

[54] **BALANCED SUSPENSION SLING**
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[58] **Field of Search** **5/327 R; 128/94; 5/92**

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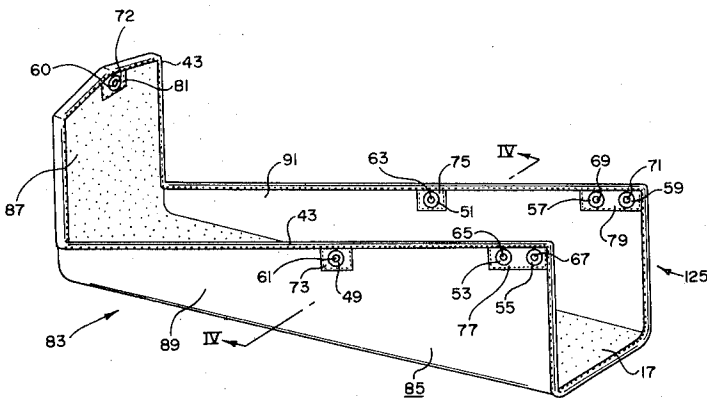
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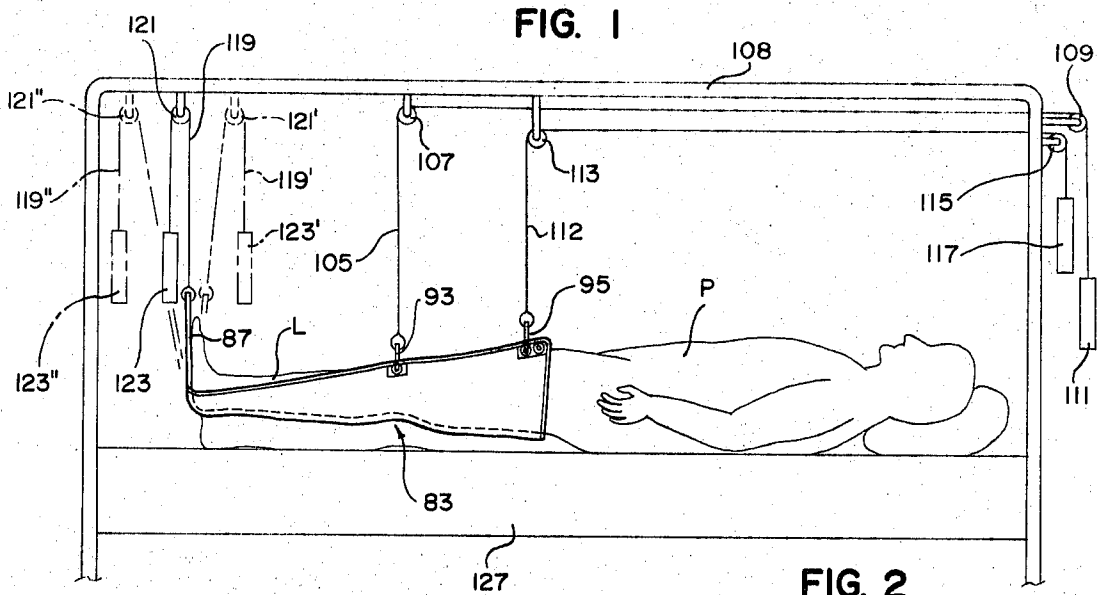
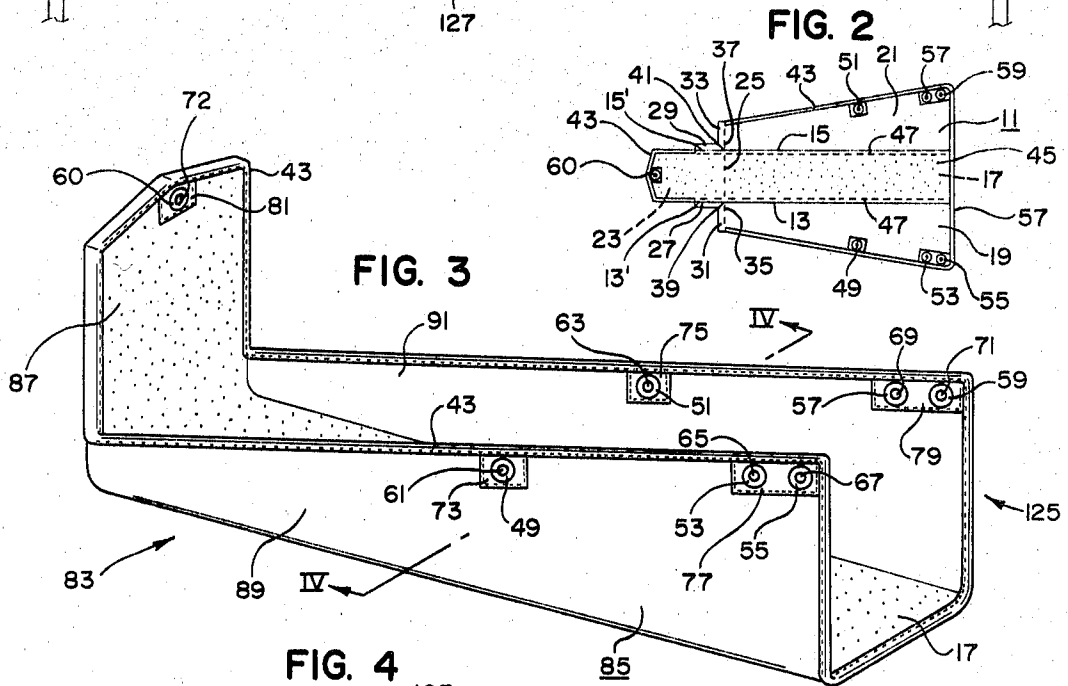
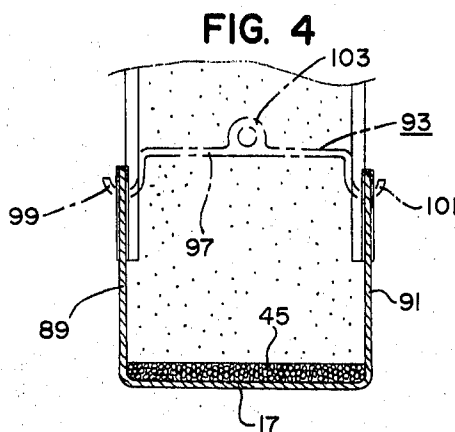
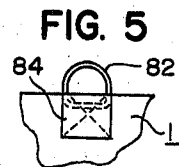
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Primary Examiner—Roy D. Frazier
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[57] **ABSTRACT**
A one piece flexible leg sling that extends substantially the entire length of the patient's leg and is supported above the bed in a balanced manner from overhead traction apparatus. The sling includes a body portion that is made substantially entirely of fabric with the body portion being substantially U-shaped along the length thereof, being open at one end to receive the upper part of the leg, and being closed at the opposite end with an upstanding foot portion. A plurality of spreader bars extend between the sides of the body portion to keep it in an upwardly open U-shaped position. Portions of the interior of the body portion are covered with a soft material adapted for contact with the patient's skin.

