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(54) **BACKPACK AND COMPONENTS THEREFOR**

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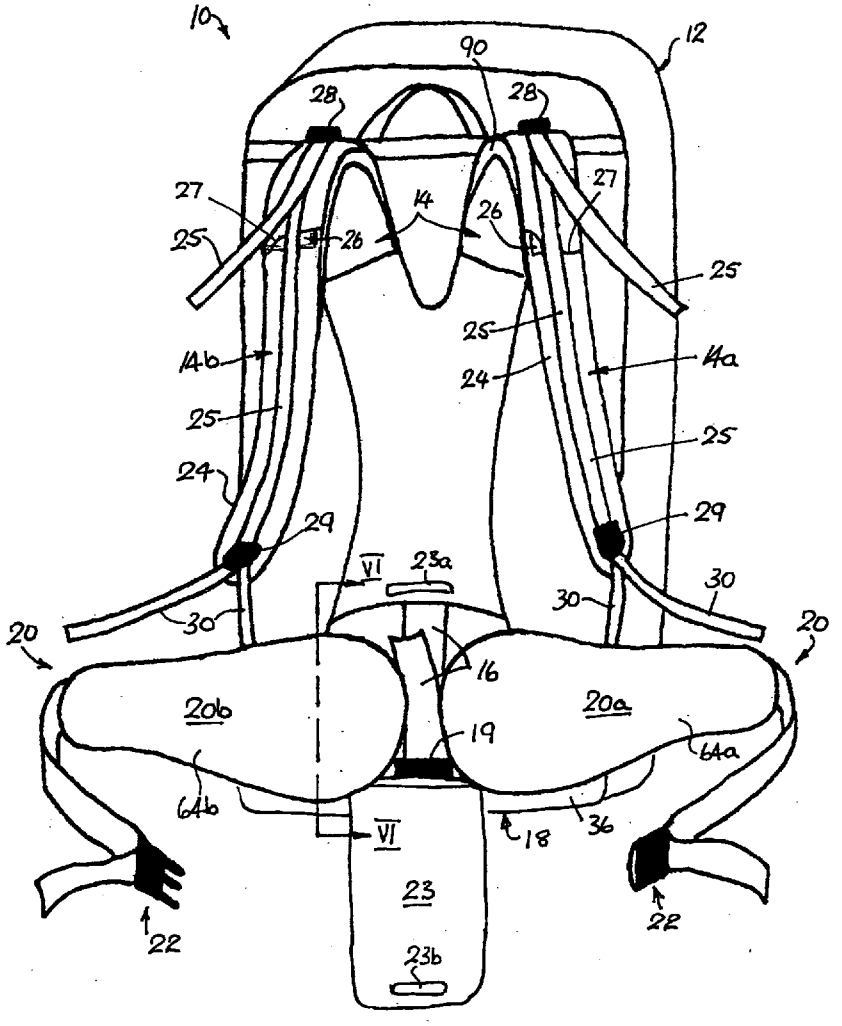
(57) **ABSTRACT**

A backpack having a shoulder harness (**14**) and a hip harness (**20**). The shoulder harness preferably consists of a pair of padded shoulder strap assemblies (**14***a* and **14***b*) that have elongate pockets (**27**) sewn into their outer linings into which contour plates (**26**) are fitted to control the lateral curvature of the straps. The plates are selected to have the stiffness and shape to suit the chest and shoulder shape of the individual user. The hip harness (**20**) is preferably divided into independent left and right halves (**20***a* and **20***b*) that are each pivotally attached to a frame element within the front lower portion of the pack. While the hip harness may be unitary, or the two halves may be more or less tightly coupled together, pivotal attachment of the back of the harness to the pack is highly desirable.



