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(54) Load carrying system

(57) A load carrying system for a wearer, comprising a carrier (10) made of at least one flexible carrier material and comprising a front portion (11) to be disposed at the wearer's front, and a back portion (31) to be disposed at the wearer's back, when the system is worn by the wearer; a load attachment arrangement (90) for detachably attaching a load to at least said front portion; a front load distribution arrangement comprising at least one elongated front load distribution element (81) made of a material more rigid than said carrier material and attached to the front portion of the carrier by a front attachment member (25) different from, and operating independently of, said load attachment arrangement; and a back load distribution arrangement disposed in said back portion of the carrier and separated from said front load distribution arrangement by the material of the carrier.

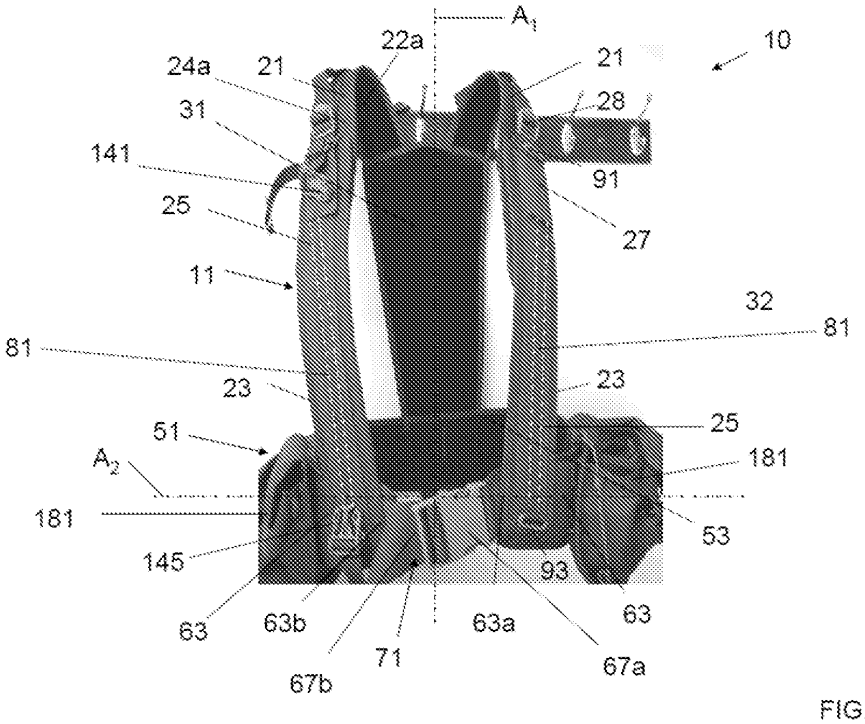

FIG. 1A

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Description

FIELD OF THE INVENTION

[0001] This invention relates to a load carrying system, in particular a carrier configured for attachment of a load thereto.

BACKGROUND

[0002] Load carrying systems used for the same purposes as the system according to the presently disclosed subject matter are disclosed for example in US 2009/0020580 and US 2008/0010730.

SUMMARY OF THE INVENTION

[0003] In accordance with one aspect of the presently disclosed subject matter, there is provided a load carrying system for a wearer, comprising:

- a carrier made of at least one flexible carrier material and comprising a front portion to be disposed at the wearer's front, and a back portion to be disposed at the wearer's back, when the system is worn by the wearer;
- a load attachment arrangement for detachably attaching a load to at least said front portion;
- a front load distribution arrangement comprising at least one elongated front load distribution element made of a material more rigid than said carrier material and attached to the front portion of the carrier by a front attachment member different from, and operating independently of, said load attachment arrangement; and
- a back load distribution arrangement disposed in said back portion of the carrier and separated from said front load distribution arrangement by the material of the carrier.

[0004] With the front portion having a height dimension parallel to that of the wearer, said at least one elongated front load distribution element can extend along a majority of the height dimension of the front portion.

[0005] The carrier may have at least two carrier wearing straps, a front portion of which can constitute at least a part of said front portion of the carrier, and bear at least a part of said load attachment arrangement.

[0006] The straps can be spaced from each other in the direction perpendicular to the height dimension of the front portion, and, optionally, at least when no load is attached to the front portion of the carrier, the spacing between the straps can be free of the carrier material at least along the majority of the front portions of the straps.

[0007] At least a part of the front portion of each strap can be associated with said front load distribution element and can comprise said front attachment member.

[0008] The front attachment member of the front portion of each strap can comprise, or be in the form of, a sleeve configured to receive therein said front load distribution element, which can be insertable in, and withdrawable from, said sleeve.

[0009] The front load distribution elements can be detachably attachable to the front portion of the corresponding strap.

[0010] At least a part of the load attachment arrangement can be spaced from said at least one front load distribution element by the material of said carrier, e.g. by the material of said strap or by the material of said sleeve.

[0011] The front load distribution element can be in the form of a rod or a longitudinal strip and can be made of metal or tutanuim.

[0012] The load attachment arrangement can comprise a plurality fasteners configured for the attachment of the load.

[0013] The load attachment arrangement can comprise one or more load carrying pockets detachably attachable at least to the front portion of the carrier and configured for carrying a load therein.

[0014] The load carrying pockets can be configured to conform to the shape of said load.

[0015] The load carrying pockets can comprise a load external attachment arrangement for attachment of a load thereto.

[0016] The load carrying pockets can comprise fasteners configured for engagement with the fasteners of the load attachment arrangement.

[0017] The load can comprise one or more of front, back and side armor panels. When the load comprises a front armor panel, the panel's dimension in the direction perpendicular to said height direction of the carrier, when the panel is attached thereto, can correspond to the dimension of the spacing between the front portions of the carrier wearing straps.

[0018] The back load distribution arrangement can comprise at least one and, optionally, at least two elongated back load distribution elements made of a material more rigid than said carrier material load distribution.

[0019] The back load distribution elements can extend along a majority of the height dimension of the back portion of the carrier and, optionally, can be spaced apart, e.g. by the material of the carrier, at least along a part of their length.

[0020] The maximal spacing between the back load distribution elements can be smaller than the maximal spacing between the front load distribution elements, and the minimal spacing between the back load distribution elements can be smaller than the minimal spacing between the front load distribution elements, in a direction perpendicular to the height direction of the carrier.

[0021] The back portion's width along the direction perpendicular to its height dimension can vary along the height direction and can be minimal at its lower edge and maximal at its upper edge. The minimal width of the back portion can be smaller than the minimal spacing between

said carrier wearing straps. In addition, or alternatively, the maximal width of the back portion can be smaller than the maximal spacing between the carrier wearing straps.

[0022] The carrier can further comprise a belt configured to encompass the wearer's pelvic area, when the carrier is worn by the wearer, said front and back portions of the carrier joining said belt at their bottom.

[0023] The belt can comprise a belt front section to be disposed at the wearer's front, a belt back section to be disposed at the wearer's back, when the carrier is worn, and belt side sections therebetween.

[0024] The front and back load distribution arrangements can terminate at the belt respective side or front, and back sections and each of them can optionally extend along the belt's height at its corresponding section so as to occupy a majority thereof, in particular, occupy more than 55%, and more particularly, more than 60% of its height.

[0025] The belt side sections can be detachably and, optionally adjustably, attachable to said belt front or back section, to allow adjustment of the width of the belt. In this case, when the carrier front portion is in the form of two spaced apart straps and each strap is attached at its lower end to the belt, the location of the attachment of the lower end of each strap to the belt can be chosen depending on whether or not it is desired to have the distance between the straps adjusted accordingly. In particular, if it is desired that the distance between the locations at which the straps are attached to the belt be constant whilst the width of the belt be adjustable, the lower ends of the straps should be attached to the front section of the belt. On the other hand, when it is desired that the distance between the locations at which the straps, change in accordance with the change in the width of the belt, the lower ends of the straps should be attached to the side sections of the belt.

[0026] In accordance with another aspect of the presently disclosed subject matter, there is provided a kit comprising a load carrying system for a wearer as described above, and at least one load carrying pocket for carrying a load therein configured for being detachably attached to the carrier by said load attachment arrangement.

[0027] Said kit can further comprise a load packed in said load carrying pocket. Said load can be armor as described above.

[0028] The load pockets may conform with a shape of said load and may further comprise load external attachment arrangement for attachment of load thereto.

[0029] In accordance with another aspect of the presently disclosed subject matter, there is provided a carrier for a wearer made of at least one flexible carrier material and comprising a carrier a front portion to be disposed at the wearer's front, a carrier back portion to be disposed at the wearer's back and a belt configured to encompass the wearer's pelvic area, when the carrier is worn by the wearer, said belt comprising a belt front section to be disposed at the wearer's front, a belt back section to be disposed at the wearer's back and belt side sections therebetween being detachably and, optionally adjustably, attachable to said belt front or back section, allowing adjustment of a width of the belt; and two carrier wearing straps, a front portion of which constituing at least a part of said front portion of the carrier, attached at its lower end to the belt side sections at locations spaced by a distance configured to change in accordance with the change of said width.

[0030] The above carrier may comprise one or more of the following features in any combination thereof:

- a load attachment arrangement for detachably attaching a load to at least said front portion;
- a front load distribution arrangement comprising at least one elongated front load distribution element made of a material more rigid than said carrier material and attached to the front portion of the carrier by a front attachment member different from, and operating independently of, said load attachment arrangement; and
- a back load distribution arrangement disposed in said back portion of the carrier and separated from said front load distribution arrangement by the material of the carrier.

[0031] The carrier can have an extremely low weight as its parts, in particular the front and the back parts, are shaped and arranged so as to comprise minimum material required for load distribution and carrying and to conform to the physiology of the wearer. This also allows the load distribution arrangement formed in the back and front parts to fit the physiological requirements. In addition, the light weight and carrier parts arrangement and shape allow easy and unlimited movement of the wearer even with heavy load attached to the carrier.

