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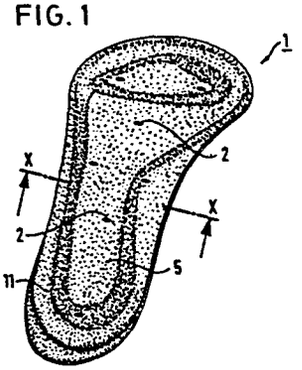
(54) An insole.

(57) An insole the material for which is made a certain kind of silicone rubber compound showing the gum-like elasticity under the normal temperature, which equally includes minute foams, and which is provided with a wedge-shapedly one-sided thickness, irregularities, curves, and the like for the purpose of making the sole incline or rectifying the state of unevenness thereof. It is used by being inserted inside shoes, slippers, sandals, etc., or by being loaded on the sole with the aid of socks, simple holders or band bodies being molded integrally with the holders. Further, it is made sometimes by boring small holes for air permeation therein.

FIG. 1



EP 0 140 985 A2

TITLE OF THE INVENTION

An Insole

BACKGROUND OF THE INVENTION

This invention relates to an improved insole which is used for conservative treatment inclusive of the rectification or the supplement of stature of the diseases of the lower limbs such as, for example, bandy legs, knock knees, fat feet, gonarthritis deformans, metatarsalgia, hallux valgus, and others.

Of those insoles, the ones that were of rigidity have been taken heretofore to be fit for their rightful purpose. Accordingly, there have been used in making them such materials, hard or relatively hard, as metals, for example, like aluminum, hard plastics, leathers, cork and others.

The insoles which have for their main body hard materials such mentioned above, however, not only are inclined to be made on the thick side so as to be put in possession of the strength and form-maintainability, especially in the case of cork or leather, but also they must be molded so as to lap the sole form-fittingly by being deeply curved at their brim, with the object of changing their bad adhesion to the sole for the

better. As a result, insoles of such type cannot help becoming bulky on the whole, and accordingly it is difficult, nay, rather impossible to use such things with inserting into socks because of their being restless therein as well as doing damage thereto. They are also hard to be used even as spacers for slippers or sandals (especially, of a slip-on type) . Then they come usually to be used by being inserted into shoes, otherwise loaded on the soles with the aid of special holder made of leathers or canvas.

But when they are inserted into shoes, they prevent the deformation of shoes (especially sole) , and are accompanied by a feeling of phsical disorder, especially at the time of walking in the standing position, so that it takes a considerable number of days until the user accomodates himself to the loading of them. On the other hand, when using such holder, there occurs various mooted points as follows that footwear becomes hard to put on, or the loading of it is troublesome, or the sense is not good in the state of being loaded, or it is easy to break into sweat, or even when being stained, they are not eashable, and so on. Further, they prevent the movement of the sole st the time of walking, so that it takes a conciderable number of days until the user accomodates himself to the loading of them, as same as the case of inserting in to shoes.

These defects are softened in the case of the insole

of leather or cork. But such insoles have still a hygenic problem to be solved like the occurrence of an offensive smell of sweat and soil resulting from the contact with the skin.

Under these circumstances, however, in the case of the conservative treatment or the rectification of the diseases of lower limbs, unlike the case of the temporal use for beauty purpose or at the time of sporting, for example, skiing, it is required to load the insole habitually over a considerable long period of time, whereas since the insole heretofore in use havevarious kinds of defects as mentioned above, there are many patients who are bold enough to withdraw the loading of them arbitarily in the middle of the treatment (According to a certain data, the patients of this sort should amount to more than 2 % of the whole : "Clinical Orthopedic Surgenry", Vol XVI, No. 7, pps, 665～672, July, 1981) . Some of them tell of the inefficaciousness of this treatment, others complain of some physical or mental pains. This is a serious problem.

BRIEF SUMMARY OF THE INVENTION

It is an object of this invention to provide an insole which has been made enhanced in effectiveness in conducting the treatment rectification of the diseases at the

regions of knees and soles by eliminating the above-mentioned defects of conventional insoles, and which us also able to be used comfortable for beauty purposes and at the time of sporting.

The insole according to this invention is the one which is molded of materials such as silicone compound, so that it is of small bulk, and accomodates itself readily to the movement of the sole to adhere closely thereto, thereby having a very good running in the region of the sole.