3 Claims, 5 Drawing Figures





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BALANCED SUSPENSION SLING

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a leg sling adapted for support in a balanced manner from overhead traction apparatus in a hospital bed.

2. Description of the Prior Art

There have previously been various devices for suspending a patient's leg in a hospital bed for orthopedic fracture treatments. One of such devices is known as the Thomas Leg Splint, which includes a metal framework, and was originally designed in the late 1800's for immobilization of fractured limbs but is currently being used also to achieve balanced suspension when it is rigged with additional fabric supports secured to hold the leg in the proper position. Also, this leg splint is utilized with a so-called Pierson attachment and with other attachments such as a rigid foot support and heel rest. In the use of the Thomas leg splint, it is necessary to put various components together to make the sling suitable for a balanced suspension. This is commonly done by means of a plurality of straps, safety pins, towels, etc. It is troublesome and time-consuming to put all these various parts together and more or less "build" the sling. In other words, the Thomas splint was originally designed for immobilization and to adapt it for use as a balanced leg suspension, it is necessary to utilize a multiplicity of products and components such as towels, safety pins, attachments, etc. Other somewhat similar metal contrivances are the so-called Bohler-Braun Leg Splint and the De Puy rocking leg splint.

Also, prior devices include a knee sling, consisting of fabric sling about 12 inches wide which encircles the leg only at the knee, but which is not a balanced suspension sling.

A preliminary patentability search revealed the following patents: U.S. Pat. No. 505,382 (similar to the Thomas splint); U.S. Pat. No. 731,083 (suspended fractured leg by means of a suspension cord); U.S. Pat. Nos. 339,106 and 980,464 (arm slings); U.S. Pat. No. 3,344,446 (orthopedic bed covering which also includes a traction mechanism having a sling attached to the upper portion of the thigh of the patient and a rope looped around the leg of the patient); and U.S. Pat. No. 2,722,692 (an anatomical support frame).

SUMMARY OF THE INVENTION

The present invention is an improvement over prior balanced suspension slings. The present invention accomplishes in a single product which has been broadly accomplished previously in a combination of a multiplicity of products and components, such as rigid metal framework, straps, towels, safety pins, etc. The sling per se of the present invention is a ready-made one piece product that does not need to be built or constructed by the doctor or traction technician, as was the case with the splint such as the Thomas Leg Splint and other similar devices.

It is an object of the present invention to provide a balanced suspension sling which is easy to apply in minutes and which is comfortable to the patient. A further object is to provide such a sling which can be laundered and re-used. In addition, it is an object of the present invention to provide a sling which gives full support to

the entire leg and which is flexible so as to conform closely to the anatomy of the patient.

A further object is to provide means whereby the angle of the footrest may be varied to support the foot at the desired degree of flexion.

Also, it is an object of the present invention to provide a sling which can be utilized to exercise the knee and which allows the patient to get on the bedpan easily. In addition, such a sling is provided which aids in nursing care.

The means by which the foregoing and other objects of the present invention are accomplished is by the provision of a one piece flexible leg sling that extends substantially the entire length of the patient's leg. The sling includes a body portion that is made substantially entirely of fabric which substantially conforms to the contour of the leg. The body portion is substantially U-shaped along the length thereof, open at one end to receive the upper part of the leg near the crotch, and is closed at the opposite end with an upstanding foot portion. The foot portion, which extends across the end of the body portion, is flexibly integrally attached to the body portion and made of fabric so that it is adapted to be suspended from an overhead traction apparatus at various angles, as desired. A plurality of spreader bars extend between the sides of the body portion to keep the body portion in an upwardly opened U-shaped position and which furnish the means by which the body of the sling is suspended by flexible lines extending through pulleys to weights. Portions of the interior of the body portion are covered with a soft material, as foam, for comfortable contact with the patient's skin.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of the leg sling of the present invention shown in use.

FIG. 2 is a plan view of the leg sling of the present invention shown on a reduced scale in a flat and partially assembled disposition.

FIG. 3 is a perspective view of the leg sling of the present invention.

FIG. 4 is a fragmentary sectional view taken as on the line IV—IV of FIG. 3, and showing in broken lines one of the spreader bars.

