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(54) **PERSONAL PROTECTION DEVICE**

(57) The present disclosure relates to a personal protection device comprising at least one first portion (101) element and one second portion (102) of an inflatable element, an inflatable element intended to protect at least partially an area of user's body, a permanent connection structure (21) designed to connect the aforementioned first and second portions (101, 102), a detachable connection device (22) having a first and a second connection element (221, 222) associated respectively with the aforementioned first and second portions (101, 102).

The detachable connection device (22) is designed to assume an open configuration in which the first and second connection elements (221, 222) are separated and a closed configuration in which the first and second connection elements (221, 222) are connected together.

The open configuration and the closed configuration correspond respectively to a first and a second predefined relationship between the aforementioned first and second portions (101, 102). The distance between the aforementioned first and second portions (101, 102) in the second spaced relationship is smaller than the distance in the first spaced relationship.

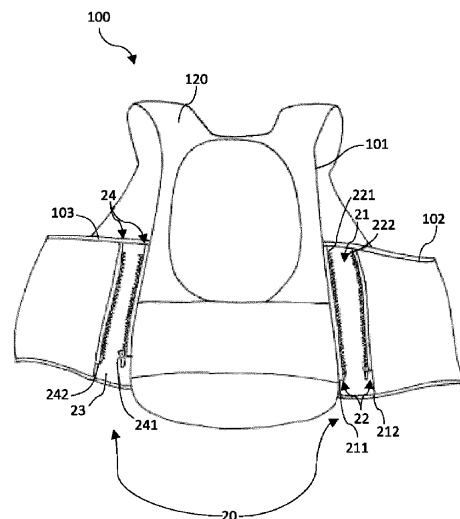


FIG. 1

Description

[0001] The present disclosure relates in general to a personal protection device for protecting a user. The personal protection device includes an inflatable element which is designed to protect at least partially from impacts and/or falls an area of the body, preferably the torso, of a motorcycle rider, a passenger, a skier, or a similar user during a sporting and/or working activity and/or any other activity. In particular, the present disclosure relates to a personal protection device with a variable or adjustable size.

[0002] For some time protection devices which include an inflatable element designed to protect at least partially an area of a user's body have been known. Said inflatable elements are designed to assume a rest condition, or deflated condition, and an active condition, or inflated condition, in which they are able to protect at least partially an area of a user's body.

[0003] In order to ensure suitable protection, the personal protection devices of the known type, as briefly described hitherto, must be worn so that the inflatable element adheres, in the inflated condition, substantially to the user, so as to ensure protection of a specific area of the body which must be protected, i.e. is intended to be protected, and eliminate any risk of non-protection.

[0004] At the same time, it is known to provide personal protection devices which are substantially independent devices, namely personal protection devices which may be worn and at the same time include all the components needed to inflate the inflatable element, namely impact detection sensors, electronic unit for signal management, and one or more fluid generators connected to the inflatable element.

[0005] Consequently, the personal protection device of this known type is like a kind of garment which may be worn if necessary when protection of the body is required. Consequently, depending on the period of the year, for example in the summer season, the personal protection device is worn so that it fits closely over a t-shirt or a light jacket. In the winter season, for reasons of volume, the same personal protection device may be worn underneath a heavier jacket. During the design and production of the said personal protection device, the position of the inflatable element is therefore determined depending on the dimensions and the volume.

[0006] Alternatively, the same user requires two or more personal protection devices with a different size depending on whether he/she intends wearing one of these personal protection devices always over an article of clothing which has a greater or smaller volume.

[0007] A technical problem underlying the present disclosure is that of providing a personal protection device which is always more versatile as regards the combination thereof with a garment.

[0008] The document WO2014199309 A1 describes a protection garment which comprises an inflatable element for a protecting an area of a user's body. The

garment may be open on the sides and, in this case, comprises side strips with respective Velcro fasteners for allowing closure thereof. By means of the strips it is possible to adapt partly the garment the user's torso.

The side strips, despite being fast closing means, have the drawback that they do not constitute adequate adjustment means with a reliable retaining action over time, considering also the possible inflated condition of the garment.

[0009] The document GB2345031 describes a protective garment which comprises several inflatable elements for protecting a user's body. The garment is of the non-adjustable type.

[0010] In view of the above, the present disclosure proposes providing a personal protection device which is able to prevent or overcome the drawbacks mentioned above with reference to the prior art and/or achieve further advantages.

[0011] This is obtained by providing a personal protection device and a method as defined in the respective independent claims. Secondary characteristics and particular embodiments of the subject of the present invention are defined in the corresponding dependent claims.

[0012] The personal protection device according to the present disclosure is wearable, namely is configured to be worn by a user and is designed to enclose or surround a portion of a user's body. The personal protection device comprises at least one first portion of the personal protection device and at least one second portion of the personal protection device.

[0013] The personal protection device also includes an inflatable element designed to protect at least partially an area of a user's body.

[0014] The personal protection device also comprises connection means including, in turn, a permanent connection structure and a detachable, i.e. removable, connection device.

[0015] The permanent connection structure is designed to connect in a fixed manner the first portion of the personal protection device to the second portion of the personal protection device.

[0016] The removable connection device is designed to connect temporarily the first portion of the protection device to the second portion of the protection device and includes a first connection element, associated with the first portion of the personal protection device, and a second connection element, associated with the second portion of the personal protection device.

[0017] It is to be understood that the connection between the permanent connection structure and the portions of the personal protection device may consist of a direct connection or fastening with the respective portion, or an indirect connection or fastening with the respective portion, for example an indirect connection or fastening via further components, such as pieces of cloth or layers of the personal protection device.

[0018] Similarly, the connection between the removable connection device and the portions of the personal

protection device may be understood as being a direct connection or fastening with the respective portion, or an indirect connection or fastening via further components, such as pieces of cloth or layers of the device.

[0019] The detachable connection device is designed to assume an open configuration, in which the first connection element is detached, i.e. separated or uncoupled, from the second connection element. The detachable connection device is designed to assume a closed configuration, in which the first connection element is connected, i.e. joined or coupled, to the second connection element.

[0020] The first connection element and the second connection element may be understood as being a part and counterpart of the detachable connection device, which are configured for stable connection together, like the parts of a Velcro fastener or a zipper.

[0021] The open configuration of the detachable connection device corresponds to a first predefined spaced relationship, namely a first predefined or preset distance, of the first portion of the personal protection device with respect to the second portion of the personal protection device. Instead, the closed configuration corresponds to a second spaced relationship, namely a second predefined or preset distance, of the first portion of the personal protection device with respect to the second portion of the personal protection device. In particular, the aforementioned second distance, or distance between the first portion and the second portion of the personal protection device in the second spaced relationship, is less than the aforementioned first distance, or distance between the first portion and the second portion in the first spaced relationship.

[0022] According to the present disclosure, therefore, the detachable connection device is of the reversible or detachable type and allows the first connection element and the second connection elements to be associated with each other, as required or temporarily, reducing the distance between the first portion of the personal protection device and the second portion of the personal protection device.

[0023] In other words, since the first connection element is associated with the first portion of the personal protection device and since the second connection element is associated with the second portion of the personal protection device, the connection device allows the first portion and the second portion of the personal protection device to be reversibly joined together. In particular, by closing or opening the detachable connection device, it is possible to position the first portion of the personal protection device and the second portion of the personal protection device at a first or second predefined or preset distance from each other.

