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(54) A KNITTED PROTECTIVE SOCK

(57) The present invention relates to a knitted protective sock (1) for protecting and supporting a wearer (100) during sports, comprising a tubular leg part (2) having an opening (3) and a first area (4), the first area being configured to be arranged opposite a tibia (5) of the wearer, the tubular leg part comprising an interknitted pocket (6) arranged in the first area, the pocket being configured to accommodate a replaceable protective member (10), the tubular leg part further having a first compression rate, a tubular foot part (7) having an upper face area (8) and a lower face area (9), the lower face area being configured to be arranged opposite a sole of a foot of the wearer, a tubular ankle part (12) arranged between the foot part and the leg part and having an ankle area (13), the ankle area being configured to be arranged opposite an Achilles tendon of the wearer, wherein the ankle area has a second compression rate, the second compression rate being larger than the first compression rate. The present invention also relates to a protective sport kit comprising a pair of knitted protective socks (1) according to the present invention and two mouldable replaceable protective members (10).

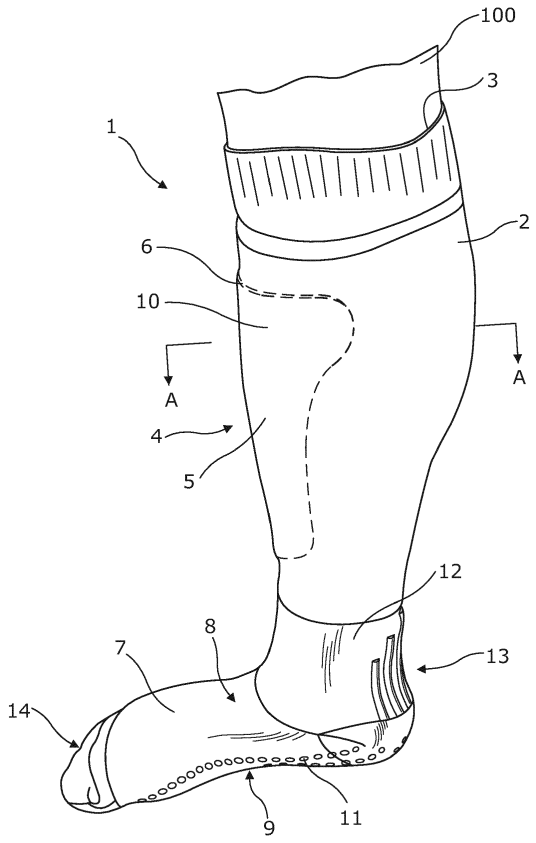

Fig. 1

EP 3 420 830 A1

Description

[0001] The present invention relates to a knitted protective sock for protecting and supporting a wearer during sports and to a protective sport kit comprising a pair of knitted protective socks according to the present invention.

[0002] Protective garments such as protective socks are often used during the performance of sports. Sports athletes, such as for instance football players, are often injured due to rapid shifts in directions when running and due to impact with the ball and/or other players.

[0003] The known protective garments provide some protection for the wearer. However, there is a need for providing a protective sock having more protection than known socks.

[0004] It is an object of the present invention to wholly or partly overcome the above disadvantages and drawbacks of the prior art. More specifically, it is an object to provide an improved knitted protective sock for enhanced protection of the wearer during performance of sports.

[0005] The above objects, together with numerous other objects, advantages and features, which will become evident from the below description, are accomplished by a solution in accordance with the present invention by a knitted protective sock for protecting and supporting a wearer during sports, comprising:

- a tubular leg part having an opening and a first area, the first area being configured to be arranged opposite a tibia of the wearer, the tubular leg part comprising an interknitted pocket arranged in the first area, the pocket being configured to accommodate a replaceable protective member, the tubular leg part further having a first compression rate,
- a tubular foot part having an upper face area and a lower face area, the lower face area being configured to be arranged opposite a sole of a foot of the wearer,
- a tubular ankle part arranged between the foot part and the leg part and having an ankle area, the ankle area being configured to be arranged opposite an Achilles tendon of the wearer,

wherein the ankle area has a second compression rate, the second compression rate being larger than the first compression rate.

[0006] The pocket may be accessible from the opening.

[0007] Moreover, the lower face area may comprise friction enhancing means.

[0008] Also, the friction enhancing means may comprise a structured surface.

[0009] Said structured surface may comprise a plurality of substantially lateral circumferential beads.

[0010] Furthermore, the structured surface may comprise a plurality of projections.

[0011] In addition, the projections may be round, square or similar.

[0012] The friction enhancing means may comprise friction enhancing material on the lower face area, such as e.g. textile-based materials, rubber, silicone, elastane, neoprene or similar material.

[0013] Further, the friction enhancing means may be interknitted into the lower face area.

[0014] Moreover, the knitted protective sock may be weft-knitted seamlessly.

[0015] Also, the pocket may be interknitted on an inside of the tubular leg part.

[0016] Furthermore, the tubular leg part, the tubular foot part and/or the tubular ankle part may be knitted using yarns comprising Elastane, polyester, polyamide, polypropylene, wool, cotton or viscose or a combination thereof.

[0017] Additionally, the pocket may be knitted as a spacer fabric having a first outer layer, a second outer layer and an intermediate spacer layer integrated with said first and second outer layers.

[0018] The first outer layer and/or second outer layer may comprise yarns comprising polyurethane, such as Elastane, up to 40% of total fabric weight.

[0019] In addition, the intermediate spacer layer may comprise monofilament and/or multifilament pile yarns.

[0020] Also, the yarns of the outer layers may comprise Elastane, polyester, polyamide, polypropylene, wool, cotton or viscose or a combination thereof.

[0021] Pile yarns of the intermediate spacer layer may comprise polyester, polyamide or polypropylene or a combination thereof.

[0022] Furthermore, the yarns of the intermediate spacer layer may be interknitted with the yarns of the outer layers, so that distances are provided between the yarns in the intermediate spacer layer.

[0023] Moreover, the spacer fabric may have a thickness of from 1 mm to 7 mm, preferably from 3 mm to 5 mm.

[0024] The knitted protective sock according to the present invention may further comprise a replaceable protective member configured to be introduced into the pocket.

