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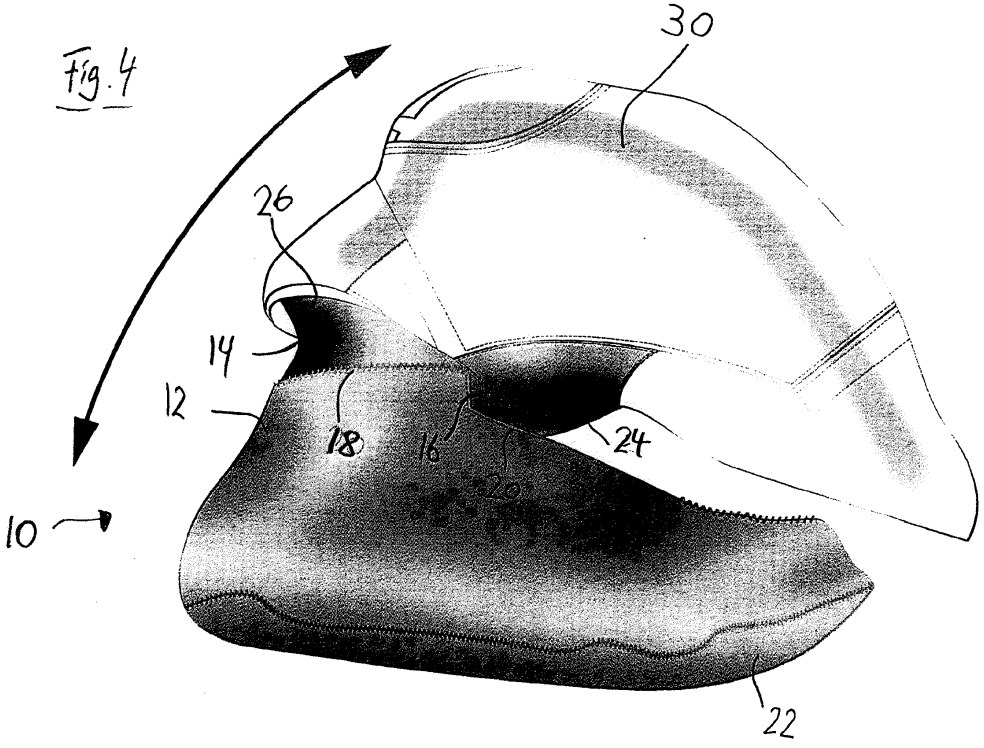
(54) FOOTWEAR ASSEMBLY

(57) Disclosed is a footwear assembly (10) for forming at least part of an upper assembly of footwear, the footwear assembly defining an instep opening (8) and comprising: a water vapor permeable and waterproof functional layer (12) having a first elasticity, and a collar layer (14) attached to the water vapor permeable and waterproof functional layer (12) such as to define at least part of the instep opening (8), the collar layer (14) having a second elasticity.



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Description

[0001] The present invention relates to a footwear assembly for forming at least part of an upper assembly of footwear, as well as to an upper assembly of footwear comprising such footwear assembly. Moreover, the present invention relates to footwear comprising such footwear assembly.

[0002] Protective clothing articles are used for wear in outdoor conditions like wet conditions (such as rain, snow, wind, cold etc.), in outdoor activities (such as skiing, biking, hiking, etc.) and should protect the wearer by preventing leakage of water or other fluids into the article while keeping the wearer comfortable by allowing perspiration to evaporate from the wearer to the outside of the article. In addition, such an article should maintain the functional attributes of protection and comfort during ordinary use.

[0003] Where flexibility of movement is essential, elastic or stretchable fabric laminates with the above functional attributes are needed along with soft and drape able feeling.. A variety of attempts have been made to improve elastic, breathable laminated and composite fabrics. Although, improvements have been made, many of these fabrics obtain varying degrees of waterproofness, breathability, elasticity, elastic-recovery, and comfort.

