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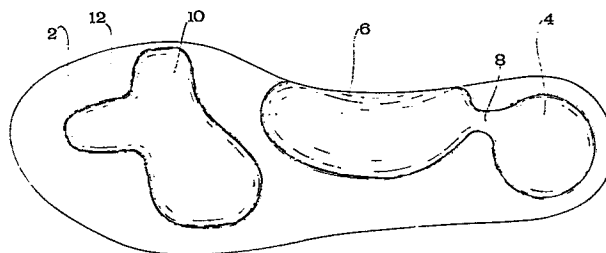
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⑤④ **Orthopedic device for use in the prevention and treatment of foot disorders.**

⑤⑦ Orthopedic sole (2) provided, in suitable points, with containers (4, 6, 10) filled with a fluid (gas or gel) or with a spongy, liquid-imbibed tissue, which transmit load stresses from support points to the foot's physiological support areas; said containers being located one (4) in the heel region and connected with a second container (6) lodged in the area of the plantar arch, which transmit stresses from the heel to the arch; a third container (10) located in the area comprising the metatarsal heads and necks for shifting stresses from the former to the latter; said container having an offshoot (12) between the first and the second toes, adapted to prevent any tendency to hallux valgus.

In an embodiment adapted to children, the first container extends from the heel area to the astragalar head and the navicular, whereas the second container extends from the metatarsal heads up to a point near the plantar arch.



-1-

"Orthopedic device for use in the prevention and treatment of foot disorders"

This invention has reference to an orthopedic device for use in the prevention and treatment of foot disorders by mechanical etiology.

5 It is well known that conventional orthopedic devices for the treatment and prevention of foot disorders have been limited essentially to orthopedic soles, i.e. shapes that are inserted in shoes for supporting the plantar arch, or soft soles for relieving the load weighing on the foot in a uniform and restful way.

10 Special mention should be made of the latter anatomical soles made of plastic material, and containing a water-based fluid. Manufacturers recommend them particularly for persons who have to stand erect for long periods.

15 Such conventional soles, however, are not free from certain drawbacks: they offer a passive support to the plantar arch, by suspending the function and consequently the tone and trophism of the muscles controlling the arch, with consequent yielding of the arch.

20 Such soles therefore act to cause a merely passive load relief and their comfort derives solely from distributing on the fluid the stress load acting on the user's feet. Nothing in them is provided for preventing or treating foot disorders by mechanical etiology. It should

be mentioned that improper use of such supports is often a cause of flatfoot in the child.

5       The device according to the invention is also based upon the laws which govern the distribution of forces in fluids, but it has as its object to prevent and treat foot disorders by mechanical etiology by taking profit from such laws and by optimally distributing forces in fluids in the supporting areas, both in statical and dynamical conditions.

10       The device of the invention substantially comprises a support sole on which are provided containers filled with a gaseous fluid, a glycerine-based fluid (gel), or containers of a water-imbibed sponge, to avoid swashing; such containers transmit the forces acting on the support points (metatarsal heads, calcaneal tuberosity) to the foot's physiological  
15       support areas (metatarsal necks and plantar arch). Such operation protects the support points from wear and actively corrects any pathological deviations caused by distorted stress lines in the foot, such as in the child's flatfoot.

20       Moreover, a dermo-epidermal and subcutaneous massage is effected, which helps to avoid wear effects such as tylomata, callosities, ulcerations, angiolymphatic edemas, etc.

25       The physiological orthopedic device of the invention substantially comprises a sole provided with a first container located in the support area of the calcaneal tuberosity and connected with a second container located in the area of the plantar arch which transmits loads from the heel to the arch, thus relieving the former and actively stressing the latter; and with a third, front  
30       container, located in an area comprising the metatarsal heads and necks, for shifting stresses from the former to the latter, the third container being connected to an

offshoot between the first and second toe, for preventing and/or correcting any tendency to hallux valgus.