[0032] The load distribution arrangement allows the load distribution from the back part of the front part, and load distribution from the shoulders to the belt both at the front and the back part.

[0033] The carrier is adapted to carry any kinds of loads, such as armor panels and equipment. The armor panels may be of any geometry and may be flat or curved. The attachment of the armor panels and/or equipment when are accommodated within load carrying pockets allow, on one hand, an easy and quick attachment of the load to any of the carrier's parts, and on the other hand prevent the load from unintentional detachment. When the carrier is worn, the wearer may also have an easy access to the load, in particular the load attached to the front part and the belt.

[0034] The carrier is easily adjusted to the dimensions of the wearer as at least some of the carrier's parts are detachably attachable one to the other and the material of the load distribution arrangement allows it to be adjusted in length so as to fit the wearer's height.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] In order to understand the invention and to see how it may be carried out in practice, embodiments will now be described, by way of non-limiting example only, with reference to the accompanying drawings, in which:

Fig. 1A is a photographic view of an example of a carrier according to the subject matter of the present application;
Fig. 1B is a photographic view of another example of a carrier according to the subject matter of the present application;
Fig. 2 is a photographic view of the carrier shown in Figs. 1A and 1B with load attached thereto;
Fig. 3A is a schematic view of an outer surface of a portion of a strap of the carrier shown in Fig. 1A;
Fig. 3B is a schematic view of an inner surface of the portion of a strap shown in Fig. 3B;
Fig. 3C is a photographic view of the inner surface of the portion of the strap shown in Fig. 3B;
Fig. 4 is an enlarged photographic view of another portion of a strap of the carrier shown in Fig. 1A;
Figs. 5A and 5B are photographic views of inner and outer surfaces, respectively, of a back portion the of the carrier shown in Fig. 1A;
Fig. 5C is an enlarged view of a sleeve of the back portion shown in Fig. 5B;
Figs. 6A and 6B are schematic views of an inner surface and an outer surface, respectively, of a central section of a belt of the carrier shown in Fig. 1;
Fig. 6C is a photographic view of the inner surface of the central section of the belt shown in Fig. 6A;
Fig. 6D is an enlarged photographic view of the inner surface of the belt central section shown in Fig. 6C, at its;
Fig. 7A and 7B are photographic views of a front part of a belt in an example of a carrier according to the subject matter of the present application;
Fig. 8 is a photographic view of the carrier shown in Fig. 1A with an addition of cushions;
Figs. 9A to 9C are photographic views of the cushions of the carrier shown in Fig. 8;
Fig. 10 is a photographic view of the carrier shown in Fig. 1B with an addition of cushions;
Fig. 11A is a photographic side view of the carrier shown in Fig. 2, as worn by a wearer;
Fig. 11B is a photographic front view of a front carrying pocket with an armor panel and with a load attached thereto;
Fig. 11C is a photographic front view of a front carrying pocket shown in Fig. 11B, without the load; and
Figs. 12 and 13 are photographic views of one example of fastening arrangement according to the subject matter of the present application.

DETAILED DESCRIPTION OF EMBODIMENTS

[0036] With reference to Fig. 1A, there is shown one example of a carrier 10 according to the subject matter of the present application, configured to be worn by a wearer (not shown), so that a front portion 11 thereof is disposed at the wearer's front, a back portion 31 is disposed at the wearer's back, shoulder straps 21 connecting between the front and back portions are disposed on the wearer's shoulders and a belt 51 to which the front and back portions are permanently attached, encompasses the wearer's pelvic area.

[0037] The carrier 10 is configured for carrying a load such as for example a personal armor, military or other kind of equipment, and it can comprise integral or detachably attachable pockets for carrying the load. For example, the carrier can be configured for detachably attaching to its front 11 and the back 31 portions and/or to sides of the belt 51, armor receiving pockets 101, 103 and 105 with personal armor panels of corresponding shapes received therein, as shown in Fig. 2. Other equipment can be detachably attached to any portion of the carrier 10, i.e. its front portion 11, back portion 31 or the belt 51 directly or within it corresponding load carrying pockets, which can be the same as or different from the armor receiving pockets. The load or armor carrying pockets can also be designed for detachably attaching thereto additional load or load carrying pockets.

[0038] The carrier 10 will now be described in detail with reference to its longitudinal direction A_1 (Fig. 1A) parallel to the height of its wearer, along which the length of the front 11 and back 31 portions of the carrier 10 and the height of the belt 51 (between its uppermost edge 51a and lowermost edge 51b, as shown in Figs. 6A and 6B) are defined, and a transverse direction A_2 parallel to the width of the wearer, along which the width of the front and back portions of the carrier and the length of the belt are defined.

[0039] With reference to Figs 1 and 3A to 3C, the front portion 11 of the carrier 10 comprises two carrier wearing straps each including a shoulder strap 21 attached at its one end to the back portion 31, and a front strap 23 extending along the direction A_1 and having an upper end 23a detachably attached to the other end of the shoulder strap 21 and a lower end 23b permanently attached at its lower end 23b to the belt 51. The front straps 23 are spaced one from the other along their entire length, to a distance along the direction A_2, which is essentially greater than the width of the straps. The width of the straps together with the spacing between them defines the width of the front portion 11 of the carrier 10.

[0040] The length of the front straps 23 between their areas of attachment to the shoulder straps 21 and the belt 51 defines the length of the front portion 11 of the carrier.

[0041] With reference to Figs. 5A and 5B, the back portion 31 is formed of two halves 31a and 31b each having an upper edge 33 to which the corresponding

shoulder strap 21 is permanently attached, and a lower edge 35 which is permanently attached to the belt 51. The length of the two halves 31 a and 31 b between their areas of attachment to the shoulder straps 21 and to the belt 51 defines the length of the back portion 11.

[0042] The length of the straps 23 and of the back portion 31 of the carrier along which they are attached to the belt 51 is less, e.g. slightly less, than the height of the belt 51 at the corresponding areas thereof. In other words, the lower end 23b of each strap, and the lower edge 35 of each half of the back portion 31, can be spaced from the lowermost edge of the belt 51b to a distance not exceeding 50%, in particular, 40% and, more particularly, 35% of the height of the belt at the area of the attachment.

[0043] In the described example, the two halves 31a and 31b of the back portion 31 have shapes similar to truncated right triangles whose hypotenuses meet along a central line L of the back portion 31, and whose long cathetuses constitute side edges 30 thereof and are oriented so that a distance therebetween along the axis A_2 is maximal at the upper edges 33 of the two halves and minimal at the lower edges 35 thereof.

[0044] The dimension of each of the upper and lower edges 33 and 35 of the back portion 31 along the direction A_2 is smaller than the spacing between the inner edges of the front straps 23, when the carrier is in its free standing position as shown e.g in Fig. 1A. In particular, both the maximal and the minimal distances between the side edges 30 of the back portion 31 along the axis A_2, as mentioned above, are smaller than the spacing along the axis A_2 between the front straps 23 at least at their lower ends 23b.

[0045] The front portion 11 and the back portion 31 of the carrier further comprise respective front and back elongated, load distribution elements 81 and 83(schematically shown in dotted lines in respective Figs. 1A and 5B), each of which is assembled with one of the front straps 23 and one of the halves 31a and 31b of the back portion 31 so as to extend therealong. In view of such assembly, the two front elongaged elements 81 are spaced one from the other along the axis A_2 by a distance corresponding to that between the straps 23, while the spacing between the two back elongated elements 83 decreases from the upper edge 33 of the back portion 31 to the lower edge 35 thereof. The front and back elongaged elements 81 and 83 can be in the form of rods or strips made of a rigid or semi-rigid material such as metal, e.g. aluminum or titanuim, with an elasticity in the range of up to 20% to 30%, and specifically up to 25%.

[0046] The length of the elongated elements 81 as shown is essentially the same as that of the straps 23. In particular, in the shown example, the front load distribution elements 81 have their upper ends 81a adjacent to the upper ends of the front straps 23 and their lower ends 81b at the lowermost location of the areas of their attachment to the belt 51 along the axis A_1. In general, however, the length of the elongated elements 23 can be less than the length of the straps 23, e.g. it can even be equal to, or exceed half the length of the straps 23 so that their upper ends 81 a can be disposed in the middle of the straps 23 or closer to the straps' upper ends 23a than to the straps' lower ends 23b.

[0047] The assembly of the front and back load distribution elements with the respective front and back portions of the carrier 10, is achieved in the described example by means of sleeves each configured to receive therein one load distribution element and formed in, or permanently attached to the outer surfaces 22 and 32 of, each of the front straps 23 and halves 31a and 31b of the back portion 31.

[0048] In particular, each of the front straps 23 comprises a sleeve 25 (Fig. lA), extending along the entire length thereof and permanently attached to its outer surface 24, configured for receiving therein the front load distribution element 81. Each sleeve 25 has an opening 25' (Fig. 4) adjacent the upper end 23a of the strap 23, via which the distribution element 81 can be inserted into the sleeve 25 and a closure 27 for closing the opening 25', as shown in Fig. 4, after such insertion. The closure can be detachably attachable to the exterior of sleeve 25 for example, by a Velcro fastener (not shown).

[0049] Similarly, each half 31a, 31b of the back portion 31 is formed with two sleeves 41 configured for receiving therein the back load distribution elements 83 and extending along the entire length of the back portion 31. Each sleeve 41 comprises an opening 42 (Fig. 5C) via which the distribution element 83 can be inserted thereto and a closure 43 similar to the closure 27. In the described example, in view of the specific shape of the back portion 11 as described above, the sleeves 41 are oriented parallel to the side edges 30 of the back portion 31, due to which a distance between the sleeves 41, and consequently between the elongated elements 83 inserted therein, is maximal adjacent the areas of attachment of the shoulder straps 21 to the back portion 31 and minimal adjacent the at the areas of attachment of the back portion 31 to the belt 51.

