Nov. 28, 1967 W. H. DEAN 3,355,075

PACK FRAME

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FIG.2

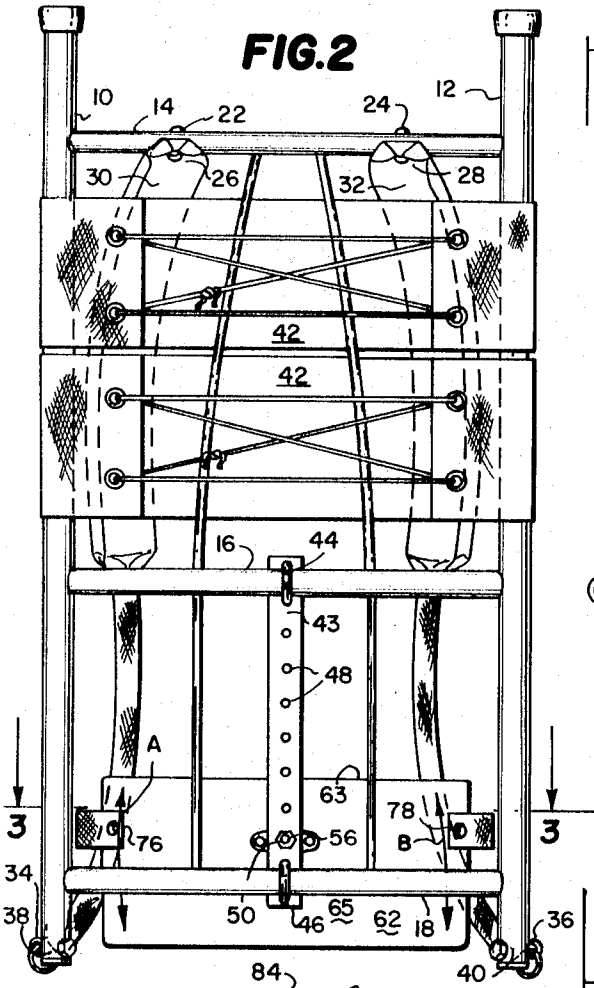


FIG.1

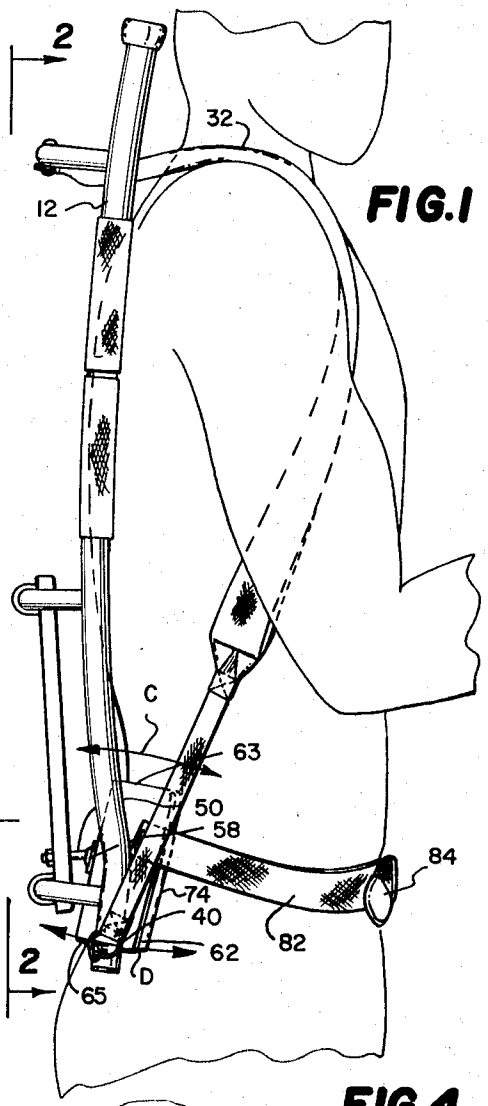


FIG.3

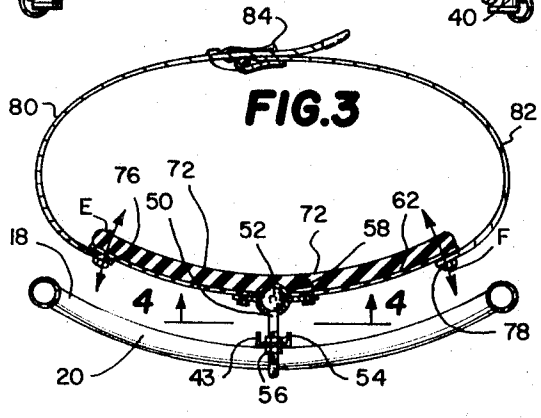
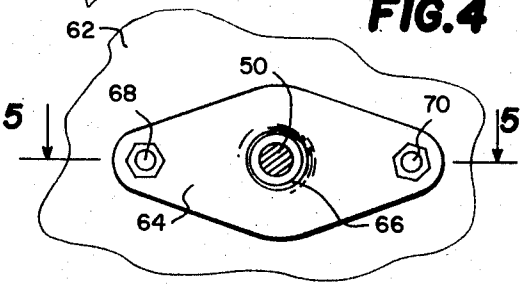


FIG.4



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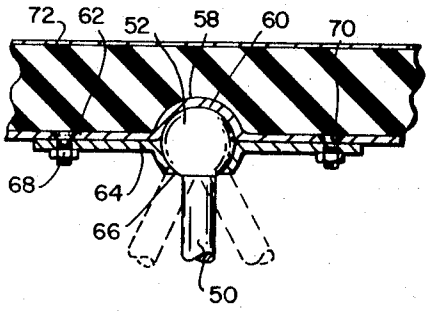


FIG. 5

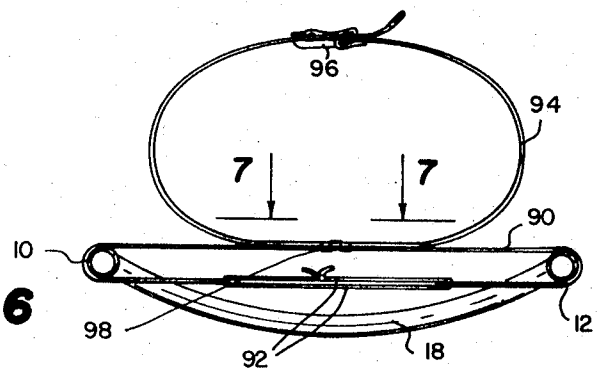


FIG. 6

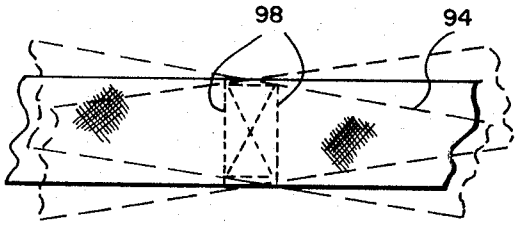


