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(54) INFLATION DEVICE

(57) The present disclosure relates to an inflating device (10) comprising an inflatable element (11) defining an internal chamber (11a) and a gas generator (12) housed inside the internal chamber of said inflatable element (11). The inflatable element (11) acts as container for the gas generator. The inflatable element has an outlet passage (13) for a gas released from said gas generator (12), said outlet passage (13) being configured to place in communication the internal chamber (11a) with an area external to the inflatable element (11). The inflating device (10) comprises a connection component (14) and a closure component (15, 26), wherein said connection component (14) is positioned in said outlet passage (13) and fixed to said inflatable element (11). The connection component (14) is designed to be connected with a connection counter-component (16) so as to define a connection device (17). The connection component (14) is configured to allow a flow of gas out of said gas generator and through said outlet passage (13). The closure component (15, 26) is designed to prevent at least momentarily, or mitigate, or reduce the passage of said gas flow out from said outlet passage (13). The present disclosure also relates to a personal protection device, a garment and a method of operation of the personal protection device.

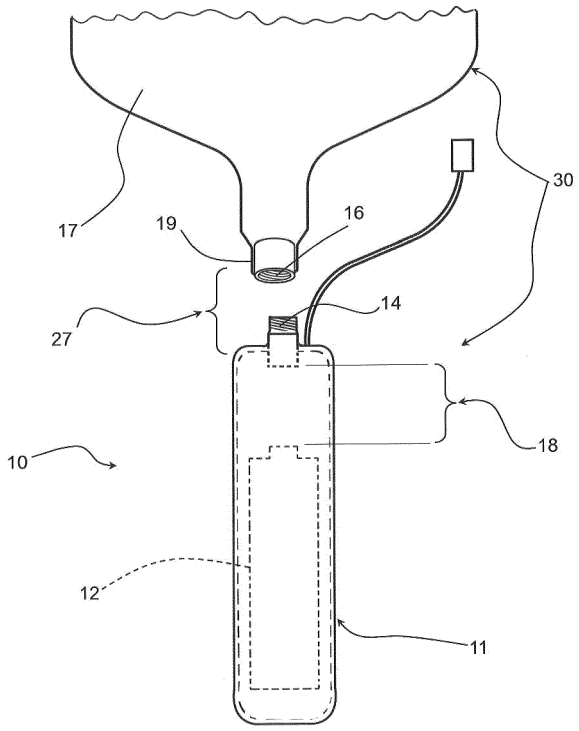

FIG. 1

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Description

[0001] The present invention relates generally to the sector of providing protection by means of an airbag, so as to protect a user from impacts due to falling or sliding, when travelling on a means of transport, such as a vehicle, preferably a two-wheeled vehicle, or any other means of transport, such as a horse or other animal, sports equipment, such as a pair of skis or a bobsleigh, or similar means of transport, or a user when performing any activity also without transport means.

[0002] More particularly, the present disclosure relates to an inflating device comprising a gas generator, for example an inflating device designed to be placed on the back, on the chest or on the flank of a user, namely in a zone of a user's body.

[0003] The present disclosure also relates to a personal protection device, including the aforementioned inflating device and an inflatable element for protecting a user in the event of falls and/or impacts of various types. The present disclosure also relates to a wearable article, or a garment, and to a method of operation of the aforementioned personal protection device.

[0004] In the sector of user protection it is known to use protection devices including an inflatable element, namely airbag, which are inflated, in the event of an impact, by an inflating device in fluid communication with the airbag itself.

[0005] Generally, this inflating device consists of a fluid source, such as a gas generator, in particular a cylindrical compressed-gas canister, which is fixed to the back portion of a protection device or a garment or arranged inside a back protector, or on a side of a wearable accessory or garment.

[0006] More precisely, the known inflating devices comprise a support structure formed by plates or other rigid mechanical components. The support structure is arranged generally along the user's spine region. In other cases the inflating devices are arranged in pockets of a garment. Said support structure or pocket is designed to support the gas generator(s) and is generally connected to a protection garment which includes the inflatable element.

[0007] The present disclosure is based on a recognition by the inventor of the present disclosure that the inflating devices such as those made available hitherto by the prior art, while being advantageous from many points of view, have not always been sufficient to ensure satisfactory mobility and comfort of a user during use, as well as easy removal and replacement.

[0008] More specifically, the inflating devices have been hitherto designed and arranged on protective garments so as to prevent them from being dangerous for the user in the event of falls, but without paying too much attention to ensuring the freedom of movement of the user and the user comfort in general.

[0009] In addition, the known inflating devices may not be easily removed from a protective garment by a user. This means that the user may not, autonomously, separate the inflating device from the protective garment in order to perform, for example, washing of the garment or replacement of the compressed-gas canister.

[0010] As a solution to these drawbacks, it is known from Italian patent application No. 102021000013706 in the name of the same proprietor of the present application, to incorporate the gas generator inside the said inflatable element; this technical solution, however, makes separation of the empty gas generator very difficult, in the case where the gas generator has been used to release the fluid contained inside it, from the inflatable element; this solution is such that, once the protection device has been used, it must be replaced entirely.

[0011] Also known are the patent documents WO2021089585A1 and WO2021089439A1 which consider technical problems associated respectively with control of the pressure inside an inflatable element connected to a gas generator and the risk of an incorrect connection between a gas generator and an inflatable element designed to inflate it.

[0012] The starting point of the present disclosure is therefore the technical problem of providing an inflating device for an inflatable element, which is able to satisfy all the aforementioned requirements with reference to the prior art and/or achieve further advantages.

[0013] In particular an object of the present disclosure is to provide an inflating device which is at the same time easy to remove and can be positioned anywhere on a wearable accessory or on a garment in a safe manner for a user.

[0014] More particularly, an object of the present disclosure is to provide an inflating device which is able to help directly protect the user without having to be inserted inside rigid or semi-rigid parts of an accessory or a garment.

[0015] This is obtained by means of an inflating device, a protection device, a wearable accessory or a protective garment, and a method of operation of the protection device, according to the respective independent claims.

[0016] Secondary characteristics forming the subject of the present disclosure are defined in the corresponding dependent claims.

[0017] In particular, in accordance with the present disclosure, in order to improve both the ease of replacement, the wearability and, where possible, also the possibility of providing a protective portion for the user, it is proposed to provide an inflating device comprising an inflatable element comprising internally a gas generator, wherein said inflatable element serves as a container for said gas generator, and wherein said inflatable element has an outlet passage for a gas released from the gas generator, the outlet passage being configured to place an internal chamber of the inflatable element in communication with an area external to the inflatable element; specifically, the inflating device comprises a connection component, positioned in said outlet passage of the inflatable element and designed to be connected to a connection counter-

component so as to define a connection device. The inflating device also comprises a closure component designed to prevent, at least momentarily, or mitigate, or reduce a passage of said gas flow through said outlet passage.

[0018] The inflatable element, which contains the gas generator, when it is in the rest condition, i.e. when it is a deflated and non-operative condition, improves the ergonomics of the inflating device overall and, since it is inside a flexible structure, allows the latter to adapt its shape essentially to any part of a user's body.

[0019] The connection component of the inflating device allows the inflating device to be reversibly connected to a further inflatable element defining an actual airbag of a protection accessory or garment.

[0020] The closure component, which may be understood in the broad sense as any closing system, ensures that the inflating device is entirely safe when manually handled during installation and enables the intact condition thereof to be easily inspected visually before use thereof.

[0021] In practical terms, in order to adapt the gas generator, which is often of the canister type, to the shape of the body, the gas generator is inserted in an inflatable element, the configuration of which, owing to its intrinsic flexibility, may be more easily adapted to the anatomy of the human body.

[0022] The inflatable element, when the gas generator is activated, is such that it also defines a body which inflates and is able to absorb knocks and impacts, in the same way as, and together with, a second flexible element which defines the actual main airbag. Namely the inflatable element may also be a protection element. Preferably, the inflatable element may withstand pressures of between 0.5 and 2 bar. The inflatable element may also be configured to withstand pressures of between 0.5 and 4 bar. As a result, the inflatable element may also be configured to withstand pressures of between 0.5 and 4 bar, preferably between 0.5 and 2 bar.

