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

(11) **EP 2 037 207 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
**18.03.2009 Bulletin 2009/12**

(51) Int Cl.:
***F41H 5/08*** *(2006.01)* *F41H 3/02* *(2006.01)*
*F42D 5/045* *(2006.01)*

(21) Application number: **08015942.9**

(22) Date of filing: **10.09.2008**

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

(30) Priority: **11.09.2007 DK 200700237 U**

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(54) **Bag with ballistic protection**

(57) The present disclosure relates to a bag with ballistic protection. One particular aspect of this disclosure is that the protection bag can be provided with an inserted flexible, ballistic protection mat and flexible shock damping material and/or ballistic insert plates. The ballistic protection is personally portable in the form of a bag and therefore always within range. The bag has various applications: individual ballistic protection, ballistic protected transport and storage of explosives, possibility for protection of a larger area by combination of more bags in open form, side and seat protection in means of transport and transport of wounded personnel.

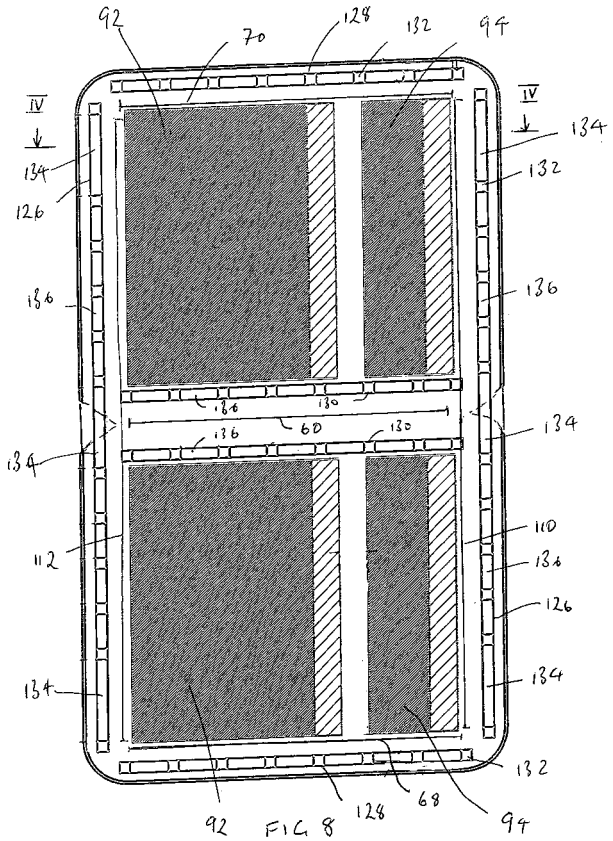


FIG 8

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## Description

**[0001]** The present invention relates to and has as its object the provision of a ballistic protection bag with an inserted flexible, ballistic protection mat and flexible shock damping material or ballistic insert plates, which gives the protection bag the following protection functions:

- Individual ballistic protection.
- Ballistic protected transport and storage of explosives.
- Opportunity for protection of a larger area by combination of more protection bags in open form.
- Side- and seat protection in means of transport.
- Transport of wounded in open form.

**[0002]** Known ballistic protection is not personally portable in form of a protection bag, which can be carried with you.

**[0003]** More specifically the present invention is directed to the provision of a ballistic protection bag of the above mentioned kind, which makes it possible always to have the ballistic protection within range, and which has various applications.

**[0004]** In order to satisfy these objects there is provided in accordance with the present invention a ballistic protection bag comprising a fabric case having a centre line and inner pockets on both sides of said centerline for receiving a flexible ballistic mat adapted to be carried by at least one person and to be combined with one or more further, like, ballistic protection bags with ballistic overlap.

**[0005]** Basically the present invention proposes a bag, which is new by inserting a flexible, ballistic mat and possibility for extra inserting of shock damping material or ballistic insert plates and in which, by combination of more bags, a ballistic overlap is obtained.

**[0006]** By always keeping the bag within range, protection of both military and civil personnel against fragments from IEDs (Improvised Explosive Devices), hand grenades, small to medium size landmines and hand weapon ammunition is secured.

**[0007]** The ballistic protection bag is in particular adapted to fulfill at least some of the following further functions:

a) to provide seat and/or side protection in a means of transport,

b) to be used for the transport of wounded in open form.

c) to receive removable ballistic insert plates,

d) to receive removable shock damping material,

e) to act as camouflage,

f) to act as protective body cover during a mortar attack,

g) to carry and store items such as arms (e.g. handguns, rifles, machine guns), grenades, detonators ammunition, explosives and any other portable items of military equipment,

h) to carry and store protective items for personnel such as a fragmentation vest, a helmet, goggles and night vision goggles.

i) to be used as personal body armour as front, back or side protection,

j) to be carried as a rucksack, as a luggage grip and/or as a shoulder bag,

k) to be used as a bomb blanket,

l) to be used as a VIP body protector,

m) to be used as window protection.

**[0008]** The bag advantageously comprises first and second generally rectangular fabric layers forming a pocket between them which extends over almost the full area of the fabric layers for receiving the flexible ballistic protection mat

which also extends over almost the full area of the fabric layers, the first and second layers being connected, e.g. stitched together at least along the portion of their side edges, there being a fastening device, such as a zip fastener or hook and loop fastener, provided around the periphery of the generally rectangular pieces of material to enable the two halves of the fabric case to be connected together after folding the two halves of the case together about said center line, there being an access permitting insertion and removal of said flexible ballistic mat into said pocket.

**[0009]** A third generally rectangular layer of fabric is provided of substantially the same size as the first and second layers and is connected to at least said second layer to form one or more further pockets adapted to receive a hard ballistic panel and/or a shock-damping material.

**[0010]** Further fabric layers are preferably provided defining internal pockets of said ballistic protection bag for receiving military items, such as arms, grenades, ammunition, explosives, goggles, helmets, fragmentation vests, knives, or the like.

**[0011]** The ballistic protection bag conveniently has first and second handgrips permitting it to be carried as a luggage grip and first and second shoulder straps, or provision for the mounting of first and second shoulder straps enabling the ballistic protection bag to be carried as a rucksack. It optionally further comprising a strap or strap-mounting elements permitting the ballistic protection bag when carried as a rucksack to be secured by a waist strap.

**[0012]** A plurality of loops is preferably provided at each longitudinal side of the ballistic protection bag permitting it to be carried as a stretcher.

**[0013]** The ballistic protection bag expediently has at least first and second fastener elements, such as a zip fastener or hook and loop elements or hook and loop fastener provided at least at longitudinal sides of the bag at an inside of the bag and/or at an outside of the bag and permitting the bag to be connected to a like bag, said fastener elements being positioned relative to the external boundary of the flexible protection mat such that when a first ballistic protection bag is joined to a second ballistic protection bag the ballistic protection material of at least one of said bags overlaps the joint formed between the mating fastener elements of the two neighbouring bags, thereby achieving a ballistic overlap.