FIG. 7

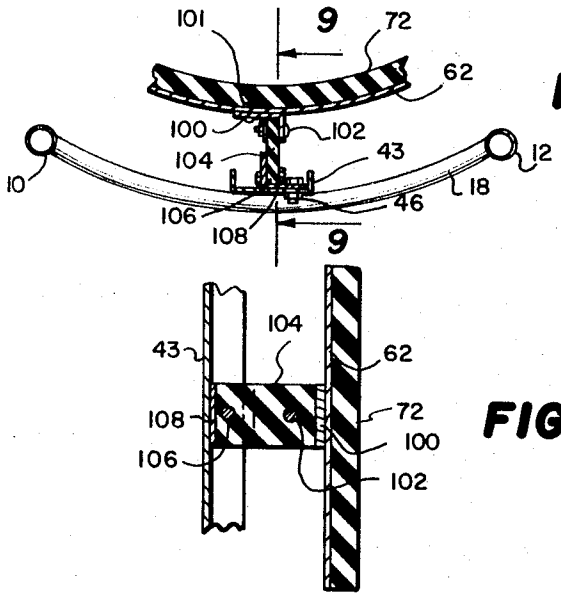


FIG. 8

FIG. 9

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PACK FRAME

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21 Claims. (Cl. 224—25)

ABSTRACT OF THE DISCLOSURE

A pack frame having a substantially rigid frame provided with shoulder engaging straps, and a hip engaging plate or means adapted to bear on the rear of human hips, and having a flexible connection between the hip plate and the lower part of the pack frame.

