

[54] **KNEE SUPPORT**

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[51] Int. Cl. .... **A61f 3/00**

[58] Field of Search ..... **128/80 C, 165, 400, 402; 2/24**

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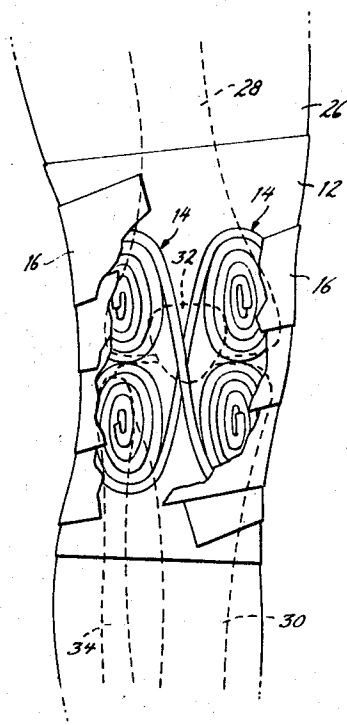
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[57]

**ABSTRACT**

A knee support adapted to strengthen and protect injured knees. The support is particularly adapted for use by athletes. The support includes an elastic sleeve and an elastic covering which aid in strengthening the knee by retaining all of the tendons, ligaments, cartilage and muscles firmly in place. Coiled tubes of rubber are positioned between the elastic sleeve and the elastic casing, and are positioned above, below and on the sides of the kneecap when the device is worn. The coiled rubber tubes absorb any shock that may be inflicted on the knee, thereby protecting the injured knee.