The above device is particularly recommended for persons who are compelled to stand erect for long periods in connection with their work or other special situations (salesmen, waiters, housewives, industry workers, chemists, surgeons, etc.).

A second embodiment of the device according to the invention is particularly recommendable in early childhood.

Such second embodiment of the device comprises a sole provided with a first container located in the support area of the heel extending to the astragalar head and the navicular, and with a second container at the support area of the metatarsal heads extending to near the plantar arch; the first container transferring the stresses medially and superiorly at the astragalar head and the navicular in the standing posture and in deambulation, thus stimulating the functions of muscle groups so as to actively cause arch formation; the second container concentrating the reaction to metatarsal load stresses at the fourth metatarsal, thus stimulating the helical mechanism tying the function of the so-called calcaneal foot with the function of the astragalar foot in the formation of the arch.

The invention will now be particularly described with reference to the attached drawings given by way of example, and in which:

Fig. 1 is a plan view of a first embodiment of the device according to the invention, particularly recommendable for adult use;

Fig. 2 is a side elevation view of the embodiment of Fig. 1;

Fig. 3 is a plan view of a second embodiment of the

device according to the invention, particularly recommendable for children's use;

Fig. 4 is a partially broken side elevation view of the embodiment of Fig. 3.

5           As shown in Figs. 1 and 2, the device according to the first embodiment of the invention substantially comprises a support sole 2, on which is provided, in the support area of the calcaneal tuberosity, a container 4 filled with a suitable fluid such as glycerine or a gaseous fluid or  
10           with a spongy material imbibed with a liquid.

          Use of glycerine or a similar fluid, or of a liquid-imbibed, spongy material, is intended to avoid swashing: this bothersome effect is usual in soles provided with containers filled with a water-based liquid.

15           Container 4 is connected with a second container 6, located in the arch area, through a duct 8.

          Container 4 transfers to container 6 the loads acting on the heel, from the heel to the plantar arch, thus relieving the former and actively stressing the latter.

20           A third container 10 is provided at the front of sole 2; this is located in an area comprising the metatarsal heads and necks, and thus shifts stresses from the former to the latter.

          Container 10 has an offshoot 12 between the first and  
25           the second toe, which acts to prevent and/or to correct any tendency to hallux valgus.

          As specified above, the embodiment shown in Figg. 1 and 2 and disclosed above is particularly suitable for people compelled to stand erect for long periods, by  
30           their work or by other special circumstances (salesmen, waiters, housewives, industry workers, chemists, surgeons, etc.).

Figg. 3 and 4 show a second embodiment of the invention, particularly suitable for early childhood.

According to said second embodiment, the device comprises a sole 14 having a relief 16 at right angles to an horizontal plane in the area of the plantar arch.

Sole 14 is provided with a container 18 located in the heel support area and with a second container 23 located in the support area of the metatarsal heads. Container 18 is connected, through a duct 22, to a second container 20 located at the astragalar head and the navicular.

Container 23, located in the support area of the metatarsal heads, extends into a container 24 located near the plantar arch.

It should be noted that container 20, corresponding roughly to container 6 of the first embodiment (Figg. 1 and 2), is slightly different from it: although it is located in the area of the plantar arch, it rests not only on sole 14, but also on wall 16 of the relief, at right angles to the sole; container 20 hence reacts along the resulting direction of two components, vertical and horizontal, and therefore substantially in a diagonal direction upon the plantar arch, or, more exactly, upon the astragalar head and the navicular.

Container 18 transfers stresses medially and superiorly at the astragalar head and the navicular when the user is standing or walking, in order to stimulate the active formation of the arch; container 23 concentrates the reactions to the metatarsal load stresses at the fourth metatarsal, in order to stimulate the helical mechanism tying the function of the so-called calcaneal foot with that of the astragalar foot in the formation of the arch.