This invention relates to a pack frame, and more particularly, to a pack frame for carriage on the back of a human body.

Pack frames have become quite popular due to many advantages thereof with respect to a conventional ruck sack or flexible bags to which shoulder engaging straps are connected.

A common fault of the pack bag or ruck sack is that the load carried in such a sack tends to bulge it away from the human body and to dispose the center of gravity of the load in the sack outward and rearwardly from the body in a cantilever fashion so as to create a substantial force moment as compared to a comparable load carried close to the body and properly held in place by a substantially rigid pack frame.

Pack frames also have the advantage that they are substantially rigid and may hold a vertically elongated load in neat position with the center of gravity of the load close to the body.

Further, pack frames have also had another advantage, that being the division of load between the shoulders and the hips of the wearer. Prior art pack frames have utilized shoulder engaging straps and, also, hip surrounding straps which are generally connected to opposite vertical rail members of the pack frame so as to bring a cross strap between the vertical members of the frame to bear on the upper rear portion of the hips.

This arrangement, however, creates a substantially rigid couple between the shoulders of the wearer and his hips, so that motions of the hips relative to the shoulders and twisting or bending of the wearer's torso is resisted by the rigidity of the pack frame. Accordingly, each walking step or motion tends to cause the hip surrounding structure rigidly connected to the lower portion of the pack frame to create a tugging stress on a shoulder strap which is transmitted to the shoulders of the wearer.

When carrying heavy loads in this manner, a substantial amount of working of the rigid frame between the hips and the shoulders transfer hip movement stresses to the shoulder straps and consequently, tends to create undue fatigue of the wearer.

Accordingly, it is an object of the present invention to provide a pack frame having shoulder straps, the pack frame being substantially rigid and provided with a hip engaging means which is movably connected to a lower portion of the pack frame, so as to permit relative movement of the pack frame and the hips about a vertical axis, also, about a horizontal side to side axis and, additionally about a forward and rearward horizontal axis, whereby the hips of a pack frame wearer may move in a universal direction without tending to move the frame relative to the wearer's shoulders, but which permits the hip engagnig means to be loaded against the body by means of the load on the frame.

Another object of the invention is to provide a pack

frame which is substantially rigid and provided with shoulder straps and a hip engaging means having a plate member adapted to bear on the rear of a person's hips and having a universal joint means interconnecting the plate member and the lower portion of the frame and a belt connected to the opposite ends of the plate member and surrounding the body of the wearer to hold the plate member firmly engaged with the rear portions of the wearer's hips.

Another object of the invention is to provide a pack frame comprising a substantially rigid frame member provided with shoulder engaging straps and a hip surrounding means comprising a plate held to the back of a person's hips by a belt and universal joint means comprising a ball socket connection between the plate and the bottom or lower portion of the frame so as to permit free pivotal movement of the hips relative to the frame to compensate for the difference in movements of the person's hips and shoulders during walking, climbing and other outdoor maneuvers in which a person carries a pack.

Another object of the invention is to provide substantial modifications of the present invention.

Another object of the invention is to provide a universal connection between the bottom of a pack frame and a person's hips, which includes flexible fabric belt means secured to a flexible fabric band extending between opposite sides of a pack frame.

Another object of the invention is to provide a resilient connection between a hip engaging means and a lower portion of the pack frame so as to provide substantially universal movement between the hip connection means and the lower part of the pack frame.

Further objects and advantages of the present invention may be apparent from the following specification, appended claims and accompanying drawings, in which:

FIG. 1 is a side elevational view of a pack frame in accordance with the present invention and showing the pack frame worn by a human;

FIG. 2 is an enlarged rear elevational view of the pack frame of the invention taken from the line **2—2** of FIG. 1;

FIG. 3 is a plan sectional view taken from the line **3—3** of FIG. 2;

FIG. 4 is an enlarged fragmentary sectional view taken from the line **4—4** of FIG. 3;

FIG. 5 is a sectional view taken from the line **5—5** of FIG. 4, showing varying positions of a universal joint means of the invention by broken lines;

FIG. 6 is a plan sectional view similar to FIG. 3, but a modification of the present invention;

FIG. 7 is an enlarged fragmentary view taken from the line **7—7** of FIG. 6;

FIG. 8 is a plan sectional view similar to FIG. 3, but showing a further modification of the present invention; and

FIG. 9 is a fragmentary sectional view taken from the line **9—9** of FIG. 8.