[0025] Further, the replaceable protective member may be made from a mouldable material.

[0026] Additionally, the replaceable protective member may be configured to be moulded to fit the tibia of the wearer, so that a custom-made protective member is provided.

[0027] Also, the mouldable material may have a low thermal conductivity. Hereby it is obtained that the mouldable material, after it has been heated, may come into direct contact with the skin of the wearer.

[0028] Furthermore, the mouldable material may have a low melt-flow index. Hereby it is ensured that the material maintains its integrity when it is heated, so that it may be handled/touched without it starting to flow. Furthermore, by having the low melt-flow index, it is ensured that the mouldable material does not become sticky when heated.

[0029] The mouldable material may be biodegradable.

[0030] Said mouldable material may become rigid when it is cooled, so that it may protect the tibia of the wearer against impact when accommodated in the pocket of the protective sock.

[0031] Moreover, different areas of the tubular leg part, the tubular foot part and/or the tubular ankle part may have one or more properties interknitted such as support, compression, skin friendliness, breathability, moisture handling properties or wickability.

[0032] The present invention also relates to a protective sport kit comprising a pair of knitted protective socks according to the present invention and two mouldable replaceable protective members.

[0033] The invention and its many advantages will be described in more detail below with reference to the accompanying schematic drawings, which for the purpose of illustration show some non-limiting embodiments and in which

Fig. 1 shows a knitted protective sock according to the present invention in a side view,

Fig. 2 shows the knitted protective sock of Fig. 1 in a front view,

Fig. 3 is a cross-sectional view of the protective sock taken along the line A-A indicated in Fig. 1,

Fig. 4 shows another cross-sectional view of the protective sock with a protective element not being fully moulded,

Fig. 5 shows the wearer pulling the protective sock upwards,

Fig. 6 shows the lower face area of the tubular foot part,

Fig. 7 shows in an enlarged view the pocket, and

Fig. 8 shows a replaceable protective member being inserted into the pocket.

[0034] All the figures are highly schematic and not necessarily to scale, and they show only those parts which are necessary in order to elucidate the invention, other parts being omitted or merely suggested.

[0035] Fig. 1 shows a knitted protective sock 1 for protecting and supporting a wearer 100 during sports. The knitted protective sock 1 comprises a tubular leg part 2 having an opening 3 and a first area 4. The first area 4 is configured to be arranged opposite a tibia 5 of the wearer 100. The tubular leg part 2 comprises an interknitted pocket 6 arranged in the first area 4, the pocket 6 being configured to accommodate a replaceable protective member 10. The tubular leg part 2 is knitted so that it has a first compression rate.

[0036] The knitted protective sock 1 further comprises a tubular foot part 7 having an upper face area 8 and a lower face area 9, the lower face area being configured to be arranged opposite a sole of a foot of the wearer as seen in Fig. 1. The lower face area 9 comprises friction enhancing means 11 which will be further described in connection with Fig. 6.

[0037] The knitted protective sock also comprises a tubular ankle part 12 arranged between the tubular foot part 7 and the tubular leg part 2 and having an ankle area 13. The ankle area 13 is configured to be arranged opposite an Achilles tendon of the wearer 100.

[0038] The ankle area 13 is knitted so that it has a second compression rate, the second compression rate being larger than the first compression rate. Hereby it is obtained that the vulnerable Achilles tendon is better protected during sports.

[0039] The knitted protective sock is preferably weft-knitted on a weft-knitting machine. The tubular leg part, the tubular foot part and/or the tubular ankle part are knitted using yarns comprising Elastane, polyester, polyamide, polypropylene, wool, cotton or viscose or a combination thereof.

[0040] The tubular ankle part 12 may for instance be knitted using well-known Jersey-knitting techniques, wherein frotté is added in the ankle area 13 for providing additional support and compression. In one embodiment, the following yarns may be used: Softair plus 78/72/2; Poliamida 78/2; Lycra 285 / PA 44f34 / 1 66 DR and Lycra 20PA78f23 / 1 AJ.

[0041] As described above, the tubular leg part 2 has an interknitted pocket 6. The tubular leg part 2 and the pocket 6 may be knitted by using Pique-knitting technique and applying yarns with high elasticity such as Lycra. The tubular leg part 2 is preferably knitted with graduated compression. The graduated compression relationship should preferably be maintained along the tubular leg part 2, so that the protective sock is more efficient and improves the oxygenation of the wearer's muscles during sports.

[0042] The pocket 6 is interknitted with the rest of the tubular leg part 2 and the following yarns may be used: Lycra 285 / PA 44f34 / 1 66 DR; Lycra 17PA44f34 / 1 AJ. Hereby it is possible to interknit the pocket with the tubular leg part 2, which facilitates correct positioning of the replaceable protective member.

[0043] The toe area 14 of the tubular foot part 7 may be knitted in the same manner as described above, however, preferably with full frotté. By adding full frotté in the toe area, improved toe protection is obtained against impacts caused by ball kicks and other foot sports.

[0044] In Fig. 2, the knitted protective sock 1 is shown in a front view. As mentioned above, the first area 4 is configured to be arranged opposite a tibia 5 of the wearer (not shown). The tubular leg part 2 comprises the interknitted pocket 6 arranged in the first area 4, the pocket 6 being configured to accommodate a replaceable protective member 10. The protective member 10 is config-

ured to protect the wearer against impact on the tibia 5, and is preferably made of a mouldable material.

[0045] According to the invention, the replaceable protective member may be configured to be moulded to fit the tibia of the wearer so that a custom-made protective member is provided.

[0046] This may be obtained by providing the mouldable material with a low thermal conductivity. Hereby it is obtained that the mouldable material, after it has been heated, may come into direct contact with the skin of the wearer. The mouldable material may be inserted into hot water so that it becomes mouldable. Hereinafter the mouldable material is taken out of the hot water and placed on the tibia of the wearer so that the mouldable material takes the form of the tibia of the wearer.

[0047] In addition, the mouldable material may have a low melt-flow index, whereby it is ensured that the material maintains its integrity when being heated, so that may be handled/touched without it starting to flow. Furthermore, by having the low melt-flow index, it is ensured that the mouldable material does not become sticky when heated.

