(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 292 460 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
20.12.2023 Bulletin 2023/51

(21) Application number: **22189164.1**

(22) Date of filing: **07.08.2022**

(51) International Patent Classification (IPC):
A41D 13/018 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
A41D 13/018

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **14.06.2022 TW 111122075**

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(54) **PERSONAL PROTECTIVE DEVICE**

(57) A personal protective device (1) is provided, which includes a device body (10), at least one airbag unit (20), and an inflatable module (30). The device body (10) is configured to be worn on a user. The at least one airbag unit (20) is disposed on the device body (10). The inflatable module (30) is disposed on the device body (10) and connected to the at least one airbag unit (20); the inflatable module (30) is configured to inflate the at least one airbag unit (20). The inflatable module (30) includes a gas generator body (31) and a quick-release joint (32). One end of the gas generator body (31) is provided with a gas discharge part (312) and a fixed convex column (313). A socket member (321) and a fixing ring (322) respectively have predetermined fixing structures corresponding to the fixed convex column (313), so as to achieve the effects of quick disassembly, simple structure, and double tightening.

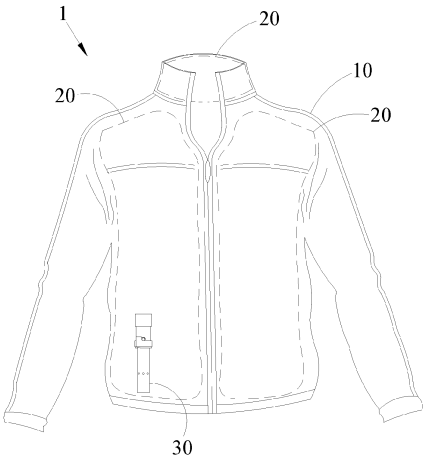

FIG. 1

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Description

CROSS-REFFERENCE TO RELATED APPLICATION

[0001] This application claims priority from Taiwan Patent Application No. 111122075, filed on June 14, 2022, in the Taiwan Intellectual Property Office, the content of which is hereby incorporated by reference in its entirety for all purposes.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present disclosure relates to a personal protective device, more particularly to a personal protective device with an airbag and an inflatable module thereof.

2. Description of the Related Art

[0003] Airbags are already standard equipment in vehicles. When a vehicle collision occurs, the gas generator inside the airbag can be instantly inflated within a very short period of time, so as to form a barrier layer with cushioning and protective functions, thereby protecting the safety of the driver and passengers. However, owing to the advantages of automobile gas generators such as fast speed, sufficient gas volume, small size, great safety, etc., many different industries are gradually using automobile gas generators as a power source for their products, such as personal protection, fire protection products, and the like.

[0004] Wherein, to achieve the purpose of life protection, inflatable protective clothing has been used in many fields, such as protective clothing, helmet, and the like for motorcyclists or extreme athletes. When a motorcyclist or extreme athlete encounters an accident during an activity, the airbag inside the inflatable protective clothing can be automatically filled with gas, so that injury to the motorcyclist or extreme athlete can be prevented with the use of the cushioning force of the airbag in the inflatable protective clothing. As stated above, in terms of personal protection, based on the product features of a gas generator, if used for personal protection purposes, a joint is required to connect the gas generator to its pouch to ensure that the generator does not separate from the pouch during operation due to recoil forces, allowing the system to maintain airtight to achieve pouch expansion and to keep the pouch full until the end of protection. Most of the general joints are connected to gas generators through screw threads. However, tightening through screw threads requires rotating the generator several times, so there is a possibility of loosening without final tightening. Moreover, the process of replacing the gas generator is time-consuming, and after repeated use or under the over-tightening condition, the joint may not be used to tighten the gas generator normally due to the damage to the screw threads. Furthermore, when the screw threads are severely damaged, the gas generator may be out of control, resulting in disengagement. Not only does it fail to protect personnel, but it may even cause unexpected injuries to them.

[0005] Accordingly, the inventor of the present disclosure has designed a personal protective device in an effort to tackle deficiencies in the prior art and further improve practical implementation in industries.

SUMMARY OF THE INVENTION

[0006] The present disclosure aims to provide a personal protective device to solve the problems that can be encountered in the prior art.

[0007] Based on the above subjects, the present disclosure provides a personal protective device, including a device body, at least one airbag unit, and an inflatable module. The device body is configured to be worn on a user. The at least one airbag unit is disposed on the device body. The inflatable module is disposed on the device body and connected to the at least one airbag unit; the inflatable module is configured to inflate the at least one airbag unit. The inflatable module includes a gas generator body and a quick-release joint. One end of the gas generator body has an assembly part, and the assembly part is a cylindrical shape. The assembly part has a gas discharge part and a fixed convex column protruding from the gas generator body in a radial direction. The quick-release joint includes a socket member and a fixing ring. The socket member is configured to be connected to the airbag unit and be rotatably positioned on the assembly part. The socket member has a first groove and a rotational groove; the first groove is disposed along an axial direction of the socket member; one end of the first groove is connected to one end of the socket member sleeved on the assembly part, and another end of the first groove is connected to one end of the rotational groove. The rotational groove is disposed along a first rotational direction, and another end of the rotational groove is a terminal end. The fixing ring may be rotatably positioned on the socket member, and the fixing ring has a second groove and a rotational sliding surface. One end of the second groove is connected to one end of the fixing ring sleeved on the socket member, and another end of the second groove is connected to one end of the rotational sliding surface; the rotational sliding surface is disposed along a second rotational direction opposite to the first rotational direction, and another end of the rotational sliding surface is a terminal end; another end of the rotational sliding surface adjacent to the rotational sliding surface is provided with a fixed convex part with a raised disposition.

[0008] Preferably, when the quick-release joint is assembled with the gas generator body, the fixed convex column is positioned between the terminal end of the rotational groove and the terminal end of the rotational sliding surface and between the terminal end of the ro-

tational sliding surface and the fixed convex part.

[0009] Preferably, the fixed convex part is an arc shape, and the fixed convex part has a maximum protrusion height; one side of the rotational groove relative to the rotational sliding surface has a concession distance from the fixed convex part, and the concession distance is greater than the maximum protrusion height of the fixed convex part.

[0010] Preferably, the assembly part has a neck part tapered from a circular diameter; the neck part is provided with a first elastic ring; one end of the socket member has an insertion hole into which the assembly part reaches; the insertion hole is provided with a stop part corresponding to a position of the first elastic ring, and a gap between the stop part and the neck part is smaller than a thickness or diameter of the first elastic ring.

[0011] Preferably, a position of the stop part relative to the neck part is provided with an oblique part.

[0012] Preferably, another end of the socket member is provided with a gas flow port, and a circular diameter of the gas flow port is larger than that of the assembly part.

[0013] Preferably, a position corresponding to the gas discharge part in the gas flow port is provided with a buffer groove, and the buffer groove is recessed inward from an inner surface of the gas flow port.

[0014] Preferably, an outer periphery of the socket member adjacent to another end of the socket member is provided with a plurality of second elastic rings at intervals.

[0015] Preferably, the gas generator body further includes a triggered unit; the triggered unit is triggered to drive the gas generator body to inflate the at least one airbag unit. the personal protective device further includes a driving line; one end of the driving line is connected to the triggered unit to trigger the triggered unit, and another end of the driving line is disposed at a predetermined position.

