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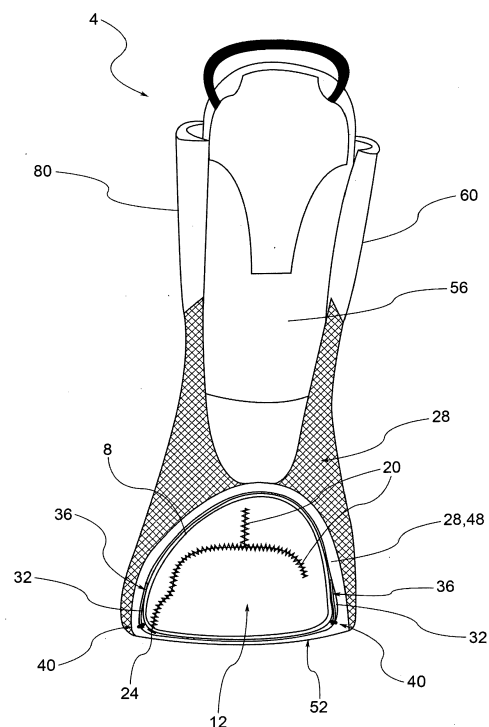
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(54) **IMPROVED BREATHABLE FOOTWEAR, IN PARTICULAR FOR APPLICATIONS TO SKI BOOTS AND/OR SPORTS SHOES, AND RELATED PRODUCTION METHOD**

(57) Breathable footwear (4) comprising a waterproofing and breathable portion (8), at least partially closed so as to identify a containment volume (12) for a foot of, wherein the waterproofing and breathable portion (8) is shaped so as to allow the escape of water or vapour to the outside of the footwear (4) and of the containment volume (12) and so as to prevent the entry of water or vapour coming from the outside, an upper (28) arranged to cover said waterproofing and breathable portion (8), wherein the upper (28) is at least partially perforated to facilitate the escape of water or vapour from the waterproofing and breathable portion (8). Advantageously, the waterproofing and breathable portion (8) is mechanically connected to the upper (28) by means of at least one tape (32), comprising at least a first flap (36) attached to the waterproofing and breathable portion (8) by means of gluing or heat welding, and comprising at least a second flap (40) fixed to the upper (28) by means of gluing, thermo-forming or sewing.



**Fig.9**

## Description

### FIELD OF APPLICATION

**[0001]** This invention relates to breathable footwear (4), in particular for applications to ski boots, off-track ski boots, telemark, snow board as well as sports shoes in general, and related production method.

### STATE OF THE ART

**[0002]** As is known, footwear in general, especially in applications for sports use, tends to warm the user's foot and to cause abundant sweating. Sweat tends to pool inside the shoe compromising comfort.

**[0003]** In fact, if one thinks of applications on ski boots, between the ski boot and the foot of the user are interposed shoes, suitably padded that have the function of cushioning the contact between the foot and the rigid structure of the boot and at the same time allowing, as much as possible, the thermal insulation of the foot.

**[0004]** In the case of ski boots, if the user's foot is wet, the comfort and temperature of the foot would be significantly reduced because the exchange of heat with the outside increases.

**[0005]** Even in sports applications not related to skiing, if the footwear does not allow adequate breathability, the pooling of sweat on the foot may cause a feeling of excessive warmth for the user as well as the possible formation of blisters.

**[0006]** For these reasons, breathable footwear is known in the sector that is provided with internal membranes that promote the breathability of the foot perspiration and avoid the pooling of sweat.

**[0007]** In the case of ski boots, the main purpose of these breathable shoes is to provide the user comfort, thermal insulation and water repellency.

**[0008]** Comfort must be achieved by creating a thickness of soft material that prevents direct contact between the user's foot and the rigid shell, typically made of plastic or other materials.

**[0009]** Thermal insulation is essential in order to provide comfort while skiing/walking and to prevent the foot from becoming too cold. This aspect is essential both in applications on boots and, for example, but not only, in the field of trekking footwear.

**[0010]** Finally, water repellency is essential because, in the case of infiltration of water/snow inside the boot, it is necessary to prevent the user's foot from getting wet: in fact, in this case, as seen, the comfort and temperature of the foot would be significantly reduced because the exchange of heat with the outside would increase.

**[0011]** At the same time, it is necessary to provide the shoe adequate breathability to provide the formation and accumulation of sweat; in fact, in case of accumulation of sweat, the user's comfort would decline drastically because sweating is one of the leading causes of loss of thermal insulation.

## PRESENTATION OF THE INVENTION

**[0012]** It is currently not possible, with the techniques of the prior art, to provide a shoe that ensures the optimal comfort, breathability of the foot, thermal insulation and water repellency.

**[0013]** In fact, thermal insulation and water repellency are often mutually incompatible with the breathability of the foot.

**[0014]** In current solutions, breathable footwear comprises a waterproofing portion/membrane, substantially a closed bag, which is sewn and fixed internally to the upper by means of adhesives and/or stitching.

**[0015]** Such solutions are not free from drawbacks.

**[0016]** In fact, the seams cause holes through which the waterproofing portion/membrane loses at least partially the waterproofing properties that allow the vapour to escape but prevent the entry of water and liquids. In other words the seam holes constitute the points through which external liquids can penetrate through the waterproofing membrane which, therefore, loses the properties of waterproofing and/or water repellency.

**[0017]** In addition, the solutions of direct stitching between the waterproofing portion and the upper involve direct adhesion between the membrane and the upper itself: such adhesion, i.e., the absence of a gap, reduces the overall thermal insulation properties between the foot and the outside.

**[0018]** Adhesives, however, create a layer of non-breathable material that causes pooling of water or vapour inside the waterproofing and breathable portion.

**[0019]** Therefore, in the current known solutions, the footwear is a closed gap that creates pooling of sweating or, indeed, does not prevent the entry of water from outside: as seen, sweating, as well as the entry of water from outside, is one of the main causes of loss of comfort, as it can generate blisters and reduce the thermal insulation of the shoe.

**[0020]** Therefore, the solutions of the prior art are a compromise between breathability/evaporation of the sweat of the foot and the waterproofing/water repellency of the footwear. This compromise is not, however, able to meet the needs of more demanding users who use shoes/ski boots continuously in harsh conditions.

**[0021]** Therefore, there is a need to solve the drawbacks and limitations mentioned in reference to the prior art.

**[0022]** This need is met by breathable shoe according to claim 1 and by a method for producing a breathable shoe according to claim 14.

## DESCRIPTION OF THE DRAWINGS

**[0023]** Further characteristics and advantages of this invention will be more understandable from the following description of its preferred and non-limiting examples of embodiments, wherein:

Figure 1 is a perspective view of a ski boot provided with a breathable internal footwear article according to an embodiment of this invention;

Figure 2 is a perspective view of a breathable sports footwear article according to an embodiment of this invention;

Figures 3, 4, 5, 6 and 10 are successive schematic views of the production of a breathable footwear article according to this invention;

Figure 7 is a sectional view of the breathable footwear article of Figure 6, along the section plane VII-VII of Figure 6;

Figure 8 is a perspective view of a breathable footwear article according to this invention, applied to a ski boot;

Figure 9 is a sectional view of the breathable footwear article of Figure 8, along the section plane IX-IX of Figure 8.

