United States Patent [19]

Harrington

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[54] STRETCHER

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[52] **U.S. Cl.**.....**128/84 C,** 5/82, 128/75

[51] **Int. Cl.**.....**A61f 5/04**

[58] **Field of Search**.....128/84, 85, 82, 71, 128/DIG. 20, 75, 70; 5/82

[56] **References Cited**

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Assistant Examiner—J. Yasko
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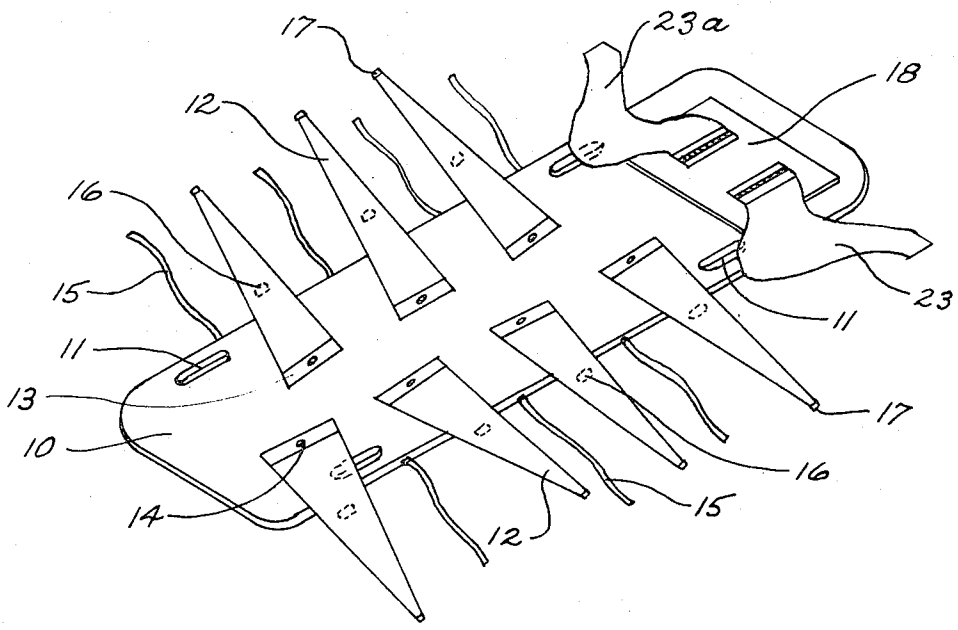
[57] **ABSTRACT**

A stretcher for emergency field work is described, having straps for securing a human body on a rigid plane for safe transport. A special carriage for the head may be biased to provide dynamic traction for the neck vertebrae.