This invention has for its another object the provision of an insole which is able to be loaded with the aid of common socks or a holder of simple make, and also an insole which has itself a simple holder.

Still a further object of this invention is to provide an insole which is good in air permeability and is good for health to be possible to be washed, and which has the sense of warmth and is agreeable to the touch and which is able to use long time, and further which is light in weight and low-priced.

And a further object of this invention is a provide an insole which is able to reform to fit the foot of the patient after molding.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view showing an example of the insoles according to the invention ;

Fig. 2 is an end view cutting X-X line of Fig. 1 ;

Fig. 3 is a side view of the same insole in the state of its being loaded on the foot part ;

Fig. 4(a) is a side view showing an example of the holders according to the invention ;

Fig. 4(b) is perspective view in the state where the insole is loaded on the foot part with the aid of the said holder ;

Fig. 5 is a plan view showing an modification of the insole accoding to the invention ; and

Fig. 6 is a perspective view showing an modification of the holder (in this case, along with the insole loaded thereon) .

Fig. 7 is an section view cutting X-X line of Fig.1 of half-finished goods.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

In Fig.1 and 2, there is shown an example of the insole according to the invention. This insole(1) is an example of lateral wedge insoles (exclusively for left foot use) used for the conservative treatment of the baker leg, and so on.

The upper fase of the insole(1) is made in the undulating form in accord with the sole part (reference numeral (31) in Fig.3), and the whole of the insole takes the form of a wedge being made thicker toward the left side (11) with the object of obtaining the expected therapeutic value. This insole is formed of foaming silicone rubber which develop the gum-like elasticity under the normal temperature. Incidentally, reference numeral (2)…in the figure indicate small holes for air permeation being bored piecing through from the upper face to the lower face. (5)… indicate minute and indipendent foams, these are equally included in whole of the insole.

Since silicone compound described later is used as the material for this insole(1), it has the flexibility and toughness, is hard to break down, is able to manufacture after molding, has the close adhesion to the sole part, and has a proper degree of hardness resistible to the load of the foot part. Further since minute foams are equally formed, exceeds in heat insulation. According to this, the insole has an effect which a pain of the affected part is softened.

Therefore, it becomes unnecessary for the insole to have an extra thickness in anticipation of the possesion of the strength and form-maintainability, or to be made largish in the mass and curved on the brim with the intention of heping a right fit for the sole. In this way, as seen in Fig. 3, it can be made relatively less bulky on the whole in propor-

tion to the foot part (3) and besides compact in geometry. On the other hand, this insole (1) according to the invention has an extremely good running in the sole with a comfortable feeling of putting on the foot, is skidproof, and can accord satisfactorily with the movement of the sole part (31). Consequently, the loading of the insole (1) becomes easy, and the stability of the foot part is heightened, wherewith the loading with the use of socks becomes also simple and easy, which was thought of as difficult or rather impossible for long time. Such being the case, by the application of the insole according to this invention, while putting every sort of footwear such as slippers, sandals, to say noting of shoes on, the therapeutic value can be heightened with certainly. Otherwise, it can be used also as a cution sole in the shoe in like manner as conventional things. Not only that, because of its nature of being ready to closely adhere to the footwear and sole, it can be further used as the same as above on slippers or sandals.

In connection with the above, the loading of the insole(1) on the sole(3) may be conducted by the use of such a holder(4) as shown in Fig. 4 (a). This holder (4) is constructed, for example, in such a manner that band bodies (43) (43) are attached to both side of a bag body (42) which has an opening part (41) for taking in and out the insole (1), and that coupling means (44) (44) are provided on both end parts of those band bodies (43) (43). In making use of this holder, the bag body (42)

is applied on the sole in the state where the insole (1) is being received within the bag body (42), and then the band bodies (43) (43) are coupled on the instep of the foot, making them settle there stably. Materials for the bag body (42) and the band bodies (43) (43) are preferable to be of good adhesion to the sole part (3) and of fine air permeability. To this end, there are used normally cloth made of, for example, strechy yarn, spandex, and the like, or knitted goods. For the coupling means (44) (44) shown in the figure, face fasteners are used, but in addition to that, it does not matter if buttons, snaps, hooks, strings and others are used.

