



(51) International Patent Classification:
A41D 13/05 (2006.01)

(21) International Application Number:
PCT/IT2011/000360

(22) International Filing Date:
26 October 2011 (26.10.2011)

(25) Filing Language: Italian

(26) Publication Language: English

(30) Priority Data:
MI2010A002019 29 October 2010 (29.10.2010) IT

(72) Inventor; and

(71) Applicant : RICUPITO, Fabrizio [IT/IT]; Via Cadolini
34, I-20137 Milano (MI) (IT).

(74) Agent: PES, Matteo; c/o Biesse S.R.L., Via Corfù 71,
I-25124 Brescia (IT).

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP,

KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD,
ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI,
NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU,
RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ,
TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA,
ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ,
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD,
RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ,
DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT,
LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS,
SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— as to the applicant's entitlement to claim the priority of
the earlier application (Rule 4.17(iii))

Published:

— without international search report and to be republished
upon receipt of that report (Rule 48.2(g))

(54) Title: STRUCTURE FOR PROTECTING OF THE BACK

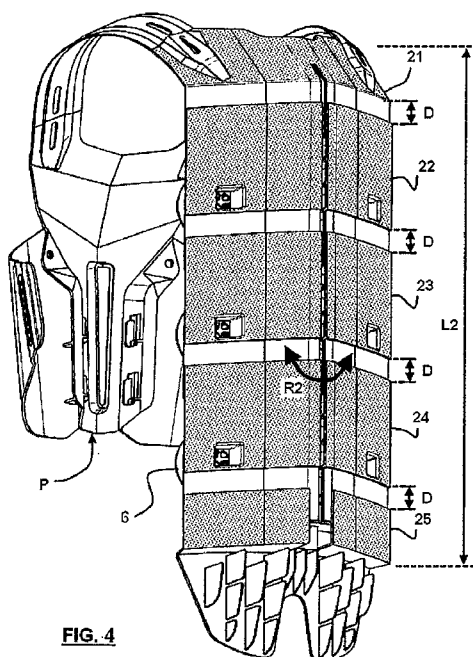


FIG. 4

(57) Abstract: A structure for protecting the back from impacts is described, for example a back protector for sports use, comprising a shield extending in a direction substantially longitudinal, able to be positioned on the user's back parallel to the spine, wherein said shield is formed by at least two elements for protecting corresponding portions of the back. The protective elements are able to translate with respect to one another in the longitudinal direction to follow the extension movements of the user's back. It is further described a protective element provided with rest elements on the user's back. The rest elements extend for a length at least sufficient to define, between the protective element and the user's back, a gap intended to promote air circulation. It is further described a protective element the outer surface thereof is substantially convex and has a discontinuity at a middle plane of the protective element. A portion of the outer surface, at the two sides of the discontinuity, is defined by deformable and/or flexible portions of the same protective element.

STRUCTURE FOR PROTECTING OF THE BACK

* * * *

DESCRIPTION

5 Background Of The Invention

The present invention refers to a structure for protecting the back, particularly it refers to a back protector for sports use, for example for motorcycle riders.

Prior art

10 In the sports scope, for example in the practice of skiing, motocross, enduro and motorbike speed competitions, it is known to protect the back wearing protection structures specifically intended for this purpose, usually defined as back protectors. The back protectors, worn by the user as a technical article of clothing, protect the back, and particularly the spine, in case of fortuitous impacts against the ground or other obstacles, thereby minimizing the risk of being subjected to contusions, perforations by
15 sharpened objects, fractures or other bone damages.

Generally back protectors consist of a plurality of shaped protective elements, each of which enveloping at least a corresponding portion of the back extending in succession from the cervical vertebrae to the lumbar vertebrae or the coccyx. The shaped protective elements are coupled one to another, for example they are fit together,
20 or they are fixed to a supporting vest the user could wear.

Independently from the coupling type existing between the shaped elements, usually the back protector is flexible to adapt to the spine curvature of the user. In practice, a play is defined between the various shaped elements, allowing the relative rotation between the consecutive shaped elements and / or their partial overlapping.

25 Usually the shaped elements are mold as curved plates or lamina enveloping at least partially a portion of the user's back at both sides of the spine. The shaped elements may all have one or more protruding portions overlapping at least partially on an adjacent shaped element.

The section of each shaped element is generally solid. For example, the shaped
30 elements may be implemented as plates made of a rigid or partially flexible plastic material, or they may have a sandwich structure obtained by overlapping a number of resilient and rigid material layers, having different shock absorbing coefficients.

The impacts the shaped elements eventually are subjected to, are transmitted partially softened to the user, because part of the collision force is absorbed by the
35 shaped elements themselves, and any way they are divided on a large area of the back;

in this way the forces acting on limited portions of the back are minimized. Further the shaped elements form a shield against the penetration of possible injuring objects.

The back protectors are usually provided with belts allowing the user to wear the back protector as a knapsack. The belts, usually of the extension adjustable type, are
5 fixed to the first and the last shaped element of the back protector, that is at the upper and lower portions thereof. Alternatively, the belts may be fixed also laterally, at the intermediate shaped elements of the back protector. As an alternative to the belts, the back protectors may comprise the afore described vest.

Back protectors of the known art are described, e.g., in CN 201079027, EP
10 1001688, EP 1369149, EP 1414530.

Generally back protectors now available suffer from some drawbacks.

A first drawback is because the conventional back protectors usually do not adapt immediately to an occurred change of the user's spine extension. For example, when the user suddenly stretches out the back changing from a sitting position to an
15 upright and bent - forward position, the spine is extended; in this way the upper cervical vertebrae (e.g. the first three cervical vertebrae) and some lumbar vertebrae may be no more protected by the shaped elements of the back protector, with evident risks for the user safety. For example, in motocross some rider movements, standing on the motorbike footboards, entail an increase of the spine length up to the 15% compared to
20 the extension corresponding to the user seating on the motorbike. The rider spine may extend in the afore said way also in case of fall, for example in case wherein the user, banging against the ground, tends to bring the knees to the chest.

Some conventional back protectors provide for the possibility of changing the number of shaped element, but this operation can be done, obviously, only in case of
25 non-use.

A second drawback of the conventional back protectors is the fact that the shaped elements usually have not a great intrinsic capacity of absorbing shocks. In other words, each shaped elements is not able to deform appreciably for minimizing the impact force transmitted to the user as much as possible.

A third drawback is because the elements composing the back protector have little breathability. This feature affects negatively on comfort of the user wearing the back protector. The air circulation between the back and the back protector is at minimum or absent, and this is the cause of an intense sweating.

On the market back protectors are also available in which, alternatively to the
35 plurality of shaped elements, a single flexible element is present, made of a resilient

material, e.g. a rubber pad. The present invention does not concern this type of back protector.

The U.S. Patent 4,680,812 describes a back protector comprising a shield made of a foamy material in the inside thereof structural elements hinged one to another are present. Every structural element is contained in the shield, that is configured as single shell (col. 4, lines 9 - 17). In an embodiment (figure 8), the structural elements are constrained one to another by a sliding coupling allowing just the shield bending, but actually it does not allow the longitudinal extension of the back protector, remaining any way defined by the shield, that is the shell made of foamy material, with no possibility of changes.

The US Application n°. 2010/0263111 describes a solution similar to the previous one, wherein the structural elements are hinged one to another to allow the shield to flex and adapt to the back curvature of the user. The shield (reference 54 in the figures), comprising the structural elements in its inside, does not allow these elements to move away one from another, that is it prevents the extension of the back protector.

It has to be observed that in the solutions described in US 4,680,812 and US 2010/0263111 the structural elements are not configured as protecting elements, because they have the function of sustaining the foamy material; it is just the shield that protects the back.

Summary Of The Invention

The Applicant developed an alternative solution to the previous solutions wherein the afore described drawbacks are avoided.

The technical problem the present invention is base on, is then to provide a structure of protection of the back protecting effectively the user back against shocks, and particularly his/her spine, in every use conditions, also in case the spine changes considerably based on the user posture.

It is a further object of the present invention to provide a structure of protection of the back able to absorb the collision force in case of accident as much as possible.

It is again an object of the present invention to provide a structure of protection of the back providing the highest comfort for the user, particularly referring to the skin transpiration in the back area.

In a first aspect, then the invention concerns a structure of protection of the back according to claim 1.

Particularly, the invention concerns a structure for protecting the back from impacts, comprising a shield that extends in a direction substantially longitudinal, able

to be positioned on the user's back parallel to the spine, wherein said shield is formed by at least two elements for protecting corresponding portions of the back, said protective elements being fixedly constrained to one another by means of a coupling which provides for at least one degree of freedom, and wherein the relative movements
5 of said elements with respect to one another are not limited by other back protector components, characterized in that said protective elements are able to translate with respect to one another in the longitudinal direction to follow the extension movements of the user's back.

