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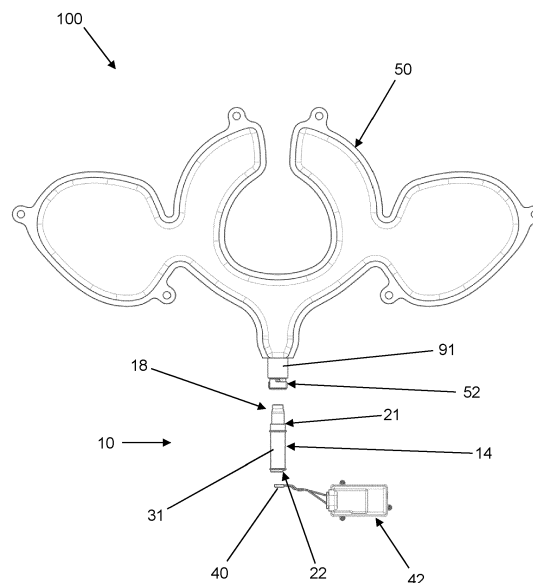
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(54) **INFLATION DEVICE AND PERSONAL PROTECTION DEVICE INCLUDING SAID INFLATION DEVICE**

(57) The present disclosure relates to an inflation device (10) for inflating an inflatable element (50). The inflatable element 50 is intended to protect at least partially an area of a user's body. The inflation device (10) includes at least one gas generator (12) and a container (14) for containing said at least one gas generator (12). The container (14) and the at least one gas generator (12) form a structurally independent assembly, configured to be handled as a single body. with respect to said

inflatable element (50). The inflation device (10) comprises a coupling component (18) configured to be coupled in a detachable manner with a coupling counter-component (52) associated with said inflatable element (50). The present disclosure relates to a personal protection device and a garment as well as to a method and a use which involve the use of the aforementioned inflation device.



**Fig. 1**

## Description

**[0001]** The present invention relates generally to the sector of providing protection by means of an inflatable element, so as to protect a user from impacts, following falling or sliding, for example when performing any activity or 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.

**[0002]** More particularly, the present disclosure relates to an inflation device for inflating an inflatable element for protecting a user in the event of falls and/or impacts of various types.

**[0003]** In the sector relating to the protection of a user it is in fact known to use protection devices including inflatable elements, which are inflated in the event of an impact by an inflation device which is in fluid communication with the said inflatable element. Generally, such an inflation device is formed by a fluid source, such as a canister which contains compressed gas and which is opened by means of a punch, or a small explosion, or a pyrotechnic gas canister which expands, also following a small explosion, which is managed by means of an electric activation signal.

**[0004]** Any form of fluid source intended to determine the outflow of pressurised gas into an inflatable element is referred to in the continuation of the present disclosure by the term "gas generator".

**[0005]** Protection devices are normally formed by an inflatable element, the aforementioned gas generator, sensors for detecting the fall or the impact and at least one control unit for managing the activation of the gas generator in order to inflate the inflatable element. The entire protection device is then associated with a garment, for example inside a pocket, or joined to it by means of a connection system of the known type.

**[0006]** Normally, the gas generator is arranged inside the inflatable element, for reasons of convenience, so as to facilitate the fluid connection with the inflatable element.

**[0007]** One problem associated with the management of protection devices is currently linked to the limited possibility of being able to restore rapidly the personal protection device following initial inflation or following subsequent inflation operations. In order to overcome this problem, it has been proposed to use gas generators which are configured with a so-called "double charge", but these generators generally are heavy and this greatly affects the weight of the personal protection device such that it becomes incompatible with use in a garment or in any case with a condition where the device is worn by a user.

**[0008]** As a result, in the case of so-called "single-charge" gas generators, the problem arises of being able to replace the entire inflatable protection device after use, in order to replace the gas generator so that it can be

used again. In particular, in order to be able to perform replacement, it is necessary to remove the entire inflatable element from the article of clothing.

**[0009]** Such an operation is not practical for the user of the article of clothing, who is obliged to request the assistance of a specialist who then certifies the correct positioning of the inflatable element and in general the correct operation of the entire personal protection device.

**[0010]** One problem forming the basis of the present disclosure is that of providing an inflation device which allows a user to replace a gas generator without necessarily removing the inflatable element and which may also have other advantages and also providing a protection device which includes said inflation device.

**[0011]** This is obtained by means of a wearable inflation device, a protection device, a garment, a method and a use according to the respective independent claims. Secondary characteristic features forming the subject of the present disclosure are defined in the corresponding dependent claims.

**[0012]** The present disclosure is based on the recognition by the inventor of the present disclosure that it is possible to incorporate the gas generator in a container and form a single body therewith. The container acts as a handle or gripping body for the gas generator. Preferably, the container consists of a closed container which may be opened in an irreversible manner at the time of use of the gas generator, so as to open a gas outlet zone and allow the gas generator to be placed in fluid communication with the inflatable element. For example, the container may be formed by two shells which are joined together by calibrated breakage means which are broken at the time of use. These calibrated breakage means are, for example, breakable bridge-pieces between the two shells.

**[0013]** The container is therefore able to prevent direct contact between an end user and the gas generator. The assembly formed by the container and the gas generator may then be coupled to an inflatable element by means of a detachable coupling device. In this way, a user may change only the gas generator without having to remove the inflatable element. The inflatable element may be configured to allow several inflation operations and ensure the same protection performance after a number of inflation operations.

**[0014]** The main advantage therefore consists in the fact that it allows direct contact with the gas generator to be avoided since the user may handle the container or only one of the two shells if the other one is removed following breakage. The gas generator container therefore acts as grip for the gas generator. A user may handle the gas generator by means of the container and connect by means of coupling the inflation device to the inflatable element in a quick and safe manner. The inflation device may advantageously be arranged in a garment so as to be easily reached by a user.

**[0015]** Moreover, a user may avoid coming into direct contact with the gas generator and avoid the risks asso-

ciated with direct handling thereof.

**[0016]** Further characteristic features and modes of use forming the subject of the present disclosure will become clear from the following detailed description of a number of preferred examples of embodiment thereof, provided by way of a nonlimiting example.

**[0017]** It is nevertheless evident that each embodiment may have one or more of the advantages listed above; in any case it is nevertheless not necessary that each embodiment should have simultaneously all the advantages listed.