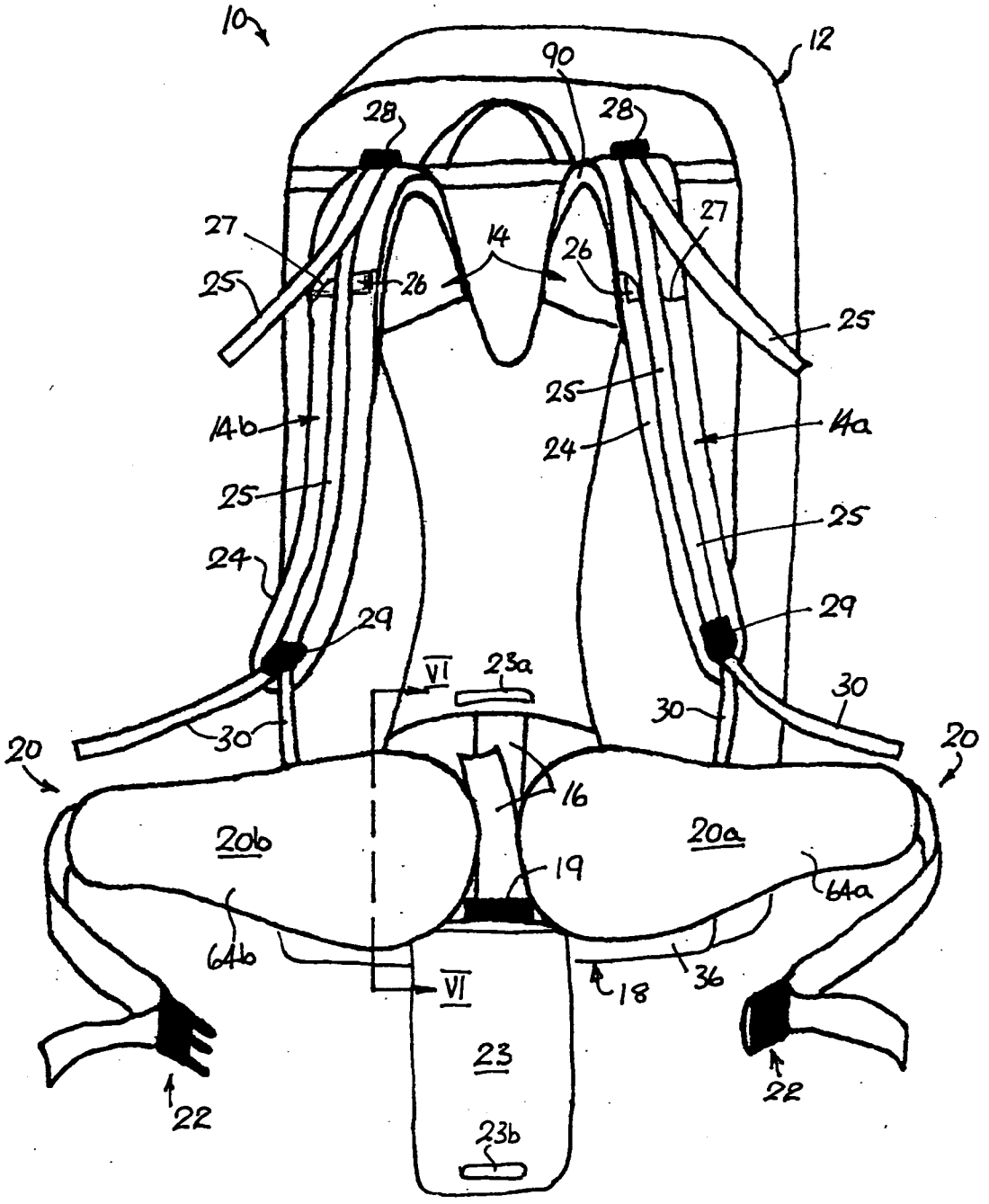

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Fig. 1

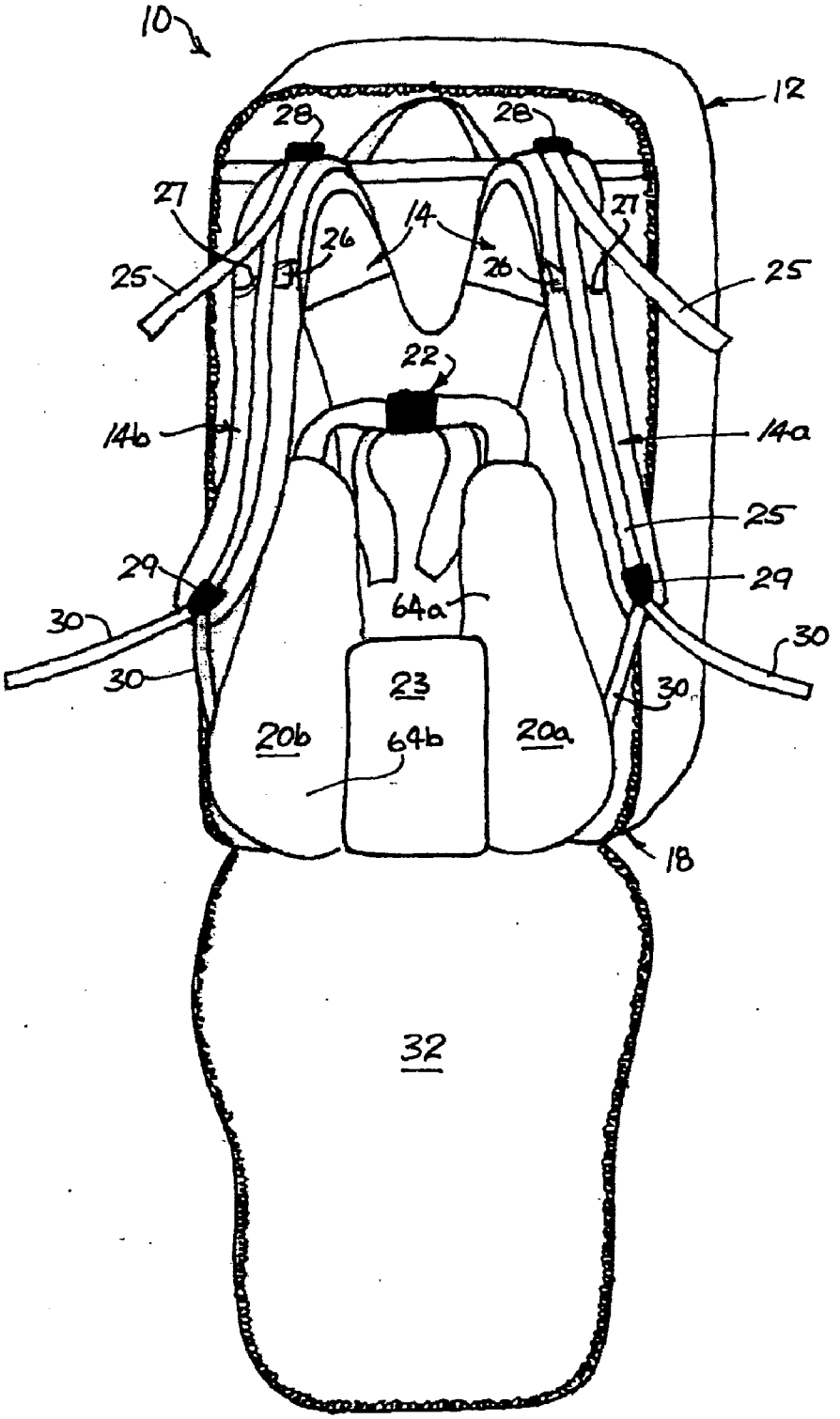
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Fig. 2

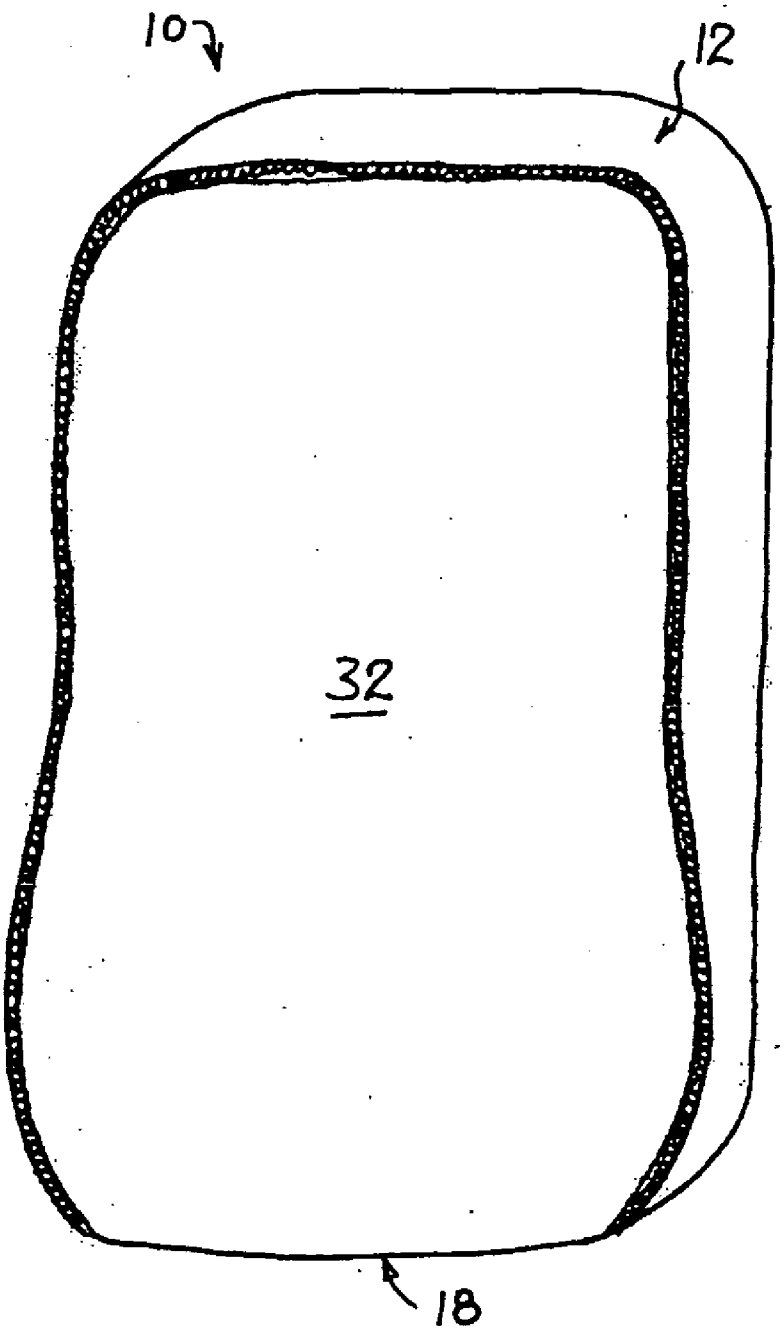

Fig. 3

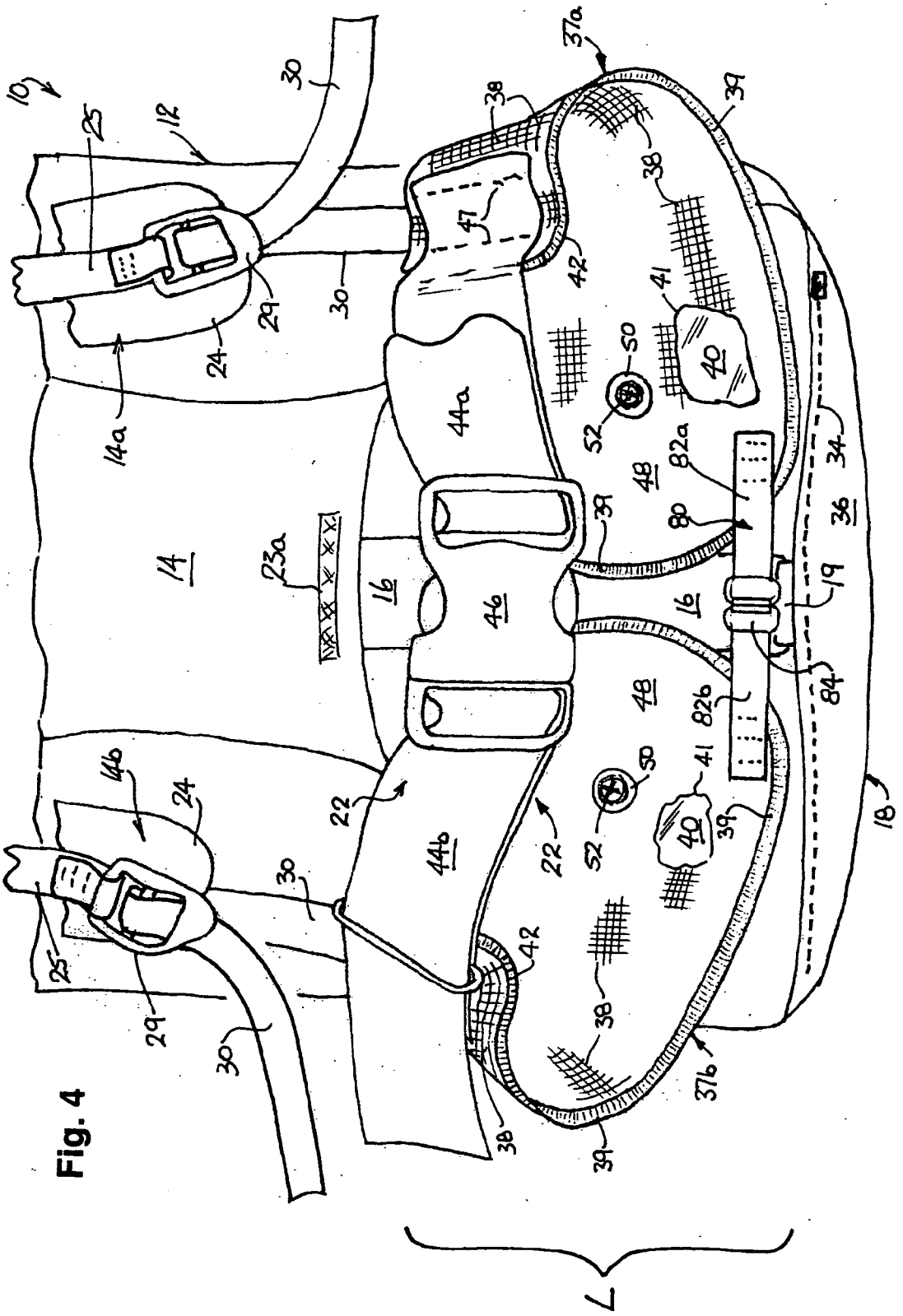
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Fig. 4