Advantageously, the shield could be extended because the coupling can be
10 translated between at least two of the protective elements composing the shield itself. In this way the structure of protection according to the invention allows to protect effectively the user's back against shocks also in condition providing the highest extension of the back itself.

For the purpose of the present invention, with the term "shield" it is intended to
15 identify a component of the structure of protection intended to cover at least the portion of the user's back along which the spine extends. The structure of protection may comprise appendices not being part of the shield, but able to be fixed thereto, e.g. an anatomically designed collar for protecting muscles of the neck, and other accessories such as, for example, belts for supporting the chest or means for fixing to the user's
20 clothes or other structures of protection.

Generally, the shield may have various shapes. For example, the shield may have a substantially elliptical shape and the latter may be convex, that is slightly rounded in the direction opposite to the back of the user wearing the structure of protection. Alternatively, the shield may have a shape following substantially the shape
25 of the user's back, that is it may extend longitudinally from the neck to the lumbar area of the user, thereby appearing broader in the upper part, for protecting the shoulder blades, and narrower in the lower area, for protecting the lumbar area.

In an embodiment of the present invention, the shield extension in the longitudinal direction, that is the vertical direction, corresponds substantially to the
30 distance between the cervical vertebrae and the lumbar vertebrae or the coccyx. The shield extension in the horizontal direction may be the lowest, and in this case the shield would protect substantially the central zone of the back, or the highest, and in this case the shield would extend at the user sides, to the point of even cover them.

The protective elements composing at least a part of the shield may have
35 different shaped one from another, but preferably they are modular elements identical

one to another.

Differently from what is expected from the known art, the protective elements of the back protector according to the present invention are not to configure as structural elements inside the shield, but they are themselves portions of the shield. Therefore the
5 protective elements are not incorporated in a single shell, for example made of foamy material, that could limit in some way the relative movements of a protective element relatively to the adjacent element.

In other words, the coupling between elements is direct and it is not expected the participation of other components or accessories of the back protector to limit the
10 relative movements of the protective elements with respect to one another.

Advantageously, at least two of the elements forming the protection shield, and preferably all the protective elements, are reciprocally coupled so that to be able to translate with respect to one another, in parallel to the longitudinal direction of extension of the shield itself, to follow possible extensions of the shield occurred while
15 driving or playing sports.

In other words, the shield of the protection structure can be extended. The extension ability may be obtained not only because of the deformability of the material the shield is made of, the material being substantially rigid in extension, but instead thanks to the sliding coupling between at least two of the protective elements
20 composing it.

Preferably all the protective elements composing the shield are constrained in the afore said way. In this way the highest ability of extension is conferred to the shield.

More preferably, the coupling between the protective elements provides at least two degrees of freedom. In this situation, the protective elements are at least partially
25 rotatable with respect to one another around a first transversal direction, substantially perpendicular to the longitudinal direction, to follow the bending movements of the back, forwards and backwards. Alternatively or in addition (3 degrees of freedom), the protective elements are rotatable with respect to one another around a second transversal direction, substantially perpendicular to the longitudinal direction, to follow the bending
30 movements of the back, leftwards and rightwards. The two above mentioned transversal directions are in their turn perpendicular; the second transversal direction is substantially parallel to the advance movement of the user when walking.

In the preferred embodiment of the invention, the shield could be extended longitudinally and it is flexible forwards, rearwards and sideways to follow better the
35 back movements. In other words, in the preferred embodiment, the protective elements

are constrained to one another with three degrees of freedom, as afore described.

Preferably, the shield is composed by at least three protective elements, one upper protective element, adapted to protect the upper portion of the back and / or the cervical area, a lower protective element, adapted to protect the lower area of the back and / or the lumbar area and / or the coccyx, and a protective elements in between the
5 firsts, adapted to protect the central area of the back. In these circumstances the intermediate protective element is constrained to the other two protective elements with a sliding or telescopic coupling. If the shield is composed of four or more protective elements, preferably but not necessarily, all the subsequent protective elements of the
10 shield are constrained with a sliding or telescopic coupling.

Preferably the lower protective element is provided with means for fixing to the user's clothes, for example to his/her trousers. By fixing the lower protective element to the user's clothes, when necessary the shield extension is aided.

In an embodiment of the structure of protection according to the present
15 invention, the sliding coupling between two subsequent protective elements is obtained by providing a protective element with a guide extending in a substantially longitudinal direction, and with an element slidably engaging the longitudinal guide of the subsequent protective element of the shield. For example, the guide is a groove obtained in the protective element body and the respective engaging element is a pin fitted
20 transversally into the guide.

Preferably, the longitudinal guide is obtained at the upper portion of the respective protective element and the engagement element is positioned at the lower portion of the same protective element along the longitudinal direction, and at a middle plane of the protective element.

The engagement element can slide into the guide along the longitudinal
25 direction of extension of the guide itself to allow the translation of the two protective constrained elements and, in practice, to allow the extension of the shield at least for a length corresponding to the length of the longitudinal guide. Obviously, in case wherein all the protective elements composing the shield are slidably and subsequently
30 constrained one to another, the highest extension of the shield is determined by the sum of the extensions between each protective element and the subsequent protective element.

Preferably the engagement element is at least partially slidable in the guide in a direction transversal to the plane of the guide itself, to allow relative rotations between
35 two subsequent protective elements of the shield around a first direction substantially

perpendicular to the longitudinal direction. Said first direction is substantially perpendicular to the vertical and to the advance direction of the user. In this way the protective elements, even if constrained, may rotate with respect to one another to follow the cervical and lumbar curvatures of the user spine and the bending of the back,
5 forwards and rearwards; during the rotation, the engagement element of the guide slides transversally to the guide and an angle is generated between the two protective elements.

Preferably the engagement element is rotatable in the guide to allow relative rotations between two subsequent protective elements of the shield around a second
10 direction substantially perpendicular to the longitudinal direction. Said second direction is perpendicular both to the vertical, that is the longitudinal direction, and the first above identified direction. In this way the two protective elements may rotate at least partially with respect to one another, in the same plane, to follow the bending of the user back towards his/her left and right.

15 Preferably the translatable constrained protective elements are each provided with a portion slidably overlapping a corresponding portion of the subsequent protective element of the shield, for a length at least equal to the maximum center-to-center that can be given to such protective elements. In this way there are no gaps remained between the protective elements when the shield is in an extended configuration, with
20 clear advantages referring to the user safety.

Preferably, the protective element is provided with means for fixing to a structure of protection of the chest the user could wear, for example a rigid plastron of the type used in motocross.

25 Preferably the lower protective element is provided with means for fixing to the user's clothes or other accessories at the waist or the coccyx. For example, the lower protective element is provided with a slot for engaging with a user's waistband, or it is provided with a portion coated with Velcro for engaging with a corresponding portion of the user's trousers, etc.

30 Preferably at least one of the protective element, and preferably every one, is/are provided with belts for supporting the bust of the user or the afore said structure for protection of the chest.

The structure of protection according to the present invention may be advantageously used as back protector in the sports usage, for example in motocross or skiing, being extremely effective in preventing or limiting damages to spine and ribs,
35 due to a localized impact against the back, independently of the posture adopted by the

user at the impact. The shield of the back protector is configured to follow the back extensions and it may be configured to follow the forwards and rearwards and sideways bending too.

5 In its second aspect, the present invention concerns a protective element according to claim 9.

In particular, the present invention concerns in its second aspect a protective element comprising a body provided with an inner surface, intended to face towards the user's back, and an outer surface, which defines a shield for protecting a corresponding portion of the back, and at least one element for the rest of the protective element on the
10 user's back, wherein the at least one rest element extends for a length at least sufficient to define, between said inner surface and the user's back, a gap intended to promote the air circulation.

In other words, the rest element extends between the protective element and the user's back for a length sufficient to promote the air passage between the back and the
15 protective element. For example, the rest element has a length equal to 1 or 2 cm.

Advantageously, the protective element according to the present invention is provided with its own element resting on the back that in normal conditions, or rather in case of no impacts, prevents the direct contact between the whole inner surface of the protective element and the back, but on the contrary it determines a gap promoting the
20 air circulation, and then it maximizes the transpiration, for the comfort benefit. The rest element has an extension smaller than the inner surface of the protective element.

Preferably the protective element comprises at least two rest elements, disposed at opposite sides relatively to a middle longitudinal plane of the protective element itself, that is disposed at opposite sides relatively to the central area of the protective
25 element in front of the user's spine.