As for the position and form of the opening part (41) of the holder (4), they may be modified arbitrarily, while the band bodies (43) (43) being separated in two in the figure may be united in a single continuous arch-shaped band, both end of which are fixed fast on the bag body (42), what by being deprived of the coupling means (44) and what by adding a new band body (not shown) insted which is to be hung on the instep part of the foot. Or it is possible to manufacture the insole which has a simple holder, by molding the band body and the above insole in a body, as shown in Fig.5.

If using a holder (4) of this type, the insole (1) can be loaded on the sole part (31) very simply and stably irrespective of indoor and outdoor and no matter what kind of footwear may be, in consequence of which the feeling of putting

on is very good and the troubleness of loading is eliminated. Upon this, patients do not have the feeling of discomfort and uneasiness attendant upon the separation-contact occurring very often between the sole and the insole, because of the whole of the insole (1) following the movement of the sole, thereby the expected therapeutic value being able to be elevated remarkably. This holder (4) can draw on the sock from over the loaded insole because of the holder being of small bulk. Further, this holder (4) is excellent in air permeability since it is made of cloth or knitted goods, and it is also sanitary as it is washable.

On the other hand, the insole (1) according to this invention can also be washed without difficulty, is good for health, can be used long time, and is very economical, unlike the ones made of leather or cork. The insole which is provided with small holes for draft, as shown in the figure, is never filled with dampness due to perspiration, thereby the cleanliness of the foot part being preserved and the unpleasant sensation of somehow offensive smell being able to be mitigated by a large margin. By the way, these small holes for draft(2)··· will do if being disposed suitable over the whole surface, otherwise to the central side of the insole. The air permeability of these small holes for draft grows better the larger they are in size and the more they are in number. The size and number of them, however, have naturally their limits. In

practice, it is thought as good that they might be about 0.5～2 mm in diameter and about 10 ～50 in number for reasons of easy cleaning. The warp of the insole(1) described the above is relative small but the insole which warp is relative large, for example, shown in Fig. 6, can be naturally manufactured in this invention for the purpose of using it inserting into shoes.

Description will be now directed to the materials used in this invention.

The insole according to the invention is a molding of silicone compound which has the gum-like elasticity in the vicinity of the normal temperature.

Silicone rubber is excellent in water-resisting property, medicine-resisting property, thermal and low-temperature resistance and high tensile strength. And it is most desirable for materials of medical appliances because of scentless and nonpoisonous. But in the past, this material was never used for the insole. The reason of this is that it is believed that the hard material exceeds in the soft material in the power of reform with the experience and the fixed idea.

However, when the patient put on the insole which manufactured of silicone rubber, the large effect of treatment is appeared. This proves that even the elastmer has the power of reform. Since the using of soft material solves the defects of hard material, the patient does not feel physical and

mental suffering. This is one of reasons which the soft insole has the effect of treatment.

Only the silicone rubber is expensive in the form of single substance, is bad in tensile strength, internal tearing resistance, crack resistance and others on account of its essentially weak intermolecular force and it non-crystal structure. Therefore, it is easily damaged by unreasonable or continuous use. And what has small holes for air permeation is further easily done. And since it is not reform after molding, every time, a mold of patient's foot must be made. Therefore, it is much cost and labor. Further, the patient feels it cool and is displeased in winter. More than that, it has some defect such that it is bad in workability, for example, it is hard to defoam the babbles incorporated in company with the kneading at the time of manifucturing.

Thereupon, the inventor of this invention was manifucturing the insoles with various silicone rubber compounds conventionally used, on the one side, while on the other hand he has been at grips with the development of an idial silicone rubber compound as material for the insole.

As the result, he could find out a silicone rubber compound which is low-priced, good in workability, and possible to be reformed after molding, and possible to be equality formed minute foams. The excellence of this compound in foam-forming property is preferable for reasons of being

able to obtain the insole which is light-weight and good in heat-retaining property through utilizing the bad deforming property of silicone rubber.