[0024] In other words, since the first distance between the first portion of the personal protection device and the second portion of the personal protection device is greater than the second distance between the first portion of the protection device and the second portion of the

personal protection device, by opening or closing the detachable connection device it is possible, respectively, to move the first portion and the second portion of the personal protection device away from each other. By moving the two portions of the personal protection device away from or towards each other, an increase in the extension or capacity for coverage of a given area of the body of a user is obtained; vice versa, by moving the two portions of the personal protection device towards each other, the space occupied by the two portions is reduced, namely the extension or capacity for coverage of a given area of the body of a user is reduced.

[0025] It can therefore be understood that, the open configuration of the detachable connection device corresponds to a first (bigger) spaced relationship between the first portion and the second portion of the personal protection device, i.e. a bigger free space between the first portion and the second portion of the protection device and, similarly, the closed configuration of the detachable connection device corresponds to a second (smaller) spaced relationship between the first portion and the second portion of the personal protection device, and therefore a smaller free space between the two portions.

[0026] It should be pointed out that preferably one or each portion of the personal protection device may be a portion which includes, in turn, a portion of an inflatable element. For example, the personal protection device includes two inflatable element portions facing each other, for example two end or edge portions, which each form part of a respective portion of the personal protection device. Alternatively, either one of the first portion and the second portion of the personal protection device includes an inflatable element portion, while the other of the first portion and the second portion of the protection device does not have an inflatable element portion.

[0027] For example, the inflatable element includes a portion arranged on a front side of the user and a portion arranged on a rear side which face each other on one flank, or they may be front inflatable element portions.

[0028] Preferably, the connection means are arranged between the two portions of the personal protection device. More preferably, the connection means are arranged between said inflatable element portions so as to adjust the distance specifically between the inflatable element portions. The personal protection device may include a single inflatable element, which in turn comprises the first inflatable element portion and the second inflatable element portion. Alternatively, the inflatable element portions may be portions of two independent inflatable elements.

[0029] If the portion of the personal protection device also includes an inflatable element portion, the portion of the personal protection device may consist of the single inflatable element. In this latter case, owing to the geometry of the parts described above, the connection means are connected to the inflatable element.

[0030] Alternatively, the personal protection device may include a lining or a general external covering or a

covering layer which covers the inflatable element so as to form a proper garment. In this latter case, owing to the geometry of the parts described above, the connection means are connected to the covering layer.

[0031] The personal protection device may form part of a more complex garment, wherein the garment includes further outer layers which may define an independent article of clothing, such as a proper external jacket or suit, or "cover", situated above the personal protection device.

[0032] What is important is that, since the personal protection device is a wearable device, which during use surrounds the body of a user, by increasing or reducing in fact the distance between the two portions of the personal protection device, the overall size of the personal protection device is increased or reduced.

[0033] The permanent connection structure has the function of determining, and controlling beforehand, the greater distance between the two portions of the protection device and establishing beforehand their position, especially in the inflated condition of the inflatable element. Preferably, the removable connection device is superimposed on the permanent connection structure. In particular, if a side which, during use, is directed towards the user's body is regarded as the inner side of the personal protection device and the side opposite to the inner side, namely the side which, during use, is directed towards the outside, is regarded as the outer side, the permanent connection structure is directed towards the inner side and the removable connection device, at least in the closed configuration, is superimposed on the permanent connection structure on said outer side.

[0034] As a result, when the personal protection device is worn, there is a wider configuration than the other one and in fact a first size of the personal protection device and a second size of the personal protection device, the first size being bigger than the second size. Expressed differently, preferably the protection device is able to assume a first configuration or first size and a second configuration or second size, respectively, in the open configuration and the closed configuration of the detachable connection device, where said first configuration or first size is bigger than the second size or configuration. In this way it is possible to ensure more correct and precise positioning with respect to each other and with respect to the user's body of the personal protection device portions, preferably inflatable element portions. For example, a size S may correspond to the closed configuration of the connection device and a size M may correspond to the open configuration of the connection device.

[0035] Therefore, by performing the opening/closing of the detachable connection device it is possible to adjust, in a reversible manner, the size, dimensions or wearability of the personal protection device. In other words, the detachable connection device is designed to pass from said open configuration into said closed configuration, and vice versa, so as to adjust reversibly the size, dimensions or wearability of the personal protection device, taking into account the presence of said inflatable

element portions. Therefore, the size, dimensions or wearability of the personal protection device may be adapted to the need or requirements of the user.

[0036] It is pointed out that a first position of said at least one inflatable element corresponds to said open configuration and a second position of said at least one inflatable element corresponds to said closed configuration

[0037] In particular, said open configuration and said first position of said at least one inflatable element correspond to, and/or determine, a first size of said personal protection device. Moreover, said closed configuration and said second position of said at least one inflatable element correspond to, and/or determine, a second size of said personal protection device.

[0038] Preferably, if one or each of the portions of the personal protection device comprise a respective inflatable element portion, it is possible to control also the distance between the inflatable element portions and control therefore the position of the inflatable element in both the configurations. In other words, the connection means are arranged between said inflatable element portions so as to adjust and control the distance between them so that they provide correct protection for the user in both configurations.

[0039] Furthermore, the detachable connection device comprises a zipper or zip fastener. The zipper ensures both a stable connection and secure retaining action, in particular in an inflated condition of each inflatable element, as well as relatively easy changing from said first size to said second size and vice versa.

[0040] This has the advantage of being able to adapt precisely the protection device to the user's body, taking into account the position of the inflatable elements while ensuring a stable retaining action in the event of activation of the inflatable elements during the closed configuration of the detachable connection device.

[0041] In addition, as mentioned above, the personal protection device according to the invention includes the permanent connection structure, namely is configured to ensure a connection or joining together of an irreversible, fixed or stable nature. Irrespective as to the configuration assumed by the detachable connection device, the permanent connection structure is configured to keep the first portion and the second portion of the personal protection device connected or joined together. Therefore, even if the detachable connection device is in the open configuration, the two portions of the personal protection device are not completely detached, divided or separated from each other. In this way, it is possible to ensure that, during use, even when there is a greater distance between them, the two portions of the personal protection device do not become separated from each other and the user's body, thereby ensuring that the first portion and the second portion of the protection device remain in the correct position with respect to the user's body.

[0042] Expressed very simply, the present disclosure relates to a personal protection device, the extension, dimensions or capacity of which to cover a given surface

area during use may be reduced or increased as required so that it is possible to obtain a significant variation in the size, i.e. variation between a first size and a second size, of the same personal protection device.

[0043] It may also be noted that, owing to the geometry of the parts described above, the removable connection device, at least in the closed configuration, reduces the overall size and the extension of the permanent connection device.

[0044] According to a preferred aspect of the present disclosure, the permanent connection structure is designed to determine the distance between the first portion and the second portion of the personal protection device in the open configuration of the detachable connection device. The permanent connection structure is designed to undergo an extension between the first portion and the second portion of the protection device. The maximum extension of the connection structure between the first portion and the second portion of the protection device determines the first predefined or predetermined distance. Therefore, the greater the maximum extension of the permanent connection structure, the greater is the variation in size.