[0016] Preferably, the gas generator body further includes a triggered unit; the triggered unit is triggered to drive the gas generator body to inflate the at least one airbag unit. The personal protective device further includes a sensing unit and a control unit disposed on the device body; the sensing unit is electrically connected to the control unit and configured to sense the device body to generate a triaxial acceleration signal; the control unit controls the triggered unit to operate when the triaxial acceleration signal is determined to meet a protection condition.

[0017] The personal protective device of the present disclosure may achieve the following beneficial effects:

1. The personal protective device of the present disclosure may achieve the effect of rapid replacement through the predetermined groove configuration of the socket member and the fixing ring of the inflatable module, as well as the configuration of the fixed convex column of the gas generator body; moreover, the effect of immediate deflation may also be achieved after use.

2. The personal protective device of the present disclosure may achieve the effect of simple structure, small size, and lightweight through the configuration of the predetermined structure of the socket member and the fixing ring of the inflatable module.

3. The personal protective device of the present disclosure has double tightening or securing protection to prevent disengagement, which is not easily damaged, through the configuration of the predetermined structure of the socket member and the fixing ring of the inflatable module.

[0018] The technical features of the present disclosure are to be illustrated in detail below with specific embodiments and accompanying drawings to make a person with ordinary skills in the art effortlessly understand the purposes, technical features, and advantages of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The drawings required for the description of the embodiments of the present disclosure are to be briefly described below to illustrate more clearly the technical solutions of the embodiments of the present disclosure. It is obvious that the accompanying drawings described below are only some embodiments of the present disclosure. For a person with ordinary skills in the art, additional drawings can be obtained according to these drawings.

FIG. 1 is a structural schematic diagram of the personal protective device according to the present disclosure.

FIG. 2 is an exploded schematic diagram of the inflatable module of the personal protective device according to the present disclosure.

FIG. 3 is a cross-sectional schematic diagram of the inflatable module of the personal protective device according to the present disclosure.

FIG. 4 is a schematic diagram of the complete assembly of the inflatable module of the personal protective device according to the present disclosure.

FIG. 5 is a schematic diagram of the first assembly of the inflatable module of the personal protective device according to the present disclosure.

FIG. 6 is a schematic diagram of the second assembly of the inflatable module of the personal protective device according to the present disclosure.

FIG. 7 is a structural schematic diagram of the first

embodiment of the personal protective device according to the present disclosure.

FIG. 8 is a block schematic diagram of the second embodiment of the personal protective device according to the present disclosure.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] The advantages, features, and technical methods of the present disclosure are to be explained in detail with reference to the exemplary embodiments and the figures for the purpose of being easier to be understood. Moreover, the present disclosure may be realized in different forms, and should not be construed as being limited to the embodiments set forth herein. Conversely, for a person with ordinary skills in the art, the embodiments provided shall make the present disclosure convey the scope more thoroughly, comprehensively, and completely. In addition, the present disclosure shall be defined only by the appended claims.

[0021] It should be noted that although the terms "first," "second," and the like may be used in the present disclosure to describe various elements, components, regions, sections, layers, and/or parts, these elements, components, regions, sections, layers and/or parts should not be limited by these terms. These terms are only used to distinguish one element, component, region, sections, layer, and/or part from another element, component, region, sections, layer, and/or part.

[0022] Unless otherwise defined, all terms (including technical and scientific terms) used in the present disclosure have the same meaning as those commonly understood by a person with ordinary skills in the art. It should be further understood that, unless explicitly defined herein, the terms such as those defined in commonly used dictionaries should be interpreted as having definitions consistent with their meaning in the context of the related art and the present disclosure, and should not be construed as idealized or overly formal.

[0023] Please refer to FIG. 1, which is a structural schematic diagram of the personal protective device according to the present disclosure. As shown in the figure, the personal protective device 1 of the present disclosure mainly includes a device body 10, at least one airbag unit 20, and an inflatable module 30.

[0024] Wherein, the device body 10 may be a protective device worn on a user's body, such as fall-proof clothing (or pant and jumpsuit), life jacket, helmet, and the like, which is well known or commonly used by a person with ordinary skills in the art; alternatively, it may be the protective device worn on a user's neck, arms, or legs, which is also well known or commonly used by a person with ordinary skills in the art.

[0025] Wherein, the airbag unit 20 may be an airbag and the like well known or commonly used by a person with ordinary skills in the art, which is disposed on the device body 10. For example, when the device body 10 is fall-proof clothing or a life jacket, the airbag unit 20 may be an airbag that may directly correspond to the user's chest and back; alternatively, the airbag unit 20 may be used as two airbags corresponding to the user's chest and back; yet alternatively, the airbag unit 20 may be used as three airbags corresponding to the user's chest, back, and neck. Another example is that when the device body 10 is a helmet, the airbag unit 20 may be an airbag bag covering the entire exterior of the helmet; alternatively, the airbag unit 20 may be used as three airbags corresponding to the top, back, and sides of the user's head; yet alternatively, the airbag unit 20 may be used as four airbags corresponding to the top, back, sides, and neck of the user's head. Wherein, when there are a plurality of airbag units 20, they may be connected to each other through one or more pipelines, so that when one of the airbags is inflated, the others may be inflated at the same time.

[0026] In the present embodiment, the fall-proof clothing commonly used by motorcyclists or extreme athletes is used as an exemplary aspect, but the personal protective device 1 of the present disclosure should not be limited thereto.

[0027] Wherein, the inflatable module 30 is disposed on the device body 10 and connected to the at least one airbag unit 20; it should be noted that the inflatable module 30 may be directly connected to an airbag unit 20, alternatively indirectly connected to an airbag unit 20 through appropriate pipelines, or yet alternatively simultaneously connected to multiple airbags 20 through appropriate pipelines. Wherein, the inflatable module 30 is configured to inflate the at least one airbag unit 20 to fill the airbag unit 20 with gas, thus protecting the human body and improving safety performance when the user makes contact with the ground.

[0028] Wherein, the detailed description of the inflatable module 30 is to be further described as follows.

[0029] Please refer to FIG. 2 to FIG. 6 together with FIG. 1. FIG. 2 is an exploded schematic diagram of the inflatable module of the personal protective device according to the present disclosure. FIG. 3 is a cross-sectional schematic diagram of the inflatable module of the personal protective device according to the present disclosure. FIG. 4 is a schematic diagram of the complete assembly of the inflatable module of the personal protective device according to the present disclosure. FIG. 5 and FIG. 6 are schematic diagrams of the first assembly and the second assembly of the inflatable module of the personal protective device according to the present disclosure.

[0030] As shown in the figure, the inflatable module 30 of the personal protective device of the present disclosure mainly includes a gas generator body 31 and a quick-release joint 32.

[0031] Wherein, the material of the bottle, the internal structure, and the contents contained therein of the gas generator body 31 may be technical means known or

commonly used by a person with ordinary skills in the art, which is not to be described herein. One end of the gas generator body 31 has an assembly part 311. Wherein, the assembly part 311 is preferably a cylindrical shape, and the assembly part 311 has a gas discharge part 312 and a fixed convex column 313 protruding from the surface of the gas generator body 31 in a radial direction; preferably, the fixed convex column 313 may be a cylinder, an ellipsoid, or the like; alternatively, the fixed convex column 313 may be a column having a structure with rounded corners, oblique corners, and the like at special sections (corresponding to the position of the fixed convex part 3223 described below).