As shown in FIGS. 1 and 2 of the drawings, the pack frame of the invention comprises a pair of substantially vertical side or rail members **10** and **12** interconnected by substantially horizontal bars **14**, **16** and **18**. These bars may be fused or otherwise connected to the substantially vertical members **10** and **12**, as desired.

As shown in FIG. 3 of the drawings, the cross member **18** is curved in a direction toward the rear **20**, thus, the other cross members **14**, **16** and **18** may be likewise curved in a rearward direction, such that the convex side of the curvature is rearward.

Pins **22** and **24** provide means near the upper portion of the frame in connection with the cross bar **14** for the securement of upper end portions **26** and **28** of shoulder engaging straps **30** and **32**. These straps are provided with

normally lower end portions 34 and 36 connected to lower portions 38 and 40 of the frame by a suitable pivotal connection.

A conventional flexible webbing strap 42 may be made of fabric or other suitable material and is secured in surrounding relation with the vertical members 10 and 12 and may serve as a back engaging strap in the conventional manner.

Secured between the cross members 16 and 18 is a vertically disposed channel or other suitable structure, designated 43. U-bolts 44 and 46 partially surround the cross members 16 and 18, respectively, and secure the channel 43 in fixed relation with the bars 16 and 18 at an intermediate location between the vertical side members 10 and 12.

The channel member 43 is provided with a plurality of openings 48 vertically spaced therein and these openings 48 are adapted to receive a bolt 50 which forms a shank for a spherical ball joint member 52. The shank 50 is provided with a pair of jam nuts 54 and 56 screw threaded on the shank 50 and jammed against the forward and rearward surfaces of the channel 43 surrounding one of the openings 48. Thus, the ball joint member 52 is projected forwardly of the frame and is engaged in a ball socket structure 58, shown best in FIGS. 3, 4 and 5 of the drawings. This ball socket structure 58 is provided with one hemispherical portion 60 indented in a plate 62. Another substantially hemispherical portion of the socket structure 58 is provided in a socket member 64 having an opening 66 through which the shank 50 extends. The opening 66 is of considerably larger diameter than the shank 50 so as to allow angular freedom of movement of the shank in the opening 66, as indicated by broken lines in FIG. 5 of the drawings. The socket member 64 is secured by bolts 68 and 70 to the plate 62, the bolts 68 and 70 extending through the plate 62 and the socket member 64, all as shown best in FIG. 5 of the drawings.

The plate member 62 is elongated horizontally and slightly curved in a concavo-convex direction, such that the concave side of the plate 62 is directed forwardly and secured thereon is a soft pad 72, this pad 72 being adapted to engage the rearward portion 74 of a human's hips, as shown in FIG. 1 of the drawings.

Secured to opposite ends 76 and 78 of the plate 62 are belt portions 80 and 82 which are provided with a buckle structure 84 adapted to connect these belt portions 80 and 82 at the belly side of the wearer or in the front of the wearer's hips.

The plate 62 together with the belt portions 80 and 82 and the buckle or fastener 84 constitutes hip surrounding structure in accordance with the present invention. The belt portions 80 and 82 and the buckle 84 are adapted to provide secure fastening of the plate 62, such that the pad 72 on the front of the plate, may be firmly engaged with the rearward portion 74 of the wearer's hips and in this manner, the plate 62 and pad 72 may be brought to bear on the upper rearward portion of the wearer's hips and to help share the load with the shoulder straps 30 and 32.