**[0014]** Preferred embodiments of the invention are described in the subsequent description of a preferred embodiment and in the subordinate claims.

**[0015]** Thus the present teaching creation relates to a bag with ballistic protection. The new with this creation is that in the protection bag is an inserted flexible, ballistic protection mat and flexible shock damping material or ballistic insert plates.

**[0016]** The ballistic protection is personnel portable in the form of a bag and therefore always within range. The bag has various applications: individual ballistic protection, ballistic protected transport and storage of explosives, possibility for protection of a larger area by combination of more bags in open form, side protection and seat protection in means of transport and transport of wounded personnel.

**[0017]** The invention will now be described in more detail by way of example only and with reference to the accompanying drawings, in which:

Fig. 1 shows a ballistic protection bag in open form and how ballistic protection panels are placed in the bag,

Fig. 2 shows how a flexible protection mat for insertion into the bag is constructed,

Fig. 3 shows how a ballistic protection plate and shock damping material are constructed,

Fig. 4 shows the four basic layers of the ballistic protection bag in accordance with the section IV-IV of Fig. 8,

Fig. 5 shows the ballistic protection bag in closed form from the front,

Fig. 6 shows the ballistic protection bag in closed form from the rear,

Fig. 7 shows the ballistic protection bag in closed form from the side in the direction of the arrow VII in Figs. 5 and 6,

Fig. 8 shows a diagrammatic view of the opened out ballistic protection bag from the inside similar to Fig. 1,

Fig. 9 shows a diagrammatic view of the ballistic protection bag from the outside when opened out and

Fig. 10 shows an alternative internal layout of the ballistic protection bag in a view on a section plane such as X-X in Fig. 9 but with the bottom half of the bag being partly broken away to simplify the drawing but actually being of mirror symmetry relative to the dashed line of symmetry through the zip.

**[0018]** Turning now to the Figs. 1 to 9 there can be seen the ballistic protection bag 10 and its components in various representations. The ballistic protection bag 10 is basically made of a textile fabric and in a specific example of polyamide

6.6 "Cordura". The fabric has a construction of 1100 dtex threads in both warp and weft directions with 13 threads per cm in warp and 12 threads per cm in weft. This results in a fabric weight of about 350 g/m$^2$. The fabric is provided with a polyurethane coating and a fluorocarbon finish to act as a dirt repellent and a hydrophobic dressing. As shown in the drawing of Fig. 1, the ballistic protection bag has a generally desert color but it can be finished in other colors, such as white for use in snow, or in camouflage colors, and indeed it could be provided with an external cover in any desired color if deemed appropriate. Furthermore, the printed camouflage can be with the ability to retain visual camouflage integrity in the near infrared surveillance range, i.e. to prevent the user being easily spotted with infra red binoculars, night sights or the like. A suitable dressing can also be used with bags in other colours or colour schemes.

**[0019]** As shown in Fig. 1, the bag is opened out and is seen from the inside. Fig. 5 shows the same bag when closed by folding it together about the center line 12 and as seen from the front side, whereas Fig. 6 shows the folded together ballistic protection bag from the rear side. It can be seen from the drawings of Figs. 5 and 6, and from the side view of Fig. 7, that the front and rear sides are provided with loop handles 14 and 16 which enable the ballistic protection bag to be carried in the manner of a luggage grip. The handles 14 and 16 can be formed of the same material as the fabric of the ballistic protection bag or can be formed of any suitable webbing or other tough material which enables possibly heavy loads to be carried without cutting into the carrier's hands. Because the ballistic multi-bag can be loaded with fairly heavy pieces of equipment, it is reinforced by webbing such as 18 of appropriate material which is doubled up in some locations, where particular heavy loads may be expected. The reference numeral 20 in Fig. 5 denotes an area where a name tag or some other identification can be placed.

**[0020]** The view of Fig. 6 is particularly important since it shows how the ballistic protection bag can also be carried as a rucksack. For this purpose there are two pieces of webbing 22 and 24 which are arranged at an angle to one another and stitched to the material of the bag while leaving two loops 26 and 28. These loops enable shoulder straps, such as 30 and 32, to be secured to the webbing. This is typically done by providing the shoulder straps 30 and 32 with an extended piece of interlocking loop and hook fastener material, such as Velcro(™), which can be folded back through the loops 26, 28 and stuck onto the mating fastener element (hook or loop) at the rear sides of the shoulder straps 30, 32 in order to fix the straps in the desired position and also to provide a length adjustment for the straps. The extended pieces of the shoulder straps can also be passed through the loops 25 and 27 in the webbing straps extending vertically below the limbs of the handgrip 16 and then turned back on themselves, For example, the extended part of the top strap 32 can pass to the left in Fig. 6 through the loop 28, the loop 25 and the loop 27 and then back onto itself outside of these loops.

**[0021]** The ends 34 and 36 of the two shoulder straps 30 and 32 can either be releasably connected to the bag by, for example, plastic or metal clips or can be permanently stitched to the bag or can also be connected to the bag by a webbing and loop arrangement in similar manner to the webbing items 18 and 22.

**[0022]** The two further pieces of webbing 38 and 40 with loops 42 and 44 are provided to accommodate a separate waist strap which the carrier can engage around his waist to keep the ballistic protection bag stable when he is carrying it as a rucksack. The heavy piece of webbing 46 is an additional piece of webbing which can be used as an occasional handle (to drag a person wearing the rucksack) or can be used to strap other pieces of equipment to the outside of the bag if desired. Naturally, further pieces of webbing can be arranged at strategic positions around the bag as appropriate.

**[0023]** The bag 10 is, in the preferred embodiment, basically of a four-layer fabric construction which is best seen from the sectional drawing of Fig. 4, where each layer of material is shown as a single line. Basically, the ballistic protection bag comprises an outer layer of textile material 50 and a first inner layer 52 which extends over the full area of the bag, i.e. over the front and rear sides, and is joined to the outside layer 50 at the side edges 54 where a zip fastener, or more correctly one half of the zip fastener 56, is provided which enables the two halves of the ballistic protection bag to be zipped together, i.e. to permit the front and rear halves of the baggage shown in Figs. 5 and 6 to be zipped together for carrying purposes. The two layers of material 50 and 52 form between them a pocket which is accessible through an access opening formed by a center zip 60 shown at the inside of the opened bag in Figs. 1 and 8. Once the flexible ballistic mat has been inserted the zip 60 can be closed.