**[0024]** The members, or parts of members, in common between the embodiments described below will be indicated with the same reference numbers.

#### DETAILED DESCRIPTION

**[0025]** With reference to the above figures, reference number 4 globally indicates a breathable footwear article, in particular for applications on ski boots, off-track ski boots, telemark, snow board as well as sports shoes in general.

**[0026]** The above-cited applications are to be regarded as non-limiting examples of the possible applications of this invention.

**[0027]** The breathable footwear 4 comprises a waterproofing and breathable portion 8, at least partially sealed so as to identify a containment volume 12 for a foot of a user.

**[0028]** In particular, the waterproofing and breathable portion 8 is shaped so as to allow the escape of water or vapour to the outside of the footwear 4 and the containment volume 12 and so as to prevent the entry of water or vapour coming from the outside of the footwear 4 inside said containment volume 12.

**[0029]** For example, the waterproofing and breathable portion 8 is formed in such a way as to be folded and sealed as a bag, having a front access portion 16 so as to cover an associable user's foot at least up to the height of an ankle of said foot.

**[0030]** According to an embodiment, said waterproofing and breathable portion 8 is folded and sealed by seams 20; preferably those seams 20 are waterproofed.

**[0031]** For example, said seams 20 are waterproofed by overlapping waterproof adhesive tape 24.

**[0032]** According to an embodiment, the waterproofing and breathable portion 8 comprises a membrane, for example, of the GORE-TEX® type.

**[0033]** The breathable footwear 4 also comprises an upper 28 arranged as a covering of said waterproofing

and breathable portion 8, wherein the upper 28 is at least partially perforated to facilitate the escape of water or vapour from the waterproofing and breathable portion 8.

**[0034]** Preferably, this upper 28 is water-repellent, so as to prevent the entry of water or vapour which would pool in the gap between the waterproofing and breathable portion 8 and said upper 28 itself.

**[0035]** Advantageously, the waterproofing and breathable portion 8 is mechanically connected to the upper 28 by means of at least one tape 32, for example made of thermoplastic or other material, comprising at least a first flap 36 attached to the waterproofing and breathable portion 8 by means of gluing or heat welding, and comprising at least a second flap 40 fixed to the upper 28 by means of gluing, thermoforming or sewing.

**[0036]** The definition of tape must be considered in the broad sense, meaning not necessarily a long and thin strip but any connection element, even thread-like, suitable to connect the waterproofing and breathable portion 8 and the upper 28 with each other.

**[0037]** Preferably, the tape 32 is shaped so as to permit a clearance or gap between the waterproofing and breathable portion 8 and the upper 28.

**[0038]** According to an embodiment, the tape 32 is shaped so that the connection between the waterproofing and breathable portion 8 and the upper 28 is of the slack type, allowing a mutual movement between the connected parts, but at the same time ensures the locking on the longitudinal axis X-X of the waterproofing and breathable portion 8 avoiding the use of glues.

**[0039]** The tape 32 may be positioned in different positions of the waterproofing and breathable portion.

**[0040]** For example, the tape 32 is positioned at one side edge 44 of the waterproofing and breathable portion 8, arranged parallel to a main direction of longitudinal extension X-X of the breathable footwear 4.

**[0041]** According to an embodiment, the tape 32 is made of thermoplastic material. Production with thermoplastic material facilitates the heat welding of the tape on portions of the waterproofing and breathable portion 8 and/or on the upper 28.

**[0042]** For example, the tape 32 can be provided with a plurality of holes (not shown) that improve its breathability.

**[0043]** Said holes enhance the breathability of the breathable footwear 4 and, in particular, do not interfere but rather facilitate breathability, from the inside towards the outside of the footwear, provided by the waterproofing and breathable portion 8: in other words, the vapour coming from the containment volume 12 and from the waterproofing and breathable portion 8 can freely exit also in correspondence of the first flap 36 of attachment of the tape 32, so as to reach the upper 28 and be able to escape through the latter.

**[0044]** According to an embodiment, the upper 28 comprises a plurality of overlapping and breathable components 48, suitable to form portions of footwear having different thicknesses, materials and/or stiffnesses.

**[0045]** For example, said components 48 may comprise padding of various types, such as anti-chafing patches, inserts and coverings arranged in correspondence of particularly exposed parts of the foot, such as the malleolus, the tip of the foot, the heel and the like.

**[0046]** These components 48 have, in their outer part in contact with an inner wall 76 of a ski boot 64, the peculiarity of being composed of hydrophobic materials.

**[0047]** According to an embodiment wherein at least one of said overlapping and breathable components 48 of the upper 28 is made of a thermo-formable material.

**[0048]** Thermo-formable material means a material suitable to be formed under the action of heat so as to maintain the conformation also following its subsequent cooling.

**[0049]** The footwear are thermo-formed by fitting the footwear to the user: in this way, the footwear can actually take the shape of the user's foot and therefore can be shaped to measure.

**[0050]** In order for the thermoforming to take place in a comfortable manner, it is necessary that the material forming the components 48 is thermo-formable at a sufficiently low temperature so that they can be heated, and thus thermo-formed, while the user is wearing the footwear, without being his being burned.

**[0051]** It is clear that the footwear 4 is composed of several parts, such as for example an insole 52, which is also preferably provided with holes and suitable to realise a comfortable support for the sole of the foot.

**[0052]** Moreover, the shoe may include a tongue 56 preferably provided with holes, and an upper structure 60, also preferably provided with holes, suitable to embrace the tibial zone of the user.

**[0053]** Even the insole 52, the upper structure 60 and the tongue 56 can be made of a thermo-formable material, as described above.

**[0054]** As mentioned above, the breathable footwear 4 according to this invention is suitable for use in applications on boots, off-track ski boots, telemark and snow board.

**[0055]** Said boots 64 typically include a shell 68 and a cuff 72, hinged to the shell 68, in correspondence of the malleolus of the user's foot.

**[0056]** The boot 64 defines an internal compartment that houses the breathable footwear.

**[0057]** Said footwear 4 is housed inside the compartment of the ski boot delimited by an inner wall 76 of the ski boot 64 so as to make an outer layer 80 of the footwear 4 face said inner wall 76 of the ski boot 64.

**[0058]** In other words, the breathable footwear 4 is interposed between the foot of the user and the boot 64.

**[0059]** We will now describe the production method of a breathable footwear article according to this invention will be described.

**[0060]** Said method comprises a waterproofing and breathable portion 8 divided into at least two separate parts 8',8" (Figures 3 to 4).

**[0061]** To the waterproofing and breathable portion 8

is applied a first flap 36 of the tape 32, by means of gluing or heat welding.

**[0062]** Then, one proceeds to seal said parts 8',8" together by joining together counter-shaped flaps, so as to identify a containment volume 12 for a foot of a user (Figure 5).

**[0063]** The waterproofing the joins of said counter-shaped flaps is performed. This waterproofing may, for example, take place through the application of waterproof thermal adhesive tape 24 to cover said seams/joins 20 (Figure 6).