[0048] Also, the mouldable material may be biodegradable.

[0049] Advantageously, the mouldable material becomes rigid when it is cooled, so that it may protect the tibia of the wearer against impact when accommodated in the pocket of the protective sock.

[0050] The pocket 6 may be interknitted to an outside of the tubular leg part 2. However, it is preferred that the pocket 6 is interknitted to an inside of the tubular leg part 2.

[0051] In Fig. 3, a cross-sectional view of the tubular leg part 2 is shown taken along the A-A line in Fig. 1. The replaceable protective member 10 is positioned in the pocket 6. The protective member 10 has been custom-made as described above to the wearer's tibia and thereby fits smoothly to the tibia as shown in Fig. 3. Hence no discomfort by wearing the protective member is encountered by the wearer 100.

[0052] In Fig. 4, an embodiment is shown, wherein the protective member 10 has been inserted into the pocket 6 of the protective sock 1. However, as depicted on Fig. 4, the protective member 10 has not been custom-made to the wearer's tibia since the protective member does not fit smoothly around the tibia of the wearer 100. Hence, additional room R is provided in the pocket on both sides of the protective member, which obviously results in discomfort for the wearer during sports, and hence the intended protection against impact is not provided.

[0053] In Fig. 5 it is shown that the wearer 100 is pulling the protective sock 1 up to positioning it correctly so that the tubular leg part 2 is being placed opposite the tibia 5 of the wearer 100.

[0054] As mentioned above, the lower face area 9 of the tubular foot part 7 may comprise friction enhancing means 11. In this embodiment, the friction enhancing means 11 comprises a structured surface having a plurality of projections 11. The projections are round but may, however, in other embodiments, have other designs.

[0055] Preferably, the entire lower face area 9 comprises the protections 11 for improving the friction between the foot of the wearer and the shoe or boot.

[0056] The friction enhancing means 9 may comprise friction enhancing material on the lower face area 9, such as e.g. textile-based materials, rubber, silicone, elastane, neoprene or similar material.

[0057] In another embodiment (not shown), the structured surface may comprise a plurality of substantially lateral circumferential beads. In addition, the friction enhancing means may be interknitted into the lower face area.

[0058] In Fig. 7, an enlarged view of the protective sock 1 wherein a part of the tubular leg part 2 has been pulled downwards, so that entrance 15 to the pocket 6 is visible. Fig. 8 shows the wearer 100 positioning the protective member 10 into the pocket 6 of the tubular leg part 2.

[0059] In another not shown embodiment, the pocket may be knitted as a spacer fabric having a first outer layer, a second outer layer and an intermediate spacer layer integrated with said first and second outer layers. The first outer layer and/or second outer layer may comprise yarns comprising polyurethane, such as Elastane, up to 40% of total fabric weight. In addition, the intermediate spacer layer comprises monofilament and/or multifilament pile yarns. Hereby it is obtained that the pocket layer between the wearer and the protective member is provided with a cushioning effect which enhances the comfort of the wearer.

[0060] The yarns of the outer layers may comprise Elastane, polyester, polyamide, polypropylene, wool, cotton or viscose or a combination thereof. The pile yarns of the intermediate spacer layer may comprise polyester, polyamide or polypropylene or a combination thereof.

[0061] Furthermore, the yarns of the intermediate spacer layer may be interknitted with the yarns of the outer layers, so that distances are provided between the yarns in the intermediate spacer layer. The spacer fabric may have a thickness of from 1 mm to 7 mm, preferably from 3 mm to 5 mm.

[0062] Furthermore, different areas of the tubular leg part, the tubular foot part and/or the tubular ankle part may have one or more properties interknitted such as support, compression, skin friendliness, breathability, moisture handling properties or wickability.

[0063] The invention also relates to a protective sport kit comprising a pair of knitted protective socks as described above and two mouldable replaceable protective members.

[0064] Although the invention has been described in the above in connection with preferred embodiments of the invention, it will be evident for a person skilled in the art that several modifications are conceivable without departing from the invention as defined by the following claims.

Claims

1. A knitted protective sock (1) for protecting and supporting a wearer (100) during sports, comprising:

   - a tubular leg part (2) having an opening (3) and a first area (4), the first area being configured to be arranged opposite a tibia (5) of the wearer, the tubular leg part comprising an interknitted pocket (6) arranged in the first area, the pocket being configured to accommodate a replaceable protective member (10), the tubular leg part further having a first compression rate,
   - a tubular foot part (7) having an upper face area (8) and a lower face area (9), the lower face area being configured to be arranged opposite a sole of a foot of the wearer,
   - a tubular ankle part (12) arranged between the foot part and the leg part and having an ankle area (13), the ankle area being configured to be arranged opposite an Achilles tendon of the wearer,

   wherein the ankle area has a second compression rate, the second compression rate being larger than the first compression rate.

2. A knitted protective sock according to claim 1, wherein the pocket is accessible from the opening.

3. A knitted protective sock according to any of the preceding claims, wherein the lower face area comprises friction enhancing means.

4. A knitted protective sock according to claim 3, wherein the friction enhancing means comprises a structured surface.

5. A knitted protective sock according to claim 4, wherein the structured surface comprises a plurality of projections (11).

6. A knitted protective sock according to claim 5, wherein the projections are round, square or similar.

7. A knitted protective sock according to any of the claims 3-6, wherein the friction enhancing means comprise friction enhancing material on the lower face area, such as e.g. textile-based materials, rubber, silicone, elastane, neoprene or similar material.

8. A knitted protective sock according to any of the preceding claims, wherein the knitted protective sock is weft-knitted seamlessly.

9. A knitted protective sock according to any of the preceding claims, wherein the pocket is interknitted on an inside of the tubular leg part.

10. A knitted protective sock according to any of the preceding claims, wherein the tubular leg part, the tubular foot part and/or the tubular ankle part are knitted using yarns comprising Elastane, polyester, polyamide, polypropylene, wool, cotton or viscose or a combination thereof.

11. A knitted protective sock according to any of the preceding claims, further comprising a replaceable protective member configured to be introduced into the pocket.