**[0024]** Reference should also be made to Fig. 2 which shows the flexible ballistic protection mat 62 in its own sealed cover 64, for example of PVC. The pocket 51 for receiving the flexible ballistic mat extends over almost the full area of the fabric layers, that is to say it extends up to the internal boundary of the join between the fabric layers 50 and 52 adjacent their outside edges. The flexible ballistic protection mat also extends over substantially the same area, i.e. it substantially extends over the same area as and fills the said pocket 51 and is only smaller than the pocket by an amount consistent with easy fitting of the mat into the pocket.

**[0025]** Ballistic protection means in the present context not just protection against bullets but protection against all high velocity fragments such as fragments of mines, hand grenades, nails or other materials from bombs of diverse kinds and shrapnel generally, as well as dust, gravel or other particles or fragments of wood or glass accelerated by explosions or blasts. Blast protection, which can be achieved by supplementing the flexible ballistic mat 62 by a shock damping material 79 as shown in Fig. 3, and which will be described later, is understood herein to mean protection against the results of blasts, explosions or detonations through a blast and shock resistant design which involves:

- dynamic absorption of the shock wave propagation and shock wave effects,
- protection and isolation of occupants of any form of transportation from shock effects and from the effects of fragments, debris and dust.

**[0026]** The flexible ballistic protection mat 62 preferably consists of filaments of glass fiber, preferably E-glass, aramide, polyethylene, preferably PE-UHMW polyethylene or other high strength fibers. The filaments are preferably disposed generally parallel to one another in layers. The filaments of one layer cross the filaments in an adjacent layer, or form a woven fabric, with a plurality of layers of said fabric being placed on top of each other to form a mat.

**[0027]** In a preferred embodiment the ballistic mats can comprise 16 layers of aramide fiber woven fabric (simple cross weave) with a fabric weight preferably in the range from 100 g/m$^2$ to 800 g/m$^2$, with a filament diameter preferably in the range from 6 to 20 μm, the filaments preferably having a linear density of 400-5000 dtex (and different dtex can be provided for the warp threads and the weft threads. The layers of fabric can be arranged at different crossing angles such as a 45 degree angle from one layer to the next, i.e. layers at 0, 45, 90, 135, 180, 225, 270, 315, 360 degrees etc. The crossing angles could also be multi-axial. Examples of suitable filaments and sources of filaments are, without restriction, glass fiber from Saint Gobain or Owens Corning, aramide from Teijin Twaron or Du Pont (Kevlar™), polyethylene from DSM Dynema or Honeywell (Spectra™). The fiber layers can be stitched together locally or with parallel or crossed seams spaced say 5 cm apart, or in another form in which they are combined to avoid slipping of one layer relative to another while preserving the overall flexibility of the so formed ballistic protection mat which is soft in texture. It should be noted that the side edges and corners of the flexible ballistic protection mat are normally taped with one or more layers of a material such as standard brown plastic packaging tape to prevent fraying. For example, the tape, which can be "Packaging Tape Low Noise 3120" from Scotch/3M in rolls 48 mm wide with 66 m length, can be folded along the middle of a strip of tape and stuck to the two outer sides of the mat either lengthways or crossways. The mat with the taped edges is then placed in the PVC cover 16, 16' or 16".

**[0028]** It should be stressed that the examples given above are only a small selection of possible designs of ballistic mats of which there are many variants.

**[0029]** Ballistic mats of this kind are known per se, and are for example available from Scanfiber Composites A/ S in Denmark.

**[0030]** As can be seen in Fig. 4, the ballistic protection bag also has a third layer of textile material 66 which forms a further pocket 65 with the layer 52. In actual fact there are two separate pockets 65 provided in the front and rear halves of the ballistic multi-protection bag and which are accessible through respective zip fasteners 68 and 70 shown in Figs. 1 and 8. These pockets, defined between the two layers of material 52 and 66, are designed to receive a hard ballistic protection panel such as 72 and 74 shown in Figs. 1 and 3. The two hard ballistic panels extend together over substantially the full area of the flexible ballistic protection mat, and are again only smaller by an amount consistent with easy insertion in the field.

**[0031]** The hard ballistic panels 72, 74 are composite panels and each consist of filaments of glass fiber, preferably E-glass, aramide, polyethylene, preferably PE-UHMW polyethylene or other high strength fibers. The filaments are preferably either disposed generally parallel to one another in layers in a matrix of a thermoplastic or a thermosetting plastic, such as polypropylene, epoxy resin, phenolic resin, PUR or polyethylene. The filaments of one layer cross the filaments in an adjacent layer, or form a woven fabric, with a plurality of layers of said fabric being combined in a matrix of thermoplastic or thermosetting plastic to form a panel.

**[0032]** In a preferred embodiment the ballistic panels can comprise 70 layers of PE-UHMW polyethylene fabric (unidirectional) with a fabric weight preferably in the range from 100 g/m$^2$ to 500 g/m$^2$. The matrix preferably consists of polyurethane. Other examples of thermoplastics or thermosetting plastics which can be used in connection with other fibers are, without restriction, epoxy resins, phenolic resins, polypropylene and polyethylene. The layers of fabric can be arranged at different crossing angles such as a 45 degree angle from one layer to the next, i.e. layers at 0, 45, 90, 135, 180, 225, 270, 315, 360 degrees etc. The crossing angles could also be multi-axial. Examples of suitable filaments and sources of filaments are, without restriction, glass fiber from Saint Gobain or Owens Corning, aramide from Teijin Twaron or Du Pont (Kevlar™), polyethylene from DSM Dynema or Honeywell (Spectra™). The filaments are preferably present in the matrix in an amount of between 60 and 95% by weight. The laid up materials, i.e. the layers of filaments or fabrics interleaved with layers of matrix material are typically bonded together with heating in a powerful press which causes the matrix material to flow around the filaments and impregnate the spaces between them.

**[0033]** It should be stressed that the examples given above are only a small selection of possible designs of ballistic panels of which there are many variants. A typical hard ballistic panel 72, 74 for use in the ballistic protection bag in accordance with the present teaching typically has a thickness ranging from 3 to 20 mm, especially of approximately 10 mm.

**[0034]** Ballistic panels of this kind are known per se, and are for example available from Scanfiber Composites A/S in Denmark.

**[0035]** The ballistic panels 72, 74 are contained in respective fabric bags 76, 78 which, on the one hand, protect the

users from possibly sharp edges and short, stiff filaments in the ballistic plates and, on the other hand, are also provided with webbing straps such as 80 and 82 and similar 84 and 86, which enable the ballistic panel to be used for example in the manner of a shield. That is to say the user can, for example, insert his forearm through the loop 80 respectively 84 and grasp the loop 82 respectively 86. Thus, in the case of a knife attack or the like, the user can protect himself with the hard ballistic panel which is completely resistant to such weapons. The ballistic panel can protect against minor antipersonnel mines and KE threats up to small rifle ammunition.