Preferably each rest element is constrained to the corresponding protective element so as to be able to rotate around a rotation axis. More preferably such a rotation axis is substantially perpendicular to an outer surface of the protective element defining a shield. Still more preferably, each rest element is able to rotate in an eccentric manner
30 with respect to the relative rotation axis, so that to follow, but in the same time to limit, the movements of the protective element relatively to the user's back.

Preferably each rest element in its turn comprises an ergonomic contact surface suitable for abutting against the user's back. The contact surface, for example, is a pad made of spongy, or any way a pliable, material.

35 Preferably the rest elements are substantially disc-shaped. Alternatively, the rest

elements may have a band shape and they could be arched.

Preferably each rest element is made at least in part of resilient material or material characterized by high deformability. The force caused by a localized impact onto the outer surface of the protective element, that is configured as a shield, is transmitted only partially to the user's back, within limits through the rest elements, buckling thereby allowing the inner surface of the protective element substantially to cling tightly to the back, but instead through the whole inner surface of the protective element. In this way the pressure acting locally on the back is minimized, that is the collision force is divided on the largest possible area.

The described protective element referring to the second aspect of the invention, if it is sufficiently extended, could be advantageously used itself as a shield of a structure of protection, for example a back protector. Alternatively, more protective elements may be associated one to another, directly by a coupling of the afore described telescopic type, or indirectly by a supporting vest the user can wear, to make a shield having the desired length.

Preferably, the shield of the structure of protection according to a first aspect of the invention is composed of one or more protective elements according to the second aspect of the invention.

In its third aspect, the present invention concerns a protective element of the back against impacts, provided with an inner surface, able to be positioned on the user's back, and an outer surface, opposite to the inner surface with respect to the user's back and defining a shield, wherein said outer surface is substantially convex and has a discontinuity at a middle plane of the protective element, and wherein at least one portion of said outer surface, at the two sides of said discontinuity, is defined by flexible (substantially elastically) and/or deformable (substantially plastically) portions of the same protective element.

The described configuration has the advantage of imparting to the protective element a great ability of absorbing impacts. In case of shock, the deformable and / or flexible portions of the protective element buckle elastically and / or plastically, and doing so they absorb a relevant part of the impact energy. It follows that the energy transmitted to the user's back is lower than the initial energy of the impact; this allows to minimize the injury risks.

Preferably the flexible portions protrude cantileverly from the opposite sides of the body of the protective element, while remaining flush with the respective outer surface.

Preferably the middle plane of the protective element corresponds to the longitudinal middle plane of the user's spine.

Preferably the protective element has a substantially C-shaped profile, considered in a plane perpendicular with respect to said middle plane, and the discontinuity is defined by an opening obtained through the outer surface of the protective element and by a cavity present between the flexible portions and the remaining part of the same protective element.

Preferably on the inner surface of the protective element there are one or more reinforcing ribs.

Preferably the protective element is made of a plastic material, for example ABS, Teflon, PVC, or rubber.

Advantageously the protective element according to a third aspect of the invention may be used as a structure of protection or to realize the shield of a structure of protection.

Preferably the shield of the structure of protection described referring to the first aspect of the invention is composed of one or more protective elements according to the third aspect of the invention.

The above described three aspects of the invention may be applied independently one from another. Obviously the best result, in terms of effectiveness in protecting the user and comfort, is obtained when the structure of protection incorporates all three previous aspects.

Brief Description Of The Figures

Further characteristics and advantages of the present invention will be more evident from the following description of its preferred embodiment, made herein below, for illustration purposes only and without limitation, with reference to the attached drawings. In such drawings:

- figure 1 is a perspective view of a structure of protection according to the present invention, in a first configuration;
- figure 2 is a side view of the structure of protection shown in figure 1;
- figure 3 is a front view of the structure of protection shown in figure 1;
- figure 4 is a perspective view of the structure of protection shown in figure 1, in a second configuration;
- figure 5 is a perspective view of the structure of protection shown in figure 1, in a second configuration;
- figure 6a and 6b are prospective views, respectively of two opposite sides, of

the component of the structure of protection shown in figure 1;

- figure 6c is a bottom view of the component shown in figure 6a;
- figure 6d is a side view of the component shown in figure 6a;
- figure 7 is a front and schematic view of a detail of a second embodiment of

5 the structure of protection according to the invention;

- figure 8 is a section view A - A of the detail shown in figure 7;
- figure 9 is a top view of the detail shown in figure 7;
- figure 10 is a front and schematic view of the second embodiment of the

structure of protection according to the invention;

10 - figure 11 is a section view B - B of the embodiment shown in figure 10.

Detailed Description Of A Preferred Embodiment Of The Invention

In figure 1, representing a prospective view of a user, with the numeral **1** is indicated on the whole a structure of protection of the back **B** according to a first aspect of the present invention. As shown, the structure **1** can be worn as a back protector, and
15 with this term it will be identified in the rest of the description.

The back protector **1** comprises a shield **2**, able to be positioned on the user's back **B** to protect the latter from impact outer objects or the ground, appendices **3** and **4** of the shield **2** and belts **5** for fixing the shield **2** to the user's chest.

The shield **2** of the back protector **1** is composed of at least two protective
20 elements reciprocally coupled and it extends in a longitudinal direction **L**, shown in figure 2, substantially parallel to the back **B** of the user, starting from an area next to the cervical vertebrae up to an area next to the coccyx. Preferably, as shown in attached figures, the shield **2** is composed of an upper protective element **21**, disposed for protecting the top portion of the back **B**, a lower protective element **25**, disposed for
25 protecting the bottom portion of the back **B**, for example the lumbar or coccyx area, and one or more intermediate protective elements **22**, **23**, **24**.

The protective elements **21** - **25** shown in attached figures are plates having a generic convex shape. In particular, the respective inner surface, facing to the back **B** of the user, is curved to adapt to the user's anatomy and the outer surface, facing rearwards
30 and intended for being subjected to impacts, is convex.

Preferably the protective elements are made of a plastic material, such as for example ABS, Teflon, etc., to be molded, otherwise they are made of rubber or they have a metal core covered with a resilient material.

The upper appendices **3** of the back protector **1** are couplings, for example
35 buckles, belts, embedments, Velcro or others, for fixing to a plastron **P** the user is

wearing for the protection of ribs and chest. The lower appendix 4, in the shown embodiment being integral part of the lower protective element 25, also if generally it could be a separated element, is a plate provided with a plurality of fins protruding orthogonally from its outer surface, for the coccyx protection.

5 Preferably, the appendix 4 of the back protector 1 can be fixed to the user's clothes, for example to a waistband or directly to the trousers, for example by a buckle, buttons, Velcro 7 or other.

 In case the appendix 4 is not present, the lower protective element 25 is provided itself with similar means for fixing to the user's clothes.

10 Figures 2 and 3 are respectively side and front views of the back protector 1 shown in the same configuration visible in figure 1, that is a non - extended configuration, corresponding for example to the user chest in a substantially vertical position, not tilted forwards.

 In the not - extended configuration the protective elements 21 - 25 are adjacent
15 one to another in succession and the shield 2 has the minimum length L1. The protective elements 21 - 25 overlap partially at the respective coupling area. Particularly, the protective elements 21 - 25 overlap in a longitudinal direction for a length D.

 Advantageously the shield 2 can be extended because of a sliding coupling, for
20 example of the telescopic type, between the protective elements 21 - 25.

 Figure 4 shows the back protector 1 in its configuration of highest extension. The longitudinal extension of the shield 2 is indicated with L2 (greater than L1) and it is determined by the sum of deviations D between the protective elements 21-22, 22-23, 23-24, 24-25.

25 In practice each protective elements 21 - 25 could be translated with respect to the protective element to which it is constrained. The constrain between the protective elements 21 - 25 will be now described referring to figure 5, which shows the completely extended back protector 1 in a prospective rear view.

 In figure 5 the protective element 24 is highlighted. At its upper portion, the
30 element 24 comprises a guide 241, in practice a longitudinal groove, having a length D. The guide 241 extends at a middle longitudinal plane of the element 24 and it is engaged by an engaging element 232 of the protective element 23, associated on top with the element 24 along the shield 2.

 At its lower portion, the element 24 comprises an engaging element 242 of the
35 longitudinal guide 251 of the lower protective element 25.

The engaging elements **232** e **242**, for example shaped as pins or runners, slide in the longitudinal direction **L** in the corresponding guides **241** e **251**. The head of the engaging elements **232** and **242** is widened to prevent the accidental disengagement of the same engaging elements through respective guides **241** and **251**.