**10 Claims, 8 Drawing Figures**



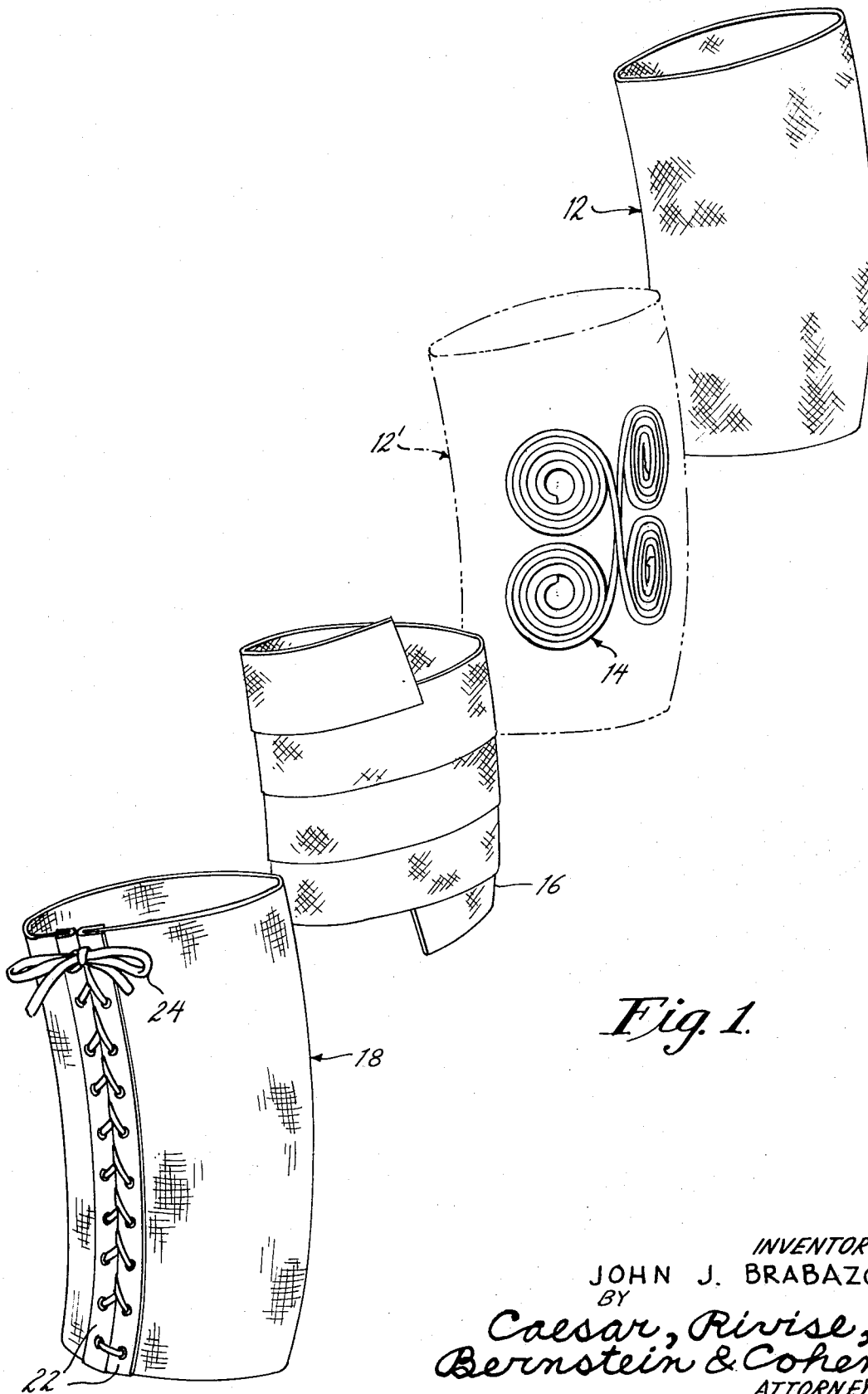


*Fig. 1.*

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