Most desirable silicone rubber compound according to this invention is a mixture of both inorganic filler and hydrous silicate powder with heat-vulcanized silicone rubber. In this connection, the one which is made by mixing only calcium carbonate as a filler with silicone rubber, even when about the equivalent is added to silicone rubber, keeps the fluidity, has the good workability, and the elevation of its strength is perceived, in spite of which a good effect is not much exerted upon the swell in volume of the product only to increase the specific gravity without contributing to the lowering of the production cost. On the other hand, in the one wherein only hydrous silicate powder is mixed, hydrous silicate powder is hard to disperse into silicone rubber thought it is perceivable that the light-weightiness is brought about by the action of foam-formation, and the fluidity is lowered remarkably, thus the workability being deteriorated. Then these defects have been eliminated by the present invention by mixing and dispersing the both components : calcium carbonate and hydrous silicate powder into silicone rubber at a certain ratio.

As inorganic fillers used in this invention, there can be used various sorts and grain sizes of calcium carbonate,

magnesium carbonate, talc, aluminum hydroxide, magnesium hydroxide, calcium sulfate, calcium silicate, ground silica, clay, mica, glass beads, micro-balloon (hollow spherical glass powder) , silica balloon, and others. Preferable out of the above are the ones which are low in oil absorption value so that the fluidity may be hard to drop at the time of mixing silicone rubber, and which a surface treatment such as the silane treatment are conducted on with the view to increasing the strength of the product, especially the tearing strength, cracking resistance, and others. Most preferable is the surface-reactive calcium carbonate whose grain surface has been activated by silane coupling agent. And micro-balloon is one of the most preferable filler. Further, preferable is the one whose specific gravity is as low as possible, for reasons of making the product light-weight.

As for hydrous silicate powder, it fulfills its function such as the actualization of high strength of the product or the reduction of production cost as an inorganic filler, and further it can make minute babbles uniform by the action of water being contained therein (water of crystallization) , playing an important role in making the product light-weight or in forming within the product. In this way, it does not need particularly any foaming agent belonging to the organic group. In practice, there is used such as white carbon which is one of the noncrystal hydrous silicate powder.

To say in addition, any pigment and other additives can be freely mixed so far as it is possible to obtain a product having the expected object properties. Other inorganic fillers can be used in place of hydrous silicate powder.

The preferable compounding ratio of these components is 5～75 parts (by weight : hereinafter the same) of an inorganic filler and 5～30 parts of hydrous silicate powder together with 100 parts of heat-vulcanized silicone rubber and 10 parts (be changed in compliance the kind of silicone rubber or vulcanizing agent) of vulcanizing agent. When mixing more than 75 parts of the inorganic filler, the fluidity drops and the workability becomes bad, and when less than 5 parts, small babbles in acompany with the foam-formation are not incorporated within, so that blow-off (bumping) holes occur unpreferably. Especially preferable is the limits of 10～50 parts. On the other hand, in the case of hydrous silicate powder, when mixing more than 30 parts of it, the fluidity drops considerably, and when less 5 parts, the foam-formation is not satisfactorily performed, and sometimes the one-sided formation is unpreferably generated. Especially preferably is the limits of 10～20 parts.

By way of preferable example, as a start 10 parts of the vulcanizing agent is mixed and stirred thoroughly with 100 parts of the heat-vulcanized silicone rubber (a colorless, transparent liquid) . Next, when commingling 25 parts of

calcium carbonate being previously surface-treated by silane coupling agent, and 15 parts of white carbon which is noncrystal hydrous silicate powder of high purity, there can be obtained slurry abundant with the fluidity. After being poured into a mold, this slurry is heated at about 100 ℃ in a thermostatic oven for about one hour to be made hardened. The object which was released from the mold is a hardened body which is light-weight and contains many minute babbles scattered uniformly on the whole surface, as shown in Fig. 1 and Fig. 2. This hardened body, that is the insole(1) has the sense of warmth, and exhibits the excellent internal tearing resistance and the cracking resistance.

Like this, the silicone rubber compound according to the invention has the proper fluidity and the foam-forming property, whereby it can not only do without the defoaming process which has been most difficult heretofore in making use of the foam-formation but also elevate the working efficiency at a large margin. Into the bargain the product obtained is also light-weight and excellent in internal tearing strength and cracking resistance. And this compound can be used semi-eternally if it is politely used, and can be reformed after molding. Accordingly, we can cut and grind the insole to fit the patient's foot, which insole is selected in some kinds of insoles which are manufactured in advance.

Therefore, the remolding and manufacturing of molds of

all patient's feet are not necessary. It brings down the cost.