[0050] With reference to Figs. 1, 2 and 6A to 6D, the belt 51 comprises a belt back section 53, a belt front section 71 and two side sections 63 extending therebetween. The belt back section 53 has a central region 55, to which the back portion 31 is permanently attached, and two lateral regions 57 (Figs. 6B and 6C). Each side section 63 has a back region 63b configured for detachable attachment to adjacent lateral region 57 of the belt back section 53, and a front region 63a to which the front strap 23 is permanently attached via its lower end 23b. The front regions 63a of the belt side sections 63 are configured for locking engagement with each other by means of fastening members 67a and 67b mounted thereon. The fastening members 67a and 67b, when lockingly engaged with each other, constitute the belt front section 71 of the belt 51.

[0051] The belt front section 71 can further comprise a front insert 70 (Figs. 7A and 7B) having front insert ends 70a and 70b, to which the front regions 63a of the

belt side sections 63 are detachably attachable and to which the lower ends 23b of the front straps 23 can be permanently attached as shown.

[0052] The carrier 10 can further comprise cushions detachably attachable to the inner surfaces of some of the parts of the carrier 10, to be disposed between the carrier and the wearer. In particular, with reference to Figs. 8 and 9A to 9C, the carrier 10 comprises a upper back cushion 121 (Fig. 9A) detachably attached to the inner surface 32 of the back portion 31, a lower back cushion 125 detachably attached to an inner surface 52 (Fig. 5A) of the belt back section 53, two front cushions 123 (Fig. 9B) detachably attached to the inner surfaces 22 of the front straps 23, and two side cushions 127 detachably attached to inner surfaces 62 (Fig. 6D) of the belt side sections 63 (Fig. 9C).

[0053] With reference to Fig. 10, there is shown an alternative cushions arrangement, so that the cushions do not exceed the dimensions of their corresponding portions of the carrier.

[0054] All elements of the carrier 10 described above, except for the load distribution elements, and at least a part of the fastening members, can be made of fabric, e.g. of an infra red absorbent, fire retarded, water and tear resistant fabric material. In particular, the outer surfaces of the carrier can be made of a material such as Corduara®, the inner surfaces of the carrier can be made of a material such as Velcro, and the cushions can be made of breathable and anti-sweat material, preferably abrasion resistant, at least at their part facing the wearer. In case where the carrier does not have cushions, its inner surface should be made of the latter material.

[0055] Regarding the manner of attachment of different elements of the carrier 10 to each other as described above and will further be described below, this attachment can be permanent or detachable. In particular, the permanent attachment between different elements can be obtained by any appropriate known means and along any appropriate attachment pattern. Thus, in the described carrier 10, the permanent attachment is obtained by sewing the elements to each other, as for example shown in Fig. 1A where the front straps 23 are sawn to the side sections 63 of the belt 51, Figs. 5A and 5B, where the back portion 31 is sawn to the back section 53 of the belt 51, and Figs. 7A and 7B where the front straps 23 are sawn to the insert 70.

[0056] The detachable attachment of different elements of the carrier 10 to each other, as described above and will be described below in connection with the attachment of loads to the carrier, can be lockable and non-lockable. The lockable mechanism by which two elements of the carrier 10 can be detachably attached to each other can be any such known mechanism, and in particular, it can be in the form of a buckle assembly, comprising a male buckle member attached to one of the elements, such as e.g. a buckle members 28 (Fig. 1A) and 68 (Fig. 5B), and a female buckle element attached to the other element, such as e.g. side release buckles 67a and 67b in Fig. 1A. In the described carrier 10, examples of the detachably attachment between different elements by the above lockable mechanism are the attachment between the front straps 23 and the shoulder straps 21 (Fig. 1A), the attachment of the side sections 63 to each other (Fig. 1A) and the attachment of the side sections 63 to the insert 70 (Figs. 7A and 7B).

[0057] The non-lockable detachable attachment of two different elements of the carrier 10 to each other can be in the form of hook-and-loop fasteners, such as Velcro fasteners, which are permanently attached to the corresponding elements, as shown for example in Fig. 3C, where the shoulder strap 21 is attached to the front strap 23, Fig. 5A, 6C and 6D where the belt back section 53 is attached to the belt side sections 63, and Fig. 10, where the cushions 121, 123 and 125 are attached to the carrier by fasteners 122, 124 and 128.

[0058] The detachable attachment of different elements of the carrier 10 to each other can be strengthened, e.g. by adding securing bands adjacent the attachment area, such as for example the bands 29 (Fig. 3C), the bands 66 (Figs. 6A, 6C and 6D) and strengthening straps 126 (Fig. 10).

[0059] The carrier 10 further comprises a load attachment arrangement 90 configured for detachably attaching different kinds of loads as mentioned above to different places of the carrier 10. The load attachment arrangement 90 in the described carrier 10 comprises a plurality of fasteners, such as, for example, SR buckles, grommets, Velcro fasteners, snaps, clips and the like, attached to the front straps 23, the back portion 31 and the belt 51 thereof.

[0060] The load can be attached directly to the corresponding fastener(s) or may be placed within load carrying pockets having fasteners engageable with the corresponding the fasteners on the carrier 10.

[0061] With reference to Figs. 2 and 11A to 11C, the carrier 10 is shown with front, back and side pockets 101, 103 and 105 each carrying an armor panel (not seen), detachably attached to the front straps 23, the back portion 31 and the side belt sections 63, respectively of the carrier 10. The armor carrying pockets 101, 103 and 105 conform to the shape of the armor received therein and are suitable to receive flat or curved armor plates of any geometry.

[0062] To allow the attachment of the front armor carrying pockets 101 to the carrier 10 as shown, the load attachment arrangement comprises upper fasteners 131 (Fig. 11B) of the front armor carrying pocket 101 engageable with upper front portion fasteners 141 disposed adjacent the upper end 23a of the front straps 23 (Fig. 1A and 1B) or on the shoulder strap 21 (not shown); lower fasteners 135 of the front armor carrying pocket engageable with lower front portion fasteners 145 disposed adjacent the lower end 23b of the front straps 23; and side fasteners 133 (Fig. 11C) engageable with side pockets fasteners 143 (Figs. 2 and 11A) of the side carrying pockets 105.

[0063] To allow the attachment of the back armor carrying pockets 103 to the carrier 10 as shown, the load attachment arrangement comprises upper fasteners 151 of the back armor carrying pocket 103 engageable with upper back portion fasteners 95 disposed adjacent to the upper edge 33 of the back portion 31 (Fig. 5B); lower fasteners 153 of the back armor carrying pocket 103 engageable with the lower back portion fasteners 97 disposed adjacent to the lower edge 35 of the back portion 31; and side fasteners 155 of the back armor carrying pocket 103 engageable with side pockets fasteners 147 (Fig. 11A) of the side carrying pockets 105.

[0064] The side armor carrying pockets 105 are attached to the front and back armor carrying pockets 101 and 103 by means of the side pocket fasteners 143 and 147 as described above.

[0065] In the described example, the armor carrying pockets 101, 103 and 105 are attachable to the corresponding portions of the carrier as described above, by means of SR buckles, grommets or a combination thereof. Attachments by means of buckles are achieved by a couple of buckles, male and female, so that one buckle is fixed to the load carrying pocket and the other buckle is fixed to the corresponding portion of the carrier. Attachments by means of grommets are achieved by a fixation of securing straps of the load carrying pocket to the grommets of the corresponding portion of the carrier. An example for such an attachment is shown in Fig. 12, where a securing strap end 161 is open and comprises two halves 163 preventing the securing strap (not shown) from releasing out of the grommet 165.

[0066] More specifically, the front load carrying pocket 101 comprises upper buckles 131 (Fig. 11B) to be fastened to corresponding upper buckles 141 on the front straps 23 adjacent there upper ends 23a (Fig. 1A and 1B), lower buckles 135 to be fastened to one side of the corresponding two-sided buckles 145 on the front straps 23, and side buckles 133 (Fig. 11C) to be fastened to the other side of the buckles 143 (Figs. 2 and 11A).

[0067] Alternatively, the front carrying pocket 101 can be attached to the straps 23 by means of both buckles and grommets. In this case, the load attachment arrangement will comprise upper and lower grommets 91 and 93 (Figs. 1A and 4) on one strap 23 and the buckles 141 and 145, as described above, on its other strap 23.

[0068] With reference to Figs. 2 and 11A, the back load carrying pocket 103 comprises upper securing straps 151 to be fastened to the corresponding upper grommets 95 of the back portion 31 (Fig. 5B) similarly to the attachment shown in Fig. 12, lower securing straps 153 to be fastened to the lower grommets 97 of the back portion 31 and side buckles 155 to be fastened to the corresponding buckles side 147 (better shown in Fig. 11A) of the side carrying pockets 105.

[0069] Each of the armor carrying pockets 101, 103 and 105 can be formed with pockets load arrangement corresponding allowing an external attachment of any kind of load, such as for example pouches, bags the like to the armor carrying pockets. Such an arrangement may comprise any kind of fasteners, such as SR buckles, grommets, Velcro fasteners, snaps, clips and the like or any kind of strap arrangement, one example of which is described below in detail. In this connection, Figs. 2, 11A and 11B show different pouches 171 attached to the front carrying pocket 101.

[0070] In particular, the armor carrying pockets 101, 103 and 105 comprise a fastening arrangement 109 (Figs. 2 and 11A) having a plurality of horizontal straps 102 extending along the direction A_2 of the carrier 10 attached to the carrying pockets 101, 103 and 105 by vertical stitches 104 spaced one from the other. Such as arrangement is known as Pouch Attachment Ladder System or PALS and allows an attachment of load to the pockets by means of vertical straps attached to the load and secured to the horizontal straps 102 by warp and weft arrangement (not shown). The vertical straps of the load may terminate with open ends and be secured to the corresponding grommets of the carrying pockets in the manner described with reference to Fig. 12, which may be also referred to as PAL-LOP and as shown in Fig. 13 where one of the pouches 171 shown as it is attached by a plurality of vertical straps having ends 173 to the plurality of grommets 175 of the front carrying pocket 101.

