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[56]

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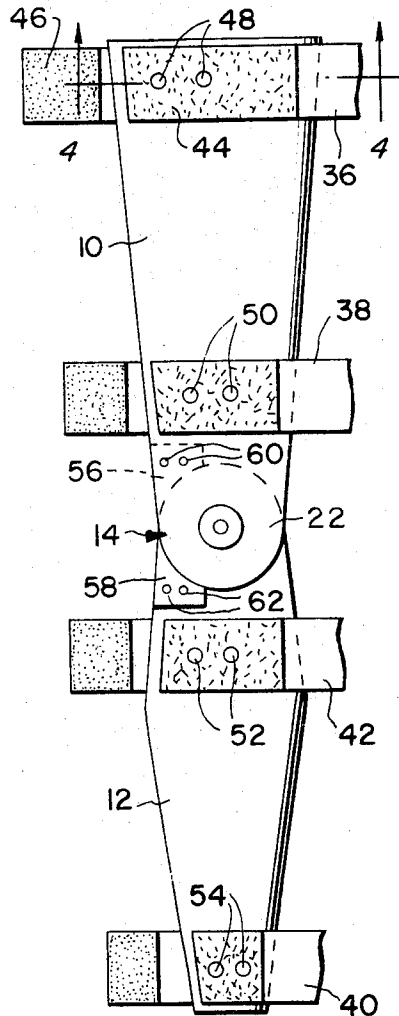
[54] **KNEE BRACE**
1 Claim, 4 Drawing Figs.

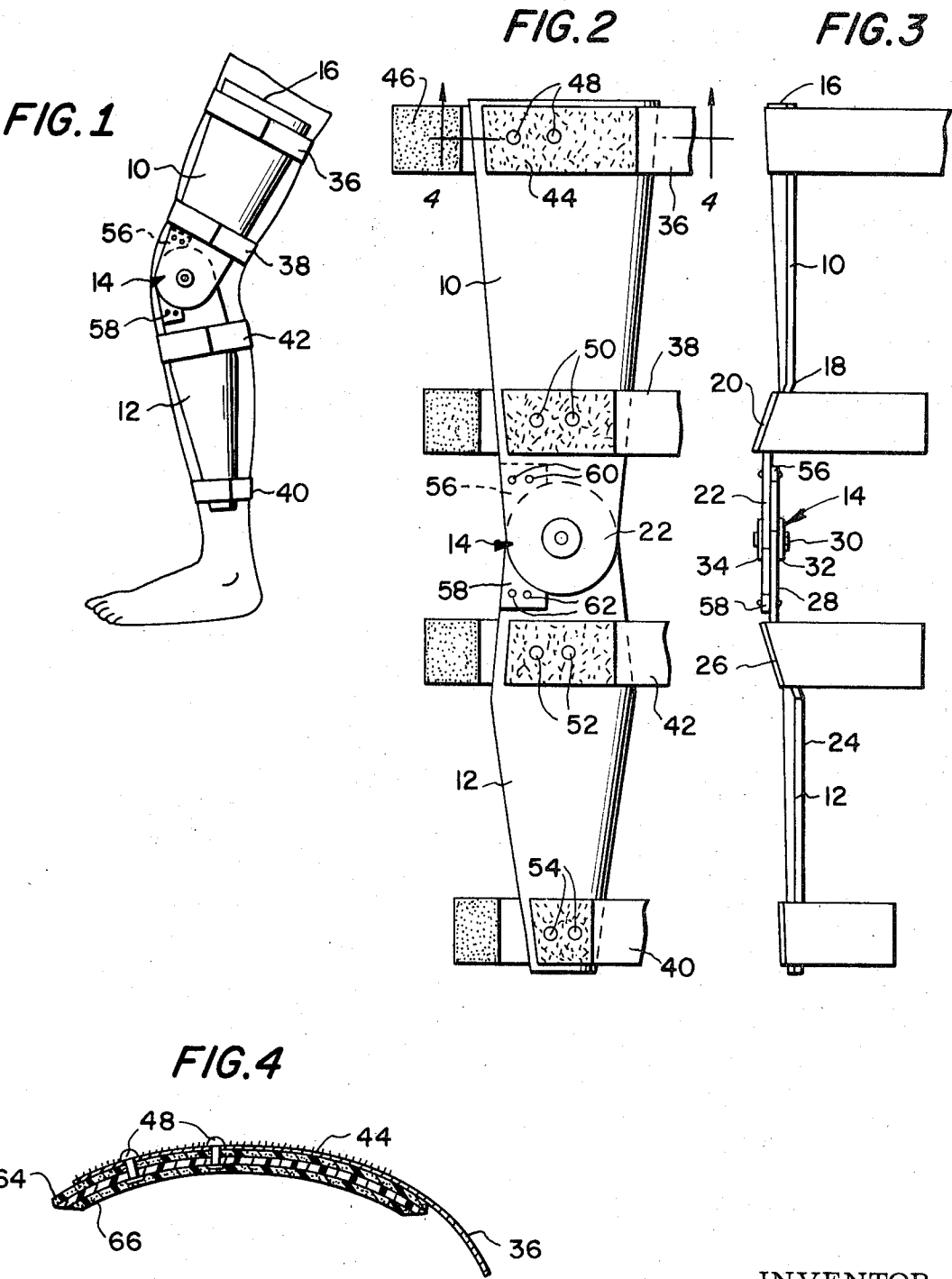
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 87, 88, 89, 165; 2/22, 62