[0004] Thus, there remains a need for a composite that achieves a high degree of waterproofness, breathability, elasticity, elastic-recovery, and comfort by in use within a variety of applications, including footwear

[0005] In footwear, a particular requirement exists in that footwear should be easy to don (to put on), as well as it should be as easy to doff (or to take off) the footwear. Therefore, footwear should be designed such as to only loosely fit to the foot of a person when donning or doffing the footwear. Nevertheless, it is required that footwear fits the foot of a person after it has been donned and is subject to extended load during use. Usually, this contradicting requirement is solved by use of dedicated closing systems, particularly lacing systems. Velcro's and/or zippers are frequently used as well, either in addition or alternative to laces. There is particularly a problem with respect to children's footwear, since younger children typically are not able to handle more complicated procedures required to don or doff footwear, like putting on laces. Zippers or Velcro's are usually used in children's footwear as an alternative to laces, since they are easier to handle. However, none of these systems is really satisfying. While there exist footwear designs without any laces or zippers (e.g. Chelsea boots), donning or doffing of such footwear usually demands great skills and requires application of substantial forces. Thus, such footwear designs are far from practical solutions to be handled by children.

[0006] Therefore, there exists a demand for footwear which is flexible enough so it can be donned and/or doffed without the need to manipulate any laces or comparable systems, but still is flexible enough to fit the foot of a wearer during use.

[0007] Embodiments disclosed herein provide for a footwear assembly configured to form at least part of an upper assembly of footwear. The footwear assembly defines an instep opening and comprises a water vapor permeable and waterproof functional layer having a first elasticity, and a collar layer attached to the water vapor permeable and waterproof functional layer such as to define at least part of the instep opening, the collar layer having a second elasticity.

[0008] As used herein the instep opening is considered to be an opening of footwear configured for insertion of a foot when putting on (or donning) the footwear and/or when taking off (doffing) the footwear. The wearer's foot has to be inserted through the instep opening when donning the footwear, and the wearer's foot has to be taken out again through the same instep opening when doffing the footwear. This requires the portion of the footwear assembly defining the instep opening to be able to adjust the instep opening size. A loose fit where the instep opening does not hinder the movement of the wearer's foot through the instep opening is required for donning or doffing the footwear. A close fit around the ankle of the foot is desirable during use of the footwear when the footwear is subject to extended load and thus should closely fit the wearer's foot in the region around the ankle in order to guarantee stable support of the foot, comfort, and particularly avoid blisters. While conventionally the size of the instep opening is designed such as to be adjustable by use of lacing systems, zippers, Velcros, or the like, the present invention suggests a different approach based on providing elasticity or stretch ability of the footwear assembly in the portions comprising the instep opening and the regions adjacent to these portions, particularly the regions adjacent the ankle of the foot when the footwear is in use. As suggested herein, the footwear assembly is provided with suitable elasticity or stretchability in these portions, such as to allow the instep opening to adjust itself according to the different requirements when donning and/or doffing the footwear, on the one hand, and during use when the footwear assembly should fit to the wearer's foot in the regions adjacent the ankle of the foot, on the other hand. The suggested configuration particularly allows to achieve the desired flexibility of the footwear assembly without having to apply large forces for donning and/or doffing, even though water vapor permeable and waterproof functional layers are used, which are known to have only limited elasticity properties or stretchability. Using the structure suggested herein it is possible to achieve sufficiently good elasticity in the portions of the footwear assembly comprising the instep opening and being adjacent to the ankle of the foot in use, even when functional layer laminates with only limited elasticity properties or stretchability are used. This allows to don or doff the footwear without the need to apply great skills and large forces, and thus footwear designed according to the invention may be donned and

doffed even by children without any aid.

[0009] Throughout this disclosure the terms elasticity and stretchability are used equivalently referring to the ability of a material to elongate in response to a tensile force applied to it and to recover at least partly towards the original shape once the tensile force is no longer applied.

[0010] Footwear designed as suggested herein may still be provided with laces and/or zippers. However, it is no longer necessary to manipulate these for donning and/or doffing the footwear. Rather, laces and/or zippers may have mere aesthetic function.