FIG. 5 shows an alternate holding means.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. 2, there is shown a flat piece of material 11, which is cut out from a fabric such as cotton duck material in the somewhat trapezoidal shape shown. For purposes of description the piece 11 is divided into the following parts by the following imaginary lines: A pair of parallel imaginary lines 13, 15 divide the piece 11 generally into a substantially rectangular bottom portion 17 and a pair of trapezoidal portions 19, 21 integrally attached respectively along lines 13, 15 and extending outwardly therefrom in opposite directions. An end portion 23 is integrally attached to bottom portion 17 along the imaginary line 25 and forms an extension of the portion 17. The distal end of end portion 23 is preferably somewhat pointed. A pair of flaps 27, 29 are integrally attached along the opposite side edges of end portion 23 along the imaginary lines 13', 15' which form an extension of lines 13, 15. In addition, flaps 31, 33 are integrally attached re-

spectively to portions 19, 21 along imaginary lines 35, 37 respectively at the ends of the portions 19, 21. A diagonal cut 39 separates flaps 27, 31, and a diagonal cut 41 separates flaps 29, 33. Bias tape 43 is preferably provided around the edges of piece 11 except for the flaps 27, 29, 31, and 33. A substantially rectangular piece 45 of soft material, as foam, is fixedly attached to the upper surface of portions 17, 23 by suitable means as stitching 47. A suitable foam material that has been found satisfactory is Scott's Reticulated Foam, manufactured by the Foam Division of Scott Paper Co., 1500 East Second Street, Chester, Pennsylvania. A pair of grommets 49, 51 are respectively provided in portions 19, 21 intermediate the ends of the portions and adjacent the distal edges thereof. Likewise, two pairs of grommets 53, 55 and 57, 59 are respectively provided in portions 19, 21 adjacent the distal edges of the portions 19, 21 but adjacent the end edge 57 of piece 11. In addition, a grommet 60 is attached to end portion 23 adjacent the distal end thereof and along the center line thereof. The grommets 49, 51, 53, 55, 57, 59, and 60 respectively define apertures 61, 63, 65, 67, 69, 71 and 72 in piece 11. The grommets 49, 51, 53, 55, 57, 59 and 60 are attached to the piece 11 and reinforced by suitable means well known to those skilled in the art, as by the cotton webbing pieces 73, 75, 77, 79 and 81, as by stitching or the like.

If desired, in place of the grommets, D-rings 82, one of which is shown in FIG. 5, may be utilized in which case the D-rings are attached to the piece 11 as by means of X-stitched cotton duck webbing material 84.

To form the partially compelted device as described above and as shown in FIG. 2 into the sling 83 of the present invention, the portions 19, 21 are folded upwardly respectively along the lines 13, 15 to provide the substantially U-shaped body portion 85; the end portion 23 is folded upwardly along the line 25 to provide the foot portion 87; the flaps 27, 31 are overlapped and fixedly attached to one another as by stitching or the like; and flaps 29, 33 are overlapped and fixedly attached to one another as by stitching or the like, so that the sling 83 will have the appearance as best seen in FIG. 3. Thus, when folded and stitched as above-described, portion 17 becomes the bottom portion of the body portion 85 and portions 19, 21 become the side portions 89, 91 of the body portion which upstand from bottom portion 17. It will be understood that when portions 19, 21 are turned up as above-described, the apertures 61, 63 will be in transverse alignment, the apertures 65 and 69 will be in transverse alignment, and the apertures 67, 71 will be in transverse alignment.

A pair of hanger or spreader bars 93, 95 are provided for keeping the side portions 89, 91 spread apart and for providing the hanger means for the sling 83 at the intermediate portion and crotch portion of the sling. Since spreader bars 93, 95 are substantially identical, the following description of spreader bar 93 will suffice for both. Spreader bar 93 is formed from substantially rigid material, as steel or the like and includes a transverse bar portion 97 having integrally formed hooks 99, 101 provided on the opposite ends thereof adapted to respectively fit into the apertures 61, 63. An eyelet 103 is integrally attached intermediate the ends of bar portion 97 and receives the end of an elongated flexible member 105 such as a rope which is tied thereto. The

member 105 extends upwardly from eyelet 103 and through a pulley 107, which is attached to an overhead traction bar 108. The member 105 then extends over another pulley 109, attached to the traction bar 108 and thence down to a weight 111. Spreader bar 95 is placed in either apertures 65 and 69 or in apertures 67 and 71. There is a similar balanced traction means for spreader bar 95 as for spreader bar 93 and includes flexible member 112, pulleys 113, 115 and weight 117.