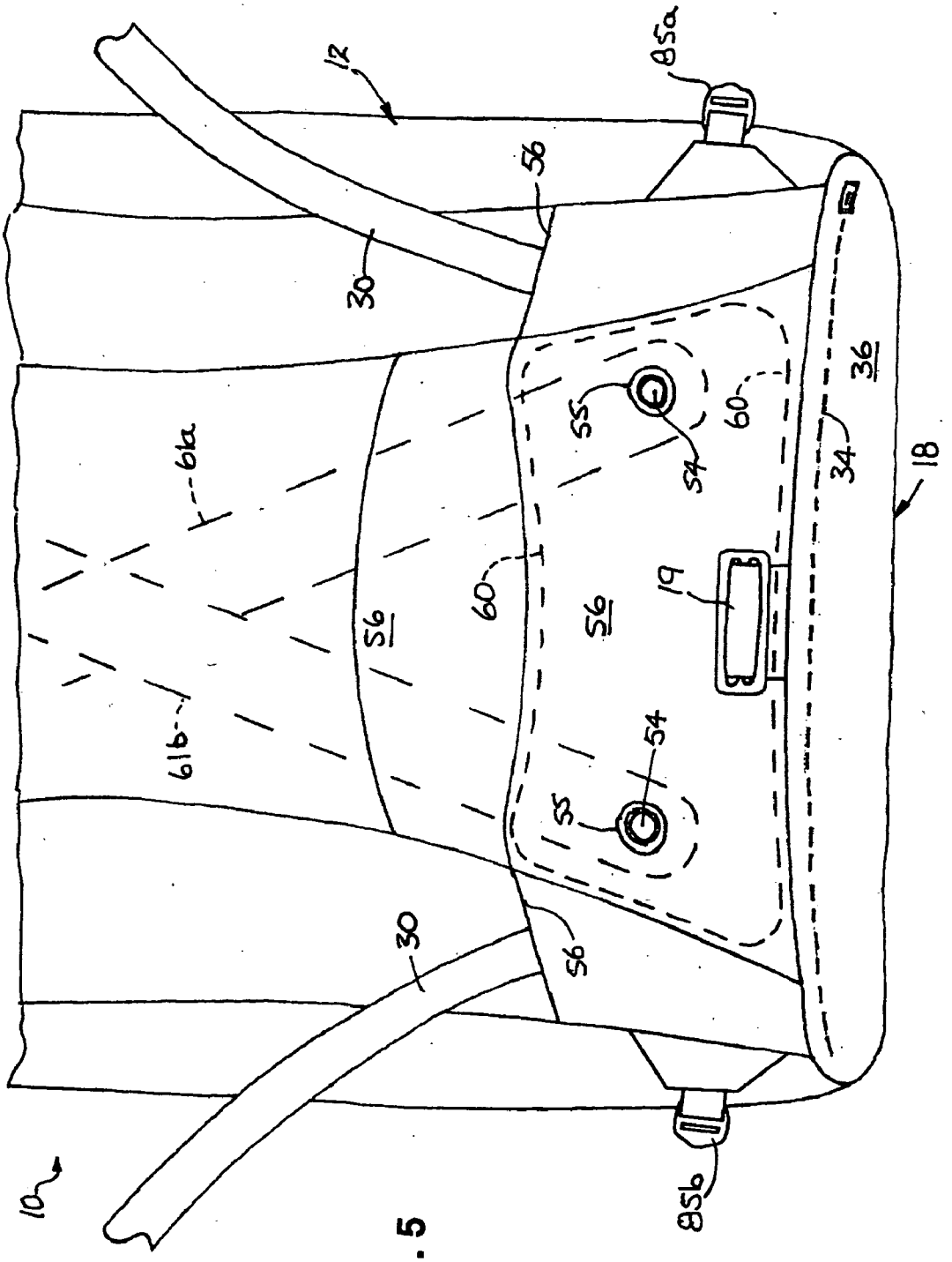

Fig. 5

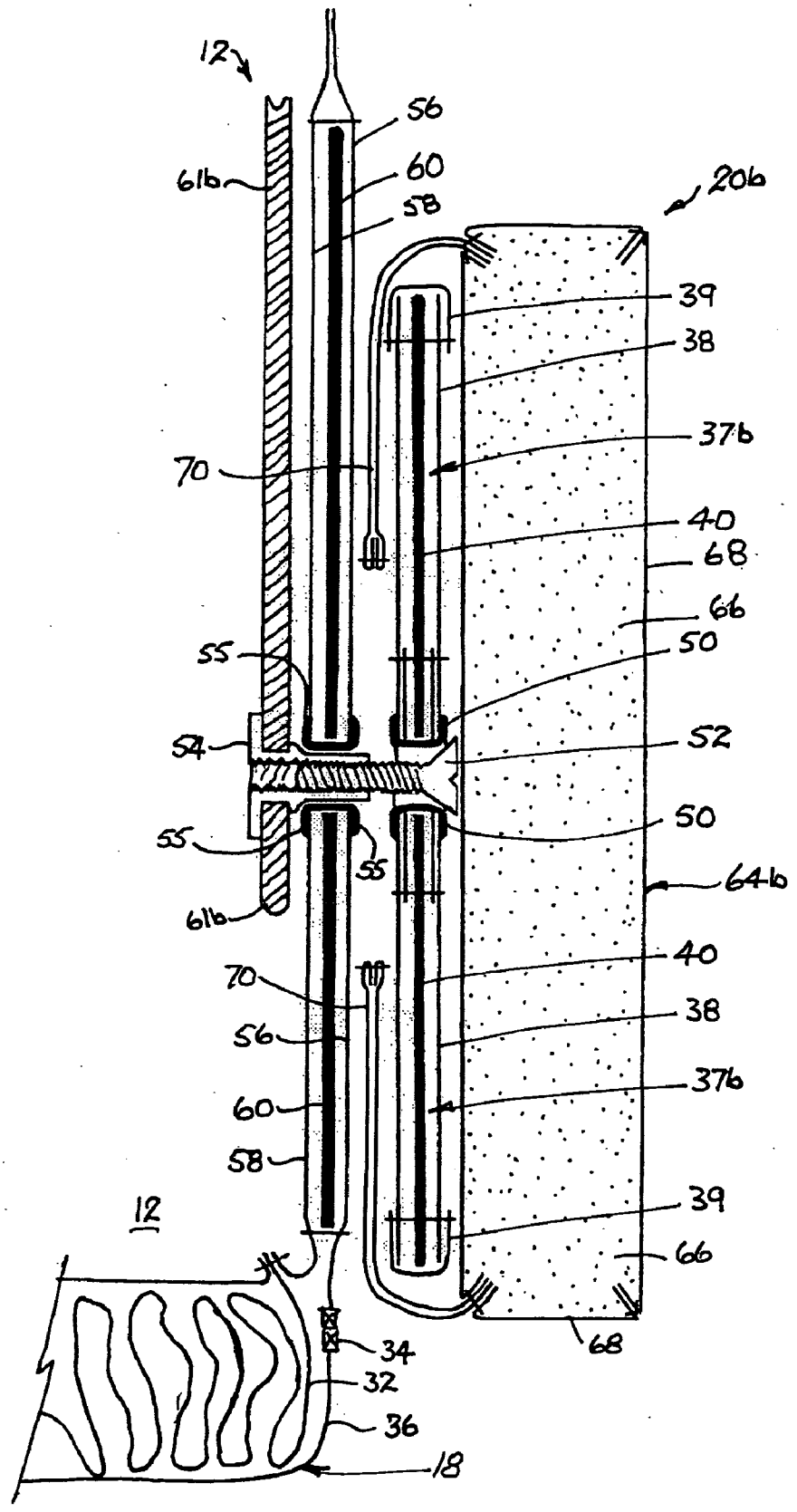
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Fig. 6