[0011] Elasticity or stretchability of the functional layer as well as of the collar layer, and any other layer mentioned herein, may be measured according to DIN EN 14704-1 (July 2005), method A. The test may carried out as set out therein, while using test samples of the following configuration: Test sample width = 25 mm, test sample testing length = 50 mm (testing length refers to the free length of the test sample in between the clamps on its opposite side), whole length of test sample = 100 - 150 mm. The test sample is subject to 5 consecutive test cycles. In each test cycle, the test sample is subject to a constant tensioning force of 7.5 N, and the maximum elongation E of the test sample is measured. Otherwise, test conditions are as set out in DIN EN 14704-1 (July 2015), method A. A test sample is considered elastic in case it achieves a maximum elongation E compared to its original length of at least 6 mm at the end of the 5th test cycle. More preferably, a test sample may achieve a maximum elongation E of at least 8 mm, at the end of the 5th test cycle. Even more preferably, a test sample may achieve a maximum elongation E of at least 10 mm, at the end of the 5th test cycle. In all cases, the test sample is required to have at least 80 % recovery, measured 30 min after release of the tensioning force. Recovery refers to the remaining elongation C according to DIN EN 14704-1 (July 2015). When relaxing the tensioning force after the end of the 5th test cycle, the test sample recovers to a remaining elongation C according DIN EN 14704-1 (July 2015). A test sample has at least 80 % recovery in case the remaining elongation C is at most equal to 20 % of the maximum elongation measured according to DIN EN 14704-1 (July 2015). For example, in case the maximum elongation E of a test sample at 7.5 N is 6 mm, a remaining elongation $C \leq 1.2$ mm is required. In particular embodiments, a recovery of even 90% or more after 30 min may be achieved.

[0012] The water vapor permeable and waterproof functional layer is required to have a first elasticity in at least one direction, e.g. in machine direction. In such case, it will be advisable to orient the functional layer such that the elasticity direction is in the direction where most elongation is needed when donning or doffing the footwear. In case the water vapor permeable and waterproof functional layer has a first elasticity in more than one direction (e.g. in machine direction and in transverse direction), it may be convenient to define the first elasticity with respect to the main direction of elasticity, i.e. to the direction in which the elasticity of the water vapor permeable and waterproof functional layer is largest, but this is not always required. In particular embodiments, the water vapor permeable and waterproof functional layer may have the configuration of a quarter section of an upper assembly. In further embodiments, the water vapor permeable and waterproof functional layer may have the configuration of a whole upper lining of an upper assembly or a bootie, except the portions around the instep opening formed by the collar layer. In even further embodiments, the water vapor permeable and water-proof functional layer may also include a shaft bottom layer, or the whole bootie, except the portions around the instep opening formed by the collar layer. In particular embodiments, the water vapor permeable and waterproof functional layer may further have the configuration of a tongue portion.

[0013] Also, the collar layer is required to have a second elasticity in at least one direction, e.g. in machine direction. Again, it will be advisable to orient the collar layer such that its elasticity direction is in the direction where most elongation is needed when donning or doffing the footwear. Frequently, the collar layer may have a second elasticity in more than one direction (e.g. elasticity in machine direction and in transverse direction, or elasticity in weft direction and in warp direction of the knit or woven fabric from which the collar layer is made). In these cases it may be convenient to define the second elasticity with respect to the main direction of elasticity, i.e. to the direction in which the elasticity of the collar layer is largest.

[0014] It may also be convenient to define the first elasticity and the second elasticity in the same direction. For example, it may be convenient to define the first elasticity and the second elasticity both in the direction where the most elongation is needed when donning or duffing a footwear.

[0015] The collar layer does not have to be waterproof. Neither does the collar layer have to be water vapor permeable. In most cases, the collar layer may be water vapor permeable, but not waterproof. This allows to make the collar layer from a highly elastic material, and particularly from a material having elasticity in more than one direction, e.g. in weft and warp direction. Combination of the water vapor permeable and waterproof functional layer laminate with the collar layer allows to use a water vapor permeable and waterproof functional layer laminate of only limited elasticity, while still allowing sufficient donning/doffing capability, particularly donning/doffing without manipulating any laces, zippers, or the like, and without requiring much forces and skills, due to the elastic properties of the collar layer. Most elastic functional layer laminates have elastic properties in only one direction. This limited elasticity of the waterproof and water vapor permeable functional layer may be compensated for by selection of a highly elastic collar layer material, particularly a material having elasticity in at least two directions,

and appropriate arrangement of the collar layer around the instep opening where most stretchability is needed.

[0016] The donning and/or doffing characteristics of the footwear assembly will be determined mostly by the collar layer and the second elasticity thereof. Therefore, usually the second elasticity may be equal to, or larger, than a predetermined threshold. In embodiments, the second elasticity may be required to fulfil at least one of the above mentioned thresholds, when measured according to DIN EN 14704-1 (July 2015).