It will be seen that the universal joint structure provided by the ball socket joint 58 permits universal movement of the substantially rigid frame composed of the vertical members 10 and 12 and the horizontal bars 14, 16 and 18 relative to the plate 62 and the belt portions 80 and 82. The relative movement of the frame and the hip surrounding structure about the center of the ball joint 52 permits freedom of movement between the wearer's hips and the shoulders, such that normal hip movements and flexing of the wearer's spine does not create any relative force reactions between the hip surrounding structure and the shoulder straps 30 and 32. Accordingly, the ball joint member 52 in the socket structure, shown in FIGS. 4 and 5 of the drawings, permits pivotal movement of the plate 62 relative to the frame in directions of the arrows A and B about a horizontal axis directed forwardly and rearwardly, as shown in FIG. 2 of the drawings, also, in the directions of the arrows E and F about a vertical axis, as shown in FIG. 3 of the drawings, and, further, permits pivotal movement about a horizontal side to side directed axis, as indicated by the arrows C and D in FIG. 1 of the drawings.

It will be appreciated that when the belt members 80 and 82 are sufficiently tightened and secured by the buckle 84, that the plate 62 and its pad 72 bear comfortably and firmly on the upper portion of the wearer's hips and may be so adjusted together with the length of the shoulder straps 30 and 32, so as to share the load with the shoulder straps and to permit a person comfortably to carry a substantially heavier load than the shoulder straps would normally permit. Furthermore, this prevents the pack frame from moving forward and backward during walking motions and holds it securely in connection with the wearer, while at the same time, permitting complete freedom of the wearer's hips relative to the upper torso and permitting the substantially rigid frame to support a pack load in close proximity to the body without permitting the load to bulge outwardly, as is common with a conventional ruck sack. The substantially rigid frame is important in order to maintain the shape and the elevation of the load and to hold the center of gravity of the load as close to the body, as possible. It is therefore important that the substantially rigid frame be employed to maintain a proper disposition of the load on the wearer's back inasmuch as the hip plate 62 and hip surrounding structure in connection therewith helps the wearer share the load with his shoulder straps. It is important that when the hips move in normal walking or climbing actions, that movements of the hips do not transmit forces through the substantially rigid frame to the shoulder straps and create undue stress and working of the wearer's body.

As shown in FIGS. 1 and 2 of the drawings, the plate 62 is provided with an upper edge 63 and a lower edge 65. The universal joint or ball socket mechanism 58 at its forward and rearwardly disposed horizontal axis, is closer to the upper edge 63 than to the lower edge 65 so that a rotating force moment imposed by weight of the frame on the universal joint structure 58, when it tends to pivot the lower edge 65 of the plate 62 toward the human body is resisted by the relatively greater portion of the plate 62 below the axis of the universal joint.

It will be understood that the axes of the strap portions 80 and 82 are disposed closer to the upper edge 63 than to the lower edge 65 so that when these straps are tightened, they tend to hold the upper edge of the plate 62 toward the body, as the force downward on the universal joint 58 tends to rotate the plate in a counterclockwise direction, as shown in FIG. 1 of the drawings. Accordingly, it will be understood that the forces exerted on the plate in a downward direction by the universal joint mechanism 58 may be so distributed by the location of the axes of the straps 80 and 82 nearer the upper edge 63 than the lower edge 65, respectively, and, further, that the disposition of the ball joint or universal joint mechanism 58 near the edge 63 also tends to provide a cooperative result. Thus, that loading on the plate 62 may be disposed such that uniform pressure or substantially uniform pressure of the pad 72 on the upper back portion of the wearer's hips may be accomplished.

It will be understood, that opposite ends 76 and 78 of the plate 62 may be extended, as desired, toward opposite sides of the human body and curved therearound so as to conform to the curvature of the wearer's back and to thereby be self-locating in the event the straps 80 and 82 are disconnected or in the event the wearer does not desire to fasten these straps around the frontal portion of the wearer's body.

In the modification, as shown in FIG. 6, a flexible fabric webbing strap 90 is looped around the vertical frame members 10 and 12 and secured by a cord 92, such that this flexible webbing strap abridges the vertical frame members 10 and 12 at opposite sides of the frame and pro-

vides a flexible support adapted to be located adjacent the rear portion **74** of the wearer, as shown in FIG. 1 of the drawings. The webbing strap **90** being located in substantially the same plane as the plate **62** directly above the horizontal cross member **18**.