**[0064]** An upper 28 is arranged so as to cover said waterproofing and breathable portion 8 (Figures 8 to 9), wherein the upper 28 is at least partially perforated to facilitate the escape of water or vapour from the waterproofing and breathable portion 8.

**[0065]** The step of mechanically connecting the waterproofing and breathable portion 8 to the upper 28 by means of at least one tape 32 (Figures 4, 5, 6 and 7), wherein at least a first flap 36 of the tape 32 is attached to the waterproofing and breathable portion 8 by means of gluing or heat welding, and at least a second flap 40 of the tape 32 is attached to the upper 28 by means of gluing, heat welding or sewing (Figure 9).

**[0066]** As can be appreciated from the description, the breathable footwear according to the invention allows overcoming the drawbacks presented in the prior art.

**[0067]** In particular, the breathable footwear according to the invention allows meeting the user's needs in terms of breathability of sweat at the same time comfort, thermal insulation and waterproofing from the outside.

**[0068]** In fact, the presence of tapes associated to the waterproofing portion by means of gluing and/or fusion firstly allows avoiding puncturing the fabric of both the upper and the same waterproofing portion, so as not to compromise the waterproofing/water repellency.

**[0069]** At the same time this type of attachment does not interfere with the function of the waterproofing and breathable membrane of allowing the evaporation of sweat, so as to avoid its pooling in contact with the foot.

**[0070]** Furthermore this type of attachment, by not requiring a direct contact between the waterproofing and breathable portion/membrane and the upper, allows the possibility of leaving a gap between said portion/membrane and the upper. Such a gap improves the breathability of the foot, allows the sweat to escape through suitable holes passing through the upper and also creates a further thermal barrier that insulates the foot from the outside environment.

**[0071]** At the same time, the presence of a waterproofing portion, such as, for example, an inner water-repellent membrane, ensures the water repellency of the shoe, i.e., it prevents water from penetrating from the outside of the shoe and coming in contact with the user's foot.

**[0072]** All the comfort characteristics of the footwear remain unchanged in terms of inner/outer layers and padded portions so as to absorb the impacts of the user's foot.

**[0073]** The footwear is light overall and comfortable to

wear.

**[0074]** The method of producing the footwear is also simple, fast and inexpensive to implement.

**[0075]** In fact, the application of the tapes or inserts on the membrane/waterproofing and breathable lining is realised in a rapid and convenient manner, even before sewing the lining itself to the bag.

**[0076]** As seen, such application may take place either by gluing or heat welding.

**[0077]** The subsequent attachment of the tapes or the inserts to the upper may in turn take place by gluing or heat welding but also by sewing, in a fast and convenient manner, since it is not required to tighten the membrane and upper in contact, but the tapes or inserts allow a certain slack between the parts to be connected.

**[0078]** A person skilled in the art, in order to satisfy contingent and specific needs, may make numerous modifications and variations to the footwear and the footwear production method described above, all however contained within the scope of the invention as defined by the following claims.

## Claims

1. Breathable footwear (4), in particular for applications to ski boots, off-track ski boots, telemark, snow board as well as sports shoes in general, comprising

- a waterproofing and breathable portion (8), at least partially closed so as to identify a containment volume (12) for a foot of a user, wherein the waterproofing and breathable portion (8) is shaped so as to allow the escape of water or vapour to the outside of the footwear (4) and the containment volume (12) and so as to prevent the entry of water or vapour coming from the outside of the footwear (4) inside said containment volume (12),
- an upper (28) positioned so to cover said waterproofing and breathable portion (8), wherein the upper (28) is at least partially perforated to facilitate the escape of water or vapour from the waterproofing and breathable portion (8),

### characterised in that

- the waterproofing and breathable portion (8) is mechanically connected to the upper (28) by means of at least one tape (32), comprising at least a first flap (36) attached to the waterproofing and breathable portion (8) by means of gluing or heat welding, and comprising at least a second flap (40) fixed to the upper (28) by means of gluing, thermoforming or sewing.

2. Breathable footwear (4) according to claim 1, wherein the upper (28) is water-repellent, so as to prevent

the entry of water or vapour which would stagnate in the gap between the waterproofing and breathable portion (8) and said upper (28).

3. Breathable footwear (4) according to claim 1 or 2, wherein the tape (32) is shaped so as to permit a clearance or gap between the waterproofing and breathable portion (8) and the upper (28).
4. Breathable footwear (4) according to claim 1, 2 or 3, wherein the tape (32) is shaped so that the connection between the waterproofing and breathable portion (8) and the upper (28) is of a slack type, allowing a mutual movement of the connected parts.
5. Breathable footwear (4) according to any of the previous claims, wherein the tape (32) is at least positioned at one side edge (44) of the waterproofing and breathable portion (8), arranged parallel to a main direction of longitudinal extension (X-X) of the footwear (4).
6. Breathable footwear (4) according to any of the previous claims, wherein the tape (32) is made of thermoplastic material.
7. Breathable footwear (4) according to any of the previous claims, wherein the tape (32) is provided with a plurality of holes.
8. Breathable footwear (4) according to any of the previous claims, wherein the waterproofing and breathable portion (8) is shaped so as to be folded and closed like a bag, having a front access portion (16) so as to cover a user's foot associable at least to the height of an ankle of said foot.
9. Breathable footwear (4) according to any of the previous claims, wherein said waterproofing and breathable portion (8) is folded and closed by means of seams (20) and wherein said seams (20) are waterproofed.
10. Breathable footwear (4) according to claim 9, wherein said seams (20) are waterproofed by overlapping of the waterproof thermal adhesive tape (24).
11. Breathable footwear (4) according to any of the previous claims, wherein said waterproofing and breathable portion (8) comprises a membrane, for example, of the GORE-TEX® type.
12. Breathable footwear (4) according to any of the previous claims, wherein the upper (28) comprises a plurality of overlapping and breathable components (48), suitable to form portions of footwear having different thicknesses, materials and/or stiffnesses.

13. Breathable footwear (4) according to claim 12, wherein at least one of said overlapping and breathable layers (48) is made of a thermo-formable material. 5
14. Ski boot (64) comprising at least a breathable footwear (4) according to any of the claims from 1 to 13, said footwear (4) being housed inside a compartment of the ski boot delimited by an inner wall (76) of the ski boot (64) so as to make an outer layer (80) of the footwear (4) face said inner wall (76) of the ski boot (64). 10
15. Method of making a breathable footwear comprising the steps of: 15
- providing a waterproofing and breathable portion (8) divided into at least two separate parts (8', 8''), 20
  - closing said separate parts (8', 8'') together by joining together counter-shaped flaps, so as to identify a containment volume (12) for a foot of a user, 25
  - waterproofing the joins of said counter-shaped flaps, 30
  - providing an upper (28) arranged so as to cover said waterproofing and breathable portion (8), wherein the upper (28) is at least partially perforated to facilitate the escape of water or vapour from the waterproofing and breathable portion (8), 35
  - mechanically connecting to the upper (28) the waterproofing and breathable portion (8) by means of at least one tape (32), wherein at least a first flap (36) of the tape (32) is attached to the waterproofing and breathable portion (8) by means of gluing or heat welding, and at least a second flap (40) of the tape (32) is attached to the upper (28) by means of gluing, thermoforming or sewing. 40
16. Method of making a breathable footwear (4) according to claim 15, comprising the step of making a footwear (4) according to any of claims 1 to 13. 45