3 Claims, 7 Drawing Figures



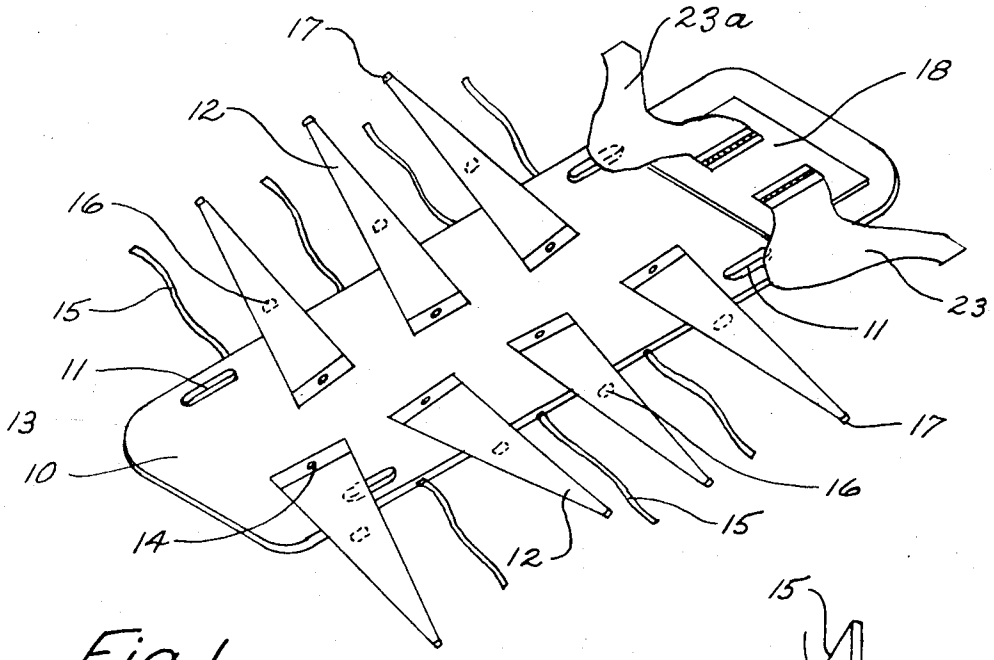


Fig. 1

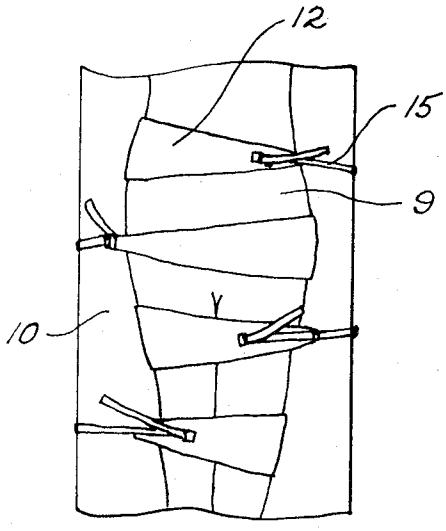


Fig. 2

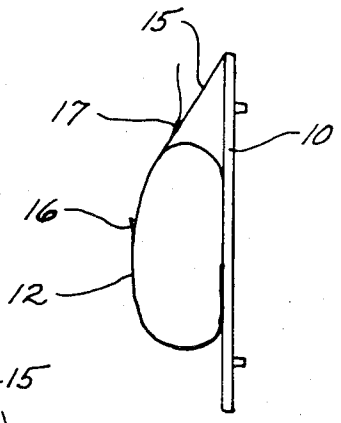


Fig. 3

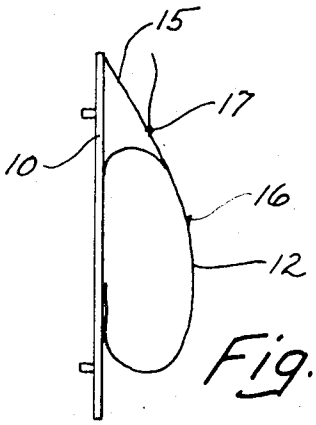


Fig. 4

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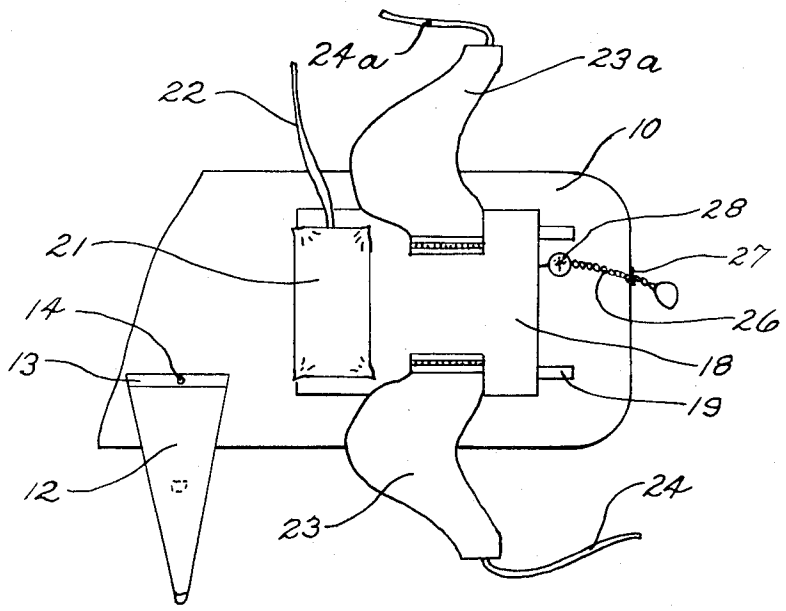

