

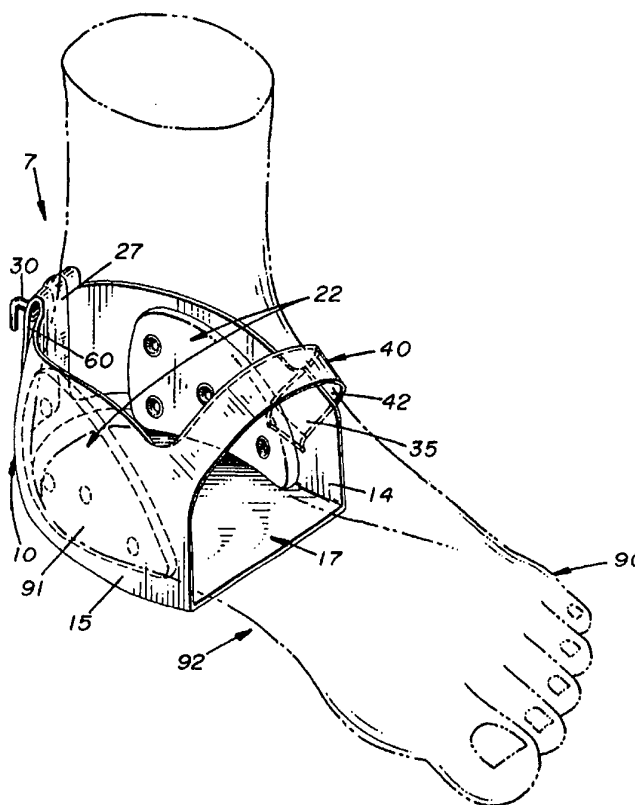


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(21) International Application Number: PCT/US94/00971 (22) International Filing Date: 27 January 1994 (27.01.94) (30) Priority Data: 08/009,765 27 January 1993 (27.01.93) US (71)(72) Applicant and Inventor: KRIVOSHA, Ronald, S. [US/US]; Suite 1-B, 11711 NE 12th Street, Bellevue, WA 98005-2461 (US). (74) Agent: CRAINE, Dean, A.; Craine & Jackson, P.S., Suite 400, 800 Bellevue Way NE, Bellevue, WA 98004 (US).		(81) Designated States: AU, CA, DE, DK, GB, JP, SE, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>

(54) Title: HEEL STABILIZING DEVICE AND METHOD**(57) Abstract**

A device (7) and method to treat heel pain including an inflatable heel cup (10) designed to be worn around the heel (91) of a foot (90). The heel cup (10), which may be worn separately or with a variety of different shoes, includes two air chambers (22) which are disposed on the lateral and medial aspects of the heel (91) at an elevation at or slightly below the Sub-talar joint (95) of the foot (90). The device further includes an air control valve (30), an adjustable strap (40) and an optional heel pad (70).



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TITLE: HEEL STABILIZING DEVICE AND METHOD**TECHNICAL FIELD**

This invention relates generally to devices and
5 methods for supporting the heel and for treating heel
pain and, more particularly, to such devices and methods
which apply pressure to the heel region of a human's
foot.

BACKGROUND ART

10 Heel pain is a relatively common medical complaint
that affects all age groups. The etiology of heel pain
includes: (1) trauma, such as contusions; (2) metabolic
conditions, such as Gout, Reiter's Disease, and
Rheumatoid Arthritis; (3) bio-mechanical conditions, such
15 as Pes Plano Valgus and Equinus, and; (4) anatomical
abnormalities, such as heel spurs, narrow heels, and
decreased plantar fat pad.

Heretofore, traditional methods used to treat heel
pain have included the use of: (1) ice therapy; (2)
20 limiting weight bearing; (3) heel pads; (4) heel cups;
(5) orthotic devices; (6) surgical procedures, and; (7)
medications.

It has been recently discovered that stabilizing the
calcaneus in the heel can be used to treat heel pain and
25 correct various heel-related medical conditions. It has
also been discovered that by applying pressure around the
heel, a fat pad under the heel may be created or
increased in size and used to relieve heel pain.

DISCLOSURE OF THE INVENTION

It is a general object of the present invention is to provide a device capable of stabilizing the heel of a foot.

5 It an object of the present invention to provide such a device which also acts to increase the size of the fat pad under the heel to protect the calcaneus against impacts.

10 It is another object of the present invention to provide such a device that is adaptable to fit different size feet and can be worn separately or with a variety of different footwear.

15 It is a further object of the present invention to provide a safe and effective method for treating heel pain.

20 The heel stabilizing device disclosed herein, comprises an inflatable heel cup designed to be worn around the heel area of a foot and used to stabilize the calcaneus. The heel stabilizing device, hereinafter known as the device, comprises a heel cup designed to fit around the posterior, lateral, medial, and plantar aspects of the heel. The device is also designed to be worn on either foot and to be used separately or with a variety of different footwear. It is also adjustable in size so that it may be used with different foot sizes.

25 Manufactured inside the heel cup is an inflatable air bladder which, in the preferred embodiment, is divided into two air chambers. The two air chambers are

disposed on the opposite, inside surfaces of the heel cup so that when the device is worn, the air chambers are positioned on the lateral and medial sides of the heel at or slightly below the Sub-talar joint, (the joint space
5 located between the Talus and the Calcaneus). When the air chambers are inflated, they exert opposite, equal compressive forces on the calcaneus which act to stabilize the calcaneus and to prevent its relative movement.

