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(54) Improvement in a method of and an apparatus for taking footprints and manufacturing the positive pattern thereof by a pneumatic system without using disposable material

(57) A method of taking negative footprints (1) and manufacturing positive moulds (2) suitable for forming custom-made arch supports and/or anatomic insoles, characterized in that in order to avoid the employment of disposable materials it provides for two bags (5) that are exactly identical to each other, i.e. one for taking footprints (RI) and one for manufacturing positive moulds (FP), and sealing means 7 to be put between the two bags (RI, FP) for obtaining positive footprint (2) after having taken negative footprint (1), said bags (5) being able to be used over and over again both for taking negative footprints (1) and moulding positive moulds (2), thus reducing the production costs.

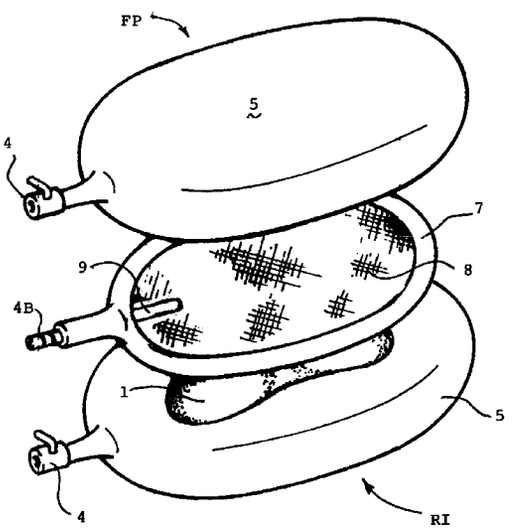

FIG. 3

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Description

[0001] The present invention relates to orthopaedics and more particularly to an improved method of manufacturing custom-made arch supports and anatomic insoles.

[0002] The known methods of manufacturing arch supports provide for taking the footprint by plastic pastes (plasticine), foams and/or plaster casts. The positive form, on which the arch support will be moulded, is made in such cases by casting plaster or rigid polyurethane foams into the negative footprints. One problem of the known art is given by that such methods necessarily make use of disposable materials which increase the cost. Furthermore, a long processing time is requested in order for the plaster or the plastic material to be allowed to set completely as well as the moulds and the moulding tools stained with plaster to be cleaned. There is known a method filed by the same Applicant which consists of taking the footprint and manufacturing the positive moulds which are suitable for moulding custom-made arch supports without using disposable materials. Such a method has the drawback of necessarily using different devices for the several manufacturing steps. Particularly, aids are needed for taking negative footprints as well as moulders of positive moulds which can be used several times but are different from one another as specifically directed to the function that they perform.

Moreover such aids for taking negative footprints and said moulders of positive moulds are complicated both in their construction and mode of use.

A first object of the invention is therefore to overcome all of the problems of the known art by providing a method of taking a negative footprint and manufacturing positive moulds by which custom-made arch supports can be moulded in a particularly easy fashion.

A second object of the invention is to provide means that puts the above method in practice and are of simple construction and easy usability.

A third object of the invention is to provide means for putting in practice the above method which can be used both for taking negative footprints and manufacturing positive moulds.

[0003] A better understanding of the invention will ensue from the following description which illustrates only by way of example a preferred not limiting embodiment with reference to the accompanying drawings. In the drawings:

Figure 1 shows how the footprint is taken;

Figure 2 is a cross-section view of the bag which can be used as means for taking footprints or moulding positive moulds;

Figure 3 is an exploded view showing the arrangement of the several parts for moulding the positive mould;

Figure 4 is a side elevation view of means for moulding the positive mould; and

Figure 5 shows the corresponding surfaces of the negative footprint and the positive mould.

[0004] According to the invention the method to be described provides two means 5, one for taking negative footprint 1 of the patient and one for manufacturing positive mould 2 on which the moulding of the custom-made arch supports has to be made, and sealing means 7 to be put temporarily between the first two means for obtaining positive footprint 2 after having taken negative footprint 1.