**[0018]** Reference will be made to the figures of the attached drawings in which:

- Figure 1 shows a top plan view of an embodiment of a protection device including an inflation device according to the present disclosure, in which the inflation device is in a condition uncoupled from an inflatable element;
- Figure 2 shows an axonometric view of the protection device according to Figure 1 in which the inflation device is in a condition coupled to the inflatable element;
- Figure 3 shows an axonometric view of the protection device according to Figure 1 in which the inflation device is shown with the parts separated and in a condition uncoupled from the inflatable element;
- Figure 4 shows a side view of the personal protection device according to Figure 2;
- Figure 5 shows a side view of the personal protection device according to Figure 3;
- Figure 6 shows a side view of an inflation device according to the present disclosure;
- Figure 7 shows a side view of the inflation device according to Figure 6, in which the inflation device is shown with the parts separated;
- Figure 8 shows a side view of the inflation device according to Figure 6, in which the inflation device is shown partially with separated parts;
- Figure 9 shows a view from behind of a garment including, or in combination with, the protection device according to Figure 1.

**[0019]** With reference to the accompanying figures, the reference number 10 indicates a personal inflation device according to an embodiment of the present disclosure. The inflation device 10 is able to inflate an inflatable element 50.

**[0020]** The inflatable element 50 is intended to protect at least partially an area of a user's body. In particular, as is explained more fully below, the inflation device 10 forms part of a personal protection device 100 which includes the aforementioned inflatable element 50.

**[0021]** With regard to the inflatable element 50 it is pointed out that the inflatable element 50 may be a single bag. The inflatable element 50 may be made using the technology described in patent application PCT/IB2009/055512 and in patent application

PCT/IT2009/000547, which are incorporated here by reference in their entirety in the present disclosure, or more preferably using the technology described in patent application WO2016178143A1, or even more preferably in patent application WO2017163196A1.

**[0022]** This inflatable element 50 is intended to protect at least partially a body area of the user, for example a top area of a user's torso.

**[0023]** As can be seen in the figures, moreover, said inflatable element 50 may be connected to the inflation device 10 in an area of the spinal column. The connection area is however not an essential characteristic of the present disclosure. The connection is advantageously provided where said connection may be easily accessed by a user.

**[0024]** The inflation device 10 includes at least one gas generator 12 and a container 14 for containing said at least one gas generator 12. The gas generator 12 is provided with a region 16 intended for the passage of gas, namely a region which, when the gas generator 12 is activated, allows gas to pass towards the inflatable element 50. In said region 16, the gas generator 12 may be provided, as is known, with a shut-off valve, not visible in the drawings.

**[0025]** The gas generator 12 may be a canister containing compressed cold gas, such as helium. Alternatively, the gas generator 12 may be a gas generator of the pyrotechnic or hybrid type or of other types known in the state of the art.

**[0026]** According to one aspect of the present disclosure, the container 14 and the at least one gas generator 12 form a structurally independent assembly, configured to be handled as a single body, with respect to said inflatable element 50. Even more particularly, the inflation device 10 comprises a coupling component 18 configured to be coupled in a detachable manner with a coupling counter-component 52 associated with said inflatable element 50.

**[0027]** Preferably, the container 14 has the form of a tubular shell defining an internal housing chamber 30 for housing the gas generator 12. In other words, it consists of a body which may be easily gripped by a user. In order to allow easy removal of the container 14 and replacement of the gas generator 12, the container 14 includes a substantially closed single-piece body formed by two shells which can be separated from each other in an irreversible manner, for example by breakage of calibrated breakage means.

**[0028]** For example, the container 14 comprises a main body 31, having a tubular shape, and a shell in the form of a closing cover 32, configured to close off the main body in the manner of a hood. It therefore consists of an end shell for closing off the main body 31 of the container 14.

**[0029]** The container 14 may in turn comprise an end cover which closes off an end zone of the main body 31. The end cover may be a slider body configured so as to be able to slide inside at least one insertion guide posi-

tioned in the proximity of the end zone of the main body 31.

**[0030]** Consequently, the main body 31 defines preferably a first open end 21, which may receive the coupling component 18 of the gas generator 12, and an opening in the vicinity of the end region, namely a second open end 22.

**[0031]** Preferably, the main body 31 and the closing cover 32 are made of rigid material. The rigid material facilitates the management of the components as indicated hereinbelow.

**[0032]** In particular, according to a preferred aspect of the present invention, the main body 31 and the closing cover 32 are, as mentioned, initially connected to form a single piece. In other words, the container 14 is a closed single-piece body and connection means may be provided between the main body 31 and the closing cover 32. For example, the connection means may be calibrated breakage bridge-pieces, also called breakable bridge-pieces. These calibrated breakage bridge-pieces may be broken by a user by means of relative rotation of the main body 31 and the closing cover 32 in opposite directions. For example, a user who is holding the container 14 may rotate at least either the main body 31 or the closing cover 32 in order to break the calibrated bridge-pieces so as to be able to separate the main body 31 and the closing cover 32.

**[0033]** In this way, it is possible to ensure safe management of the closed gas generator and allow access thereto only when needed for coupling with the inflatable element 50.

**[0034]** Preferably, the coupling which is formed between the inflation device 10 and the inflatable element 50 is a mechanical coupling, for example a so-called quick-release coupling, quick-fit coupling, screw connection or a similar mechanical coupling which is known to the person skilled in the art. More preferably, it consists of a mechanical coupling of the male/female type. The inflation device therefore comprises one between a male coupling component and a female coupling counter-component. The advantage of the male/female coupling is that a user is able to perform a connection in a quick and easy manner. Another advantage of a male/female coupling is that it is able to ensure a high-pressure seal.

**[0035]** Preferably, the coupling component 18 is placed in the region 16 of the gas generator 12 intended for the outflow of the inflation gas. The coupling component 18, for example the aforementioned male or female component, may be located in the vicinity of the region 16 intended for the gas outflow and be coupled with the other coupling component 52 which in turn may be located on the vicinity of a gas intake opening of the inflatable element. In this way, as soon as the inflation device 10 is coupled to the inflatable element 50, it is possible to establish fluid communication between the gas generator 12 and the inflatable element 50 when the gas generator is activated 12.

**[0036]** Preferably, the gas generator 12 comprises

said coupling component 18. In other words, the gas generator 12 is suitably modified to allow coupling. This solution ensures a greater pressure tightness, considering the fact that the pressure comes from the gas generator. In yet other words, the gas generator 12 is shaped to comprise said coupling component as one piece or integrally. The coupling component 18 and the gas generator 12 form a single piece, namely they are components which are integrally made as a single body.