[0032] Wherein, the quick-release joint 32 includes a socket member 321 and a fixing ring 322. The socket member 321 may be made of general steel iron metal but may also be made of aluminum alloy to reduce the overall weight. The socket member 321 may be rotatably positioned or disposed on the assembly part 311 . The fixing ring 322 is made of general steel iron metal to ensure the characteristics of wear resistance and better rigidity. The fixing ring 322 is rotatably positioned on the socket member 321.

[0033] Further, the socket member 321 may be substantially a cylindrical or tubular shape to have an insertion hole 3214, so that the socket member 321 may be positioned or disposed on the assembly part 311 by using the insertion hole 3214. Wherein, the socket member 321 has a first groove 3211 and a rotational groove 3212. The first groove 3211 is disposed along an axial direction of the socket member 321; one end of the first groove 3211 is connected to one end of the socket member 321 sleeved on the assembly part 311, and another end of the first groove 3211 is connected to one end of the rotational groove 3212; that is, the first groove 3211 is extended and connected to the rotational groove 3212 from one end of the socket member 321 that is reached or inserted by the assembly part 311. Another end of the rotational groove 3212 is a terminal end. That is, the first groove 3211 and the rotational groove 3212 may form a limiting structure in an L shape (or "Γ" shape"). In so doing, when the socket member 321 is positioned or disposed on the assembly part 311 by using the insertion hole 3214, the fixed convex column 313 may enter the limiting structure (the first groove 3211 and the rotational groove 3212) of the socket member 321 through the first groove 3211.

[0034] It should be noted that the outer periphery of the socket member 321 adjacent to another end of the socket member 321 is provided with a plurality of second elastic rings 34 at intervals. In so doing, excellent air tightness is achieved between the inflatable module 30 of the present disclosure and the airbag unit 20 assembled or disposed.

[0035] In addition, the fixing ring 322 correspondingly has a second groove 3221 and a rotational sliding surface 3222. Wherein, one end of the second groove 3221 is connected to one end of the fixing ring 322 sleeved on the socket member 321; another end of the second groove 3221 is connected to one end of the rotational sliding surface 3222, and another end of the rotational sliding surface 3222 is a terminal end. That is, the second groove 3221 and the rotational sliding surface 3222 may form a limiting structure in an L shape (or "¬" shape"). In so doing, when the fixing ring 322 is positioned or disposed on the combination of the socket member 321 and the assembly part 311, the fixed convex column 313 may enter into the limiting structure of the fixing ring 322 through the second groove 3221.

[0036] It should be noted that the rotational groove 3212 is disposed along the first rotational direction R1, whereas the rotational sliding surface 3222 is disposed along the second rotational direction R2 opposite to the first rotational direction R1. Furthermore, another end of the rotational sliding surface 3222 adjacent to the rotational sliding surface 3222 is provided with a fixed convex part 3223 with a raised disposition. That is, when the quick-release joint 32 is assembled with the gas generator body 31, the fixed convex column 313 is positioned between the terminal end of the rotational groove 3212 and the terminal end of the rotational sliding surface 3222 and between the terminal end of the rotational sliding surface 3222 and the fixed convex part 3223. In so doing, when the gas generator body 31 or the quick-release joint 32 is rotated to make the fixed convex column 313 pass over the fixed convex part 3223, the fixed convex part 3223 may limit the degree of freedom in the reverse displacement of the fixed convex part 313, so that the quick-release joint 32 may be stably disposed on the gas generator body 31.

[0037] On the other hand, the assembly part 311 has a neck part 313 tapered from a circular diameter, and the neck part 313 is provided with a first elastic ring 33; preferably, the first elastic ring 33 may be made of EPDM material to achieve the feature of excellent temperature resistance. Wherein, the insertion hole 3214 is provided with a stop part 3215 corresponding to the position of the first elastic ring 33, and a gap between the stop part 3215 and the neck part 313 is smaller than the thickness or circular diameter of the first elastic ring 33. It should be noted that the position of the stop part 3215 relative to the neck part 313 is provided with an oblique part 3216; that is, oblique part 3216 is disposed at the position where the stop part 3215 faces the first elastic ring 33. Through the configuration of the stop part 3215 and the predetermined structure of the first elastic ring 33, the stop part 3215, the oblique part 3216, and the neck part 313 may press and deform the first elastic ring 33 when the quick-release joint 32 is assembled with the gas generator body 31, thus filling or blocking the gap between the stop part 3215 and the neck part 313, so that excellent air tightness may be achieved between the inflatable module 30 of the present disclosure and the airbag unit 20 assembled or disposed.

[0038] As shown in FIG. 6, it is worth mentioning that the fixed convex part 3223 is an arc shape or has a struc-

ture with rounded corners, circular arcs, bevels, and the like at both ends. Wherein, the fixed convex part 3223 has a maximum protrusion height H, which may be 0.4 mm to 0.8 mm, for example; the actual value thereof may be adjusted according to the actual application, which should not be regarded as a limitation. Wherein, one side of the rotational groove 3212 relative to the rotational sliding surface 3222 has a concession distance 3213 from the fixed convex part 3223, and the concession distance 3213 is greater than the maximum protrusion height H of the fixed convex part 3223. Because the first elastic ring 33 has an appropriate elastic restoring force, the first elastic ring 33 may also provide the ability to restore the position of the fixed convex column 313 at the time of the gas generator body 31 being displaced in an axial direction during the period when the fixed convex column 313 passes over the fixed convex part 3223. Furthermore, when the stop part 3215, the oblique part 3216, and the neck part 313 press the first elastic ring 33 to deform the first elastic ring 33, the elastic restoring force of the first elastic ring 33 may simultaneously provide the effects of the fixed convex column 313 being positioned between the terminal end of the rotational groove 3212 and the terminal end of the rotational sliding surface 3222 and between the terminal end of the rotational sliding surface 3222 and the fixed convex part 3223.

[0039] It should be noted that the oblique part 3216 also helps the smoothness of the up-and-down movement of the socket member 321 during assembly, so as to facilitate the user to assemble the socket member 321 to the assembly part 311.

[0040] What's more, another end of the socket member 321 (that is, the end opposite to the insertion end of the assembly part 311) has a gas flow port 3217, and the caliber of the gas flow port 3217 is larger than the circular diameter of the assembly part 311. Wherein, the position of the gas flow port 3217 corresponding to the gas discharge part 312 is provided with a buffer groove 3218, and the buffer groove 3218 is recessed inward from the inner surface of the gas flow port 3217; that is, the gas flow port 3217 and the buffer groove 3218 may be substantially or cross-sectionally formed into a convex-shaped structure. Preferably, a junction of the buffer groove 3218 and the inner surface of the gas flow port 3217 is provided with a diversion part 3219.