[0045] According to a preferred aspect of the present disclosure, the permanent connection structure is designed to form a bridge body between the first portion and the second portion of the personal protection device. In other words, the permanent connection structure extends between a first end or first edge, associated with the first portion of the protection device, and a second end or second edge, opposite to the first end or first edge and associated with the first portion of the protection device. The other edges of the connection structure are free edges or in any case edges which are not associated with these portions of the protection device.

[0046] Furthermore, it is pointed out that said first connection element of said zipper is associated with a start of said bridge body and said second connection element of said zipper is associated with an end of said bridge body.

[0047] According to a preferred aspect of the present disclosure, the permanent connection structure is made of flexible - namely pliable or soft - material. In this way, during the transition between the open configuration and the closed configuration of the detachable connection device, the permanent connection structure is designed to flex, or fold, onto itself, allowing the first portion and the second portion of the protection device to move closer together.

[0048] According to a preferred aspect of the present disclosure, the permanent connection structure comprises elastic inserts or is made of elastic material, so as to offer further adaptation of the wearability and greater comfort during use or wearing of the personal protection device.

[0049] In fact, the personal protection device is designed to be worn by a user. In other words, the device is of the wearable type. In particular, according to a

preferred aspect of the present disclosure, the personal protection device is designed to enclose an upper area of the body, namely the trunk or torso of a user. In other words, the protection device is designed to be worn on the upper area of the body, namely the trunk or torso of a user. Preferably, the first portion of the personal protection device is intended to cover a back region or a chest region of a user and the second portion of the personal protection device is intended to cover a flank region of a user.

[0050] According to a preferred aspect of the present disclosure, the personal protection device includes a third portion intended to cover a flank region of a user, different from that which may be intended to be covered by the second portion of the personal protection device. For example, the second portion and the third portion are designed, during use, to cover respectively a right flank and a left flank of the user.

[0051] According to a preferred aspect of the present disclosure, the connection means include a further permanent connection structure and a further detachable connection device. In other words, the connection means described briefly hitherto are respectively a first permanent connection structure and a first detachable connection device and the connection means include a second permanent connection structure and a second detachable connection device.

[0052] The second permanent connection structure is designed to connect the first portion and the third portion of the protection device. In particular, the second permanent connection structure is designed to permanently join together the first portion of the protection device and the third portion of the protection device.

[0053] The second detachable connection device is configured to join together reversibly the first portion of the protection device and the third portion of the protection device. The second detachable connection device comprises, in turn, a first connection element, associated with the first portion of the protection device, and a second connection element, associated with the third portion of the protection device. Like the first detachable connection device, the second detachable connection device is designed to assume an open configuration and a closed configuration. In the open configuration of the second detachable connection device, the respective first connection element is detached, i.e. separated or disconnected, from the respective second connection element. In the closed configuration of the second detachable connection device, the respective first connection element is connected, i.e. joined or coupled, to the respective second connection element. The open configuration of the second detachable connection device corresponds to a first predefined spaced relationship, namely a first predefined or preset distance, of the first portion of the personal protection device with respect to the third portion of the personal protection device. Instead, the closed configuration of the second detachable connection device corresponds to a second spaced re-

relationship, namely a second predefined or preset distance, of the first portion of the personal protection device with respect to the third portion of the personal protection device. The distance between the first portion of the personal protection device and the third portion in the second spaced relationship is less than the distance between them in the respective first spaced relationship. By opening and closing the second detachable connection device it is therefore possible to move the first and the third portion of the personal protection device away from or towards each other. This thus results respectively in an increase or reduction in the extension, size or covering capacity also astride the first portion of the protection device and a further portion thereof. Consequently, it is possible to adjust the size or dimensions of the personal protection device, for example along both the flanks of a user.

[0054] According to a preferred aspect, apart from the fact that they are designed to connect the first portion and third portion of the protection device, the second permanent connection structure and the second detachable protection device are structurally and functionally similar, respectively, to the first connection structure and the first detachable connection device, as briefly described above, and the same description is therefore applicable to them. In other words, the second permanent connection structure and the second detachable connection device differ, respectively, from the first connection structure and from the first detachable connection device only in that they connect the first portion and the third portion of the protection device, instead of connecting the first portion and the second portion of the protection device.

[0055] Moreover, it should be noted that, both in said open configuration and in said closed configuration said connection means are not superimposed on said one or more inflatable element portions. In other words, in said first size and said second size of said personal protection device, the connection means are not superimposed on the inflatable element portions.

[0056] Further advantages, characteristic features and modes of use forming 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.

[0057] It is in any case clear that each embodiment forming the subject of the present disclosure may have one or more of the advantages listed above; in any case it is not required that each embodiment should have simultaneously all the advantages listed.

[0058] Reference will be made to the figures of the attached drawings in which:

- Figure 1 shows a top plan view of the personal protection device according to the present disclosure, in which the first detachable connection device and the second detachable connection device are in the open configuration;
- Figure 2 shows a top plan view of the same personal

protection device according to Figure 1, in which the first detachable connection device and the second detachable connection device are in the closed configuration;

- 5 - Figure 3 corresponds to Figure 1, in which a covering layer has been partially removed so that an underlying inflatable element may be seen;
- Figure 4 is a front view of the personal protection device according to Figure 1;
- 10 - Figure 5 is a view of an inflatable element for the personal protection device according to Figure 1.

[0059] With reference to the accompanying figures, the reference number 100 indicates overall an embodiment of a personal protection device according to the present disclosure.

[0060] The personal protection device 100 is a wearable device and comprises an inflatable element 12 which is intended to protect at least partially an area of a user's body. The inflatable element 12 is designed to assume a rest condition, or deflated condition, and an active condition, or inflated condition, in which it is able to protect at least partially an area of a user's body. The inflatable element 12 is designed to surround at least partially the body in both the aforementioned operating conditions.

[0061] "Wearable personal protection device" is understood as meaning a device which may be worn, namely placed on a user's body with a protective function, or which can be associated with or is designed to be associated with a garment or an undergarment, such as a motorcycling suit, a jacket, a vest or a pair of trousers. Since it is a device which can be preferably worn, in the context of the present disclosure reference will be made for greater clarity to parts of the body which said protection device is intended to protect and in general spatial references such as above, below, inner and outer and similar references are to be understood in a non-limiting manner as though the device were being worn.

[0062] In the present case the personal protection device 100 has the form of a gilet.

[0063] More specifically, with reference to Figure 5, the inflatable element 12 is intended to protect at least partially a torso region of the user. More precisely, in the embodiment shown, the inflatable element 12 includes a first part 121, intended to be placed in the neck region, chest parts 122, each intended to be placed along a right-hand and a left-hand region of the chest, respectively, and a spinal or back portion 123 intended to be placed along a back region which is centred on the user's backbone.

[0064] The modes of inflating the inflatable element 12 will be described in the description below.

[0065] The wearable personal protection device 100 is therefore, in fact, a protective garment, in the case in question of the gilet type, and includes at least one covering structure 120 or lining or covering designed to contain or line or cover the inflatable element 12. Where

the inflatable element 12 is not present, the covering structure 120 is to be understood as being a layer of the personal protection device 100.

[0066] The personal protection device 100 according to the present disclosure comprises at least one first portion 101 of the personal protection device 100, which may be a shoulder portion, and at least one second portion 102 of the personal protection device 102, which may be a flank portion.