[0023] Furthermore, the inflating device, which comprises the inflatable element and the gas generator inside it, are handled together as a single body and removed from a personal protection device or a garment with which they are associated, so that the gas generator may be conveniently replaced without having to directly handle the airbag of the said protection device.

[0024] 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.

[0025] 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.

[0026] Reference will be made to the figures of the attached drawings in which:

- Figure 1 shows a schematic plan view of an inflating device according to the present disclosure;
- Figure 1A shows a cross-sectional plan view of the inflating device according to the invention shown in Figure 1;
- Figure 1B shows a cross-sectional view, along the line I-I of Figure 1A, of the inflating device according to the disclosure;
- Figure 2 shows a view of an inflating device according to the invention in a non-operating condition before use;
- Figure 3 shows a schematic plan view of a variation of embodiment of an inflating device according to the present disclosure;
- Figure 3A shows another variant of the inflating device according to Figure 3;
- Figure 3B shows a further variant of the inflating device according to the invention;
- Figure 3C shows an inflating device according to the invention with a particular auxiliary element;
- Figure 4 shows a schematic view of a detail of the inflating device according to the disclosure;
- Figure 5 shows a schematic view, from behind, of a garment including an inflating device according to the present disclosure;
- Figure 6 shows a schematic view, from behind, of a different embodiment of a garment including an inflating device according to the present disclosure;
- Figure 7 shows a schematic view, from the rear, of a further embodiment of a garment including an inflating device according to the present disclosure.

[0027] With reference to the attached figures, an embodiment of an inflating device according to the present disclosure is denoted overall by the reference number 10. Said inflating device 10 comprises:

- an inflatable element 11 defining an internal chamber 11a;
- a gas generator 12 which is housed, preferably freely and/or with play, inside the internal chamber 11a of the inflatable element 11;

wherein the inflatable element 11 serves as container for the gas generator 12.

[0028] Said inflatable element 11 has an outlet passage 13 for a gas released by said gas generator 12.

[0029] The outlet passage 13 is configured to place the internal chamber 11a in communication with an area external to the inflatable element 11.

[0030] The inflating device 10 comprises a connection component 14, which is clearly visible in Figures 1, 1B and 2.

[0031] The inflating device 10 comprises a closure component 15, 26 such as a cap 26.

[0032] The connection component 14 is positioned in said outlet passage 13 and is fixed to the inflatable element 11.

[0033] The connection component 14 is configured to allow the passage of a fluid, for example pressurised gas out from the gas generator 12, towards the outside of the inflatable element 11; preferably, the connection component 14 has a tubular or sleeve-like configuration.

[0034] The same connection component 4 is designed to be connected to a connection counter-component 16 so as to define a connection device 27.

[0035] The connection component 14 is configured to allow a flow of fluid or gas out of the gas generator and through the outlet passage 13.

[0036] The closure component 15, 26 is designed to close and/or prevent at least momentarily, or mitigate, or reduce a passage of said gas flow through the outlet passage 13.

[0037] The gas generator 12 consists, for example, of a canister-type gas generator; it is understood that said gas generator 12 may also be of another similar or technically equivalent type. For example, the canister-type gas generator 12 may be a canister containing compressed cold gas, such as helium. The canister may be provided with a respective shut-off valve (not shown). Alternatively, the inflation fluid source may comprise gas generators preferably of the pyrotechnic or hybrid type or other types known in the prior art. Also the type of gas or fluid for inflation may be understood in the broadest sense as any fluid known to a person skilled in the art.

[0038] The connection component 14 is a reversible connection component, namely a connection component which may be either joined to or separated from a corresponding counter-component, in the present disclosure the counter-component 16.

[0039] The reversibility of the connection between the connection component 14 and the connection counter-component 16 allows the entire inflating device 14 to be separated from the connection counter-component 16 for the replacement, where required, of the said inflating device in the case where it has been activated.

[0040] The inflating device 10 is therefore a disposable spare part and may be easily manually replaced by a user.

[0041] The connection component 14 is a connection component which is sealingly fixed to said inflatable element 11 so that the gas exiting the gas generator 12 is efficiently conveyed through the said connection component 14 towards the outside of the inflatable element 11.

[0042] The inflatable element 11 may be, for all intents and purposes, a bag suitable for protecting a user and able to withstand at least pressures of between 0.5 bar and 2 bar, preferably also pressures of between 0.5 bar and 4 bar.

[0043] The closure component 15 is preferably an element which is designed to constrict or close by means of hooping said inflatable element 11 in a closing area 18 of said inflatable element 11, situated between said connection component 14 and said gas generator 12; by way of example, the closing area 18 is shown in Figure 1. However, it is possible to imagine other closure components 15 with a safety function which prevent at least momentary release of gas in the event of activation of the gas generator or which in some way may prevent the explosion effect resulting from sudden activation. For example, the closure component may be a cap 26 for closing off the outlet hole of the connection component 14 or 214 of the inflatable element 11. The cap 26 may also be provided in the absence of a closure component 15 of another type, namely the cap 26 may be the only closure component provided in the inflating device 10.

[0044] Consequently, the fold resulting from the presence of the closure element may be absent.

[0045] In particular, as clearly shown in Figure 1A, the internal chamber 11a has a first region 20 which acts as a housing for said gas generator 12 and a second region 21 free from said gas generator 12 and comprised between the connection component 14 and the gas generator 12.

[0046] The second region 21 of the internal chamber 11a places in communication the first region 20 and the outlet passage 13 which is in turn occupied by the connection component 14,

[0047] The closure component 15 is preferably arranged between said connection component 14 and said gas generator 12 so as to close the second region 21.

[0048] The closure of the second region 21 is such as to cause the obstruction of the closure zone 15 in order to prevent or mitigate, namely reduce, the undesirable passage of gas outside the inflatable element 11. Thus the system prevents or at least limits any release of gas coming into direct contact with the user.

[0049] In a variation of embodiment of the present disclosure, shown by way of example in Figure 2, the inflatable element 11 is folded in the closure zone 18 so that at least two portions of the inflatable element are superimposed on each other.

[0050] The first region 20 is defined by a containment portion, or internal chamber, 11a inside which said gas generator 12 is housed; said first region 20 extends into a discharge portion 11b comprising said outlet passage 13 and into an intermediate portion 11c, situated between said containment portion 11a and said discharge portion 11b.

[0051] Said intermediate portion 11c defines at least partly the second region 21.

[0052] The intermediate portion 11c is occupied neither by said gas generator 12 nor by said first tubular connection element 14.

[0053] In a non-operating condition, shown by way of example in Figure 2, the intermediate portion 11c is folded so that the discharge portion 11b is superimposed on and adjacent to said containment portion 11a.

[0054] The intermediate portion 11c, when folded, is surrounded by a constriction element which acts as a closure component 15, positioned, configured and tightened so as to prevent the unwanted passage of gas out from said gas generator 12 towards the outlet passage 13.

[0055] By way of example, the closure component 15 is formed by an elastic ring or, alternatively, by an annular body, having a shape and size and made of materials such as to perform an equivalent function. Said closure component 15 is positioned so as to surround the discharge portion 11b and the containment portion 11a in the part onto which the discharge portion 11b is folded.

[0056] In a variation of embodiment of the invention, not shown for simpler illustration, the closure component 15 is formed by a membrane with a predefined yielding action which is positioned so as to obstruct the second region 21, namely the intermediate portion 11c, or so as to obstruct the discharge portion 11b.

[0057] The flexible element 11 is formed by, or comprises, for example, two multi-layer sheets 50 and 51, consisting of an outer layer made of fabric and an impermeable inner layer.

[0058] The two multi-layer sheets 50 and 51 are joined together so that said internal chamber, or a first region 20, said discharge portion 11b, said second region 21 and said intermediate portion 11c are defined between them.

[0059] The two multi-layer sheets 50 and 51 may be joined together by means of heat-welding or stitching or by means of a combination of the two fixing systems.