5 In the shown embodiment, the protective elements **21 - 25** are substantially identical, or similar, and any way modular. Therefore each element **21 - 25** comprises an engaging element (**221**, **222**, **232**) sliding in the corresponding longitudinal guide (**211**, **221**, **231**) of the subsequent protective element.

10 Figure 6b shows a single protective element in prospective, for example the element **24**. In figure the guide **241** and the engaging element **242** are highlighted. As can be seen, both these elements are integrally obtained with the protective element **24**, for example in the molding or thermoforming step. Alternatively, these elements **241** and **242** can be applied to the protective element **24** successively after its manufacturing, for example by screws or glues.

15 The protective element **24** is provided with an upper portion **243** adapted to be slidably overlapped to the lower portion of the protective element **23** for a length equal to, or greater than, the length of the guide **241** in the direction **L**.

The protective element **24** is provided with a lower portion **244** adapted to be slidably covered by the upper portion of the protective element **25**.

20 During the back protector use, the appendix **4** is fixed to the user's trousers by means of portions **7** coated with Velcro and the upper protective element **21** is fixed to the plastron **P**. Possible extensions of the back **B** are copied by the back protector **1**; the protective elements **21 - 25** composing the shield **2** each translate with respect to the subsequent one and allow the extension of the shield **2**.

25 The person skilled of the art will comprises that, generally, each protective element **21 - 25** may be provided with several guides and corresponding engaging elements, for example placed at the two sides of the longitudinal middle plane. The herein described solution, wherein only one guide in central position is provided, has the advantage, as will be described later on, to allow the relative rotation of the associated protective elements **21-22**, **22-23**, **23-24**, **24-25** too.

30 Referring to figures 2, 5 and 6b - 6d, the protective elements **21 - 25** are preferably rotated one with respect to the element associated therewith, in the direction indicated by the double arrow **R1** (figure 2), that is around a first direction **M** orthogonal to the longitudinal direction **L**, and / or in the direction shown by the double arrow **R2**, that is around a second direction **N** orthogonal to the longitudinal direction **L**

and corresponding to the user advance direction.

The relative rotation of the elements **21 - 25**, according to **R1** (figure 2), determines a general curvature forwards and rearwards of the shield **2**, that is the shield **2** adapts to the occurred bending of the back forwards (not shown). When the user returns the chest in a vertical position, bending rearwards, as shown in figure 2, also the shield **2** returns in its initial configuration.

The relative rotation of the elements **21 - 25**, according to **R2** (figures 3, 4, 5, and 6b) determines a general curvature leftwards and rightwards (referring to the user) of the shield **2**, that is the shield **2** adapts to the occurred side bending of the back **B** (not shown) leftwards and rightwards. In this case, for example, the upper portion **243** of the element **24** overlaps to the lower portion of the element **23** more at one side of the guide **241**.

The rotations of the protective elements **21 - 25** in the directions **R1** and **R2** can be carried out because the engaging element **242** of the guide, that is in practice a pin, can be rotated in the corresponding guide **251** around its own axis, substantially parallel to the direction **N**, and it is sliding transversally into the guide **241** and / or it can be rotated around the direction **M**.

In other words, the coupling between the pin **242** and the respective guide **251** provides for three degrees of freedom; the same goes for all the modular protective elements **21 - 25**.

The back protector **1** is then able to protect the back **B** of the user with the shield **2** in every use conditions, also when the posture provides for extensions and bending of the back in different directions, forwards, rearwards and sideways.

Referring to all the attached figures, the present invention, in a second aspect, concerns an element **24** of protection provided with one or more element **6** resting on the back **B**.

In the shown embodiment, the rest elements **6** are two for every protective elements **21 - 25**, and they are disposed at opposite sides relatively to the longitudinal guide (at opposite sides relatively to a middle vertical plane passing through the axis **N** indicated in figure 6c); however generally the protective element **6** may be only one, having great dimensions, or they may be more than two.

The rest elements **6** are constrained to the corresponding protective element **21 - 25** at the inner surface **2''** and they each extend along a corresponding axis **R6**, that is the respective rotation axis, substantially orthogonal to the outer surface **2'** of the protective element **21 - 25**.

Particularly referring to figures 6b - 6d, the rest elements extend along the respective axis **R6** for a length sufficient for determining a gap **G** between the back **B** of the user and the respective protective element **21 - 25**, during the back protector **1** use. The gap **G**, indicated schematically in dotted line in figure 6c, promotes the air circulation and the transpiration of the user's skin, for the comfort benefit. This is a problem particularly felt in sports scope, for example in the motocross or enduro discipline.

The rest elements **6** have, in the embodiment shown in figures, a generic circular shape, a disc - shape. Preferably, the surface **61** intended for contacting directly the back **B** of the user is coated with a soft or pliable coating, otherwise with Velcro if the rest elements **6** are designed for being temporarily constrained to the user's cloths.

Preferably, as best indicated in figure 6b, the rest element **6** can be rotated around the respective axis **6R**, because of a specific rotating coupling **62** (figure 6a) constraining them to the respective protective element **21 - 25**.

More preferably the elements **6** rotate in an eccentric manner with respect to the relative axis **6R**, as indicated by the respective circles in figure 6b. This characteristic allows the comfort of the back protector **1** to be maximized. The rest elements are still contacting the back **B** of the user and the shield **2** has a further minimum freedom of movements because of the eccentric rotation of the rest elements **6** around the respective rotation axes **6R**. The little movements of the back **B** are followed by the rest elements **6** by means of the respective eccentric rotation; in the meanwhile the shield **2** does not substantially move with respect to the back **B**, which remains effectively protected.

The rest elements **6** are preferably made, at least partially, of a soft or pliable material that, while buckling, does not impede the task of the shield **2** in redistribution of the impact energy on the widest possible surface of the back **B**.

In its third aspect the invention concerns a protective element **24** having a specific structure. Particularly referring to figure 5 and 6a - 6c, the protective element **24** has a generic curved section, for example C-shaped, considered in an plane perpendicular to the longitudinal direction **L**. Figure 6c shows particularly the protective element **24** from bottom.

Through the outer surface **2'** of the protective element **24** is obtained a discontinuity, in practice a slot **245**. The surface **2'** is defined, at two sides of the discontinuity **245**, by two portions **246** and **247** of the body of the protective element, which prove to be at least partially flexible when loaded. Particularly, the portions **246** and **247** extend cantileverly from the sides of the protective element **24**; an extension of

the discontinuity **245** is defined between the flexible portions **246** and **247** and the inner surface **2''** of the protective element **24**, in its turn defined by reinforcing ribs **30**, the extension being in practice a cavity allowing the portions **246** and **247** to flex towards the ribs **30**.

5 This feature has implications on the functionality of the protective element **24** and, then, on the shield **2**. Possible shocks given to the protective element **24** are at least partially softened before being transmitted to the back **B**; the portions **246** and **247**, flexing towards the cavity **245** (figure 6c), with an elastic and / or plastic deformation, absorb a portion of the impact energy.

10 Then the material of the element **24** may be selected to anticipate an only elastic deformation of the flexible portions **246** and **247** or elastic and / or plastic.

Figures 7 - 11 show a second possible embodiment of the back protector according to the present invention;

15 Particularly, figure 7 shows schematically and frontally one of the protective elements **23**, comprising a lower slot **231** for the sliding engagement of a pin **242** of an associated protective element **24**.

20 Figures 8 and 9 show respectively a cross-section **A - A** of the element **23** and a top view of such an element **23**, the latter being curved to follow the back shape. With the reference **P**, it is indicated a layer of pliable material, for example a pad made of foam - rubber or rubber, having the function of damping the shocks as much as possible. Each protective element **23**, **24**, etc., may be provided with a corresponding pad **P**, which anyway has to remain independent from the pads **P** of the other protective elements **23**, **24**, etc.

25 Also these protective elements **23**, **24**, etc., may be provided with rest elements **6** (herein not shown).

30 Figure 10 is a schematic front view of the second embodiment of the back protector, wherein only two associated protective elements **23**, **24** are shown to allow the described movements referring to the first embodiment. The pin **242** engages slidably and rotatably the slot **231** to allow the relative translation of the two protective elements **23**, **24** and the relative rotation forwards and rearwards and sideways.

Figure 11 is a view of the section **B - B** of figure 10, showing the two engaged protective elements **23** and **24**.