[0071] As already mentioned above, the belt 51 can comprise fasteners of the load attachment arrangement 90. Alternatively or in addition, the belt 51 can be formed with strap arrangement allowing attachment of any kind of load thereto, such as for example pouches 181 attached thereto as shown in Fig. 1A.

[0072] Fig. 2 shows the side sections 63 of the belt 51 formed with strap arrangement 111, similar to the arrangement 109 of the carrying pockets 101, 103 and 105.

[0073] The belt 51 can comprise pockets and/or pouches integrally formed thereon.

[0074] As already indicated above, the carrier 10 is configured to be worn by a wearer, specifically by a wearer needing a protection against ballistic or other impacts, such as soldiers during military operations.

[0075] The carrier 10 can be worn in two ways. In case the belt 51 of the carrier 10 does not comprise the front insert 70 shown in Figs. 7A and 7B, the side sections 63 of the belt 51 are detached one from the other by opening the buckle 67, so that the carrier 10 is worn like a garment. When the belt 51 comprises also the front section 71, the carrier 10 is pulled on over the wearer's head like a shirt.

[0076] The carrier 10 can be adjusted by the wearer to fit his dimensions by adjusting the length of the parts detachably attachable to each other, i.e. the front and/or shoulder straps 23 and 21 and the side and/or front sections 63 of the belt 51. When the carrier 10 is adjusted to the wearer, the front load distribution elements 81 and 83 can be deformed to fit the wearer's front. The elongaged elements 81 and 83 can be replaced by longer or shorter elements, if necessary. The front elements 81 can be replaced without even taking off the carrier 10,

as due to the closures 27 an easy access to the elements 81 within the sleeves 25 is provided.

[0077] The attachment of the load can be performed before and/or after the carrier 10 is worn. In particular, the load, including the armor panels, that is intended to be attached to the back portion 31 of the carrier, with or without load carrying pockets, has to be attached before the carrier 10 is put on, while the load intended to be attached to the front portion 11 and, optionally, the side sections 63 of the belt 51, with or without load carrying pockets, can be attached when the carrier 10 is already worn by the wearer, as load attachment arrangement 90 allows an easy access and easy attachment of the load by the wearer.

[0078] The carrier 10 as described above can be very light and its weight without any loads can be in the range of 700 gr to 1 kg.

[0079] The carrier 10 can be configured to carry loads up to about 30 kg, e.g. in the range between about 18 to 25 kg, in particular about 20 kg.

[0080] Comparative biomechanical testing was performed of an exemplary carrier according to the presently disclosed subject matter and an existing carrier used for the same purpose, in which the following parameters were examined: pelvic tilt, pelvic obliquity, pelvic rotation, hip flexion/extension, knee flexion/extension, knee valgus/varus moment, hip flexion/extension moment, hip abduction/adduction moment, hip rotation moment, head angle, spine angle, neck angle and thorox angle.

[0081] It was found that in the disclosed carrier the above parameters were of lower values than in the existing carrier, i.e. the disclosed carrier had a smaller effect on the corresponding body parts. In particular, with the disclosed carrier, spine, neck and thorox angles of movement were reduced relative to those of the existing carrier, thereby reducing the risk of biomechanical injuries to the user. Moreover, the disclosed carrier reduced moments applied to the knee joint of the user, which is very sensitive to biomechanical injuries.

Claims

1. A load carrying system for a wearer, comprising:

- a carrier made of at least one flexible carrier material and comprising a front portion to be disposed at the wearer's front, and a back portion to be disposed at the wearer's back, when the system is worn by the wearer;
- a load attachment arrangement for detachably attaching a load to at least said front portion;
- a front load distribution arrangement comprising at least one elongated front load distribution element made of a material more rigid than said carrier material and attached to the front portion of the carrier by a front attachment member different from, and operating independently of, said load attachment arrangement; and
- a back load distribution arrangement disposed in said back portion of the carrier and separated from said front load distribution arrangement by the material of the carrier.

2. A load carrying system according to Claim 1, wherein the front portion has a height dimension parallel to that of the wearer, said at least one elongated front load distribution element extends along a majority of the height dimension of the front portion.

3. A load carrying system according to Claim 2, wherein said carrier has at least two carrier wearing straps, at least a front portion of which constitutes at least a part of said front portion of the carrier, the straps being spaced from each other in the direction perpendicular to the height dimension of the front portion, at least a part of the front portion of each of straps being associated with said front load distribution element and comprising said front attachment member.

4. A load carrying system according to Claim 3, wherein said part of the front portion of each strap comprises a sleeve configured to receive therein said front load distribution element, which is insertable in, and withdrawable from, said sleeve.

5. A load carrying system according to Claim 3, wherein each of said front load distribution elements is detachably attachable to the front portion of the corresponding strap.

6. A load carrying system according to any one of Claims 3 to 5, wherein said straps bear at least a part of said load attachment arrangement.

7. A load carrying system according to any one of Claims 3 to 6, wherein said part of the load attachment arrangement is spaced from said at least one front load distribution element by the material of said carrier, by the material of said strap or by the material of said sleeve.

8. A load carrying system according to any one of Claims 1 to 7, wherein said front load distribution element is a rod or longitudinal strip made of metal or tutanium.

9. A load carrying system according to any one of Claims 1 to 8, wherein the load attachment comprises one or of the following features: a plurality fasteners configured for the attachment of the load and one or more load carrying pockets detachably attachable at least to the front portion of the carrier and configured for carrying a load therein.

10. A load carrying system according to any one of Claims 1 to 9, wherein said load comprises a front armor panel.

11. A load carrying system according to any one of Claims 1 to 10, wherein the back load distribution arrangement comprises at least one elongated back load distribution element made of a material more rigid than said carrier material and optionally comprises at least the same number of the elongated back load distribution elements as the front load distribution elements.

12. A load carrying system according to Claim 11, wherein the back load distribution elements extend along the back portion of the carrier and, optionally, are spaced apart at least along a part of their length, so that a maximal spacing between the back load distribution elements is optionally smaller than the maximal spacing between the front load distribution elements in a direction perpendicular to the height direction of the carrier, and a minimal spacing between the back load distribution elements is optionally smaller than the minimal spacing between the front load distribution elements in a direction perpendicular to the height direction of the carrier.

13. A load carrying system according to any one of Claims 1 to 12, further comprising a belt adapted to encompass the wearer's pelvic area, when the carrier is worn by the wearer, said front and back portions of the carrier joining said belt at their bottom, the belt optionally comprising one or more of the following features: a belt front section is associated with the wearer's front so that the front load distribution arrangement terminate at the belt front section, the belt is detachably attachable at least to the back portion of the carrier, said front load distribution arrangement extends along at least a portion of the belt front section, a belt back section associated with the wearer's back so that the back load distribution arrangement terminates at the belt back section, said back load distribution arrangement extends along at least a portion of the belt back part, and said belt front section is detachably attachable to said belt back part.

14. A kit comprising:

(a) a load carrying system for a wearer, comprising:

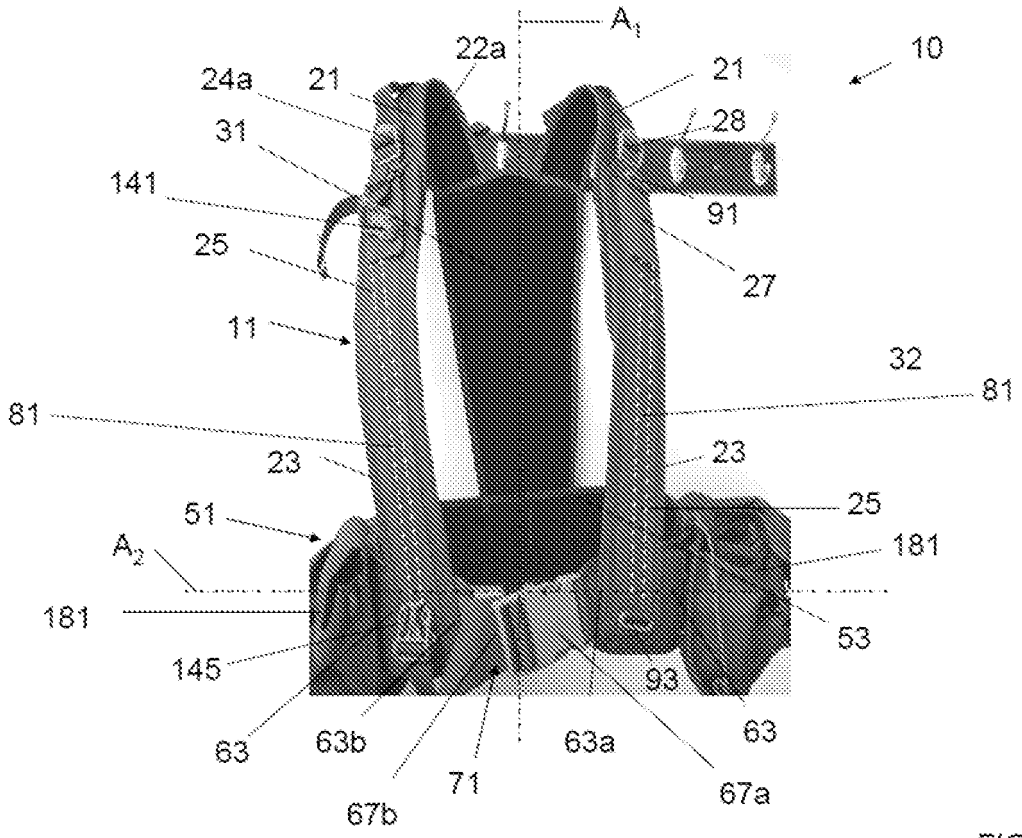
- a carrier made of at least one flexible carrier material and comprising a front portion to be disposed at the wearer's front, and a back portion to be disposed at the wearer's back, when the system is worn by the wearer;
- a load attachment arrangement for detachably attaching a load to at least said front portion;
- a front load distribution arrangement comprising at least one elongated front load distribution element made of a material more rigid than said carrier material and attached to the front portion of the carrier by a front attachment member different from, and operating independently of, said load attachment arrangement; and
- a back load distribution arrangement disposed in said back portion of the carrier and separated from said front load distribution arrangement by the material of the carrier;

(b) at least one load carrying pocket for carrying a load therein configured for being detachably attached to the carrier by said load attachment arrangement.