In order to give a better understanding of the importance and effectiveness of the invention in all its embodiments, the actions afforded on the foot by the device according to the invention in its various embodiments will now be distinctly pointed out:

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- areas subjected to hyperpressure are relieved, with transmission of the baric reaction at the areas that are physiologically dedicated to support loads;

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- the foot sole is massaged, with consequent entrophic stimulus and resolution of hypercheratrosic effects such as tylomata or circulation disorders, both in the hematic and the lymphatic systems, such as stasis, edemas and the like;

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- adjuvant action in the active formation of the plantar arch or in its correction in early childhood.

It should be understood that the invention is not limited to the embodiments shown and described; numerous changes and further improvements can be made within the scope of the invention.

## CLAIMS:

1. A physiological orthopedic device, characterized in that it comprises a sole provided in suitable places  
5 with containers filled with suitable fluid, such as glycerine, adapted to transmit load stresses from support points to physiological support areas of the foot, thus protecting from wear the support points and if necessary correcting actively any pathological deviations of distorted stress  
10 lines in the foot; such load stress transmissions causing, moreover, a dermo-epidermal and subcutaneous massage useful in avoiding wear effects such as tylomata, callosities, ulcerations, angiolymphatic edemas and the like.

2. A physiological orthopedic device according to  
15 claim 1, characterized in that the containers provided on the sole in the suitable points are filled with a spongy tissue imbibed with a liquid, in order to avoid swashing.

3. A physiological orthopedic device according to claim 1, characterized in that the containers provided in  
20 the sole in said suitable places are filled with a gaseous fluid.

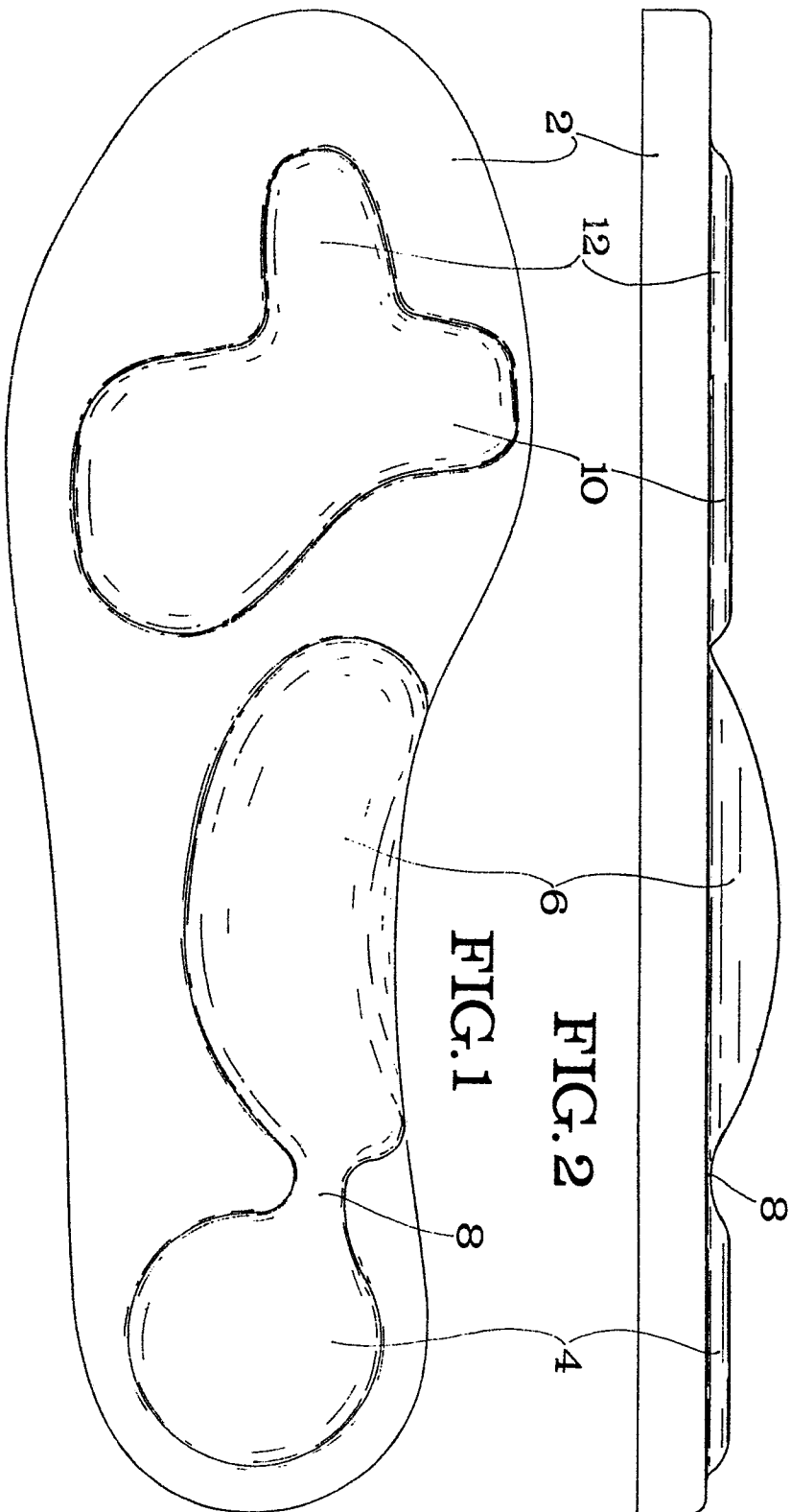
4. A physiological orthopedic device according to one of claims 1, 2 or 3, particularly for adults, characterized in that it substantially comprises a sole provided  
25 with a first container located in the support area of the calcaneal tuberosity and connected with a second container located in the area of the plantar arch to transmit loads from the heel to the arch, thus relieving the former and actively stressing the latter; and with a third, front  
30 container, located in an area comprising the metatarsal heads and necks, thus shifting stresses from the former to