[0041] In so doing, the buffer groove 3218 may effectively mitigate the impact force of the gas generator when gas is discharged, avoiding the occurrence of rupture of the airbag unit 20 (airbag) caused by excessive impact force when gas is discharged. It is worth mentioning that in actual application, the caliber of the gas flow port 3217 may be adjusted to be larger than the circular diameter of the assembly part 311; that is, the size of the gap between the socket member 321 and the assembly part 311 after the buffer groove 3217 is adjusted when the gas flows out, so as to adjust the flow rate and flow volume of the gas.

[0042] Please refer to FIG. 2 and FIG. 3 together with FIG. 5 and FIG. 6. The related steps of the inflatable module 30 are to be described below.

[0043] Firstly, the assembly part 311 of the gas generator body 31 is inserted into the quick-release joint 32, which means that the fixing ring 322 is rotated to align or overlap the first groove 3211 with the second groove 3221 and that the fixed convex column 313 is aligned with the first groove 3211 and the second groove 3221, followed by the assembly part 311 being inserted into the insertion hole 3214. Meanwhile, the fixed convex column 313 enters the first groove 3211 and the second groove 3221 at the same time. Next, the user may first fix the rotational freedom of the quick-release joint 32 and rotate the gas generator body 31 along the first rotational direction R1 (or the user may rotate the socket member 321 and the gas generator body 31 relatively) to make the fixed convex column 313 reach the terminal end of the rotational groove 3212.

[0044] Then, the rotational freedoms of the gas generator body 31 and the socket member 321 are fixed, and the fixing ring 322 is rotated along the first rotational direction R1 (or the user may rotate the combination of the gas generator body 31 with the socket member 321 and the fixing ring 322 relatively) to make the fixed convex column 313 reach the position of the fixed convex part 3223. After that, the rotational freedom of the fixing ring 322 is fixed, and the gas generator body 31 is rotated along the second rotational direction R2 to make the fixed convex column 313 pass over the fixed convex part 3223. Finally, the gas generator body 31 is rotated to make the fixed convex column 313 reach a terminal end of the rotational groove 3212. Meanwhile, the fixed convex column 313 is positioned between the terminal end of the rotational groove 3212 and the terminal end of the rotational sliding surface 3222 and between the terminal end of the rotational sliding surface 3222 and the fixed convex part 3223.

[0045] In so doing, between the gas generator body 31 and the quick-release joint 32, the inflatable module 30 may have double tightening or securing protection to prevent disengagement, which is not easily damaged, through the configuration of the predetermined structure of the socket member 321 and the fixing ring 322. It is worth mentioning that from the aforementioned description, the inflatable module 30 of the personal protective device 1 of the present disclosure may be quickly assembled; certainly, the gas generator may also be quickly disassembled. Therefore, after the personal protective device 1 of the present disclosure is operated to make the airbag unit 20 (airbag) inflated with gas for the protection of the user, relevant personnel may quickly disassemble the gas generator body 31 to make the gas in the airbag unit 20 (airbag) quickly discharged for the convenience of facilitating the follow-up procedures to the user, such as inspection or medical first aid, and the like.

[0046] Please refer to FIG. 7, which is a structural schematic diagram of the first embodiment of the personal protective device according to the present disclosure. As

shown in the figure, what mainly differentiates the present embodiment from the aforementioned description is that the gas generator body 31 further includes a triggered unit 315, and the personal protective device 1 further includes a driving line 40.

[0047] Wherein, the triggered unit 315 may be, for example, an element such as an igniter well known to a person with ordinary skills in the art; the triggered unit 315 is triggered to drive the gas generator body 31 to inflate the at least one airbag unit 20. That is to say, when an unexpected situation occurs, the triggered unit 315 may be triggered, so that the content inside the gas generator body 31 is activated to generate gas (e.g., suitable temperature and high-pressure gas), and the airbag unit 20 is filled through the gas discharge part 312.

[0048] Wherein, one end of the driving line 40 is connected to the triggered unit 315 to trigger the triggered unit 315, another end of the driving line 40 is disposed at a predetermined position, and the predetermined position is, for example, a specific position on a motorcycle or a specific position on tool devices used by extreme athletes. That is to say, when an unexpected situation occurs, the user is separated from the motorcycle or the tool devices used, so that the driving line 40 may be used to pull the triggered unit 315, thus triggering the triggered unit 315.

[0049] Please refer to FIG. 8, which is a structural schematic diagram of the second embodiment of the personal protective device according to the present disclosure. As shown in the figure, what mainly differentiates the present embodiment from the aforementioned description is that the gas generator body 31 further includes a triggered unit 315, and the personal protective device 1 further includes a sensing unit 51 and a control unit 52 disposed on the device body 10.

[0050] Wherein, as described in the previous embodiment, the triggered unit 315 is triggered to drive the gas generator body 31 to inflate the at least one airbag unit 20. The sensing unit 51 is electrically connected to the control unit 52 and configured to sense the device body 10 to generate a triaxial acceleration signal 511. For example, the sensing unit 51 may be, for example, a triaxial accelerometer for sensing the acceleration of the three axes (that is, vertical axis, horizontal axis, and vertical axis). The control unit 52 has the capability of logic operation and may be used for numerical operation, which may be, for example, a central processing unit (CPU), a microcontroller (MCU), or an open-source single-chip controller (e.g., Arduino, Raspberry Pi, etc.), which controls the triggered unit 315 to operate when the protection condition 521 is met according to the triaxial acceleration signal 511.

[0051] For example, the signals detected by the sensing unit 51 may always be sent to the control unit 52 for determination; if the detected signals all show stable changes within a certain period of time, the control unit 52 may determine the situation as the non-protection condition; if the signals change drastically within a certain period of time, the control unit 52 may determine the situation as the protection condition 521. Another example is that when the sensing unit 51 detects that the signals exceed the preset value set by the control unit 52, the protection condition 521 may be determined.

[0052] It is worth mentioning that the aforementioned embodiments may be applied in combination without conflicting with each other. Hence, the exemplary aspects in the embodiments should not be used as limitations only.

[0053] The above description is merely illustrative rather than restrictive. Any equivalent modifications or alterations without departing from the spirit and scope of the present disclosure are intended to be included in the following claims.

Claims

1. A personal protective device (1), comprising:

a device body (10) configured to be worn on a user;
at least one airbag unit (20) disposed on the device body (10); and
an inflatable module (30) disposed on the device body (10) and connected to the at least one airbag unit (20), the inflatable module (30) being configured to inflate the at least one airbag unit (20), the inflatable module (30) comprising a gas generator body (31) and a quick-release joint (32), one end of the gas generator body (31) having an assembly part (311), the assembly part (311) being a cylindrical shape, and the assembly part (311) having a gas discharge part (312) and a fixed convex column (313) protruding from the gas generator body (31) in a radial direction; the quick-release joint (32) comprising a socket member (321) and a fixing ring (322), the socket member (321) being configured to connect to the at least one airbag unit (20) and be rotatably positioned on the assembly part (311), the socket member (321) having a first groove (3211) and a rotational groove (3212), the first groove (3211) being disposed along an axial direction of the socket member (321), one end of the first groove (3211) being connected to one end of the socket member (321) sleeved on the assembly part (311), another end of the first groove (3211) being connected to one end of the rotational groove (3212), the rotational groove (3212) being disposed along a first rotational direction (R1), and another end of the rotational groove (3212) being a terminal end; the fixing ring (322) being rotatably positioned on the socket member (321), the fixing ring having a second groove (3221) and a rotational sliding surface (3222), one end of the second groove

(3221) being connected to one end of the fixing ring (322) sleeved on the socket member (321), another end of the second groove (3221) being connected to one end of the rotational sliding surface (3222), the rotational sliding surface (3222) being disposed along a second rotational direction (R2) opposite to the first rotational direction (R1), and another end of the rotational sliding surface (3222) being a terminal end; another end of the rotational sliding surface (3222) adjacent to the rotational sliding surface (3222) being provided with a fixed convex part (3223) with a raised disposition.