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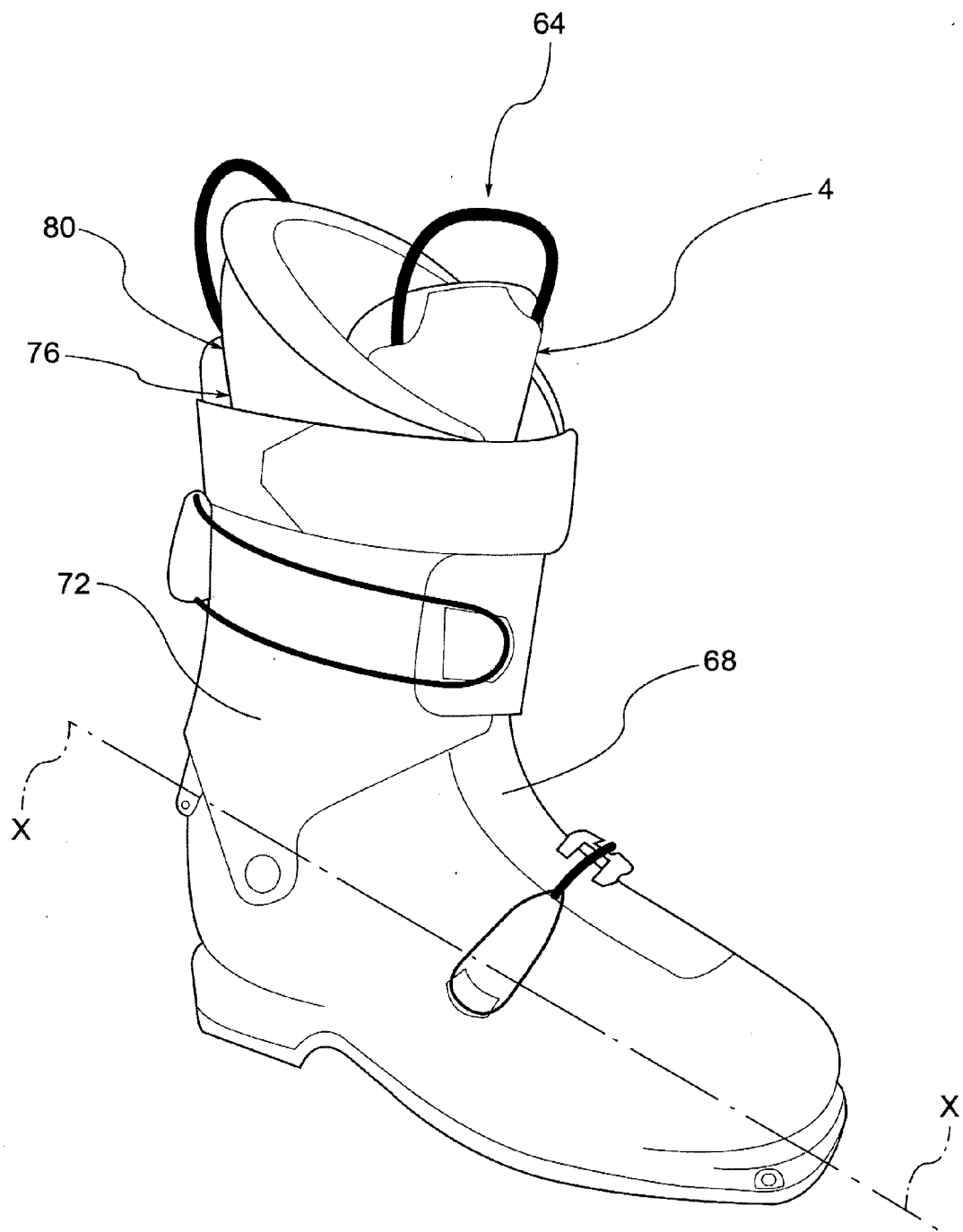