By shaping in unevenness, upper part(12) of the insole is only formed in arch shaped, and bottom part(13) is left in flat shape, as shown Fig. 7. This is semi-product(14). This semi-product can be became finished product by cutting and/or grinding the bottom part(13) to fit the patient's foot. this method makes the manifacturing of the mold simple. What is more, it exhibits the sense of warmth by involving the minute balls in itself, thereby bringing about the effect of removing the pain at the time of loading it onto the sole in winter, and of the promotion of treatment by heating the part of the sole. Moreover, the mixing of inorganic fillers and the foam-formation enable the material cost to be cut down. Further the mixing and the new method of manufacturing enable to provide the insole in low price and in large quantities. All things considered, it may be said that the insole of this invention is the most suitable one as a therapeutical means which is to be loaded on the human body because of all it component materials being harmless and poisonless.

As described above, the insole according to the invention is the one that is integrally molded by the use of silicone rubber compound having the gum-like elasticity, is of small bulk, is easy to accord with the movement of the sole while closely adhering thereto, and thereby is able to become very satisfactorily accustomed to the sole part. What is more,

WHAT IS CLAIMED IS :

1. An insole which is provided with a wege-shapedly one sided thickness, irregularities, curves and such like for the purpose of making the sole incline or rectifying the state of unevenness thereof, characterized by being molded of silicone compound which show the gum-like elasticity, and in a state of including equally minute babbles.

2. An insole as set forth in claim 1, wherein silicone compound is made from silicone rubber added inorganic filler and hydrous silicate powder.

3. An insole as set forth in claim2, wherein the mixing ratios are 5 ~75 parts of inorganic filler, 5 ~30 parts of hydrous silicate powder per 100 parts silicone rubber respectively.

4. An insole as set forth in claim 1, said insole is made by the process which a product molded is cut and/or grinded after molding.

5. An insole as set forth in claim 1, which is made by boring a plurality of small holes for air permeation.

6. An insole as set forth in claim 1, which is made by integrally molding a band body used for loading it on the sole part.

7. An insole as set forth in claim 1, which is made by being colored, especially in skin-color.

it is possible for it to be loaded with the aid of socks and other simple holders, and to expect the perfection of the therapeutic value. For insoles, except the lateral wedge insole described in the foregoing examples, there are also different kinds of insoles for the medical use such as the medical wedge insole used for the conservative treatment of baker legs, the arch support used for the rectification treatment of fat feet, the metatar-sal support, and the insole used for the supplement of stature. These insoles all display the excellent effect in like manner.

The insole which are called in this invention include, except for one covering the whole of the sole from near the metatarsus to the instep of the foot, as shown in the figures, also the partial ones which are restrictedly applied, for example, to the platar arch or the metatarsal part. It may be more desireable for the invention to color those insole in different tints. Then the womankind will use them lightheartedly when the insoles with the holders are tinged in skin color because of their not striking the eyes under nylon stockings on.