[0067] Consequently, owing to the geometry of the parts, below each portion 101, 102 includes a respective covering portion and cover 120.

[0068] The personal protection device 100 according to the present disclosure comprises connection means 20. The connection means 20, in turn, include: a permanent connection structure 21 and a detachable connection device 22. The permanent connection structure 21 is designed to connect in a stable and fixed manner the first portion 101 to the second portion 102 of the personal protection device 100. In other words, the permanent connection structure 21 forms a permanent connection between the first portion 101 and the second portion 102 of the personal detection device 100. Expressed in other words, the first portion 101 and the second portion 102 of the personal protection device 100 are connected permanently, i.e. reversibly, by means of the permanent connection structure 21. In the context of the present disclosure, the term "irreversible" or "permanent" is understood as meaning a connection which is intended to last, unless subject to voluntary misuse, accidental breakage or wear.

[0069] The detachable connection device 22 comprises a first connection element 221, associated with the first portion 101 of the personal protection device 100, and a second connection element 222, associated with the second portion 102 of the personal protection device 100. The detachable connection device 22 is designed to assume an open configuration and a closed configuration. It should be noted that a first position of the inflatable element 12 corresponds to the open configuration and a second position of the inflatable element 12 corresponds to the closed configuration.

[0070] In the open configuration, the first connection element 221 is detached, i.e. separated or disconnected, from the second connection element 222. Consequently, in the open configuration, the first portion 101 and the second portion 102 of the personal protection device 100 are connected together only by means of the permanent connection structure 21.

[0071] In the closed configuration, instead the first connection element 221 is connected, i.e. coupled or joined, to the second connection element 222. Consequently, in the closed configuration, the first portion 101 and the second portion 102 of the personal protection device 100 are connected together both by means of the permanent connection structure 21 and by means of the detachable connection device 22.

[0072] The open configuration corresponds to a first

predefined spaced relationship, namely a first predefined or predetermined distance, of the first portion 101 with respect to the second portion 102 of the personal protection device 100. The closed configuration, instead, corresponds to a second predefined spaced relationship, namely a second predefined or predetermined distance, of the first portion 101 with respect to the second portion 102 of the personal protection device 100.

[0073] In particular, a distance between the first portion 101 of the personal protection device 100 and the second portion 102 in the second spaced relationship is less than a distance between the first portion 101 of the personal protection device 100 and the second portion 102 in the first spaced relationship. Expressed differently, the first predefined or predetermined distance is greater than the second predefined or predetermined distance.

[0074] By opening or closing the detachable connection device it is possible increase or reduce the predefined or preset distance between the first portion 101 and the second portion 102 of the personal protection device 100 and consequently it is possible, respectively, to increase or reduce the extension, dimensions or size of the personal protection device 100. Therefore, the personal protection device has an extension, dimensions or capacity to cover a given area during use which may be controlled or adjusted by the user depending on his/her needs.

[0075] In other words, the open configuration and the first position of the inflatable element 12 correspond to and/or determine a first size of the personal protection device 100, and the closed configuration and the second position of the inflatable element 12 correspond to and/or determine a second size of the personal protection device 100.

[0076] According to a preferred aspect of the present disclosure, the permanent connection structure 21 is designed to determine the distance between the first portion and the second portion 102 of the personal protection device 100 in the open configuration of the detachable connection device 22. In other words, the permanent connection structure 21 limits or constrains the movement of the first portion 101 away from the second portion of the personal protection device to the aforementioned first predefined or predetermined distance. As a result, the maximum extension of the permanent connection structure 21 between the first portion 101 and the second portion 102 of the protection device 100 determines the first predefined or predetermined distance between them.

[0077] According to a preferred aspect of the present disclosure, the permanent connection structure 21 is designed to form a bridge body between the first portion 101 and the second portion 102 of the personal protection device 100. The permanent connection structure 21 extends, that is, between a first end 211, or first edge, associated with the first portion 101 of the protection device 1000, and a second end 212 or second edge, opposite to the first end 211 and associated with the

second portion 102 of the protection device 100.

[0078] According to a preferred aspect of the present disclosure, the permanent connection structure 21 is made of flexible - namely pliable or soft - material. During the transition to the closed configuration of the detachable connection 22 device, the permanent connection structure 21 may therefore curl up or fold up onto itself so as to allow the first connection element 221 and the second connection element 222 to move towards each other and consequently allow the first portion 101 to move towards the second portion 102 of the personal protection device 100.

[0079] According to a preferred aspect of the present disclosure, one or each of the first portion 101 and the second portion 102 of the personal protection device include a corresponding portion of the inflatable element 12. In this case, therefore, the permanent connection structure 21 and the detachable connection device 22 may be indirectly associated with the inflatable element and allow the position of the inflatable element 12 to be adjusted in a more precise manner.

[0080] In other words, the personal protection device 100 comprises the covering structure or lining 120 or cover designed to contain or line or cover the inflatable element 12. The first portion 101 and the second portion 102 of the personal protection device in this case may each comprise, as mentioned, a different portion of the covering structure or lining. Therefore, according to this preferred aspect, the permanent connection structure 21 and the connection device 22 are indirectly associated with the inflatable element 12 by means of the covering structure 120. Preferably, according to this preferred aspect, the first portion 101 is designed to support and/or house the inflatable element 12. For example, the first portion 101 is a pocket 111 which forms part of the covering structure and is designed to contain the inflatable element 12 inside it.

[0081] Preferably, moreover, the covering structure 120 or lining is made of knitted material or fabric or cloth and the permanent connection structure 21 is a piece or panel of knitted material, cloth or fabric.

[0082] Alternatively, if there is no lining or covering, the permanent connection structure 21 and the detachable connection device 22 may be directly associated with the inflatable element 12, for example with one of the sealing walls which, as explained below, may form part of the inflatable element.

[0083] According to a preferred aspect of the present disclosure, the permanent connection structure 21 comprises elastic inserts or is made of elastic material; in this way it is possible to ensure greater wearing comfort and/or better adaptation of the dimensions or size of the protection device with respect to the user's body.

[0084] According to a preferred aspect of the present disclosure, the removable connection 22 comprises or consists of a zipper or zip fastener. For example, the first connection element 221 may correspond to a first zipper or zip fastener portion and, likewise, the second connec-

tion element 222 may correspond to a second zipper or zip fastener portion.

[0085] The zipper allows a stable connection, in particular in the inflated condition, and precise adjustment of the size. In other words, the use of a zipper is preferable because it ensures a firm connection also in the inflated condition of the inflatable element 12. The zipper, moreover, allows the size to be rapidly changed without precise adjustment, and ensure the predefined position of the portions of the personal protection device, preferably of the inflatable element portions, for each size.

[0086] Alternatively, the detachable connection device 22 comprises or consists of a structure with ties, strips, laces or buttons or Velcro fasteners.

[0087] It should be noted that, both in the open configuration and in the closed configuration, the connection means 200 are not superimposed on said one or more inflatable element portions 12.

[0088] According to a preferred aspect of the present disclosure, the first connection element 221 is associated with the first portion 101 of the personal protection device 100 in the vicinity of the first end 211, or first edge, of the permanent connection structure 21, and the second connection element 222 is associated with the first portion 101 of the personal protection device 100 in the vicinity of the second end 212, or second edge, of the permanent connection structure 21.