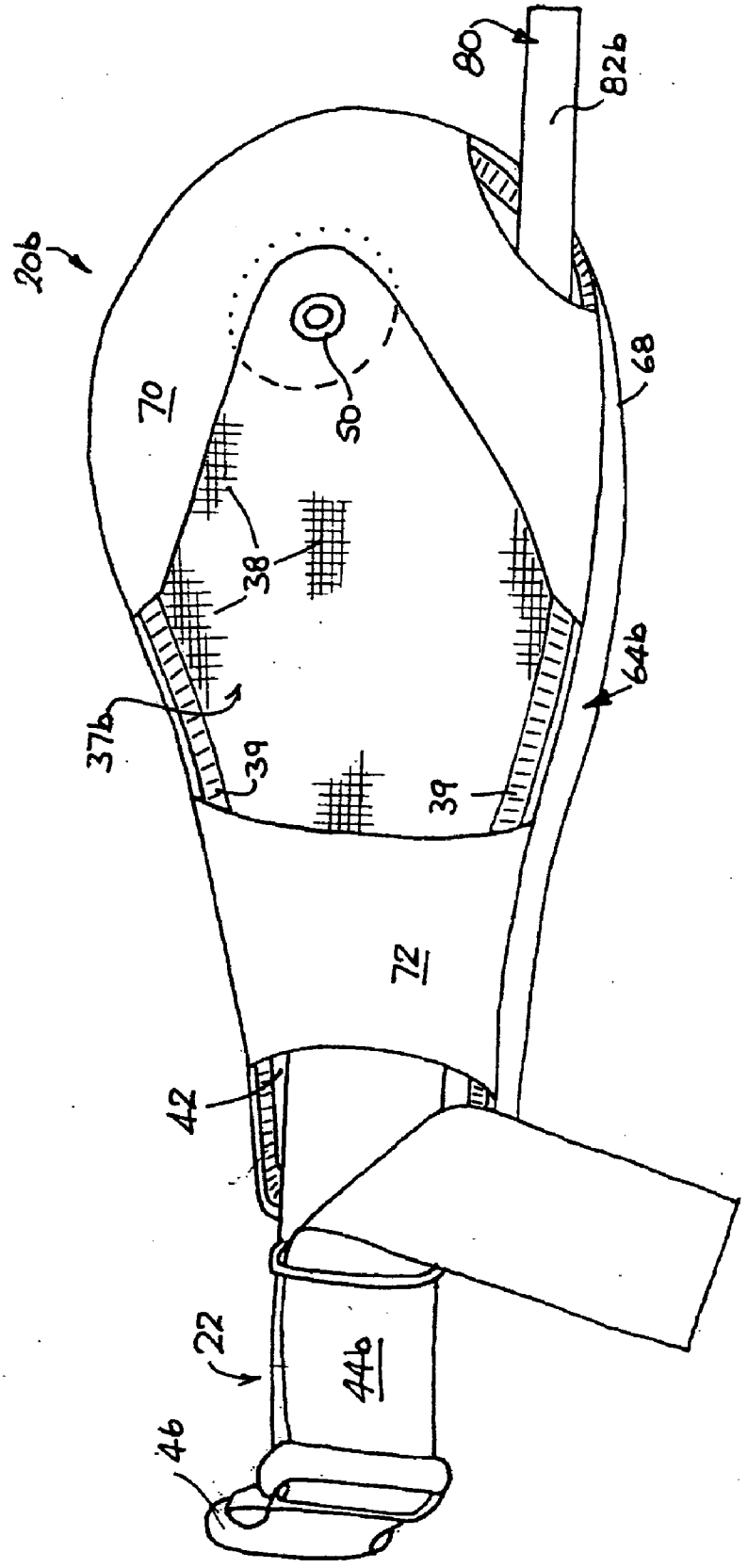

Fig. 7

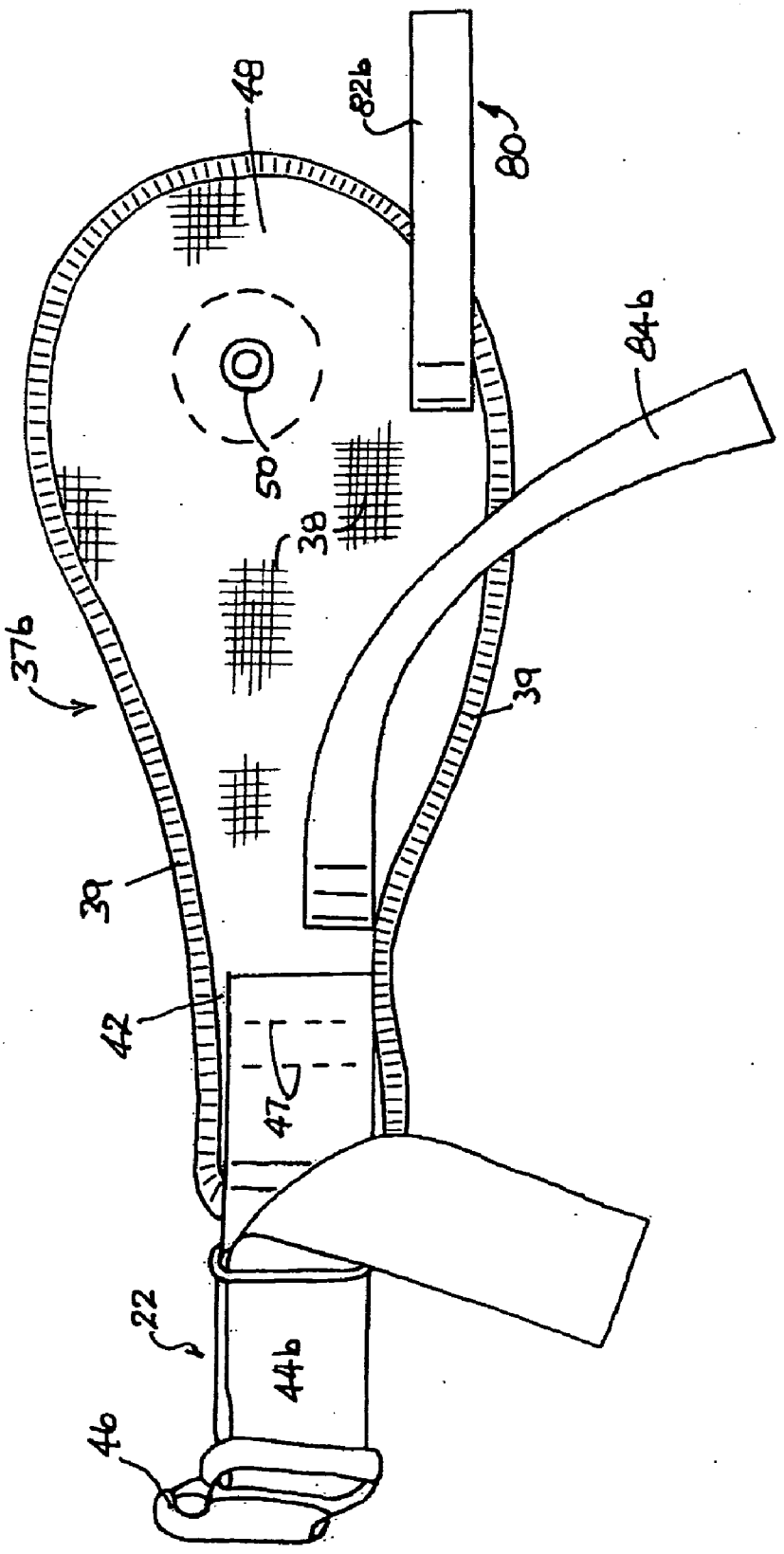

Fig. 8

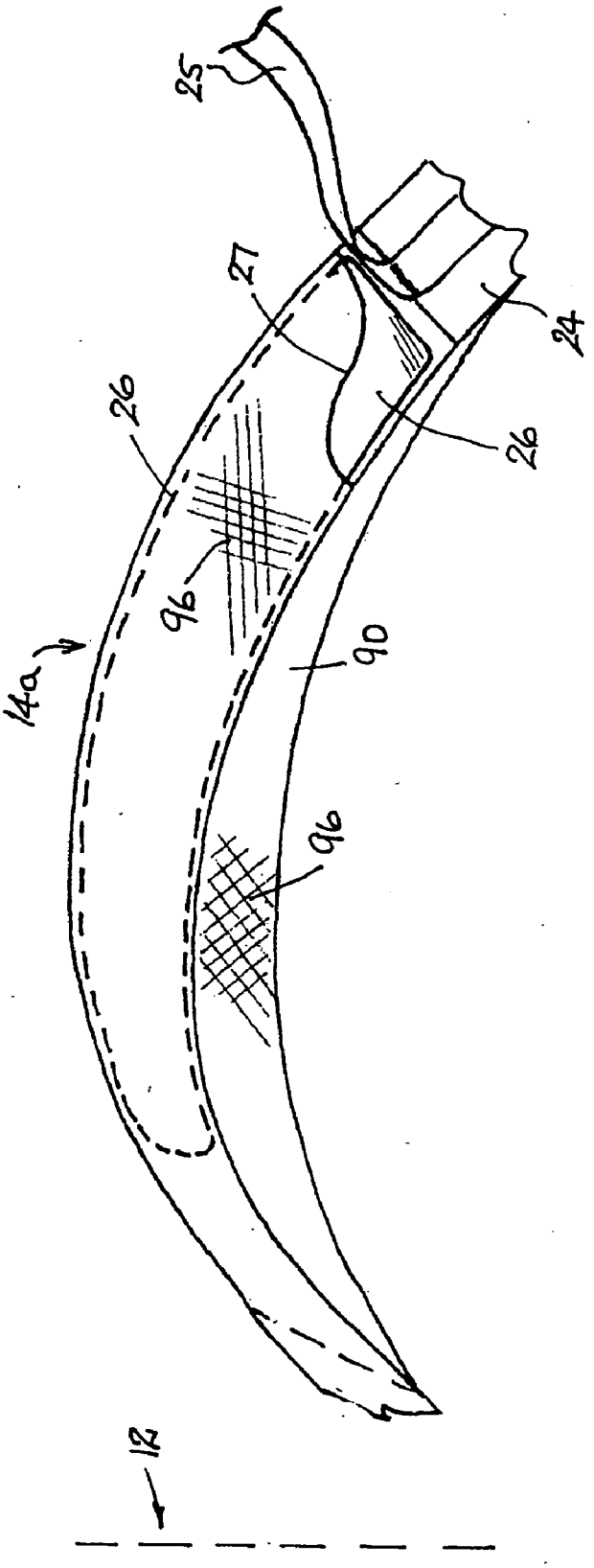

Fig. 9

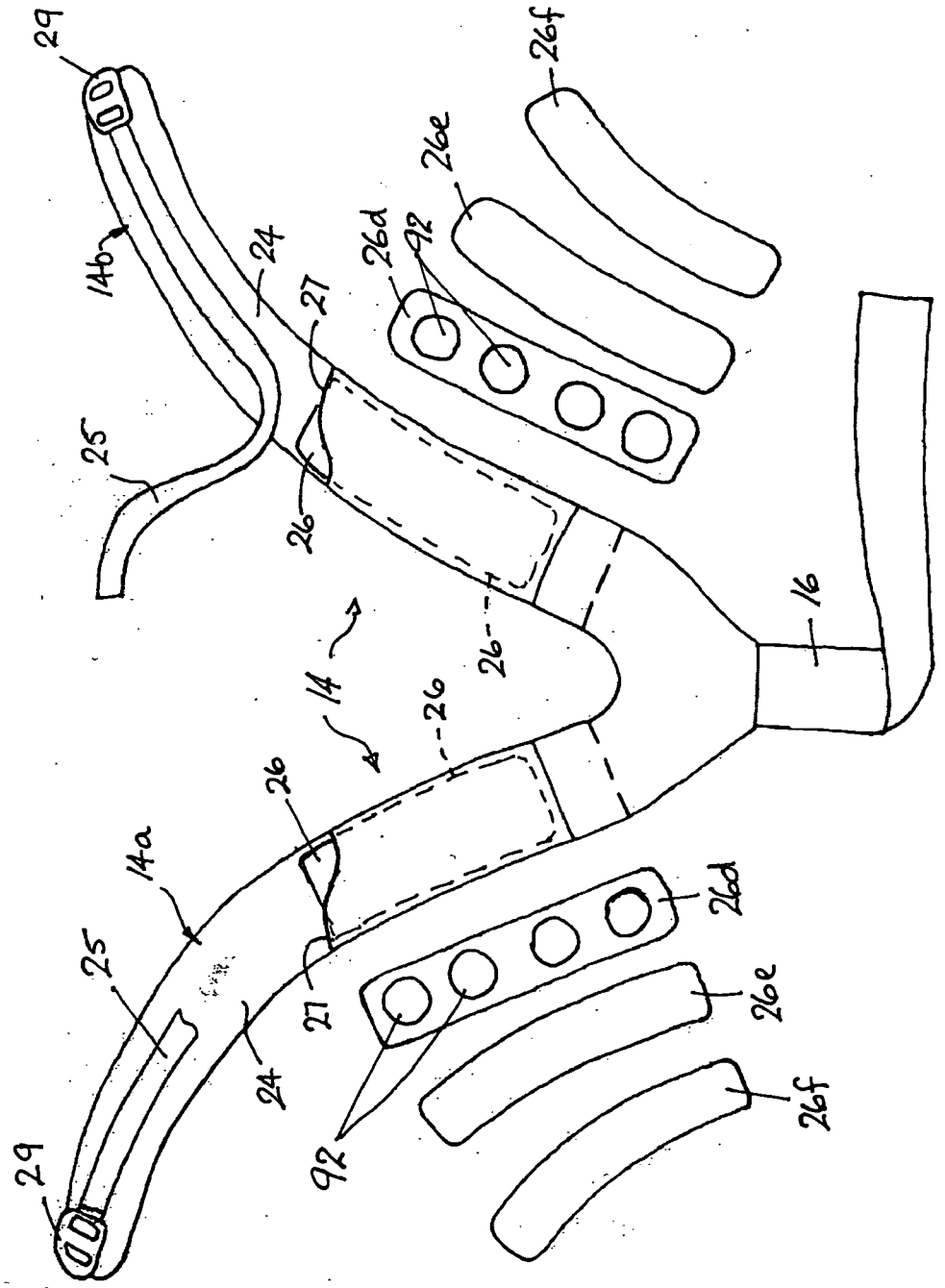

Fig. 10

BACKPACK AND COMPONENTS THEREFOR

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority from Australian provisional patent application serial number 2003906034, filed Nov. 3, 2003.

TECHNICAL FIELD

[0002] This invention relates to backpacks and to backpack shoulder harnesses and hip harnesses.

[0003] As a matter of convention, the terms 'front' and 'back', 'left' and 'right' and 'lumbar portion' when used with a backpack have reference to a standing person wearing the pack. Thus, the front of a backpack is the face that lies adjacent the back of the person and the back of the backpack is the part that is most remote from the person when the pack is worn. Similarly, the right and left sides of the pack are those which lie to the right and left of the person wearing the pack, and the lumbar portion of the pack is the lower portion opposed to the lumbar spine of the user at about the level of the hip harness of the backpack.

BACKGROUND TO THE INVENTION

[0004] The backpacks with which this invention is concerned are intended for carrying loads on or against the backs of people. They mostly have some form of load-bearing or distributing frame element, a shoulder harness for supporting some of the load on the shoulders of the user and a hip harness for supporting the remainder of the load on the gluteal muscles and/or hips of the user. The frame element may be incorporated in or otherwise attached to a load bag, or it may be used to support a load directly without the mediation of a load bag. It can be omitted altogether, as in light day-packs where the hip and shoulder harnesses are simply attached to the front of the load bag. When present, the frame element can take many different forms. In light packs it can simply be a cloth stiffening panel sewn into the lower front face of a load bag. With heavy packs, a skeletal metal or plastic frame can be employed that extends the full height of the pack—from the lumbar region of the wearer to shoulder level—with the hip and shoulder harnesses securely attached to it. Smaller metal or plastic frame elements are often fitted into pockets in the front of the load bag with the harnesses secured through to the frame. Or, in the absence of a load bag, the frame can be an external framework to which a load such as a box or drum can be directly secured and to which the shoulder and hip harnesses are also directly attached.

[0005] Because of the wide variety of human body shapes and sizes and the wide variety of body movements during walking, climbing, skiing etc, it is difficult to design a back pack—especially one intended to carry substantial loads—to suit a wide variety of people, despite providing adjustable shoulder and hip harnesses. Tailor-making a pack, hip harness, shoulder harness and frame elements to suit an individual is generally impractical for cost reasons. There is therefore a need for a backpack that is better adaptable to a variety of body sizes and walking styles, particularly where substantial loads are carried.