A first peculiar characteristic of said means 5 is that they are exactly the same even if they can be used from time to time for taking negative footprints 1 and moulding positive moulds 2, which reduces advantageously the production costs.

A second peculiar characteristic of the invention is that each means 5 has a very simple construction. In fact such means consists essentially of a sealed bag, preferably of latex or other material, which can be easily deformed and that contains granular material 6 such as sand and is capable of taking the patient's footprint. Such a bag 5 is closed by a gas sealing tap 4 which is can be connected to a vacuum pump.

In case of a deformable bag 5 which is used as a means for taking footprints RI, the shape that it takes because of the weight borne by the patient's foot which has been put thereon is kept and made stable and sturdy enough by the fact that tap 4 communicating with the inside of the bag is connected to a vacuum pump which sucks in all of the air from the inside of bag 5. In such a way, granular material 6 inside bag 5 is compacted and keeps the same shape that it had previously taken.

Once negative footprint 1 of the foot is "frozen", deformed bag 5 is placed on a working table and a second bag 5 is placed thereon with the interposition of sealing member 7.

Upper bag 5 is capable of being deformed so as to develop positive mould 2 corresponding to negative footprint 1 in lower bag 5. To this end, said sealing member 7 consists essentially of a ring of a very soft elastic material which is capable of fitting in and sealing tightly the contour of both overlapped bags 5. Such a sealing function is very important in order to allow all of the air between the two overlapped bags 5 to be sucked in, thus causing the upper bag to become deformed and to take on a "positive" shape 2 corresponding to negative footprint 1 of lower bag 5. To this end, sealing ring 7 is provided with an intake pipe connected to a quick-coupling connector 4B outside the ring and provided with an open end 9 projecting inside the ring.

In other words, after the two bags 5 which are respectively used as a means for moulding positive moulds FP

and a means for taking negative footprints RI have been overlapped so that the contours of the lower surface of the upper bag and those of the upper surface of the lower bag are put in contact with sealing ring 7, the air between the two bags is sucked in through quick-coupling connector 4B connected to pipe 9 communicating with the inside of sealing ring 7 and negative footprint 1, so that the lower surface of upper bag FP is deformed and takes the same shape as negative footprint 1 of lower bag FI.

Preferably a weight 3 is placed on the two overlapped bags 5 in order to improve the sealing and then the shaping of positive mould 2. To this end it is recommended that such a weight 3 has a flat lower face so that upper bag 5 used as moulder of positive moulds FP has no depressions or protrusions which could hinder the manufacturing of the arch supports that follows.

In the preferred embodiment herein described, a thin elastic membrane 8, preferably of cloth or thin net, is provided inside sealing ring 7 so as to prevent any undesired adhesion between negative footprint 1 and positive mould 2.

It is self-evident from the foregoing that said sealing ring 7 should have such a size as to surround negative footprint 1 and to leave a free side edge so as to make negative footprint 1 perfectly corresponding to positive mould 2.

[0005] The method herein described includes essentially the following steps:

1 - taking the patient's footprint under load by one of the bags 5 used as means for taking footprints RI (Fig. 1);

2 - matching the contours of the footprint which has been taken with the patient's foot;

3 - fixing negative footprint 1 by sucking the air from the inside of bag 5 of footprint taking means RI through tap 4 (Fig. 2);

4 - superimposing a second bag 5 used as a moulder of positive moulds FP onto negative footprint 1 of footprint taking means FI with the interposition of a sealing ring means 7;

5 - adapting by a suitable manipulation the lower surface of deformable bag 5 used as a moulder of positive moulds FP in such a way that its lower surface fits tightly the contour of the underlying negative footprint of footprint taking means RI (Fig. 3);

6 - sucking in air from the inside of sealing means 7 and negative footprint 1 by a quick-coupling connector 4B of the sealing means so that the lower surface of the moulder of positive moulds FP matches with the upper surface of footprint taking means RI filling negative footprint 1 so as to form a positive mould 2 of the patient's foot;

7 - sucking in air from the inside of bag 5 of the moulder of positive moulds FP through a tap 4 so as to fix positive footprint 2;

8 - removing weight 3 and positioning positive footprint 2 in a suitable thermoforming machine TF of the known type (not shown) and manufacturing the arch supports according to known methods.