15. A carrier for a wearer made of at least one flexible carrier material and comprising:

- a carrier a front portion to be disposed at the wearer's front, a carrier back portion to be disposed at the wearer's back and a belt configured to encompass the wearer's pelvic area, when the carrier is worn by the wearer, said belt comprising a belt front section to be disposed at the wearer's front, a belt back section to be disposed at the wearer's back and belt side sections therebetween being detachably and, optionally adjustably, attachable to said belt front or back section, allowing adjustment of a width of the belt; and

two carrier wearing straps, a front portion of which constituing at least a part of said front portion of the carrier, attached at its lower end to the belt side sections at locations spaced by a distance configured to change in accordance with the change of said width.


A1
22a
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81
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A2
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145
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63
63b
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67b
67a

FIG. 1A

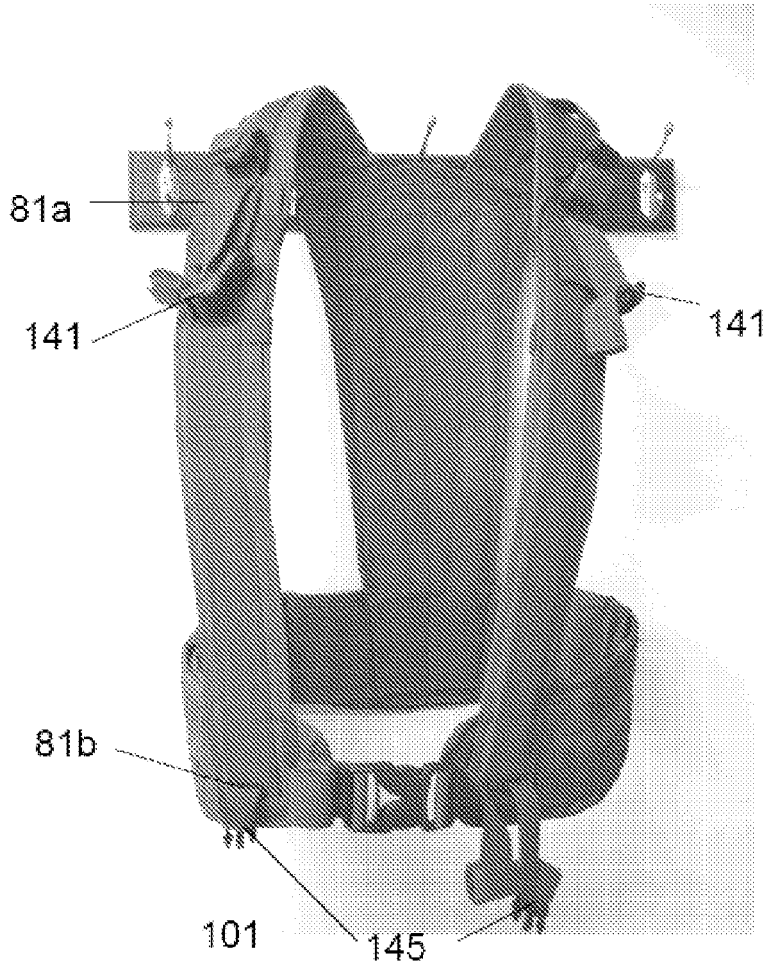
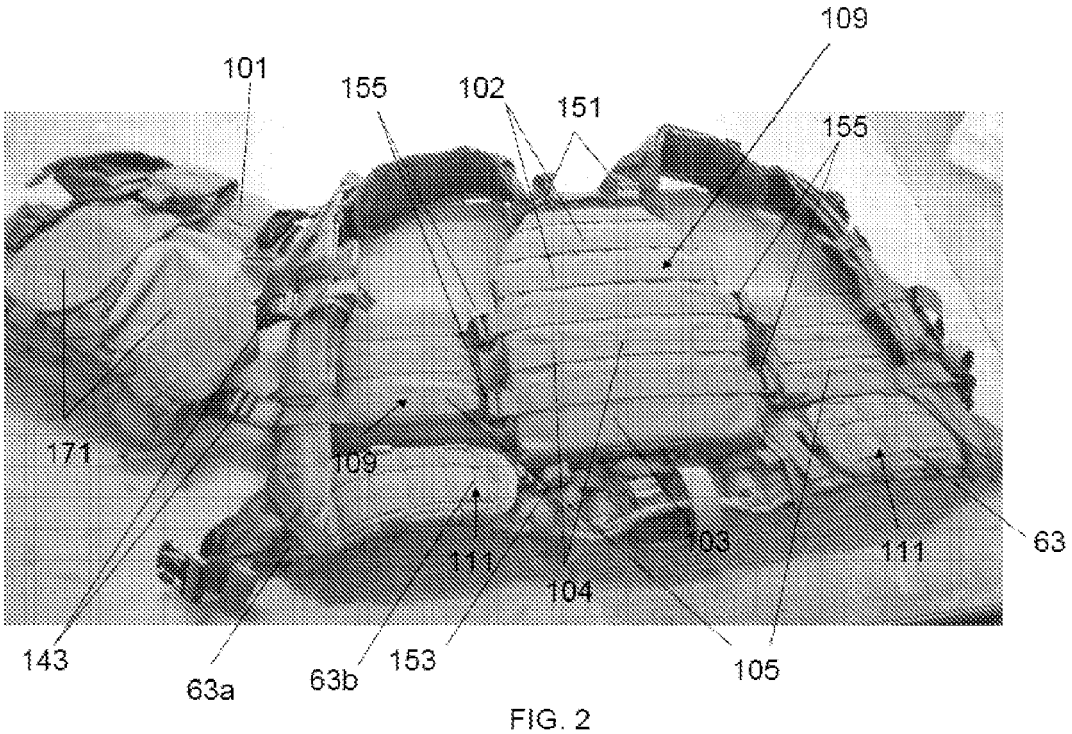


FIG. 1B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171
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103
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63
104
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63a
63b
153
105