A flexible fabric belt **94** is secured by stitches **98** to the webbing **90** at an intermediate location between opposite vertical frame members **10** and **12** and opposite ends of the belt **94** are secured by a buckle **96** at the frontal portion of the wearer's hips.

The flexible fabric belt **94** secured to the flexible fabric webbing **90** by stitches **98**, as shown in FIGS. 6 and 7, provides for a universal joint action or relative movement between the wearer's hips and the substantially rigid frame in a similar manner as does the ball socket mechanism **58**, hereinbefore described. The fabric of the belt **94** and webbing **90** provides for relative flexing, as indicated by broken lines in FIG. 7. However, it will be appreciated that this modification or modified structure, as shown in FIGS. 6 and 7, may not bear as great a load as the ball socket mechanism **58**, hereinbefore described.

In the modification, as shown in FIGS. 8 and 9, an angle clip **100** is secured to the plate **62** at its rear side by means of a rivet **101**. The angle member extends rearwardly relative to the plate **62** and secured thereto by a rivet **102** is a flexible member **104**. This flexible member **104** is preferably a rubberized fabric capable of flexing in all directions.

The flexible or resilient structure of the rubberized fabric member **104** is secured by a rivet **106** to a forwardly extending leg of a second angle member **108** and one leg of this angle member **108** is secured by a bolt **46** to the channel member **43** and the bolt **46** may be located in any one of the holes **48**, hereinbefore described.

It will be appreciated that the modifications, shown in FIGS. 8 and 9, provides for relative freedom of movement between the plate **62** and the frame of the invention in a similar manner as does the ball socket mechanism **58**, hereinbefore described.

It will be appreciated by those skilled in the art that various modifications of the present invention may be resorted to in a manner limited only by a just interpretation of the following claims.

I claim:

1. In a pack frame for carriage on the back of a human body the combination of: a substantially rigid frame having a longitudinal axis normally disposed substantially vertical, said frame having upper and lower ends, opposite sides and forward and rearward portions; first means for securing shoulder engaging straps to an upper portion of said frame; a pair of shoulder straps having respective first ends connected by said first means to said frame; said shoulder straps having second respective ends; second means for securing said second ends to said frame at portions thereof relatively lower than said first means; a hip engaging means disposed to surround human hips, said hip engaging means having disengageable belt portions and belt fastening means for securing said belt portions together and adapted for holding said hip engaging means in surrounding position on the human hips; and movable connection means connecting said frame to said hip engaging means, said movable connection means adapted to permit relative movement of said hip engaging means and said frame about a vertical axis, about a side to side directed horizontal axis, and about a forward and rearward directed horizontal axis.

2. The invention, as defined in claim **1**, wherein: said hip engaging means comprises a plate portion adapted to be supported on rear portions of human hips, said movable connection means being a universal joint comprising a ball and socket mechanism connecting said frame and said plate portion.

3. The invention, as defined in claim **1**, wherein: said hip engaging means comprises a plate portion adapted to be supported on rear portions of human hips, said movable connection means being a universal joint mechanism.

4. The invention, as defined in claim **2**, wherein: said plate portion is constructed of a semi-rigid material and said hip engaging means comprises said belt portions connected to said plate portion and adapted to extend around opposite sides of human hips, said belt fastening means adapted to secure said belt portions together at a frontal portion of a human body in the hip area thereof.

5. The invention, as defined in claim **1**, wherein: said movable connection means comprises a flexible fabric structure.

6. The invention, as defined in claim **5**, wherein: said flexible fabric structure is secured to opposite sides of said frame and extends from side to side of said frame, said hip engaging means being a fabric belt, said fabric structure secured to said fabric belt at a location between opposite sides of said frame so as to permit universal joint flexural movement of said fabric between opposite sides of said frame.

7. The invention, as defined in claim **1**, wherein: said movable connection means comprises a resilient structure interconnecting said frame and said hip engaging means.

8. The invention, as defined in claim **2**, wherein: said ball and socket mechanism includes a ball socket means connected to said plate; a ball in said socket means; said ball having an extending shank connected to said frame.