[0006] Once the custom-made arch support or anatomic insole is manufactured, air is allowed inside bags 5 again so that they can recover their original form and be ready for a new utilization.

It is evident from the description of the steps of the above method that the latter implies advantageously a reduction of the processing time as well as a cleanliness of the working steps.

Claims

1. A method of taking negative footprints (1) and manufacturing positive moulds (2) which are capable of forming custom-made arch supports and/or anatomic insoles, characterized in that in order to avoid the employment of disposable materials it provides for the utilization of two means (5) that are exactly identical to each other, i.e. one for taking footprints (RI) and one for manufacturing positive moulds (FP), and sealing means 7 to be put between said former two means (RI, FP) for obtaining positive footprint (2) after having taken a negative footprint (1), said means (5) being able to be used again from time to time both for taking negative footprints (1) and moulding positive moulds (2), thus reducing the production costs.

2. The method of claim 1, characterized in that such means (5) consists essentially of two identical airtight bags, preferably of latex or other material, which can be easily deformed, containing granular material (6) which is able to take the patient's footprint, each of said bags (5) being closed by a gas sealing tap (4) which is apt to be connected to a vacuum pump.

3. The method of the preceding claims, characterized in that in case bag (5) which can be deformed is used as a means for taking footprints (RI), the shape that it takes because of the weight borne by the patient's foot which has been put thereon is kept and made stable and sturdy enough by the fact that tap (4) communicating with the inside of the bag is connected to a vacuum pump which sucks in all of the air from the inside of bag (5), granular material (6) inside bag (5) being compacted and taking the same shape as the bag.

4. The method of the preceding claims, characterized in that once negative footprint (1) of the foot is "frozen", bag (5) used as a means for taking negative footprints (RI) is placed on a working table and a second bag (5) is placed thereon with the interposition of sealing member (7).

5. The method of the preceding claims, characterized in that upper bag (5) deforms so as to develop positive mould (2) corresponding to negative footprint (1) in lower bag (5), said sealing member (7) consisting essentially of a ring of a very soft elastic material which is capable of fitting in and sealing tightly the contour of both overlapped bags (5) so as to cause the upper bag (FP) to become deformed and to take on a "positive" shape (2) matching with negative footprint (1) of lower bag (RI).

6. The method of the preceding claims, characterized in that after the two bags (5) have been superimposed so that the lower surface of the upper bag and the upper surface of the lower bag are put in contact with the interposed sealing ring (7), the air between the two bags is sucked in through a pipe connected to an outside quick-coupling connector (4B) and provided with an end (9) projecting inside the ring and communicating with the inside area of sealing ring (7) and negative footprint (1) so that the lower surface of upper bag (FP) is deformed and takes the same shape as negative footprint (1) of lower bag (FI).

7. The method of the preceding claims, characterized in that a weight (3) is put on the two overlapped bags (5) between which sealing ring (7) has been interposed to improve the sealing and then the shaping of positive mould (2).

8. The method of the preceding claims, characterized in that a thin elastic membrane (8) is provided inside sealing ring (7) so as to avoid any undesired adhesion between negative footprint (1) and positive mould (2).

9. The method of the preceding claims, characterized in that said sealing ring (7) has such a size as to circumscribe negative footprint (1) leaving a side edge free so as to make negative footprint (1) perfectly matching with positive mould (2).