[0060] Figure 3 shows a further variation of embodiment of the invention, where the inflatable element is indicated by the number 111. In said further variation of embodiment, at least the first region 120 has a shape with recesses 124 designed to keep the gas generator 12 in a predefined operating condition; the more precise the position of the gas generator 12 inside the inflatable element 111, the more efficiently the gas is directed from the gas generator 12 towards the outlet passage 13.

[0061] Preferably, as schematically shown in Figure 4, the inflating device 10 according to the disclosure, comprises a heating component 25 placed in contact with said inflatable element 11 and 111 and configured to burn locally the inflatable element 11 and 111 and cause puncturing of the said inflatable element 11 and 111; the hole caused by the heating component 25 allows the gradual calibrated outflow of the gas.

[0062] Said heating component 25 is preferably a resistive component preferably in a circular configuration.

[0063] The heating device 10 comprises a control unit 28 which is connected to said heating component 25 so as to command initial heating of said heating component 25.

[0064] Said control unit 28 is connected to the gas generator 12 so as to cause also activation of said gas generator 12, in a manner known per se. In particular, the inflation device may be connected by means of cables to a control unit (not shown in the drawings) which allows activation of the inflation to be controlled. In particular, the control unit 28 may be programmed to activate the heating component with a delay with respect to inflation. For example, a time period may be envisaged, following activation of the gas generator, within which the heating component (for example the electric resistance) is activated, and which may be adjusted in a predefined manner (e.g. with activation immediately afterwards, or after 2, 5 or 10 seconds, as required).

[0065] The present disclosure also relates to a personal protection device 30 for the personal protection of a user, comprising an inflating device 10, as described above.

[0066] The personal protection device 30 is configured so that the inflatable element 11 also has the function of a protective element for the body of a user. In other words, the inflating device 10 forms part of a personal protection device 30 which also comprises other elements. The personal protection device 30 is preferably a wearable device, namely a device which is configured to be worn.

[0067] In particular, but not exclusively, the inflatable element 11 is a first inflatable element, and the personal protection device 30 includes a second inflatable element 17, wherein the second inflatable element 17 has an inlet passage 19 and wherein the personal protection device 30 comprises said connection counter-component 16, which is fixed to the second inflatable element 17 and is positioned in the inlet passage 19.

[0068] The second inflatable element 17 is to be understood as being the main airbag of the personal protection device 30, while the first inflatable element 11 and 111 defines an auxiliary airbag which is formed around the gas generator 12 and which inflates protecting the user from any knocks and bruising against it in the event of a fall or other accident.

[0069] Essentially, the inflatable element 11 and the second inflatable element 17 are connected by means of a connection device 27 which is a reversible connection device; said reversible connection device 27 comprises said connection component 14 and said connection counter-component 16.

[0070] By way of example, the connection component 14 comprises an externally threaded screwing collar, while said connection counter-component 16 comprises an internally counter-threaded sleeve which is configured for reversible screwing to the connection component 14.

[0071] Figure 3A shows a variation of embodiment of the disclosure, in which the connection counter-component 216 comprises an externally threaded screwing collar, while said connection component 214 comprises an internally counter-threaded sleeve which is configured for reversible screwing to the connection counter-component 216; the reversible connection device is indicated therein by means of the number 227.

[0072] Figure 3B shows the variation of embodiment of Figures 1 to 3.

[0073] Generally, the disclosure is to be understood as relating to all the variants of the reversible connection device 27 and 227, in which the connection component and connection counter-component are of the male-female type, irrespective as to whether one is fixed to the first inflatable element 11 and the other one is fixed to the second inflatable element 17, or vice versa.

[0074] Figure 3C shows an inflating device 10 according to the present disclosure which comprises, as closure component, in addition to or instead of the closure component 15 described above, also a cap 26 for sealing off the outlet hole of the connection component 14 or 214 of the inflatable element 11.

[0075] In the case where the cap 26 is present, in order to perform replacement of the inflating device 10, the user must perform the following operations:

- unscrew the cap 26 of a new inflating device 10, while keeping the closure component 15, for example an elastic ring, in position;
- screwing the new inflating device 10 to the second inflatable element 17, namely to the main airbag;
- once the new inflating device 10 has been joined together with the second inflatable element 17, removing the closure component 15.

[0076] Owing to the cap 26 and the closure component 15, manual handling of the gas generator 12 is exceptionally safe during all stages of its installation.

[0077] The cap 26 in fact serves, in addition to or instead of the closure component, as an additional or sole safety element, for preventing the outflow of the gas flow in the event of accidental activation, but also serves to protect the inflatable element 11, preventing the accidental infiltration therein of undesirable material, namely the entry of debris, dust, fragments and the like which could alter, at the moment of activation of the inflating device, the operation and/or intact condition of the said inflatable element 11.

[0078] It is however to be understood that the inflating device 11, 111 may include only the cap 26 as closure component. In other words, the closure component 15 in the form of a membrane or annular body may not be provided in the inflating device and the passage of a gas out of the gas generator 12 towards the outlet passage 13 may be prevented only by the cap 26. The cap 26 may be configured for example to close off the outlet hole of the connection component 14 or 214 of the inflatable element 11.

[0079] The electronic unit 28 is configured so that, following possible activation of the gas generator 12, the heating component 25 is also activated, such that, once full optimum inflation of the second inflatable element 17 and the first inflatable element 11 has been completed, said first inflatable element 11 is perforated by the action of the heating component 25 and consequently the gas flows out in a controlled manner from this hole in the first inflatable element 11, so as to reduce as far as possible the incidence of an article of clothing, in terms of its volume, and prevent any harm due to the prolonged pressure against the body, etc., once it has performed its impact protection function; the solution of deflating the bag after a predefined period of time may therefore, for example, also facilitate any operations for recovery or assistance of a user following a fall.

[0080] In any case, the action of the heating component 25 prevents the user from being exposed, in some cases in a prolonged manner, to the pressure exerted by the inflatable element against the body of the user.

[0081] With regard to inflation, 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 is designed to cooperate with special activation means (normally consisting of the aforementioned control unit and sensors) which are for example operationally connected to the canister-shaped gas generator 2.

[0082] It should also be noted that the activation modes, although being an aspect of particular importance for efficient 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.

[0083] The present disclosure also relates to a wearable accessory or garment 40, which is schematically shown by way of example in Figure 5.

[0084] Said wearable accessory 40 comprises a personal protection device 30 as described above. In other words, the personal protection device 30 may form part of a wearable accessory 40 or garment.

[0085] In Figure 5 the garment 40 has a personal protection device 30, the second inflatable element 17 of which is configured so as to act on at least part of the central zone of the back down to the shoulders. In this case, the inflating device 10, 110 is connected underneath the second inflatable element 17 with the gas generator 12 positioned in a substantially horizontal position with respect to the normally erect position of a user wearing the garment 40.

[0086] In Figure 6 a garment 340, according to a variation of embodiment of the invention, has a personal protection device 330, the second inflatable element 317 of which is configured so as to act on at least part of the central zone of the back down to the shoulders. In this case, the personal protection device 330 comprises two opposite inflating devices 10, 110, one of which is connected to the right and the other to the left of the second inflatable element 317, with the respective gas generators 12 positioned in a substantially vertical manner with respect to a normally erect position of a user wearing the garment 340.

[0087] In Figure 7 a garment 440, according to a further variation of embodiment of the invention, has a personal protection device 430, the second inflatable element 417 of which has a "waistcoat" configuration so as to act on at least part of the front zone of the chest cavity up to the shoulders. In this case, the personal protection device 430 comprises two opposite inflating devices 10, 110, one of which is connected to the right and the other to the left of the second inflatable element 317, with the respective gas generators 12 positioned in a substantially horizontal manner with respect to a normally erect position of a user wearing the garment 340.

[0088] It is to be understood that the combinations of

forms and relative positions of the first inflatable element and the second inflatable element may also be different, depending on the specific needs and technical requirements of use.

[0089] The present disclosure also relates to a method of operation of a personal protection device 30 as described above.

[0090] According to this method of operation, when the gas generator 12 of the personal protection device 30 is empty, the connection component 14 is separated from the connection counter-component 16 and the entire inflating device 10 is removed from the second inflatable element 17, the second inflatable element 17 remaining mounted on a wearable accessory or garment 40 in which said second inflatable element 17 is incorporated.