the latter; the third container being connected with an offshoot between the first and the second toe, so as to prevent and/or correct any tendency to hallux valgus.

5           5. A physiological orthopedic device according to one of claims 1, 2 and 3 and a variation of claim 4, particularly for children, characterized in that it substantially comprises a sole provided with a first container located in the support area of the heel extending to the  
10           astragalar head and the navicular, and with a second container located at the support area of the metatarsal heads, extending near the plantar arch; the first container transferring stresses medially and superiorly at the astragalar head and the navicular when the user is standing or  
15           walking, thus stimulating the function of muscle groups in order to actively cause arch formation; the second container concentrating the reaction to the metatarsal load stresses in the area of the fourth metatarsal, so as to stimulate the helical mechanism tying the function of the  
20           so-called calcaneal foot with that of the astragalar foot in arch formation.

          6. A physiological orthopedic device according to the previous claims, characterized in that the containers provided on the sole are located in an area suitably determined on a case-by-case basis.  
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          All as shown and described and for the specified objects.



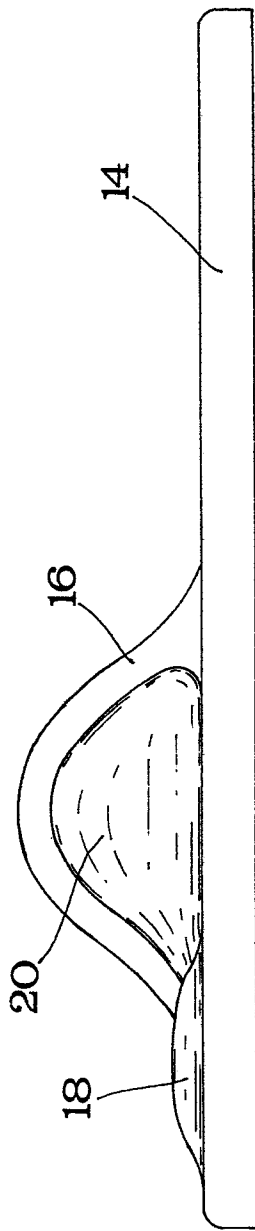


FIG. 4

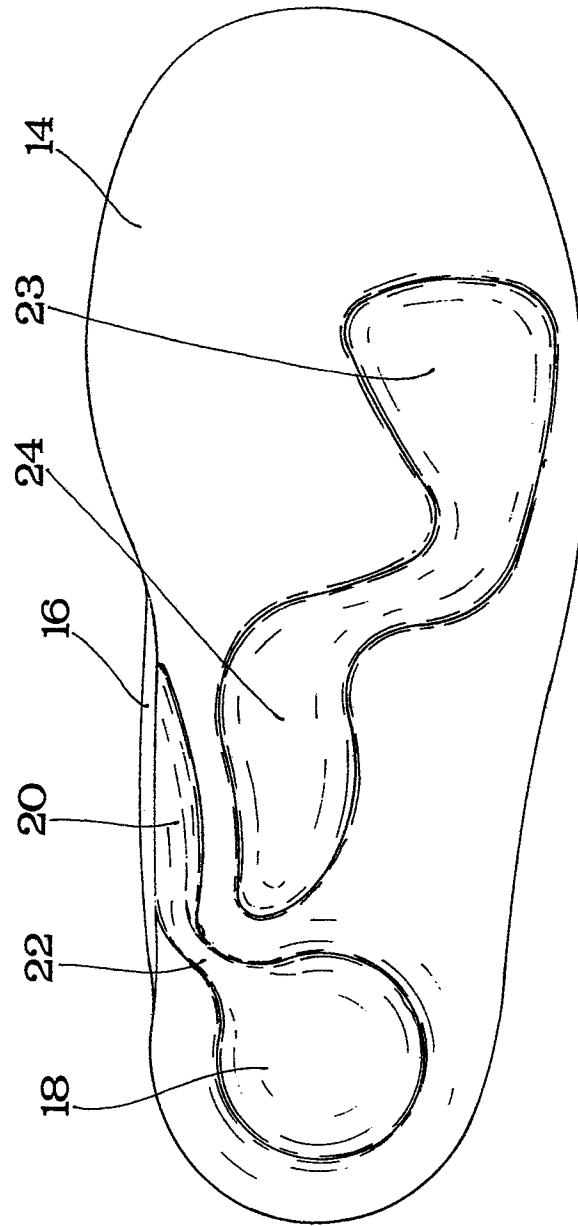


FIG. 3

0060353



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application number

EP 81 20 1070.0

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	<u>US - A - 2 074 286</u> (SULLIVAN) * page 1, left-hand column, lines 1 to 22; fig. 1, 2 * --	1,3	A 61 F 5/14
X	<u>US - A - 2 177 116</u> (PERSICHINO) * claims 1, 2; fig. 1 to 3 * --	1,3,4	
X	<u>US - A - 2 488 382</u> (DAVIS) * column 1, lines 1 to 11; fig. * --	1,3,4	
X	<u>US - A - 2 645 865</u> (TOWN) * claim 1; fig. 1 * --	1,3	
X	<u>AT - B - 200 963</u> (SCHÜTZ et al.) * entire document * --	1,4,6	
A	<u>DE - B - 1 180 649</u> (LUNKENHEIMER) * claim 1 * -----	2	
			TECHNICAL FIELDS SEARCHED (Int.Cl.3)
			A 43 B 13/20 A 43 B 17/03 A 61 F 5/14
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons
<input checked="" type="checkbox"/> The present search report has been drawn up for all claims			&: member of the same patent family, corresponding document
Place of search		Date of completion of the search	Examiner
Berlin		04-06-1982	KANAL