ABSTRACT: A knee brace having upper and lower portions adapted to secure to the upper and lower legs, a pivotal connection between the upper and lower portions having bumper stops to limit pivotal movement preventing hyperextension of the leg, the pivotal joint being offset on the outside of the leg, straps for securing the brace to the leg, and resilient covering for the brace for preventing medial and lateral displacement of the knee joint is disclosed.





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KNEE BRACE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to protective and corrective prosthetic knee brace for aiding the healing of an injured knee and preventing the injury of a knee.

2. Description of the Prior Art

Knee braces are known in the prior art for limiting the movement of the knee joint. Such devices have been effective in many instances where it is desired severely to limit the movement of the knee. It has been discovered that in many instances it is desirable to give the knee substantially free pivotal movement but to limit very strictly any lateral movement. The devices of the prior art have generally been unsuccessful in accomplishing this latter result. Accordingly, it is an object of this invention to provide an improved knee brace which will permit relatively free pivotal movement of the knee but to prevent lateral movement thereof and at the same time protect the knee from external forces.

SUMMARY

A principal object of the present invention is the provision of a knee brace adapted and constructed to fit on the outside of the user's leg wherein the joint between an upper and lower member is spaced outwardly from the knee and is constructed to prevent lateral movement of the knee by absorbing the force of a lateral blow along the length of the leg.

A specific object of the invention is the provision of a knee brace having upper and lower members and a pivotal joint therebetween including stops or bumpers for preventing excessive pivotal movement of the knee.

A further object is the provision of a knee brace having a joint which is spaced outwardly away from the knee and is constructed to permit only pivotal movement and not lateral movement and has stops for limiting the degree of pivotal movement.

Yet an additional object is the provision of a knee brace which is covered with a resilient protective material.

An additional and important feature of the invention is the provision of a knee brace having straps secured thereto which include Velcro fasteners for securing the knee brace to the user's leg.

Other important objects and purposes of the invention will be discovered by those skilled in the art and will become apparent from the specification which follows and the drawings to which reference is made.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side view showing the knee brace in position on the user's leg.

FIG. 2 is a side view showing the construction of the knee brace of FIG. 1.

FIG. 3 is an edge view showing the construction of the knee brace of FIG. 1.

FIG. 4 is a partial cross-sectional view taken substantially along lines 4—4 as shown in FIG. 2 illustrating the construction of the knee brace and more specifically the inclusion of a resilient foam rubber layer on the knee brace.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference particularly to FIG. 1, the knee brace of this invention comprises an upper member having a generally concave portion adapted to rest comfortably on the upper leg of the user shown at 10. The knee brace also includes a lower member 12 having a generally concave portion adapted to rest comfortably on the lower leg of the user. The upper and lower members are secured together by a joint 14 which is secured in correspondence with the user's knee joint to permit pivotal movement between the upper and lower members.

As best illustrated in FIG. 3, it will be seen that the upper member 10 is concave at its upper portion 16 and maintains a

concave configuration down to a point just above the knee as indicated at 18. Angular interconnecting means 20 displace the joint 14 outwardly from the outside of the knee and secures a portion of the joint 14, a substantially flat semi-cylindrical plate 22 to the upper member 10. In a similar manner the lower member 12 is concave in the portion indicated at 24 and extends outwardly as indicated at 26 for securing an interiorly disposed substantially flat semi-cylindrical plate 28 in overlying relationship with respect to the disk-like plate or member 22. The two plates are secured together by a pivot pin 30 and a pair of washers 32 and 34 in a manner to permit pivotal movement but to prevent any lateral movement.

It is not necessary to provide means for securing the knee brace to the user's leg since this may be done with conventional adhesive tape but it is convenient to provide a plurality of straps 36 and 38 secured to the upper member 10 and straps 40 and 42 secured to the lower member. Each of the straps is provided with a Velcro fastening surface 44 and a second Velcro fastening surface 46 for securement to the surface 44. Similar securement is provided in each of the straps, although only one such securement is enumerated at 44 and 46. The straps are secured by means of rivets 48, 50, 52 and 54 to the upper and lower members respectively.