*Fig. 2.*

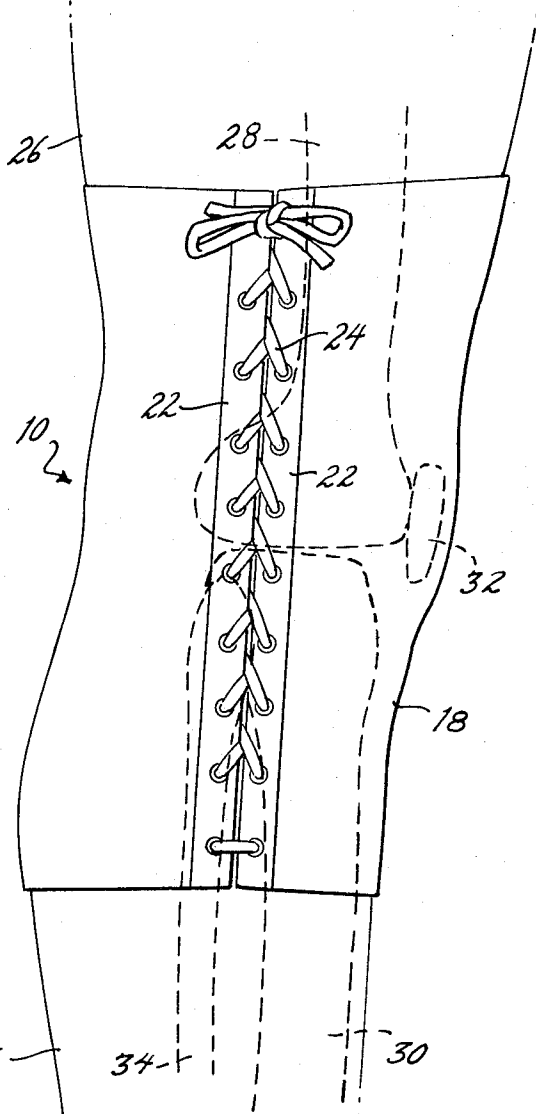
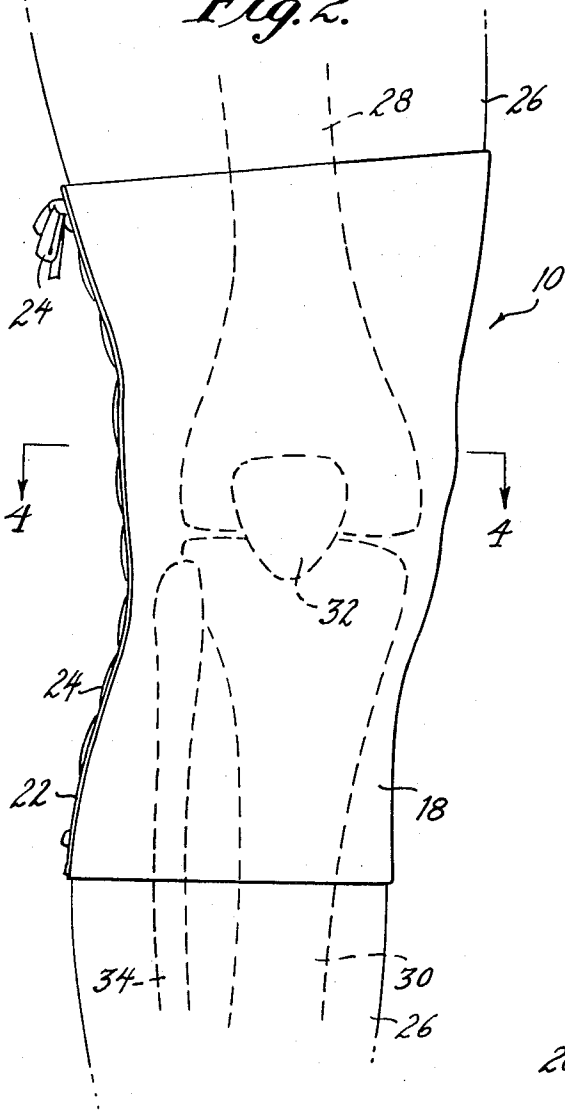