12. A knitted protective sock according to claim 11, wherein the replaceable protective member is made from a mouldable material.

13. A knitted protective sock according to claim 11 and/or 12, wherein the replaceable protective member is configured to be moulded to fit the tibia of the wearer, so that a custom-made protective member is provided.

14. A knitted protective sock according to claim 12, wherein the mouldable material has a low thermal conductivity.

15. A protective sport kit comprising a pair of knitted protective socks (1) according to any of the preceding claims and two mouldable replaceable protective members (10).

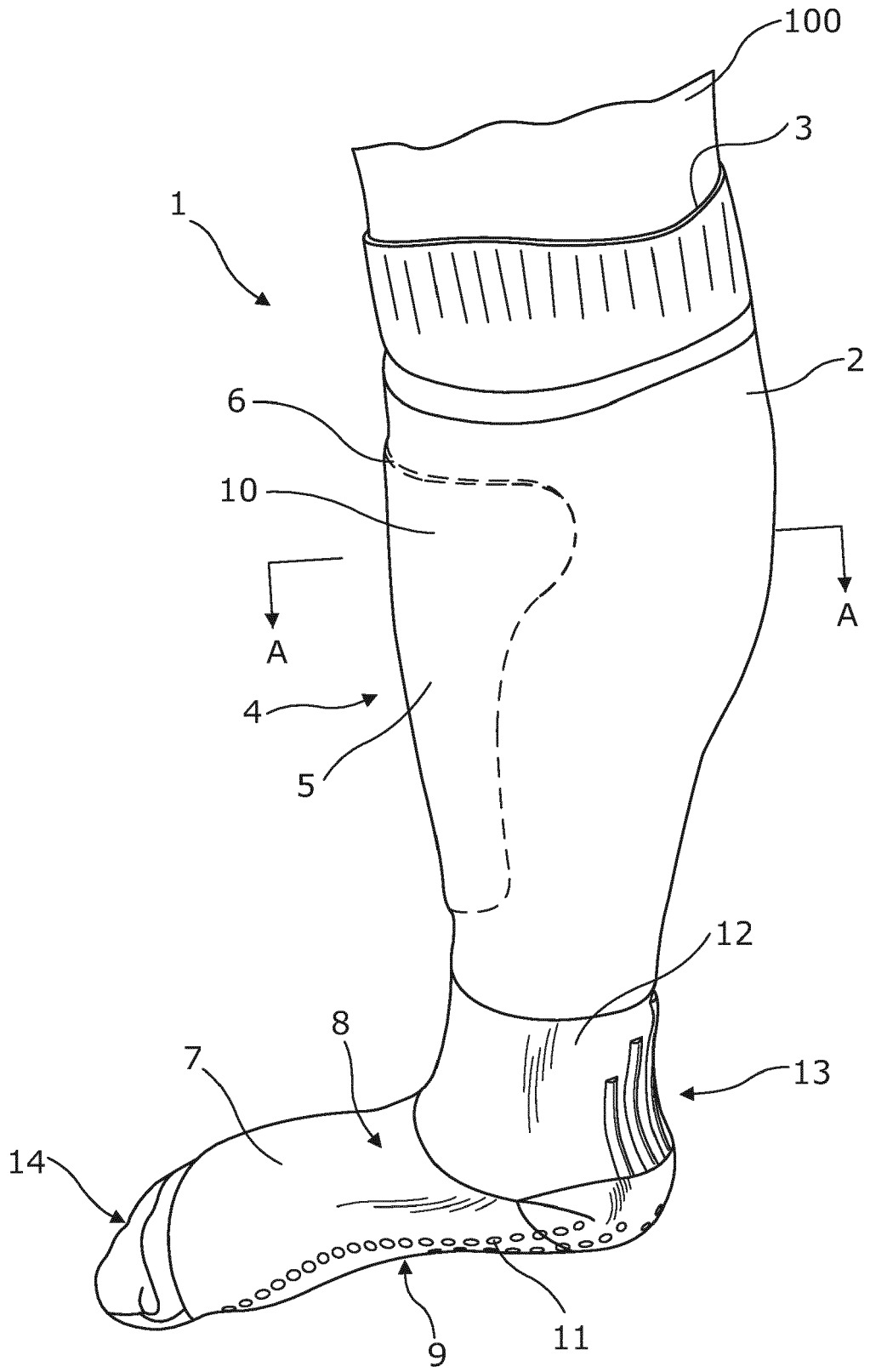

Fig. 1

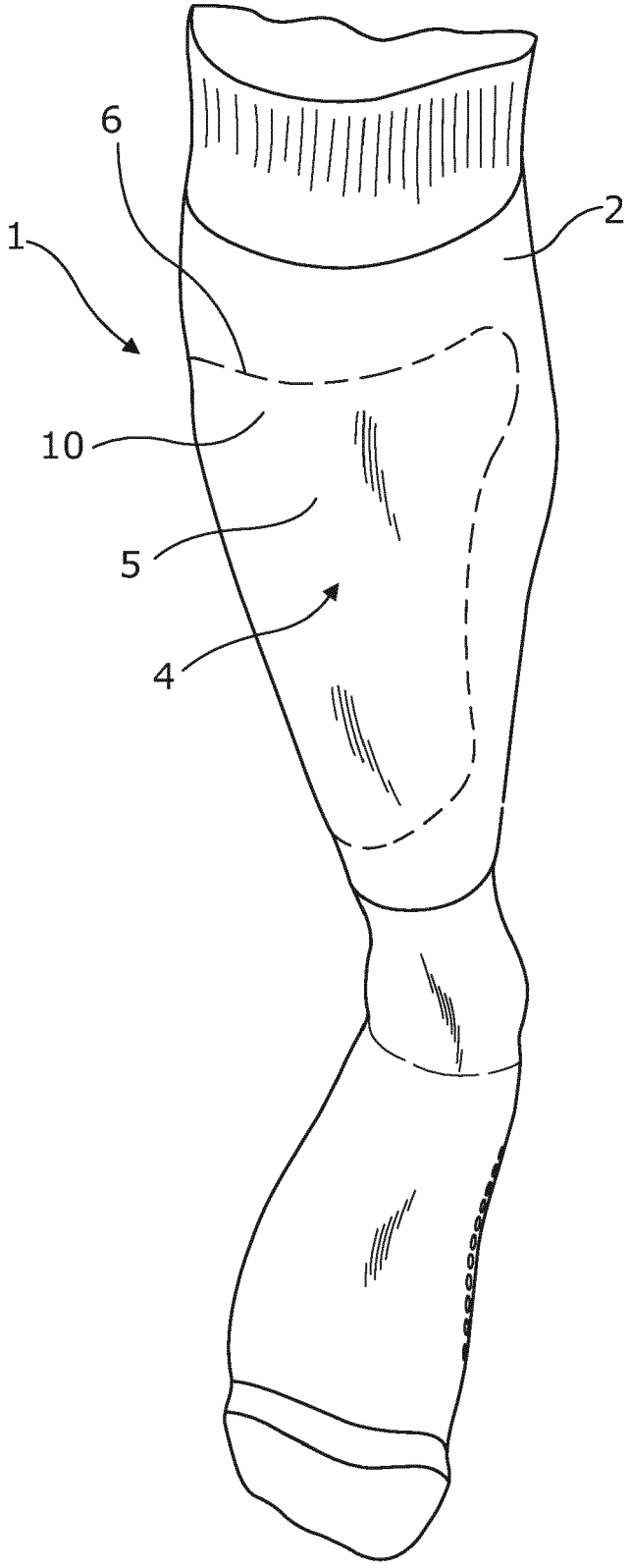

Fig. 2

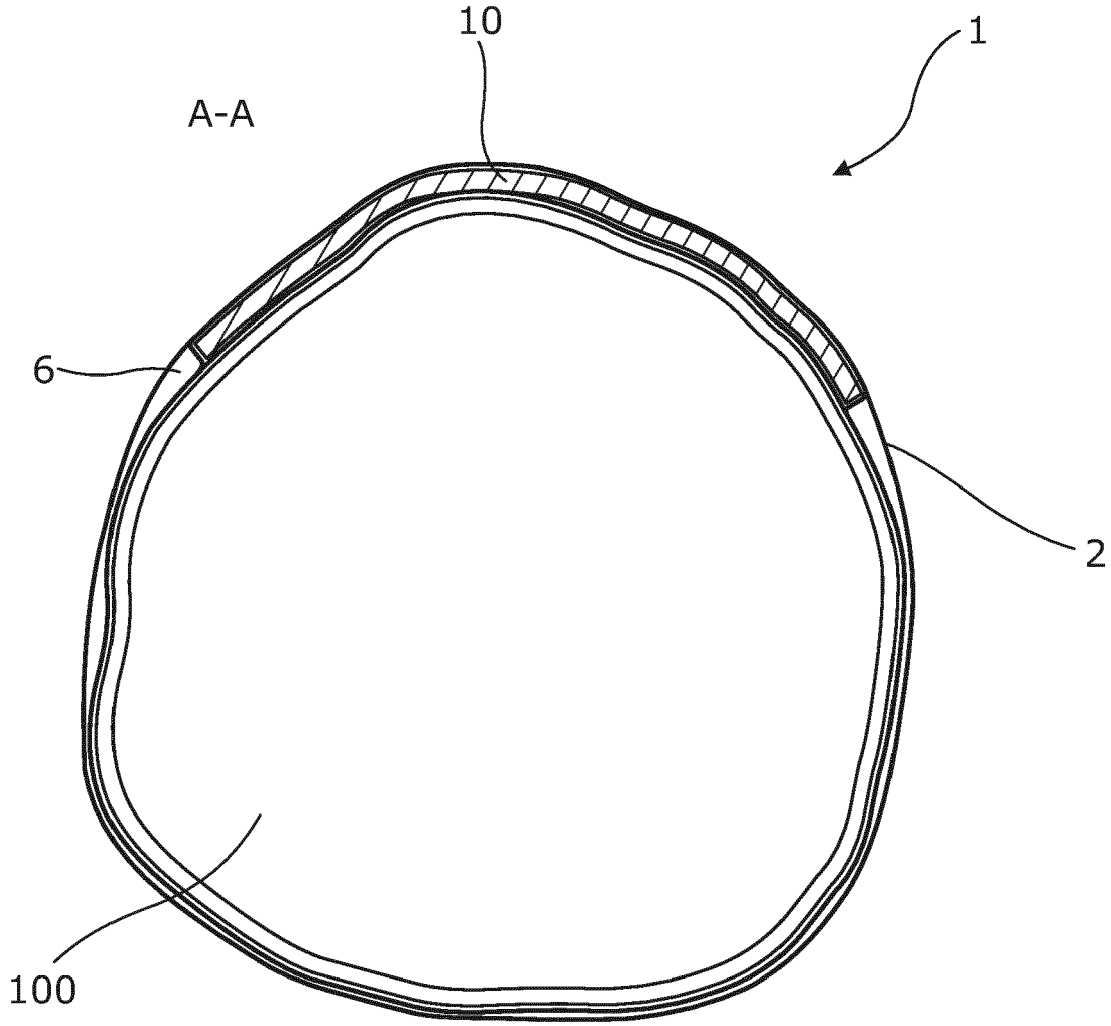