2. The personal protective device (1) according to claim 1, wherein when the quick-release joint (32) is assembled with the gas generator body (31), the fixed convex column (313) is positioned between the terminal end of the rotational groove (3212) and the terminal end of the rotational sliding surface (3222) and between the terminal end of the rotational sliding surface (3222) and the fixed convex part (3223).

3. The personal protective device (1) according to claim 1, wherein the fixed convex part (3223) is an arc shape, the fixed convex part (3223) has a maximum protrusion height (H), one side of the rotational groove (3212) relative to the rotational sliding surface (3222) has a concession distance (3213) from the fixed convex part (3223), and the concession distance (3213) is greater than the maximum protrusion height (H) of the fixed convex part (3223).

4. The personal protective device (1) according to claim 1, wherein the assembly part (311) has a neck part (313) tapered from a circular diameter, the neck part (313) is provided with a first elastic ring (33), one end of the socket member (321) has an insertion hole (3214) into which the assembly part (311) reaches, the insertion hole (3214) is provided with a stop part (3215) corresponding to a position of the first elastic ring (33), and a gap between the stop part (3215) and the neck part (313) is smaller than a thickness or diameter of the first elastic ring (33).

5. The personal protective device (1) according to claim 4, wherein a position of the stop part (3215) relative to the neck part (313) is provided with an oblique part (3216).

6. The personal protective device (1) according to claim 4, wherein another end of the socket member (321) is provided with a gas flow port (3217), and a circular diameter of the gas flow port (3217) is larger than that of the assembly part (311).

7. The personal protective device (1) according to claim 6, wherein a position corresponding to the gas discharge part (312) in the gas flow port (3217) is provided with a buffer groove (3218), and the buffer groove (3218) is recessed inward from an inner surface of the gas flow port (3217).

8. The personal protective device (1) according to claim 1, wherein an outer periphery of the socket member (321) adjacent to another end of the socket member (321) is provided with a plurality of second elastic rings (34) at intervals.

9. The personal protective device (1) according to any one of claim 1 to claim 8, wherein the gas generator body (31) further comprises a triggered unit (315), the triggered unit (315) is triggered to drive the gas generator body (31) to inflate the at least one airbag unit (20), the personal protective device (1) further comprises a driving line (40), one end of the driving line (40) is connected to the triggered unit (315) to trigger the triggered unit (315), and another end of the driving line (40) is disposed at a predetermined position.

10. The personal protective device (1) according to any one of claim 1 to claim 8, wherein the gas generator body (31) further comprises a triggered unit (315), the triggered unit (315) is triggered to drive the gas generator body (31) to inflate the at least one airbag unit (20), the personal protective device (1) further comprises a sensing unit (51) and a control unit (52) disposed on the device body (10), the sensing unit (51) is electrically connected to the control unit (52) and configured to sense the device body (10) to generate a triaxial acceleration signal (511), and the control unit (52) controls the triggered unit (315) to operate when the triaxial acceleration signal (511) is determined to meet a protection condition (521).

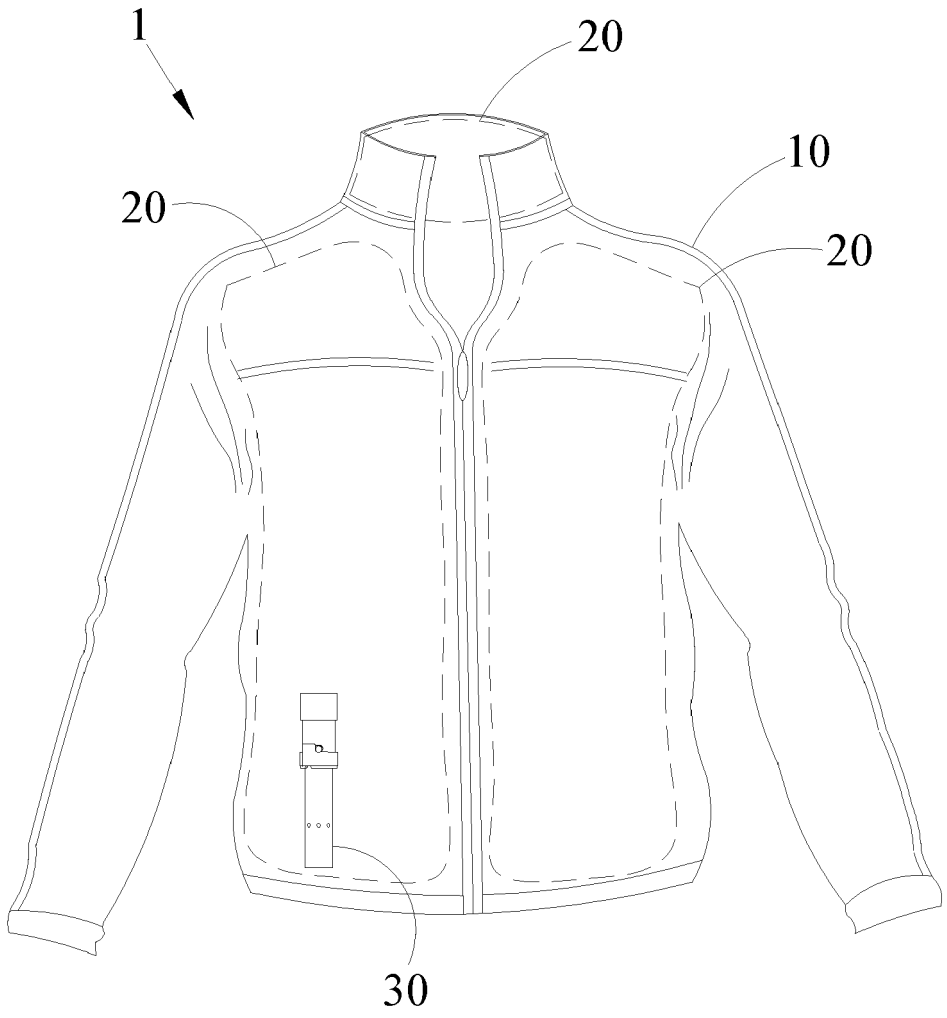
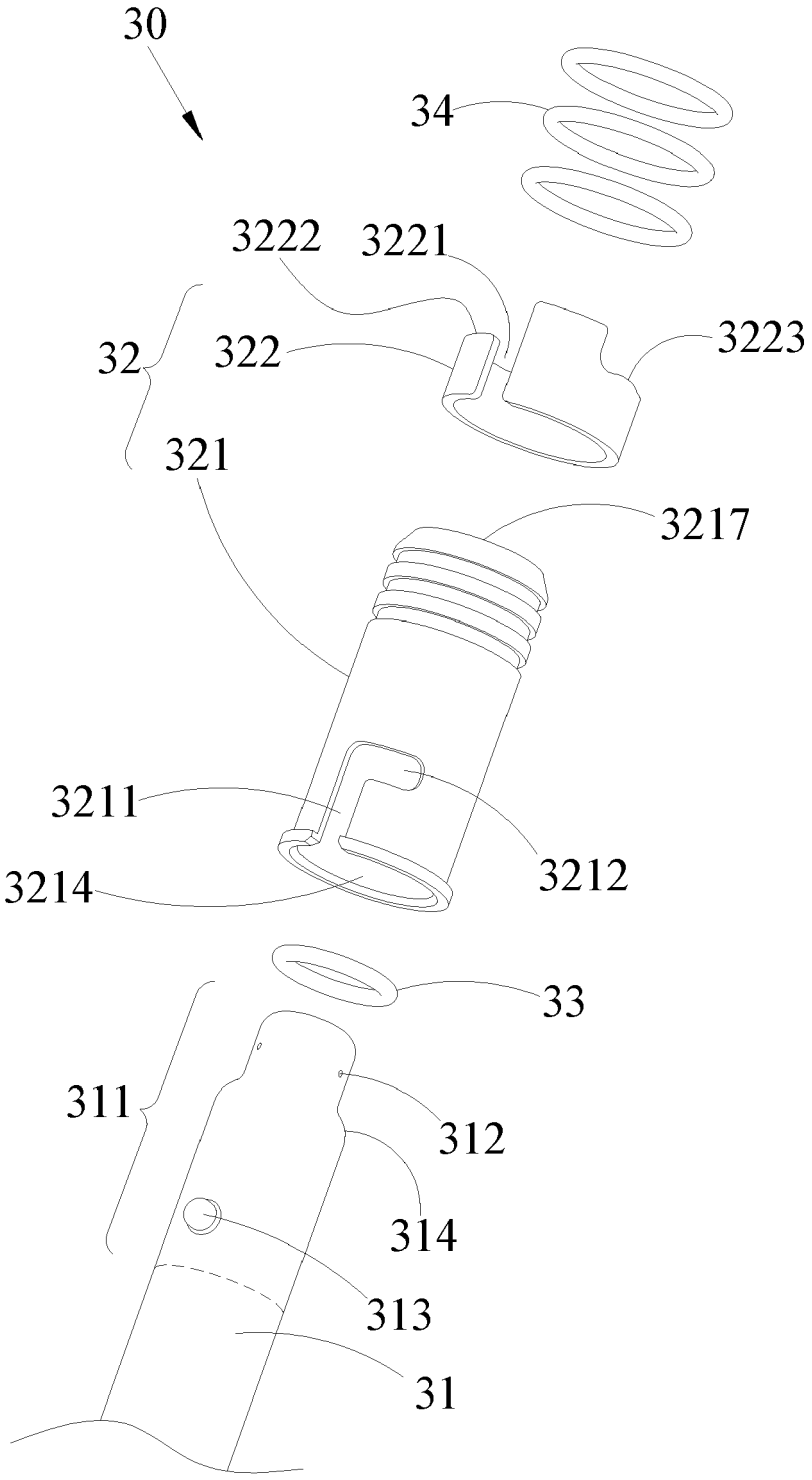