[0089] According to a preferred aspect of the present disclosure, the personal protection device 100 is designed to be worn by a user. In other words, the personal protection device is intended, during use, to be worn by a user. Preferably, the personal protection device 100 may be shaped like a garment or article of clothing and may be placed on top of a light jacket, for example choosing the size M. More preferably, the personal protection device 100 is designed to enclose an upper area of the body or trunk or torso of a user and, even more preferably, is in the form of a light jacket, jacket, gilet, sleeveless jacket, body vest or waistcoat.

[0090] Alternatively, the personal protection device 100 is comprised within or forms part of a more complex garment, which includes an outer cover placed on top of the personal protection device 100, for example choosing the size S.

[0091] In particular, the first portion 101 is intended to cover a back region or a chest region of a user, while the second portion 102 of the personal protection device 100 is intended to cover a flank region of a user. In other words, the first portion 101 is designed, during use, to be positioned on the back or chest of a user, while the second portion 102 is designed, during use, to be positioned along a flank of a user.

[0092] According to a preferred aspect of the present disclosure, the detachable connection device 22 and the permanent connection structure 21 are connected, respectively, to the first portion 101 and the second portion 102 of the personal protection device 100 in the region or in the vicinity of the lower back, underneath the sleeves or

armpits, or in the lower stomach area.

[0093] According to a preferred aspect of the present disclosure, the personal protection device 100 comprises a third portion 103. Preferably, the third portion 103 is also intended to cover a flank region of a user, different from that covered by the second portion 102 of the personal protection device 100. For example, the second portion 102 of the personal protection device 100 is intended to cover a right-hand flank region of a user and the third portion 103 of the personal protection device 100 is intended to cover a left-hand flank region of a user.

[0094] According to a preferred aspect of the present disclosure, the connection means 20 include a further permanent connection structure 23 and a further detachable connection device 24. In other words, the aforementioned permanent connection structure 21 is a first permanent connection structure 21 and a second permanent connection structure 23 is also included in the connection means 20. The second permanent connection structure 23 is designed to connect the first portion 101 of the personal protection device 100 to the third portion 103 of the personal protection device 100. Similarly, the aforementioned detachable connection device 22 is a first detachable connection device and a second detachable connection device 24 is also included in the connection means 20. The second detachable connection device 24 comprises, in turn, a first connection element 241, associated with the first portion 101 of the personal protection device 100, and a second connection element 242, associated with the third portion 103 of the personal protection device 100.

[0095] The second detachable connection device 24, in a similar manner to the first detachable connection device 22, is designed to assume an open configuration, in which the first connection element 241 is separated from the second connection element 242, and a closed configuration, in which the first connection element 241 is connected to the second connection element 242.

[0096] The open configuration of the second detachable connection device 24 corresponds to a first predefined spaced relationship of the first portion 101 of the personal protection device 100 with respect to the third portion 103 of the personal protection device 100.

[0097] The closed configuration of the second detachable connection device 24 corresponds to a second predefined spaced relationship of the first portion 101 of the personal protection device 100 with respect to the third portion 103 of the personal protection device 100.

[0098] In particular, a distance between the first portion 101 of the personal protection device 100 and the third portion 103 in the second spaced relationship is less than a distance between the first portion 101 of the personal protection device 100 and the third portion 103 in the first spaced relationship. Consequently, according to this preferred aspect of the present disclosure, it is possible to obtain a further adaptation or adjustment of the size or dimensions of the personal protection device 100. Preferably, it is possible to adjust the size or dimensions of

the personal protection device 100, along both the flanks of a user.

[0099] According to a preferred aspect, apart from the fact that they are designed to connect the first portion and third portion of the protection device, the second permanent connection structure and the second detachable connection device are structurally and functionally similar, respectively, to the first connection structure 121 and the first detachable connection device 22, as described above. It is therefore considered unnecessary for them to be described in further detail.

[0100] As regards the inflatable element 12, it is pointed out that it may be made using any technology known in the sector. According to a preferred aspect of the present disclosure, the inflatable element 1 includes a closed textile structure defining an internal chamber or area or region. Said internal chamber or area or region is designed to contain an inflation fluid.

[0101] According to a further preferred aspect of the present disclosure, the inflatable element 12 includes, moreover, sealing walls which cover or line an outer side or outer surface of the knitted body. The outer side or outer surface of the knitted body corresponds to a side or surface which is opposite to an inner side or surface of the textile structure which faces or surrounds the aforementioned internal chamber or area or region. The sealing walls may be, for example, a first sheet or first wall and a second sheet or second wall, fixed to each other along respective perimetral edges.

[0102] As already mentioned above, if the connection means described above are directly connected to the inflatable element 12, they may be connected to the sealing walls.

[0103] It is also possible to consider the configuration in which the permanent connection structure 21 is directly connected to the inflatable element 12 and the detachable connection device is connected to the covering layer 120.

[0104] With regard to inflation, in order to perform inflation of the inflatable element 12, in the event of a fall and/or sliding and/or a sudden impact involving a user or a vehicle being ridden/driven, the protection device 100 is preferably designed to cooperate with special activation means which are operationally connected to an inflation fluid source. Preferably, the inflation fluid source comprises or consists of a canister of compressed cold gas such as helium (not shown). Alternatively, the inflation fluid source may comprise or consist of gas generators of the pyrotechnic or hybrid type or other types known in the prior art.

[0105] The inflation fluid source may be provided with a respective shut-off valve (not shown). Opening of the shut-off valve of the inflation fluid source is preferably controlled by a control unit depending on detection of the state of the vehicle/rider system; for example said control unit may implement a system for predicting the fall which allows early identification of the fall event and a reliable prediction of this by accelerometer sensor means fixed to

the vehicle (or rider) and a unit for processing the signals produced by the said sensors.

[0106] Alternatively, the personal protection device 100 according to the present disclosure may also be applied using an activation cable connected to a vehicle ridden/driven by a user, which cable activates inflation of the inflation fluid source following the movement of the user away from the vehicle, for example following a fall or a sudden impact. This cable-type activation means is used in particular in the horse-riding sector.

[0107] In any case the aforementioned activation means and the inflation fluid source may be incorporated in the personal protection device 100 according to the present disclosure and for example are indicated in general by the reference number 130 in Figure 5 or located on the outside thereof.

[0108] It should also be noted that the activation modes, although being an aspect of particular importance for effective operation of the device, will not be further described in greater detail since they are methods which are essentially already known to a person skilled in the art of protection of a person from sudden impacts.

[0109] Finally, the present disclosure refers to a method for modifying the size of a personal protection device 100 as described hitherto. Therefore, In the description of this method, the elements of the personal protection device 100 involved in the method and having the same function and the same structure as the elements described above retain the same reference number and are not described again in detail.

- separating the first connection element 221 associated with the first portion 101 of the personal protection device 100 from the second connection element 222 associated with the second portion 102 of the personal protection device 100 so as to assume said open configuration and cause the first portion 101 of the personal protection device 100 to assume the first spaced relationship with respect to the second portion 102 of the inflatable element, so as to define a first size of the personal protection device;
- joining the first connection element 221 associated with the first portion 101 of the personal protection device 100 to the second connection element 222 associated with the second portion 102 of the personal protection device 100 so as to assume said closed configuration and cause the first portion 101 of the personal protection device 100 to assume the second spaced relationship with respect to the second portion 102 of the personal protection device, wherein by assuming the second spaced relationship a second size of the personal protection device 110, smaller than the first size, is obtained. In other words, the size of the personal protection device 100 is thus reduced in this way.