**[0036]** It can be seen from Fig. 1 at the right-hand side that the bag 76 containing the hard ballistic panel has a folded over flap at 88 which is typically sealed to the remainder of the bag by a strip of interlocking loop and hook material such as Velcro(™). This also applies to the bag 78 for the ballistic panel shown at the left in Fig. 1.

**[0037]** As mentioned above the flexible ballistic protection mat described with reference to Fig. 2, and/or the hard ballistic panels 72, 74 described with reference to Fig. 3, can be supplemented by the flexible shock damping material 79 which is an optional separate item. The flexible shock damping material 79 of Fig. 3 will typically be placed between the ballistic mats/panels and the person/object to be protected, for example in the pocket 51 or in the pockets 65.

**[0038]** The shock damping material 79 preferably comprises a resilient fiber or granulate material bound with a synthetic binder. Fibrous materials are generally to be preferred because they result in better damping properties due to their higher shear strength. The shock damping material again takes the form of two plates each having substantially the same area as one of the two hard ballistic panels. That is to say the plates of shock damping material extend together over substantially the full area of the flexible ballistic protection mat, and are again only smaller by an amount consistent with easy insertion into the pockets 65 in the field. When combined with the ballistic mat the shock damping material could also be full size like the ballistic mat.

**[0039]** The resilient fiber or granulate material preferably comprises rubber, in particular a recycled rubber for example from motor vehicle tyres, and said synthetic binder preferably comprises a polyurethane resin.

**[0040]** One particular material that has been found useful as a ballistic and/or blast damping material is the material sold under the trade mark Regupol (Regupol is a registered trade mark of BSW GmbH Berleburger Schaumstoffwerk 57301 Bad Berleburg, Germany and Regupol material is available from that source). Regupol material is sold in different qualities one of which is typically used in shooting ranges to protect the users against rebounds and ricochets. That material, which is suitable as the shock or blast damping material of the present invention, is able to capture bullets from hand weapons and retain them so that even if they hit an underlying concrete floor or wall the rebounding or ricocheting bullet or fragments thereof or indeed fragments of concrete knocked out of the concrete floor or wall do not re-emerge from the Regupol material and endanger users of the shooting range.

**[0041]** The suitable Regupol material is preferably in the form of rubber plates or mats made out of "PUR" bound high quality rubber fibers with a three layer PUR-coating. The rubber is understood to consist of recycled cut up or shredded car tires, which is a relatively inexpensive source of such material. The rubber can consist of rubbers of different hardnesses.

**[0042]** Suitable shock damping panels 79 in accordance with the present teaching should have or result in a damping effect factor of at least 10. This damping effect factor can be measured in the following way:

**[0043]** A test is carried out using two artificial legs with military boots on them. The artificial legs carry sensors such as piezo crystals and are weighted down with 80 kg of sand in bags to simulate a standing soldier with full equipment. The boots are typically placed on a thin stiffened steel plate of 1mm thickness and the plate is weighted down with say two tons of ballast.

**[0044]** An explosion is then detonated beneath the steel plate of a level corresponding to a small land mine with say 200 to 300 gm of high explosive but without metal fragments. The sensors or data collectors connected to the legs (piezo crystals) are used to measure the acceleration experienced by the foot. This is typically a curve with pronounced positive and negative peaks which decay in size over a period of say 100 ms. The amplitude of the first positive peak is noted. It can for example be around 7,700 g where 1 g = 9.81 $m/s^2$. This level of acceleration would normally completely destroy a person's leg, probably killing him at the same time. The test is then repeated with the blast damping material combined with a ballistic mat placed between the boot and the floor. This second test, carried out under the same conditions might, for example, result in a peak acceleration of say 770 g. The quotient formed between the peak acceleration for the test without blast damping material and the test with blast damping material yields the damping effect factor. In our example:

the blast damping factor is thus 7,700 / 770 = 10.

**[0045]** In actual fact significantly better damping effect factors can be achieved. In the case of a ballistic protection bag the composite use of a flexible ballistic mat of 15 mm thickness and comprising aramide with a shock damping material (Regupol) of 30 mm thickness can readily lead to a reduction of the peak acceleration to 410g and thus to a

damping effect factor of 19 in the example given. If a hard ballistic panel is additionally used the ballistic protection properties are increased even further and a further reduction of shock damping can be expected.

**[0046]** It should be noted that this is a comparative value and this means that the conditions for the test are not terribly critical. Thus the thickness of the steel plate, the size of the explosive charge, the ballast load on the steel plate are largely irrelevant, so long as they have some bearing on reality. Also the sand load and the type of boot and artificial leg are not really critical.

**[0047]** In the test without blast damping material there is, as stated typically a negative peak following the positive peak and generally of about the same amplitude. In the test with blast damping material the negative peak is almost completely missing and the duration of the positive peak is frequently about the same as the total duration of the positive and negative peaks without blast damping material.

**[0048]** In the ballistic protection bag of the present invention further fabric material 96, 98 is provided at the inside of the ballistic protection bag to form two further pockets 92 and 94. These pockets can be used to accommodate arms, ammunition, detonators, other weapons, explosives, hand grenades, goggles, helmets, fragmentation vests or any other items which the user may wish to carry with him. These pockets 92 and 94 of which one of each are provided in each of the two inner sides of the ballistic protection bag comprise a layer of fabric 96, 98 which respectively form the pocket with the layer of fabric 66 and a closure flap 100, 102 (typically also of the fabric material) which can be stuck to the layer of material 96, 98 respectively by means of an interlocking hook and loop Velcro(™) (not shown). The flap 100 can actually also be a continuation of the piece of fabric 98 forming the pocket 94.

**[0049]** The individual layers of material 50, 52, 66, 96 and 98 and 102 can either all be stitched together at the side edges 54 or can be successively stitched together, for example such that the piece of material 96 is joined to the bottom edge of the piece of material 66 in Fig. 4. The piece of material 66 projects beyond this join and is joined to the piece of material 52 and the piece of material 52 again extends beyond this join and is joined to the piece of material 50 at or shortly before the zip fastener 56.

**[0050]** Turning now to Fig. 8 there can be seen two further long zips 110 and 112 which are respectively provided along the inner long sides of the ballistic protection bag and which enable one multi ballistic protection bag to be connected to another so that a plurality of ballistic protection bags can be assembled into a protective blanket or cover. It will be seen, by comparison of Fig. 8 with Fig. 9, that the two long zips 110, 112 are actually inboard of the external edges 114, 116 of the flexible ballistic mat incorporated into the pocket 51 provided between the layers of material 50 and 52 in Fig. 4. In actual fact there should be a reasonable spacing between the edges 114 or 116 and the respective zip fasteners 110 and 112 of say two cm so that when first and second bags are joined together by the connection of the zip 110 of one bag with the zip 112 of an adjacent bag, the flexible ballistic mats of the two bags overlap the zip fasteners so that there is still ballistic overlap at this position and not a weak position where fragments of shrapnel, debris, bullets or the like could penetrate the protection and reach a person sheltering on the other side of it. In actual fact the ballistic overlap can also be arranged differently. For example the zip 110 can be arranged inboard of the edge 114, whereas the zip 112 is arranged outboard of the edge 116. Because the zip 110 of one bag is joined to the zip 112 of another bag, there will still be ballistic overlap at the joins.

