United States Patent [19]

Christen

[11] **3,906,944**

[45] **Sept. 23, 1975**

[54] **SHOULDER HARNESS**

[76] Inventor: **Fred F. Christen,** Rt. 1, Box 546, Raymond, Wash. 98577

[22] Filed: **Oct. 3, 1973**

[21] Appl. No.: **402,992**

[52] **U.S. Cl.** **128/133;** 128/DIG. 19; 2/45

[51] **Int. Cl.**[2] **A61F 13/00**

[58] **Field of Search** ..... 128/133, 78, 87, DIG. 19, 128/DIG. 15; 2/44, 45, DIG. 6

[56] **References Cited**

UNITED STATES PATENTS

84,787	12/1868	Adamson	128/DIG. 19

FOREIGN PATENTS OR APPLICATIONS

5,100	2/1893	United Kingdom	128/DIG. 19
4,981	2/1895	United Kingdom	128/DIG. 19

OTHER PUBLICATIONS

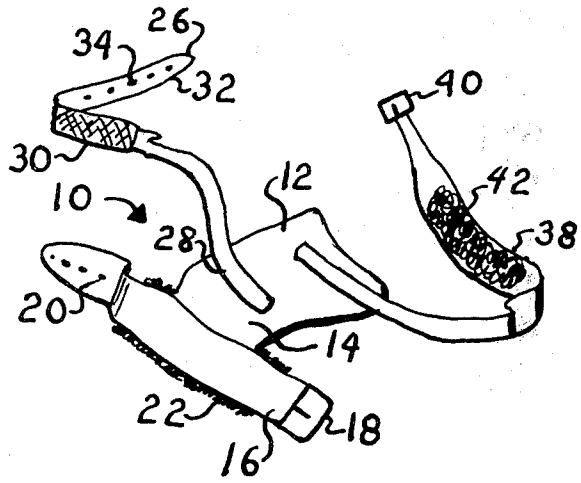
Orthopaedic Appliances Atlas, Vol. 1, 1952, p. 335, FIGS. 493, 494.

Primary Examiner—Richard A. Gaudet
Assistant Examiner—J. Yasko

[57] **ABSTRACT**

This invention relates to a surgical, orthopedic appliance or harness designed to be worn upon the person and to restrict movement of the upper arm during periods of strenuous physical activity, so as to prevent damage to the muscles, tendons and ligaments in the area of the shoulder and, in case, the shoulder area is more than usually susceptible to such injuries, to prevent dislocation of the shoulder, or movement of the ball of the upper arm out of the socket of the shoulder.