FIG. 2

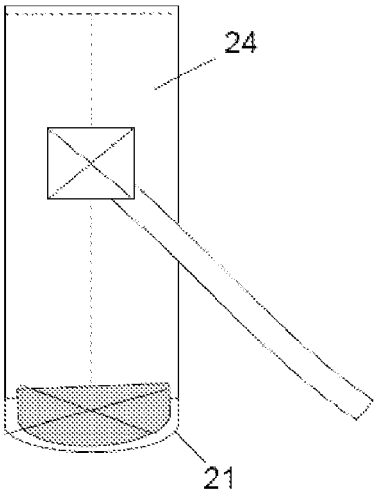


FIG. 3A

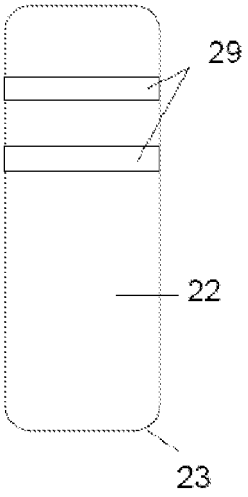


FIG. 3B

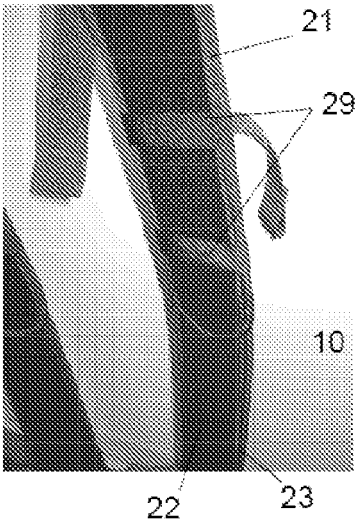


FIG. 3C

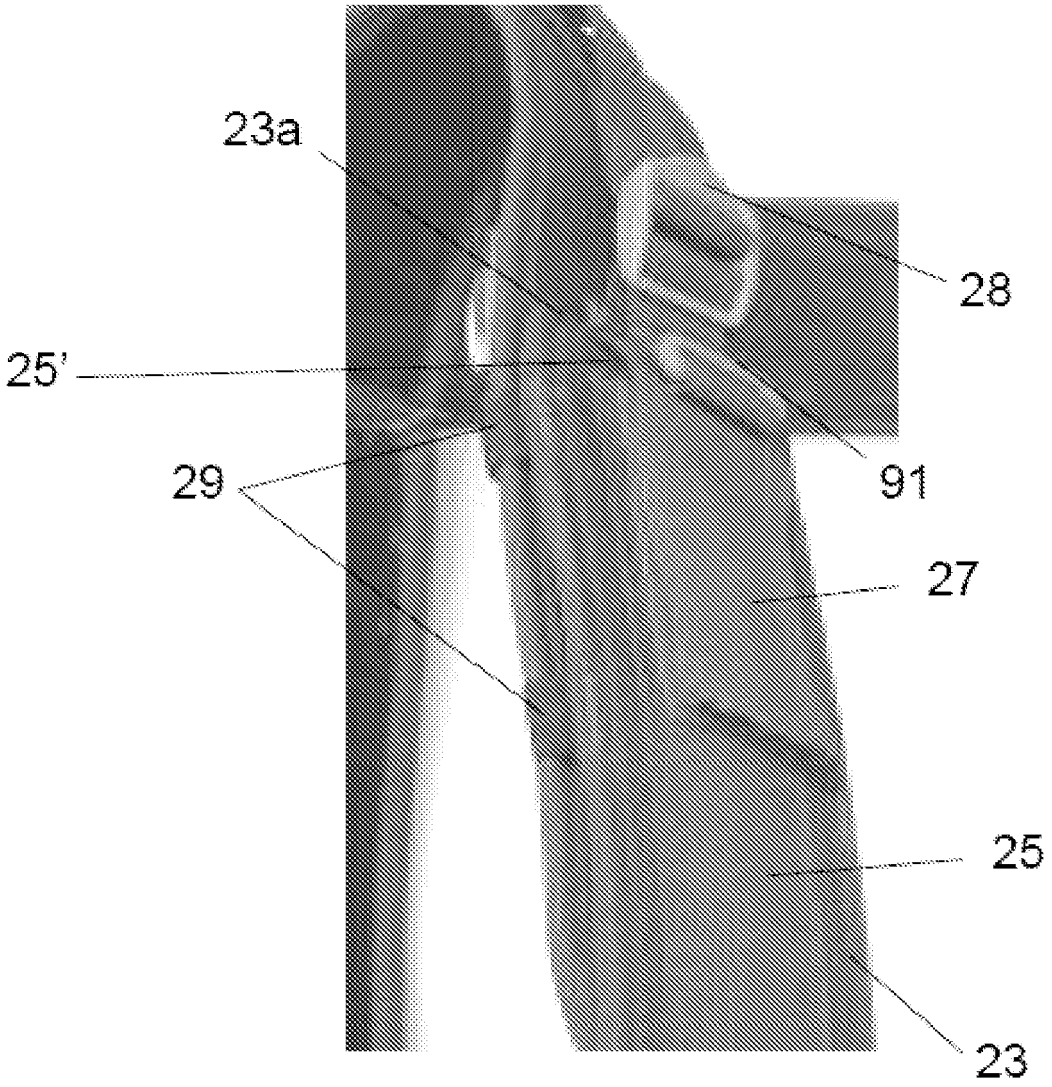
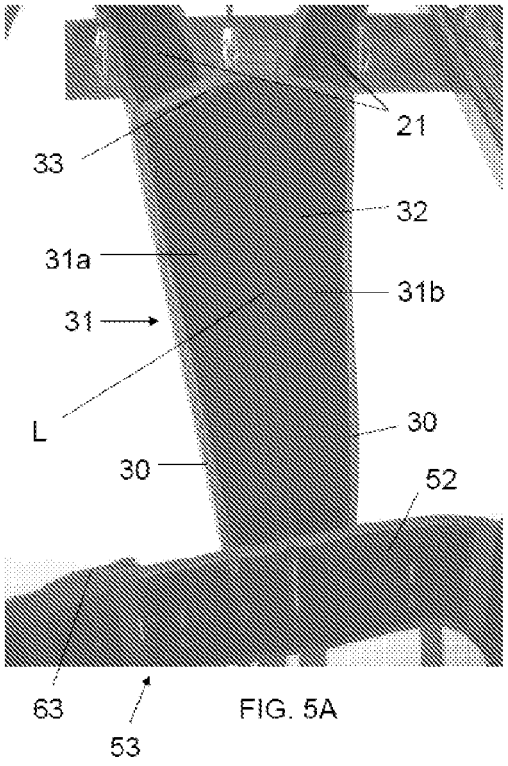


FIG. 4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63
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FIG. 5A

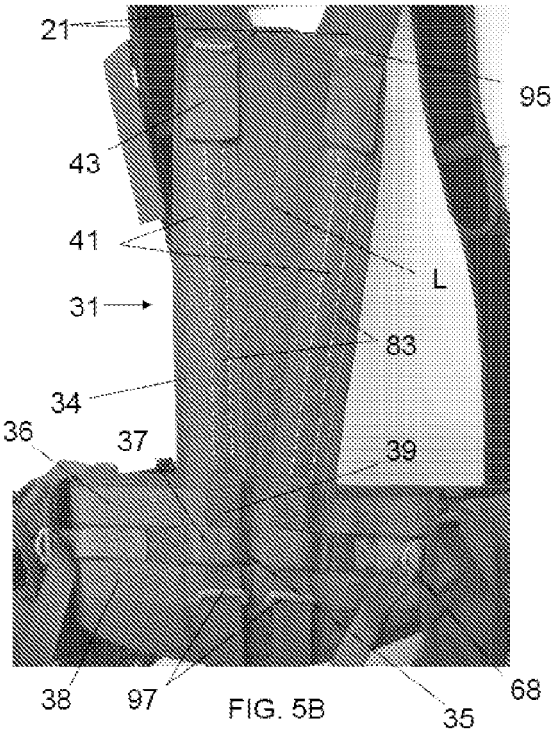
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FIG. 5B