[0006] It is my experience that good harness conformance with the shape and walking motions of the wearer is the primary requirement for backpacks, especially when carrying heavy loads. Padding design and fabric choice are secondary considerations.

SUMMARY OF THE INVENTION

[0007] From one aspect, this invention involves a backpack in which the hip harness is attached by a pivot joint that permits the harness to rock from side to side with the movement of the user's hips when walking. The hip harness may include separate left and right side segments that are pivotally attached to the pack so that they can move independently of the other. Preferably, the harness is attached to one or more frame elements incorporated in the backpack and, where independently movable segments are employed it is preferred that they are pivotally attached to a common frame element to rotate about separate axes. The separate axes preferably extend substantially horizontally and parallel in the front-to-back direction, one on either side of the spine in the lumbar area of a user wearing the pack.

[0008] The backpack preferably includes a primary and substantially inextensible frame element in the lumbar region at the level of the hip harness and, where separate hip harness segments of the type indicated above are used, it is preferable that each segment includes a substantially inextensible hip-plate having front and rear portions. The rear portion of each hip-plate is preferably relatively large and pivotally attached to the primary frame element so that it can overlie the respective gluteus maximus muscle of the user. The front portion of each hip-plate is preferably attached to waist strap and buckle means by which the hip-plates can be coupled together about the waist or the user. Each hip segment preferably includes a padded boot or hip pad that is preferably fitted over the respective hip-plate so as to be interposed between the hip-plate and the body of the user. To mitigate chafing, the edges of the hip-plates may be covered with edging material.

[0009] Preferably, the hip-plate of each segment is encased in a tightly fitting cover or pocket of textile fabric having good tensile strength. This helps to reinforce the plate against tearing along stitch-lines, cracking from the periphery and buckling or crumpling under stress. The hip harness buckle means can be attached directly to the hip-plates or to their pockets, allowing the hip harness to be tightened as much as desired without stretch or creep. Resistance to stretch and creep is further enhanced by the pivotal mounting of the hip-plates on the frame element.

