

[54] **DEVICE FOR SUPPORTING A LIMB AND ASSOCIATED EXTREMITY**

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[51] **Int. Cl.<sup>2</sup>**..... **A61F 5/10**

[58] **Field of Search**..... **128/77, 80, 87, 89, 83, 128/84, 133, DIG. 15, 149, 134**

[56] **References Cited**

**UNITED STATES PATENTS**

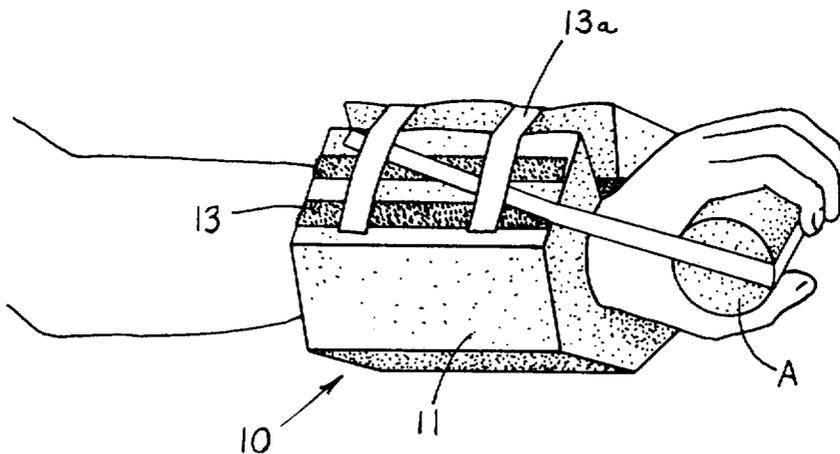
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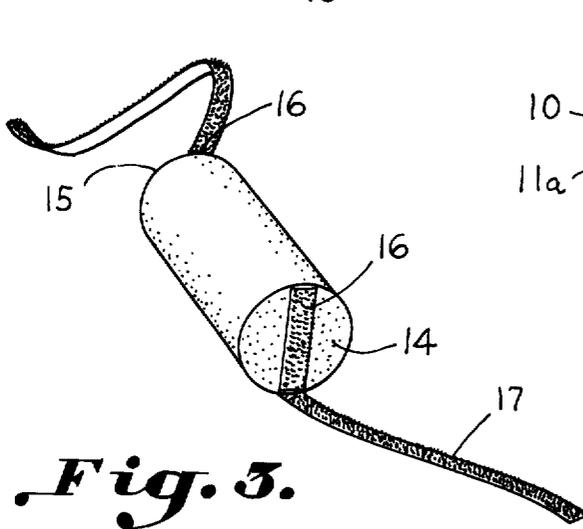
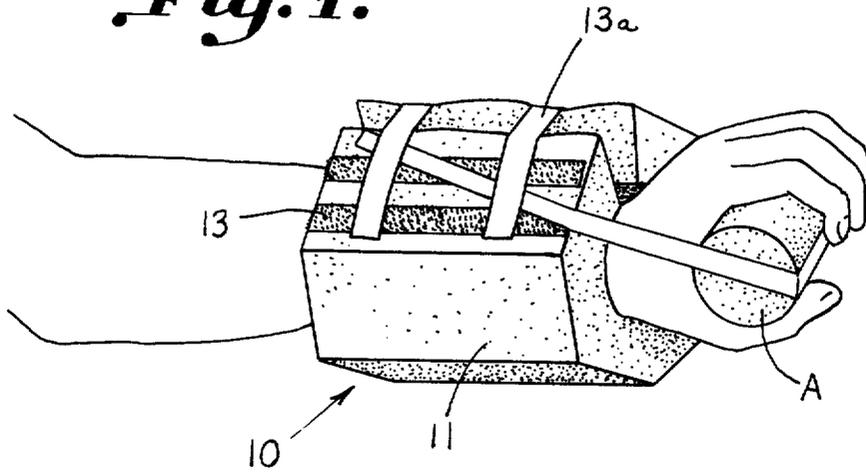
[57] **ABSTRACT**

A device for supporting a limb and its associated extremity, such as a hand or foot, is formed from a block of resilient, air-permeable polyurethane foam having a polygonal cross-section and being of such configuration as to include; an internal groove extending along the entire length of the block providing a cradle for the limb, a slot extending radially from the groove through an outer wall surface for receiving the limb therethrough, and a pressure sensitive fastening means carried by the block and by an elongated strip member, which engages the underside portion of the associated extremity, for connecting the block and the strip member so as to hold the lower portion of the limb and the extremity together as a unit.