10 The air chambers are disposed at a sufficiently low position on the device so that when inflated, they force soft tissue surround the foot downward creating or increasing the size of the fat pad disposed plantarly directly below the plantar tubercle of the calcaneus.
15 This fat pad acts as a cushioning, protective layer which reduces any impact forces on the plantar tubercle of the calcaneus.

To attach the device around the heel, a fastening means is provided. In the preferred embodiment, the
20 fastening means comprises an adjustable strap attached integrally at one end to one side of the heel cup. To attach the device around the heel, the strap is wrapped around the instep or dorsal region of the foot and attached at the opposite end to the opposite side of the
25 heel cup to hold the device in place around the heel. The attachment means used to connect the opposite end of the strap to the device allows the tension of the strap to be adjusted so that the inward forces exerted by the

air chambers on the lateral and medial surfaces of the heel may be adjusted. This adjustable feature also allows the device to be used with different foot sizes. In another embodiment, the entire strap is detachable
5 from the device.

An air control valve is also provided with the device which enables pressurized air from an external air pressure source to be transferred into the air bladder. The end of the air control valve is externally located so
10 that the user can adjust the amount of air pressure in the air bladder while the device worn and used with footwear.

An optional heel pad also may be attached to the heel support surface located inside the heel cup to
15 provide additional support and protection to the heel.

Using the above stated device, a method of treating heel pain is also provided.

BRIEF DESCRIPTION OF THE DRAWINGS

20 Fig. 1 is a perspective view of the heel stabilizing device attached to the heel of a foot.

Fig. 2 is a lateral, side elevational view of the heel stabilizing device to a foot showing the position of the air chamber relative to the Sub-talar joint.

25 Fig. 3 is a medial, side elevational view of the heel stabilizing device attached to the foot as shown in Figs. 1 and 2.

Fig. 4 is a top plan view of the heel stabilizing

device attached to the foot as shown in Figs. 1, 2, and 3.

Fig. 5 is an illustration of the heel stabilizing device shown in a flat position.

5 Fig. 6 is a perspective view of another embodiment of the heel stabilizing device attached to the heel of a foot.

Fig. 7 is a partial side elevational view of the heel stabilizing device showing the tab structure folded
10 downward and attached to the rear surface of a shoe.

Fig. 8 is a partial side elevational view of the heel stabilizing device showing the tab structure extended in an upward direction.

Fig. 9 is a rear elevation view of a foot showing
15 the formation of a fat pad below the calcaneus when the air chambers exert pressure along the lateral and medial sides of the foot.

BEST MODE FOR CARRYING OUT THE INVENTION

20 As can be seen in Fig. 1, the herein disclosed invention is a heel stabilizing device, generally designated as 7, comprised of a flexible, inflatable heel cup 10 capable of being wrapped around the heel 91 of a foot 90.

25 The heel cup 10 is made of flexible, lightweight material comprising two panels sewn, adhesively attached, or heat sealed together along their edges to form an inside wall 14 and an outside wall 15. The exterior

surface of the inside wall 14 is intended to contact the heel 91 when the device 7 is worn. In the preferred embodiment, the inside wall 14 and outside wall 15 are made of flexible polyurethane or polyvinyl film material or similar material.

When viewed in a opened, flat position as shown in Fig. 5, the heel cup 10 has two wing sections which extend in opposite directions from the heel cup's central vertical axis 11. Although the device 7 can be manufactured in different sizes, for an adult foot, the heel cup 10 measures approximately 7 inches in length and 2-1/2 inches in height along the central axis 11. The length of the heel cup 10 is sufficient so that it extends forward along the lateral and medial sides of the foot to approximately the mid-point of the longitudinal arch 92 of the foot 90. The height of the heel cup 10 along the central axis 11 is sufficient so that the heel cup 10 extends upward over the distal end of the Achilles tendon when worn.

Manufactured centrally on the heel cup 10 is a flat, heel support surface 17. The heel support surface 17 has a curved edge 18 and a straight front edge 19. Overall, the heel support surface 17 has a configuration similar to the heel of a shoe. During manufacturing, the lower flat edge 13 of the heel cup 10 is attached to the curved edge 18 of the heel support surface 17 to form a curved, U-shaped, heel cup 10 capable of receiving the heel 91 of foot 90.

Manufactured on the lateral and medial sides of the heel cup 10 is an inflatable air bladder comprising two interconnecting air chambers 22. The air chambers 22 are formed by joining portions of the interior surface of the inside wall 14 to corresponding portions of the interior surface of the outside wall 15. The air chambers 22 are located on the heel cup 10 so that when the device 7 is worn around the heel 91, the air chambers 22 are disposed on the lateral and medial sides of the foot 90 at an elevation at or slightly below the Sub-talar joint 95 as shown in Figs. 2, 3, and 5. In the preferred embodiment, the air chambers 22 are triangular in shape and are designed to compress the heel by exerting pressure to the lateral and medial aspects of the calcaneus. The vertical leg 23 of each air chamber 22 begins at a point on the foot adjacent to the protuberance on the calcaneus 96 and extends upward ending at approximately the Sub-talar joint 95. The horizontal leg 24 of each air chamber 22 extends forward to a point just below the midline of the transverse arch of the foot 90. The hypotenuse 25 of each air chamber 22 slopes downward from back to front.

As shown in Fig. 6, the air chambers 22 may be manufactured rectangular in shape.

Selected areas of inside wall 14 of each air chamber 22 are attached to the outside wall to form connection points 50 which act to prevent each air chamber 22 from excessively "pillowing" outward when inflated.