FIG. 1

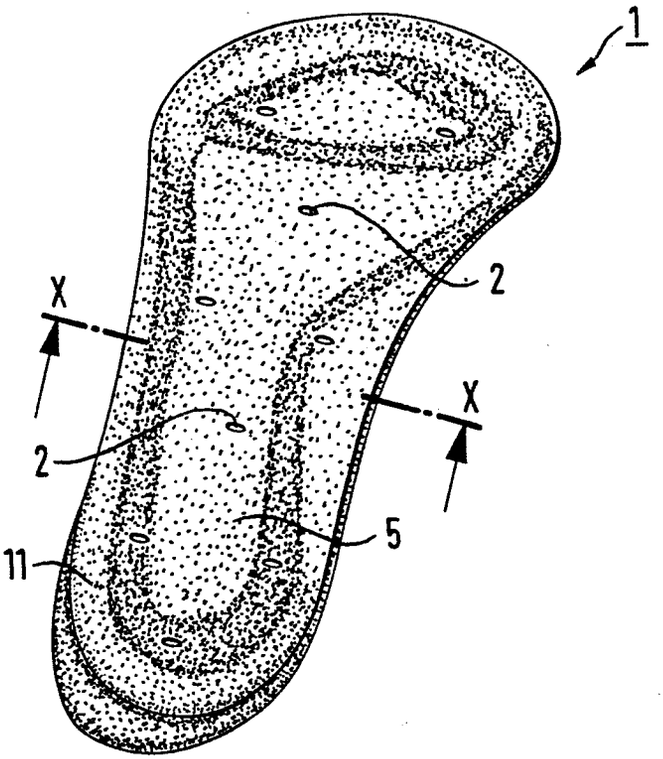


FIG. 2

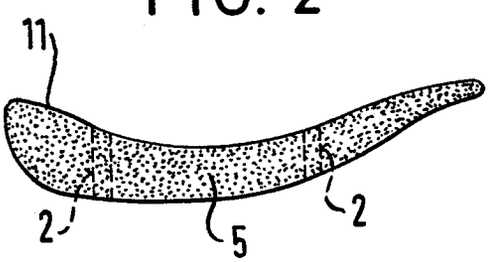


FIG. 3

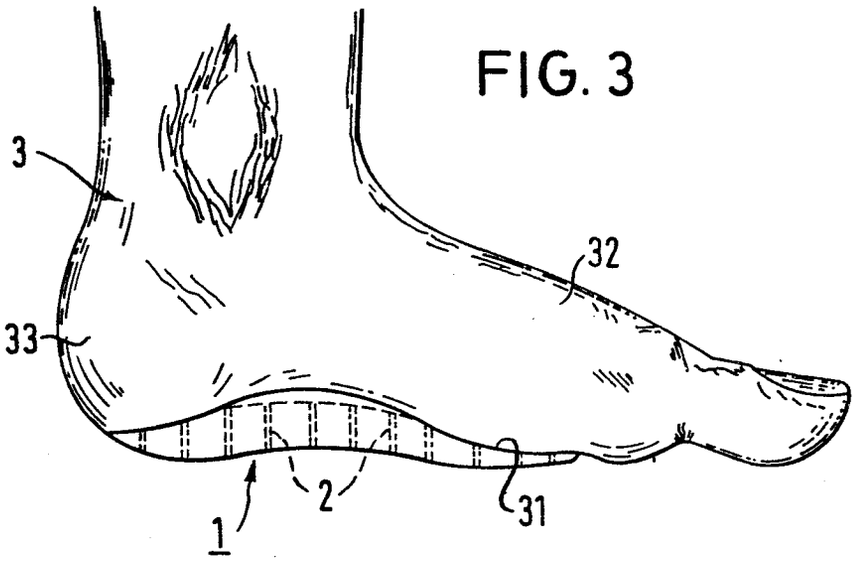


FIG. 4(a)