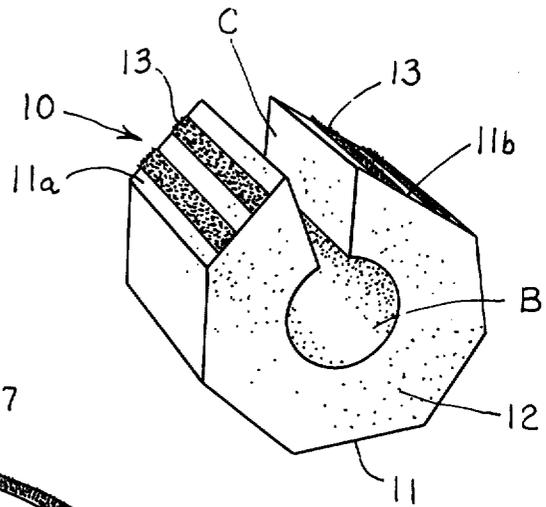
**6 Claims, 7 Drawing Figures**



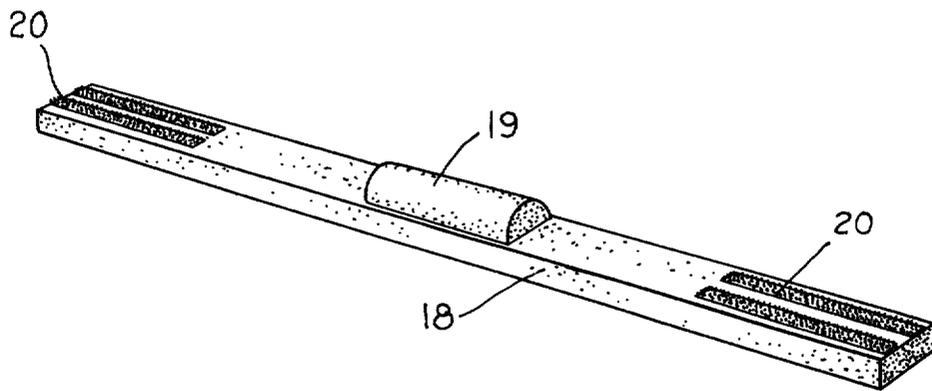
*Fig. 1.*



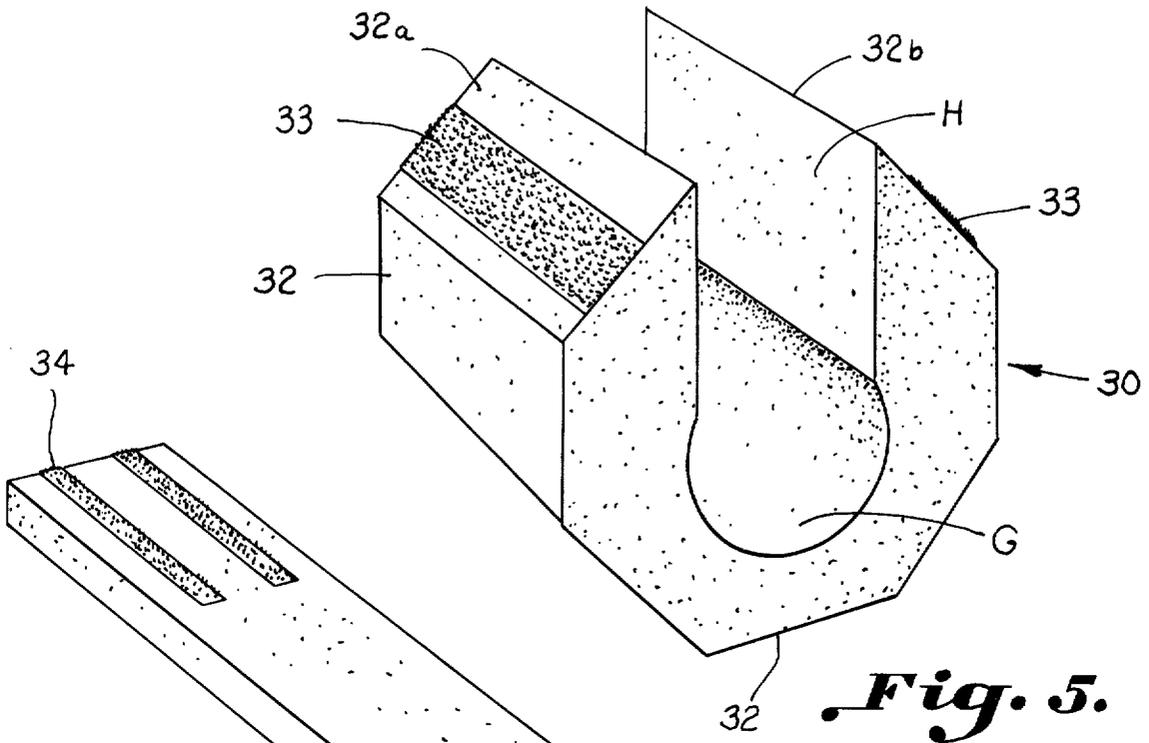
*Fig. 3.*



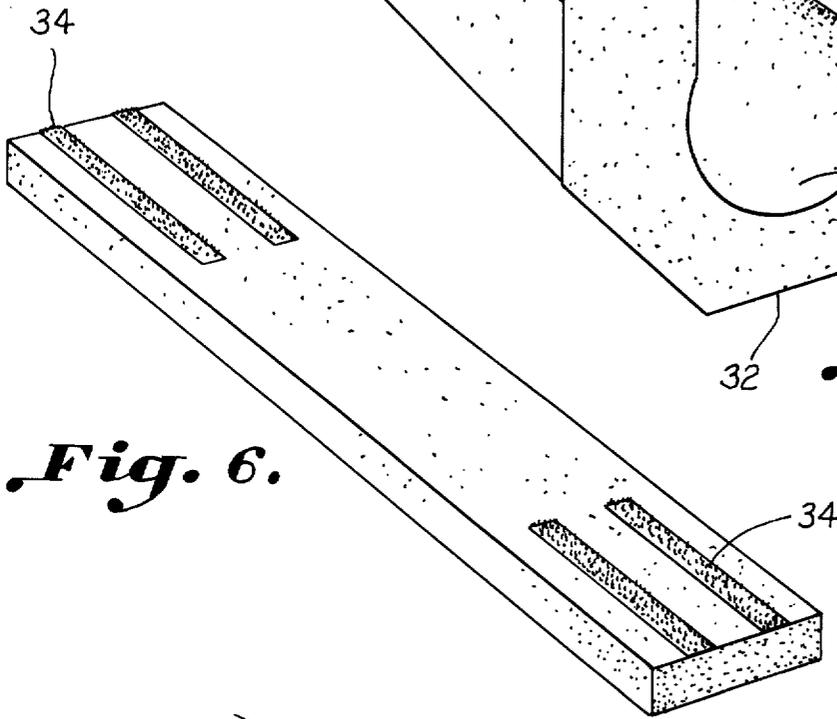
*Fig. 2.*



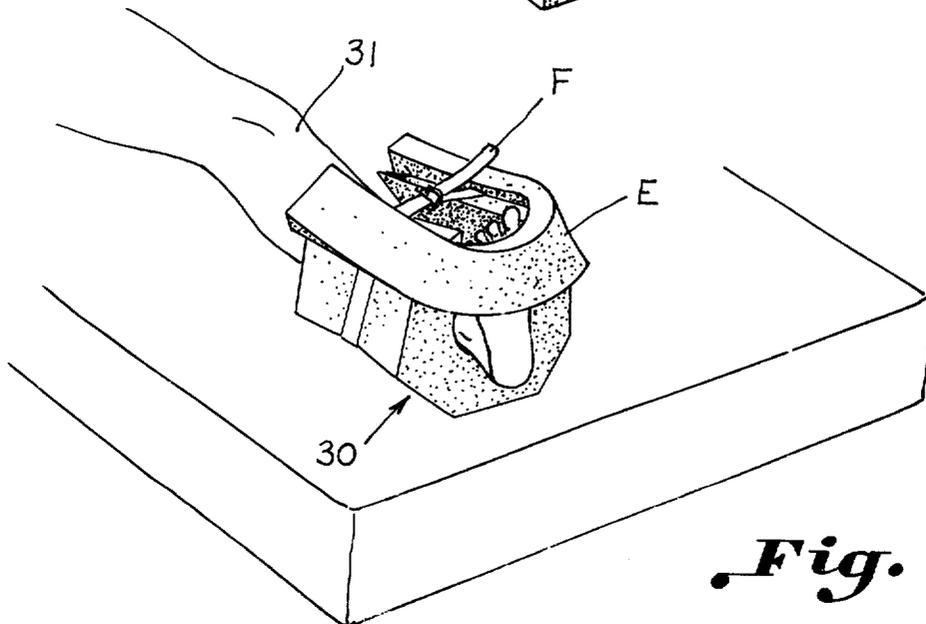
*Fig. 4.*



*Fig. 5.*



*Fig. 6.*



*Fig. 7.*

## DEVICE FOR SUPPORTING A LIMB AND ASSOCIATED EXTREMITY

### BACKGROUND OF THE INVENTION

Medical personnel have become increasingly aware that proper positioning and support of a bed patient's limb and its associated extremity as a unit can be an important factor in the patient's condition when released from bed confinement and in the time required for recovery. In so doing, it is also important that the limb and associated extremity, while supported as a unit, are capable of being exercised and flexed a certain amount, and that the supported skin area can be easily observable to note skin chaffing and rawness.

Prior devices have been developed for resiliently encircling the lower portion of a limb of a bed patient for restraining movement thereof, such as in U.S. Letters Pat. No. 3,535,718 and 3,027,395. Other devices such as shown in U.S. Letters Pat. No. 3,345,656 include supporting blocks for maintaining a lower limb above a bed surface to prevent the formation of bed ulcers or sores on the heel which often result from prolonged periods of bed rest. However, these devices, while restraining limb members and supporting limb members, do not support the extremities of the limb which are allowed to drop or be held loosely therein.

Often as a result of permitting the extremity of a limb to drop loosely from a supporting device, the muscles and ligaments stretch at the top of the limb and contract at the bottom of the limb. When this is permitted for prolonged periods of time, as is often the case of bed-ridden patients, the muscles and ligaments become loose and out of shape requiring much physical reconditioning of the patient's limb when released from bed confinement.

