

19



Europäisches Patentamt
European Patent Office
Office européen des brevets

11

Publication number:

0 150 553
A2

12

EUROPEAN PATENT APPLICATION

21

Application number: **84304060.1**

51

Int. Cl.⁴: **A 61 H 23/04**

22

Date of filing: **15.06.84**

30

Priority: **22.06.83 GB 8316959**
11.11.83 GB 8330138

71

Applicant: **Gardner, Arthur Michael Newsam, The Priory, Ipplepen Devon (GB)**
Applicant: **Fox, Roger Harrington, Winthills Dartington, Totnes Devon (GB)**

43

Date of publication of application: **07.08.85**
Bulletin **85/32**

72

Inventor: **Gardner, Arthur Michael Newsam, The Priory, Ipplepen Devon (GB)**
Inventor: **Fox, Roger Harrington, Winthills Dartington, Totnes Devon (GB)**

84

Designated Contracting States: **AT BE CH DE FR IT LI NL SE**

74

Representative: **Cross, Rupert Edward Blount et al, BOULT, WADE & TENNANT 27 Furnival Street, London EC4A 1PQ (GB)**

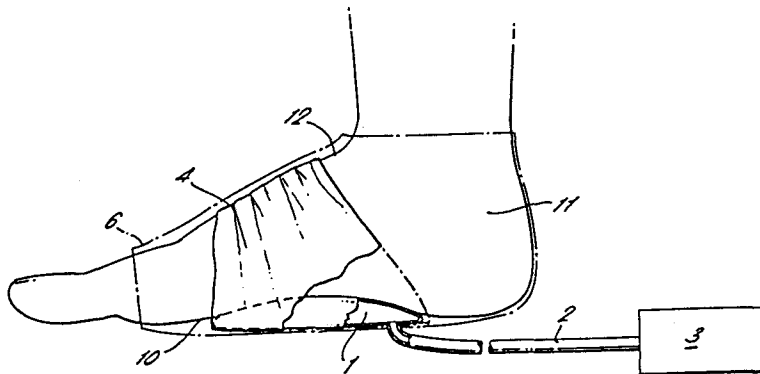
54

Medical appliance for applying a pumping action to the sole of a foot.

57

A medical appliance for applying pumping pressure to the sole (10) of a human foot (11) comprises an inflatable bag (1) which in use is held in engagement with the foot (11), for example by means of a sling (4), a plaster cast or an article of footwear, and which can be inflated rapidly by means of, for exam-

ple, a pump (3). At least the part of the bag (1) in contact with the foot (11) can be of air permeable material allowing controlled deflation of the bag. The appliance serves to stimulate venous blood flow in the limb carrying the foot (11).



TITLE MODIFIED MEDICAL APPLIANCE
see front page

This invention relates to a medical appliance, and particularly to a medical appliance for applying pressure to a part of a human body for the purpose of stimulating blood circulation.

5 Such medical appliances are known which comprise a double-walled sheath adapted to fit over a limb, for example an arm or a lower leg portion, to be treated, and a pump apparatus arranged to inflate and deflate the sheath cyclically thereby to apply a
10 pumping action to the limb and thus assist venous blood-flow therein.

 A particular disadvantage of such known appliances is that they cannot be used when the limb to be treated is also to be encased in a plaster
15 cast, or sometimes when the limb has been subjected to surgery.

 A further disadvantage of known appliances is that they are not suited to continuous wear by a user.

 These disadvantages are particularly
20 significant in relation to appliances for use on feet

and legs where as is known stimulation of blood flow is desirable when the limb cannot be used for walking.

We have discovered a venous pump mechanism in the sole of the human foot, which under normal walking conditions for the foot, serves to return blood from the leg into the abdomen with no assistance from muscular action.

According to one aspect of this invention there is provided a medical appliance comprising an active device for engagement, in use, with at least the sole of a human foot, said device being operative, in use of the appliance to apply pressure cyclically to said sole thereby to stimulate the venous pump mechanism in said foot.

Preferably said active device includes means to render said device active when said foot is not in use for ambulation.

According to another aspect of this invention there is provided a medical appliance comprising an active device in the form of an inflatable bag shaped for engagement with at least the sole of a human foot; inflation means connected to the bag and capable of inflating the bag rapidly; means to deflate the bag; and means to secure the bag to a human foot such that when being inflated the bag applies pumping pressure

to the sole of the foot.

Two medical appliances embodying this invention will now be described by way of example with reference to the drawings, in which:-

5 Figure 1 is a view of a first appliance with part broken away in position on a human foot;

 Figure 2 is a view similar to Figure 1 but showing a sectional view of the second appliance; and

 Figure 3 is a sectional view on the line
10 III-III in Figure 2.