CLAIMS

1. Structure (1) for protecting the back (B) from impacts, comprising a shield (2) that extends in a direction (L) substantially longitudinal, able to be positioned on the user's back (B) parallel to the spine, wherein said shield (2) is formed by at least two elements (21-25) for protecting corresponding portions of the back (B), said protective elements (21-25) being fixedly constrained to one another by means of a coupling (232-241, 242-251) which provides for at least one degree of freedom, and wherein the relative movements of said elements with respect to one another are not limited by other back protector components, characterized in that said protective elements (21-25) are able to translate with respect to one another in the longitudinal direction (L) to follow the extension movements of the user's back (B).
2. Structure (1) according to claim 1, wherein said coupling provides for at least two degrees of freedom, and said protective elements (21-25) are at least partially rotatable with respect to one another around a first transversal direction (M), substantially perpendicular to the longitudinal direction (L), to follow the bending movements of the back (B), forwards and backwards.
3. Structure (1) according to claim 1 or claim 2, wherein said coupling provides for at least two degrees of freedom, and said protective elements (21-25) are rotatable with respect to one another around a second transversal direction (N), substantially perpendicular to the longitudinal direction (L), to follow the bending movements of the back (B), to the left or to the right.
4. Structure (1) according to any one of the previous claims 1-3, wherein there are at least three protective elements (21-25), an upper protective element (21), suitable for protecting the upper part of the back (B) and/or the cervical area, a lower protective element (25), suitable for protecting the lower area of the back and/or the lumbar area and/or the coccyx, and at least one protective element (22-24) intermediate to the previous ones, suitable for protecting the central area of the back, wherein said intermediate protective element (22-24) is coupled to both the upper (21) and lower (25) protective elements and the coupling between two successive protective elements (21-22, 22-23, 23-24, 24-25) of the shield (2) is of sliding or telescopic type.
5. Structure (1) according to any one of the previous claims 1-4, wherein each protective element (24) comprises a guide (241) extending in a substantially longitudinal direction (L), and an element (242) slidably engaging the longitudinal guide (251) of the subsequent protective element (25) of the shield.
6. Structure (1) according to claim 5, wherein the coupling between said element (242)

- for engaging the guide (251) and the guide itself (251) is characterized by one or more of the following characteristics:
- the engagement element (242) is slidable in the guide (251) along the longitudinal direction (L) of extension of the guide (251) itself;
 - 5 - the engagement element (242) is at least partially slidable in the guide (251) in a direction transversal to the plane of the guide (251) itself, to allow relative rotations between two subsequent protective elements (24, 25) of the shield (2) around a first direction (M) substantially perpendicular to the longitudinal direction (L);
 - the engagement element (242) is rotatable in the guide (251) to allow relative rotations
 - 10 between two subsequent protective elements (24, 25) of the shield (2) around a second direction (N) substantially perpendicular to the longitudinal direction;
 - the guide (251) is obtained at the upper portion of the protective element (25) and the engagement element (242) is positioned at the lower portion of the protective element (24) along the longitudinal direction (L) and at a middle plane of the protective element
 - 15 (24, 25).
7. Structure (1) according to any one of the previous claims 1-6, wherein at least one (24) of the protective elements (21-25) is provided with a portion (243) slidably overlapping a corresponding portion of the preceding protective element (23) of the shield (2), for a length greater than or equal to the maximum extension (D) that can be
- 20 given to such protective elements (23, 24).
8. Structure (1) according to any one of the previous claims 4-7, comprising one or more of the following characteristics:
- the upper protective element (21) is provided with means (3) for fixing to a structure (P) for protecting the chest able to be worn by the user;
 - 25 - the lower protective element (25) is provided with means (7) for fixing to the user's clothes or other accessories at the waist or the coccyx;
 - at least one of said protective elements (21-25) is provided with belts (5) for supporting the user's bust.
9. Element (24) for protecting the back (B) from impacts, comprising a body provided with an inner surface (2''), intended to face towards the user's back (B), and an outer surface (2'), which defines a shield (2) for protecting a corresponding portion of the back (B), and at least one element (6) for the rest of the protective element (24) on the user's back (B), wherein the at least one rest element (6) extends for a length at least
- 30 sufficient to define, between said inner surface (2'') and the user's back (B), a gap (G)
- 35 intended to promote air circulation.

10. Protective element (24) according to claim 9, comprising one or more of the following characteristics:
- the at least one rest element (6) is constrained to the corresponding protective element (24) so as to be able to rotate around a rotation axis (6R);
 - 5 - the protective element (24) comprises at least two rest elements (6), arranged on opposite sides with respect to a longitudinal middle plane of the same protective element (24);
 - the at least one rest element (6) in turn comprises an ergonomic contact surface (61) suitable for abutting against the user's back (B).
- 10 11. Protective element according to claim 10, comprising one or more of the following characteristics:
- the rotation axis (6R) of each rest element (6) is substantially perpendicular to an outer surface (2') of the protective element (24) defining a shield;
 - each rest element (6) is able to rotate in an eccentric manner with respect to the
- 15 relative rotation axis (6R).
12. Protective element (24) according to any one of the previous claims 9-11, comprising one or more of the following characteristics:
- the at least one rest element (6) is substantially disc-shaped;
 - the at least one rest element (6) is made at least in part of resilient material or material
- 20 characterized by high deformability.
13. Element (24) for protecting the back from impacts, provided with an inner surface (2''), able to be positioned on the user's back (B), and an outer surface (2'), opposite the inner surface (2'') with respect to the user's back (B) and defining a shield (2), wherein said outer surface (2') is substantially convex and has a discontinuity (245) at a middle
- 25 plane of the protective element (24), and wherein at least one portion of said outer surface (2'), at the two sides of said discontinuity (245), is defined by deformable and/or flexible portions (246, 247) of the same protective element.
14. Protective element (24) according to claim 13, comprising one or more of the following characteristics:
- 30 - the middle plane of said protective element (24) is the longitudinal middle plane of the user's spine;
 - said protective element (24) has a substantially C-shaped profile, considered in a plane perpendicular with respect to said middle plane, and said discontinuity (245) is defined by an opening obtained through the outer surface (2') of the protective element (24) and
- 35 by a cavity present between said flexible portions (246, 247) and the remaining part of

the same protective element (24);

- on the inner surface (2'') of the protective element there are one or more ribs (30) for reinforcing the protective element;

- said protective element (24) is made of plastic material or rubber.

- 5 **15.** Structure (1) according to any one of the previous claims 1-9, wherein said shield (2) is formed by at least one protective element (24) according to claims 10-12 or according to claims 13-14.