[0017] Except for cases where a highly elastic water vapor permeable and waterproof functional layer is used, the collar layer may have a second elasticity equal to, or larger, than the first elasticity. As mentioned before, when comparing the first elasticity and the second elasticity, it may be convenient to measure the first elasticity and the second elasticity in the same direction.

[0018] To provide sufficient extension of the instep opening when donning or doffing the footwear, the collar layer may extend along at least 30% of circumference of the instep opening, in particular at least 60% of circumference of the instep opening; in particular at least 2/3 of the circumference of the instep opening. With any of these embodiments, the collar layer does not necessarily have to extend around a contiguous section of the circumference, but may extend around a number of circumference pieces, separated by non-elastic portions comprising a water vapor permeable and waterproof functional layer, or not. In a number of particular embodiments, the collar layer may extend between 30 % and 60 % of the circumference of the instep opening. In a number of particular embodiments, the collar layer may extend between 30 % and 2/3 of the circumference of the instep opening (upper boundary not included), in particular between 60 % and 2/3 of the circumference of the instep opening (upper boundary not included). In a number of particular embodiments, the collar layer may extend along 90% of the circumference of the instep opening, in some embodiments even along the full circumference of the instep opening.

[0019] In embodiments the collar layer may be attached to the water vapor permeable and waterproof functional layer by means of a seam. In order not to compromise elasticity of the collar layer and/or the water vapor permeable and waterproof functional layer, the seam may have the configuration of an elastic seam. For example, the elastic seam may be formed by a thread having a third elasticity. Elastic threads are widely used in the art for providing elastic seams. For example, threads comprising, or even made of, Lycra or Elasthan, are frequently used. As an alternative, or in addition using an elastic thread the elastic seam may be formed by a stitch pattern providing elastic characteristics, like a zig-zag stitch. A zig zag stich has elastic characteristics by itself such that in this case a thread made of non-elastic material may be used. In most embodiments, the elastic seam may extend along any portion where the water vapor permeable and waterproof functional layer and the collar layer abut each other. At least, the elastic seam may extend along at least 30% of the circumference of the instep opening. In a number of particular embodiments, the elastic seam may extend along 60%, along 2/3, or even along 90% of the circumference of the instep opening, in some embodiments even along the full circumference of the instep opening.

[0020] As mentioned before, usually it will make sense if the elastic seam will extend at least along any contact region where the water vapor permeable functional layer and the collar layer are attached to each other around the instep opening. The elastic seam may extend further than these contact regions, but this is not necessary. The elastic seam may extend along only a part or parts of the contact region, in case the collar layer extends along more than 2/3 of the circumference of the instep opening. However, the elastic seam should extend along at least 2/3 of the circumference of the instep opening in such embodiments. In case the collar layer extends along at least 60 % of the circumference of the instep opening, it is possible that the elastic seam may extend along only a part or parts of the contact region. However, the elastic seam should extend along at least 30 % of the circumference of the instep opening in such embodiments. Even in case the collar layer extends along at least 30 % of the circumference of the instep opening, it is possible that the elastic seam may extend along only a part or parts of the contact region. However, the elastic seam should extend along at least 30 % of the circumference of the instep opening in such embodiments.

[0021] As mentioned above, normally it will be convenient to measure the first elasticity and the second elasticity in the same direction. Typically, the direction in which the first elasticity and the second elasticity are measured will correspond to the direction where most elongation is required when donning of doffing the footwear. For most footwear designs, the direction where most elongation is required for donning or doffing the footwear is roughly in the horizontal direction, between the heel and the toe, and thus the first elasticity and the second elasticity may be measured in a direction parallel to the horizontal direction. The horizontal direction usually extends parallel to the plane of the tread of the shoe which contacts the ground in use. Parallel as used herein may include an angular range of at most $\pm$ 25 degrees with respect to the horizontal direction, particularly at most $\pm$ 15 degrees with respect to the horizontal direction, particularly at most $\pm$ 10 degrees with respect to the horizontal direction.

[0022] When the water vapor permeable and waterproof functional layer and the collar layer are attached to each other via a seam, it may be conceivable that the first elasticity and the second elasticity are measured in direction parallel the seam. Parallel as used herein may include an angular range of at most $\pm$ 25 degrees with respect to the seam, particularly at most $\pm$15 degrees with respect to the seam, particularly at most $\pm$ 10 degrees with respect to the seam. The seam may be ori-

ented parallel to the direction in which most elongation is required during donning or doffing.