Fig.1

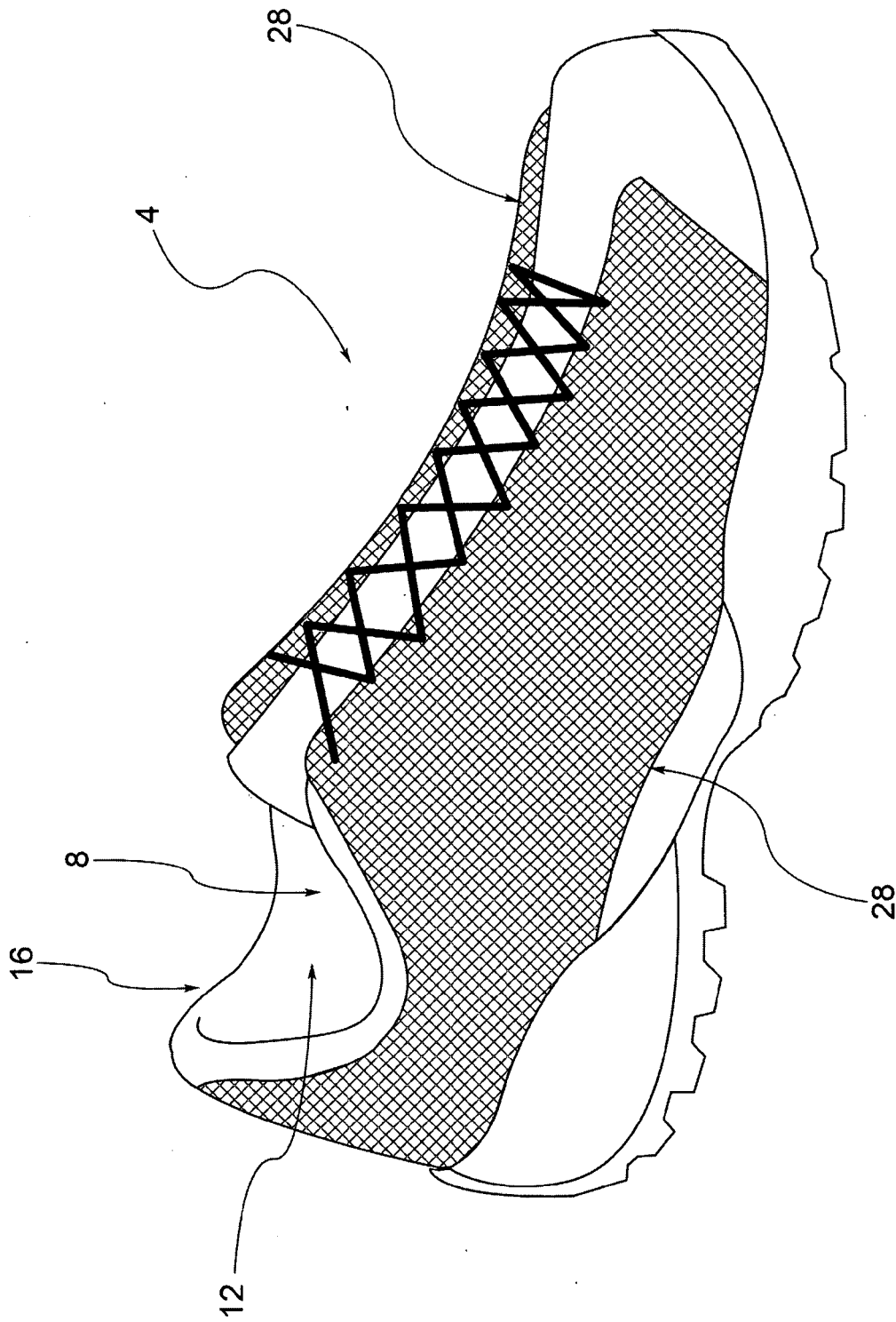


Fig.2



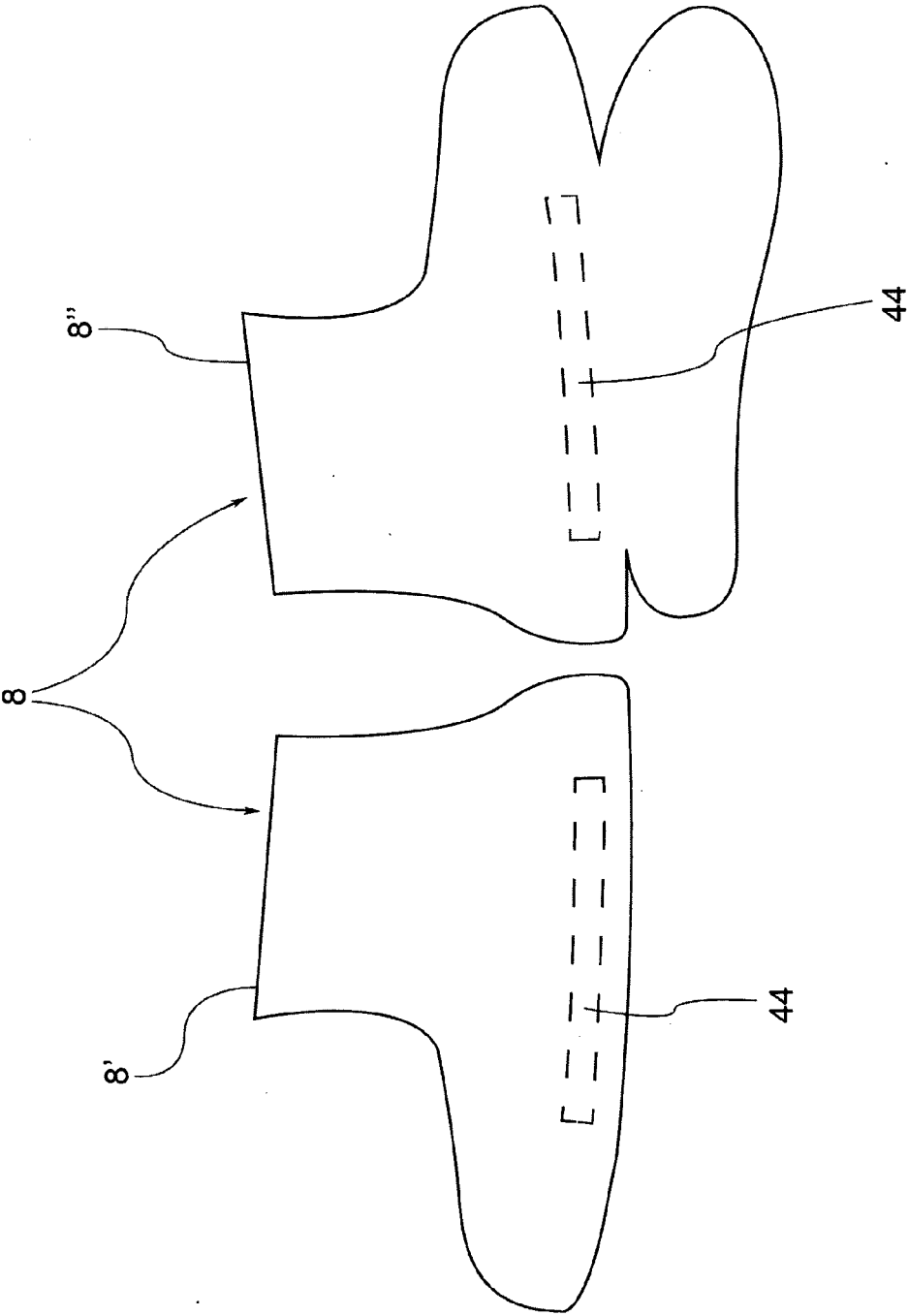


Fig.3

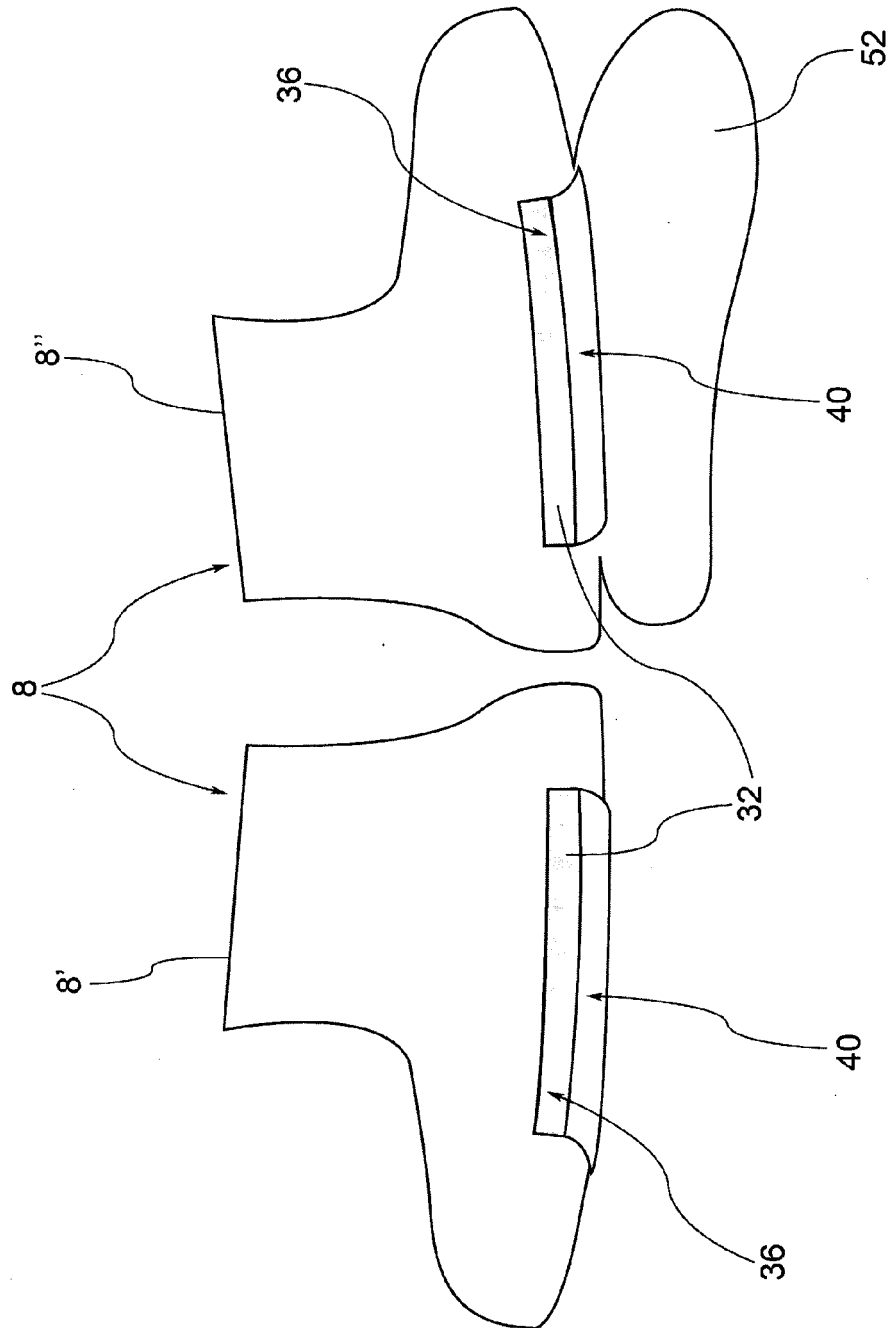


Fig. 4

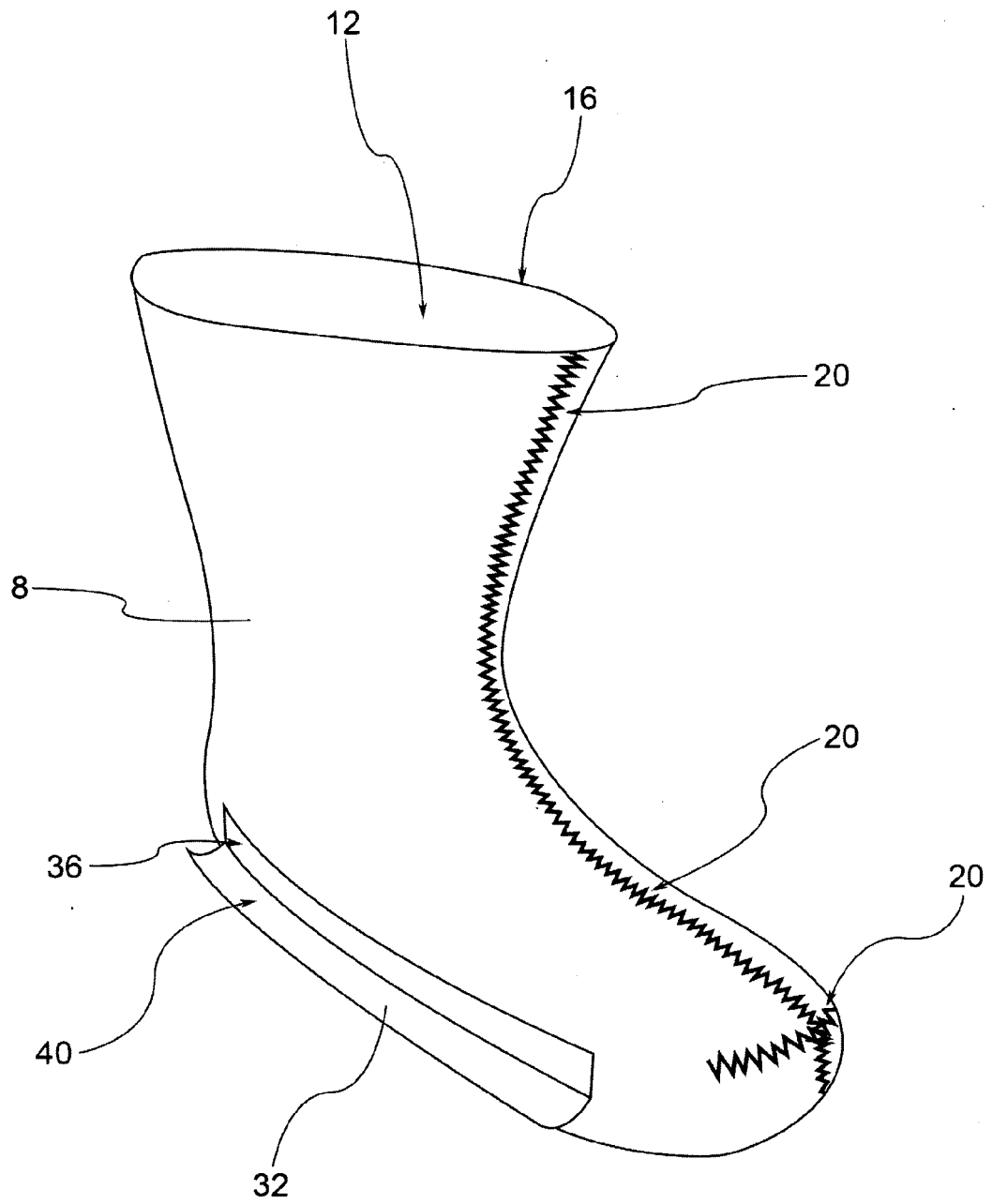


Fig.5

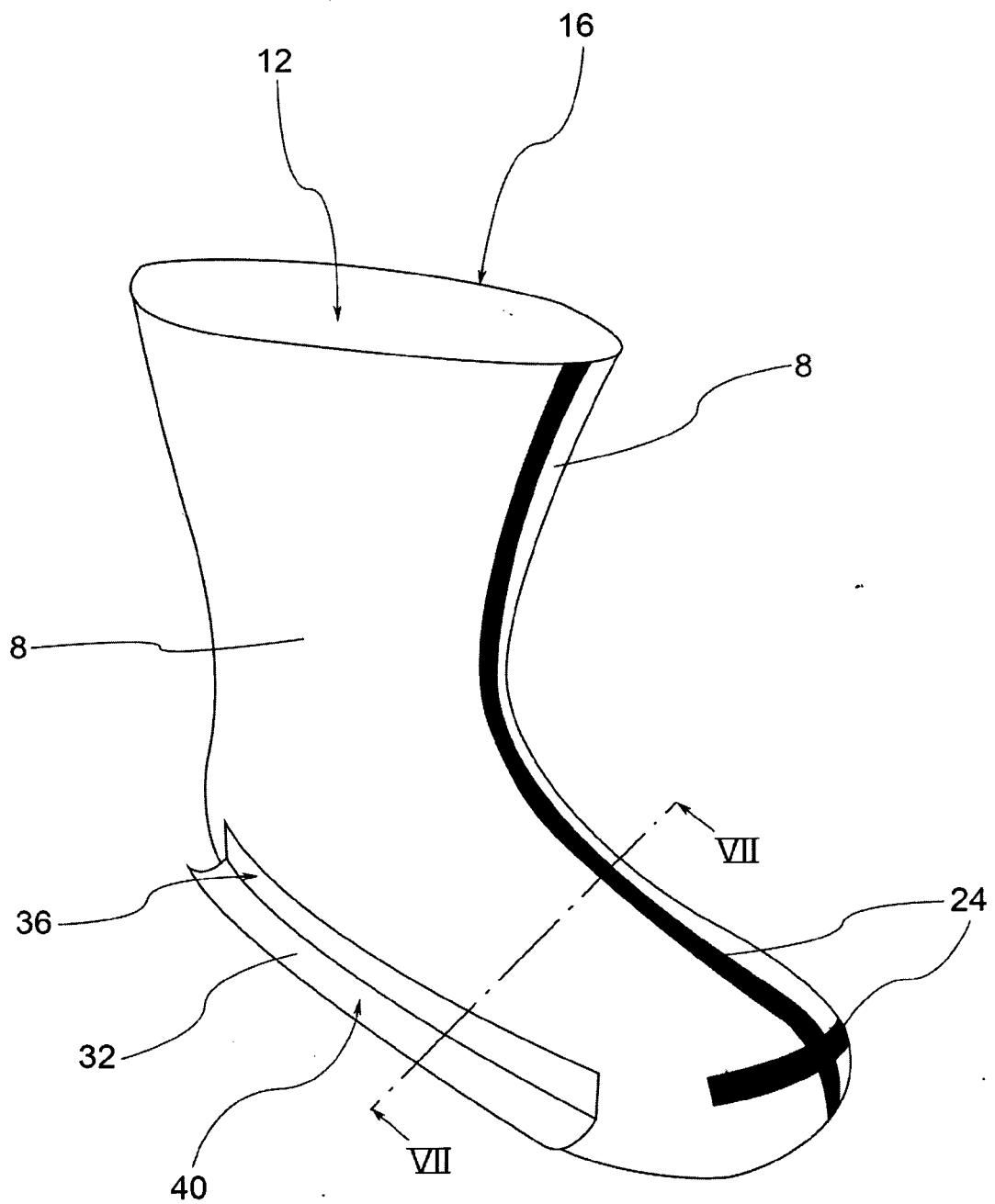


Fig.6

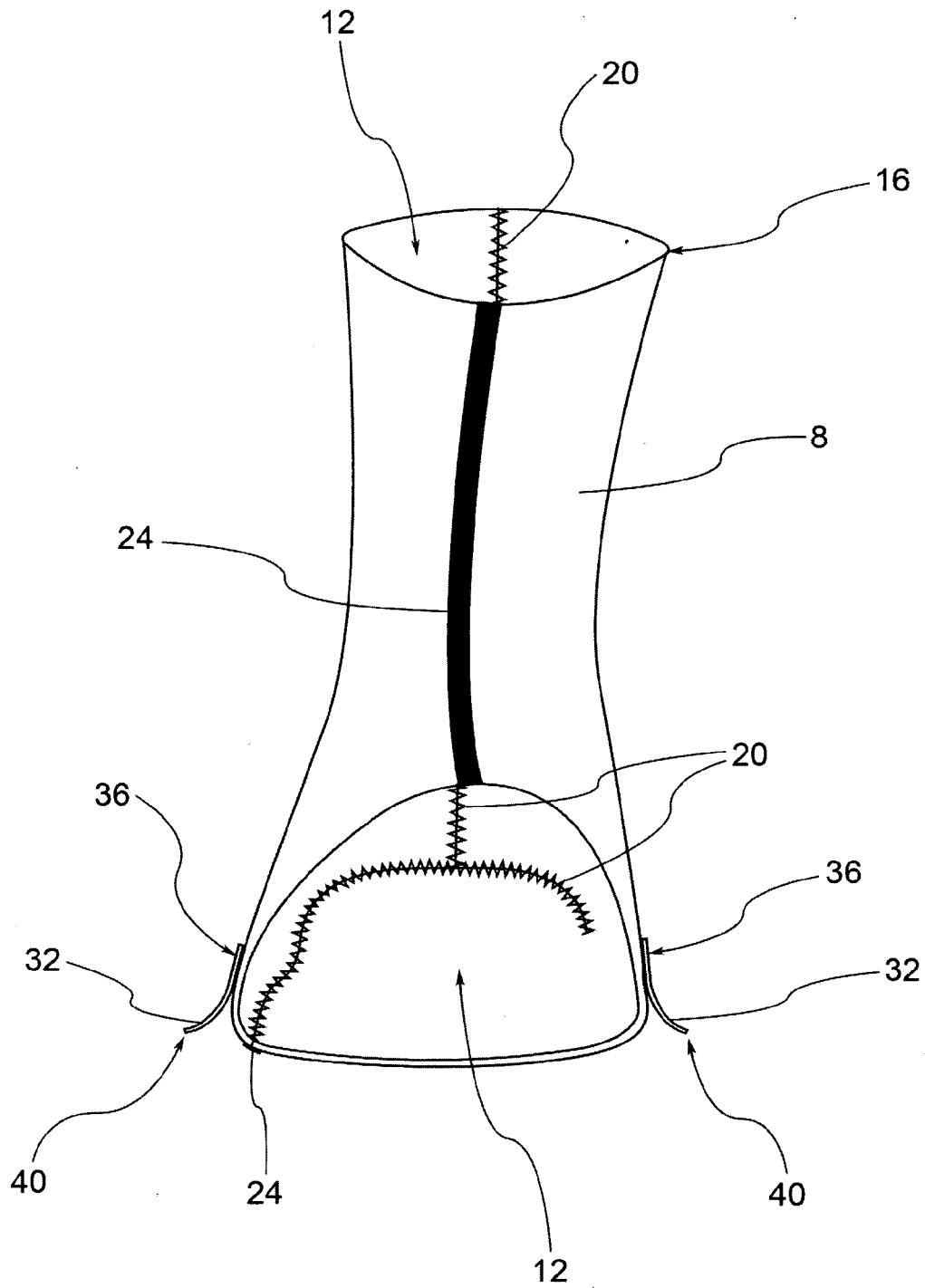


Fig.7