1/7

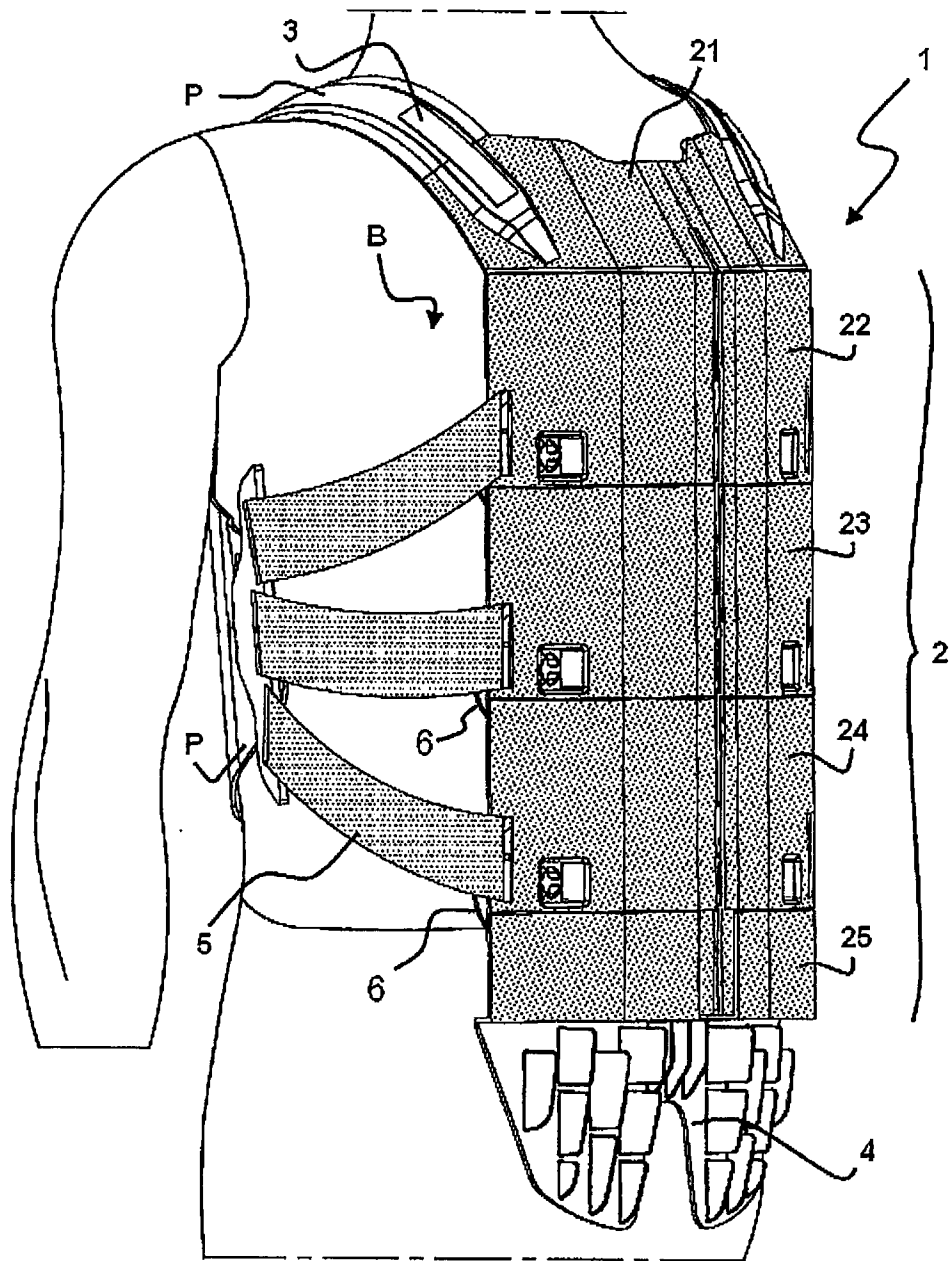


FIG. 1

217

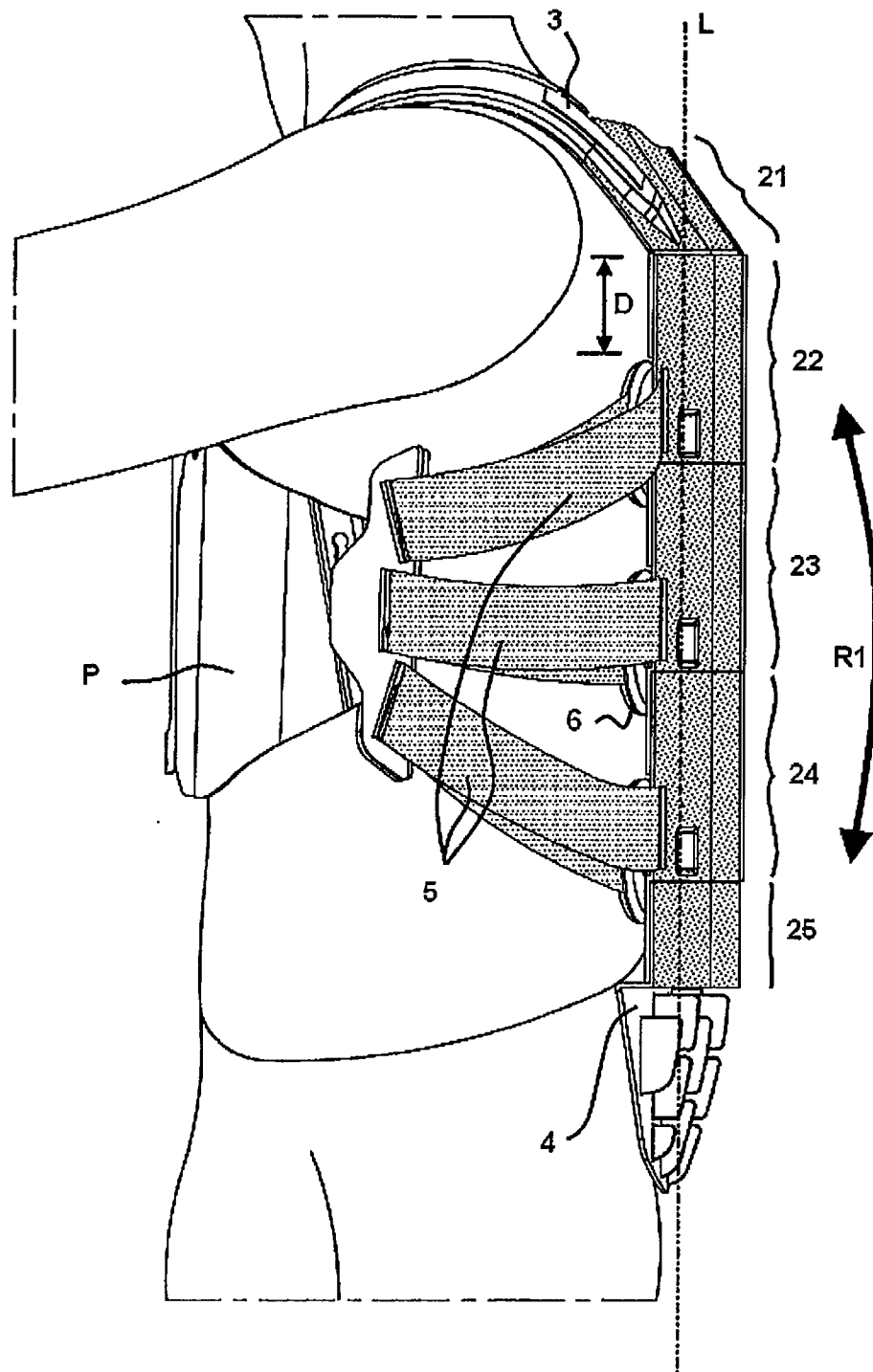