[0023] Particularly, a composite sample piece made of the water vapor permeable and waterproof functional layer and the collar layer attached to each other by a seam may have a fourth elasticity. The fourth elasticity may be equal to, or larger, than a predetermined threshold. The fourth elasticity may be required to fulfil at least one of the above mentioned thresholds, when measured according to DIN EN 14704-1 (July 2015). The fourth elasticity may be equal to, or larger, than the first elasticity. The fourth elasticity may even be equal to, or larger than, the second elasticity. In this way, the seam connecting the water vapor permeable and waterproof functional layer and the collar layer is sufficiently elastic to avoid compromising the elasticity of the water vapor permeable and waterproof functional layer or the elasticity of the collar layer. As mentioned such elasticity can be provided by using an elastic seam configuration, e.g. a zig-zag stitch and/or using an elastic thread.

[0024] The fourth elasticity may measured in the same way as the first elasticity, i.e. according to DIN EN 14704-1 (July 2015), method A. The test sample for measuring the fourth elasticity has the same overall dimensions: width = 25 mm, test length = 50 mm, whole length of sample 100 - 150 mm. The first functional layer and the collar layer cover half of the area of the test sample and are attached to each other along a linear seam extending in the longitudinal direction of the test sample.

[0025] Otherwise, the test conditions apply as set out above with respect to the first elasticity: The test sample is subject to 5 consecutive test cycles. In each test cycle, the test sample is subject to a constant tensioning force of 7.5 N, and the maximum elongation E of the test sample is measured. A test sample is considered elastic in case it achieves a maximum elongation E of at least 6 mm at the end of the 5th test cycle. More preferably, a test sample may achieve a maximum elongation E of at least 8 mm, at the end of the 5th test cycle. Even more preferably, a test sample may achieve a maximum elongation E of at least 10 mm, at the end of the 5th test cycle. The test sample is required to have at least 80 % recovery, measured 30 min after the tensioning force has been released. Recovery refers to the remaining elongation C according DIN EN 14704-1 (July 2015). In particular embodiments, a recovery of even 90% or more after 30 min may be achieved.

[0026] The water vapor permeable and waterproof functional layer may have the configuration of a laminate made up with a water vapor permeable and waterproof membrane and at least one textile layer attached to the water vapor permeable and waterproof membrane. Such laminates are principally known in the art, e.g. from US 5,804,011 which discloses a fabrics being stretchable in two dimensions. The textile layer may have an elastic textile configuration, e.g may be made as a knit having an elastic knit pattern (like a tricot, warp knit, or similar knit pattern). In such case the textile need not necessarily include elastic threads to provide the desired elastic characteristics. However, in a number of configurations, it may be helpful if the textile layer comprises elastic filaments, e.g. made from elasthane, to further enhance the elasticity of the textile layer.

[0027] The water vapor permeable and waterproof functional layer may include a water vapor permeable and waterproof membrane. The membrane may be selected from polyurethane, polyester, polyether, polyamide, polyacrylate, copolyether ester and copolyether amides, as well as other suitable thermoplastic and elastomeric films. In an aspect of the invention the waterproof, water vapor permeable membrane may be made of a fluoropolymer, particularly made of microporous expanded polyterafluorethylene (ePTFE). The microporous polytetrafluoroethylene membrane is a membrane of expanded polytetrafluoroethylene as taught in U.S. Pat. Nos. 3,953,566 and 4,187,390, to Gore. Such membranes of expanded polytetrafluoroethylene are present in commercially available laminates from W. L. Gore and Associates, Inc., Elkton, Md., under the tradename GORE-TEX® fabric. The water vapor permeable and waterproof functional layer may be composed of a polyurethane coated microporous expanded polytetrafluoroethylene membrane made substantially according to the teachings of U.S. Pat. No. 4,194,041 and U.S. Pat. No. 4,942,214 assigned to W.L. Gore and Associates, Inc, in Elkton, Md.

[0028] The collar layer may be a water vapor permeable and waterproof functional layer as well, but this is not a requirement. Normally, the collar layer will not be a water vapor permeable and waterproof functional layer. Rather, the collar layer may have any desired configuration, given it provides for the required elasticity characteristics. In some embodiments, the collar layer may be waterproof.