A pair of bumpers or stops 56 and 58 are secured by means of rivets 60 and 62 to the upper and lower members respectively. As will be seen best in FIG. 3, and in FIG. 1, the upper bumper 56 is adapted to engage the lower member 12 and the lower bumper 58 is adapted to engage the upper member 10 in a manner to limit the extent of pivotal movement possible. When the knee brace is secured to the user's leg, this prevents hyperextension of the knee. The limitation on pivotal movement may be reversed simply by moving the bumpers to the other side of the brace. Thus, while the brace shown in the drawings is constructed for use on the left leg, a similar construction would be used on the right leg except that the bumpers would be on the opposite side of the upper and lower members respectively.

It is highly desirable to cover both the outside and the inside of the upper and lower members and the joint with a resilient material such as sponge rubber shown at 64 and 66. The exterior coating is for the purpose of preventing scratches or injury to others and the interior provides a comfortable fit on the leg of the user.

The knee brace of this invention is intended for use as a prosthetic device to aid in recovering from surgery or injury to a knee as well as a corrective or therapeutic crutch. In addition, it may be used by one who has no history of knee injury for the purpose of preventing such an injury in unusually strenuous activity. The device is intended for use in contact sports, such as football, wrestling, etc., to stabilize the knee and aid in the prevention of injury or re-injury. Its use should hasten re-entry into ambulation with greater confidence and does not interfere with engagement in sports activity.

By reason of the construction and position of the joint and the knee brace on the outside of the leg, it more effectively stabilizes the knee against lateral movement than the braces of the prior art. It is lighter and does not restrict pivotal movement, however. It is easily attached to the leg and may be used by a large number of subjects. The brace protects equally well against medial or lateral displacement of the articulating surfaces, the condyles of the femur and the tibia, while protecting the collateral and medial collateral ligaments.

In over-all length, the present invention is preferably approximately 27 inches long, considerably longer than those of the prior art, which allows the ends of the brace to be secured to the leg with greater leverage. Buckling and collapsing are prevented because of the unusual force needed to overcome the attachments at the distal ends of the brace. The contour of the brace fits the leg snugly to discourage dislodgement. The lateral pitch or rise keeps blows or pressure off the knee. The length and pitch allow tension to be absorbed over a very large area rather than concentrated in the articulated surfaces. The pitched surfaces, since they are pinned, are mutually support-

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ing, thereby being able to withstand greater pressure. The placement of bumpers or guides acts as a secondary defense against lateral action at the knee. The brace is as strong in the flexed knee position, the knee's unstable position, as in the extended position, the knee's most stable position.

It will be noted, especially in FIG. 3, that the joint includes an outer plate which is secured to the upper leg and an inner plate which is secured to the lower leg. These plates have the same terminal pitch and are not offset from each other but are offset outwardly from the outside of the knee. I have found that no offset between the plates is necessary because of the natural offset existing due to the increased size of the upper leg as compared with the lower leg.

In some respects, adhesive tape provides a more secure connection of the brace to the user but it has been found desirable to use the Velcro straps as disclosed. These Velcro straps may easily be sterilized or washed and do not mildew or mold as do other straps. They do not become loose when wet nor do they become stiff upon drying. Their attachment to the knee brace permits the user to put the brace on and take it off very easily.

The present brace is very light in weight. It may be made of a light metal or alloy such as magnesium or aluminum or it may be made of a rigid plastic material such as the polyacrylics, the polystyrenes, the polyvinyls and the like. As constructed and used, it weighs only about one and three-fourths pounds.

It will be understood that the foregoing disclosure is merely exemplary of the invention and that variations from the exact construction disclosed may be made without departing from the spirit and scope of the invention as defined in the following claim.

I claim:

1. A knee brace constructed and adapted to be fitted on the outside of the user's leg to prevent injury to his knee as a result of a lateral blow thereon from the inner or outer sides thereof, said brace comprising:

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an elongated normally upright upper member having a concave inner side portion to rest comfortably on the upper leg of the user, said upper portion having opposed longitudinally extending edges and a first substantially flat semi-cylindrical plate fixedly secured to its lower end and offset in a direction away from its said concave side;

an elongated normally upright lower member having a concave portion opening in the same direction as said upper member to rest comfortably on the lower leg of the user, said lower member having opposed longitudinally extending edges and a second substantially flat semi-cylindrical plate fixedly secured to its upper end and being offset in a direction away from its said concave side;

strap means secured to said upper and lower members to secure them to the upper leg and lower leg of the user;

said first and second plates being superimposed against one another with the inner side of said first plate engaging the outer side of said second plate;

a pivot pin connecting said semi-cylindrical plates substantially centrally thereof for pivotal movement therearound in laterally and outwardly spaced relation relative to the knee of the user; and

stop means on the inner side of said first plate and on the outer side of said second plate, said stop means being spaced inwardly from said pivot pin, said stop means having forward areas on said upper and lower members engaging substantially simultaneously with the adjacent edge of said lower and upper members, respectively, to limit the extent of relative pivotal movement therebetween in one direction to prevent hyperextension of the knee joint of the user, and having rearward areas engaging substantially simultaneously with the opposed adjacent edges of said lower and upper members, respectively, to limit the relative pivotal movement therebetween in the reverse direction.

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