*Fig. 3.*

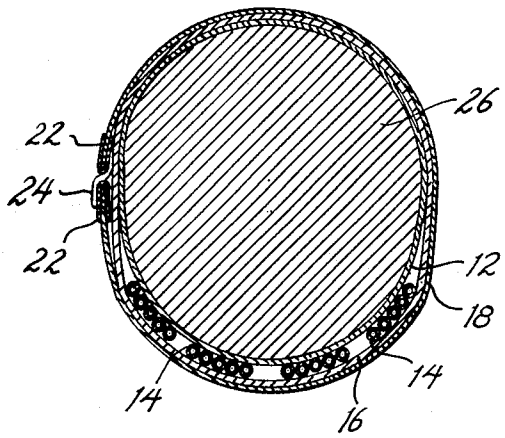
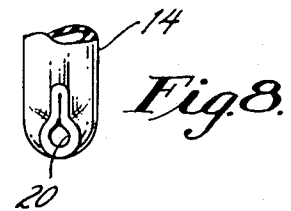
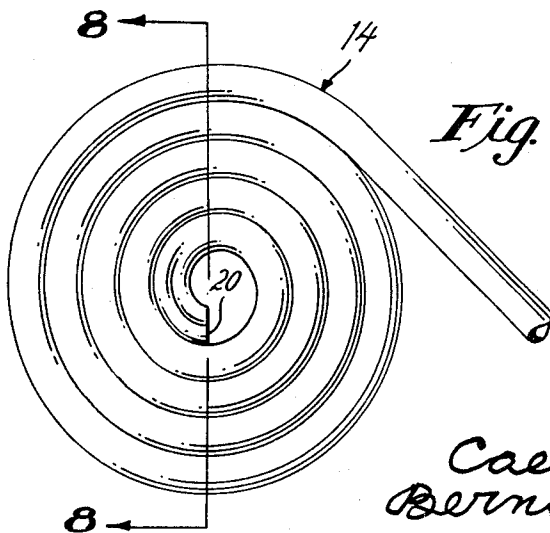
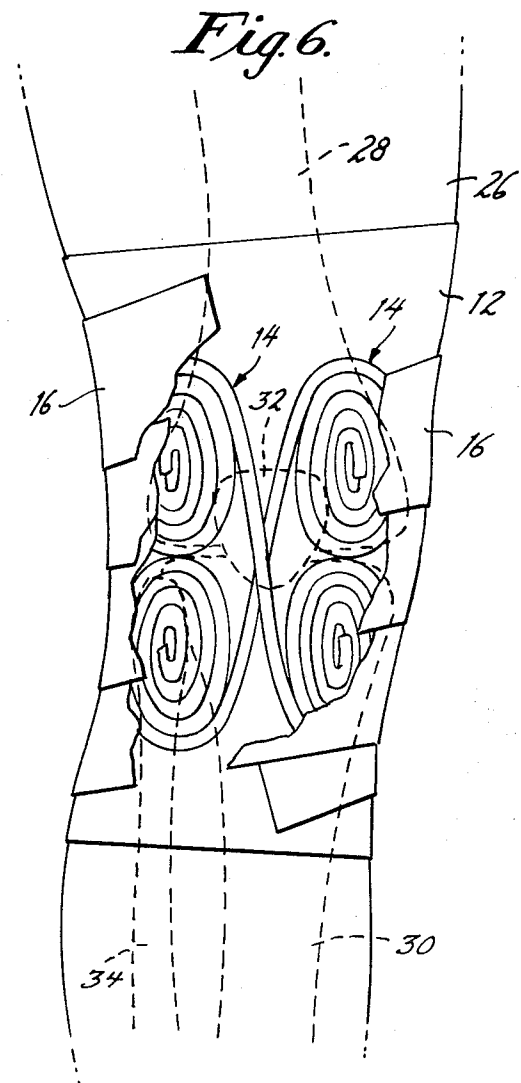
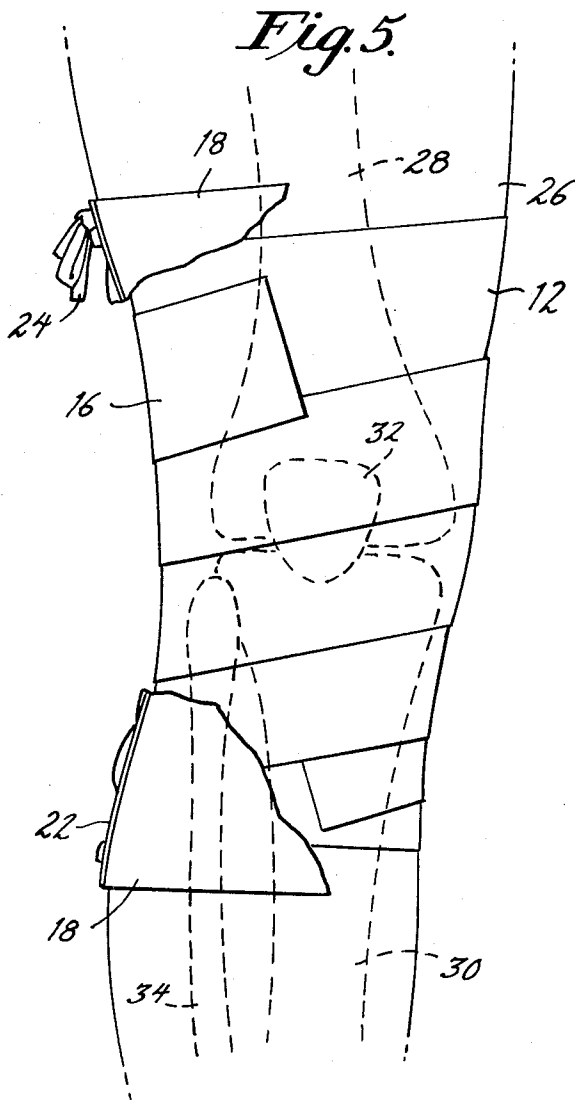