[0029] In some embodiments, the footwear assembly as described above may have the configuration of an upper lining. As an upper lining, the footwear assembly is attached to the inner side of an upper material from which an upper assembly of a footwear article is made. In some embodiments, the upper lining may have the configuration of a water vapor permeable and waterproof sock. Such a sock is also referred to in the art as a "bootie". A bootie comprises an upper lining surrounding the upper side of a person's foot as well as an upper bottom on which the sole of a person's foot rests. As such, the bootie is an independent lining structurally separate from an upper material or an assembly insole of the footwear article. In the course of manufacturing the footwear, the bootie is inserted into the upper assembly such as to abut the inner side of the upper material and the upper side of an assembly insole. The bootie may be fixed to the upper material and/or to the assembly insole, but otherwise is independent of the upper material and/or the assembly insole.

[0030] In some embodiments, the footwear assembly may have the configuration of a water vapor permeable

and waterproof upper lining to be attached to an upper bottom. Different from a bootie, the upper lining according to such configuration does not include an upper bottom, but only includes an upper lining surrounding the upper part of the foot. In the course of manufacturing the footwear, the upper lining is to be closed on its bottom side by an upper bottom. The upper bottom may be waterproof, if desired water vapor permeable and waterproof. For example, the upper lining may attached to upper bottom by lasting using a lasting glue. Alternatively, upper lining may be attached to upper bottom by way of a strobel seam. Upper lining may attached to upper bottom directly, or via an intermediate element, e.g. a sealing band or a netband. When a netband is used, a waterproof seal may be obtained by injection molding of plastics material, e.g. during assembly of a sole to the upper assembly.

[0031] In particular embodiments of the footwear assembly the water vapor permeable and waterproof functional layer may extend up to a height of at least 20 % of the height of the footwear assembly. In some embodiments, the water vapor permeable and waterproof functional layer may extend up to a height between 20 % of the height of the footwear assembly and 65 % of the height of the footwear assembly (upper boundary not included). Particularly, the water vapor permeable and waterproof functional layer to a height of at least 65 % of the footwear assembly, more in particular 90% or even up to a height of at least 95 % of the footwear assembly. Such configuration is particularly helpful in embodiments where the collar layer is not waterproof or where the collar layer is waterproof, but not breathable. In case of a non-waterproof collar layer, the higher the water vapor permeable and waterproof functional layer extends, the better will be waterproofness of the footwear article. In case of a waterproof, but non-breathable collar layer, the higher the water vapor permeable and waterproof functional layer extends, the better will be the water vapor permeability of the footwear article.

[0032] In particular embodiments of the footwear assembly the collar layer may comprise elastic extensions on its side opposite the water vapor permeable functional layer. These extensions may be configured to be folded over and attached to an upper material layer, such as to form an elastic backing layer covering openable portions, tongue portions and/or gusset portions of the upper material layer. In such configurations, the collar layer may be folded over at the periphery of the instep opening such that the extensions extend from the instep opening downwards. The downwards extending portions might be attached to the inner side of the upper material layer and thereby allow to cover any openable portions in the upper material layer by an elastic layer on the inner side. This is a particularly elegant design to cover openings or slits in the upper material, which would otherwise have to be covered by some flexible material. In one example gusset portions required laterally from a tongue in conventional footwear designs might be replaced completely by such folded over extensions of the elastic collar layer. The same applies to any portions in the upper material layer where zippers are provided. The slits in the upper material being created when the zipper is opened might be easily backed by the elastic material of the folded over extensions of the collar layer.

[0033] Any of the embodiments of a footwear assembly described above may be used in the manufacturing of an upper assembly of footwear. The upper assembly may comprise an upper material layer surrounding at least an upper portion of a foot, and the footwear assembly according to any of the previous embodiments. The footwear assembly as described above may form an upper lining arranged on an inner side of the upper material layer, the upper lining being independent of the upper material to such extent that the upper lining at least in the region of the water vapor permeable and waterproof functional layer and the elastic collar is able to adapt its shape independently of the upper material layer. Hence, the upper material can be designed such as to only loosely fit to the foot, particularly in the regions adjacent to the instep opening and the regions around the ankle of the foot, without compromising comfort or stability of the foot in use. This allows a simple donning or doffing of the footwear, even in case upper materials with poor elasticity are used, without compromising stability and comfort to the person wearing the footwear.