Fig. 5

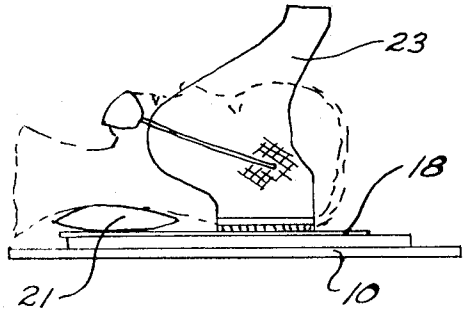

Fig. 5a

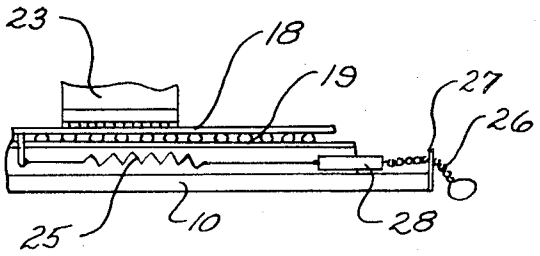

Fig. 6

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STRETCHER

My invention relates to rescue apparatus and relates more particularly to an improved form of stretcher which can aptly be termed a "whole body splint." My device provides for virtually complete immobilization of an injured person during the often critical period during which he must be transported from the place of the accident to a hospital or other center where medical attention can be had. Often the trauma caused by an accident are exacerbated during subsequent transport of the patient. Within the scope of first aid the body can only be immobilized by contact in some way with its outer envelope, re, the skin. A certain amount of movement of the skeletal structure relative to the body envelope in response to acceleration forces (positive and negative) cannot be avoided. It is always desirable that the entire skeletal structure, including the skull, move together; this movement, of course, is to be kept at a minimum. This is particularly important in cervical spine injuries. Furthermore, the gravity force vector presents a problem. Normally the position of the patient on a stretcher is supine, with the body resting on a rigid base of some sort. However, it is sometimes necessary to tilt the patient, either by rotation around the longitudinal axis of the spine or in the vertical plane of the spine. Thus, in case of vomiting and where a cervical spine injury is involved, such motions of the stretcher facilitate the management of the patient's airway. Then too, the stretcher may have to be tilted as on steep inclines, staircases, or narrow passageways. The means by which the patient is strapped to the base of the carrier must be able to resist any sagging along the axis of the spine as the patient is rotated. If tilting in the vertical plane of the spine is required, it is essential that the change in the gravity force vector relative to the spinal axis does not cause appreciable tensional or compressive forces on the spine or neck due to the weight of the head. As the skeletal structure shifts within the body envelope in response to all these forces, the spatial relationship of the skull to the rest of the skeleton must be maintained.

To meet the problems just described, I provide a whole body splint in which a rigid base board provides the fundamental reference plane upon which the patient is carefully placed. I have found that in most cases it is impractical to keep the patient in the position found, because effective immobilization in an infinite variety of attitudes is not possible. Current medical opinion is that careful return to a normal position (supine or prone) followed by really effective immobilization during transport is the best practice in the majority of cases, and damage during transport thus minimized.

On the base of my carrier I provide confining straps in the form of gores which are swiveled so as to adapt to the contours of the body envelope as such envelope surfaces taper toward and from the spinal axis. I further provide for an improved head rest which is essentially a carriage with a degree of freedom along the spinal axis. A pneumatic pad is employed to fill the cavity under the neck formed by the cervical arch. This pad is infinitely adjustable in size to accomodate any size patient. Further, an adjustable degree of traction on the head along the spinal axis is provided for.

For a complete understanding of my invention reference is now made to the accompanying drawings in which:

FIG. 1 is a general view in perspective of my device showing the overall plan;

FIG. 2 is a detailed view of the application of the supporting gores to the body contours of the patient;

FIGS. 3 and 4 depict the action of the supporting gores in two positions of the stretcher; and

FIGS. 5 and 6 are details of the head rest and traction arrangement.

Referring now more particularly to the drawings, a rigid board 10 forms the reference plane for support of the patient. The board 10 is preferably made of radiolucent material (the same being the case for all other components of my stretcher) to facilitate the taking of X-ray photographs in the position of arrival at the hospital or other medical center. Hand holds 11 provide means for carrying the device and patient.

Along the longitudinal axis of the board 10 are affixed a series of alternately spaced webs in the form of gores 12 as shown. These gores may be made of a smooth strong plastic material which is easily kept clean. The board ends of the gores 12 are defined and kept somewhat rigid by thin stiffening members 13 sewn into the gore. The gores 12 are pivotally fastened to the board 10 at points 14, and it will be seen that each gore 12 can be set at a variety of angles with respect to the axis of the board 10.

The purpose of so designing and mounting the body supporting gores 12 becomes apparent from the showing of FIG. 2. The gores have been shown spaced rather more than in actual practice for the sake of clarity in illustrating one of the principles of my invention. By means of adjustable connecting straps 15 the gores are drawn taut after being wrapped around a given portion of the patient's body 9 from well under the body and thence up and around the portion being contained to a point on the opposite edge of the board. It will be seen that a tear drop cross section (FIGS. 3 and 4) is formed, and that by reason of being pivotally mounted, each gore 12 can follow the respective body contour. Thus the gores collectively can effectively engage and contain the entire body envelope over a considerable surface thereof. In this connection, and to make most effective use of this principle, I may provide a plurality of straps 15 along the sides of the board 10, and not necessarily one strap directly opposite each gore. Therefore, the rescue personnel can select an appropriate strap to maximize the supportive affect of each gore, as shown in FIG. 2.