10. The method of the preceding claims, characterized in that the following steps are provided in succession:

    1 - taking the patient's footprint under load by one of the bags (5) used as means for taking footprints (RI);
    2 - matching the contours of the taken footprint with the patient's foot;
    3 - fixing negative footprint (1) by sucking the air from the inside of bag (5) of footprint taking means (RI) through tap (4);
    4 - superimposing a second bag (5) used as a moulder of positive moulds (FP) onto the negative footprint formed in footprint taking means (FI) with the interposition of a sealing ring means (7);
    5 - adapting by a suitable manipulation deformable bag (5) used as a moulder of positive moulds (FP) in such a way that its lower surface fits tightly the contour of the underlying negative footprint formed in footprint taking means (RI);
    6 - sucking in air from the inside of sealing means (7) and negative footprint (1) by a quick-coupling connector (4B) of sealing means (7) so that the lower surface of the moulder of positive moulds (FP) matches with the upper surface of footprint taking means (RI) filling negative footprint (1) so as to form positive mould (2) of the patient's foot;
    7 - sucking in air from the inside of bag (5) of the moulder of positive moulds (FP) through a tap (4) so as to fix positive footprint (2);
    8 - removing weight (3) and positioning positive footprint (2) in a suitable thermoforming machine TF and manufacturing the arch supports according to known methods.

11. The method of the preceding claims, characterized in that it is enough to blow air inside bags (5) again so that they can recover their original shape and be ready for a new utilization.

12. Means for taking negative footprints (1) and manufacturing positive moulds (2) capable of forming custom-made arch supports and/or anatomic insoles, characterized in that in order to avoid the employment of disposable materials there are provided two means (5) that are exactly identical to each other, i.e. one for taking footprints (RI) and one for manufacturing positive moulds (FP), and sealing means (7) to be put between said former two means (RI, FP) for obtaining positive footprint (2) after having taken negative footprint (1), said means (5) being able to be used over and over again both for taking negative footprints (1) and moulding positive moulds (2), thus reducing the production costs.

13. The means of claim 12, characterized in that such means (5) consists essentially of two identical air-tight bags, preferably of latex or other material which can be easily deformed, containing granular material (6) capable of taking the patient's footprint, each of said bags (5) being closed by a gas sealing tap (4) which is able to be connected to a vacuum pump.

14. The means of claims 12 and 13, characterized in that the shape taken by the bags when negative footprint (1) and positive footprint (2) are formed is

kept and made stable and sturdy enough by the fact that tap (4) communicating with the inside of the bag is connected to a vacuum pump which sucks in all of the air inside bag (5), granular material (6) inside bag (5) being compacted and taking on the same shape as the bag.

15. The means of claims 12 to 14, characterized in that upper bag (5) is capable of being deformed so as to make positive mould (2) corresponding to negative footprint (1) in lower bag (5), said sealing member (7) consisting essentially of a ring of a very soft elastic material which is capable of fitting and sealing tightly the contour of both superimposed bags (5) so as to allow the air between the two bags (5) to be sucked and to cause the upper bag (FP) to become deformed and to take on a "positive" shape (2) corresponding to negative footprint (1) of lower bag (RI).

16. The means of claims 12 to 15, characterized in that sealing ring (7) is provided with a sucking tube connected to a quick-coupling connector (4B) outside the ring and having an end (9) projecting inside the ring and communicating with the inside area of sealing ring (7), therefore with negative footprint (1).

17. The means of claims 12 to 16, characterized in that a weight (3) is placed on the two superimposed bags (5) between which sealing ring (7) has been interposed in order to improve the sealing and then the shaping of positive mould (2).

18. The means of claims 12 to 17, characterized in that a thin elastic membrane (8) is provided inside sealing ring (7) so as to prevent any undesired adhesion between negative footprint (1) and positive mould (2).