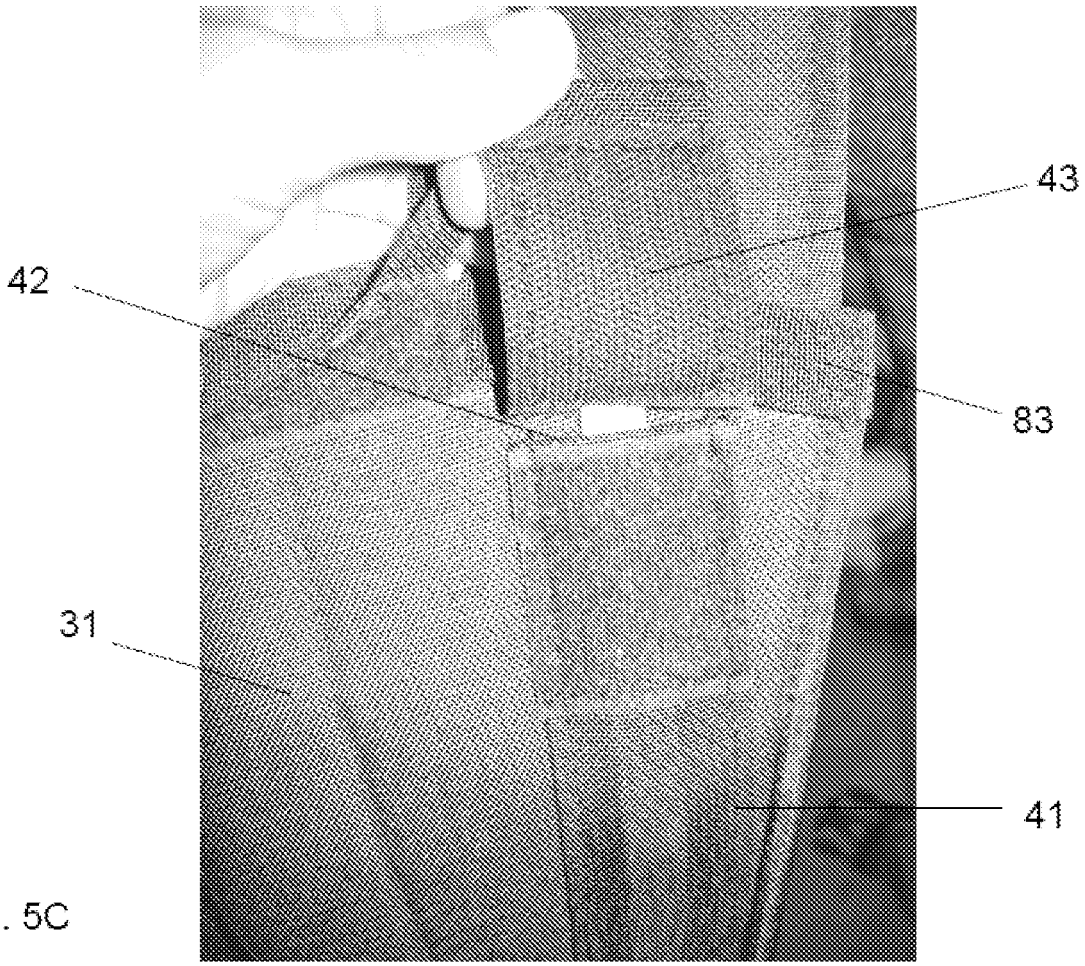

FIG. 5C

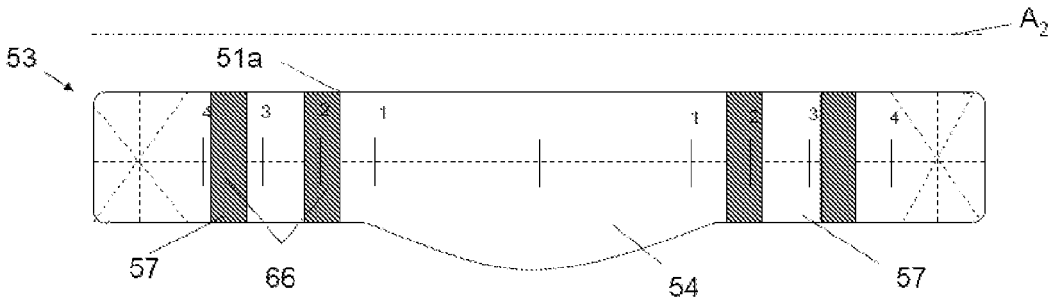

FIG. 6A

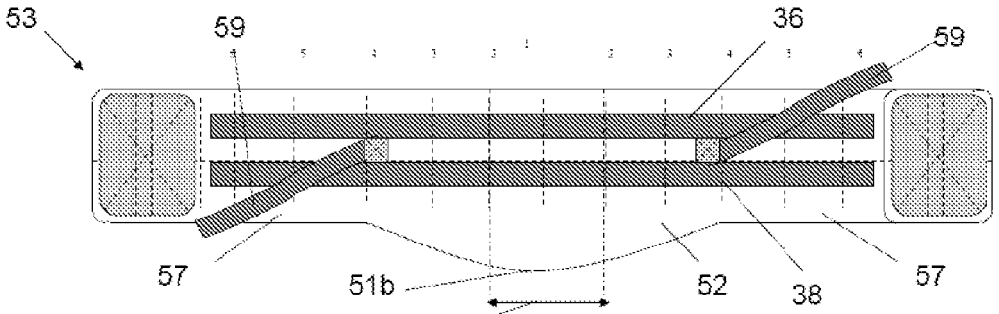

FIG. 6B

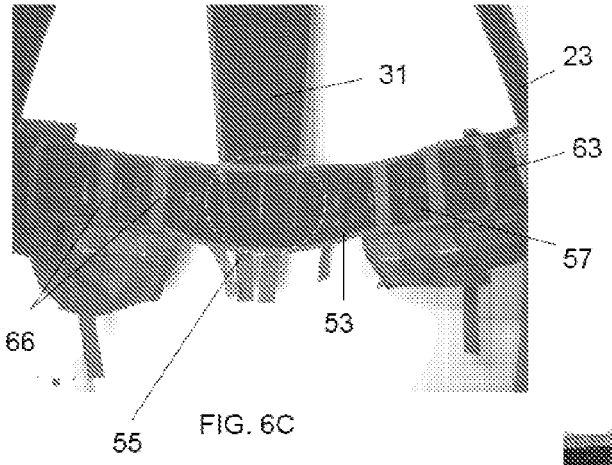

FIG. 6C

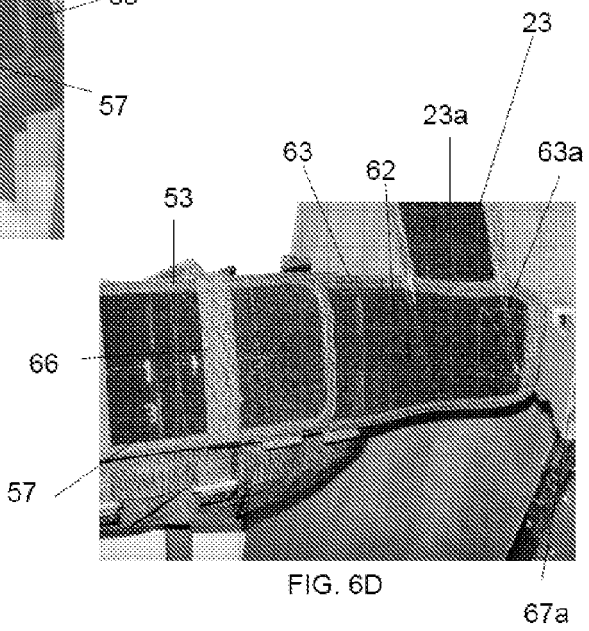

FIG. 6D

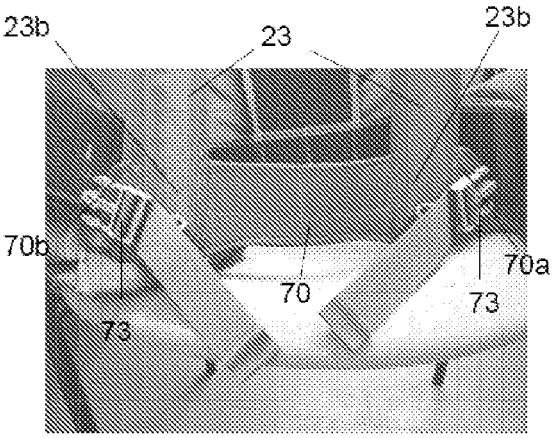

FIG. 7A

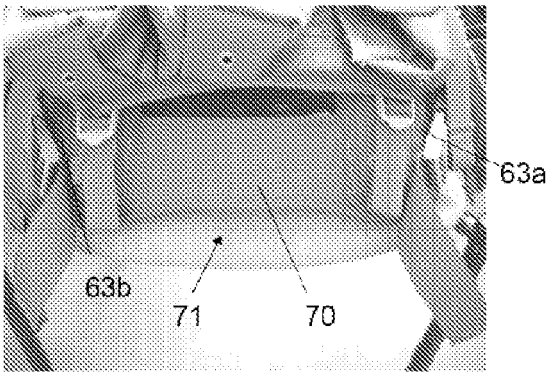

FIG. 7B

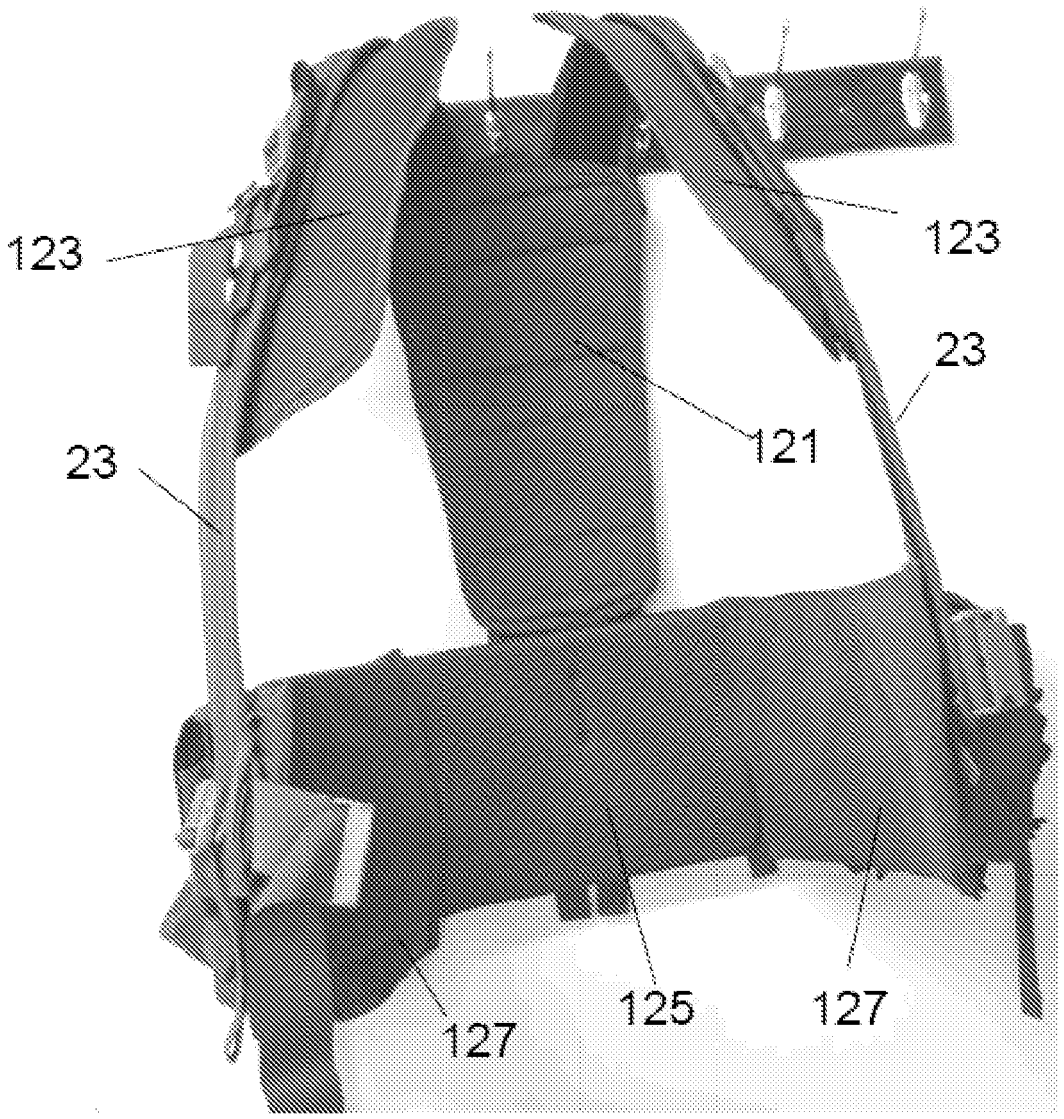

FIG. 8A

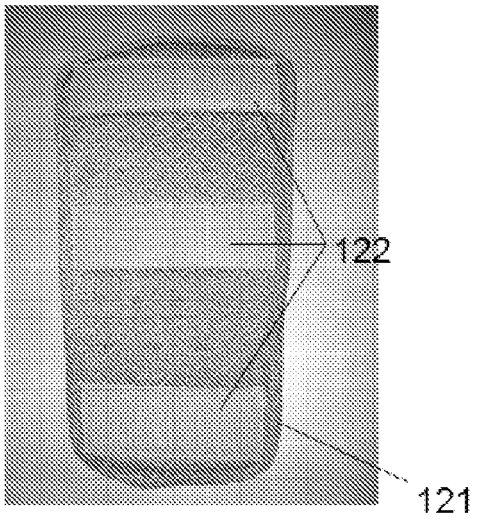

FIG. 9A