**[0051]** In addition, although not shown in these Figures, it will be possible to provide further short zips at the short sides of the opened bag as shown in Fig. 8 so that the bags could be joined not only at their longitudinal sides but also at their shorter sides. The reference numerals 118, 120 in Fig. 9 indicate hook and loop fastener elements which can be used to secure the flexible protection mat within the ballistic protection bag. Also referring to Fig. 9 it can be seen that the zip fastener 56 extends all around the perimeter of the bag and that there are two V-shaped regions 122, 124 designed to enable the bag to fold easily at the center line 12.

**[0052]** Referring now again to Fig. 8 it can be seen that various pieces of webbing 126, 128 and 130 are provided at the inside of the bag and stitched to it at points such as 132 indicated generally by squares to form loops of materials such as 134, 136 disposed between the individual stitching points 132. The larger loops 134, of which there are conveniently three along each long side of the bag, form handles which enable the bag to be easily used as a stretcher so that, for example, two soldiers can carry a third injured soldier lying along the length of the bag. The smaller loops 136 are intended to enable the user to strap any pieces of equipment he needs to the inside of the bag at strategically convenient positions.

**[0053]** Such joined together bags can conveniently be used in buildings or other partially or fully enclosed spaces such as in containers or ruins to close off window openings or protect thin walls against explosions, shrapnel, debris and bullets fired at the building, to protect both personnel and/or equipment. They can also be used to form temporary protection for gun emplacements or firing positions as well as for protection of individuals.

**[0054]** The ballistic protection bag of the present teaching is also able to be used in or mounted on the coachwork and/or body parts of a means of transport, such as a motor car, a pick-up truck, an all terrain vehicle, a jeep, a truck, a tank or any other form of transportation, preferably in contiguity with said coachwork or body parts, to reduce the acceleration forces acting on personnel carried by said means of transport. It can for example be unfolded to line a footwell and an adjacent seat or to line a seat and an adjacent side or door of a vehicle., depending on the expected threat:

**[0055]** Finally, Fig. 10 shows an alternative arrangement to Fig. 4. Here the bag has an outside fabric layer 150 folded at each end inwardly to form a further layer extending almost up to the middle zip 60 and then turning back on itself to define a pocket 155 for receiving a ballistic panel 74 and/or a shock damping material such as 79 (not shown). A zip 70 is provided for closing this pocket as in the previous example. The zip 56 serves here, as in the other drawings, to zip the two halves of the bag, i.e. of the flexible case, together.

**[0056]** The material is then folded back on itself yet again to form the layer 156 and to form a further pocket 157 for receiving the flexible ballistic mat 62. Further pieces of fabric 160, 162 164 and 166 are provided to form pockets 170 and 172 corresponding to the pockets 92 and 94 with flaps 100 and 102 of the embodiment of Fig. 4.

**[0057]** It should be noted here that the pockets 170, 172 have actually been turned through 90° in the illustration of Fig. 10 to make their design clearer. In actual fact the position of the section line X-X in Fig. 9 on which Fig. 10 is based would only pass through the pocket 170 and the layer of material 160. However, in a modified embodiment, it would also be possible to arrange the pockets 170, 171 precisely as shown in Fig. 10.

**[0058]** Thus, in this example, the flexible ballistic mat extends in the full area pocket 157 extending through both halves of the mat. Again the hard ballistic panel is provided in two pieces each in a separate pocket 155. It will be understood that the pockets 155 and 157 can also be realized by sewing together distinct fabric layers rather than by folding one layer as explained above. Naturally the layers must be stitched together at the side edges irrespective of whether a long piece of fabric is multiply folded or discrete pieces are sewn together.

## Claims

1. A ballistic protection bag (10) comprising a fabric case (50, 52, 56, 66, 96, 98; 150, 152, 154, 156, 56, 160, 162) having a centre line (12) and an inner pocket (51) extending on both sides of said centerline for receiving a flexible ballistic mat (62) adapted to be carried by at least one person and to be combined with one or more further, like, ballistic protection bags (10) with ballistic overlap.

2. A ballistic protection bag (10) in accordance with claim 1 and adapted to fulfill at least some of the following further functions:

   a) to provide seat and/or side protection in a means of transport,
   b) to be used for the transport of wounded in open form.
   c) to receive removable ballistic insert plates (72, 74),
   d) to receive removable shock damping material (79),
   e) to act as camouflage,
   f) to act as protective body cover during a mortar attack,
   g) to carry and store items such as arms (e.g. handguns, rifles, machine guns), grenades, detonators ammunition, explosives and any other portable items of military equipment,
   h) to carry and store protective items for personnel such as a fragmentation vest, a helmet, goggles and night vision goggles.
   i) to be used as personal body armour as front, back or side protection,
   j) to be carried as a rucksack (straps 30, 32), as a luggage grip (handles 14, 16) and/or as a shoulder bag,
   k) to be used as a bomb blanket,
   l) to be used as a VIP body protector,
   m) to be used as window protection.

3. A ballistic protection bag (10) in accordance with either one of the preceding claims, wherein the fabric case (10) comprises first and second generally rectangular fabric layers (50, 52; 154, 156) forming a pocket (51; 157) between them for receiving the flexible ballistic protection mat (62), the first and second layers (50, 52; 154, 156) being connected, e.g. stitched together at least along a portion of their side edges, there being a fastening device (56), such as a zip fastener or hook and loop fastener, provided around the periphery of the fabric case ((50, 52, 56, 66, 96, 98; 150, 152, 154, 156, 56, 160, 162) to enable the two halves of the fabric case (50, 52, 56, 66, 96, 98; 150, 152, 154, 156, 56, 160, 162) to be connected together after folding the two halves of the case (50, 52, 56, 66, 96, 98; 150, 152, 154, 156, 56, 160, 162) together about said center line (12), there being an access (60) permitting insertion and removal of said flexible ballistic mat (62) into said pocket (51; 157).

4. A ballistic protection bag (10) in accordance with claim 3, wherein a third generally rectangular layer of fabric (66; 154) is provided either of substantially the same size as the first and second layers (50, 52) or connected to the second layer (152) by a fold and is connected to at least said second layer (52; 152) to form one or more further

pockets (65; 155) adapted to receive a hard ballistic panel (72, 74) and/or a shock-damping material (79).