As shown in Fig. 5, the air chambers 22 are interconnected via a "T"- shaped conduit 27 so that pressurized air can be evenly distributed therebetween. Attached to the upper end of the conduit 27 is an air control valve 30. In other embodiments, not shown, each air chamber 22 may have a separate conduit and a separate air control valve 30.

The heel cup 10 is provided with a fastening means for securing it around the user's foot 90. In the preferred embodiment, shown in Figs. 1-5, the fastening means includes an adjustable strap 40 which extends over the dorsal area of the foot 90 and attaches to the opposite side of the heel cup 10. Strap 40 is fixed at one end to one side to the heel cup 10. When the strap 40 is pulled across the dorsal region of the foot 91, it adjustably attaches to a first pad 35 made of hook connector material firmly affixed to the external surface of the outside wall 15 located on the opposite side of the heel cup 10. The inside surface 41 of the strap 40 is made or covered with loop connector material which can be interconnected to the first pad 35 to securely attach the strap 40 thereto.

In an alternative embodiment shown in Fig. 6, strap 42 is a separate structure capable of being adjustably attached at each end to the heel cup 10. Strap 42 has a first detachable end 43, a second detachable end 44, and an inside surface 43 made or covered with loop connector material. A first pad 35 of hook connector material (not

shown) is attached to the external surface similar to the first embodiment which engages the second detachable end 44 of the strap. A second pad 44, made of hook connector material similar to first pad 35, is firmly affixed to
5 the external surface of the outside wall 15 opposite the first pad 35 so that the first detachable end 43 of strap 42 may be adjustably attached to the heel cup 10.

In other embodiments, straps 40 and 42 may be made of elastic material to provided greater adjustability.

10 As mentioned above, the air chambers 22 are attached to a air control valve 30 which attaches to an external air source (not shown) to inflate each air chamber 22. The direction of air through the air control valve 30 can be controlled thereby enabling the user to control the
15 amount of air into each air chamber 22. When the device 7 is worn with different types of shoes, this feature enables the user to adjust the device 7 for greater comfort and support. When the air chambers 22 are deflated, the device 7 can be stored and packaged in
20 compact manner.

Upon inflation, the air chambers 22 expand and exert pressure on the lateral and medial sides of the heel 91. Since only one air control valve 30 is connected between the two air chambers 22, the amount of pressure exerted
25 by the air chambers 22 on opposite sides of the heel 91 are substantially equal.

The device 7 will normally be worn with various types of footwear, although it may be worn separately, if

desired. In the preferred embodiment, the air control valve 30 is disposed externally so that the user can selectively inflate or deflate the air chambers 22 without removing the device 7 from the footwear or the foot. As shown in Fig. 5, in the preferred embodiment a flap structure 60 is attached centrally to the heel cup 10 along the upper curved edge 12. As shown in Fig. 7, when the device 7 is worn with shoes 98, the flap structure 60 may be folded over the rear surface 99 of the shoe 98. A pad 65 made of hook or loop connector material is fixed to the exterior surface 62 of the flap structure 60 which is interconnected with a pad 66 made of complimentary hook or loop connector material fixed to the rear surface 99 of the shoe 98 to hold the flap structure 60 in a folded position. When the flap structure 60 is in the folded position, the air control valve 30 extends rearward from the interior surface 61. In another embodiment, shown in Fig. 8, the flap structure 60 extends upward during normal use with the air control valve 30 extending from the exterior surface 62 so that the air control valve 30 is in an exposed position.

Fig. 6 shows an optional heel pad 70, made of foam material or some other shock absorbing material, attached to the horizontal heel surface 17 to provide addition protection against impact forces.

From the foregoing, it will be assumed that numerous variations and modifications of the invention can be

made. For example, the size, shape, and location of the air chambers 22 in the heel cup 10 can be varied. The air control valve 30 may be eliminated so that the heel cup 10 is manufactured fully sealed with air contained
5 therein and still perform the same functions of compressing and stabilizing the heel.

The advantages of using an heel cup 10 with two air chambers 22 which exert, equal but opposite compressive forces to the lateral and medial aspects of the
10 calcaneus 96 can best be understood by reviewing Figs. 4 and 9, showing the air chambers 22 in an inflated state. The air chambers 22, when inflated, exert pressure on the lateral and medial sides of the calcaneus 96 which act to hold or stabilize the calcaneus 96 in the foot 90. By
15 stabilizing the calcaneus 96 in this manner, irritation and inflammation of the calcaneus 96 and the adjacent tissues is reduce, which reduces heel pain.

As shown in Fig. 9, when the air chambers 22 exert pressure laterally and medial to the calcaneus 96, they
20 also force soft tissue "T" surround the calcaneus 96 downward to form a fat pad 97 under the calcaneus 96. This fat pad 97 provides a layer of cushion to protect the calcaneus 96.

Using the device 7 to stabilize the calcaneus in the
25 manner described above, the device 7 may be used with or without shoes to treat several different foot conditions. First, the device 7 may be used to reduce heel valgus or varus which may cause irritation of the calcaneus and

related structures. Second, the device 7 may be used to reduce formation of bursa and bone spurs. Third, the device 7 may be used with small children with calcaneal apophysitis to stabilize and to elevate the heel to prevent and/or reduce inflammation of the growth plate located within the calcaneus. In addition to these uses, the device 7 may be used with shoes to improve shoe fit for individuals having abnormal narrow heels. After attaching the device 7, the individual would place the foot into a shoe and then inflate the air chambers until the heel slippage was reduced.