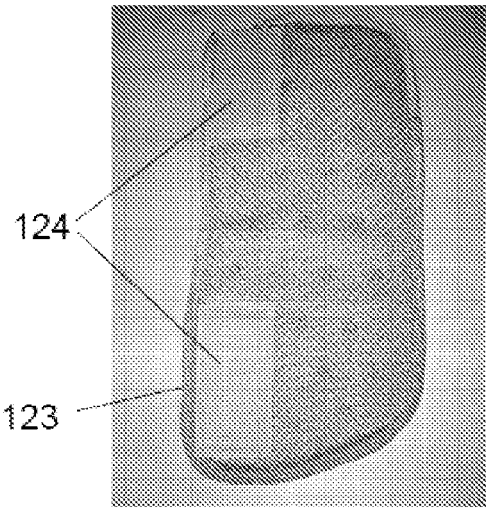

FIG. 9B

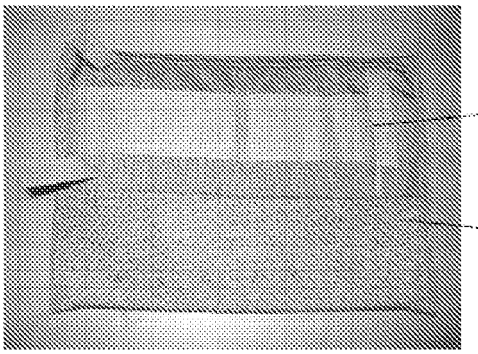

FIG. 9C

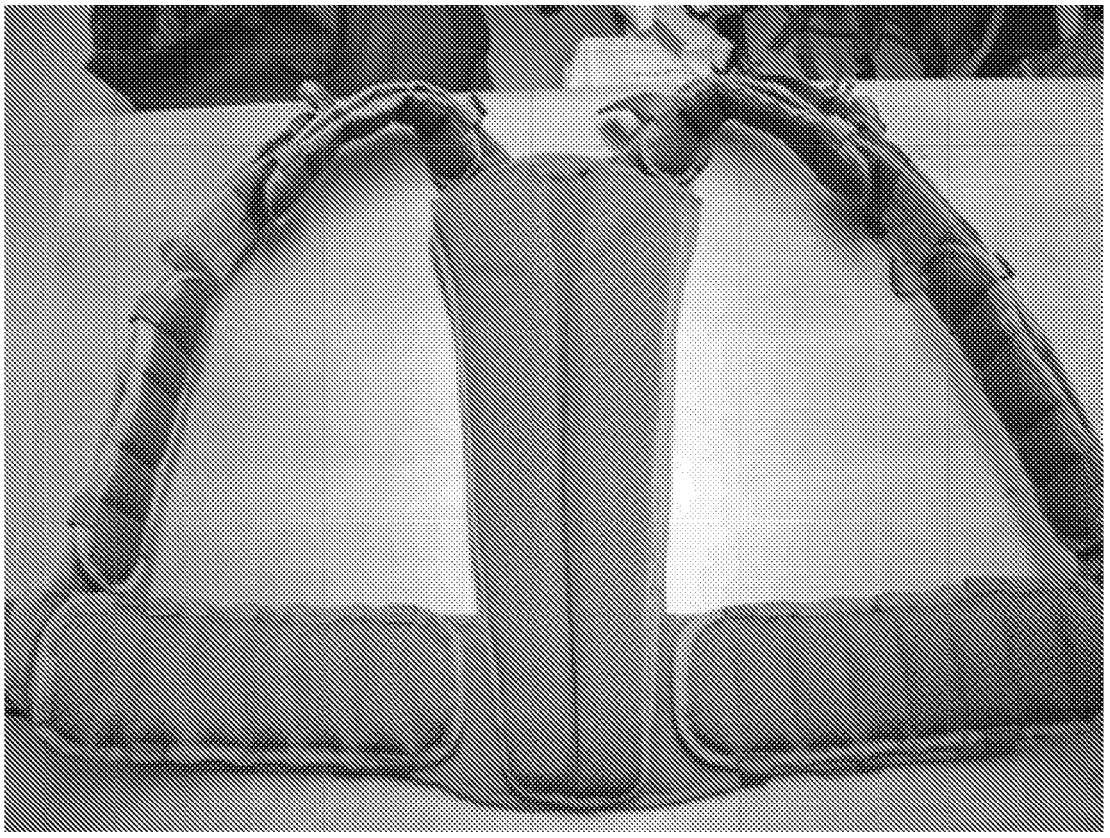

FIG. 10

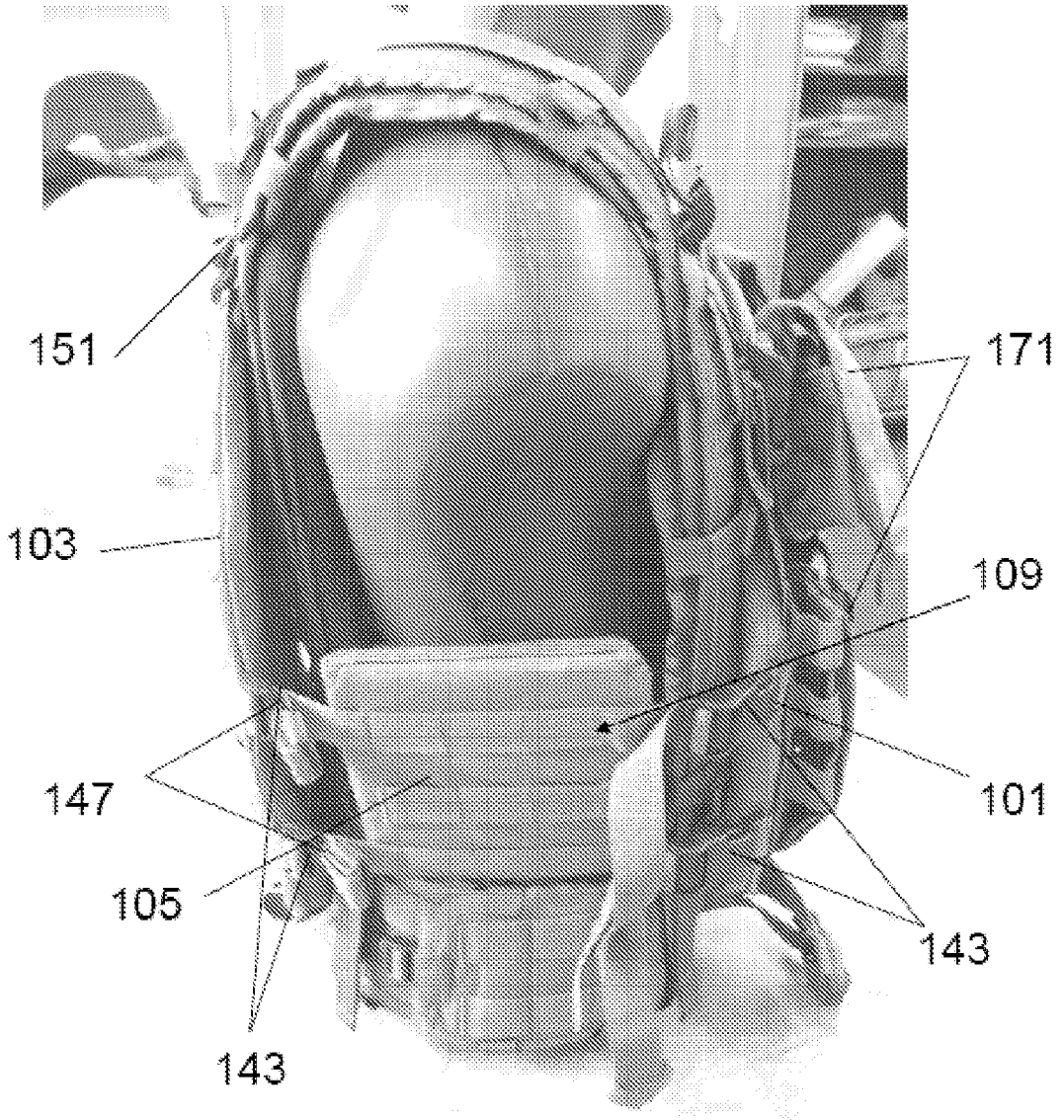

FIG. 11A

FIG. 11B

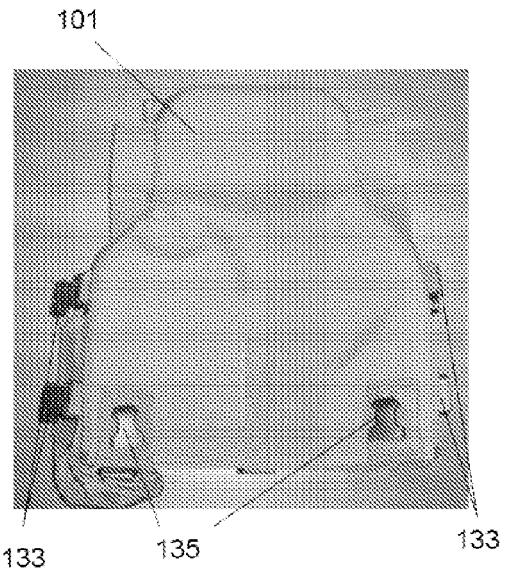

FIG. 11C

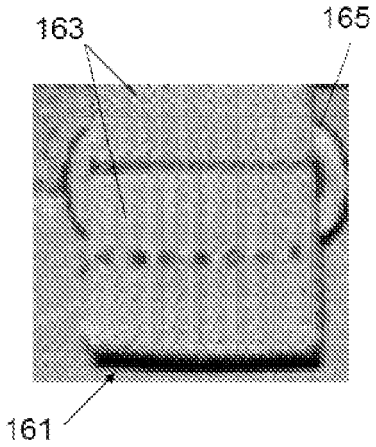

FIG. 12

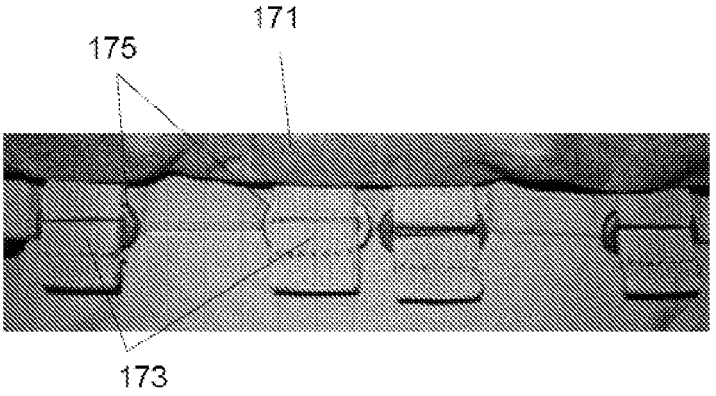

FIG. 13

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 20090020580 A **[0002]**
- US 20080010730 A **[0002]**