*Fig. 4.*

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## KNEE SUPPORT

This invention relates to a knee support, and more particularly, to a knee support that is adapted to strengthen and protect an injured knee joint.

One of the common injuries suffered by athletes, such as football, basketball or soccer players, is a knee joint injury. The injury can take various forms, such as sprained or strained muscles, torn ligaments and torn cartilage. Quite often these injuries require surgery which prevents the athlete from continuing the playing of his sport. After healing has progressed to a predetermined point, the athlete can again play his sport providing some protective measures are carried out to support the knee and to prevent re-injury to the knee.

One of the methods now used to aid an athlete that has injured his knee is to tape the knee. One of the shortcomings of this method is that it is time-consuming in that it must be carried out each time the athlete is going to play. Additionally, continual taping and untaping of the knee can cause a skin irritation.

A device that is in common usage for athletes having injured knees is a sleeve of elastic material. The elastic material of the sleeve holds the ligaments, muscles, tendons and cartilage in place, while at the same time permitting the athlete to flex his knee so that he can engage in his sport in a normal manner. Although the elastic sleeves are satisfactory for this purpose, they suffer from the shortcoming that they do not prevent further injury to the knee in the event the knee is subjected to a sudden shock. This problem is particularly acute with football players and basketball players.

In order to overcome the deficiencies of the elastic sleeves, various shock-absorbing knee supports have been developed. One of the most common of this type of knee support includes the provision of foam rubber over the elastic sleeve. Other knee supports are formed from rigid plates. The foam rubber knee supports have been found to be inadequate because they are not sufficiently strong to absorb severe shocks, such as would occur when a football player is tackled. The rigid plate supports also suffer from the deficiency that they inhibit the athlete from complete mobility and flexibility in running and other movements.

The knee support of this invention overcomes all of the problems of the prior art knee supports, while at the same time giving complete flexibility to the knee joint. Accordingly, the device of this invention will not interfere with the normal movement of the limb, while at the same time giving support to an unstable knee resulting from injury and protecting the knee against re-injury.

It is accordingly an object of this invention to provide a novel knee support.

It is another object of this invention to provide a knee support that supports and injured knee and protects the knee from re-injury.

These and other objects of this invention are accomplished by providing a knee support comprising an elastic sleeve and a plurality of shock-absorbing means secured on said sleeve, said shock-absorbing means each comprising a coil of hollow rubber tubing.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is an exploded perspective view of the four elements of the knee support of this invention;

FIG. 2 is a front elevational view of the device of this invention as positioned on the right knee;

FIG. 3 is a side elevational view of the knee support of this invention as positioned on the right knee;

FIG. 4 is a sectional view taken along the line 4—4 of FIG. 2;

FIG. 5 is a side elevational view, similar to FIG. 2, but showing the outer member partly broken away in order to illustrate the next lower layer of the knee support of this invention;

FIG. 6 is a side elevational view similar to FIG. 5, but with the layer of FIG. 5 partially broken away to show the next lower layer of the device of this invention;

FIG. 7 is an elevational view of one of the rubber tube coils used in the device of this invention; and

FIG. 8 is a fragmentary sectional view taken along the line 8—8 of FIG. 7, and enlarged to show the reduced opening of each end of the rubber tubing forming the coils of the device of this invention.

Referring now in greater detail to the various figures of the drawings wherein like reference characters refer to like parts, a knee support embodying the present invention is generally shown at 10 in FIG. 2. As seen in FIG. 1, device 10 basically comprises four superimposed layers, with the lowest layer 12 comprising an elastic sleeve, the next layer 14 comprising four coils of rubber tubes, the next layer 16 comprising a wrapped elastic strap, and the top layer 18 comprising a casing.

Sleeve 12 is formed from a knitted elastic tubular fabric. The diameter of the sleeve is sufficiently small to have the sleeve closely confine the leg of the user.

The rubber coils 14 are formed from rubber tubes that are wound into the helical coils shown in FIG. 1. As seen in FIG. 1, the tubes cross between the four coils. The tubes are positioned on the sleeve 12, which is shown in phantom at 12', and are held in place thereon, as by stitching. As seen in FIG. 8, the ends of the rubber tubes forming coils 14 are partially closed, thereby leaving a constricted opening 20. The constricted opening can be formed by heat sealing a portion of the open ends of the tube or by adhesive. The constricted openings 20 are positioned at the center of each of the helical coils of rubber tubing.

After the rubber coils 14 are placed on sleeve 12, they are covered by an elastic strap 16. The strapping is wound around the coils and is secured in place against sleeve 12, as by stitching.

After the strap 16 has been stitched in place, the assembly comprising the sleeve 12, coils 14 and strap 16 is inserted in case 18. Case 18 can be formed by cutting a tubular elastic sleeve or by rolling a flat elastic sheet. The case 18 includes a pair of abutting edges to which are secured eyelet strips 22. After the case 18 has been wrapped around the inner assembly of the knee support it is stitched in place, and lacing 24 is threaded through the eyelet strips.

The device of this invention is shown in FIG. 2 as being positioned on a right leg 26. In order to place the device 10 on the leg, lacing 24 is loosened within the eyelet strips 22. Thereafter, the foot is inserted in sleeve 12 and the knee support 10 is pulled vertically up the leg. When the knee support is in the position shown in FIG. 2, the lacing 24 is pulled taut, and tied. This places a firm pressure on the injured knee joint.

In FIG. 2, the bones forming the knee joint are shown in phantom. Thus, the knee joint comprises the femur or thighbone 28 and the tibia or shinbone 30. Stability and support for this joint are provided by four ligaments, two cartilages, various tendons and sheets of tissue. Also shown in FIGS. 2 and 3 are the patella or kneecap 32 and the fibula 34, which is the smaller leg bone.