6 Claims, 6 Drawing Figures



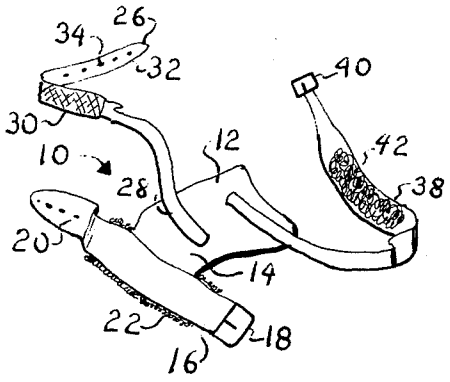


FIG 1

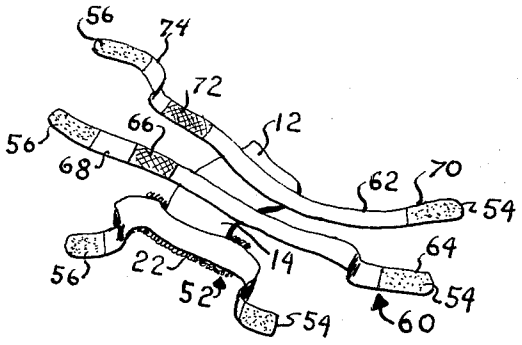


FIG. 2

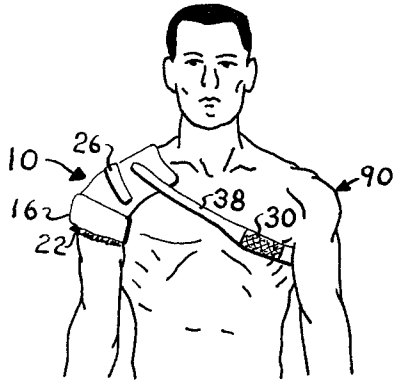


FIG. 3

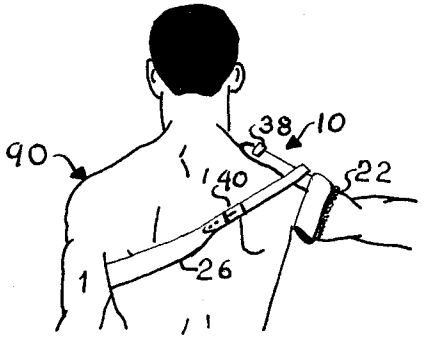


FIG.4

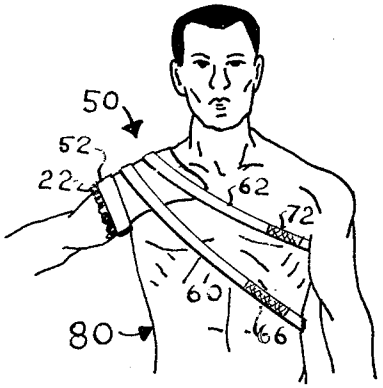


FIG. 5

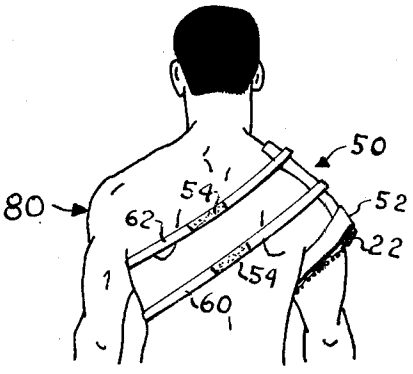


FIG.6

SHOULDER HARNESS

BACKGROUND OF THE INVENTION

There are persons who are more than usually susceptible to muscle pull and to the straining of tendons and ligaments in the area of the shoulder, such injuries occurring when the upper arm is raised above the level of the shoulder or more than, approximately, 90° away from the body of the person. Such persons are quite capable of carrying out normal daily tasks, even those involving heavy physical labor, just so they train themselves to refrain from raising the upper arm to a point where damage can be done. When such a person is engaged in active sports, however, there is a tendency to concentrate on the problems of the game and to do one's utmost to perform a task, regardless of the physical consequences to the performer. In these circumstances, it is necessary to provide some means to restrict the physical movements of the upper arm with respect to the shoulder which, ordinarily, results in the damage mentioned.

For example, my son plays football in high school and, unfortunately, has an easily dislocatable shoulder. He has played line backer and in such position must raise his arms. There is the possibility of dislocation of the ball-and-socket joint. Because of this possibility of dislocation and the fact that my son cannot play as much football as he would like because of this possibility of dislocation, I have made this invention to restrict the movement of the upper arm with respect to the shoulder and to lessen the possibility of the ball and socket separating. This invention may be of help and assistance to others with a similar problem.

By way of background with regard to the shoulder joint, it is known that the shoulder joint is a ball-and-socket joint which allows extremely free movement. It is so loosely constructed that it gives little stability and is very frequently dislocated. James E. Crouch in *FUNCTIONAL HUMAN ANATOMY*, 2nd Edition, Lea & Febiger, Philadelphia, 1972, states, page 145:

"The articular surfaces of this joint are the pear shaped, shallow glenoid fossa of the scapula and the considerably larger head of the humerus. Their surfaces are covered with articular cartilage. These is relatively little area of contact between these two bones at any time, and always a considerable part of the head of the humerus is in contact with the joint capsule. Though the shallow glenoid fossa does have a rim of fibrocartilage, the glenoid labrum, around its periphery to deepen it, it still remains a weak, insecure joint.