**5.** A ballistic protection bag (10) in accordance with claim 3 or claim 4, wherein further fabric layers (96, 98; 160, 162) are provided defining internal pockets (92, 94; 170, 172) of said ballistic protection bag (10) for receiving military items, such as arms, grenades, ammunition, explosives, goggles, helmets, fragmentation vests, knives, or the like.

**6.** A ballistic protection bag (10) in accordance with claim 5, wherein flaps (100, 102; 164, 166) are provided permitting closure of said storage pockets (92, 94; 170, 172).

**7.** A ballistic protection bag (10) in accordance with any one of the preceding claims, having first and second handgrips (14, 16) permitting it to be carried as a luggage grip.

**8.** A ballistic protection bag (10) with any one of the preceding claims, having first and second shoulder straps (30, 32) or provision (22, 24) for the mounting of first and second shoulder straps enabling the ballistic protection bag (10) to be carried as a rucksack and optionally further comprising a strap or strap-mounting elements (38, 40) permitting the ballistic protection bag (10) when carried as a rucksack to be secured by a waist strap.

**9.** A ballistic protection bag (10) in accordance with any one of the preceding claims, wherein a plurality of loops (134) are provided at each longitudinal side of the ballistic protection bag (10) permitting it to be carried as a stretcher.

**10.** A ballistic protection bag (10) in accordance with any one of the preceding claims and having a plurality of loops (136, 46) provided by stitched-on webbing at an inner side of the bag (10) and/or at an outer side of the bag (10) permitting items or equipment to be securely attached to the bag (10).

**11.** A ballistic protection bag (10) in accordance with one of the preceding claims and having at least first and second fastener elements (110, 112), such as a zip fastener or hook and loop elements or hook and loop fastener provided at least at longitudinal sides of the bag (10) at an inside of the bag (10) and/or at an outside of the bag (10) and permitting the bag (10) to be connected to a like bag (10), said fastener elements (110, 112) being positioned relative to the external boundary of the flexible protection mat (62) such that when a first ballistic protection bag (10) is joined to a second ballistic protection bag (10) the ballistic protection material of at least one of said bags overlaps the joint formed between the mating fastener elements (110, 112) of the two neighbouring bags, thereby achieving a ballistic overlap.

**12.** A ballistic protection bag (10) in accordance with any one of the preceding claims, wherein said fabric material comprises a synthetic woven fabric, such as polyamide 6.6, for example with warp and weft threads of 1100 dtex and 13 threads per cm in warp/12 threads per cm in weft and a fabric weight of about 350 g/m$^2$ respectively, with the fabric having a polyurethane coating and/or a fluorocarbon finish and the camouflage print to be with the ability to retain visual camouflage integrity in the near infrared surveillance range.

**13.** A ballistic protection bag (10) in accordance with one of the preceding claims, wherein said flexible ballistic mat (62) comprises a plurality of layers of high strength filaments such as glass fiber or aramide fiber woven fabric with a filament diameter preferably in the range from 6 to 20 μm and with the layers of fabric possibly being arranged at different crossing angles such as a 45 degree angle from one layer to the next, with the layers being stitched together locally or with parallel or crossed seams spaced say 5 cm apart, or connected in another form in which they are combined to avoid slipping of one layer relative to another while preserving the overall flexibility of the so formed ballistic protection mat (62), with the side edges and corners of the flexible ballistic protection mat (62) preferably being taped to prevent fraying.

**14.** A ballistic multi-purpose bag (10) wherein said hard ballistic panel comprises filaments of glass fiber, preferably E-glass, aramide, polyethylene, preferably PE-UHMW polyethylene or other high strength fibers disposed generally parallel to one another in layers in a matrix of a thermoplastic or a thermosetting plastic, such as polypropylene, epoxy resin, phenolic resin, PUR or polyethylene, with the filaments of one layer crossing the filaments in an adjacent layer, or form a woven fabric, and with a plurality of layers of said fabric being combined in a matrix of thermoplastic or thermosetting plastic to form a panel.

**15.** A ballistic protection bag (10) in accordance with one of the preceding claims, wherein a shock-damping material can be inserted into one or more of said pockets (51, 65; 155, 157).