FIG. 1


30
34
3222
3221
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322
3223
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3217
3211
3212
3214
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311
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313
31

FIG. 2

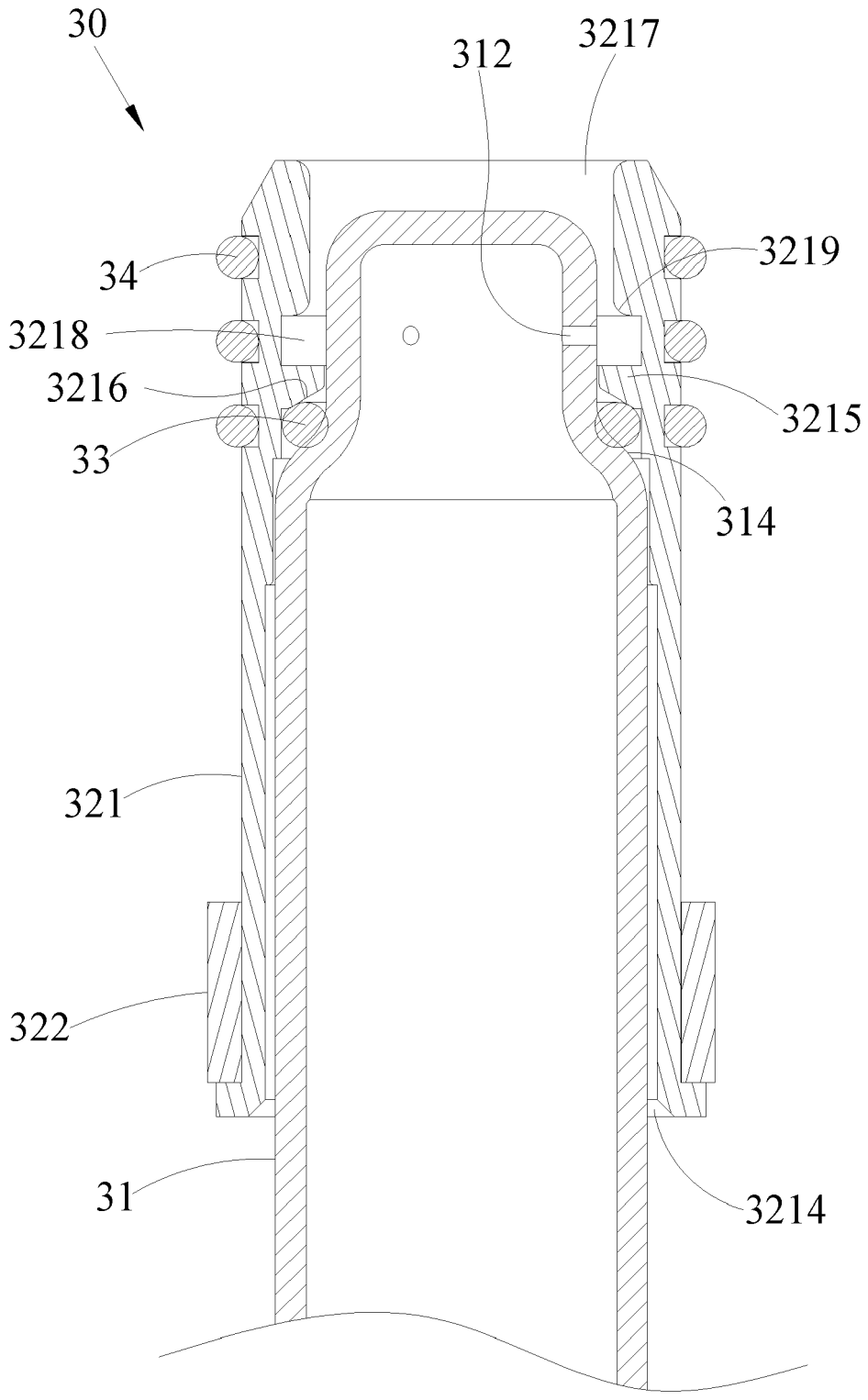

FIG. 3