Accordingly, an important object of the present invention is to provide a device for supporting a lower portion of a limb and an associated extremity together as a unit.

Another important object of the present invention is to provide a device for supporting a limb and an associated extremity in such a manner as to prevent the stretching and contracting of muscles and ligaments which often results when the associated extremity is allowed to drop loosely from the supporting device.

Another important object of the present invention is to provide a device for supporting a limb and an associated extremity together as a unit while permitting the exercise of the extremity held therein.

Another important object of the present invention is to provide a device for supporting a limb and an associated extremity wherein the skin of the supported limb may be conveniently observed.

### SUMMARY OF THE INVENTION

It has been found that a device for supporting a lower portion of a limb and an associated extremity, such as a foot or hand, can be constructed of a resilient polyurethane foam block having a substantially polygonal cross-section, a continuous internal groove extending longitudinally through the length of the block providing a cradle for the lower portion of the limb, and a slot extending radially from the groove through an outer wall surface of the block for receiving the lower portion of the limb therethrough. A pressure sensitive fastening means is carried on the outer wall surface of the block member adjacent opposite sides of the slot for closing

the slot and gripping the lower portion of the limb therein. An elongated strip member constructed from resilient polyurethane foam is provided for engaging the underside of the associated extremity of the limb and carries pressure sensitive fastening means which cooperate with the pressure sensitive fastening means carried by the block member to fasten the strip member and the block member together. Thus, the lower portion of the limb is supported together with its associated extremity as a unit depending upon the adjustable positioning of the fastening means.