"The articular capsule attaches to the rim of the bony glenoid fossa and to the anatomical neck of the humerus. It is extremely loose and allows the articulating surface of the bones to be separated by as much as 2.5 cm. The most prominent of the restraining ligaments is the coracohumeral ligament which extends from the coracoid process to the greater tubercle of the humerus to strengthen the upper part of the capsule. The glenohumeral ligaments add some strength to the anterior part of the capsule.

"Lacking support from capsule and ligaments the shoulder joint is dependent for its integrity upon the surrounding muscles. The Supraspinatus above, the long head of the Triceps brachii below, the tendons of the Teres minor and Infraspinatus behind, and the Subscapularis is front help to strengthen the joint. The long tendon of the Biceps brachii, from its origin on the superior border of the glenoid fossa, passes inside the capsule of the joint.

"The shoulder joint is protected above and anteriorly by the coracoid process and above by the acromion of the scapula and by a coraeoacromial ligament. Beneath many of the muscles of shoulder joint are fluid-filled spaces, the bursae, which help to cut down friction around moving parts. Some of them, such as the one under the Subscapularis muscle, connect with the synovial cavity of the joint . . . .

"The shoulder joint is capable of a wide range of movement: flexion, extension, abduction, adduction, rotation, and circumduction."

On pages 226–228, Crouch states:

"The Deltoideus is a large, thick triangular, and coarse-textured muscle which forms the roundness of the shoulder. Like the Trapezius, with which it almost appears continuous at the scapula and clavicle, it has three parts which in the cat are separate muscles. Its anteior fibers arise from the lateral third of the anterior border and upper surface of the clavicle; its middle fibers from the lateral border and upper surface of the acromion; its posterior fibers from the posterior border of the spine of the scapula. The middle portion of the muscle is the strongest and its fibers are arranged in a complex bipennate fashion. The fibers of all portions converge into a thick tendon which inserts into the deltoid tuberosity on the middle lateral surface of the humerus. A large bursa is found beneath the Deltoideus, the subacromial bursa . . . .

"The muscle, working as a whole, is an abductor of the humerus. The anterior fibers flex and rotate the humerus medially; the posterior fibers extend and rotate it laterally.

"The Subscapularis, Supraspinatus, Infraspinatus and Teres minor, all of them deep muscles of the shoulder, are closely associated in strengthening and stabilizing the shoulder joint. They also serve as the chief rotators of the arm, and constitute what is sometimes referred to as the 'rotator cuff' . . . .

"The Subscapularis, as its name suggests, arises in the subscapular fossa where it has a multipennate origin. It converges laterally into a broad tendon which passes over the front of the fibrous capsule of the shoulder joint which it reinforces. It inserts on the lesser tubercle of the humerus. Beneath this tendon is a bursa which communicates with the shoulder joint . . . . The Subscapularis is a medial rotator of the arm. Its superior fibers weakly abduct while its inferior ones weakly adduct the humerus.

"The Supraspinatus arises from the supraspinous fossa of the scapula which it completely fills. Its tendon passes over the superior part of the fibrous capsule of the shoulder joint, with which it adheres, and inserts on the highest point of the greater tubercle of the humerus. The Supraspinatus is an important abductor of the humerus. It initiates abduction, and works with the Deltoideus. The Deltoideus is quite handicapped without it, since its pull is at first directly upward along the line of the humerus, not in a direction to initiate abduction.

"The Infraspinatus has a multipennate origin from the infraspinous fossa of the scapula. Closely associated with it along its lateral border is the small Teres minor.

These muscles both insert on the greater tubercle of the humerus, the Infraspinatus just above the Teres minor. Their tendons reinforce the shoulder joint capsule. They are lateral rotators of the humerus.

"The Teres major arises from the inferior angle and lower part of the axillary border of the scapula and inserts on the crest of the lesser tubercle of the humerus. Its insertion is just behind that of the Latissimus dorsi with which it is closely associated embryologically and functionally. It adducts, extends, and rotates the humerus medially.