[0110] The subject of the present disclosure has been described hitherto with reference to preferred embodi-

ments. It is to be understood that other embodiments relating to the same inventive concept may exist, these all falling within the scope of protection of the claims which are attached hereinbelow.

Claims

1. Personal protection device (100), wherein the personal protection device is wearable and is designed to enclose or surround at least a portion of a user's body, wherein the personal protection device (100) comprises:

- at least one inflatable element (12) intended to protect at least partially an area of a user's body,
- at least one first portion (101) of the personal protection device (100) and at least one second portion (102) of the personal protection device (100);

- connection means (20) including a permanent connection structure (21) and a detachable connection device (22), wherein the permanent connection structure (21) connects the first portion (101) of the personal protection device (100) to the second portion (102) of the personal protection device (100) and the detachable connection device (22) includes a first connection element (221) associated with the first portion (101) of the personal protection device (100) and a second connection element (222) associated with the second portion (102) of the personal protection device (100);

wherein said detachable connection device (22) is designed to assume an open configuration, in which the first connection element (221) is separated from the second connection element (222), and a closed configuration, in which the first connection element (221) is connected to the second connection element (222); wherein the open configuration corresponds to a first predefined spaced relationship of the first portion (101) of the personal protection device (100) with respect to the second portion (102) of the personal protection device (100);

wherein the closed configuration corresponds to a second predefined spaced relationship of the first portion (101) of the personal protection device (100) with respect to the second portion (102) of the personal protection device (100); and wherein the distance between the first portion (101) of the personal protection device (100) and the second portion (102) in the second spaced relationship is less than the distance between the first portion (101) of the personal protection device (100) and the second portion (102) in the first spaced relationship, and wherein in said personal protection device (100) one or

- each of said first portion (101) and said second portion (102) of the personal protection device (100) includes a corresponding inflatable element portion (12), wherein said connection means (20) are interposed between said first portion (101) and said second portion (102), and wherein a first position of said at least one inflatable element corresponds to said open configuration and a second position of said at least one inflatable element (12) corresponds to said closed configuration.
2. Personal protection device (100) according to claim 1, wherein said open configuration and said first position of said at least one inflatable element (12) correspond to and/or determine a first size of said personal protection device (100), and wherein said closed configuration and said second position of said at least one inflatable element (12) correspond to and/or determine a second size of said personal protection device (100).
 3. Personal protection device (100) according to claim 1 or 2, wherein the detachable connection device (22) comprises or consists of a zipper.
 4. Personal protection device (100) according to claim 1, 2 or 3, wherein said permanent connection structure (21) is designed to determine the distance between the first portion (101) of the personal protection device (100) and the second portion (102) of the personal protection device (100) in the open configuration of the detachable connection device (22).
 5. Personal protection device (100) according to any one of the preceding claims, wherein said permanent connection structure (21) is designed to form a bridge body between the first portion (101) of the personal protection device (100) and the second portion (102) of the personal protection device (100).
 6. Personal protection device (100) according to claim 5 when dependent on claim 3, said first connection element (221) of said zipper is associated with a start of said bridge body and said second connection element (222) of said zipper is associated with an end of said bridge body.
 7. Personal protection device (100) according to any one of the preceding claims, wherein said permanent connection structure (21) is made of flexible material.
 8. Personal protection device (100) according to the preceding claim, wherein said permanent connection structure (21) is a piece or panel of cloth or fabric.
 9. Personal protection device (100) according to the preceding claim, wherein said permanent connection structure (21) comprises elastic inserts or is made of elastic material.
 10. Personal protection device (100) according to any one of the preceding claims, wherein the personal protection device includes a cover lining (120) designed to cover a respective portion of the inflatable element (12), and wherein said permanent connection structure and said removable connection device are indirectly connected to the respective portion of the inflatable element via said cover lining (120).
 11. Personal protection device (100) according to any one of the preceding claims 1 to 9, wherein said permanent connection structure and said removable connection device are directly connected to the respective portion of the inflatable element.
 12. Personal protection device (100) according to any one of the preceding claims 10 or 11, wherein the inflatable element portions are designed to surround or enclose said at least one portion of a user's body both in an inflated condition and in a deflated condition.
 13. Personal protection device (100) according to any one of the preceding claims, wherein said personal protection device is designed to enclose an upper region of the body or torso of a user and wherein the first portion (101) of the personal protection device (100) is intended to cover a back region or chest region of a user, and wherein the second portion (102) of the personal protection device (100) is intended to cover a flank region of a user.
 14. Personal protection device (100) according to one of the preceding claims, comprising a third portion (103) of the personal protection device (100); and wherein said permanent connection structure (21) is a first permanent connection structure (21) and said detachable connection device (22) is a first detachable connection device; and wherein said connection means (20) include a second permanent connection structure (23) designed to connect the first portion (101) of the personal protection device (100) to the third portion (103) of the personal protection device (100); and wherein said second detachable connection device (24) in turn comprises a first connection element (241) associated with the first portion (101) of the personal protection device (100) and a second connection element (242) associated with the third portion (103) of the personal protection device (100); wherein said second detachable connection device (24) is designed to assume an open configuration in which the respective first connection element (241) is separated from the respective second connection element (242) and a closed configuration in which the respective first element connects

tion element (241) is connected to the respective second connection element (242);

wherein the open configuration corresponds to a first predefined spaced relationship of the first portion (101) of the personal protection device (100) with respect to the third portion (103) of the personal protection device (100);
 wherein the closed configuration corresponds to a second predefined spaced relationship of the first portion (101) of the personal protection device (100) with respect to the third portion (103) of the personal protection device (100);
 and wherein a distance between the first portion (101) of the personal protection device (100) and the third portion (103) in the second spaced relationship is less than a distance between the first portion (101) of the personal protection device (100) and the third portion (103) in the first spaced relationship.

15. Personal protection device (100) according to one of the preceding claims, wherein said detachable connection device (22) is superimposed on said permanent connection structure (21) at least in the closed configuration.
16. Personal protection device (100) according to one of the preceding claims, both in said open configuration and in said closed configuration said connection means (20) are not superimposed on said one or more portions of the inflatable element (12).
17. Garment including a personal protection device (100) according to any one of the preceding claims.
18. Method for modifying the size of a personal protection device according to one of the preceding claims 1 to 16, wherein the method involves:

- separating the first connection element (221) associated with the first portion (101) of the personal protection device (100) from the second connection element (222) associated with the second portion (102) of the personal protection device (100) so as to assume said open configuration and cause the first portion (101) of the personal protection device (100) to assume the first predefined spaced relationship with respect to the second portion (102) of the inflatable element so as to define a first size of the personal protection device;
- joining the first connection element (221) associated with the first portion (101) of the personal protection device (100) to the second connection element (222) associated with the second portion (102) of the personal protection device so as to assume said closed configura-

tion and cause the first portion (101) of the personal protection device (100) to assume the second predefined spaced relationship with respect to the second portion (102) of the personal protection device (100), wherein assuming the second spaced relationship decreases the size of the personal protection device (100).