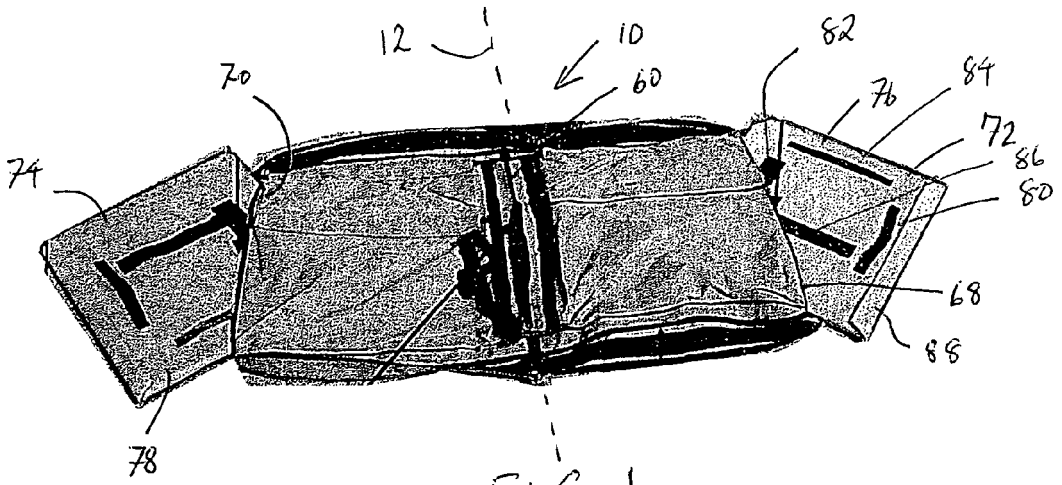



FIG. 1

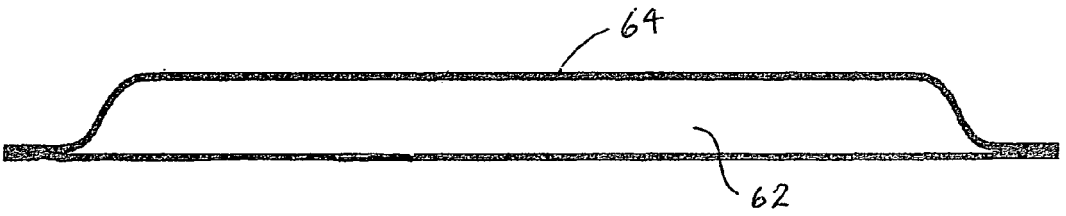



FIG. 2

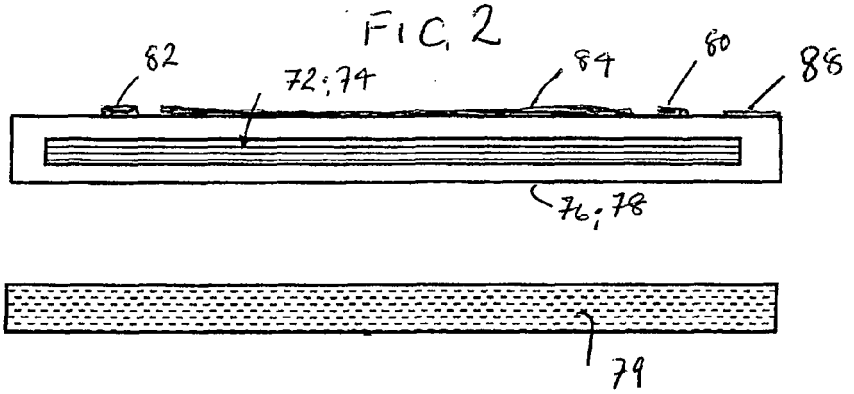



FIG 3

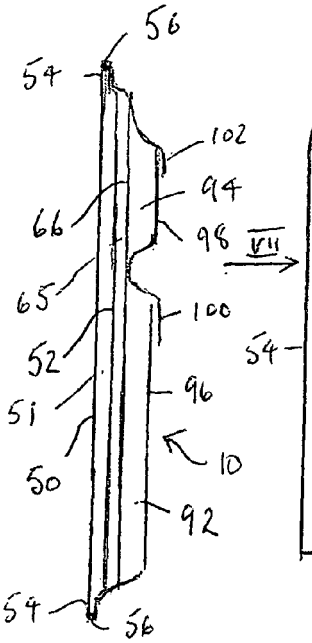



FIG 4

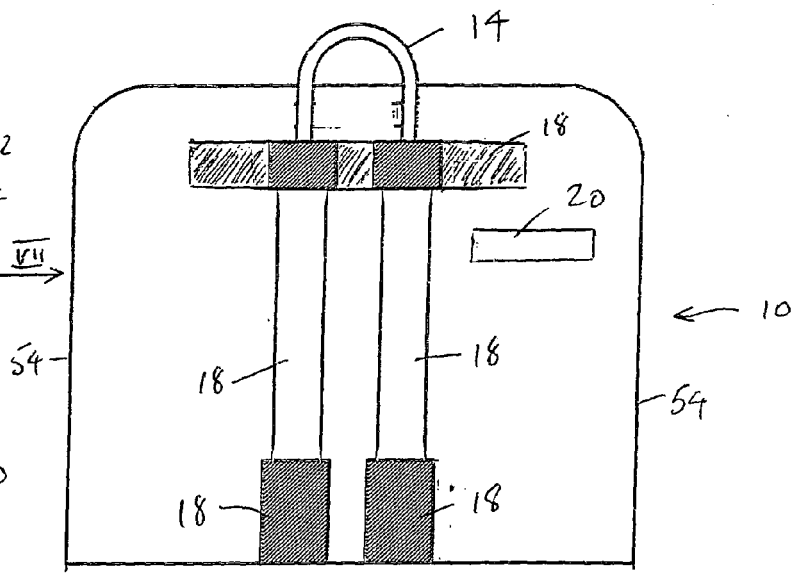



FIG 5

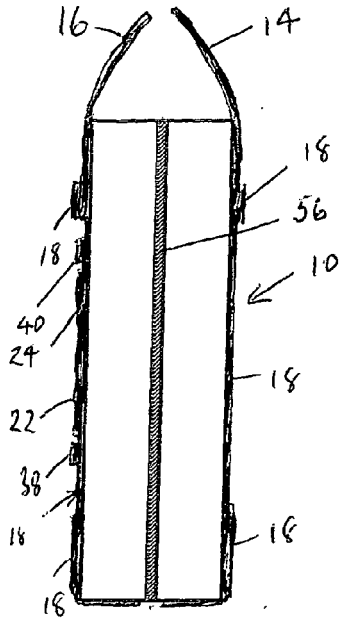



FIG 7

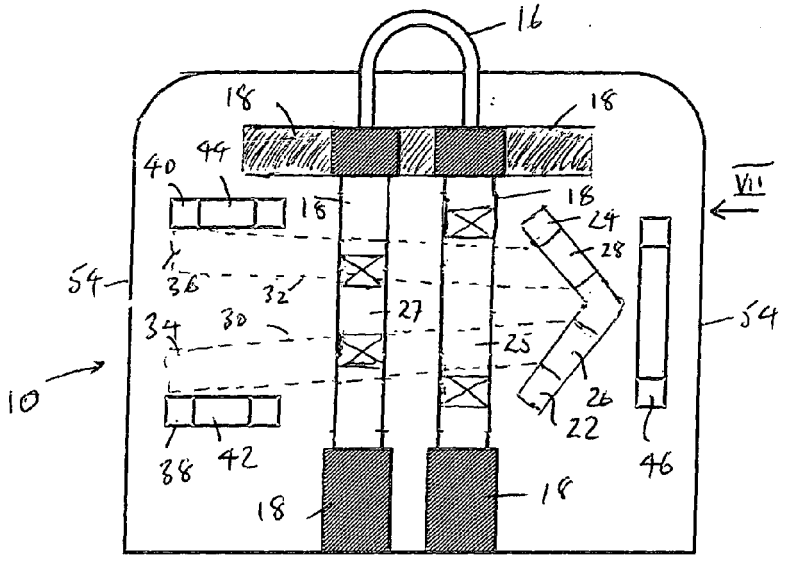



FIG 6

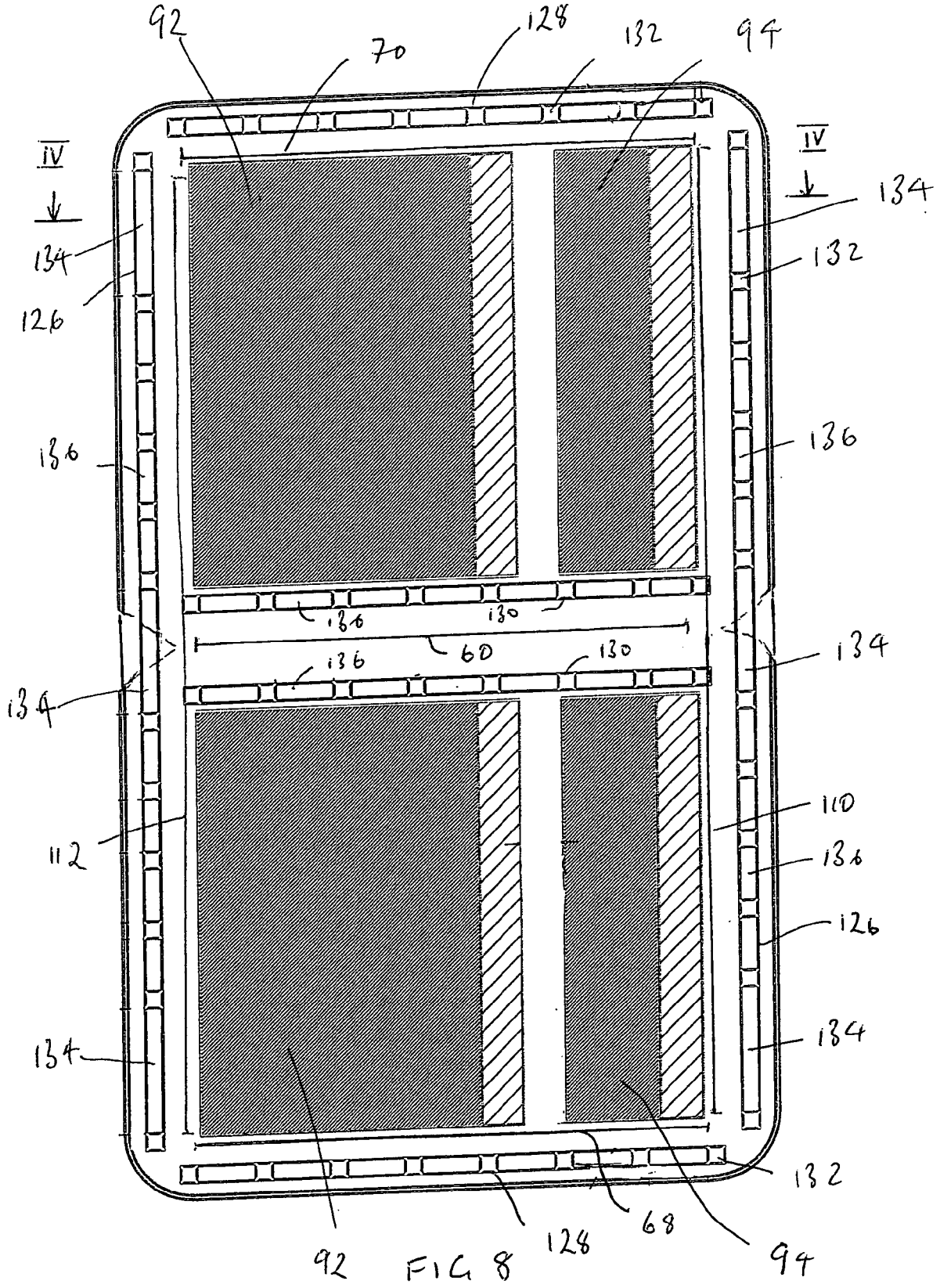

92
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132