"The Coracobranchialis is a small muscle having a common origin with the short head of the Biceps brachii, on the tip of the coracoid process of the scapula. It inserts by a flat tendon half-way down the medial border of the shaft of the humerus. It is perforated by the musculocutaneous nerve. Its function is to flex and adduct the humerus."

I have found that there is no appliance that can be purchased which will prevent a person from, inadvertently, raising his upper arm above the level of his shoulders, and which won't yet allow all other kinds of activity, such as allowing the arm to swing forward and backward, or to rotate in a horizontal plane, or any combination of these movements.

Accordingly, I have designed a shoulder harness to accomplish these ends so as to prevent movement of an upper arm above the level of the shoulder or more than 90° away from the body, and to permit all other normal movements of the upper arm.

BRIEF DESCRIPTION OF THE INVENTION

This invention is directed to a shoulder harness comprising a shoulder portion and an arm portion. There is a strap for strapping the arm portion to the wearer and there is a strap or straps for strapping the shoulder portion to the wearer. The shoulder harness restricts the movement of the upper arm with respect to the shoulder so as to restrict the movement of the ball and socket with respect to each other.

An object of this invention is to provide a shoulder harness which lessens the possibility of dislocation of the arm and shoulder and ball and socket with respect to each other; a further object is to provide such a shoulder harness which is light in weight; and additional important object is to provide such a shoulder harness which is easy to strap onto the individual wearer and to remove from the individual wearer; another object is to provide such a shoulder harness which allows movement of the upper arm to approximately the horizontal level position of the shoulder but not above the shoulder; a further object is to provide such a shoulder harness which is relatively inexpensive to manufacture; another important object is to provide such a shoulder harness which is, relatively, small and compact and easy for the wearer to store when he is not using it; and, a further important object is to provide such a shoulder harness which does not interfere with athletic equipment worn by the wearer when the wearer is also wearing a shoulder harness.

These and other important objects and advantages of the invention will be brought forth upon reference to the detailed description of the invention, the appended claims, and the accompanying drawings.

THE DRAWINGS

FIG. **1** is a top view of one species of the shoulder harness and illustrates the pad and the straps for attaching to a wearer;

FIG. **2** is a front view of another species of a shoulder harness and illustrates the pad and the straps for attaching to a wearer of the shoulder harness;

FIG. **3** is a front view of a person wearing the shoulder harness of FIG. **1** and with the arm hanging down by the side of the wearer;

FIG. **4** is a rear view of a person wearing the shoulder harness of FIG. **1** and with the arm outstretched to show the restriction of movement of the upper arm to less than, approximately, 90°;

FIG. **5** is a front view of the wearer of a shoulder harness of FIG. **2** and illustrates the arm of the wearer stretched outwardly to illustrated the restriction of movement of the upper arm of the wearer to move less than, approximately, 90° away from the body; and,

FIG. **6** is a rear view of the wearer of a shoulder harness of FIG. **2** and illustrates the arm of the wearer hanging down by the side of the body of the wearer.

DETAILED DESCRIPTION OF THE INVENTION

In FIG. **1**, there is illustrated a shoulder harness **10** comprising a pad having a shoulder portion **12** and an arm portion **14.**

There is connected to the arm portion **14** an arm strap **16** having a buckle **18** and an end with holes or apertures **20.** Also, on the inside surface or face of the arm strap **16** there is a cushion **22.** The cushion **22** may be foam rubber, solid plastic foam or thick cotton or a thick wool pad, as appropriate.

There is a first strap **26** connecting with the pad in the, approximate, region of the juncture of the arm portion **14** and the shoulder portion **12.** The first strap **26** comprises a body portion **28,** an elastic portion **30,** and end portion **32.** The first portion **28** is secured to the pad by stitching or sewing or by a suitable adhesive. It is conceivable that the first portion **28** can be attached to the pad by means of rivets, if desirable. The elastic portion **30** is attached to the first portion **28** by sewing or stitching and is also attached to the end portion **32** by sewing or stitching. In the end portion **32** there are apertures or holes **34.**

There is a second strap **38** which is attached to the shoulder portion **12** by means of sewing or stitching or suitable adhesive, or, even, by means of rivets. On the end of strap **38** there is a buckle **40.** On the inside surface of strap **38** there is a cushion **42** for cushioning the strap onto the wearer. The cushion **42** may be of cotton or wool or foam rubber or a suitable solid plastic.