Fig. 3

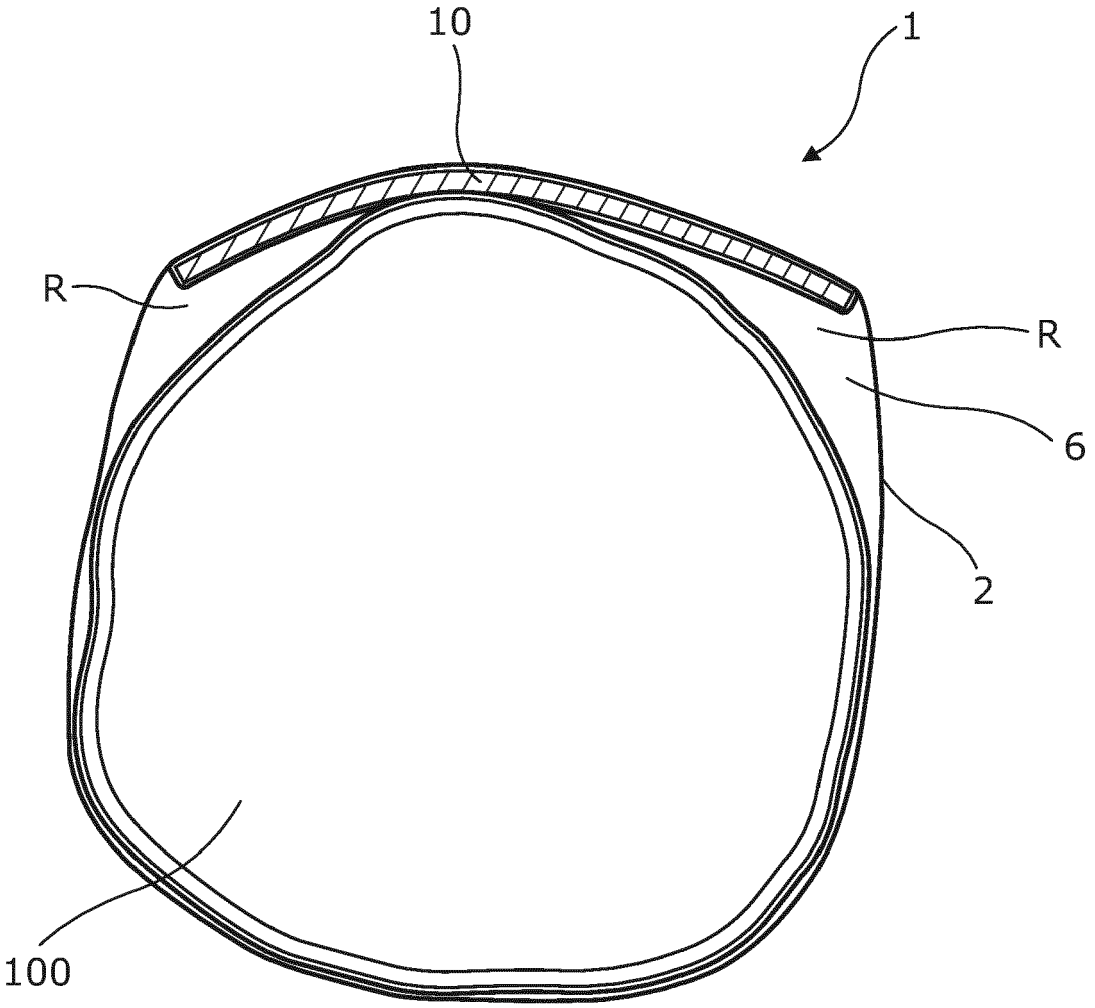

Fig. 4

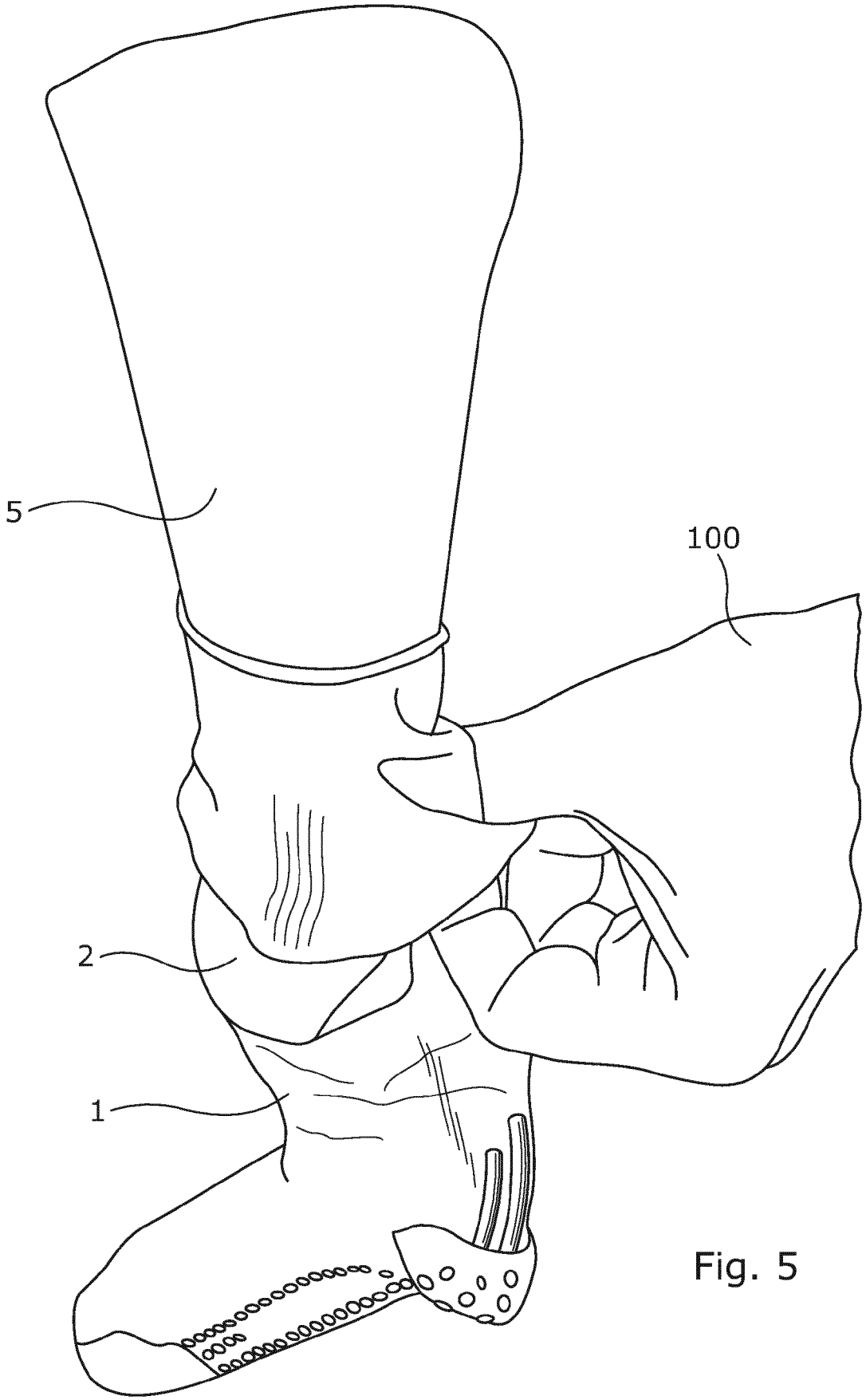

Fig. 5

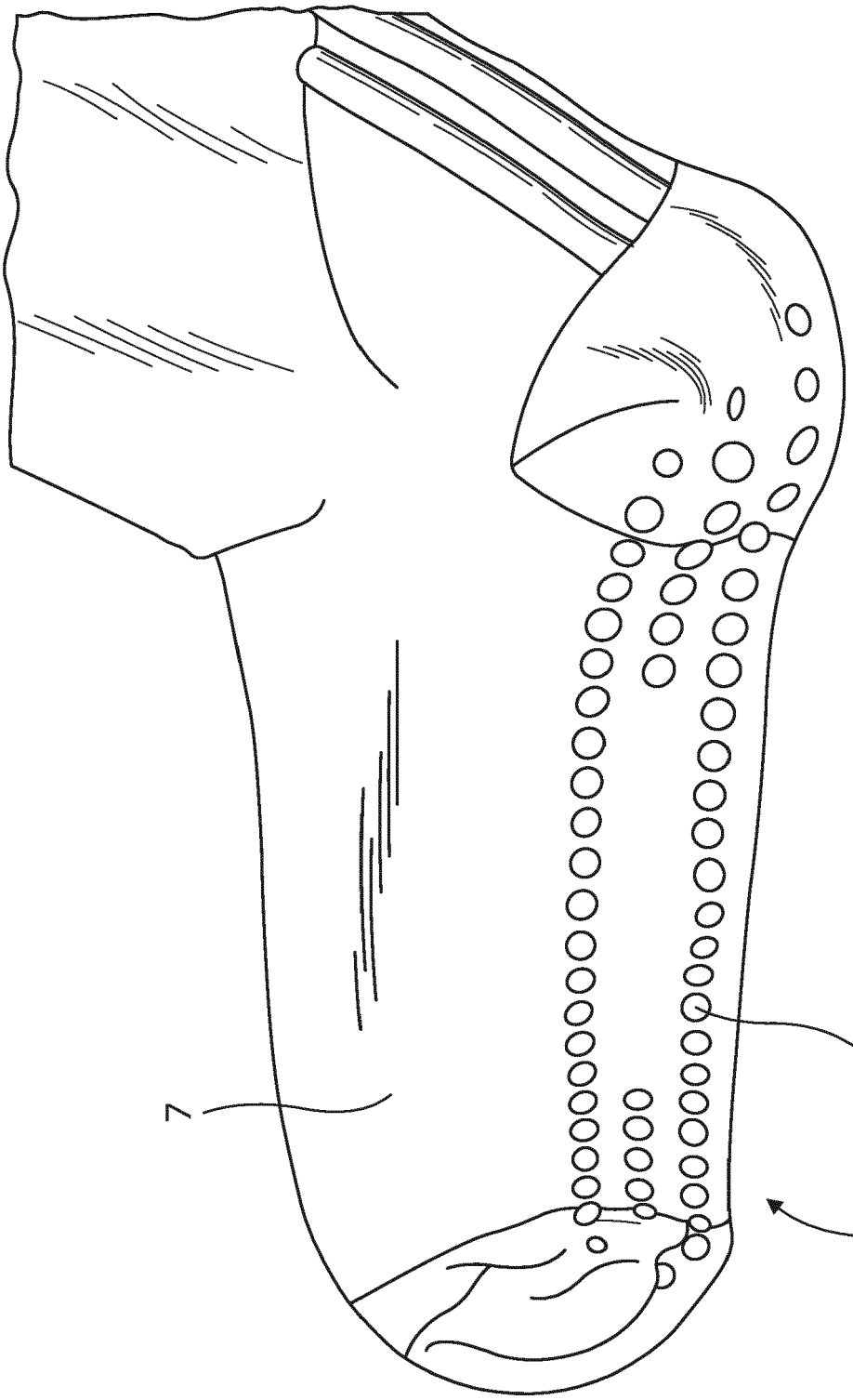

Fig. 6

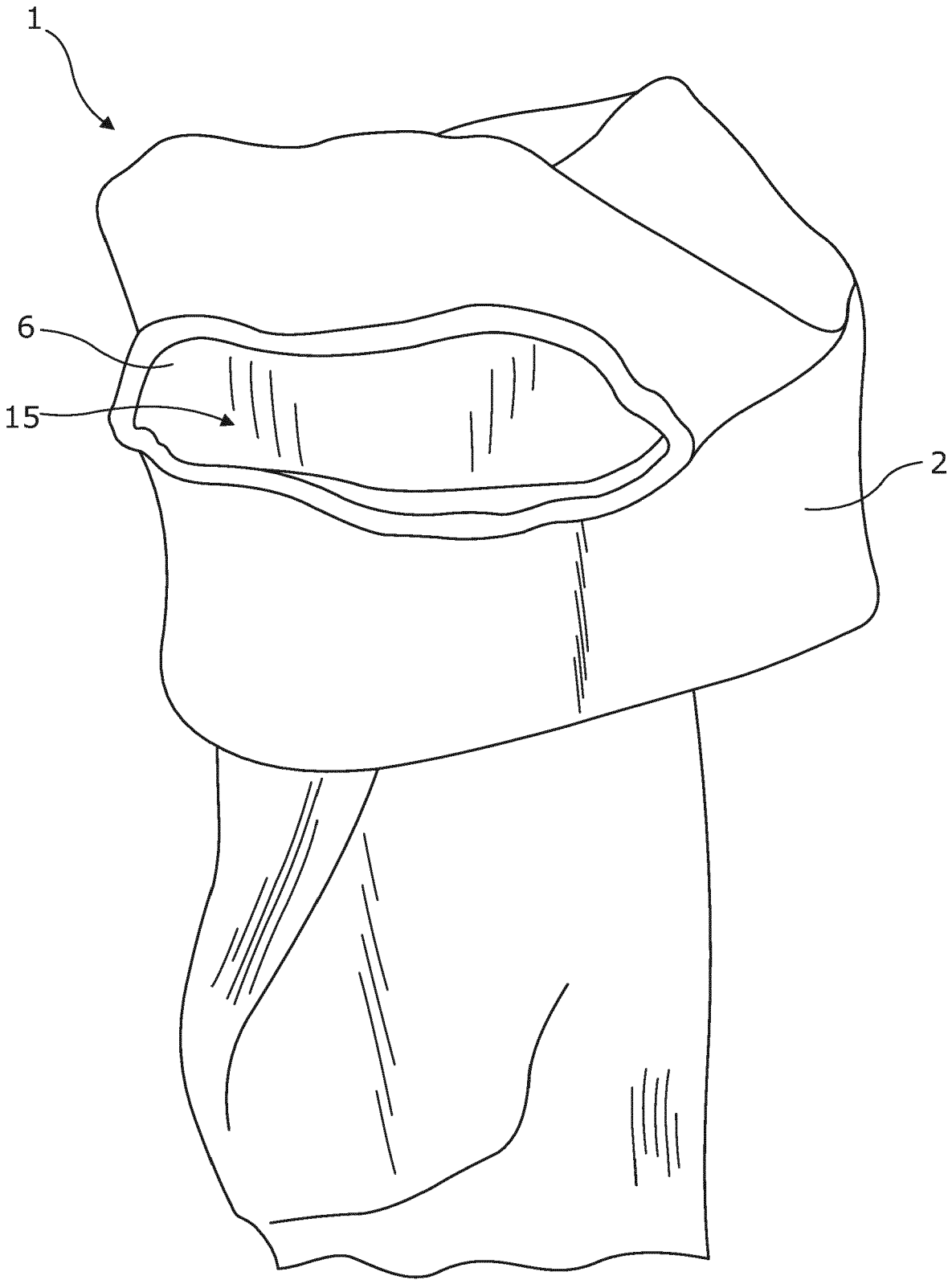

Fig. 7

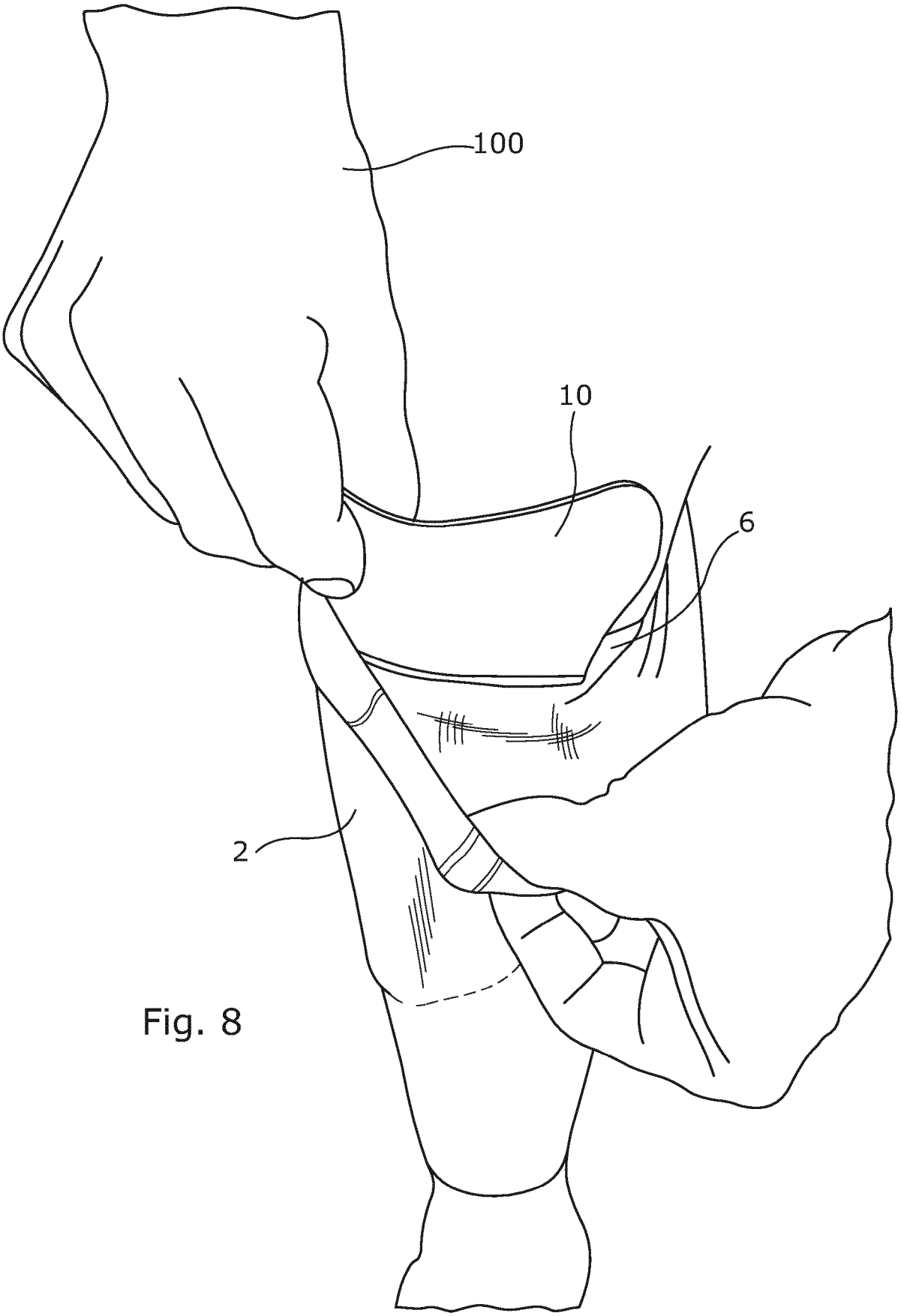

Fig. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 17 17 8412

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	8 November 2017	Thielgen, Robert

CATEGORY OF CITED DOCUMENTS

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