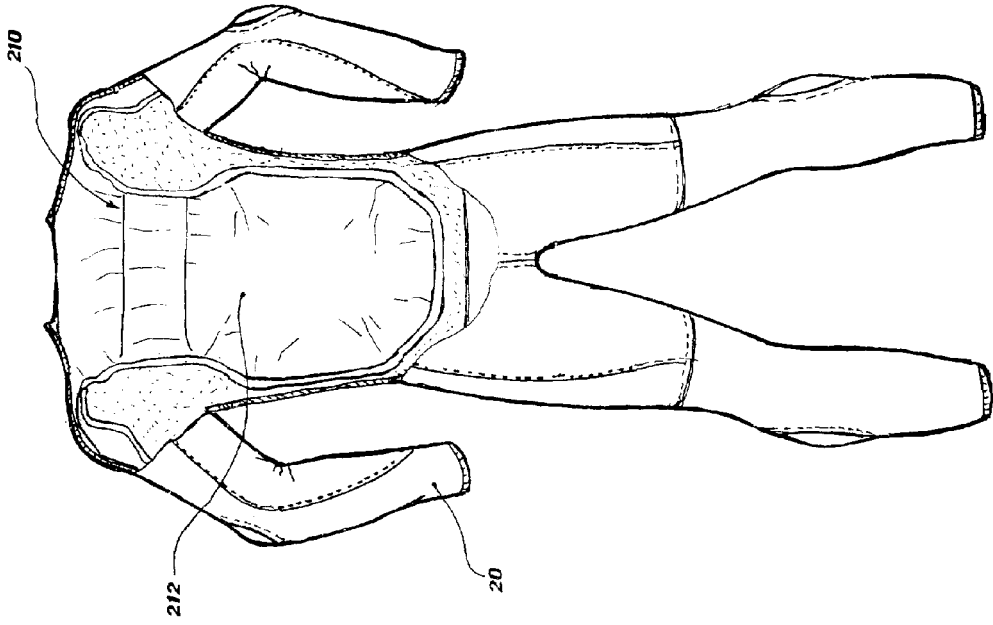


Fig. 11

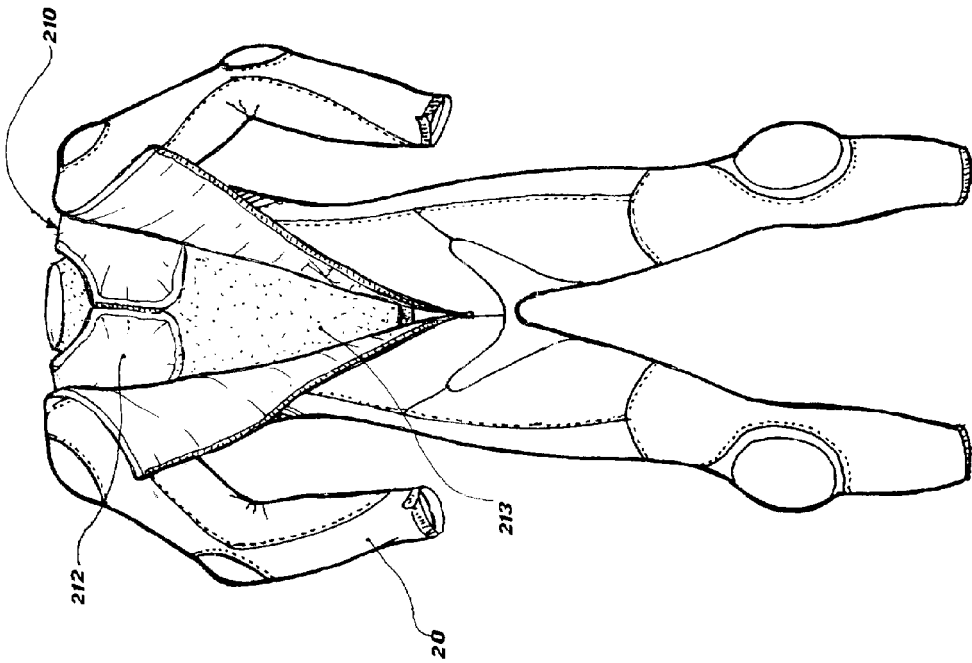


Fig. 10



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Application Number  
EP 13 16 9898

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The present search report has been drawn up for all claims			
Place of search <b>The Hague</b>		Date of completion of the search <b>30 August 2013</b>	Examiner <b>D'Souza, Jennifer</b>
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