**[0037]** According to a preferred embodiment, the coupling component 18 comprises a first plug-in component 71 connected to the gas generator 12, and the coupling counter-component comprises a first guide seat 81. The first guide seat is preferably configured to allow sliding of the first plug-in component 71 in such a way as to couple in a detachable manner the gas generator 12 to the inflatable element 50. In other words, the first plug-in component 71 may slide along the first guide seat 81 so as to couple in a detachable manner together the coupling component 18 and the coupling counter-component 52.

**[0038]** Preferably, the first guide seat 81 has an L-shaped form or a right-angled form. The L-shaped or right-angled form allows the first plug-in component 71 to slide along the first guide seat 81 and, once the angle of the L-shaped or right-angled form is reached, by means of relative rotation of the coupling component 18 and the coupling counter-component 52 it is possible to prevent a further sliding action of the first plug-in component 71. In this way uncoupling of the coupling component 18 and the coupling counter-component 52, and therefore of the gas generator 12 and the inflatable element 50, may be prevented.

**[0039]** According to a preferred embodiment, the inflation device 10 further comprises a ring nut body associated with the coupling counter-component 52 and configured to prevent the first plug-in component 71 from coming out of the first guide seat 81. In other words, once the first plug-in component 71 has been inserted or slid along the first guide seat 81, the ring nut body may prevent sliding in the opposite direction of the first plug-in component 71, for example by means of rotation of the ring-nut body about the coupling counter-component 52.

**[0040]** Preferably, the container 14 has in the end region the aforementioned second open end 22 which may receive an electrical connection component 40 configured so that it may be connected to a control unit 42 in order to control activation of the gas generator 12.

**[0041]** According to a preferred embodiment, the inflation device 10 comprises a second plug-in component 72 connected to said gas generator 12, and the main body 31 of the container 14 comprises a second guide seat 82. The second guide seat 82 may be configured to allow sliding of the second plug-in component 72 in such a way as to guide insertion of the gas generator 12 inside the internal housing chamber 30 of the main body 31.

**[0042]** Preferably, the inflation device 10 comprises an annular body 91 configured to surround the coupling

counter-component 52 in such a way as to support a connection between the coupling counter-component 52 and the inflatable element 50, for example exerting a given pressure.

**[0043]** Preferably, the gas generator 12 is shaped like a canister and, as mentioned above, the container 14 has a tubular form for receiving the gas generator 12, and even more preferably the gas generator 12 is modified to include the coupling component 18 which, in the embodiment, is a male engaging component.

**[0044]** As can be seen in the figures, the main body 31 of the container 14 has a first open end 21, said first open end 21 receiving the coupling component 18 of the gas generator 12. Owing to the configuration of the aforementioned parts the gas generator 12, after being inserted inside the container 14, together with the latter, may be handled as a single body by the user. The gas generator 12 may be coupled to the coupling counter-component 52 of the inflatable element 50 by means of direct gripping of the container 14.

**[0045]** The main body 31 of the container 14 therefore acts as a handle or gripping body for the gas generator 12, for example during coupling together of the gas generator 12 and the inflatable element 50.

**[0046]** It is pointed out that the main body 31 of the container 14 may be advantageously configured to include the aforementioned second open end 22. For example, the second open end may be closed by the aforementioned end cover, which may be said slider body or a slidable body configured so that it can slide inside the at least one insertion guide positioned close to the end zone of the main body 31. In other words, the end body may be uncoupled from the main body 31, for example by means of sliding, so as to define the second open end 22, which may receive the electrical connection component 40.

**[0047]** The container 14 may therefore be designed so as not to prevent, on the one hand, coupling with the inflatable element 50 and, on the other hand, connection with the control unit 42.

**[0048]** With regard to the control unit 42 it is pointed out that, in a known manner, it may be configured for the opening of the aforementioned shut-off valve of the gas generator 12 depending on the detection of the state of the user; for example, said control unit 42 may implement a fall prediction system which allows early identification of the fall event and a reliable prediction thereof by means of accelerometric sensors and a unit for processing the signals produced by the said sensors. Alternatively, the device 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 inflatable element following the movement of the user away from the vehicle, for example following a fall or a sudden impact. Use of a cable is employed in particular in the horse-riding sector. It should also be noted that the activation modes, although being an aspect of particular importance for effective operation of the de-

vice, 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 an individual from sudden impacts.

**[0049]** As already mentioned above, the inflation device forms part of a personal protection device 100 comprising the inflatable element 50 and the inflation device 10 according to one or more of the characteristics described above.

**[0050]** Preferably, the inflatable element 50 comprises said coupling counter-component 52.

**[0051]** As mentioned above, the gas generator 14 is a body which has a region 16 intended for a gas outflow and said coupling component 18 is configured to connect said gas outflow region 16 to the inflatable element 50. A coupled condition of the inflation device 10 and the inflatable element 50 corresponds to a condition of possible fluid communication between the gas generator 12 and the inflatable element 50.

**[0052]** The protection device 100 may include in a known manner the control unit 42 and sensor means (not shown) designed to detect the fall or an impact for a user.

**[0053]** The personal protection device 100 according to the present disclosure may be worn on its own as a separate garment, optionally lined with a fabric aesthetically attractive for a user, or a comfortable and practical fabric, or may be incorporated in suitable pockets inside a garment, such as a motorcyclist's suit or jacket.

**[0054]** More particularly, the personal protection device 100 may be associated with a wearable article 1000, such as a garment, or a motorcyclist's suit such as that shown in Figure 9. The garment therefore comprises the personal protection device 100 and the inflation device 10. Figure 9 shows only a rear part of the personal protection device 100, transparent with respect to the garment.

**[0055]** The present disclosure also relates to a method for assembling a personal protection device. According to the method, before associating the gas generator 12 with the inflatable element 50, the gas generator 12 is arranged inside a container 14 so as to define a structurally independent assembly, configured to be handled as a single body, with respect to said inflatable element 50.

**[0056]** The container 14 therefore acts as a gripping body for the gas generator 12.

**[0057]** The structurally independent assembly thus obtained is then coupled in a detachable manner to the inflatable element 50 by means of a detachable coupling device.

**[0058]** The detachable coupling device includes preferably the coupling component 18 and the coupling counter-component 52.

**[0059]** According to a preferred embodiment, initially the gas generator 12 is arranged inside the container 14 formed by the main body 31 and the closing cover 32 which covers at least partially a gas outflow region 16 of the gas generator 12. Preferably, before coupling in a

detachable manner the structurally independent structure formed by the gas generator 12 and the container 14, the closing cover 32 is removed from the main body 31 so as to allow fluid communication between the gas outflow region 16 and the inflatable element 50 following coupling together.

**[0060]** The closing cover 32 is joined together initially as one piece to the main body and is broken in an irreversible manner.