Also using the device 7 with a shoe, a novel method of treating acute or chronic heel pain is provided. The method comprises the following steps:

- (a). positioning on a foot having heel pain a heel stabilizing device having an air bladder capable of stabilizing the heel of a foot by exerting compressive pressure to the lateral and medial sides of the calcaneus when worn around the heel of a foot;
- (b). attaching the foot to a shoe, and;
- (c). inflating the air bladder until a sufficient amount of pressure is exerted on the calcaneus to stabilize it in the foot;

Since the device 7 can be worn with different shoes, the following optional steps are included:

- (d). removing air from the air bladder;
- (f). removing the foot from the shoe, and;
- (g). inflating the air bladder until a sufficient

amount of pressure is exerted on the calcaneus to stabilize it in the foot.

In compliance with the statute, the invention has been described in language more or less specific as to structural features. It should be understood, however, that the invention is not limited to the specific features shown since the means and construction shown comprises the preferred forms of putting the invention into effect. The invention is, therefore, claimed in any of its forms or modifications within the legitimate and valid scope of the amended claims, appropriately interpreted in accordance with the doctrine of equivalents.

INDUSTRIAL APPLICABILITY

The invention disclosed herein, will have wide application in the podiatric and medical fields concerned with the treatment of acute and chronic foot pain. In addition, the invention disclosed herein, will have wide application and use in the shoe industry to improve the fitting of shoes on feet.

CLAIMS

I claim:

1. A device used to stabilize the heel of a foot,
comprising:

- 5 a. heel cup capable of being placed around the
heel of a foot;
- b. an air bladder disposed inside said heel cup,
said air bladder being capable of exerting equal
compressive pressure on the lateral and medial sides of
10 said heel at or slightly below the Sub-talar joint
thereby stabilizing the calcaneus in said foot and
creating or increasing the size of a fat pad disposed
plantarly on said foot below said calcaneus when said
heel cup is placed around said heel and said air bladder
15 is inflated with a sufficient amount of fluid;
- c. an air control valve connected to said air
bladder enabling said air bladder to be selectively
inflated with a pressurized fluid, and;
- d. a fastening means attached to said heel cup
20 capable of attaching said device to said foot.

2. A device, as recited in claim 1, wherein said heel
cup is made of lightweight, flexible material.

- 25 3. A device, as recited in claim 2, wherein said air
bladder is divided into two air chambers which are
separately disposed on the lateral and medial sides of
said heel when said heel cup is attached to said foot.

4. A device, as recited in claim 3, wherein said air chambers are triangular in shape.

5. A device, as recited in claim 3, wherein said air
5 chambers are rectangular in shape.

6. A heel support device, as recited in claim 1,
wherein said fastening means includes a strap fixed at
one end to one side of said heel cup, said strap having
10 an first attachable end, said fastening means further
including an attachment means disposed between said first
detachable end of said strap and the side of the heel cup
opposite the side having said strap integrally attached
thereto, said strap being sufficient length to be
15 disposed over the dorsal area of said foot and attached
to said heel cup on the opposite side of said heel cup to
hold said device around said foot.

7. A heel support device, as recited in claim 6,
20 wherein said attachment means includes a pad of hook or
loop connector material attached to the external surface
of said heel cup opposite said fixed end, said pad of
hook or loop connector material being capable of engaging
the attachable end of said strap.

25

8. A heel support device, as recited in claim 3 wherein
said fastening means includes a strap, said strap
structure having a first and second detachable ends, said

fastening means having first and second attachment means disposed between said first and second detachable ends and said first and second sides of said heel cup to selectively attach said strap to said heel cup, said
5 strap being sufficient length to be positioned across the dorsal area of said foot and selectively attached to the opposite side of said heel cup to hold said device around said heel.

10 9. A device, as recited in claim 1, further including said air control valve being manufactured on an upward extending flap structure attached to said heel cup, said flap structure having an interior surface and an exterior surface.

15 10. A device, as recited in claim 9, wherein said air control valve extends outward from said interior surface of said flap structure.

20 11. A device, as recited in claim 9, wherein air control valve extends outward from said exterior surface of said flap structure.

25 12. A device, as recited in claim 10 further including a flap attachment means disposed between said exterior surface of said flap structure and the rear surface of a shoe to enable said flap structure to be disposed and held in a folded position over said rear surface of said

shoe.

13. A device as recited in claim 9, further including a heel pad disposed horizontally inside said heel cup.

5

14. A device used to treat heel pain, comprising:

a. heel cup capable of being placed around the heel of a foot;

b. an air bladder disposed inside said heel cup,
10 said air bladder being divided into two air chambers which are disposed on opposite lateral and medial sides of said heel at or slightly below the Sub-talar joint when said heel cup is placed around said heel;

c. an air control valve connected to said air
15 bladder enabling said air chambers to be selectively inflated with a pressurized fluid to exert equal compressive pressure on the lateral and medial sides of said heel at or slightly below the Sub-talar joint thereby stabilizing the calcaneus in said foot and
20 creating or increasing the size of the fat pad disposed plantarily on said foot below said calcaneus, and;

d. a fastening means attached to said heel cup capable of holding said device around said heel.

25 15. A device, as recited in claim 14, wherein said fastening means includes a strap and an attachment means, said strap capable of being disposed over the dorsal area of said foot, said strap having a fixed end securely

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attached to one side of said heel cup and an attachable end capable of being adjustably attached to the opposite side of said heel cup, said fastening means further including an attachment means disposed between said attachable end of said strap and said heel cup to adjustably attached said strap structure thereto.

16. A device, as recited in claim 15, wherein said air chambers are triangular in shape.

10

17. A device, as recited in claim 16, wherein said air control valve is attached to a flap structure attached to said heel cup.