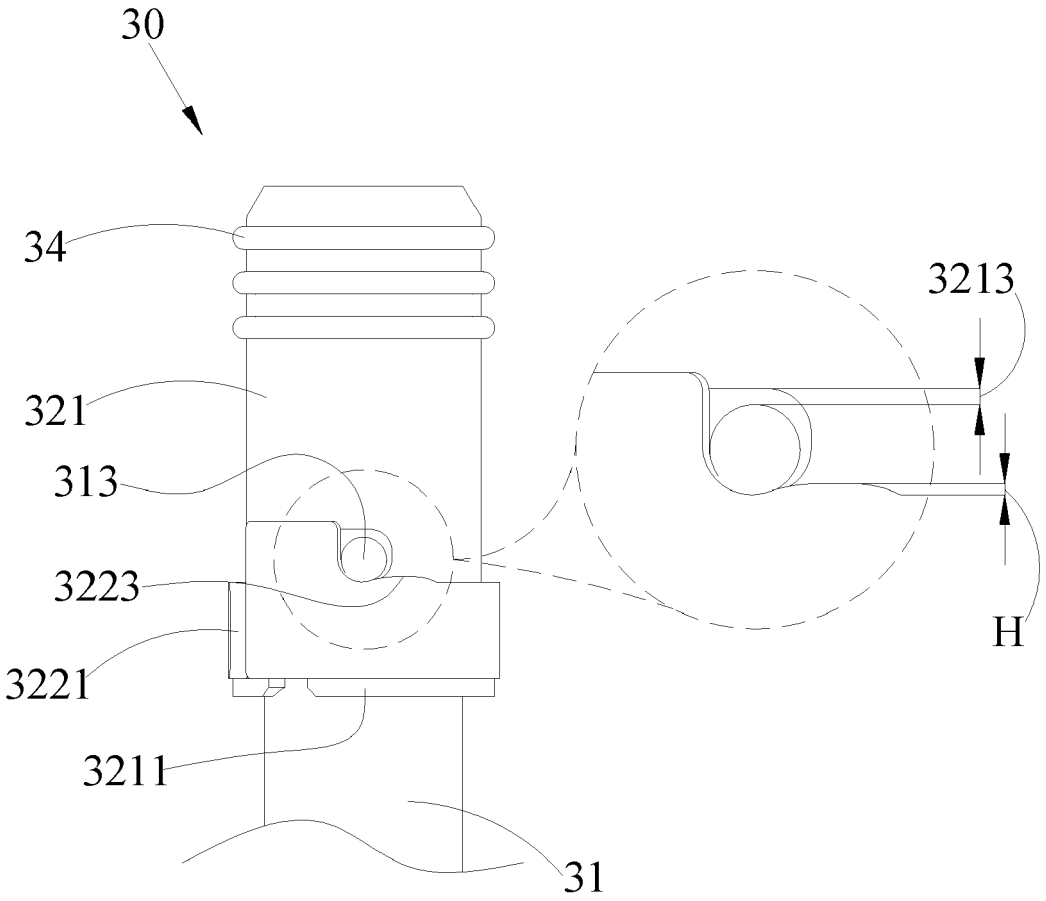

FIG. 4

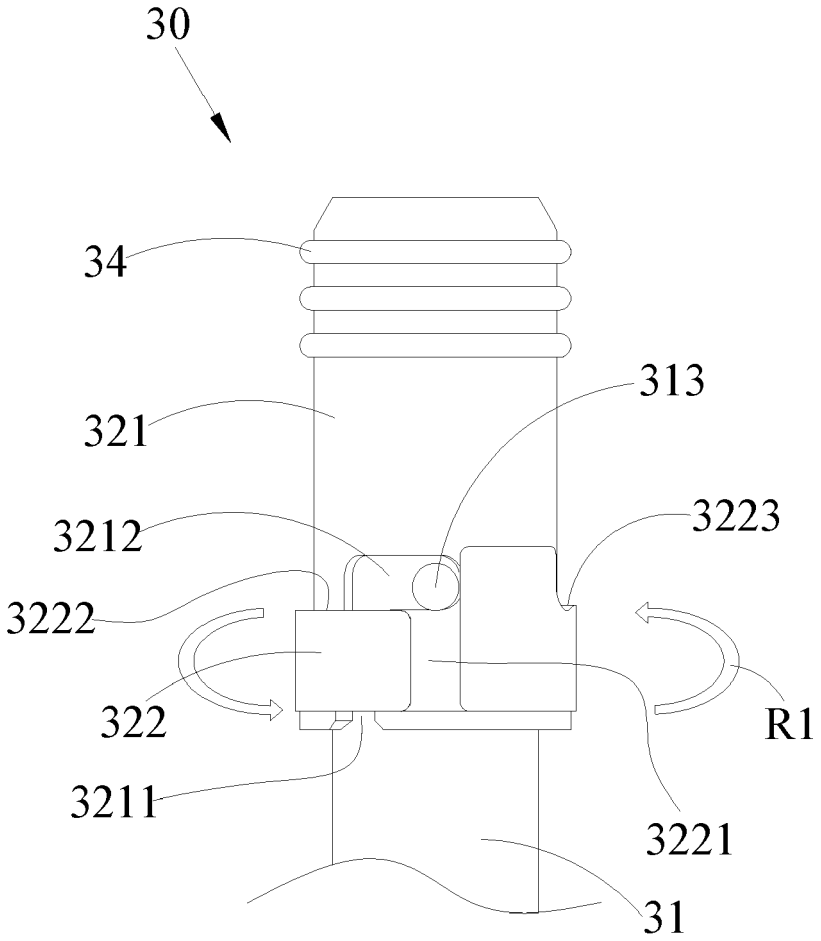

FIG. 5

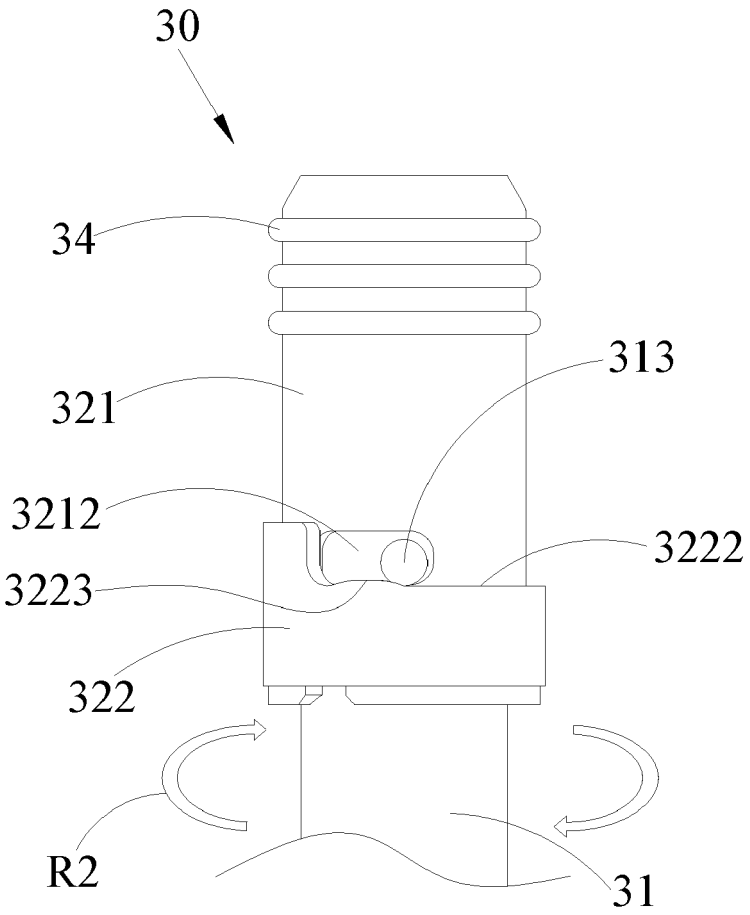

FIG. 6

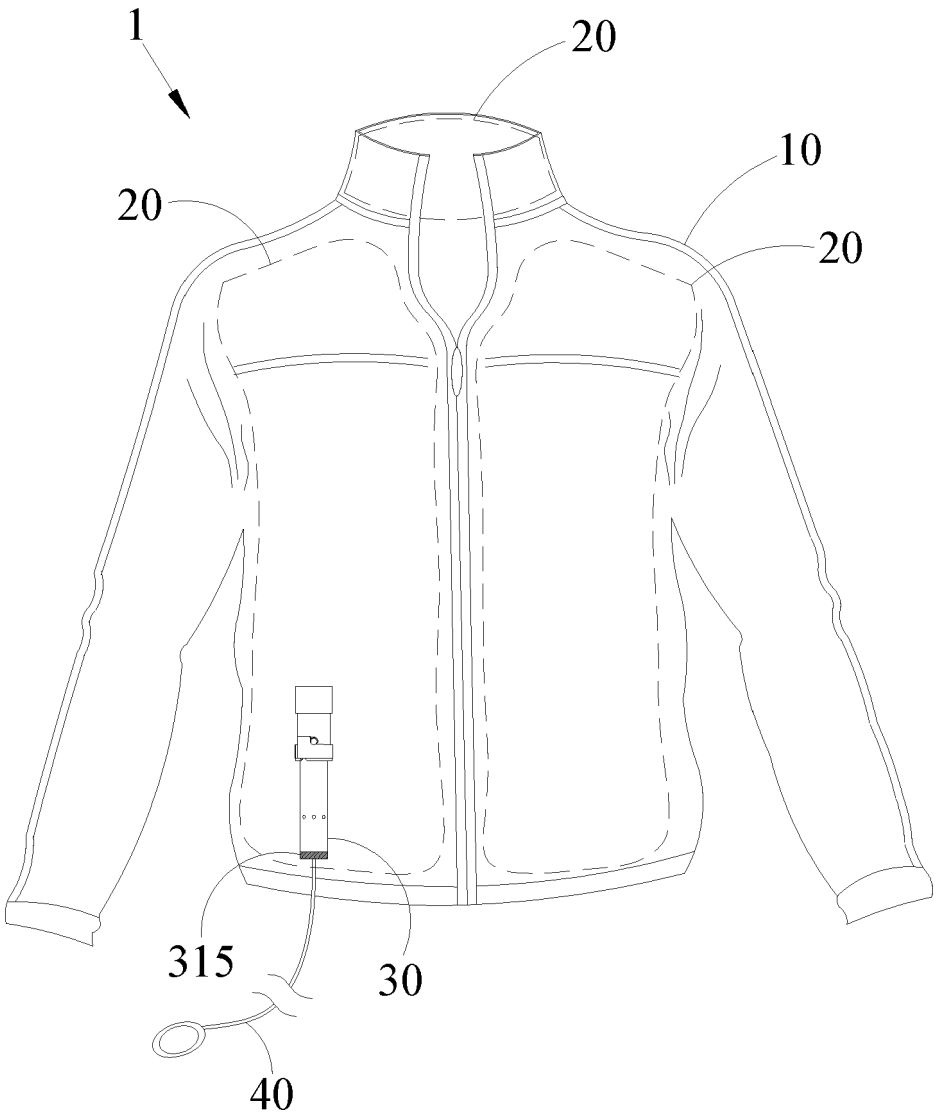

FIG. 7

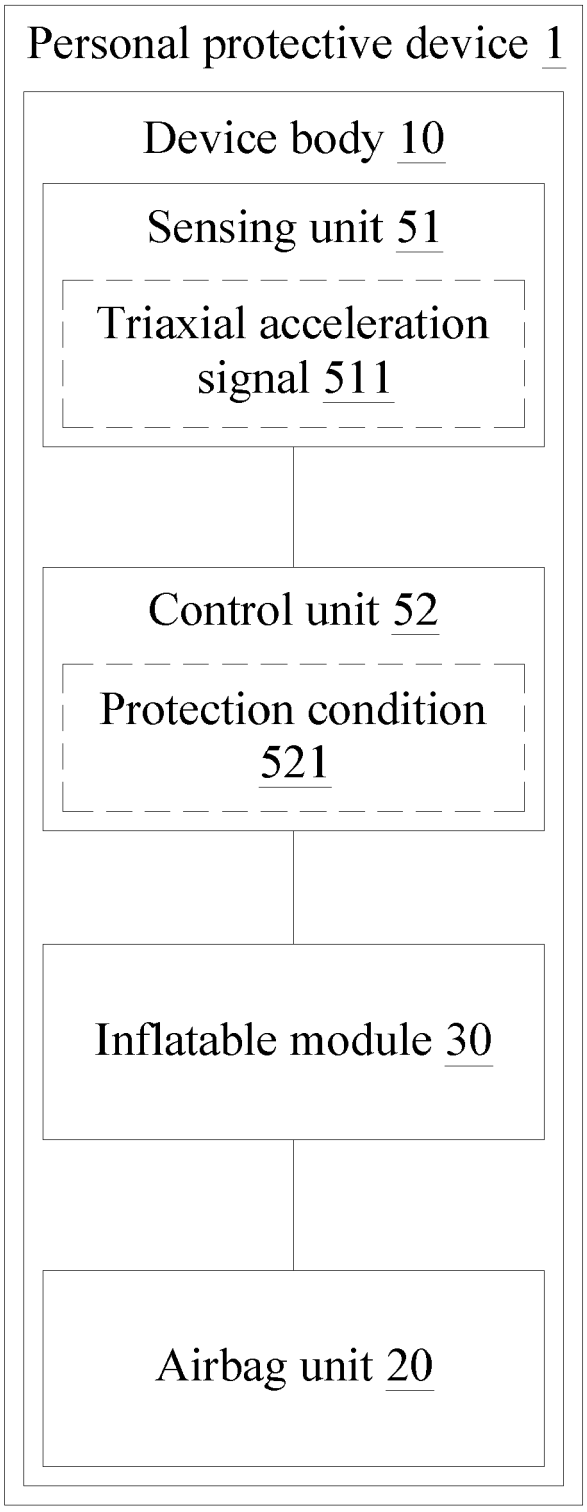
Personal protective device 1
Device body 10
Sensing unit 51
Triaxial acceleration signal 511
Control unit 52
Protection condition 521
Inflatable module 30
Airbag unit 20

FIG. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 22 18 9164

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F17C
B60S

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	10 May 2023	Thielgen, Robert

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