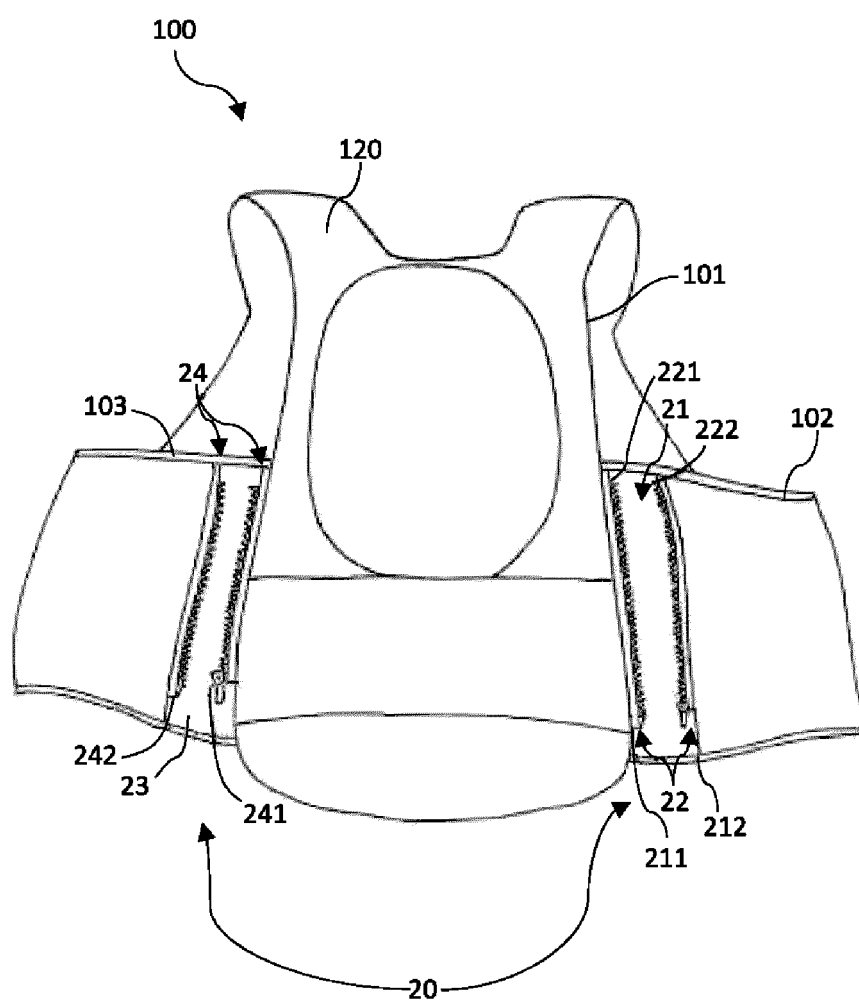


FIG. 1

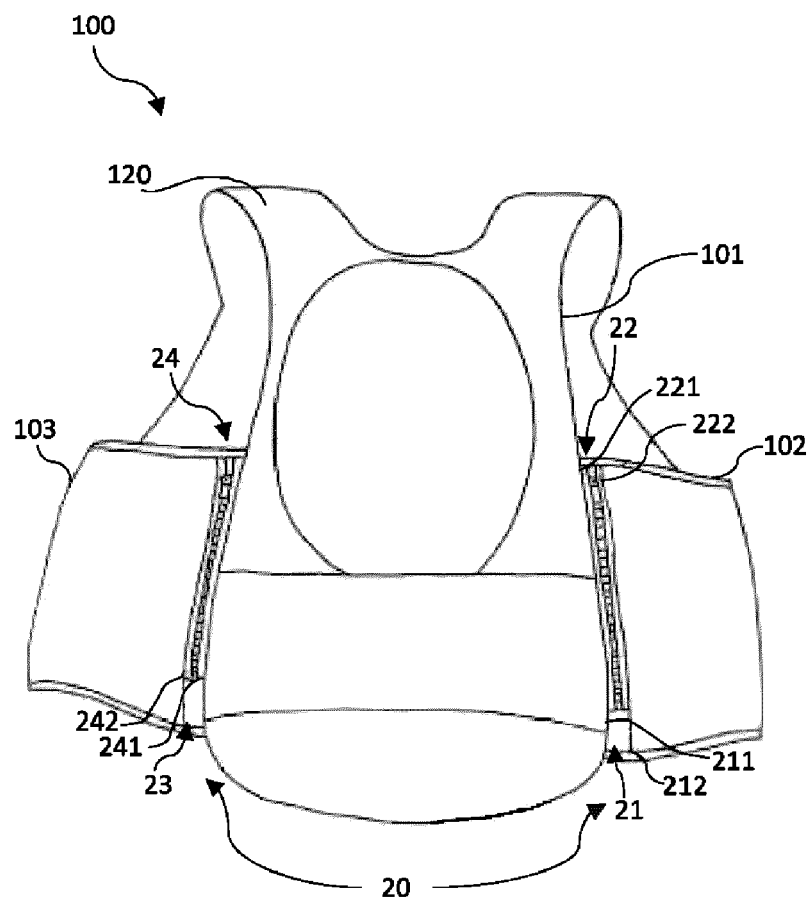


FIG. 2

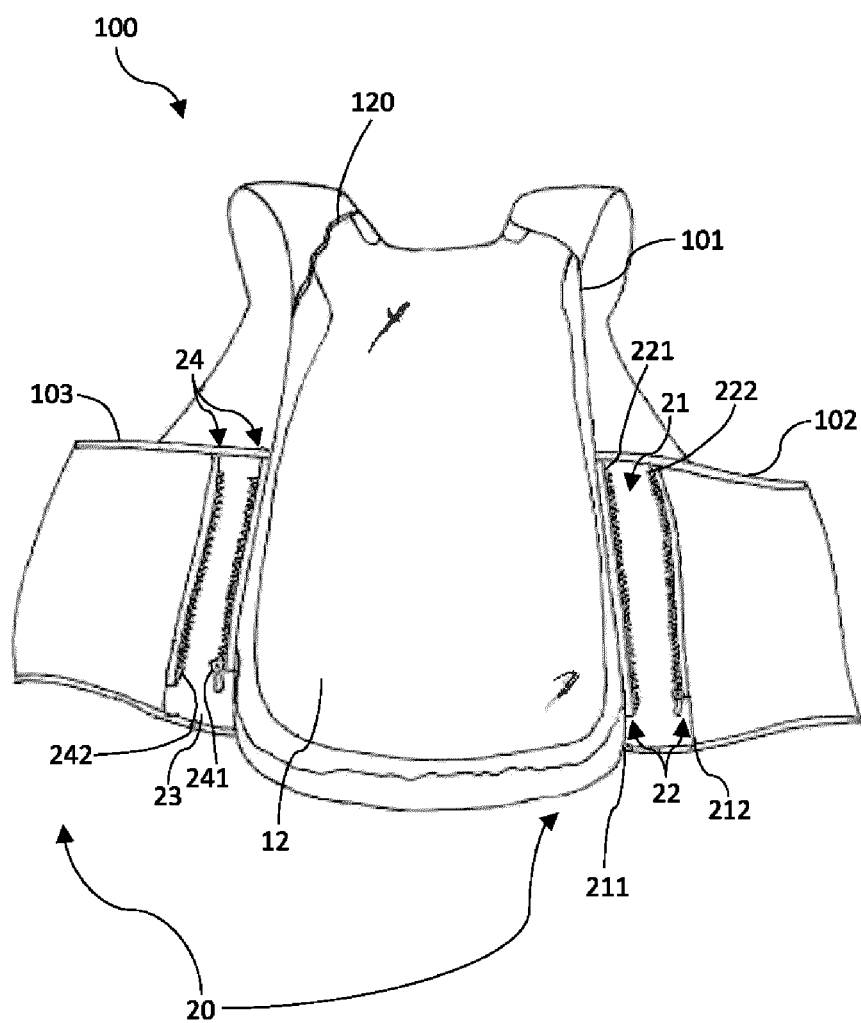


FIG. 3

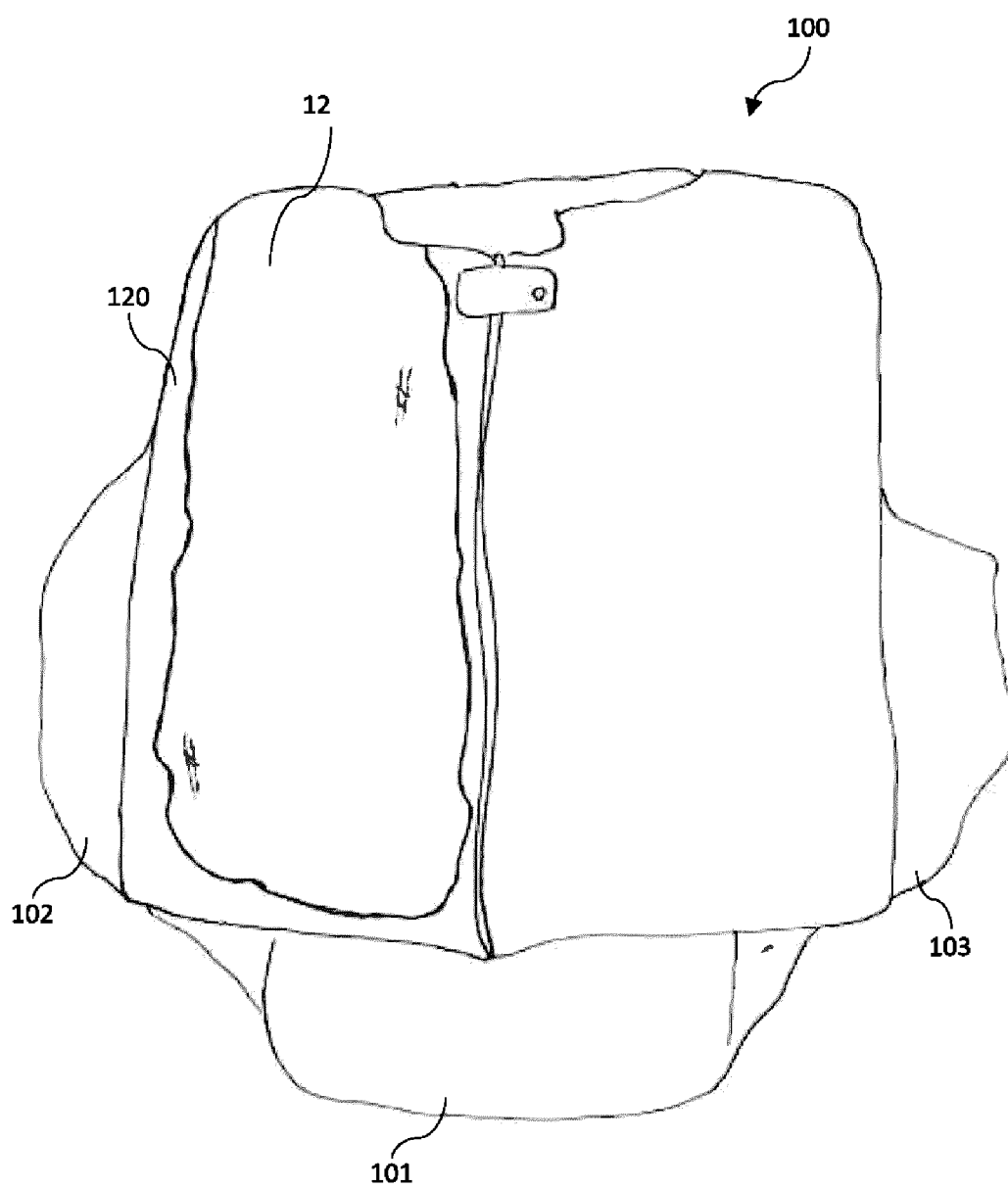


FIG. 4

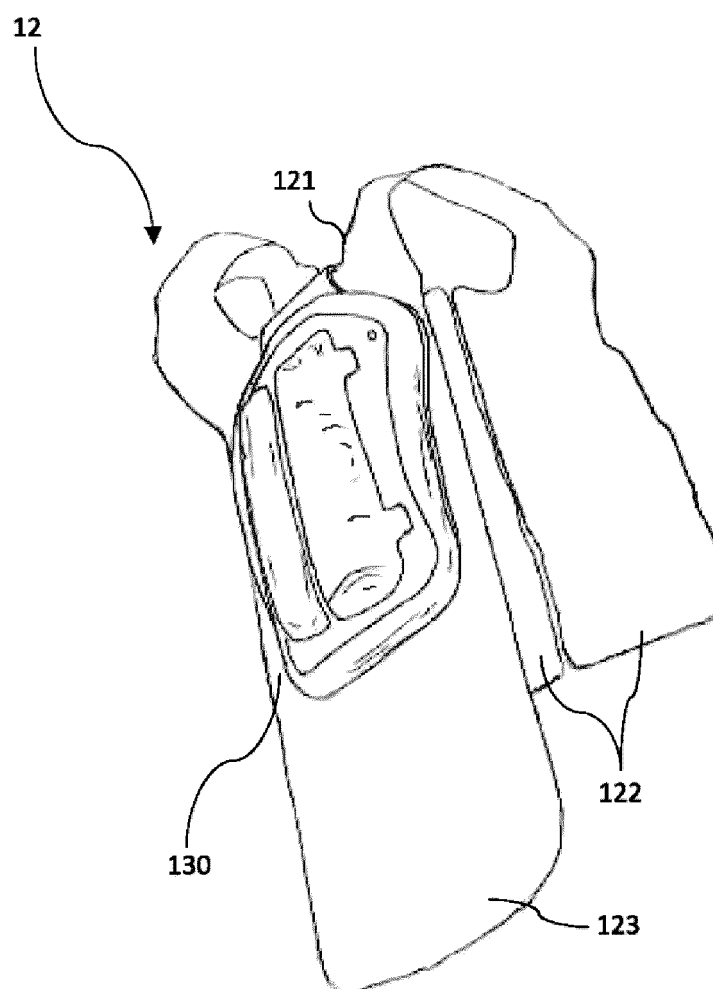


FIG. 5



EUROPEAN SEARCH REPORT

Application Number

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CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
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