 Referring to Figure 1, the appliance here shown comprises an inflatable bag 1 formed of plastics material and shaped for engagement with the sole 10 of a human foot 11 in the plantar arch thereof. The bag
15 1 is connected by way of a flexible pipe 2 to a pump apparatus 3 by which the bag 1 can be inflated.

 The bag 1 is secured to the foot 11 by means of a cloth sling 4 which embraces the bag 1 and is secured over the instep 12 of the foot 11. Padding
20 material can be located between the sling 4 and the instep 12 if necessary or desirable.

 The sling 4 and bag 1 are covered by a cloth slipper 6 which covers the majority of the foot 11.

 In use of the appliance when secured to a
25 foot as shown in Figure 1, the pump apparatus 3

operates rapidly to inflate the bag 1 which then applies a pumping pressure to the sole 10 of the foot 11, and also urges the ball and heel of the foot away from each other, thus flattening the plantar arch as would occur if the foot 11 was placed on the ground during normal ambulation, thereby stimulating venous blood-flow. A valve arrangement (not shown) in the pump apparatus 3 then allows the bag 1 to deflate whereafter the bag 1 is again inflated, the inflation/deflation cycle being repeated as long as treatment with the appliance is required.

Preferably inflation of the bag 1 is effected in two seconds or less to provide a satisfactory pumping action, while deflation of the bag 1 can take as long as is necessary for the return of blood to the veins of the foot 11.

The treatment thus provided simulates walking on the foot 11, and thereby improves venous blood circulation in a person being treated who would normally be unable to walk or possibly even stand on the foot.

As a modification of the above described appliance, the valve arrangement in pump apparatus 3 can be dispensed with, the pump apparatus serving

only for cyclic inflation of the bag 1, and at least the surface of the bag 1 in contact with the foot 11 being formed with air leakage orifices thereby to be permeable to air, or being made of a material which is inherently permeable to air, such material being sold under the name VALMIC Microporous Film by Van Leer of the United States of America. Such a surface can be provided as will give the required period for deflation of the bag 1.

10 Such an appliance gives the advantages that the air leaving the permeable surface of the bag 1 serves to prevent accumulation of moisture between the bag 1 and the foot 11, this enhancing the comfort of the user of the appliance and making skin problems less likely.

15 A particular advantage of the appliance of this invention is that it can be used when a foot is to be encased in a plaster cast, or when the leg carrying the foot 11 has been subjected to surgery.

20 Figures 2 and 3 of the drawings show an appliance in position for use on a human foot 11 under a plaster cast 100, the same reference numerals as used in Figure 1 being used for corresponding parts.

25 The appliance shown in Figures 2 and 3 is similar to that shown in Figure 1 but is larger and

extends not only under the sole 10 of the foot 11 but also around the inside of the foot 11 and over the instep 12 of the foot 11.

For use, the appliance is positioned on the
5 foot 11 and the plaster cast 100 is then formed over the bag 1 as required, with the pipe 2 from the pump apparatus 3 passing either through a hole in the cast 100 or out of one end of the cast 100.

The bag 1 can be maintained in a partially
10 inflated condition while the plaster cast 100 is formed whereby allowance for subsequent possible swelling of the foot 11 is made.

As a modification of the appliance shown in Figure 1 or Figures 2 and 3 of the drawings the
15 bag 1 can be incorporated in an article of footwear, such as a conventional boot, to be worn by a person needing to use the appliance.

CLAIMS:

1. A medical appliance comprising an active device (1) for engagement, in use, with at least the sole (10) of a human foot (11), said device being operative in use of the appliance, to apply pressure
5 cyclically to said sole (10) thereby to stimulate the venous pump mechanism in said foot (11).

2. An appliance as claimed in Claim 1, in which said active device includes means (2, 3) to
10 render said device (1) active when said foot (11) is not in use for ambulation.

3. An appliance as claimed in Claim 1, or Claim 2, in which said active device (1) is shaped for
15 engagement with the sole (10), around the inside, and over the instep (12) of said foot (11).

4. A medical appliance comprising an active device in the form of an inflatable bag (1) shaped for
20 engagement with at least the sole (10) of a human foot (11); inflation means (3) connected to the bag (1) and

capable of inflating the bag (1) rapidly; means to deflate the bag; and means (4; 100) to secure the bag (1) to a human foot (11) such that when being inflated the bag (1) applies pumping pressure to the
5 sole (10) of the foot (11).

5. An appliance as claimed in Claim 4, in which the bag (1) is substantially totally impervious to air, said deflation means comprising a valved
10 outlet from the bag (1).

6. An appliance as claimed in Claim 4, in which said deflation means comprises a surface of the bag (1), which is permeable to air and which in use of
15 the appliance contact the foot (11).