In FIGS. **3** and **4,** there is illustrated the shoulder harness **10** as worn by an individual wearer. In these figures, it is seen that the arm strap **16** is strapped around the middle part or the upper part of the arm of the wearer. Also, it is seen that the straps **26** and **38** are attached around the body of the wearer. The harness **10** is placed over the right shoulder of the wearer and the straps **26** and **38** run around the body of the wearer, viz., the chest, the left side, and the back. In this manner, the shoulder harness **10** is positioned over the shoulder of the wearer and over the deltoideus muscle and the subscapularis muscle of the wearer.

In FIG. **2** there is illustrated a shoulder harness **50** having a shoulder portion **12** and an arm portion **14.**

The shoulder harness 50 has an arm strap 52. The arm strap 52 has on one end a fastening means 54 and on another end a fastening means 56. The fastening means 54 and 56 are complementary to each other, for example, the fastening means 54 may be a first layer of fabric of a velvet type and fastening means 56 may be a second layer of fabric of loop type or, conversely, the fastening means 56 may be a first layer of fabric of a hooked velvet type and the fastening means 54 may be a second layer of fabric of a loop type. The materials 54 and 56 are known under the trademark VELCRO, a product of the Velcro Corporation, 681 Fifth Avenue, New York, New York, and referred to in U.S. Pat. Nos. 2,717,437; 2,933,797; and 3,009,235. As is well known, the fabric of a loop type may be pressed into the fabric of a hooked velvet type to form a fastening means.

The shoulder harness 50 also comprises strap 60 and a strap 62.

The strap 60 is composed of three parts, there is a first part 64, and an elastic part 66, and an end part 68. The first part 64 connects to the pad in that area situated close to the shoulder portion 12 and the arm portion 14 when the shoulder harness 50 is on the wearer. The elastic portion 66 is joined to the first part 64. There is an end part 68 joined to the elastic portion 66. On the first part 64 there is a fastening means 54 and on 68 there is a fastening means 56.

There is a strap 62 having a first part 70 which connects with the shoulder portion 12 and in that region between the upper arm of the wearer and the neck of the wearer when the shoulder harness 50 is on a wearer. An elastic part 72 connects with the first part 70 and end 74 connects with the elastic part 72. The first part 70 is attached to the shoulder portion 12 by stitching or sewing or a bonding agent or, even, by rivets. On the first part 70 there is a fastening means 54 and on the part 74 there is a fastening means 56.

In FIGS. 5 and 6, there is illustrated the shoulder harness 50 as worn by a wearer or individual 80. It is seen that the arm strap 52 is encircling the middle or upper portion of the right arm. The strap 60 runs from the right shoulder around the chest of the person, the left side and over the back of the wearer. Again, the strap 60 runs across that part of the wearer 80 at, approximately, the junction of the shoulder and the upper arm. The strap 60 overlies the deltoideus muscle and the subscapularis muscle of the wearer. Further, it is seen that the strap 62 runs from the right shoulder region of the wearer across the chest, around the left side and the back.

The pads of the shoulder harnesses 10 and 50, comprising the shoulder portion 12 and the arm portion 14, should be of a flexible, supple material and yet have sufficient body and strength to resist the easiest of movements. In regard to being flexible, the shoulder portion 12 and the arm portion 14 should be able to be bent or folded without breaking and in regard to being supple, should be able to be readily bent, twisted, or folded without any sign of injury. This is desirable as by positioning the shoulder harness over the shoulder and the upper arm of the individual 80, see FIGS. 5 and 6, or an individual 90, see FIGS. 3 and 4, the shoulder harness restricts the outward movement of the upper arm away from the shoulder or body of the wearer 80 or 90. The shoulder portion 12 and the arm portion 14 should be supple and flexible in this regard and yet have sufficient body to resist the easiest of bending and movement.