[0010] The use of independently pivoting side segments allows each side of the hip harness to automatically assume the contour of the wearer's hip region and to move more freely and independently as the pelvis of the walker rocks cyclically during walking or tilts during climbing. It also allows the hip harness to be stowed during storage or transport of the backpack by swinging the side segments upwards against the front of the pack. A zip-around cover flap may be attached to the bottom of the pack, or accommodated within a pocket in the bottom of the load bag, so that it can be pulled out over the stowed hip and shoulder harnesses and zipped in place for transport. This is especially valuable when backpacks are entrusted to the baggage handling systems of airports.

[0011] According to an optional feature, where hip-plates of separate hip harness side segments are pivotally attached

to the frame element for movement about laterally spaced axes, the rear portions of the hip-plates may be coupled together below the level of their respective pivot axes by a stabilizing strap to limit simultaneous upward movement of the front portions of the hip-plates when the pack is worn. The stabilizing strap may be of adjustable length so that the wearer can adjust the way in which the load is shared by the side segments as the hips move during walking. Of course, some means of undoing the stabilizing strap is necessary to allow the hip side segments to be rotated to their substantially vertical stowage positions.

[0012] One way of effecting the pivotal joint by which a side segment is attached to the primary frame element is to mount a threaded metal nut or socket on or in the frame at the desired location, to press a metal eyelet into the respective hip-plate and to enter a screw through the eyelet into the nut or socket to pivotally secure the hip-plate and segment to the frame element. It is envisaged that the screw or nut may rotate with the hip-plate in an eyelet or bore formed in the frame element. While lose-riveting the stiffening plate to the primary frame element (so as to allow pivotal movement) is also envisaged, it makes replacement of the hip-plate and segment more difficult. It will be appreciated, however, that the means by which each hip-plate is attached to the frame is not of prime importance, so long as a pivotal joint is effected.

[0013] As already indicated, replaceable padded boot-like covers—here called hip pads—may be fitted over the hip-plates. The length and shape of the hip pads can be chosen to suit the size and shape of the user. The pads can be readily fitted and replaced if desired. The lateral contour of the hip pad will be determined in large part by the lateral contour of the associated hip-plate. The use of the hip-plate and/or its aforementioned pocket to take the tension of the hip harness enables the hip pad to be designed solely for padding and comfort having regard to the intended use of the pack. For example, the carrying of heavy, medium or light loads, bush-walking, alpine ascent and descent, travel in city areas, or day walking.

[0014] From another aspect, the invention comprises a backpack having a shoulder harness including left and right shoulder straps that extend over the shoulders of the user and characterized in that a pocket is formed in the top face of each shoulder strap in the shoulder region and a removable flexible contour plate is fitted into each pocket to shape the respective strap in the lateral (generally horizontal direction). Each shoulder strap is formed with inner or lower padding and with an outer or upper lining and the pocket is formed on or in the upper lining. A series of alternative contour plates of different shapes can be fitted into the pocket to force the strap into different lateral configurations, depending upon the slope and contour of the user's neck and shoulders. The contour plate additionally serves to mitigate bunching or edge-curling of the shoulder strap padding over the shoulder.

[0015] The plates of the hip and shoulder harnesses are preferably cut from sheet plastic material—such a polypropylene—that is at least one millimeter thick and is substantially inextensible under the loads encountered in backpacks. Such plates are easily flexed in directions orthogonal to their planes but strongly resist coplanar flexing forces. As already indicated, the plates may be confined within a closely fitting textile cover that extends over the edges of the plate and/or edge bound with textile material to reduce chafing of an by their edges.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Having broadly portrayed the nature of the present invention, a particular example will now be described with reference to the accompanying drawings. However, those skilled in the art will appreciate that many variations and modifications can be made to the example without departing from the scope of the invention as defined by the claims appended hereto. In the accompanying drawings:

[0017] **FIG. 1**, is a front elevation of the backpack of the chosen example, showing the hip harness and shoulder harness ready for use.

[0018] **FIG. 2** is a front elevation of the backpack of **FIG. 1** showing the hip harness segments in their stowed positions and a cover flap ready for deployment thereover.

[0019] **FIG. 3** is a front elevation of the backpack of **FIG. 1** showing the cover flap deployed and the backpack ready for transport.

[0020] **FIG. 4** is an enlarged front elevation of the lower portion of the backpack of **FIG. 1** showing the hip-plates, portions of their respective pivot joints and the attached buckle means.

[0021] **FIG. 5** is a similar view to **FIG. 4**, with the hip-plates and buckle means removed, the outline of the frame elements being shown in broken lines.

[0022] **FIG. 6** is a sectional side elevation of the right segment of the hip harness of **FIG. 1** taken on section plane VI-VI of **FIG. 1**.

[0023] **FIG. 7** is a rear elevation of the right hip harness segment and buckle means of **FIG. 1**, showing an optional stabilizing strap.

[0024] **FIG. 8** is a similar view to **FIG. 7** showing the right hip-plate of the right hip harness segment with the associated hip pad removed, showing the optional stabilizing strap illustrated in **FIG. 7** together with a second stabilizing strap.

[0025] **FIG. 9** is an enlarged front elevation of portion of one of the shoulder strap assemblies of **FIG. 10** showing a contour plate fitted within its pocket.

[0026] **FIG. 10** is a plan view of the shoulder harness removed from the backpack of **FIG. 1** and laid out flat on a horizontal surface with its front uppermost and with three pairs of contour plates of different shapes that can be fitted within the pockets of the shoulder straps.

DETAILED DESCRIPTION

[0027] With reference to **FIG. 1**, the backpack **10** of the chosen example has a load-bag **12**, a Y-shape shoulder harness **14**, having left and right padded shoulder strap assemblies **14***a* and **14***b* and a common tail **16** that is adjustably secured to the base **18** of the pack by an anchor buckle **19**, and a hip harness **20** comprised of (i) separate left and right side segments **20***a* and **20***b* pivotally attached to pack **10** near base **18** and (ii) waist buckle means **22**. The front faces of segments **20***a* and **20***b* are covered by pads **64***a*

and **64***b* (respectively, which will be described below. An optional lumbar flap **23** may be used to cover buckle **19** and shoulder harness tail **16** when the pack is worn. One end of flap **23** is sewn to base **18** so that the opposite end can be raised and attached by mating Velcro™ patches **23***a* and **23***b* to the front of pack **10**.

[**0028**] Each strap assembly **14***a* and **14***b* of shoulder harness **14** essentially comprises (i) an elongated padded body **24** arranged to extend over the upper back and respective shoulder and down the respective side of the chest of the wearer, (ii) a load-bearing top-webbing **25** passing downward over the top front face of padded body **24**, and (iii) a contour plate **26** fitted upwardly into a pocket **27** in the upper portion of body **24** that extends over the shoulder of the user. Each top-webbing **25** extends from a respective top anchor buckle **28** that is fixed to the load bag **12** a little below shoulder height. The lower end of each top-webbing **25** terminates at a respective bottom buckle **29** through which an adjustable bottom-webbing strap **30** is passed, one end of bottom-webbing **30** being anchored to base **18** of pack **10** and the other end hanging free to permit easy adjustment by pulling. Except for the use of contour plates **26** and their respective pockets **27** the general configuration and construction of the shoulder harness **14** is well known in the art.

[**0029**] **FIG. 2** shows the pack with the side segments **20***a* and **20***b* of hip harness **20** swung up about their pivots (to be described below) to substantially vertical positions and lumbar flap **23** folded up and attached to the front of the pack in its normal position. A zip-around cover **32**, which is attached to pack base **18** and is normally stowed in a zip-pocket **34** (see **FIGS. 4 and 5**) formed in the bottom **36** of load bag **12**, is shown unpacked and extended from that pocket in **FIG. 2**. **FIG. 3** shows cover **32** after it has been zipped in place, covering the entire harness system to ready pack **10** for transport.

[**0030**] **FIG. 4** is an enlarged view of the lower portion of the front of pack **10** including the lumbar region, generally indicated by the bracket L. **FIG. 4** shows the lower ends of padded bodies **24** of left and right shoulder strap assemblies **14***a* and **14***b*, the lower ends of top-webbings **25**, bottom buckles **29** and bottom webbings **30**. The tail **16** of the shoulder harness **14** and the anchor buckle **19** at the base **18** of pack **10** are also shown, along with zip pocket **34** for cover **32** in the bottom **36** of load bag **12**, but the lumbar flap **23** is omitted for clarity. In **FIG. 4**, the left and right pads **64***a* and **64***b* of hip harness segments **20***a* and **20***b* shown in **FIGS. 1 and 2** have been removed to show left and right flexible plastic hip-plate assemblies **37***a* and **37***b* that form part of the respective segments and will be described with reference to **FIGS. 6, 7** and **8** below. Each hip-plate assembly comprises a sheet-plastic hip-plate **40** sewn into a tightly fitting strong fabric pocket **38** with edge bindings **39**, plates **40** being shown in cut-away areas **41** of the fabric pockets **38**. Hip-plate assemblies **37***a* and **37***b* have relatively narrow front ends **42**, which are shown are shown flexed forwards and inwards and joined by waist buckle means **22** that comprises left and right belt-like webbing straps **44***a* and **44***b* joined by a central buckle **46**. The rear ends of straps **44***a* and **44***b* are sewn directly to front ends **42** of respective hip-plate assemblies **37***a* and **37***b*. The relatively large rear or inner end portion **48** of each hip-plate assembly is lobe-like and located to oppose the respective gluteus maximus muscles of the wearer when pack **10** is in place. An eyelet **50** is swaged through each plate assembly **37***a* and **37***b* at approximately the center of the lobe of inner portion **48** so that the plate assembly can be pivotally secured to the frame of pack **10** by a countersunk-head screw **52** passing though eyelet **50**, as will be described more particularly with reference to **FIGS. 5 and 6**. It is to be noted that the axes of screws **52** are substantially horizontal and parallel and extend generally in the front-to-back direction (when the pack is worn).