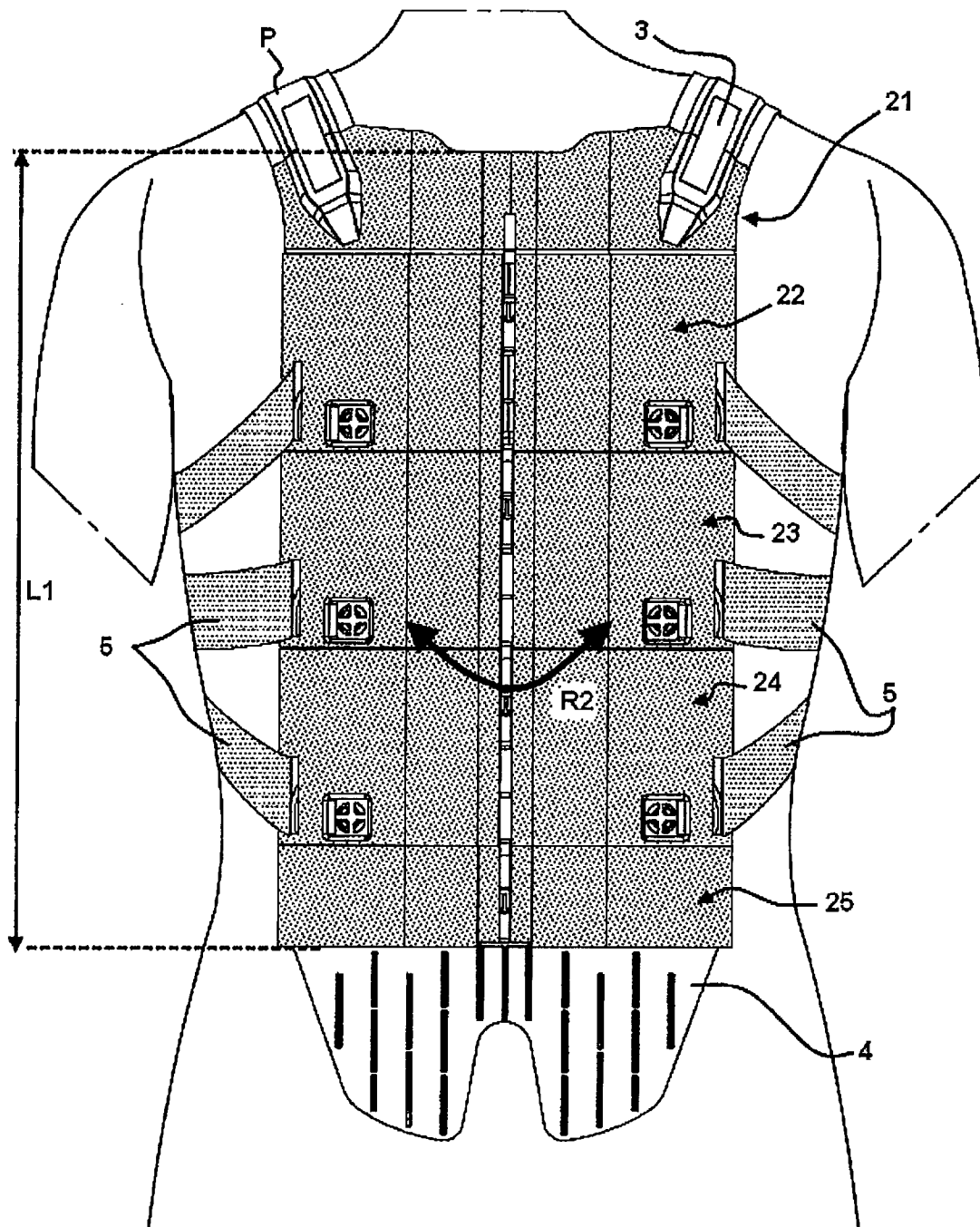
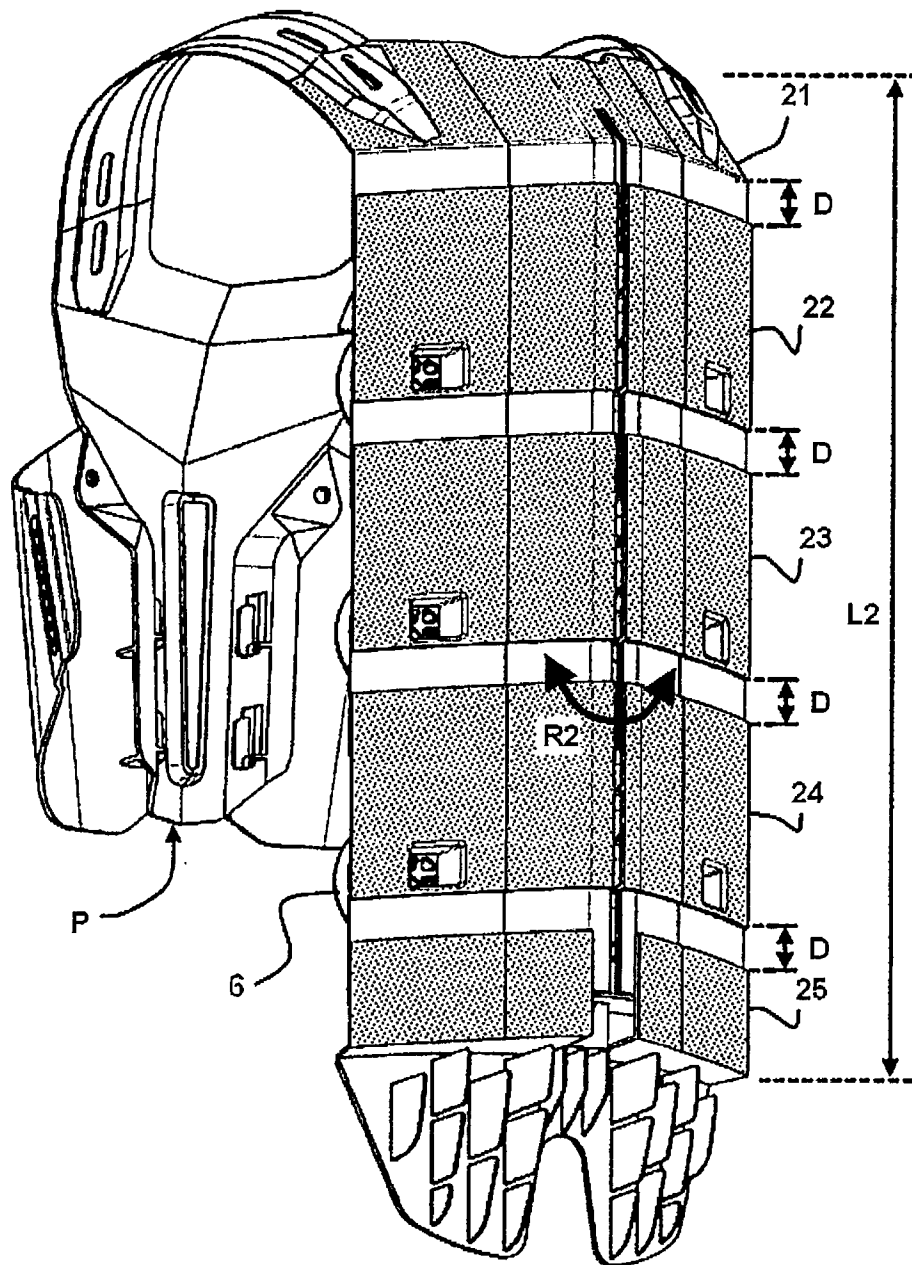