[0091] When the gas generator 12 is activated, said heating component 25 is activated so as to cause the controlled puncturing of the inflatable element 11, inside which the gas generator 12 is housed, and the gradual deflation of the said inflatable element 11 and the second inflatable element 17 connected thereto by means of the reversible connection device 27.

[0092] Following removal of the empty inflating device 10 from the second inflatable element 17, a new inflating device 10 is connected to said second inflatable element 17 such that the protection device 30 is again operative and ready for use.

[0093] The subject-matter of the present disclosure has been described hitherto with reference to its embodiments. It is to be understood that other embodiments relating to the same inventive idea may exist, all of these falling within the scope of protection of the claims which are attached below.

Claims

1. Inflating device (10), comprising:

- an inflatable element (11) defining an internal chamber (11a);
- a gas generator (12) housed in the internal chamber of said inflatable element (11);

wherein said inflatable element (11) serves as a container for said gas generator, and wherein said inflatable element has an outlet passage (13) for a gas released from said gas generator (12), said outlet passage (13) being configured to place the internal chamber (11a) in communication with an area external to the inflatable element (11),
and wherein the inflating device (10) comprises a connection component (14) and a closure component (15, 26), wherein said connection component (14) is positioned in said outlet passage (13) and fixed to said inflatable element (11), said connection component (14) being able to be connected with a connection counter-component (16) so as to define a connection device (17),
and wherein the connection component (14) is configured to allow a flow of a gas out of said gas generator and through said outlet passage (13) and wherein said closure component (15, 26) is designed to prevent at least momentarily, or mitigate, or reduce a passage of said gas flow from said outlet passage (13).

2. Inflating device (10) according to claim 1, wherein said connection component (14) is a reversible connection component.

3. Inflating device (10) according to claim 1 or 2, wherein said connection component (14) is sealingly fixed to said inflatable element (11).

4. Inflating device (10) according to one or more of the preceding claims, wherein said inflatable element (11) is suitable for withstanding pressures of at least between 0.5 bar and 2 bar.

5. Inflating device (10) according to one or more of the preceding claims, wherein said closure component (15) is an element adapted to constrict or close by means of hooping said inflatable element (11) in a closure area (18) of said inflatable element (11), situated between said connection component (14) and said gas generator (12).

6. Inflating device (10) according to one or more of the preceding claims, wherein said internal chamber has a first region (20) which acts as a housing for said gas generator (12) and a second region (21) free from said gas generator (12) and comprised between said connection component (14) and said gas generator (12).

7. Inflating device (10) according to claims 5 and 6, wherein said closure component is interposed between said connection component (14) and said gas generator (12) so as to close said second region (21).

8. Inflating device (10) according to claims 5 or 6, wherein said inflatable element (11) is folded in said closure area (18) so as to have at least two inflatable element portions superimposed on each other.

9. Inflating device (10) according to one or more of the preceding claims, wherein at least said first region (120) has a shape with recesses (124) suitable for retaining said gas generator (12) in a predefined operating condition.

10. Inflating device (10) according to one or more of the

preceding claims in combination with claim 6, wherein said first region (20) is defined by a containment portion (11a) in which said gas generator (12) is housed, and said first region (20) extends into a discharge portion (11b) comprising said outlet passage (13) and into an intermediate portion (11c), situated between said containment portion (11a) and said discharge portion (11b), said intermediate portion defining at least in part said second region (21), said intermediate portion (11c) being occupied neither by said gas generator (12) nor by said first tubular connection element (14),
wherein, when not in use, said intermediate portion (11c) is folded so that said discharge portion (11b) is superposed on and adjacent to said containment portion (11a), said folded intermediate portion (11c) being surrounded by a constriction element (15) which acts as a closure component, which is positioned, configured and tightened in such a way as to prevent the unwanted passage of a gas out from said canister gas generator (12) towards said outlet passage (13).

11. Inflating device (10) according to claim 10, comprising a heating component (25) placed in contact with said inflatable element (11) and configured to locally burn said inflatable element (11) and cause puncturing of said inflatable element.

12. Inflating device (10) according to claim 11, wherein said heating component (25) is a resistive component, preferably in a circular configuration.

13. Inflating device (10) according to claim 12 comprising, or in combination with, a control unit (28), wherein said control unit (28) is connected to said heating component (25) so as to command initial heating of said heating component (25).

14. Inflating device (10) according to claim 13, wherein said control unit (28) is connected to said gas generator (12) so as to command activation of said gas generator (12).

15. Personal protection device (30) for the personal protection of a user, comprising an inflating device (10) according to one or more of the preceding claims.

16. Personal protection device (30) according to the preceding claim, wherein said inflatable element (11) also has the function of a protective element for a user's body.

17. Personal protection device (30) according to claim 15 or 16, wherein said inflatable element (11) is a first inflatable element and said personal protection device includes a second inflatable element (17), wherein said second inflatable element (17) has an inlet passage (19) and wherein said personal protection device (30) comprises said connection counter-component (16) fixed to said second inflatable element and positioned in said inlet passage.

18. Personal protection device (30) according to one or more of claims 15 to 17, wherein said inflatable element (11) and said second inflatable element (17) are connected by means of a reversible-type connection device (27), said connection device (27) comprising said connection component (14) and said connection counter-component (16).

19. Personal protection device (30) according to one or more of claims 15 to 18, wherein said connection component (14) comprises an externally threaded screw collar, while said connection counter-component (16) comprises an internally counter-threaded sleeve configured for reversible screwing to said connection component (14).

20. Wearable accessory or garment (40) comprising a personal protection device (30) according to any of the preceding claims 15 to 19.

21. Method of operation of a personal protection device according to one or more of claims 15 to 19, wherein, when said gas generator (12) of said personal protection device (30) is empty, separation of said connection component (14) from said connection counter-component (16) is performed and said entire inflating device (10) is removed from said second inflatable element (17).

22. Method of operation according to the preceding claim, wherein when said entire inflating device (10) is removed from said second inflatable element (17), the second inflatable element (17) remains mounted on a wearable accessory or garment (30) in which said second inflatable element (17) is included.

23. Method of operation according to claim 21 or 22, wherein, when said gas generator (12) is activated, said heating component (25) is activated so as to cause the controlled puncturing of said inflatable element (11), inside which said gas generator (12) is housed, and the gradual deflation of said inflatable element itself (11) and of said second inflatable element (17).

24. Method of operation according to claim 21, 22 or 23, wherein, after the removal of said empty inflating device (10) from said second inflatable element (17), a new inflating device (10) is connected to said second inflatable element (17).