**[0061]** Preferably the device consists of a mechanical coupling device. Therefore, the structurally independent assembly is coupled to the inflatable element 50 by means of a mechanical coupling and one coupling component is one between a coupling component and a coupling counter-component associated with the gas generator 12 and one component is the other between a coupling component and a coupling counter-component associated with the inflatable element 50.

**[0062]** Even more preferably, the gas generator 14 is a body shaped like a canister having said region 16 intended for a gas outflow. In this way, when the gas generator is coupled to the inflatable element in said region 16, simultaneously the gas generator is coupled to the inflatable element 50. By so doing, the gas generator 12 may be placed in fluid communication with the inflatable element 50.

**[0063]** Again even more preferably, the gas generator is then connected to the control unit 42 in order to control activation of the gas generator 12.

**[0064]** Preferably, the coupling counter-component 52 comprises a first guide seat 81, which is for example shaped as an L or a right angle. Even more preferably, the first guide seat 81 is configured to allow sliding of a first plug-in component 71 of the coupling component 18 in such a way as to couple in a detachable manner the coupling component 18 and the coupling counter-component 52. The first plug-in component 71 may be connected to the gas generator 12.

**[0065]** According to a preferred embodiment, in order to couple together the coupling component 18 and the coupling counter-component 52, the first plug-in component 71 is slid along the first guide seat 81, which is preferably L-shaped. Preferably, the device 10 comprises a ring nut body associated with the coupling counter-component 52 and configured to prevent the first plug-in component 71 from coming out of the first guide seat 81. In other words, once the first plug-in component 71 has been slid along the first guide seat 81, the ring nut body may be rotated so as to prevent the first plug-in component 71 from sliding out from the first guide seat 81.

**[0066]** Preferably, an annular body 91 of the device 10 may surround the coupling counter-component 52 so as to support a connection between the coupling counter-component 52 and the inflatable element 50.

**[0067]** Preferably, the coupling together of the gas generator 12 and the container 14 may be assisted by a second plug-in component 72 which is connected to the gas generator 12 and configured to allow sliding along a

second guide seat 82 of the container 14. In particular, the second guide seat 82 may be formed along the main body 31 of the container 14 in such a way as to assist "controlled" insertion of the gas generator inside an internal housing chamber 30 of the main body 31 by means of guided sliding of the second plug-in component 72 along the second guide seat 82.

**[0068]** Preferably, the container 14 comprises, even more preferably along the main body 31, a third opening configured to allow viewing of at least one portion of the gas generator 12 contained inside it, for example in order to view an alphanumeric code or a bar code of the gas generator 12. Alternatively, for this purpose the container 14 may be made at least partially of transparent material.

**[0069]** It is pointed out that the second plug-in component 72 is preferably a body separate from the first plug-in component 71. Moreover, the second plug-in component 72 may be replaced by one or more similar elements associated with the gas generator 12 and having the same function described above. For example, the second guide seat 82 may be associated with the gas generator 12 and the second plug-in component 72 may be associated with the container 14, while maintaining a similar method of use.

**[0070]** The present disclosure also relates to use of a coupling device for coupling an inflatable element of a personal protection device to a gas generator for inflating the inflatable element.

**[0071]** The gas generator is housed inside a container so as to define a structurally independent assembly, configured to be handled as a single body, with respect to said inflatable element. The detachable coupling device is used to allow, when the gas generator is activated, stable fluid communication between the gas generator and the inflatable element.

**[0072]** The personal protection device may be the personal protection device 100 in accordance with one or more of the characteristics described above. Alternatively, the personal protection device is that used in the wearable article 100 or is used to carry out a method described above.

**[0073]** The subject of the present disclosure has been described hitherto with reference to preferred embodiments. 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. Inflation device (10) for inflating an inflatable element (50), wherein said inflatable element (50) is intended to protect at least partially an area of a body of a user, and wherein the inflation device (10) includes at least one gas generator (12) and a container (14) for containing said at least one gas generator (12), and wherein the container (14) and the at least one

- gas generator (12) define a structurally independent assembly, configured to be handled as a single body, with respect to said inflatable element (50), and wherein the inflation device (10) comprises a coupling component (18) configured to be coupled in a detachable manner with a coupling counter-component (52) associated with said inflatable element (50).
2. Inflation device (10) according to the preceding claim, wherein said container is a closed body comprising at least two shells joined together as one piece and detachable from each other only once or in an irreversible manner or connected by calibrated breakage means.
  3. Inflation device (10) according to claim 1, wherein said two shells include respectively a main body (31) and a cover (32) for closing said main body (31), wherein the main body has the form of a tubular shell defining an internal housing chamber (30) for housing the gas generator (12) and wherein the main body (31) has a first end (21), wherein said first open end (21) receives said coupling component (18) of the gas generator (12).
  4. Inflation device (10) according to any one of the preceding claims, wherein said two shells are connected by means of breakable bridge-pieces.
  5. Inflation device (10) according to any one of the preceding claims, wherein said coupling is a mechanical coupling, preferably of the male-female type, and wherein said coupling component is either a male coupling component or a female coupling counter-component.
  6. Inflation device (10) according to any one of the preceding claims, wherein the gas generator (12) comprises said coupling component (18) or wherein said gas generator (12) is shaped to comprise said coupling component (18) as one piece or integrally.
  7. Inflation device (10) according to any one of the preceding claims, wherein said coupling component (18) comprises a first plug-in component (71) connected to said gas generator (12), and wherein said coupling counter-component (52) comprises a first guide seat (81) configured to allow sliding of said first plug-in component (71) in such a way as to couple in a detachable manner said gas generator (12) to said inflatable element (50).
  8. Inflation device (10) according to the preceding claim, wherein said first guide seat (81) has an L-shaped form.
  9. Inflation device (10) according to claim 8, comprising
- a ring nut body associated with said coupling counter-component (52) and configured to prevent said first plug-in component (71) from coming out of said first guide seat (81).
10. Inflation device (10) according to claim 8 or 9, wherein said container (14) has a second open end (22), wherein the second open end (22) receives an electrical connection component (40) with a control unit (42) for controlling activation of the gas generator (12).
  11. Inflation device (10) according to the preceding claim, comprising an end cover for momentarily covering said second open end (22).
  12. Inflation device (10) according to any one of the preceding claims in combination with claim 3, comprising a second plug-in component (72) connected to said gas generator (12), and wherein said main body (31) of said container (14) comprises a second guide seat (82) configured to allow sliding of said second plug-in component (72) in such a way as to guide insertion of said gas generator (12) inside said internal housing chamber (30) of said main body (31).
  13. Personal protection device (100) comprising an inflatable element (50), and an inflation device (10) according to any of the claims from 1 to 12.
  14. Personal protection device (100) according to the preceding claim, wherein said inflatable element (50) comprises said coupling counter-component (52), and wherein the gas generator (14) is a body having a region (16) intended for the gas outflow, and wherein said coupling component (18) is configured to connect said gas outflow region (16) to the inflatable element (50), and wherein a coupled condition between the inflation device (10) and the inflatable element (50) corresponds to a condition for allowing a fluid communication between the gas generator (12) and the inflatable element (50).
  15. Wearable article (1000), such as a garment, comprising a personal protection device (100) according to either one of claims 13 or 14.
  16. Method for assembling a personal protection device (100), wherein the personal protection device (100) comprises at least one inflatable element (50) and a gas generator (12) for inflating an inflatable element (50) and wherein, before associating the gas generator (12) with the inflatable element (50), the gas generator (12) is arranged in a container (14) so as to define a structurally independent assembly, configured to be handled as a single body, with respect to said inflatable element (50), and wherein said structurally independent assembly is then coupled