### BRIEF DESCRIPTION OF THE DRAWINGS

The construction designed to carry out the invention will be hereinafter described, together with other features thereof.

The invention will be more readily understood from a reading of the following application and by reference to the following specification and by reference to the accompanying drawings forming a part thereof, and wherein an example of the invention is shown and wherein:

FIG. 1 is a perspective view illustrating a device for supporting the lower arm and hand of a patient together as a unit constructed in accordance with the present invention,

FIG. 2 is a perspective view illustrating a polygonal block member constructed in accordance with the present invention for receiving and cradling the lower portion of a limb,

FIG. 3 is a perspective view illustrating a strip member constructed in accordance with the present invention which fastens with the block member of FIG. 2 to support the associated extremity of the limb held therein,

FIG. 4 is a perspective view illustrating a modified form of the strip member shown in FIG. 3 constructed in accordance with the Present invention,

FIG. 5 is a perspective view illustrating a support block member constructed in accordance with the present invention for supporting a limb as a lower leg portion,

FIG. 6 is a perspective view illustrating a strip member constructed in accordance with the present invention for engaging the underside of an associated extremity to be fastened to the support block member of FIG. 5, and

FIG. 7 is a perspective view illustrating the support block member and strip member of FIGS. 5 and 6 as used to support a lower leg portion and foot in accordance with the present invention.