An elongated flexible member 119, such as a rope or the like, is attached to foot portion 87 as by extending the flexible member through the aperture 72 and tying it to the foot portion. The flexible member 119 extends through a pulley 121 that is adapted to be selectively fixedly mounted in various positions from traction bar 108. Flexible member 119 then extends downwardly from pulley 121 to a weight 123. It will be understood that when the pulley 121 is in the position shown in solid lines in FIG. 1, there will be a straight upward pull on the foot portion 87 so that it will be substantially at a right angle relative to bottom portion 17. When the parts are in another position shown in broken lines with the prime mark designations, as 119', 121', and 123', the foot portion 87 is held in an angular position sloping forwardly towards the head of the bed. When the parts are in still another position shown in broken lines and designated by the double prime marks, as flexible member 119'', pulley 121'', and weight 123'', the foot portion 87 is held in a position angled rearwardly towards the foot of the bed. It will be understood that these selected angular positions are possible since the foot portion 87 is flexibly attached to the remainder of the sling 83. Displacement of the foot portion 87 at the desired angle allows easy correction of drop-foot.

The sling 83 is particularly adapted for post-operative uses which include: post-operative cup arthroplasty; post-operative fracture nailing of the hip; post-operative fracture nailing of the femoral shaft; post-operative total hip arthroplasty; and post-operative care of Austin-Moore arthroplasty. In using the sling 83, the patient's leg is placed in the sling with the leg extending through the open U-shaped end 125 and resting on the foam covered bottom portion 17 and with the foot of the patient being contiguous with foot portion 87. In FIG. 1 is shown the patient lying on the bed 127 with his leg L in the sling 83 in the manner above described. The overhead traction apparatus 108 to which the pulleys 107, 109, 113, 115 and 121 are attached is of any suitable construction known to those skilled in the art. The weights 111, 117 and 123 are adjusted so that the sling 83 with the patient's leg therein is balanced whereby the leg will remain a few inches above the bed. It will be understood that since the sling is made out of flexible material, it will conform to the curvature of the leg.

In summary, it will be understood that the one piece sling 83 of the present invention can be applied much faster than previous splints such as the Thomas splint, and saves valuable time of both the doctor and the traction technician. The splint is comfortable since it is flexible and is padded with a soft material which covers the entire length of the leg and the foot. The sling 83 aids nursing care by making it easier for the patient to use the bedpan. In addition, it eliminates the cumbersome ring in the crotch area, which was prevalent on many of the prior devices. The adjustability of the angle

of the foot portion allows easy correction of drop-foot by placement of the traction pulley at the desired plate. Also, the grommets 49, 51 and the spreader bar 93 over the knee allows support in that area and enables the surgeon to suspend the leg at the desired angle of flexion with adjustments of the weights. Also, the patient may exercise the foot by pulling down on the weight attached to the flexible member 105 to cause the middle portion of the sling to move upwardly, thus bending the patient's leg. Then, when he lets go, the leg slowly but surely stretches out. In addition, the plurality of spreader bars 93 95 keep the side portions 89, 91 spread apart and open so that there is good circulation of air and so that the doctor may easily examine the patient's leg. Additionally, the sling body portion 85, being made substantially entirely of fabric, is transparent to X-rays as opposed to some of the previous devices that have metal parts which show up in the X-ray.

Although the invention has been described and illustrated with respect to a preferred embodiment thereof, it is not to be so limited since changes and modifications may be made therein which are within the full intended scope of this invention.