in a detachable manner to said inflatable element (50) by means of a coupling device.

17. Method according to the preceding claim, wherein the container (14) is a closed body comprising at least two shells joined together as one piece and wherein, in order to use the gas generator, one shell is detached from the other shell, irreversibly, or by calibrated breakage means, or once only.
18. Method according to claim 17, wherein the two shells comprise respectively a main body (31), having the form of a tubular shell defining an internal housing chamber (30) for housing the gas generator (12), and a cover (32) for closing said main body (31), wherein said closing body (32) is associated in a detachable manner with said main body (31), and wherein said closing body (32) is uncoupled from said main body (31) before coupling in a detachable manner said structurally independent assembly to said inflatable element (50).
19. Method according to either one of the preceding claims 17 or 18, wherein said shells are detached from each other by breakage of breakable bridge-pieces.
20. Method according to any one of claims 16 to 19, wherein the structurally independent assembly is coupled to the inflatable element (50) by means of a mechanical coupling and wherein one coupling component is one between a coupling component (18) and a coupling counter-component associated with the gas generator (12), and one component is the other between a coupling component and a coupling counter-component (52) associated with the inflatable element (50) and wherein the gas generator (14) is a body shaped like a canister having a region (16) intended for the outflow of the gas and wherein the gas generator (12) is coupled to the inflatable element (50) in said region (16) and wherein, when the gas generator (12) is coupled to the inflatable element (50), the gas generator (12) may be placed in a condition of fluid communication with the inflatable element (50) and wherein the gas generator is connected to a control unit (42) for controlling activation of the gas generator (12).
21. Use of a detachable coupling device for coupling in a detachable manner an inflatable element (50) of a personal protection device (100) to a gas generator for inflating the inflatable element (50) and wherein the gas generator (12) is housed inside a container (14) so as to define a structurally independent assembly, configured to be handled as a single body, with respect to said inflatable element (50), and wherein the detachable coupling device is used to allow stable fluid communication between the gas

generator (12) and the inflatable element (50).

22. Use according to the preceding claim, wherein the personal protection device is that according to either one of claims 13 or 14, or wherein the personal protection device is employed in the wearable article (1000) according to claim 15, or in order to carry out a method according to any one of claims 16 to 20.