It is to be noted that for the shoulder harness 10 and the strap 26, that there is an elastic marked 30 and that in the straps 60 and 62, there are elastic parts 66 and 72. In this regard, elastic applies the property of resisting deformation by stretching. Also, the parts 30, 60 and 62 may be resilient and springy wherein resilient implies the ability to recover shape quickly when the deforming force or pressure is removed and springy stresses both the ease with which something yields to pressure and the quickness of its return to shape.

I consider that the elasticity, resiliency, and springiness of the part 30 of the shoulder harness 10 and parts 60 and 62 of the shoulder harness 50 assist in holding the shoulder portion 12 firmly against the shoulder of the wearer 90 or the wearer 80. Also, with the shoulder harness 10, the part 30 assists in holding the strap 26 against the wearer in that portion approximately the junction of the shoulder and the upper arm. Likewise, the part 66 assists in holding the straps 60 and the shoulder harness against the wearer 80 in that area approximating the junction of the shoulder and the upper arm.

In FIGS. 4 and 5, it is seen that the arm of the wearer 90 and the arm of the wearer 80 are outstretched, substantially, horizontally. The shoulder harness 10 and the shoulder harness 50 assist in restricting the movement of the upper arm to move, less than, approximately, 90° away from the body. One of the factors that assist in lessening the movement of the upper arm above the, apprxoimately, horizontal position, is the material of the shoulder portion 12 and the arm portion 14 and also the fact that in the shoulder harness 10 there is the strap 26 and that part 28 of the strap over the approximately area of the junction of the shoulder and the upper arm. Likewise, for the shoulder harness, the strap 60 overrides the shoulder portion 12 and the arm portion 14 in that approximate area at the junction of the shoulder and the upper arm of the wearer. The part 28 and the strap 60, that part 64, may be considered to be a stiffening or reinforcing means for the shoulder portion 12 and the arm portion 14 of the pad to assist in restricting the upward movement of the upper arm of the wearer.

Materials of construction of the shoulder harness 10 and the shoulder harness 50 may be many. For example, the pad comprising the shoulder portion 12 and the arm portion 14 may be leather, rubber, or plastic such as a pad of polyurethane or polyvinyl chloride or polyvinyl alcohol or polyethylene. The strap may be of, in the main body, leather or plastic, and for the regions 30 and 66 and 72, the strap should be of elastic and resilient and springy properties so as to pull the shoulder harness tightly against the shoulder of the wearer and also against the upper arm of the wearer.

From the foregoing, it is seen that I have provided a shoulder harness which allows considerable freedom of movement of the upper arm with respect to the body of the wearer or the torso of the wearer and yet assist in maintaining the ball of the upper arm in the socket of the shoulder so as to lessen the possibility of dislocation of the shoulder or the movement of the ball away from the socket of the wearer. In the specification, it was stated that the ball and socket in a shoulder may be separated by as much as 2.5 cm. or close to 1 inch. For a person who has the problem of a dislocated

shoulder or the propensity for the the shoulder to become easily dislocated, it is desirable to have assistance in maintaining the ball in the vicinity of the socket and to not let the ball be more than 1 inch away from the socket. With shoulder harnesses of this invention, I think I have provided such an apparatus and means for restricting the movement of the ball with respect to the socket and, especially, restricting the upward movement of the arm with respect to the body so as to lessen the possibility of the ball coming out of the socket. I believe that I have accomplished this with a minimum of inconvenience to the wearer of a shoulder harness and also allowing the wearer of the shoulder harness to perform many activities which prior to using this shoulder harness such a wearer could not perform. I know that with my son, he is able to play high school football with much more confidence and assurance that his shoulder will stay in position than he was before I invented the shoulder harness and before he started wearing the shoulder harness.