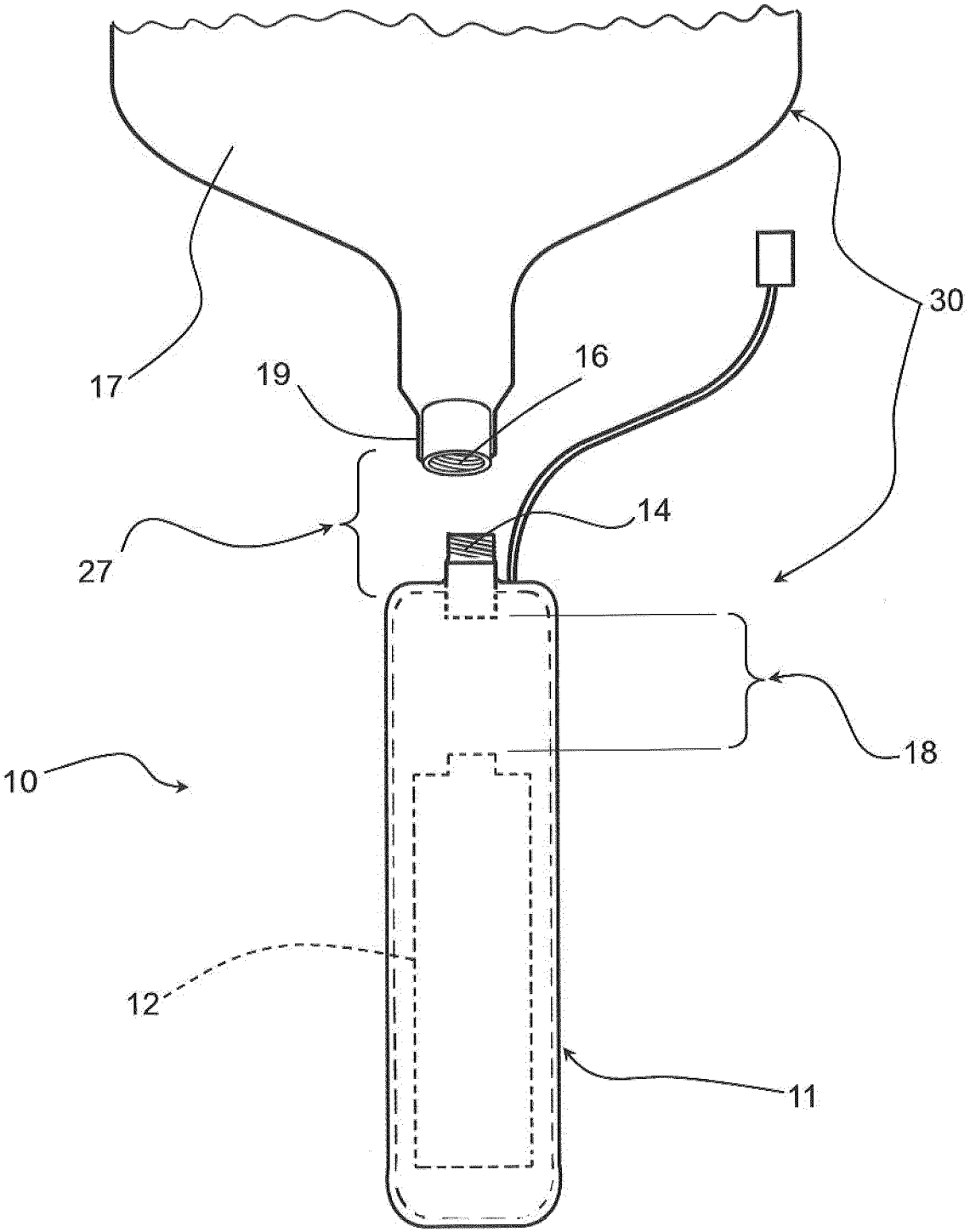

FIG. 1

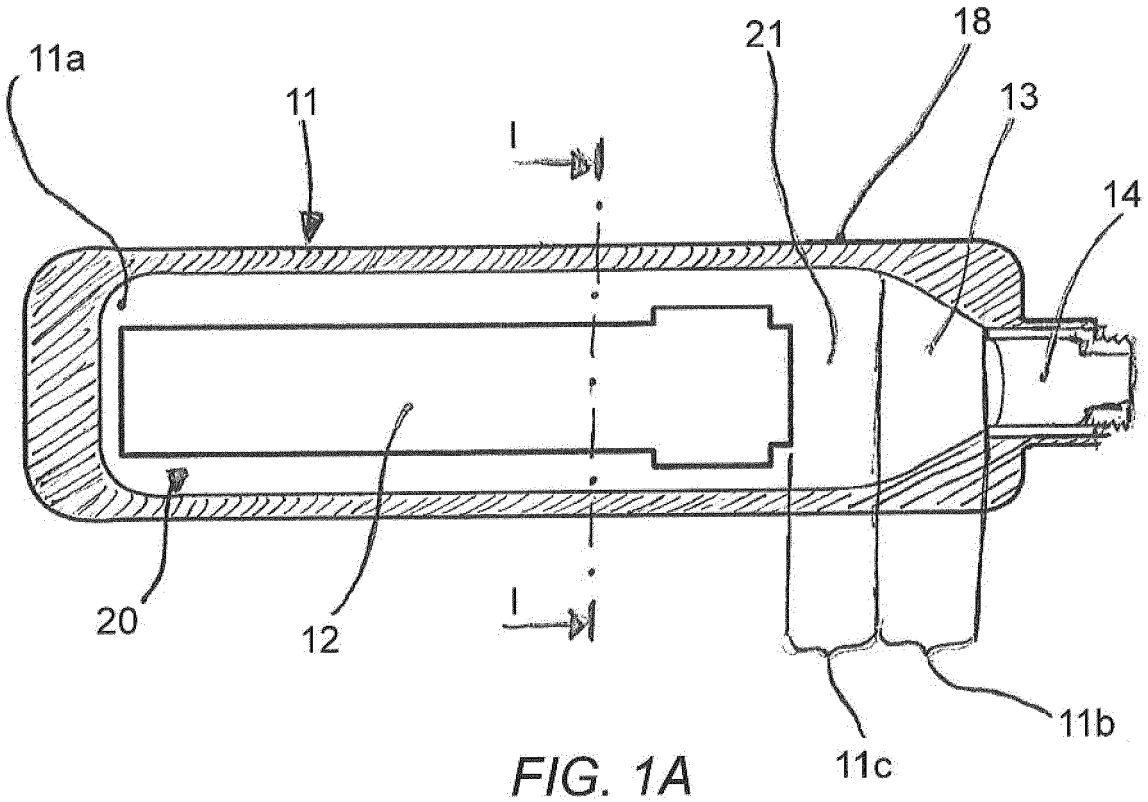

FIG. 1A

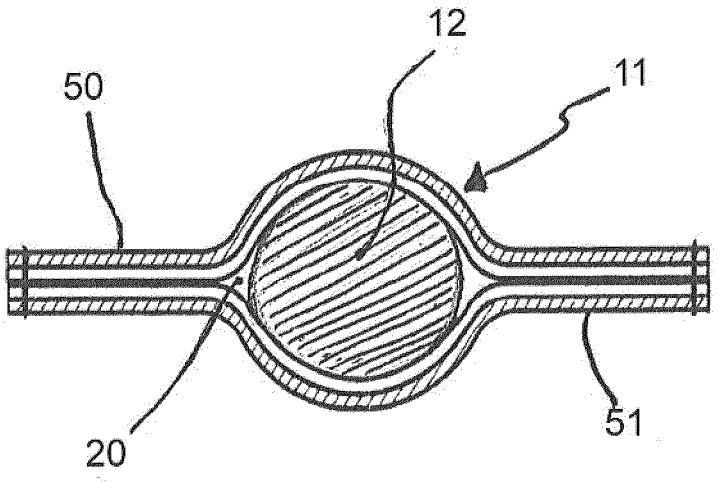

FIG. 1B

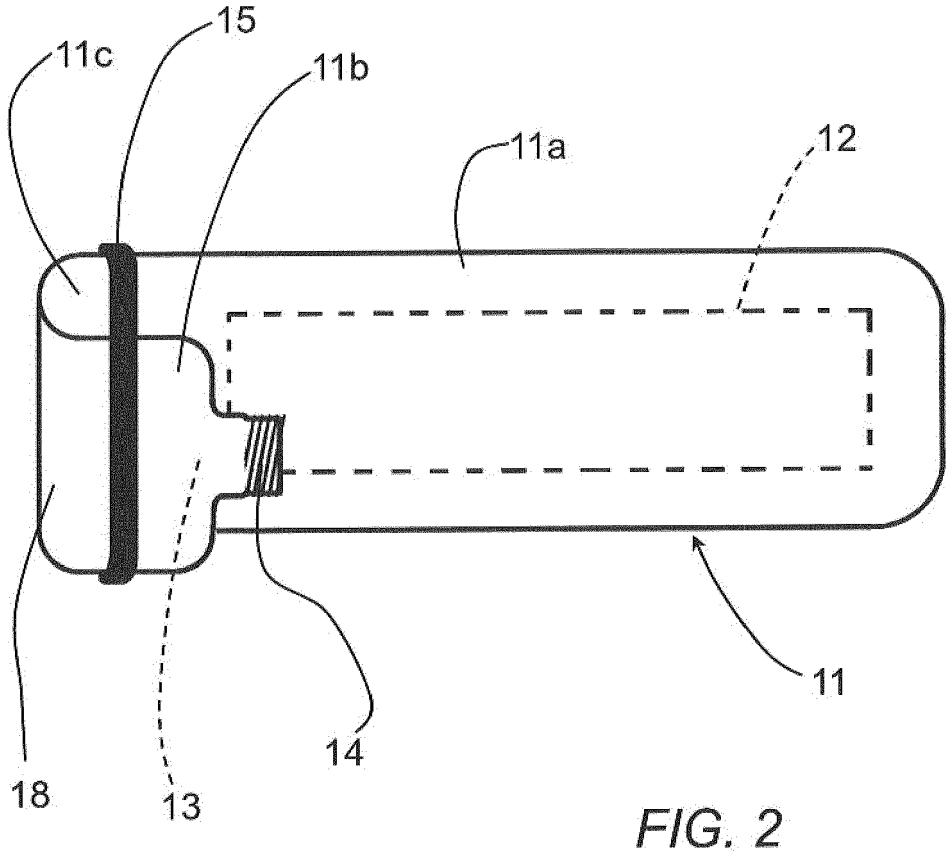

FIG. 2

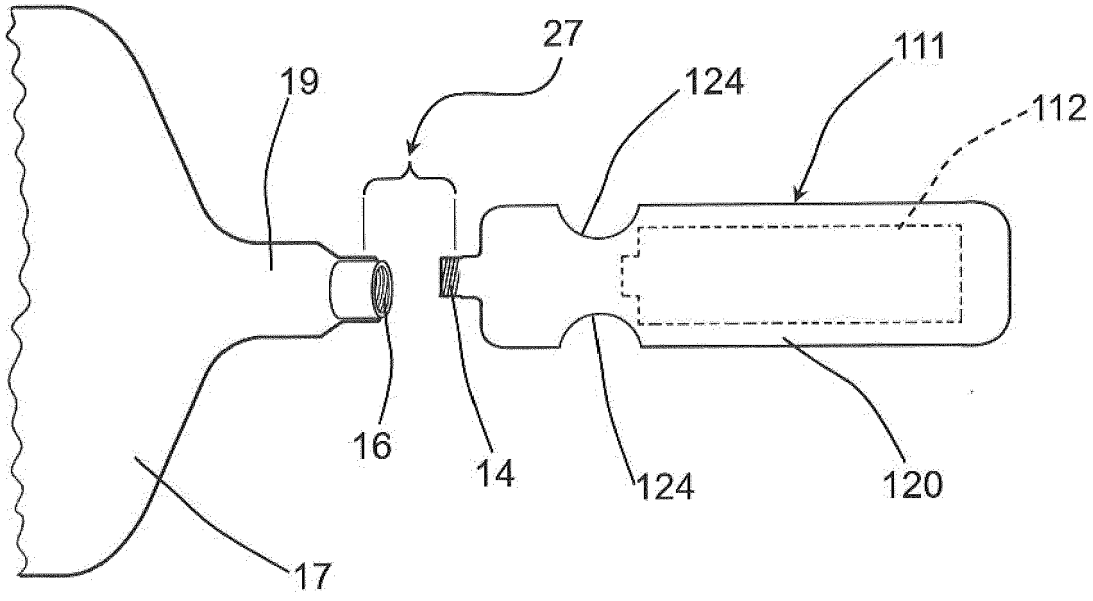

FIG. 3

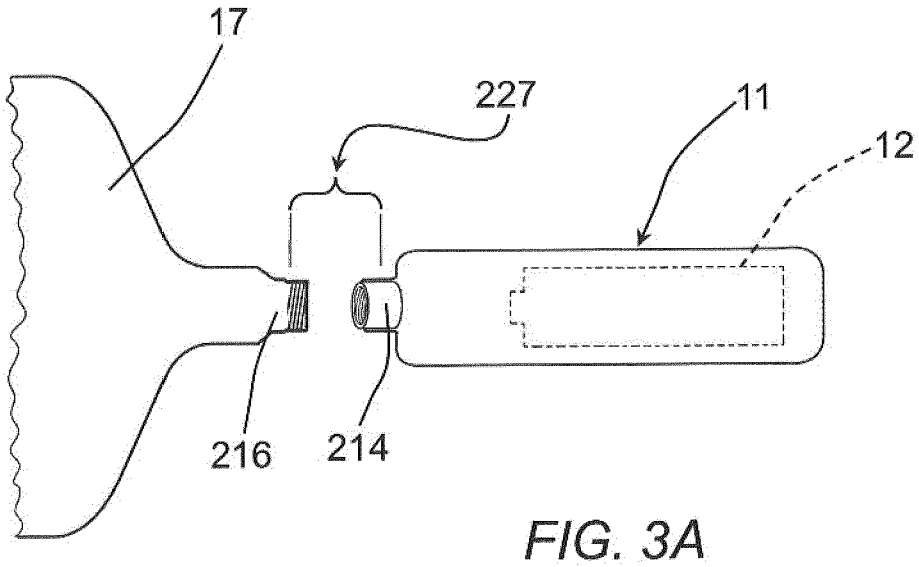

FIG. 3A

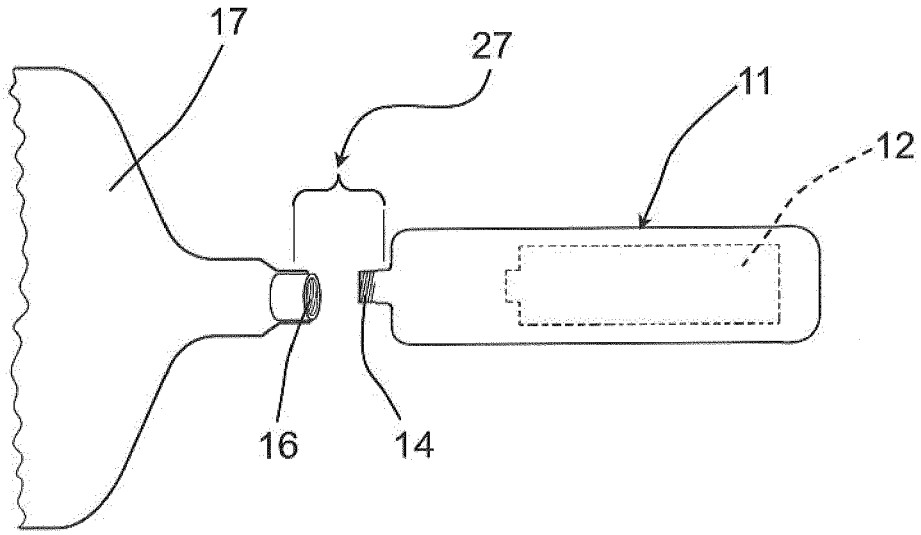

FIG. 3B

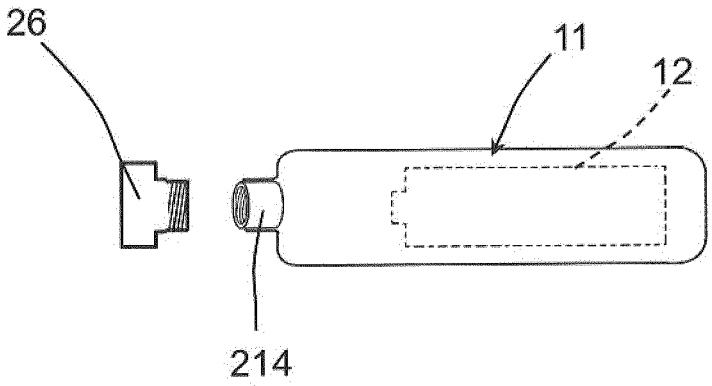

FIG. 3C