By reason of the wrap of each gore from a point well under the patient, effective lateral support is also achieved. By alternating the gores 12 as shown in FIG. 1, support in the planes shown in FIGS. 3 and 4 is accomplished. Thus should it become necessary to tilt the patient (as is often the case) movement of the body envelope is minimized. It will be noted that each gore 12 has two strap engaging D-rings 16 and 17 to accomodate a variety of body sizes. These are shown in solid lines on FIG. 1 for clarity, although it will be appreciated that they are secured to the outside surfaces of the gores 12.

While the body envelope of the patient is thus effectively held and immobilized, there is no effective method of keeping the skeletal structure likewise immobile within that envelope. Some movement of bones

relative to skin surface is inevitable by the very nature of the human body.

To cope with this problem, which is most acute in cases of cervical spine injuries, I provide a slidable head rest which can be biased along the axis of the board **10** to permit the patient's head to move as the rest of the skeletal structure moves. This means is shown in FIGS. **5** and **6.** A head supporting carriage **18** is mounted on a ball track **19** so that it may move along the axis of the stretcher. The patient's head is placed on the carriage **18.** If in supine position, the cervical arch is supported by an inflatable pneumatic cushion **21,** which may be blown up to the desired size through tube **22.** The tube may be clamped, merely tied, or a valve can be provided. In the prone position the cushion **21** fills the space directly under the cervical arch. The patient's head is laterally restrained by two supporting members **23** and **23** (*b*) which are hinged to the carriage **18** as shown. These members are held against either side of the head by straps **24** and **24**(*a*). The strap **24** may be fastened to member **23** and the strap **24**(*a*) likewise affixed to member **23**(*a*).

In this connection I should point out that all fastenings of straps and gores on my carrier may be by conventional buckle or gripper techniques. However, I have found the fastener having the trade name VELCRO to be most effective for quick fastening, infinite adjustability, and quick release. A chin strap as shown in FIG. **5**(*a*) is used to help maintain proper position of the patient's head on the carriage **18.** The strap shown can conviently be affixed to each member **23** and **23**(*a*) by a fastener, VELCRO, or the like. Thus, with the carriage **18** spring biased to the right (as viewed in FIG. **6**) the head is in effective dynamic traction with respect to the spine.

In FIG. **6** it will be seen that after the patient is secured on the board **10** and after his head is secured on the carriage **18,** as explained, traction can be applied by means of a spring **25.** A pull chain **26** provides a series of small steps of adjustment by which the tension may be increased or decreased as chain **26** engages a clamp **27.** A spring tension indicator **28** may be placed in series with the spring **25** to give readings directly in force units such as pounds. A practical device could be used without the indicator **28** by providing a spring **25** which would produce a maximum of five pounds of tractive force. This amount is considered well below a safe maximum to use under first aid conditions. It should be emphasized that under emergency conditions the traction desired may not be that which would be ultimately prescribed after clinical diagnosis. What is contemplated here is just sufficient traction to keep head and body in a fixed relationship during transport. Only a few pounds are required for this purpose, and more might be excessive medically and beyond the immediate purposes of this device. This is most important as any form of static traction heretofore proposed would quickly lose its effectiveness. The traction here provided on the other hand is dynamic; that is, within the skeletal movements to be inevitably expected the "follow up" movements of the carriage **18,** in either direction, keep constant the spatial relationship between head and spine. Chances for further injury during transport are accordingly minimized.

The principal features of my improved stretcher include:

a. means to hold the patient securely on a board;
b. safe dynamic traction for the cervical spine;
c. adaptability to a variety of patient sizes and configurations;
d. low profile for ease of storage and placement in vehicles, and, most important,
e. means to secure the head and support the cervical arch of the neck;
f. security during tilting of patient if such motion becomes necessary.

While I have described a particular embodiment of my invention for illustrative purposes, it will be appreciated that variations within its spirit and scope will occur and can be made by persons skilled in this art.

I claim:

1. A stretcher comprising a baseboard; means for securing a human body to said baseboard including a plurality of gore shaped webs arranged alternately along the axis of said baseboard, each such web being pivotally fixed to said baseboard at a point inwardly of the edges of said baseboard so as to be well under the body being supported; a plurality of strap means secured along the edges of said baseboard to secure said webs taut after they are wrapped around said body; head rest carriage mounted on said baseboard at one end thereof and slidable along the longitudinal axis of said baseboard; means for restraining a human head on said carriage; and means for biasing said carriage towards the end of said baseboard upon which said carriage is mounted to thereby provide traction between head and body of a patient thereon.

2. A stretcher in accordance with claim **1.** in which said biasing means comprise a spring with an adjustable degree of tension.

3. A stretcher in accordance with claim **1.** in which said restraining means comprise a pair of laterally restraining head plates hinged on said carriage; straps to secure said head on said carriage; and an adjustably inflatable pneumatic cushion on said carriage to fill the cavity under the cervical arch of said body.

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