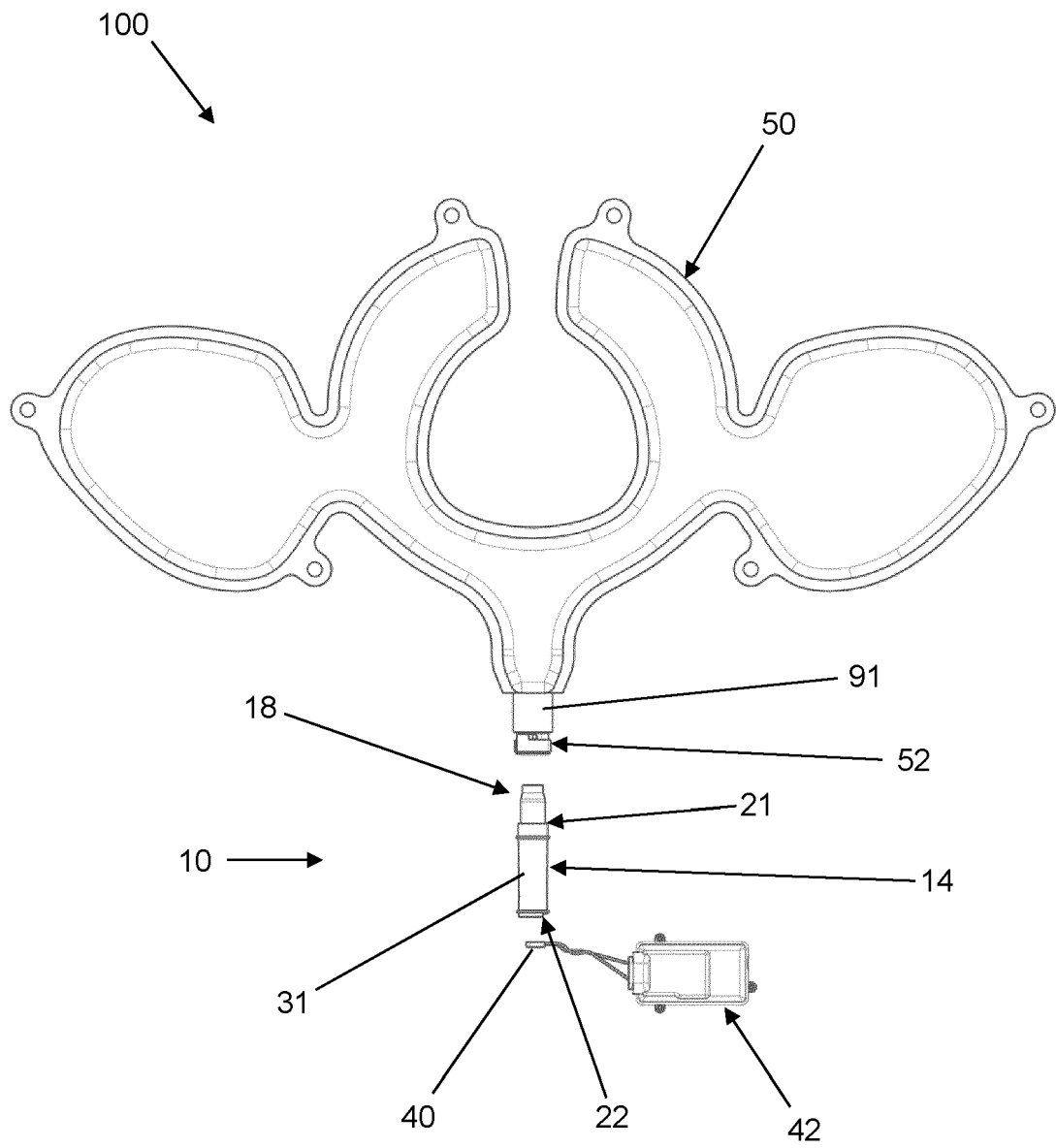


Fig. 1

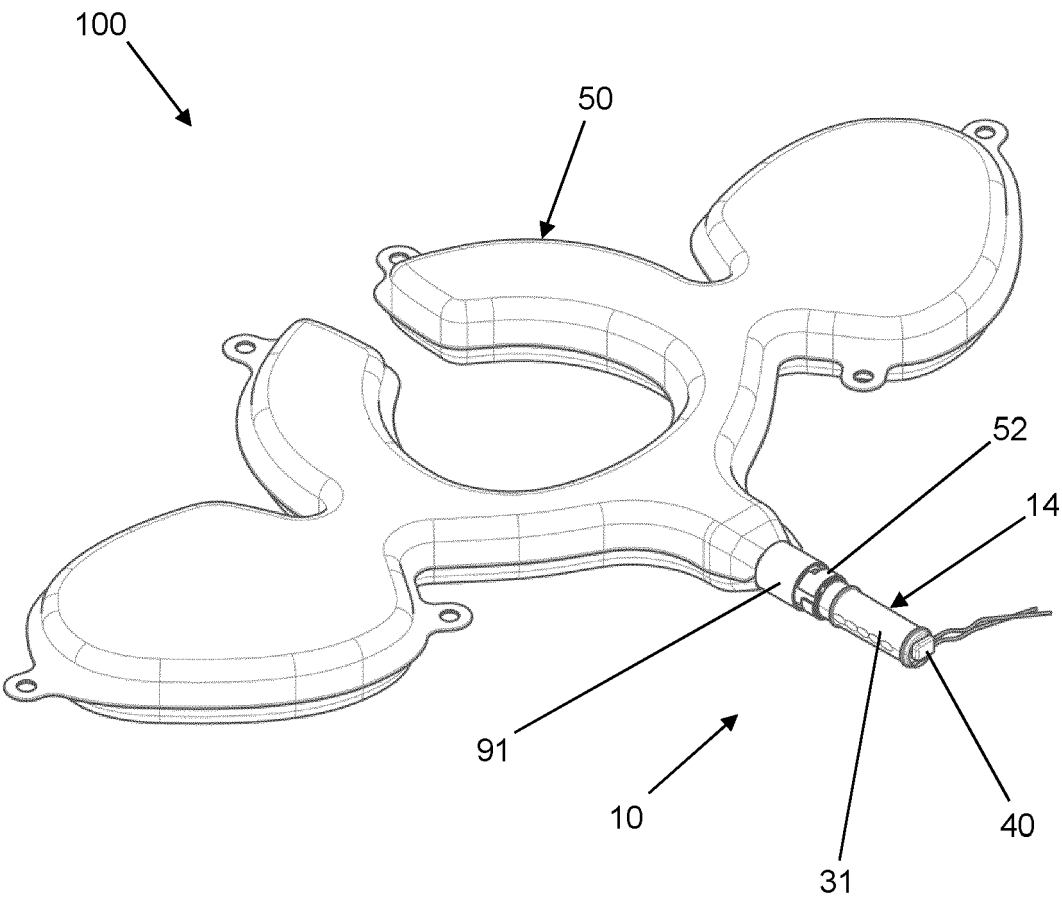


Fig. 2

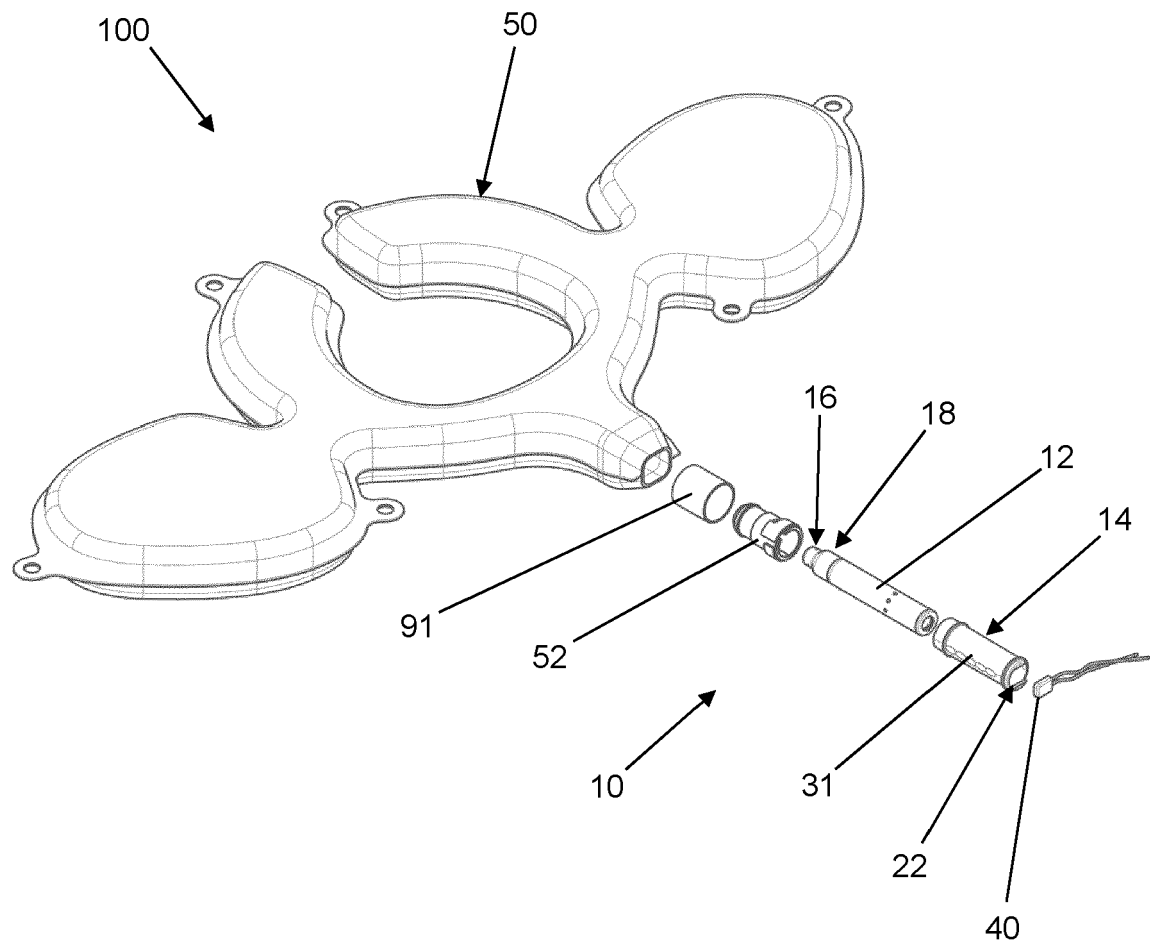


Fig. 3

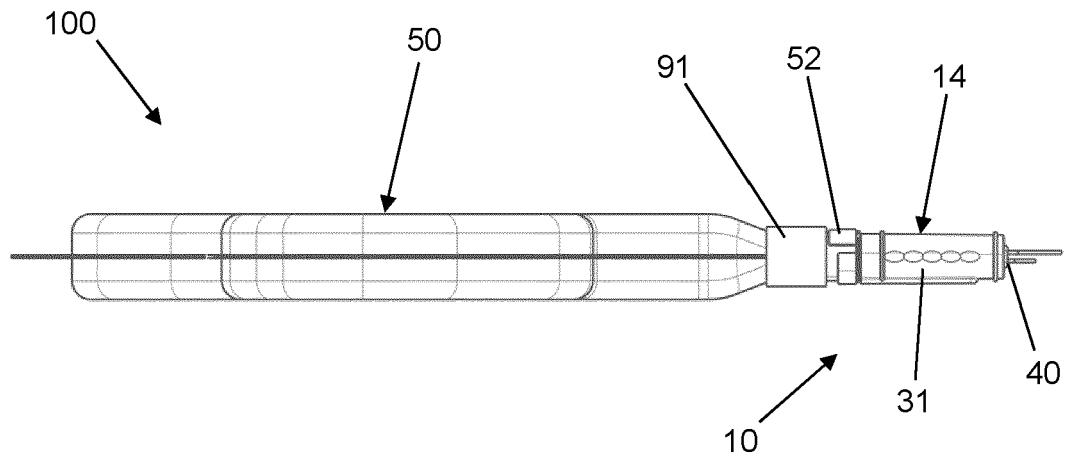


Fig. 4

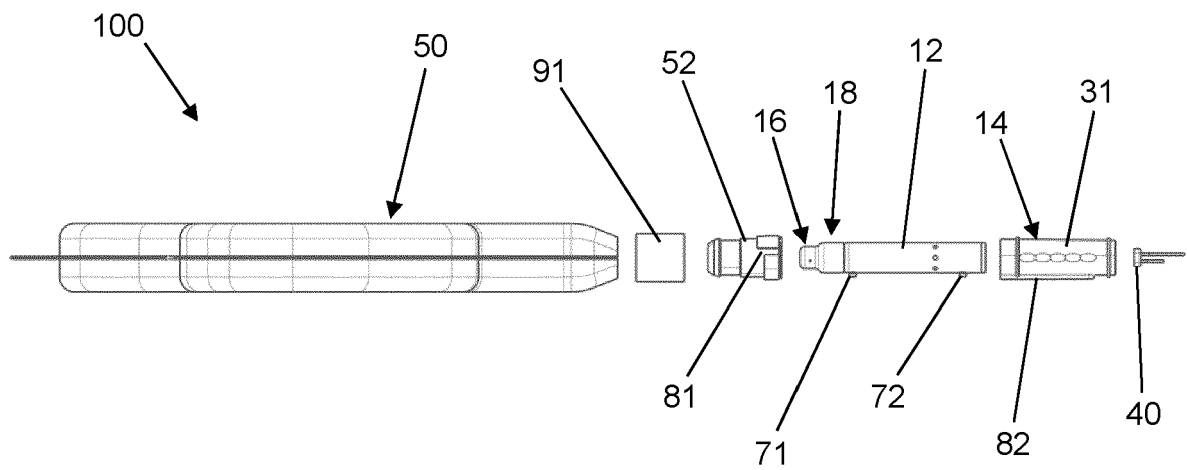


Fig. 5

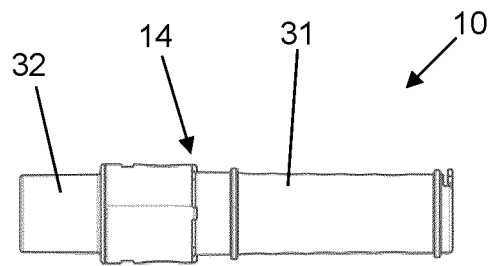


Fig. 6

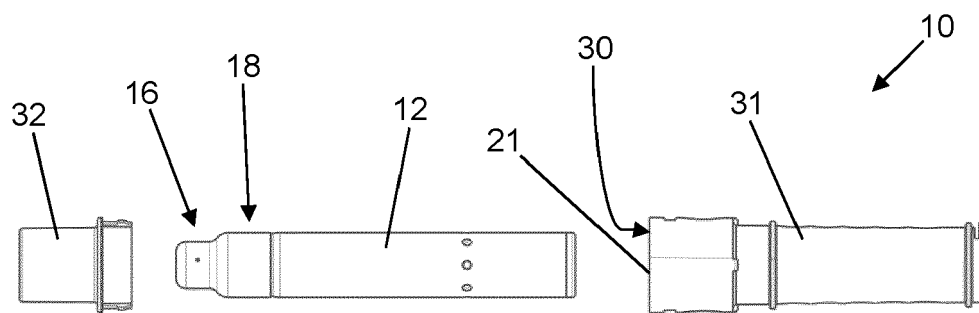


Fig. 7

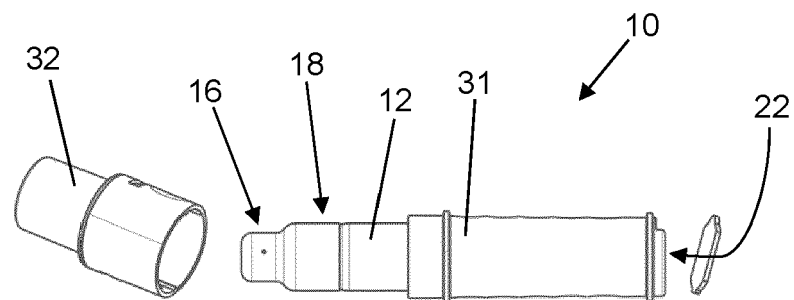
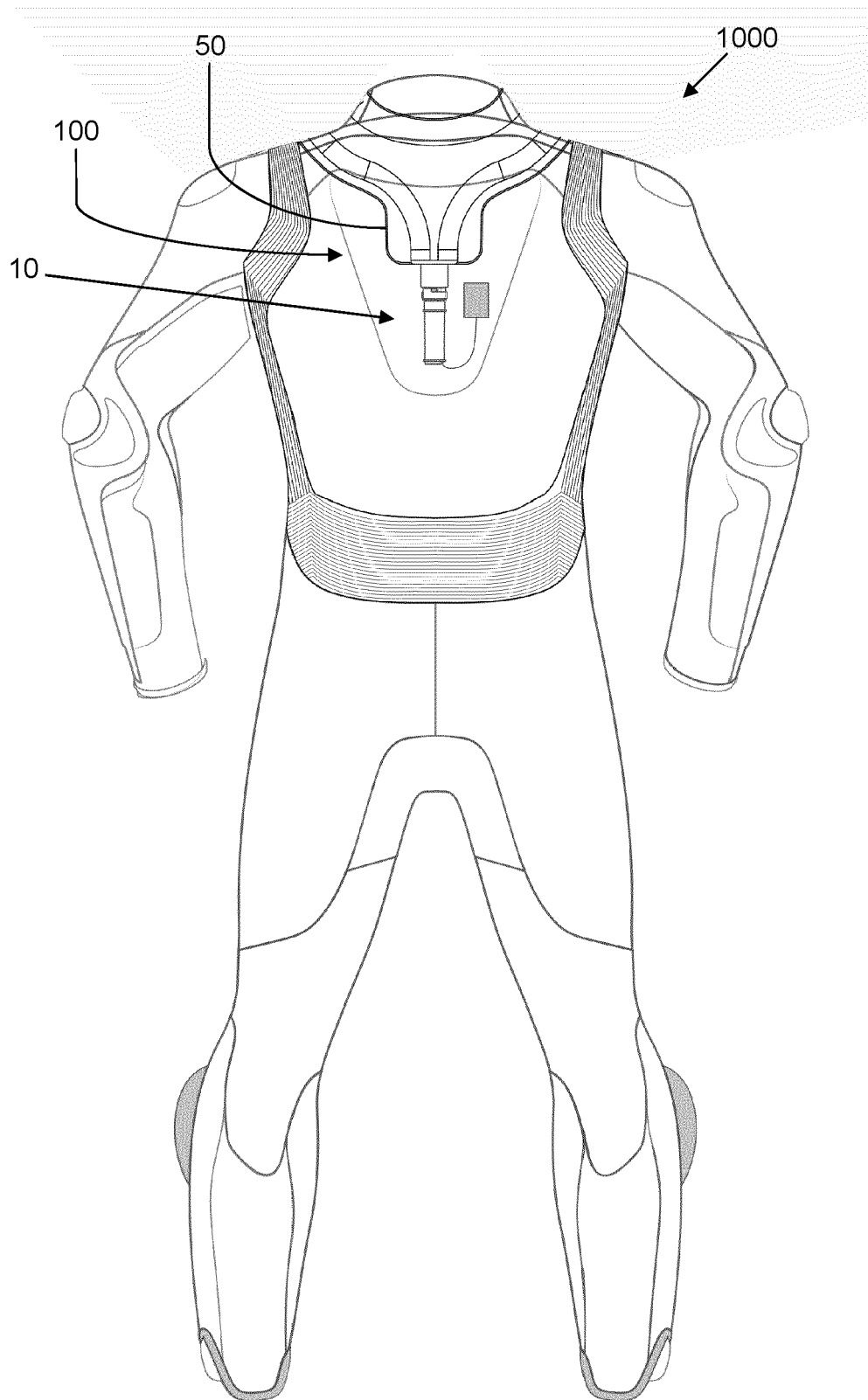


Fig. 8



**Fig. 9**



## EUROPEAN SEARCH REPORT

Application Number

EP 22 15 7262

## DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	US 6 158 380 A (ASCHAUER PETER [DE] ET AL) 12 December 2000 (2000-12-12) * the whole document *	1, 5-16, 20-22 2, 17	INV. A41D13/018
X	US 5 313 670 A (ARCHER III SHREVE M [US]) 24 May 1994 (1994-05-24) * claim 19; figures 32-34 *	1, 5, 13-16, 21, 22	