18. A device as recited in claim 17, further including a heel pad disposed horizontally inside said heel cup.

19. A method of treating heel pain, comprising the following steps:

a. positioning around the heel of a foot having heel pain a device having a heel cup that surrounds said heel of said foot, said heel cup having an inflatable air bladder capable of stabilizing said heel of said foot by exerting equal compressive pressure to the lateral and medial sides of said heel at or slightly below the Subtalar joint when said heel cup is worn around said heel of said foot;

b. attaching said foot to a shoe, and;

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c. inflating said air bladder until the sufficient amount of pressure is exerted on said lateral and medial sides of said heel to stabilize said heel and thereby relieve heel pain.

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20. A method of treating heel pain, as recited in claim 19, further including the following steps:

(d). removing said air from said air bladder;

(e). removing said foot from said shoe, and;

10 (f). inflating said air bladder until a sufficient amount of pressure is exerted on the lateral and medial sides of said calcaneus to stabilize said heel.

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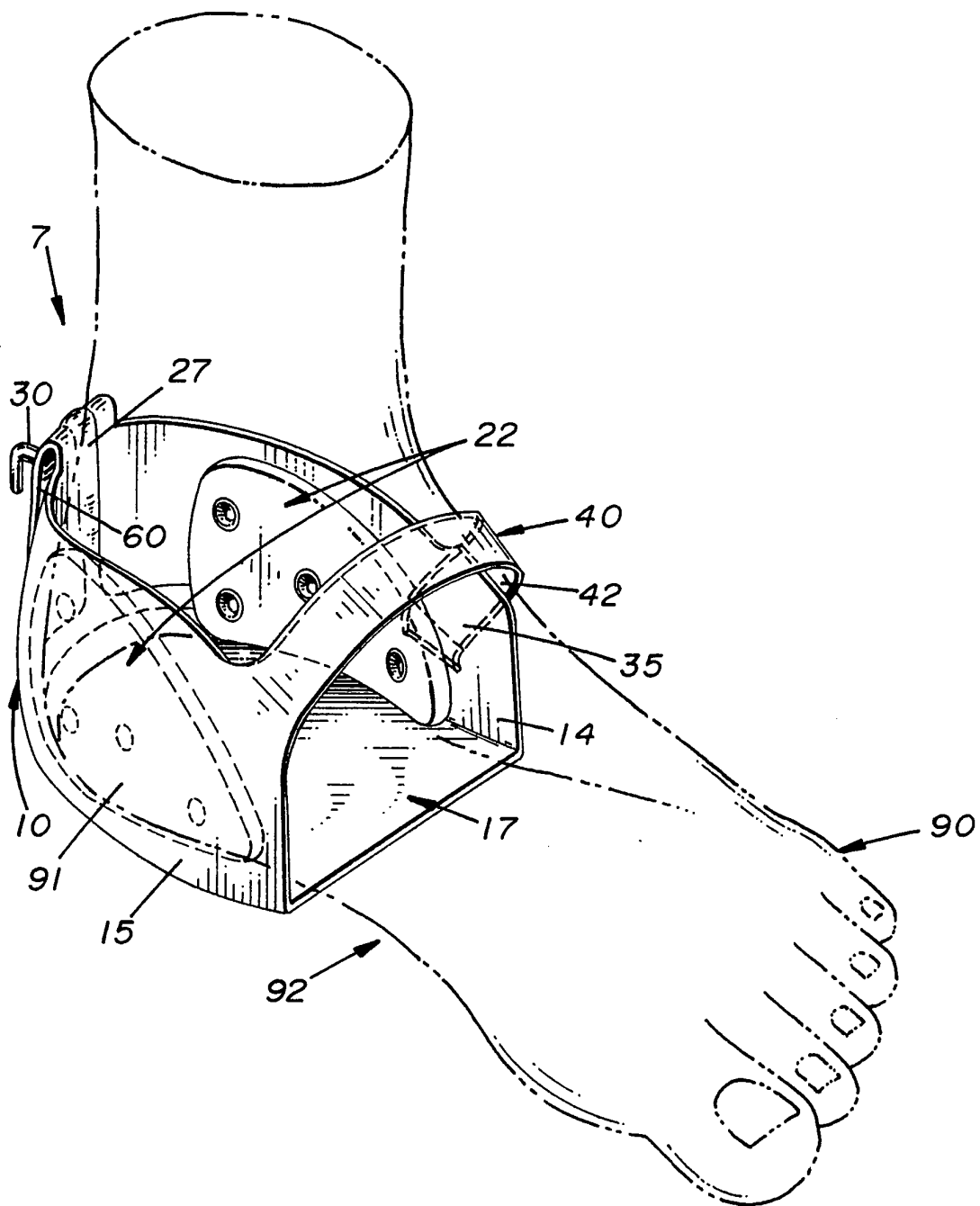
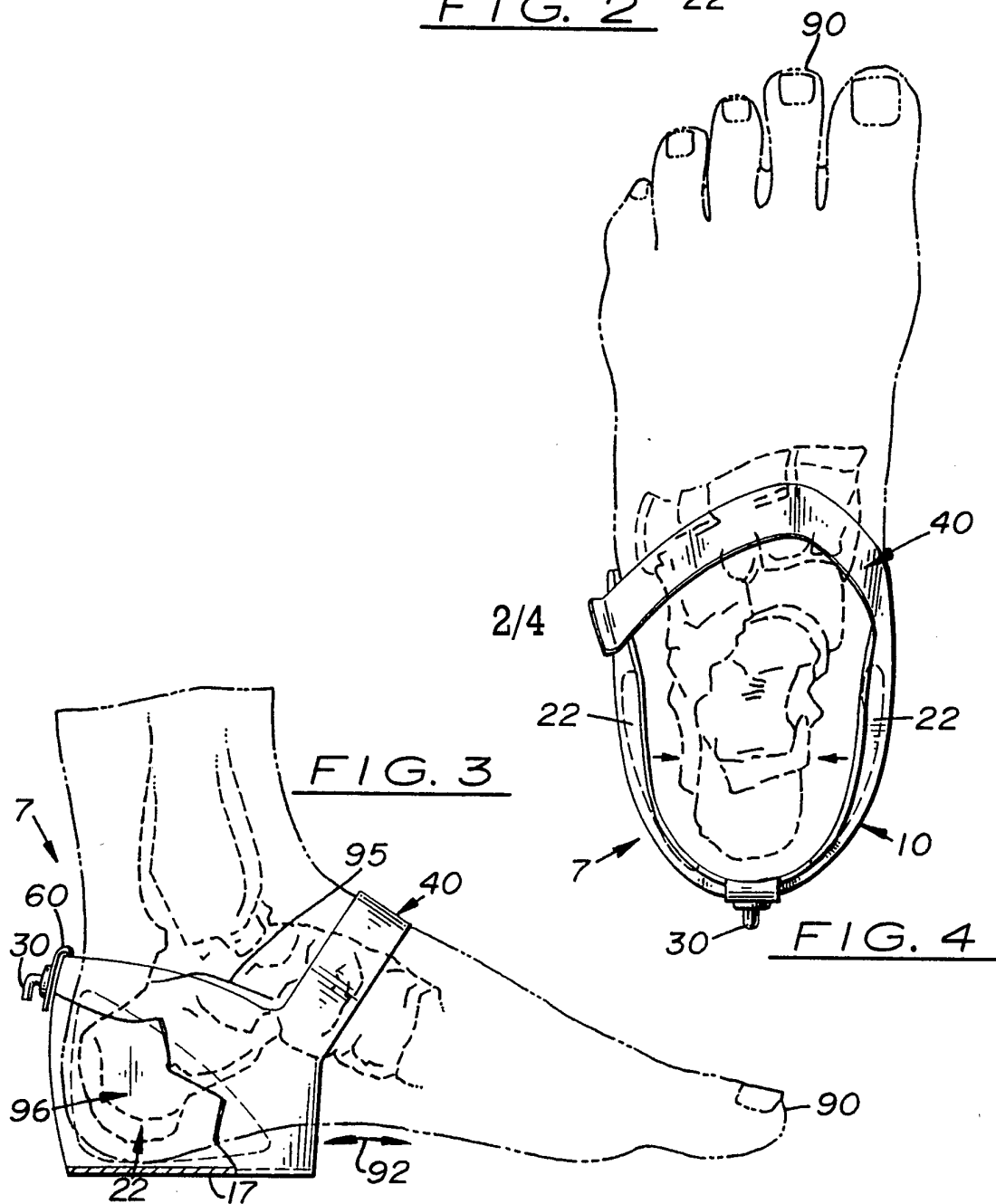
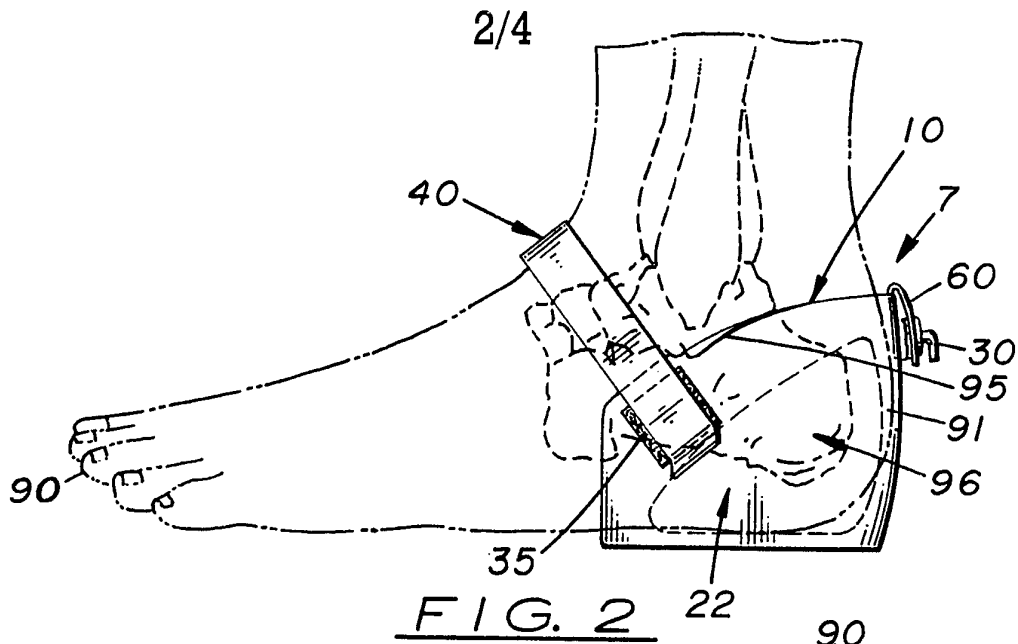
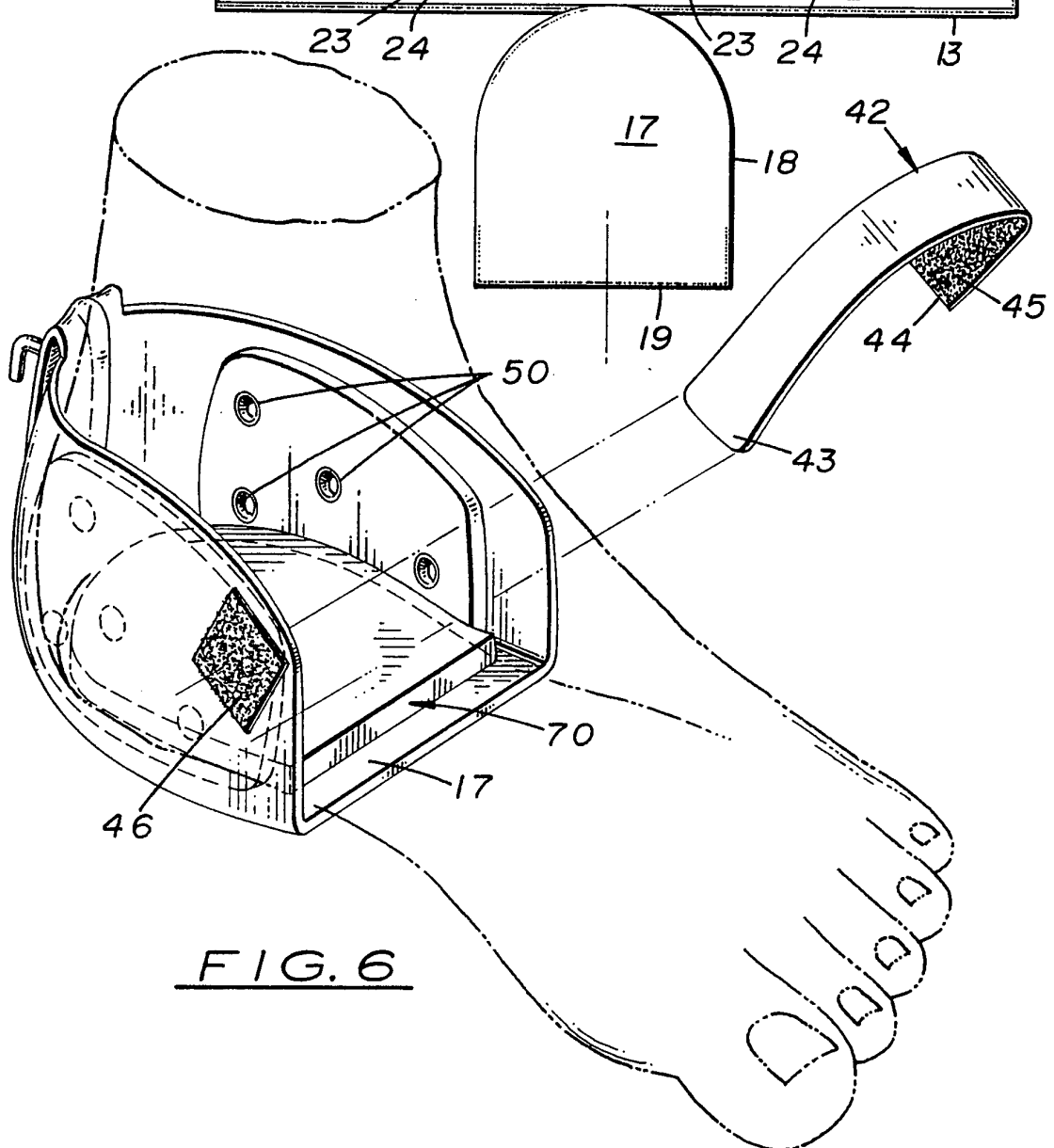
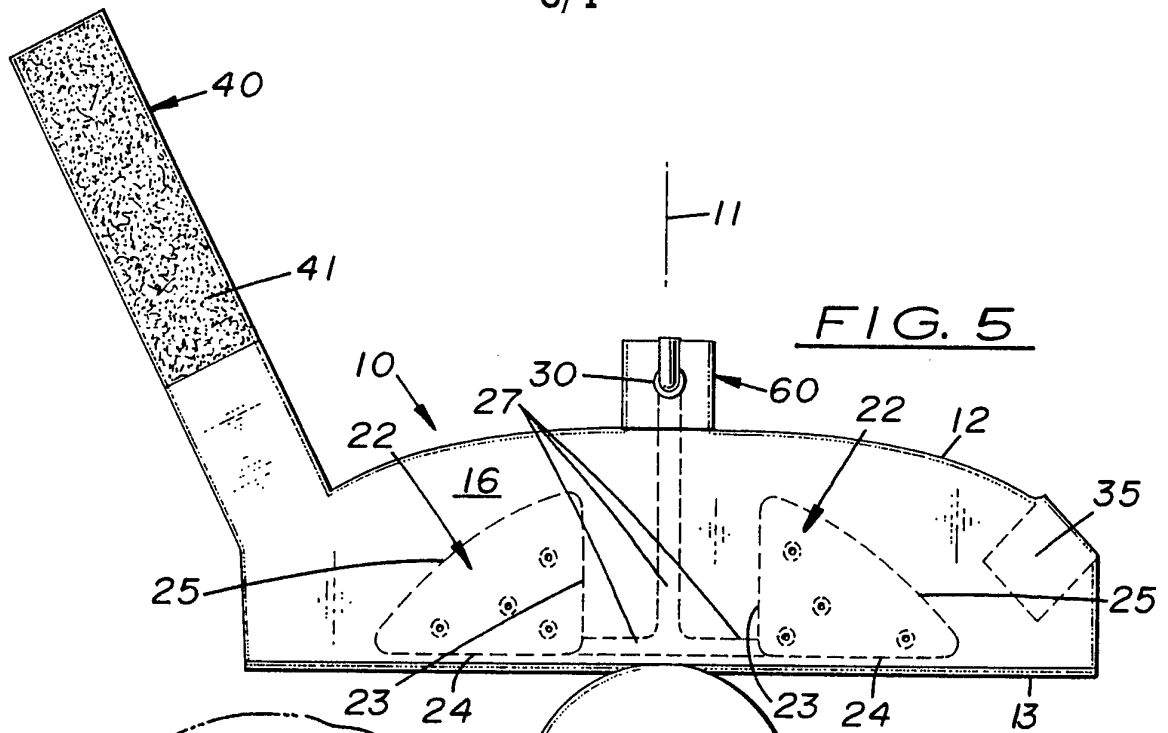