### DESCRIPTION OF A PREFERRED EMBODIMENT

The drawings illustrate a device for supporting a lower portion of a limb and an associated extremity to avoid the sagging of related muscles as often results from inactivity due to prolonged bed rest and the like. A device constructed in accordance with the present invention is illustrated in FIG. 1 wherein a supporting block member, designated generally at 10, is provided for receiving and cradling a forearm portion of a limb with the associated hand being properly supported by a resilient strip member A and fastened to the block member 10 as a unit by using conventional Velcro fastening strips.

The support block member 10 is preferably cut or sawed from a one-piece block of resilient polyurethane

foam material which is lightweight and permits the flow of air therethrough. The block has the advantage of being inexpensive and suitable for one-patient use so that it does not have to be reused. As best seen in FIG. 2, the block is formed to include a plurality of flat side surfaces 11 and an internal groove portion B of substantially semi-circular cross-section extending through the entire length of the block providing a cradle for the lower portion of a patient's limb. One of the flat side surfaces 11 may be selected as a base surface when the block is used on the surface of a bed, and the thickened portion 12 of the support block 10 between the bottom of the groove B and the base surface provides for supporting the patient's limb above the bed surface in a stable manner. A slot C extends radially from the groove portion B through an outer wall surface of the support block providing an opening through which the lower portion of the limb may be received. Pressure sensitive fastening means are provided by a plurality of Velcro hook coupling strips 13 carried on outer wall surfaces 11a and 11b of the support block adjacent opposite sides of the slot C which operate with pile coupling members 13a for closing the slot and gripping the limb held therein. The hook strips 13 may be attached to the block member in any suitable manner, such as by using a polyurethane resin or epoxy cement.

For purposes of illustration, in one particular embodiment, the block 10 was constructed to be 4.5 inches in length and 6 inches in diameter with groove C approximately 2.5 inches in diameter.

Referring to FIG. 3, an elongated strip member A is shown as being formed of polyurethane foam and having a cylindrical cross-section. On each end 14 and 15 of the cylinder strip is located a Velcro hook coupling strip 16. A Velcro pile coupling member 17 cooperates with the hook coupling strips 16 to provide a pressure sensitive fastening means for connecting the strip member as a unit with the supporting block 10. The cylindrical strip member A engages the underside portion of the patient's hand and adjustably positions the hand as held with the forearm by the support block 10 as a unit. The position of the hand may be adjusted to provide for comfort and therapy for the forearm and the hand as desired. A modified form of the strip member is shown in FIG. 4 as including an elongated rectangular strip of resilient polyurethane foam 18 on which is mounted a semi-cylindrical body member 19 for engaging the underside portion of the patient's hand. The body member 19 may be formed as by cutting strip 18 and body member 19 out of a one piece stock of material or body member 19 may be made integral with strip 18 as by gluing. The strip and body member are of sufficient width so as to effectively distribute pressure over a large area of the underside portion of the hand so as to prevent poor blood circulation in any particular cell. In one particular embodiment the strip is approximately 24 inches in length and 5½ inches wide, and the body member 19 is approximately 5 inches in length with a radius of 1¾ inches. Adjacent each end of the strip member 18 is a plurality of Velcro pile coupling members 20 for attaching the strip member to the hook coupling on support block 10.

The device thus described is effective for supporting a patient's forearm and hand together as a unit. The wrist is cocked slightly so that the muscles on top of the forearm will contract and become shorter and will stretch slightly on the underside making a patient's

physical therapy much more progressive than would be otherwise. A limb in a fresh cast may be supported with the device with the drying of the cast enhanced by the air flow through the foam material. The support block 10, being open at the top, provides convenient observation of the patient's skin in the supported area. The use of a wide strip member A effectively distributes the pressure over a large area of the underside of the hand so that blood circulation is not cut off in any particular cell. In one particular embodiment, the cylindrical body A is approximately 5 inches long and 2½ inches in diameter. The strip member also permits exercise of the hand as by squeezing the cylindrical member A, as well as flexing of the wrist.