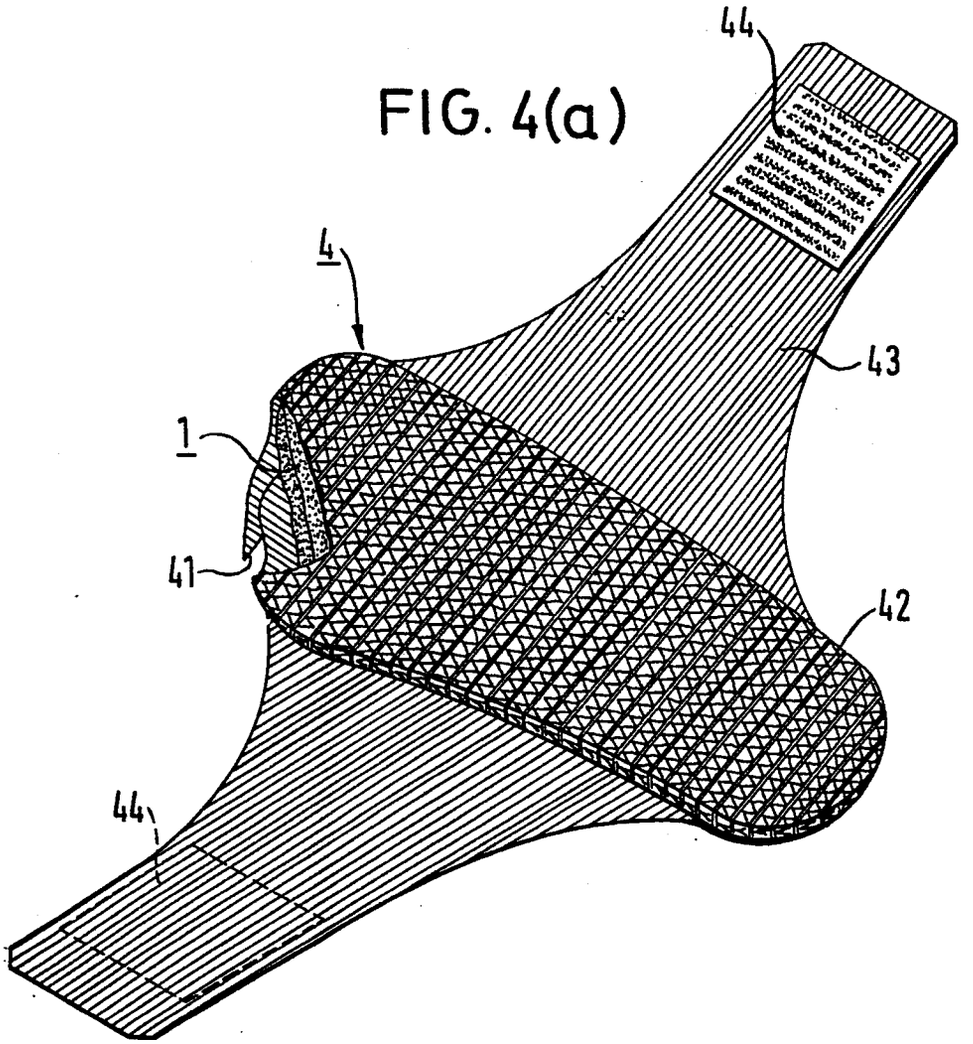


FIG. 4(b)