FIG. 1



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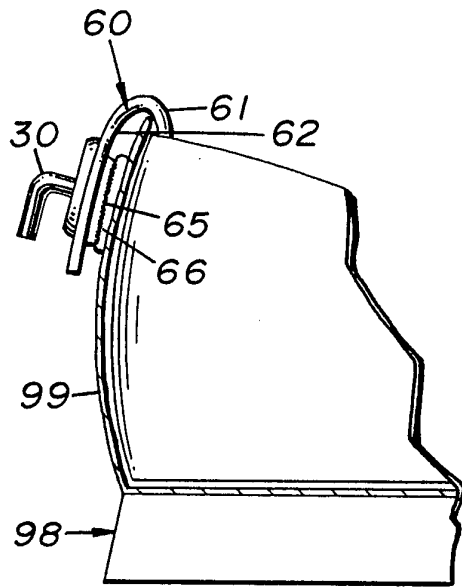


FIG. 7

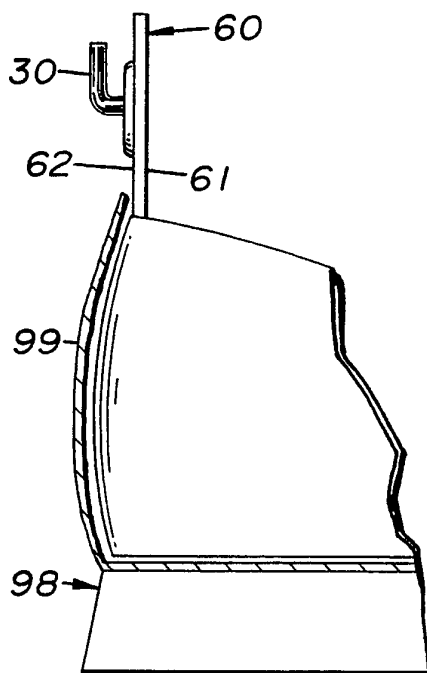


FIG. 8

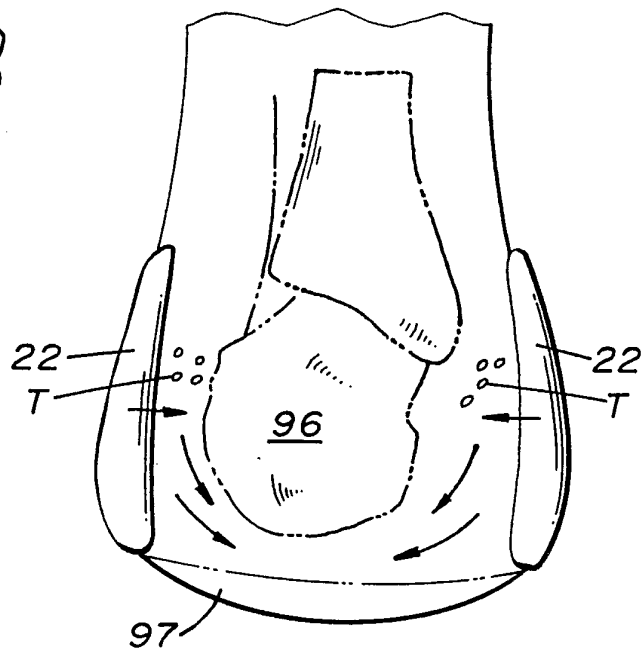


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US94/00971

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :A43B 19/00

US CL :36/71

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 36/50.1, 35R, 36R, 36B, 55, 71, 89, 92, 93, 132

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONEElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
NONE**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 2,774,152 (ALBER) 18 December 1956, col. 3, lines 10-15.	9-12, 17
X	US, A, 2,830,585 (WEISS) 15 April 1958, col. 2, lines 3-38.	1-3, 5, 8, 14, 19
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Y		4, 6, 7, 9-13, 15-18, 20
Y	US, A, 3,810,318 (EPSTEIN) 14 May 1974, col. 5, lines 39-50.	9-12, 17
Y	US, A, 4,266,298 (GRAZIANO) 12 May 1981, col. 1, lines 35-63.	19, 20



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US94/00971

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 4,724,627 (SISCO) 16 February 1988, col. 5, lines 24-36.	1-4, 16
Y	US, A, 4,730,610 (GRAEBE) 15 March 1988, col. 3, lines 1-4.	6, 7, 13, 14, 15, 18
A	CH, A, 333,156 (ZANETTI) 15 October 1958.	NONE
A	DE, A, 2,316,014 (HERUNTER) 08 November 1973.	NONE