FIG. 2

3/7FIG. 3

417**FIG. 4**

5/7

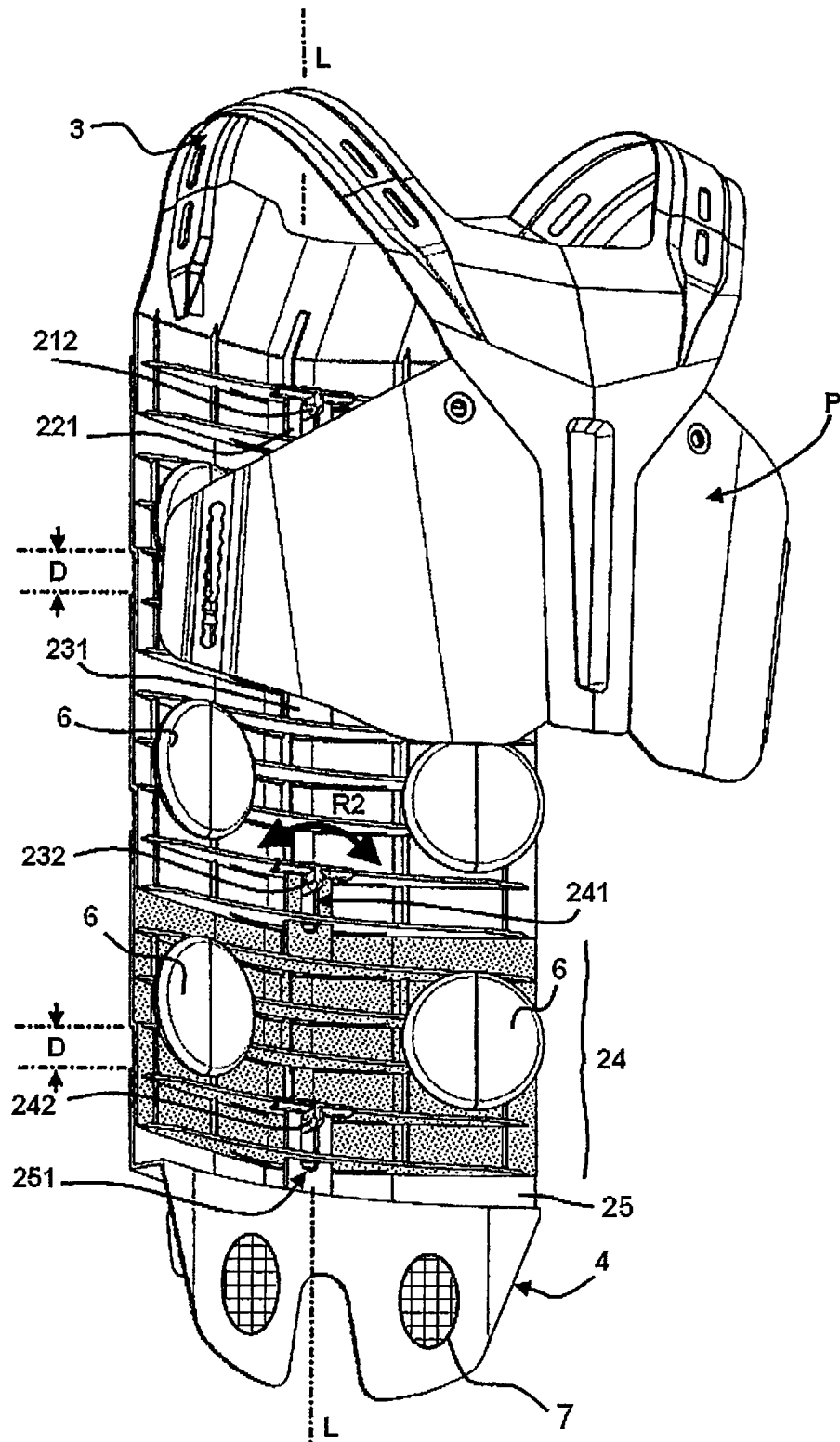


FIG. 5

6/7

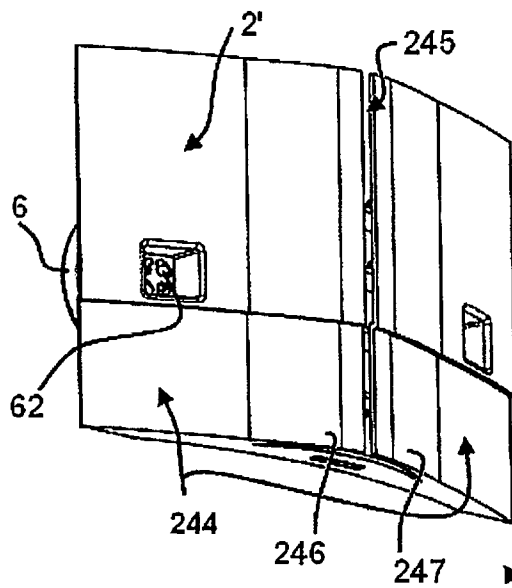


FIG. 6a

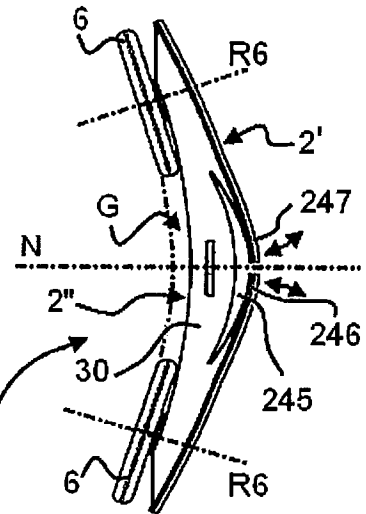


FIG. 6c

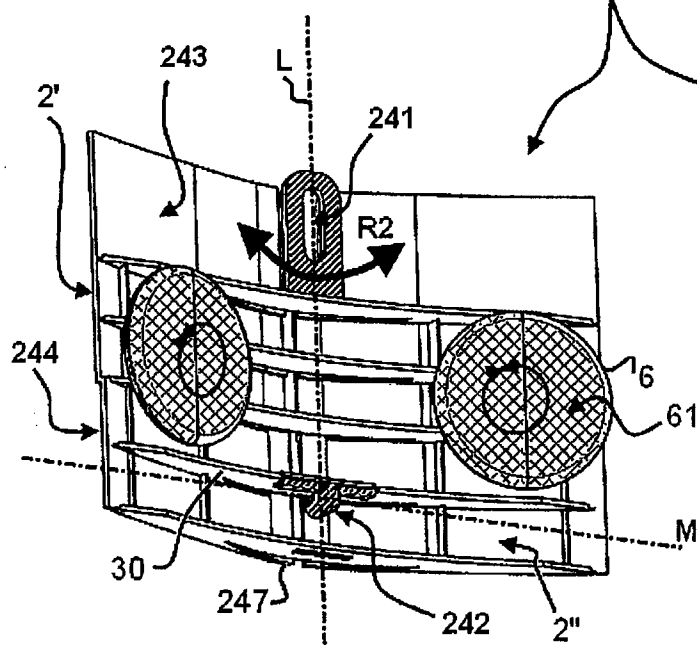


FIG. 6b

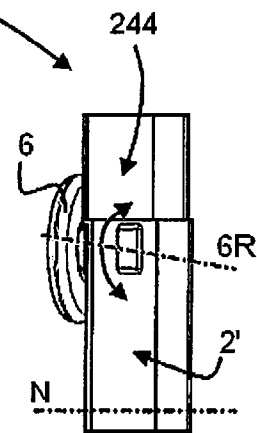


FIG. 6d

24

7/17

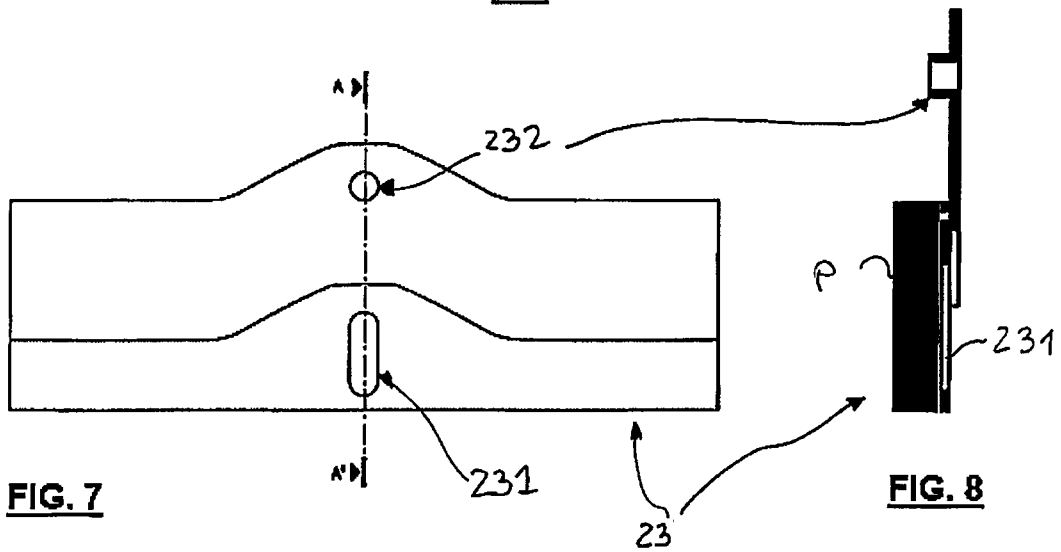


FIG. 7

FIG. 8

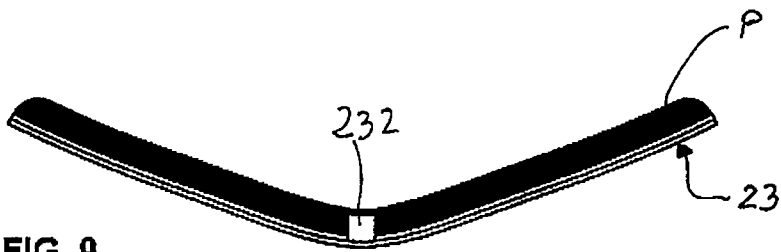


FIG. 9

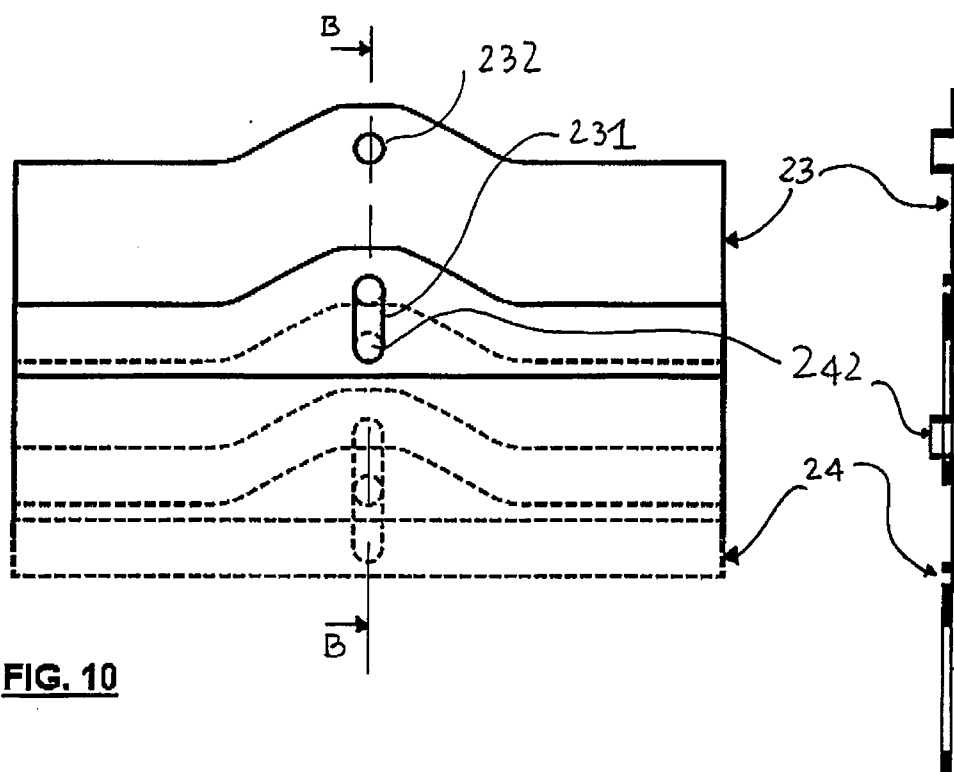


FIG. 10

FIG. 11