Injuries to the knee joint usually result from two causes. A player may twist the knee with his foot firmly planted on the playing surface, causing a cartilage to tear. The far more serious type of injury is the torn ligament, which is usually attributed to a direct blow from the side or the rear. The injuries sometimes heal by themselves, or healing can be aided by surgery. However, during the healing process, the strength, endurance and agility of the leg are lessened.

It has been found that players with knee injuries can continue to play the sport if an external stabilizing medium is applied to the joint. The most commonly used of the knee supports for this purpose comprise elastic sleeves. These sleeves give sufficient support to the knee to permit the player to move with a fair degree of agility and flexibility of the knee. However, the elastic sleeves provide no protection to the knee against further injury. In the device of this invention, the

coiled tubes of rubber 24 provide the necessary protection for the damaged knee joint while the knee joint is healing. As best seen in FIG. 6, the tubes 14 are positioned above and below and on the sides of the kneecap or patella 32. Thus, the tubes will not interfere with the normal flexing of the knee joint. However, a blow to any area around the patella will be received by the coils 14. Because of the resilient nature of the rubber forming the coils, they will readily absorb the shock of the blow. Additionally, the air within the coils is slowly expelled through the constricted openings 20 at the center of each coil. This further enables the coils to absorb the shock of the blow.

Since the coils 14 are hollow, they are light in weight and flexible enough to avoid any interference with the normal motion of the knee. The coils can be formed from either natural or synthetic rubber. Additionally, high plasticized plastics can also be used for forming the coils. However, plastics must be used which do not become too brittle in cold temperatures, especially in view of the fact that the knee support of this invention can be used by football players who will be subjecting the same to extremely cold conditions. The cold problem is not involved when the coils 14 are formed of rubber. Since the tubes from which the coils 14 are formed are open at both ends, any air that is expelled by a blow to the knee support will readily be replenished, thereby expanding the coils to the form shown.

The sleeve 12, strap 16 and case 18 can be formed from any elastic material known to the art. Thus, the fabric can be woven, knitted, and possess either a one or two-way stretch. The degree of elasticity can also be varied to suit the needs of the user. Although this invention has been described as being applicable to a knee support, it is to be understood that the device of this invention can be adapted for use with any joint, such as the elbow, wrist or ankle.

Without further elaboration, the foregoing will so fully illustrate my invention, that others may, by applying current or future knowledge, adopt the same for use under various conditions of service.

What is claimed as the invention is:

1. A knee support comprising an elastic sleeve and a plurali-

ty of shock-absorbing means secured on said sleeve, said shock absorbing means each comprising a coil of hollow rubber tubing.

2. The knee support of claim 1 wherein the rubber tubing forming said coil has at least one end thereof partially constricted, said constriction promoting a controlled release of air from said rubber tubing when pressure is applied against said rubber tubing.

3. The knee support of claim 1 wherein said plurality of coils is spaced whereby said coils will surround the patella when said knee support is placed over the knee.

4. The knee support of claim 3 wherein four coils of rubber tubing are provided, with each pair of said coils being formed from a single length of rubber tubing, with a length of rubber tubing passing between each coil of said pair, said coils being secured to said sleeve with said lengths of tubing extending diagonally to each other and crossing each other in the area of said patella.

5. The knee support of claim 4 wherein both ends of each tube forming said coils are partially constricted, with each of said ends being positioned in the center of one of the coils of each pair, whereby release of air from said tubes is controlled when the tubes are subjected to an impact.

6. The knee support of claim 1 and further including an elastic casing over said coils.

7. The knee support of claim 6 wherein the tension on said elastic casing is adjustable.

8. The knee support of claim 7 wherein said elastic casing includes a longitudinally extending opening formed therein, and the means for adjusting the tension on said casing comprises lacing received in eyelet strips which are positioned on both sides of said longitudinally extending opening.

9. The knee support of claim 1 and further including elastic strapping wrapped around said coils, said elastic strapping being secured to said sleeve, and a casing secured over said elastic strapping, said casing being formed from an elastic material.

10. The knee support of claim 9 and further including means for adjusting the tension on said casing.

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