7. An appliance as claimed in Claim 6, in which said surface is formed with air leakage orifices.

20 8. An appliance as claimed in Claim 6, in which said surface is formed of inherently air permeable material.

9. An appliance as claimed in any one of Claims
25 4 to 8, in which said inflation means (3) is capable

of inflating the bag (1) in two seconds or less.

10. An appliance as claimed in any one of
Claims 4 to 9, in which the bag (1) is shaped for
5 engagement with the sole (10), around the inside,
and over the instep (12) of said foot (11).

11. An appliance as claimed in any one of
Claims 4 to 10, in which said securing means comprises
10 a plaster cast (100) formed about the bag (1) and the
foot (11) of a user of the appliance.

12. An appliance as claimed in any one of
Claims 4 to 10, in which said securing means comprises
15 an article of footwear to be worn by a user of the
appliance.

1/2

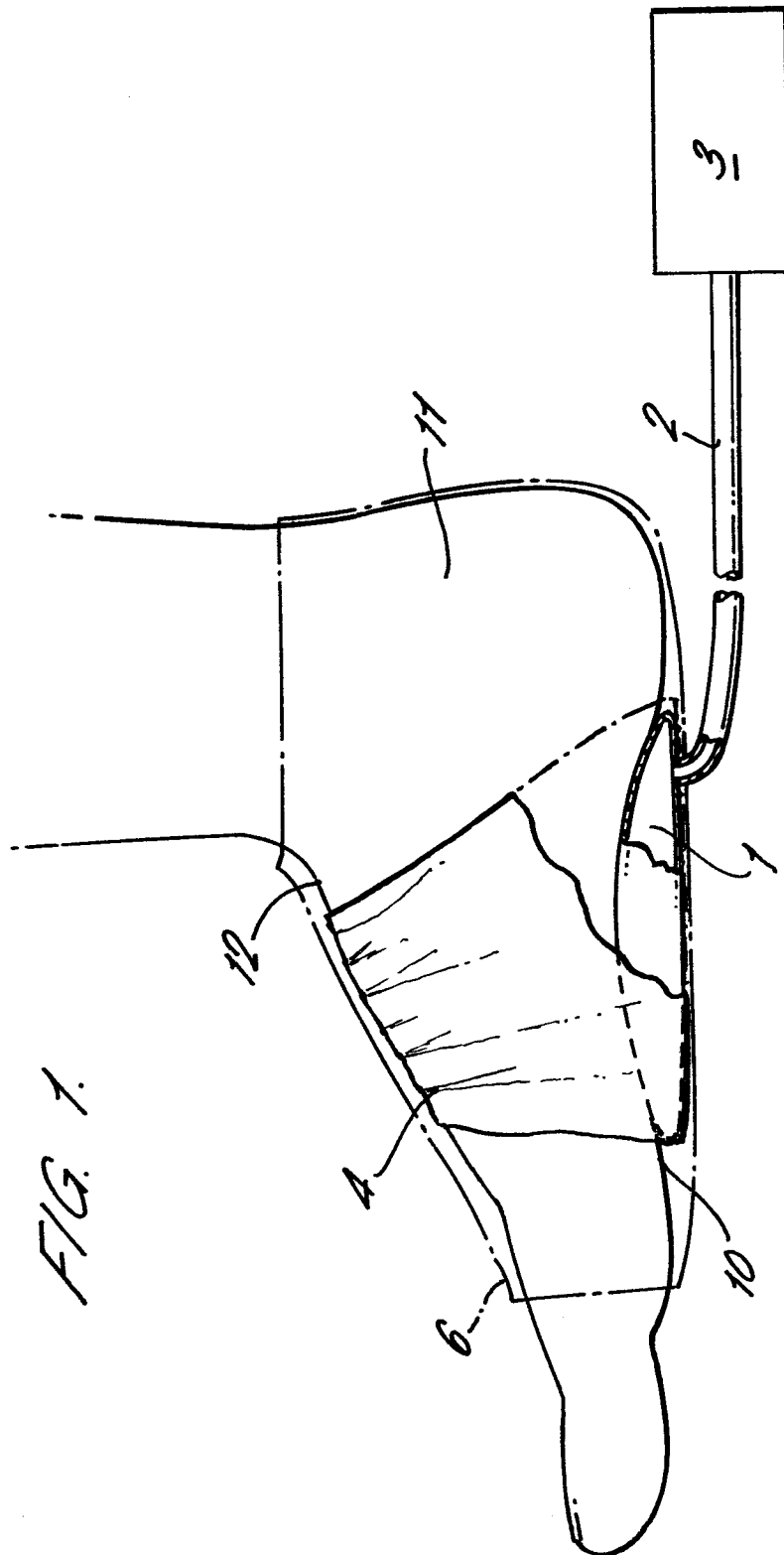


FIG. 1.

2/2