9. The invention, as defined in claim **8**, wherein: said frame is provided with a substantially vertically disposed member at a location approximately midway between opposite sides of said frame; said vertically disposed member having bolt connection means extending a considerable distance vertically thereon; and said shank having an externally screw threaded portion and means to screw threadably fix said shank in various elevated positions longitudinally with respect to said bolt connection means.

10. The invention, as defined in claim **9**, wherein: said plate portion being elongated and having first and second opposite ends extending generally in a direction toward respective opposite sides of said frame.

11. The invention, as defined in claim **10**, wherein: said hip engaging means having said belt portions connected to said opposite ends of said plate, each belt portion having one end secured to one of said opposite ends of said plate portion and said belt portions each having an opposite end connected together by said fastening means.

12. The invention, as defined in claim **11**, wherein: said plate portion is provided with a generally concave forward surface and a generally convex rearward surface.

13. The invention, as defined in claim **12**, wherein: said plate is constructed of a thin resilient material.

14. In a pack frame for carriage on the back of a human body the combination of: a substantially rigid frame having a longitudinal axis normally disposed substantially vertically, said frame having upper and lower ends, opposite sides and forward and rearward portions; first means for securing shoulder engaging straps to an upper portion of said frame; a pair of shoulder straps having respective first ends connected by said first means to said frame; shoulder straps having second respective ends; second means for securing said shoulder straps to said frame at portions thereof relatively lower than said first means; and hip engaging means disposed to surround human hips, said hip engaging means having disengageable belt portions; belt fastening means for securing said belt portions together and adapted for holding said hip engaging means in surrounding position on human hips; and movable connection means connecting said frame to said hip engaging means at a location between said opposite sides of said frame, said movable connection means adapted to permit relative movement of said hip engaging means and said frame about a vertical axis, about a side to side directed horizontal axis, and about a forward and rearward directed horizontal axis.

15. The invention, as defined in claim **14**, wherein: said hip engaging means comprises a plate portion adapted to

be supported on rear portions of human hips; said movable connection means being a universal joint comprising a ball and socket mechanism connecting said frame and said plate portion.

16. The invention, as defined in claim **15**, wherein: a frontal portion of said plate portion is provided with a soft resilient padding structure.

17. In a pack frame for carriage on the back of a human body the combination of: a substantially rigid frame having a longitudinal axis normally disposed substantially vertical, said frame having upper and lower ends, opposite sides and forward and rearward portions; first means for securing shoulder engaging straps to an upper portion of said frame; a pair of shoulder straps having respective first ends connected by said first means to said frame; said shoulder straps having second respective ends; second means for securing said second ends to said frame at portions thereof relatively lower than said first means; a hip engaging means disposed to engage rearward portions of human hips, and movable connection means connecting said frame to said hip engaging means, said movable connection means adapted to permit relative movement of said hip engaging means and said frame about a vertical axis, about a side to side directed horizontal axis, and about a forward and rearward directed horizontal axis.

18. The invention, as defined in claim **17**, wherein: said hip engaging means comprises a plate portion adapted to be supported on rear portions of human hips, said movable connection means being a universal joint comprising a ball and socket mechanism connecting said frame and said plate portion.

19. The invention, as defined in claim **1**, wherein: said hip engaging means comprises a plate portion adapted to be supported on rear portions of human hips; said plate portion having upper and lower edges, said belt portions and said movable connection means connected to said plate portion nearer said upper edge than said lower edge.

20. In a pack frame for carriage on the back of a human body the combination of: a substantially rigid frame having a longitudinal axis normally disposed substantially vertical, said frame having upper and lower ends, opposite sides and forward and rearward portions; first means for securing shoulder engaging straps to an upper portion of said frame; a pair of shoulder straps having respective first ends connected by said first means to said frame; said shoulder straps having second respective ends; second means for securing said second ends to said frame at portions thereof relatively lower than said first means; a hip engaging means having a plate member disposed to engage rearward portions of human hips, and movable connection means connecting said frame to said plate member, said movable connection means adapted to permit relative movement of said hip engaging means and said frame about a forward and rearward directed horizontal axis.

21. The invention, as defined in claim **20**, wherein: said movable connection means is also adapted to permit said relative movement about a vertical axis.

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