X	US 2011/154561 A1 (SINGHAL TARA CHAND [US]) 30 June 2011 (2011-06-30) * paragraph [0049]; figures *	1, 5, 13-16, 21, 22	
X	WO 01/54523 A1 (TAKASHIMA SOHEI [JP]) 2 August 2001 (2001-08-02) * the whole document *	1, 5, 13, 14, 16, 21, 22	
			TECHNICAL FIELDS SEARCHED (IPC)
			A41D A62B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		13 June 2022	Debard, Michel
CATEGORY OF CITED DOCUMENTS			
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ON EUROPEAN PATENT APPLICATION NO.**

EP 22 15 7262

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13-06-2022

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
<b>US 6158380 A</b>	<b>12-12-2000</b>	<b>CA 2237627 A1</b> <b>US 6158380 A</b>	<b>14-11-1996</b> <b>12-12-2000</b>
<b>US 5313670 A</b>	<b>24-05-1994</b>	<b>AT 182754 T</b> <b>AU 687411 B2</b> <b>CA 2162558 A1</b> <b>EP 0701407 A1</b> <b>JP H08510300 A</b> <b>NZ 267778 A</b> <b>US 5313670 A</b> <b>WO 9426136 A1</b>	<b>15-08-1999</b> <b>26-02-1998</b> <b>24-11-1994</b> <b>20-03-1996</b> <b>29-10-1996</b> <b>22-09-1997</b> <b>24-05-1994</b> <b>24-11-1994</b>
<b>US 2011154561 A1</b>	<b>30-06-2011</b>	<b>NONE</b>	
<b>WO 0154523 A1</b>	<b>02-08-2001</b>	<b>AU 2553001 A</b> <b>JP 3070441 U</b> <b>WO 0154523 A1</b>	<b>07-08-2001</b> <b>04-08-2000</b> <b>02-08-2001</b>

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**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- IT 2009000547 W [0021]
- WO 2016178143 A1 [0021]
- WO 2017163196 A1 [0021]