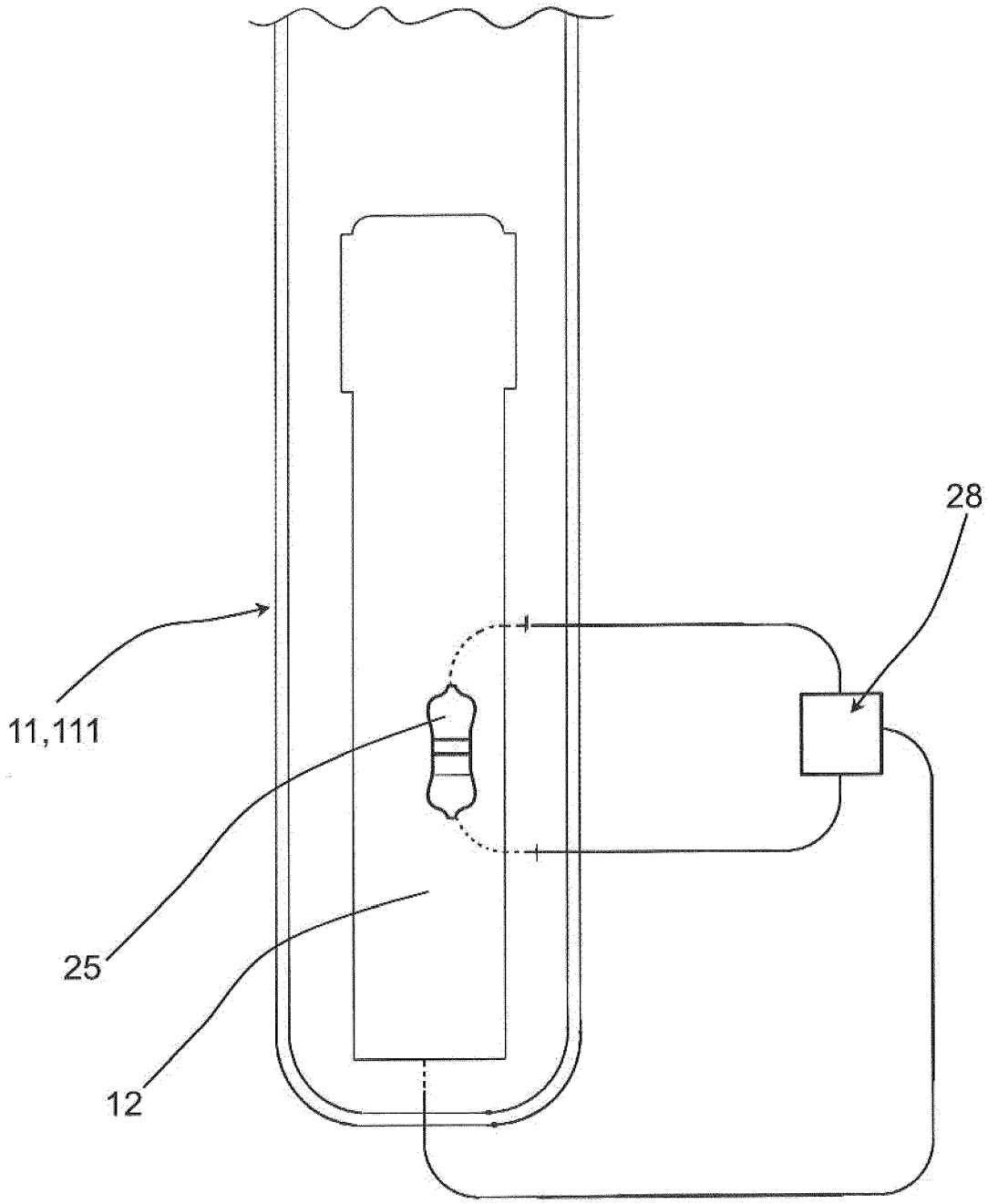

FIG. 4

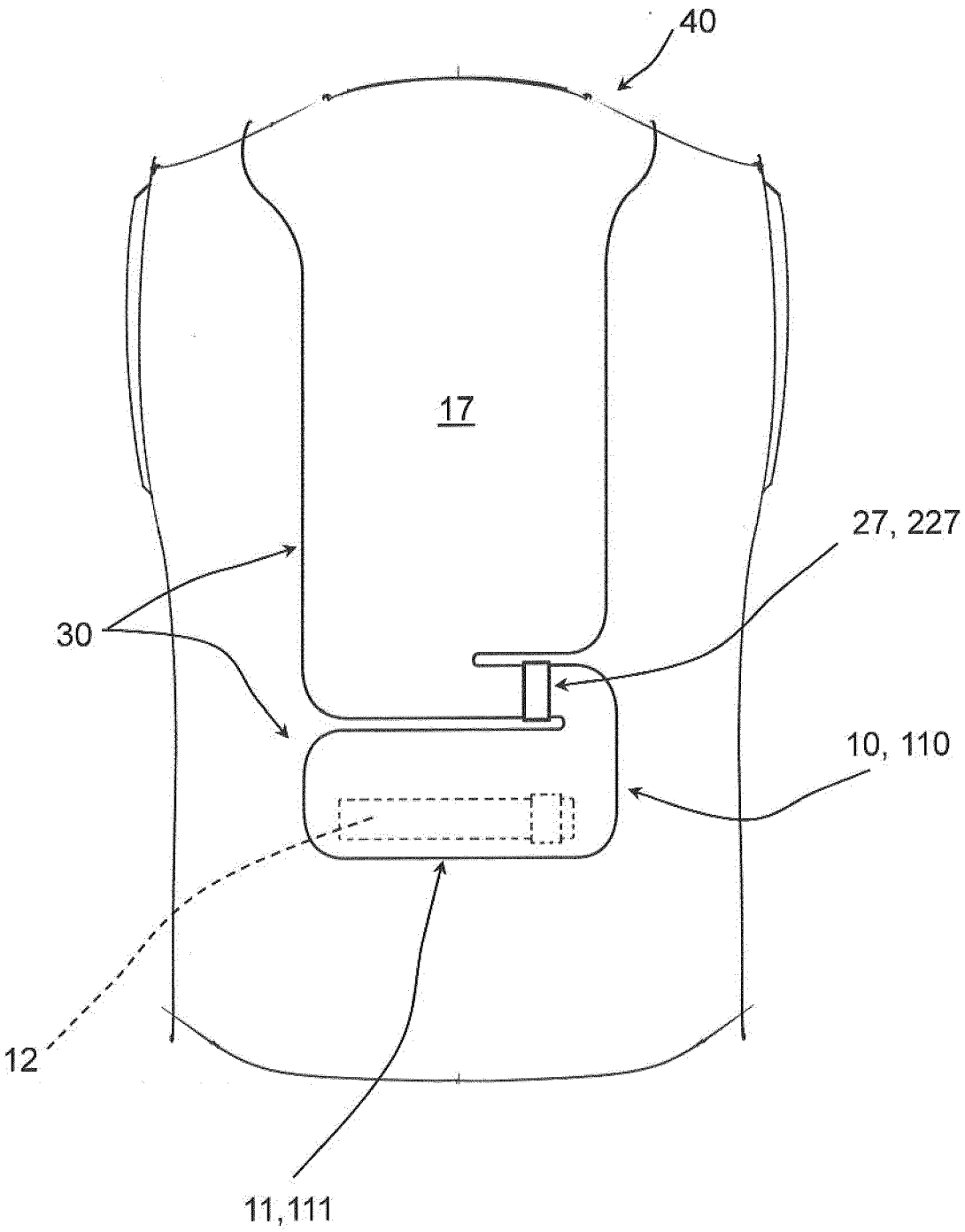

FIG. 5

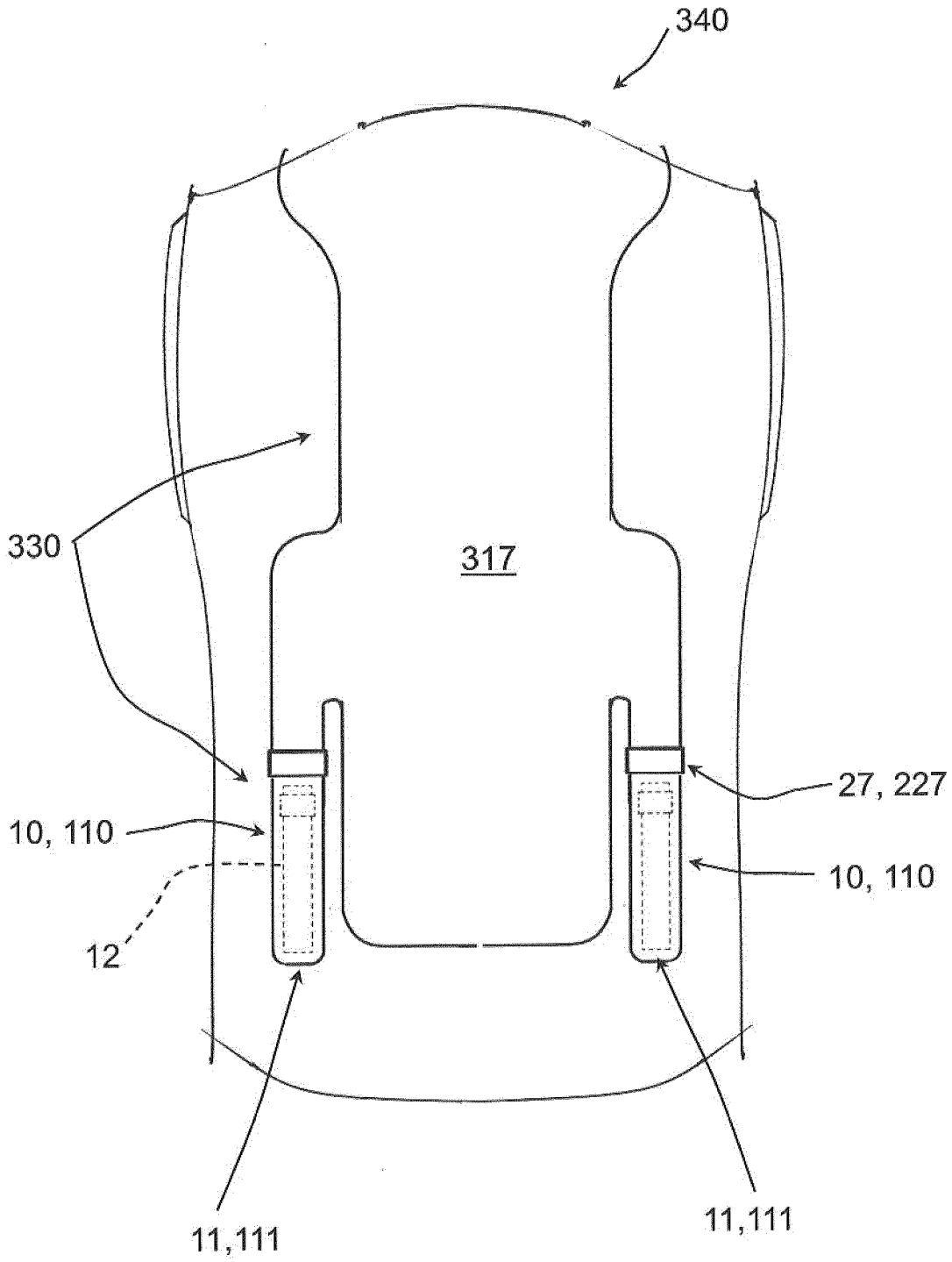

FIG. 6

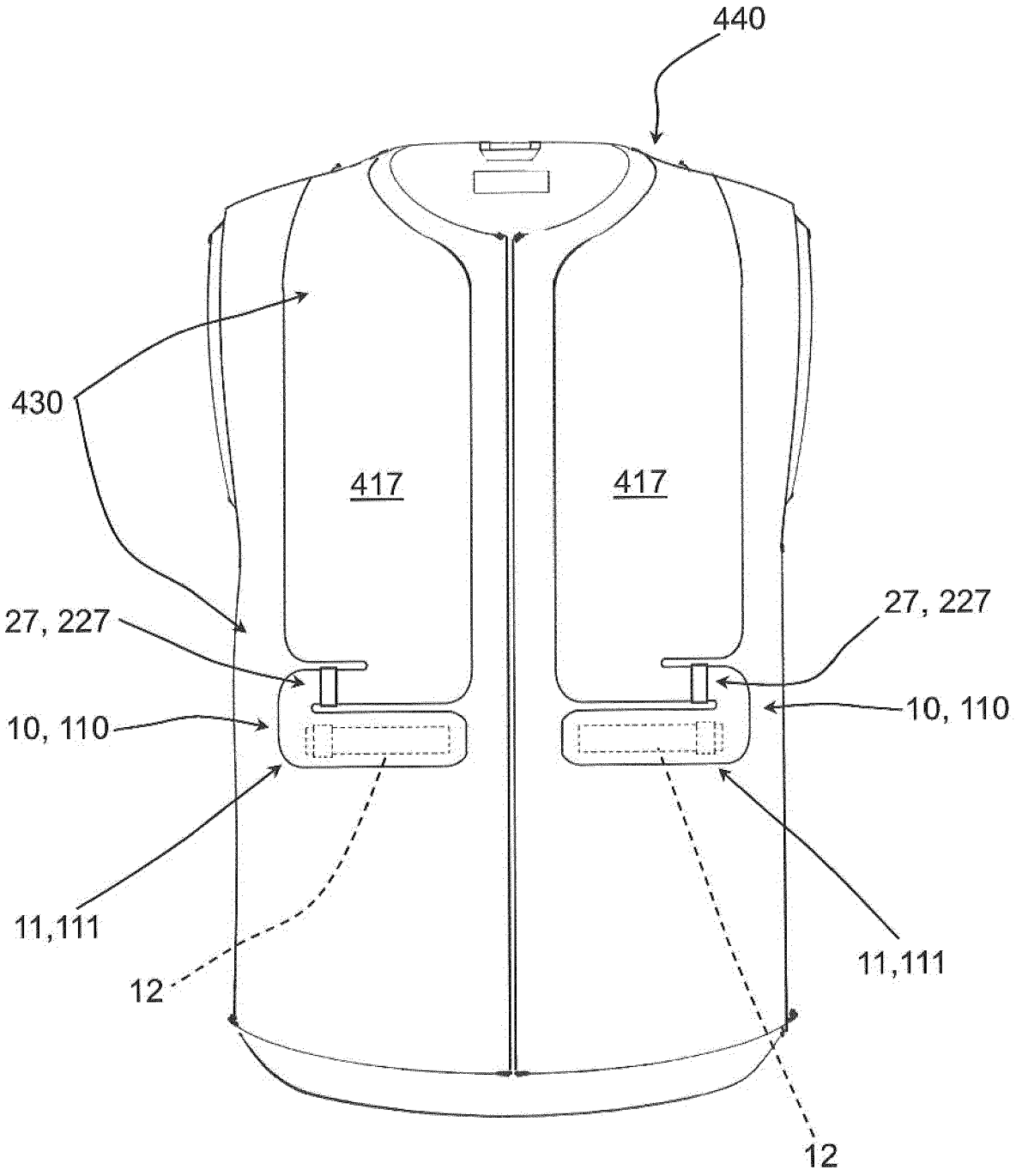

FIG. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 24 16 3908

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2022/248779 A1 (YANAGISAWA TOSHIHITO [JP] ET AL) 11 August 2022 (2022-08-11) * abstract; figures 1-14 * * paragraphs [0005], [0006] * * paragraph [0023] - paragraph [0028] *	1-24	INV. A41D13/018
A	EP 4 046 514 A1 (DAINESE SPA [IT]) 24 August 2022 (2022-08-24) * abstract; figures 1-9 * * paragraph [0024] - paragraph [0028] * * paragraph [0034] - paragraph [0037] *	1-24	
A	EP 3 854 244 A1 (SCHINDLER WOLFGANG [DE]) 28 July 2021 (2021-07-28) * abstract; figures 5,6 * * paragraph [0041] - paragraph [0045] *	1-24	
A	KR 102 150 796 B1 (CHO JOO HYUN [KR]; MOON MAN HO [KR]) 1 September 2020 (2020-09-01) * figures 1-5 *	1-24	TECHNICAL FIELDS SEARCHED (IPC) A41D B60R A42B F17C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	5 August 2024	Thielgen, Robert

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05-08-2024

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- WO 2021089585 A1 **[0011]**
- WO 2021089439 A1 **[0011]**