From the foregoing and having presented my invention, what I claim is:

1. A shoulder harness comprising:

a. a pad having a shoulder portion and an upper arm portion;

b. said pad being flexible and supple;

c. a first means connecting with said pad for attaching said upper arm portion to an arm of a wearer;

d. a second means connecting with said pad for positioning said shoulder portion over the shoulder of the wearer;

e. said second means comprising a strap capable of passing across the chest, around the side and under the other arm and across the back of the wearer;

f. said second means upon being positioned on the wearer of the shoulder harness forcing said pad to bear on the wearer in the area of the deltoideus muscle and in the area of the subscapularis muscle and in the area of the supraspinatus muscle and with said strap means being in the area of the supraspinatus muscle to assist in holding together the ball-and-socket joint of the upper arm and the shoulder;

g. said first means comprising a first strap for encircling the upper arm of the wearer;

h. said second means comprising a second strap and a third strap;

i. said second strap and said third strap adapted to encircle the chest, side and back of the wearer;

j. said second strap connecting with said shoulder portion in the area which is adapted to be over the ball and socket of the wearer; and,

k. said third strap connecting with said shoulder portion in the area which is adapted to be between the ball and socket of the wearer and the neck of the wearer.

2. A shoulder harness according to claim **1**, said harness comprising:

a. said second means stiffening said pad in that part which is near the deltoideus muscle, the supraspinatus muscle and the subscapularis muscle of the wearer to restrict the flexibility and suppleness of the wearer.

3. A shoulder harness according to claim **1**, said harness comprising:

a. said second strap being elastic for forcing said pad against the wearer; and,

b. said third strap being elastic for forcing said pad against the wearer.

4. A method for lessening the possibility of dislocating the ball-and-socket joint of the upper arm and shoulder, of a human being, said method comprising:

a. restricting the movement of ball and socket away from each other;

b. restricting the movement of the upper arm to move less than, approximately, 90° away from the body;

c. said arm being free to move without the inner part of the upper arm being tied to the body;

d. positioning a flexible and supple pad over the shoulder and over the outer part of the upper arm to cover, at least, part of the deltoideus muscle, the supraspinatus muscle and the subscapularis muscle of the human being;

e. said pad being positioned on the upper arm;

f. said pad being positioned on the shoulder;

g. said pad restricting the movement of the upper arm with respect to the shoulder to restrict movement of the ball and socket with respect to each other;

h. positioning said flexible and supple pad by means of a first strap connecting with said pad and for encircling the upper arm of the wearer, and a second strap; and,

i. said second strap comprising a first part connecting with the shoulder portion in the area which will be over the ball and socket of the human being, and a second part connecting with said shoulder portion in the area between the ball and socket of the human being and the neck of the human being.

5. A shoulder harness comprising:

a. a pad having a shoulder portion and an upper arm portion;

b. said pad being flexible and supple;

c. a first means connecting with said pad for attaching said upper arm portion to an arm of a wearer;

d. a second means connecting with said pad for positioning said shoulder portion over the shoulder of the wearer;

e. said second means comprising a strap capable of passing across the chest, around the side and under the other arm and across the back of the wearer;

f. said second means upon being positioned on the wearer of the shoulder harness forcing said pad to bear on the wearer in the area of the deltoideus muscle and in the area of the subscapularis muscle and in the area of the supraspinatus muscle and with said strap means being in the area of the supraspinatus muscle to assist in holding together the ball-and-socket joint of the upper arm and the shoulder;

g. said first means comprising a first strap for encircling the upper arm of the wearer;

h. said second means comprising a second strap for encircling the chest, side and back of the wearer;

i. said first means and said second means by positioning the pad with respect to the upper arm and to the shoulder portion of the wearer, restrict the movement of the ball and socket of said arm and said shoulder;

j. said second strap comprising a first portion having a first part connected with said shoulder portion at the upper part of said pad in the area which is adapted to be over the ball and socket of the wearer;

k. said second strap comprising a second portion having a second part connecting with said shoulder portion at the upper part of said pad in the area which is adapted to be between the ball and socket of the wearer and the neck of the wearer; and,

l. means to join said first portion and said second portion of said strap.

6. A shoulder harness according to claim **5,** said harness comprising:

a. said second strap being elastic for forcing said pad against the wearer.

* * * * *