19. The means of claims 12 to 18, characterized in that said sealing ring (7) has such a size as to circumscribe negative footprint (1) and to leave a side edge free so as to make negative footprint (1) perfectly matching with positive mould (2).

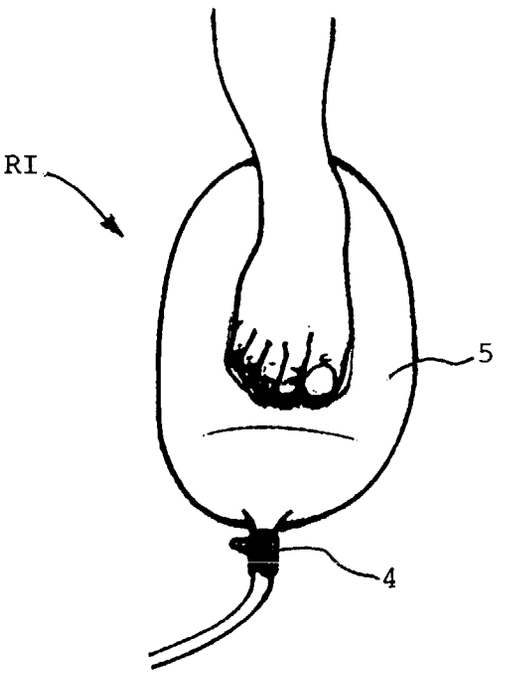

FIG. 1

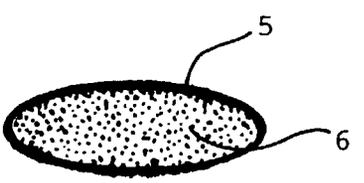

FIG. 2

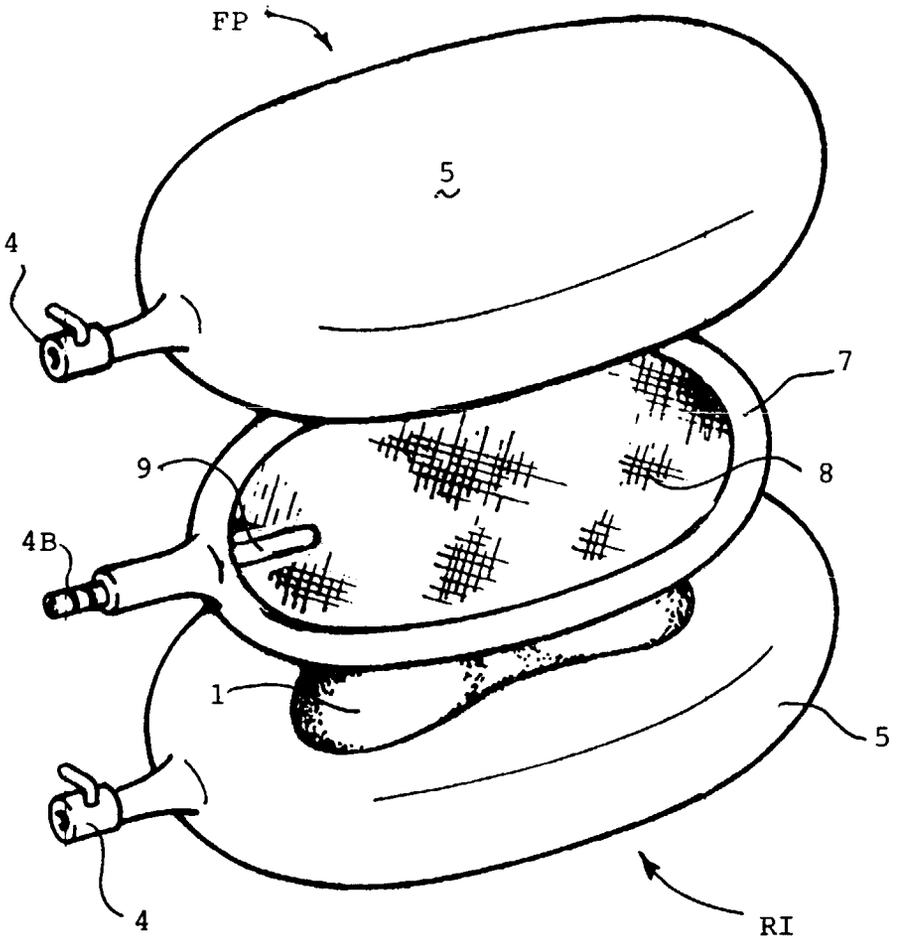

FIG. 3

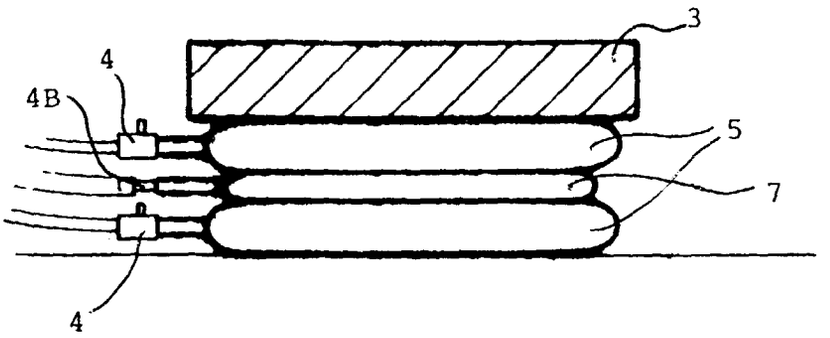

FIG. 4

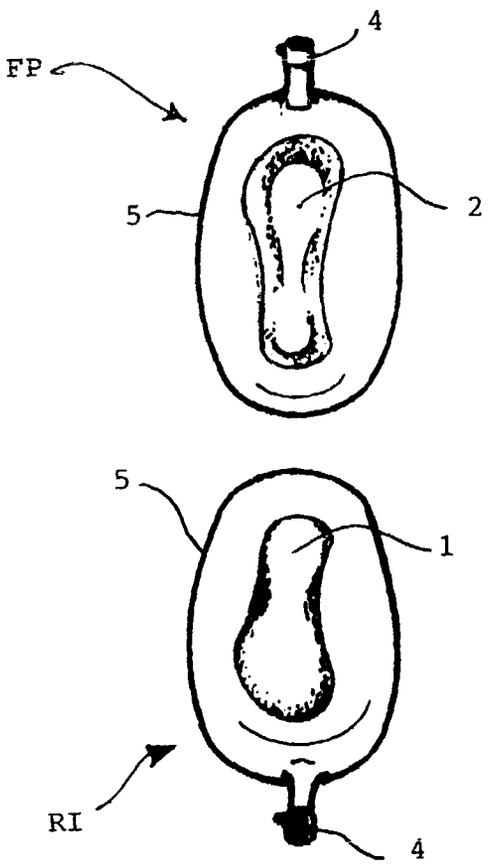

FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 98 83 0178

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	EP 0 310 531 A (POUSSOU ALAIN A) 5 April 1989 * column 8, line 52 - column 10, line 28; figures *	1-19	A43D1/02
A	WO 97 28761 A (KURANOV VLADIMIR BORISOVICH ;AKTSIONERNOYE OBSCHESTVO ZAKRY (RU);) 14 August 1997 * page 7, line 26 - page 8, line 7; figure 9 *	1-19	
A	US 2 472 754 A (MEAD) 7 June 1949 * column 1, line 38 - column 3, line 52; figures *	1-19	
A	GB 1 416 453 A (LANDSTINGENS INKOPSCENTRAL) 3 December 1975 * page 2, line 76 - line 124; figures 1-3 *	1-19	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

A43D
A61B
B29C
A43B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	7 September 1998	Scholvinck, T

CATEGORY OF CITED DOCUMENTS

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