I claim:

1. Apparatus for suspending the leg of a patient in a bed comprising a leg sling including a substantially rectangularly shaped sheet of flexible fabric having opposite side edges and opposite ends, said sheet being turned upwardly substantially perpendicular to the remainder of said sheet to establish an upturned foot portion and with the remainder of said sheet establishing a bottom portion having side edges and a transverse edge remote from said foot portion, a pair of substantially trapezoidally shaped side sheets of flexible fabric having upper and lower non-parallel edges and a shorter end edge and a longer end edge, said pair of side sheets being fixedly attached adjacent the lower edges thereof to said bottom portion adjacent the side edges thereof and extending perpendicularly upward from said bottom portion in parallel spaced apart relationship to establish side portions of said sling with said shorter end edge of each of said side sheets being adjacent said foot portion and attached thereto, and said longer end edge of each of said side sheets being adjacent said transverse edge of said bottom portion, said foot portion extending upwardly beyond said shorter end edges of said side sheets and being provided with at least one aperture therethrough adjacent the upper end thereof, said side portions respectively being provided with a plurality of apertures adjacent the upper edges thereof with at least one of said apertures in each of said side portions being adjacent said longer end edges to establish at least a pair of transversely aligned end apertures in said sling and with at least one of said apertures in each of said side portions being intermediate said shorter and longer end edges to establish at least a pair of transversely aligned intermediate apertures in said sling, an overhead traction means for extending longitudinally over the bed, a plurality of pulleys supported from said traction means, at least a pair of rigid hanger and spreader devices having hook means at the opposite ends thereof and an eyelet portion intermediate the ends thereof, said hanger devices

being removably attached to said sling with said hook means of one of said devices extending through said intermediate apertures and with said hook means of another of said devices extending through said end apertures to hold said side portions apart, a plurality of weight means, a plurality of elongated flexible members attached respectively at one of the ends thereof to said hanger devices at said eyelet portions and to said foot portion at the aperture therein and respectively extending through said pulley means and being attached adjacent the opposite ends thereof to said weight means for balancingly suspending said sling means substantially horizontally over the bed with the patient's leg being removably received therein and with the patient's foot being adjacent said foot portion and said bottom portion extending beneath substantially the entire length of the patient's leg.

2. The apparatus of claim 1 in which is included a resilient foam material sheet substantially covering said sling on the bottom portion and foot portion thereof.

3. Apparatus for suspending the leg of a patient in a bed comprising a leg sling including a substantially rectangularly shaped sheet of flexible fabric having opposite side edges and opposite ends, said sheet being turned upwardly substantially perpendicular to the remainder of said sheet to establish an upturned foot portion and with the remainder of said sheet establishing a bottom portion having side edges and a transverse edge remote from said foot portion, a pair of substantially trapezoidally shaped side sheets of flexible fabric having upper and lower non-parallel edges and a shorter end edge and a longer end edge, said pair of side sheets being fixedly attached adjacent the lower edges thereof to said bottom portion adjacent the side edges thereof and extending perpendicularly upward from said bottom portion in parallel spaced apart relationship to establish side portions of said sling with said shorter end edge of each of said side sheets being adjacent said foot portion and attached thereto, and said longer end edge of each of said side sheets being adjacent said transverse edge of said bottom portion, said foot portion extending upwardly beyond said shorter end edges of said side sheets and being provided with at least one aperture therethrough adjacent the upper end thereof, said side portions respectively being provided with a plurality of apertures adjacent the upper edges thereof with at least one of said apertures in each of said side portions being adjacent said longer end edges to establish at least a pair of transversely aligned end apertures in said sling and with at least one of said apertures in each of said side portions being intermediate said shorter and longer end edges to establish at least a pair of transversely aligned intermediate apertures in said sling, and at least a pair of rigid hanger and spreader devices having hook means at the opposite ends thereof and an eyelet portion intermediate the ends thereof, said hanger devices being removably attached to said sling with said hook means of one of said devices extending through said intermediate apertures and with said hook means of another of said devices extending through said end apertures to hold said side portions apart.

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