[**0031**] **FIG. 5** is a similar view to that of **FIG. 4** but with shoulder harness **14** and hip harness **20** removed, the latter being simply effected by first removing screws **52** (**FIG. 4**) leaving internally threaded nuts **54** in place. The exteriors of nuts **54** are cylindrical and extend through respective eyelets **55** that are swaged into the cloth facing **56** of the load bag **12** of pack **10**. The lower ends of bottom webbings **30** of the shoulder harness **14** are anchored to the base of load bag **12** by being sewn between respective sides of facing **56** and the front of load bag **12**.

[**0032**] In this example, the primary frame element is a lightweight, strong flat piece of plastic or aluminium, shown in outline by broken lines at **60** in **FIG. 5** because it lies behind facing **56**. In this example, primary frame element **60** is supplemented by left and right crossed strap-like secondary frame elements **61***a* and **61***b* respectively, which are preferably formed from aluminum sheet though plastic sheeting may also be used. Each secondary element extends diagonally upward to provide at their top ends (not shown) anchor points for (respectively) the right and left anchor buckles **28** (**FIG. 1**) of shoulder harness **14**. Secondary frame elements **61***a* and **61***b* are also shown in broken lines as they also lie behind the facing **56** of load bag **12**.

[**0033**] **FIG. 6** is a sectional side elevation of right segment **20***b* and portion of the front of load bag **12** taken on section plane VI-VI shown in **FIG. 1**, which passes through the right pivot joint formed (in part) by the right hand one of screws **52**. It is to be noted that the sectional dimensions of the components shown in **FIG. 6** have been exaggerated for the sake of clarity. Primary frame element **60** is located between cloth facing **56** (see **FIG. 5**) and a cloth backing **58** that form the font of load bag **12** and is held in position by the swaging of eyelet **55** through facing **56**, frame element **60** and backing **58**. In the example shown, nut **54** is swaged into the bottom end of the right secondary frame element **61***b* and is of tubular form so that it extends forwards through the right eyelet **55** so as to positively locate the bottom end of secondary frame element **61***b* with respect to primary frame element **60**. Both secondary frame elements **61***a* and **61***b* are located within load bag **12** immediately behind backing cloth **58**.

[**0034**] It might be noted that **FIG. 6** also illustrates—in section—portion of the base **18** of pack **10** including zipped pocket **34** in the bottom **36** of and showing cover **32** packed into pocket **34**.

[**0035**] Referring now to **FIGS. 7 and 8** as well as to **FIG. 6**, right hip harness segment **20***b* basically consists of right hip-plate assembly **37***b*, (which includes plastic hip-plate **40** with sewn-on fabric cover **38** and edging **39**, and with eyelet **50** swaged therethrough) and padded right boot **64***b* fitted over the front of hip-plate assembly **37***b*. Boot **64***b* comprises a foam core **66** encased in a sewn fabric cover **68** having a rear pocket **70** accommodating lobe **48** of hip-plate

37*b* and having a rear strap-like bridge **72** (**FIG. 7**) accommodating the narrow front portion **42** of hip-plate **37***b* (along with the inner end of right strap **44***b* of buckle means **22**).

[**0036**] By way of review, it is to be noted that screws **52**, nuts **54** and eyelets **50** and **55** serve to positively locate and assemble primary frame element **60**, secondary frame elements **61**, and left and right hip segments **20***a* and **20***b* together as a functioning assemblage. Primary frame element **60** thus serves to pivotally anchor the side segments **20***a* and **20***b* of hip harness **20**, setting the relative location and spacing of left and right segments **20***a* and **20***b* and allowing buckle means **22** to be tightened without displacing the segments of the hip harness **20**. A thread-locking compound can be used to prevent screws **52** working loose in nuts **54** during use.

[**0037**] It will be appreciated that there are many alternative arrangements by which the desired function of the side segments of the hip harness can be effected. A threaded nut can be carried by the primary frame element and a screw or bolt entered forwards from within the load bag of the pack. A tubular rivet that passes through all the components of the joint could be employed. Such a rivet could lock or clamp the primary and secondary frame elements together while allowing free-rotation of the hip-plate assemblies and their associated side segments. The secondary frame elements (if present, for they are optional) need not be fixed by the screw, rivet or the like that forms the pivot joint, but can be attached to the primary frame element elsewhere. Or the primary and secondary frame elements may form an integral cut or molded plastic structure that is entirely housed within the front face of the load bag.

[**0038**] **FIGS. 4, 7** and **8** show an optional stabilizer link **80** that ties the lobe portions **48** of hip-plates assemblies **37***a* and **37***b* together so as to restrict their relative angular movement. Users with broad hips may find this helpful when carrying heavy loads so as to reduce the amount of load-shifting from one hip to the other while still permitting some pivotal movement of the hip harness. As shown in **FIG. 4**, link **80** comprises left and right straps **82***a* and **82***b* joined by a buckle **84** in such a way that the effective length of the link can be accurately adjusted, strap **82***a* being sewn to the lobe of left hip-plate **37***a* at a point below the pivot axis defined by the axis of screw **52** or eyelet **50** and strap **82***b* being sewn to the lobe of right hip-plate **37***b* in a corresponding location.

[**0039**] As an alternative or an addition to link **80**, the narrow front portions **42** of hip-plates can be fitted with longer side stabilizer straps that attach to buckles at the base **18** of load bag **12** and on the same side. An example for the right side of the pack is shown a right side stabilizer strap **84***b* on right hip-plate **37***b* in **FIG. 8**. The free end of right side stabilizer strap **84***b* attaches to right side buckle **85***b* shown in **FIG. 5**. The left side stabilizer strap (not shown) attaches to left side buckle **85***a* shown in **FIG. 5**. When heavy loads are carried the side stabilizer straps resist the tendency of buckle means **22** to rise; that is, they transfer some of the weight from the shoulders and buttocks to the hips.

[**0040**] The use of contour plates **26** and pockets **27** in the shoulder strap assemblies **14***a* and **14***b* will now be described with reference to **FIGS. 9 and 10**. **FIG. 9** is an enlarged front perspective view of the portion of the left shoulder strap assembly **14***a* that normally rests on the shoulder of the user. A guide to the orientation of this portion of shoulder strap assembly is provided by the broken line on the left of **FIG. 9** indicating the front face of load bag **12**. **FIG. 10** is a plan view of shoulder harness **14** depicted as if lying on a horizontal surface and viewed from the back and top so that left and right shoulder strap assemblies **14***a* and **14***b* appear reversed with respect to **FIG. 1**. Most of the tension webbings **25** (see **FIG. 1**) have been cut away for clarity in **FIGS. 9 and 10**.

[**0041**] As already noted, left and right shoulder strap assemblies **14***a* and **14***b* have padded bodies **24**. The padding is normally heaviest in the shoulder region where it rests against the tops of the shoulders and, sometimes, the pectoral muscles of the user, this heavy padding being indicated at **90** in the perspective view of the left strap assembly **14***a* in **FIG. 9** and in the front elevation of **FIG. 1**. As described with respect to **FIG. 1**, a pocket **27** is formed in the outer or upper lining of the shoulder portion of each strap assembly to take a selected contour plate **26**, most of which is shown in broken lines in **FIG. 9** because it is located within pocket **27**. The purpose of contour plate **26** is to laterally shape the shoulder portions of the strap assemblies so as to make them more comfortable under load and so as to inhibit the bunching or curling of padded portion **90**.

[**0042**] Because of the wide variation in shoulder, chest and breast size and shape between people and, in particular, between men and women, the optimum lateral curve of the shoulder portions of the strap assemblies will vary widely even for the same pack and load. It has been found that much of this variation can be accommodated by selecting between contour plates of different, shapes, stiffness and curvature for use in a common shoulder harness that has tight-fitting pockets shaped to take the plates. An added degree of accommodation is possible by varying the location of the pockets along the shoulder strap assemblies of the shoulder harness. This may be done by forming multiple pockets in the outer lining or by controlling the vertical location of a contour plate within a long pocket. In general, however, only one pocket over each shoulder will be sufficient as in the illustrative example.