Referring now to FIGS. 5 through 7, a somewhat modified form of the invention is illustrated wherein a support block member designated generally at 30, supports and cradles a lower portion of a leg 31. The associated foot is positioned and supported by a strip member E, and a fastening means F is provided for tightening the support block member about the lower portion of the leg. The support block member 30 includes a plurality of flat outer surfaces 32 and a continuous internal groove portion G extending through the entire length of the block member providing a cradle for the lower portion of the leg. One of the flat outer surfaces 32 may be selected to provide a base for the support block above which the lower limb portion rests on a thickened portion for maintaining the limb above a bed surface. A slot portion H extends radially from the groove portion through an outer wall surface providing an opening for receiving the lower leg portion there-through. A plurality of Velcro hook coupling strips 33 are carried on the outer wall surfaces 32a and 32b of the block member adjacent the opposite sides of the slot providing a pressure sensitive fastening means thereon.

For purposes of illustration, in one particular embodiment the block member 30 was constructed to be 7 inches in length, 8.5 inches in diameter, and groove G being approximately 3.25 inches in diameter.

The elongated strip member E is provided for engaging the underside portion of the foot and for supporting the foot together with the block member 30 as a unit. Adjacent each end of the strip member E are a plurality of pile coupling strips 34 which cooperate with the hook coupling strips 33 carried by the block member to provide a pressure sensitive fastening means. A conventional fastening belt member F, such as a strip and buckle arrangement, may be used to close the slot H and tighten the block member 30 about the lower portion of the leg 31 to firmly grip the leg therein, or additional Velcro hook strips may be used. The strap member F may also be used to encircle both the block member 30 and the strip member E to give additional fastening support to the block member and strip member as a unit. As thus described, the device of the present invention provides support and positioning of a lower portion of a leg, together with its associated extremity or foot depending upon the adjustable positioning of the fastening means to secure and support the limb and its associated extremity together as a unit.

The foot is effectively prevented from dropping at the end of the support block, thus avoiding sagging of the related muscles and ligaments. The foot is permitted a certain amount of exercise and flexing against the flexible strip member. Easy access is provided to the

supported area of the skin when using block 30 through the slot opening.

While a preferred embodiment of the invention has been described using specific terms and approximate dimensions, such description is for illustrative purposes only, and it is to be understood that changes and variations may be made in the various dimensions and shapes without departing from the spirit or scope of the following claims.

What is claimed is:

1. A device for supporting a lower portion of a limb and an associated extremity avoiding the sagging of related muscles as often results from inactivity due to prolonged bed rest and the like, comprising:

- a. a supporting block member constructed from resilient deformable polyurethane foam material;
- b. a continuous internal groove portion extending longitudinally through the entire length of said block providing a cradle for a lower portion of a limb;
- c. said block member having a thickened base portion for supporting the lower portion of a limb and the associated extremity above a surface of a bed;
- d. said block member including a slot extending radially from said groove portion through an outer wall surface providing an opening in said block for receiving the lower portion of a limb therethrough;
- e. first pressure sensitive fastening means carried by said member on said outer wall surface adjacent opposite sides of said slot for gripping the lower portion of a limb therein;
- f. an elongated strip member constructed from resilient polyurethane foam material for engaging the underside of the associated extremity of a limb; and
- g. second pressure sensitive fastening means carried

by said strip member cooperating with said first pressure sensitive fastening means for attaching said strip member together with said block member as a unit;

whereby a lower portion of a limb is supported together with its associated extremity depending upon the adjustable positioning of the fastening means to securely position and support the lower portion of a limb and its associated extremity as a unit.

2. The structure of claim 1 wherein said supporting block member is substantially of polygonal cross-section having a plurality of planar outer surfaces providing a plurality of selectable base surfaces.

3. The structure of claim 1 wherein said elongated strip member includes a cylindrical body portion engaging the underside of the associated extremity for effectively distributing pressure over a substantial area of the extremity.

4. The structure of claim 3 wherein said cylindrical body portion carries complementary pressure sensitive fastening means for fastening said cylindrical body to said second pressure sensitive fastening means.

5. The structure of claim 1 wherein said strip member includes a rectangular strip having a sufficient width to engage and span the underside of the associated extremity effectively distributing pressure over a substantial area of the extremity.

6. The structure of claim 1 wherein said strip member includes a semi-cylindrical body portion carried by a rectangular strip of sufficient width to engage and span the underside of associated extremity, said rectangular strip carrying said second pressure sensitive fastening means adjacent each end thereof.

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