94
IV
IV
134
132
126
136
136
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110
112
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126
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92
128
68
94

FIG 8

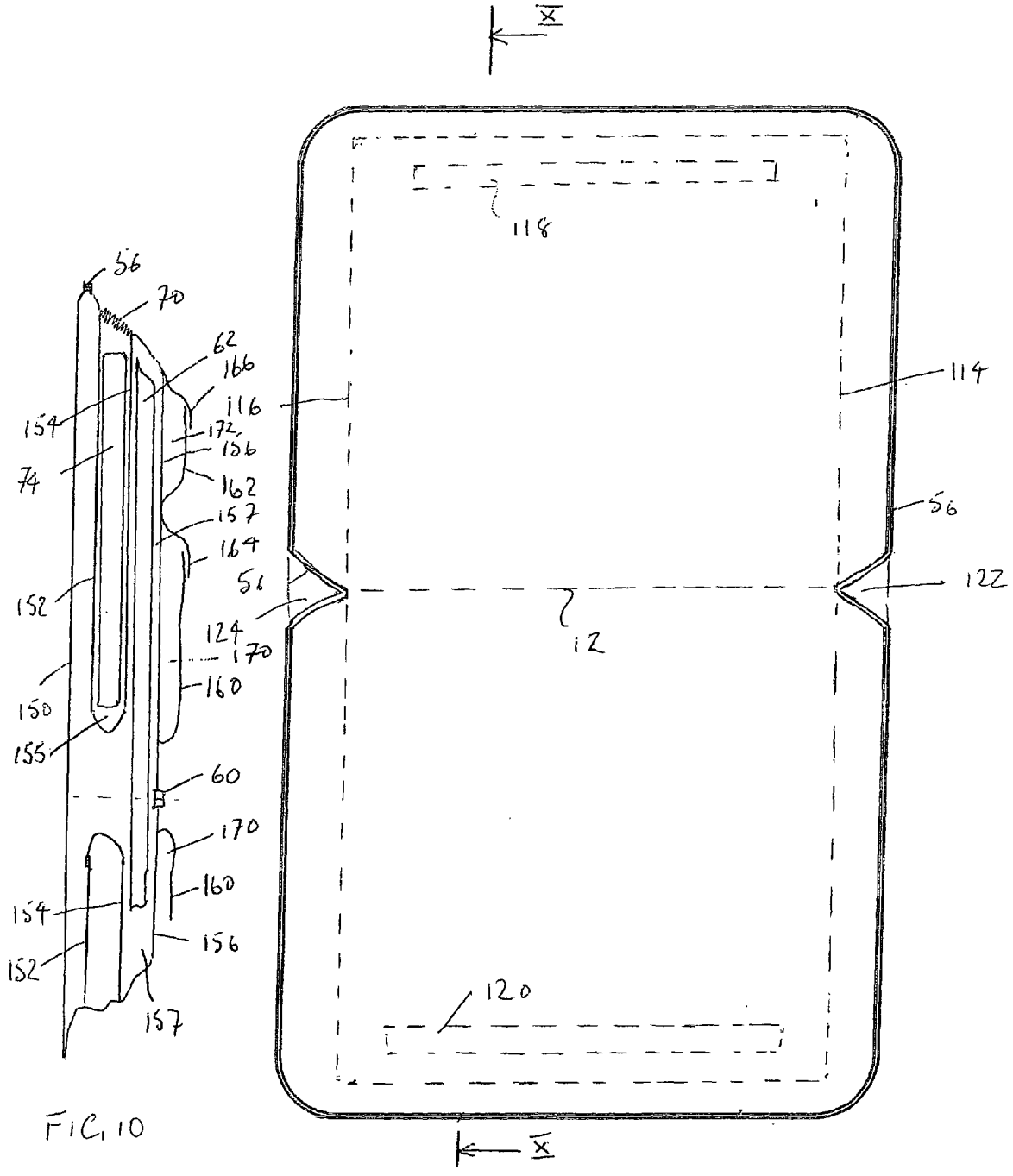

X
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114
56
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12
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157

FIG 9

FIG 10