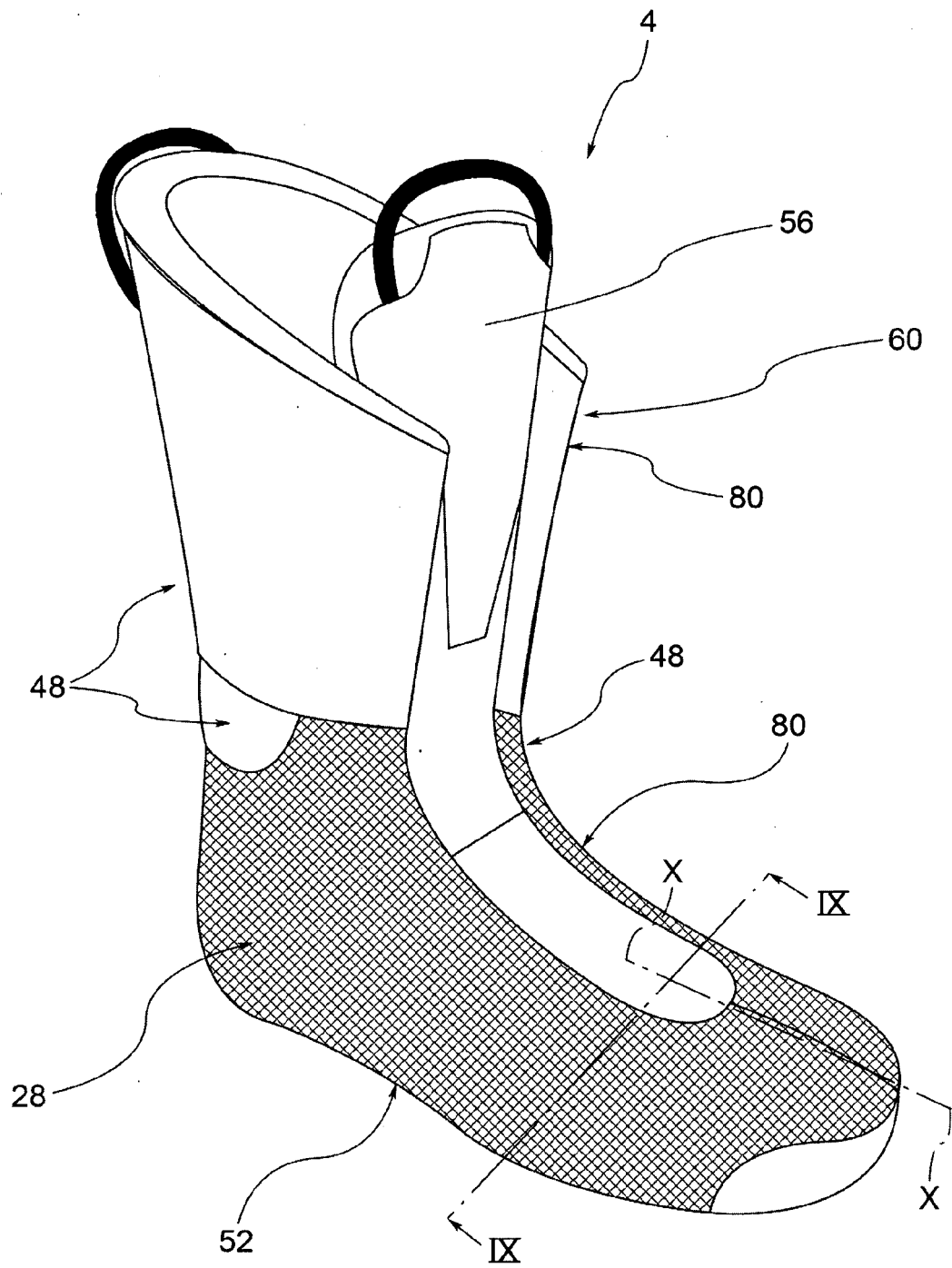


Fig.8

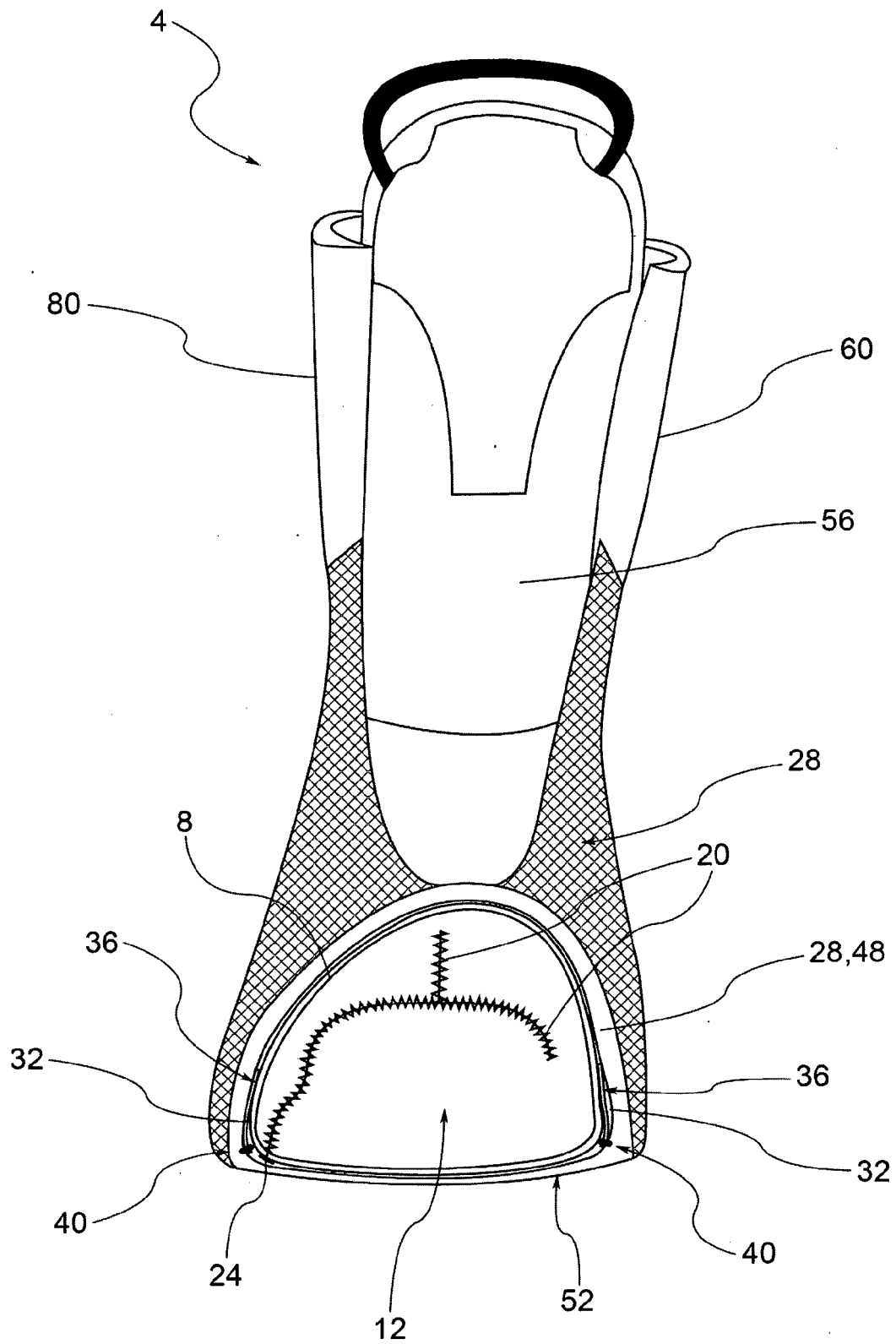


Fig.9



## EUROPEAN SEARCH REPORT

Application Number  
EP 15 00 2722

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	* paragraph 98-173 - pages - *	1-13,15, 16	A43B19/00 A43B7/12 A43B5/04
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			TECHNICAL FIELDS SEARCHED (IPC)
			A43B
The present search report has been drawn up for all claims			
Place of search <b>The Hague</b>		Date of completion of the search <b>18 February 2016</b>	Examiner <b>Cianci, Sabino</b>
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 & : member of the same patent family, corresponding document	

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EPO FORM 1503 03.02 (P04C01)



**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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18-02-2016

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