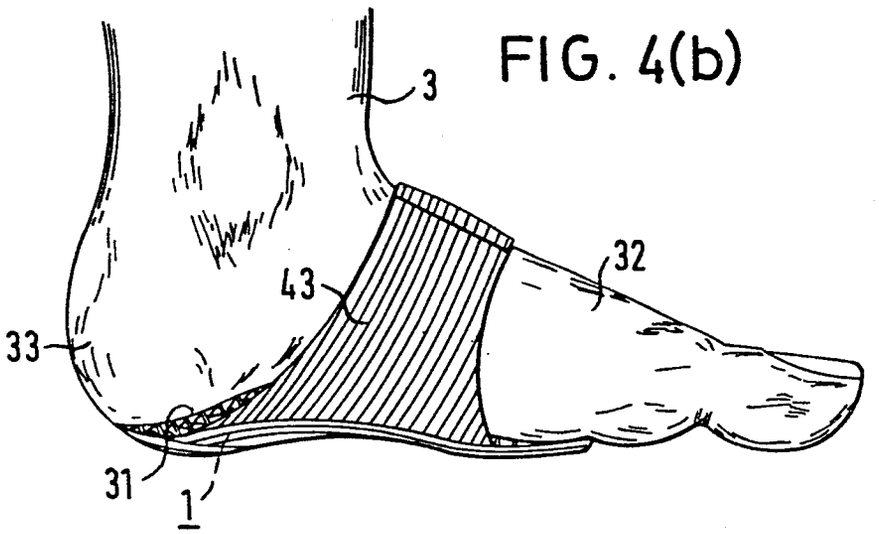


FIG. 5

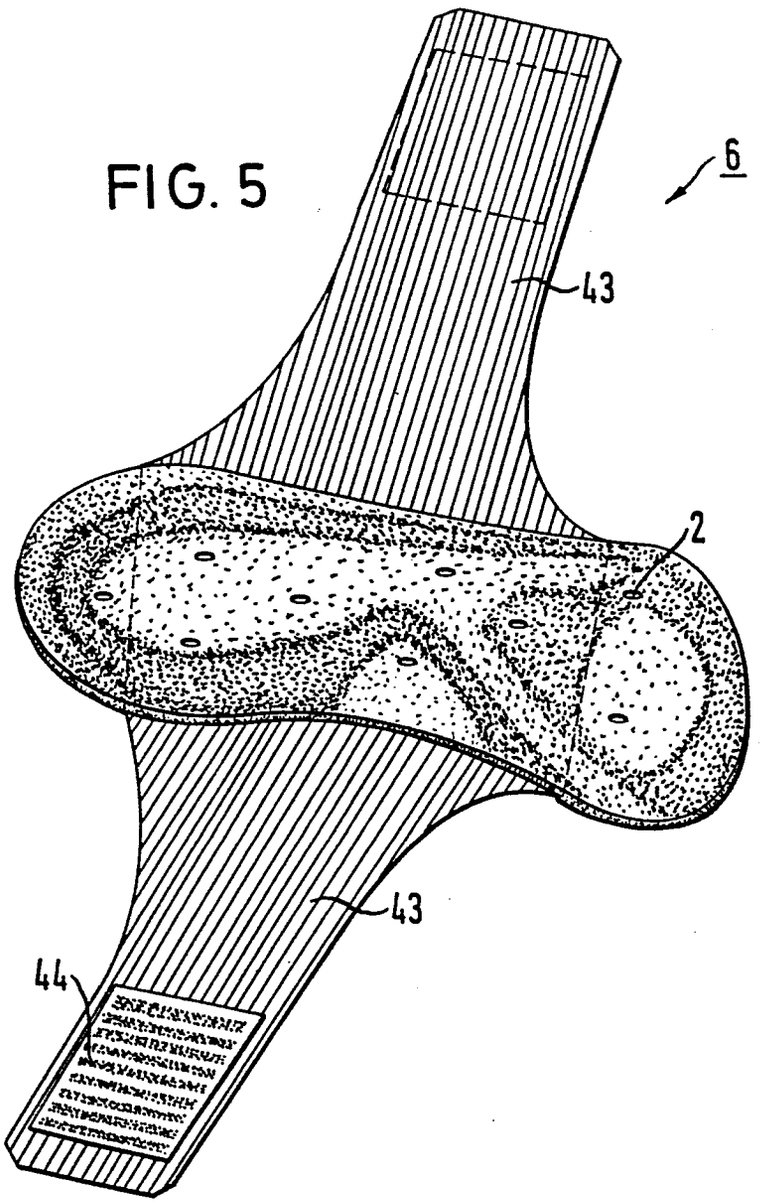


FIG. 6

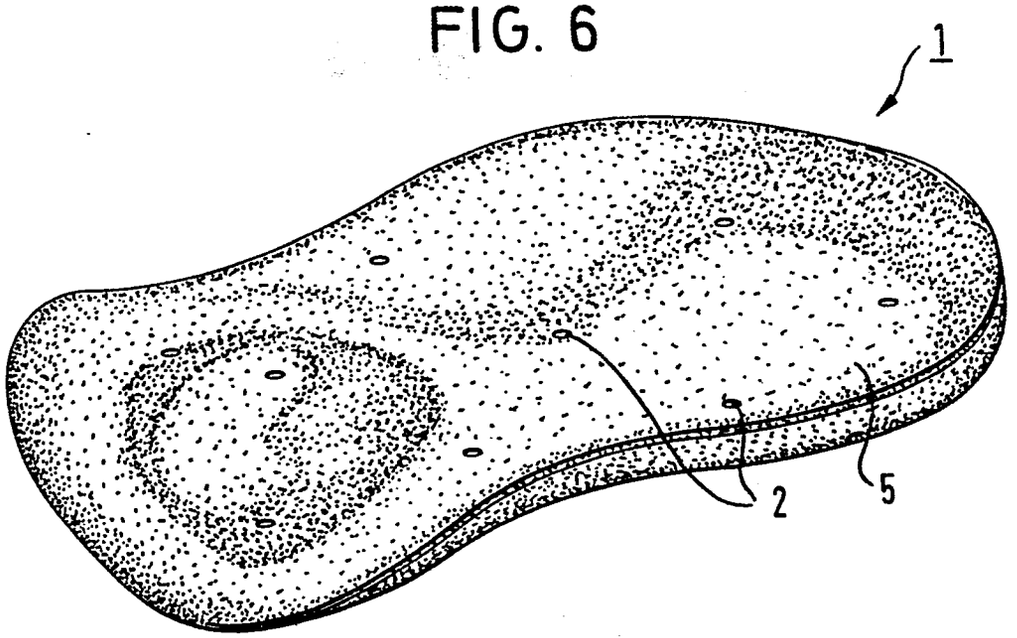


FIG. 7