[**0043**] **FIG. 10** shows shoulder harness **14** of the pack of **FIG. 1** laid out in the manner indicated above, with tension webbings **25** cut away and pockets **27** showing. Three alternative contour plates **26***d*, **26***e* and **26***f* having increasing curvature are shown along side each pocket **27**. Conveniently, the plates may be stamped or cut from plastic sheeting between 0.5 and 3 mm in thickness with the thicker plates having holes formed therein to reduce weight if desired. Plates **26***d* are shown with holes **92** for this purpose. As in **FIG. 10**, the alternative plates may be relatively short and may all be of essentially the same width (though of differing curvature). As indicated in **FIG. 9**, they may be relatively long and of tapering form. If desired, the plates may be enclosed in a fabric pocket with the perimeter finished with a binding tape in a similar way to the reinforcing plates **40** of hip-plate assemblies **37***a* and **37***b*.

[**0044**] It is desirable that pockets **27** are formed with upper and lower layers of material securely sewn together on their sides and lower ends, each pocket then being secured to the padded portion of the corresponding strap assembly **14***a* or **14***b*. Thus, selected contour plate does not come into contact with the padding **90** of the strap and can be made a

firm fit within pocket **27**. The material of the upper and lower surfaces of the pocket **27**, as well as adjacent material covering padded body **24**, is preferably of woven construction and cut on the bias so as to facilitate conformity of this region the strap assembly to the shape of curved plates such as **26***f*. The bias cut is indicated by hatching **96** in **FIG. 9**.

[**0045**] It will be appreciated by those skilled in the art that the backpack of the chosen example offers many advantages over known backpacks in the comfortable distribution of the load between the shoulders and the hips, this being achieved in important part by the use of the contour plates in the shoulder harness and the reinforcing plates of the hip harness. Important and separate advantages are also obtained from the use of independently pivoted hip harness segments. However, those skilled in the art will also appreciate that many variations and additions can be made to the backpack of the example without departing from the scope of the invention as defined by the following claims.

What is claimed is:

1. A backpack having a lumbar portion that is opposed to the lumbar region of the user's back when the pack is worn, the backpack including:

a shoulder harness adapted to transfer some weight of the backpack to the shoulders of the user when the backpack is worn,

a hip harness adapted to encircle the waist of the user and to transfer some of weight of the backpack to the gluteal muscles and hips of the user when the backpack is worn,

a primary frame element located within said lumbar portion, and

pivot joint means securing the hip harness to the frame element to enable lateral pivoting movement of the hip harness with respect to the frame element and to the remainder of the backpack.

2. A backpack according to claim 1 wherein:

said hip harness comprises:

a left segment having a rear portion located between the lumbar region of the user's back and said frame element when the pack is worn,

a right segment having a rear portion located between the lumbar region of the user's back and said frame element when the pack is worn, and

said pivot joint means secures said rear portions of said left and right segment to the primary frame element to enable independent lateral pivoting movement of each segment with respect to the frame element.

3. A backpack according to claim 2 wherein:

said rear portion of the said left segment is located to the left of the spine of a user wearing the backpack,

said rear portion of the said right segment is located to the right of the spine of a user wearing the backpack,

said pivotal joint means comprises:

a left pivot joint securing the rear portion of the left segment to the frame element for pivotal movement about a left pivot axis, and

a right pivot joint securing the rear portion of the right segment to the frame element for pivotal movement about a right pivot axis, and wherein

said left pivot axis is spaced horizontally from said right pivot axis, and

said left and right segments of the hip harness are capable of independent pivotal movement about their respective pivot axes.

4. A backpack according to claim 3 wherein, when the back pack is worn by an upright user:

said rear portion of the left hip segment is adapted for location over at least portion of the user's left gluteus maximus muscle, and

said rear portion of the right hip segment is adapted for location over at least portion of the user's right gluteus maximus muscle.

5. A backpack according to claim 3 wherein:

the left segment of the hip harness includes an elongate flexible and substantially inextensible left hip-plate, said left hip-plate having a rear portion that is attached by said left pivot joint to the frame element and said left hip-plate having a front portion,

the right segment of the hip harness includes an elongate flexible and substantially inextensible right hip-plate, said right hip-plate having a rear portion that is attached by said right pivot joint to the frame element and said right hip-plate having a front portion, and

and the hip harness includes buckle means adapted to connect said front portion of said left hip-plate to said front portion of said right hip-plate across the abdomen of a user wearing the backpack.

6. A backpack according to claim 5 wherein:

said rear portion the left hip-plate is coupled to said rear portion of the right hip-plate by stabilizer strap means located below the level of said left and said right pivot joints,

said stabilizer strap means is operable to limit the degree to which the front portions of the left and right hip-plates can be jointly raised, and

said stabilizer strap means includes a releasable buckle so that, upon release of said releasable buckle the degree to which the front portions of the left and right hip-plates can be raise is not limited by the stabilizer strap means.

7. A backpack according to claim 5 wherein:

a left stabilizer strap having a front end and a rear end is attached by said front end to the front portion the left hip-plate,

left attachment means for the rear end of said left stabilizer strap is provided on the left side of the load bag at a level below said left pivot joint, so that by attaching the rear end of the left stabilizer strap to the said left attachment means and by adjusting the length the left stabilizer strap, the degree to which the front portion of the left hip-plate can be raised is limited by the left stabilizer strap,

a right stabilizer strap having a front end and a rear end is attached by said front end to the front portion the right hip-plate,

right attachment means for the rear end of said right stabilizer strap is provided on the rigtht side of the load bag at a level below said right pivot joint, so that by attaching the rear end of the right stabilizer strap to the said right attachment means and by adjusting the length the right stabilizer strap, the degree to which the front portion of the right hip-plate can be raised is limited by the right stabilizer strap.

8. A backpack according to claim 5 wherein:

a left padded boot is fitted around the rear portion of the left hip-plate so that said boot is interposed between the rear portion of the left hip-plate and the user when the backpack is worn, said rear portion of the left hip-plate and said left padded boot comprising said the rear portion of the left hip-segment, and

a right padded boot is fitted around the rear portion of the right hip-plate so that said right padded boot is interposed between the rear portion of the right hip-plate and the user when the backpack is worn, said rear portion of the right hip-plate and said right padded boot comprising said the rear portion of the right hip-segment,

9. A backpack according to claim 3 wherein:

said left and right hip-segments can each be pivoted to a substantially vertical position when the backpack is upright but is not being worn, and

a zip-around cover is removably incorporated in the backpack and adapted to be withdrawn over said segments when each is pivoted to said vertical position and zipped therearound to enclose the entire hip harness between the cover and the body of the backpack.

10. A backpack according to claim 5 wherein:

the left pivot joint comprises a left eyelet fitted into said left hip-plate and a left screw that passes through said left eyelet and enters said frame element,

the right pivot joint comprises a right eyelet fitted into said right hip-plate and a right screw that passes through said right eyelet and enters said frame element, and

said left and right screws are arranged so as to extend generally horizontally in a front-to-back direction when the backpack is worn by an upright user.

11. A backpack according to claim 5 wherein:

the backpack includes a load bag having a front face that is opposed to the back of a user when the pack is worn,

the shoulder harness includes left and right shoulder strap assemblies supported from respective anchor buckles attached to said front face near the respective shoulder of the user, when the backpack is worn,

said primary frame element comprises a substantially inextensible laterally extending plate located within or against said front face of the load bag, and

there is at least one secondary frame element comprising a vertically extending substantially inextensible plate located within or against the front face of the load bag, said secondary frame element or frame elements mechanically connecting said primary frame element to said anchor points for said shoulder strap assemblies.

12. A backpack according to claim 11 wherein:

there are two second secondary elongate frame elements comprising a left secondary frame element having an upper end and a lower end and a right secondary frame element having an upper and a lower end,

the lower end of said left secondary frame element is attached to said left pivot joint,

the lower end of said right secondary frame element is attached to said right pivot joint,

the upper end of said left secondary frame element is attached to one of said anchor buckles, and

the upper end of said right secondary frame element is attached to the other one of said anchor buckles.

13. A backpack according to claim 3 wherein said shoulder harness comprises:

flexible left and right shoulder strap assemblies, each assembly including an elongate portion that extends from the respective shoulder and over the respective pectoral area of a user wearing the pack,

an elongate pocket is formed in said elongate portion of each shoulder strap,

an elongate contour plate is fitted into each of said pockets, said contour plate being longitudinally flexible but laterally stiff, and

the lateral shape of said portion of each shoulder strap assembly is at least partially determined by the shape of said contour plates fitted in the respective one of said pockets.

14. A backpack comprising:

flexible left and right shoulder strap assemblies, each assembly including an elongate portion that extends from the respective shoulder and over the respective pectoral area of a user wearing the pack,

an elongate pocket is formed in said portion of each shoulder strap assembly,

an elongate contour plate is fitted into each of said pockets, said contour plate being longitudinally flexible but laterally stiff, and wherein

the lateral shape of each of said portions of the shoulder strap assemblies is at least partially determined by the lateral shape of the respective contour plates fitted in the respective pockets of the shoulder strap assembly.

15. A backpack according to claim 5, wherein:

at least one of said plates is formed from stitchable sheet plastic that is at least one millimeter thick and can be readily flexed in directions orthogonal to the plane of the plate while being stiff and resistant to bending in the plane of the plate, said at least one plate having a peripheral edge,

said peripheral edge is covered by a cloth edging stitched thereto, thereby mitigating the danger of wear to other components of the backpack caused by rubbing against said peripheral edge.

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