[0034] The upper material layer and/or the upper lining layer may be configured to be attached to an upper bottom layer in such a way as to form a waterproof and water vapor permeable upper assembly.

[0035] In embodiments, the upper material layer may comprise at least one openable portion, tongue portion and/or gusset portion, and the collar layer of the upper lining layer may comprises elastic extensions on its side opposite the water vapor permeable functional layer. The extensions may be folded over and may be attached to the upper material layer on an inner side thereof. Thereby, the extensions of the collar layer may form an elastic backing layer covering the at least one openable portion, tongue portions and/or gusset portions of the upper material layer, as described in detail above.

[0036] The invention will be described in more detail in the following by way of exemplary embodiments which are sown in the figures. These show:

Fig. 1 shows a highly simplified and schematic view of a footwear assembly having the configuration of a water vapor permeable and waterproof functional layer bootie for a low cut shoe;

Fig. 2 shows a highly simplified and schematic view of a footwear assembly having the configuration of a water vapor permeable and waterproof functional layer bootie for a mid cut shoe;

Fig 3 shows a highly simplified and schematic view of a footwear assembly having the configuration of a water vapor permeable and waterproof functional

layer bootie for a high cut shoe;

Fig. 4 shows a highly simplified and schematic view of a footwear assembly having the configuration of a water vapor permeable and waterproof functional layer bootie for a mid cut shoe with an upper material layer attached to the footwear assembly;

Fig. 5 shows a highly simplified and schematic view of the footwear assembly of Fig. 4 in a view from the from tip of the footwear; and

Fig. 6 shows a highly simplified and schematic view of a mid cut footwear comprising the footwear assembly of Figs. 4 and 5, in a completed state.

[0037] Figs. 1 to 3 show highly simplified and schematic views of a footwear assembly 10 having the configuration of a water vapor permeable and waterproof functional layer bootie. Fig. 1 shows a bootie for a low cut shoe. Fig. 2 shows a bootie for a mid cut shoe, and Fig. 3 shows a bootie for a high cut shoe. The following considerations relate to all embodiments shown in Figs. 1 to 3, unless explicit reference is taken to only one of the Figs.

[0038] The footwear assembly 10 (bootie) comprises a water vapor permeable and waterproof functional layer laminate 12, as described above, and a collar layer 14. The collar layer 14 is attached to the functional layer laminate 12 such as to form an upper portion of the footwear assembly 10 and surrounding an instep opening 8. The collar layer 14 is attached to the water vapor permeable and waterproof functional layer laminate 12 by an elastic seam 18. The collar layer 14 is made from an elastic fabric having elasticity in two dimensions, namely the warp and weft directions of the fabric. The collar layer 14 is made from a fabric having required elastic characteristics to allow easy donning and doffing, particularly applying only moderate forces and not requiring to open any laces or zippers. However, the collar layer 14 is not waterproof.

[0039] The water vapor permeable and waterproof functional layer 12 is a laminate formed by a water vapor permeable and waterproof membrane and a textile layer attached to the water vapor permeable and waterproof membrane. The water vapor permeable and waterproof functional membrane may be made from expanded PTFE which is attached to a supporting textile layer according to the teaching of US 5,804,011. The microporous polytetrafluoroethylene membrane is a membrane of expanded polytetrafluoroethylene as taught in U.S. Pat. Nos. 3,953,566 and 4,187,390, to Gore. The water vapor permeable and waterproof functional layer may be composed of a polyurethane coated microporous expanded polytetrafluoroethylene membrane made substantially according to the teachings of U.S. Pat. No. 4,194,041 and U.S. Pat. No. 4,942,214 assigned to W.L. Gore and Associates, Inc, in Elkton, Md..The membrane may also be made of polyurethane (PU), polyether ester (PES), polyethylene or combinations of these materials.

[0040] Water Vapor Permeability (WVP) as used herein concerning the functional layer may be tested as defined in EN ISO 15496 (2004), also known as the "Cup Test". A 20 x 20cm or Ø 100mm sample of functional layer or functional layer laminate is placed onto a container containing water and covered with a membrane. Then a cup containing potassium acetate and being covered by the same membrane is placed on the sample. Water vapor passes through the functional layer into the cup, whose weight increase is then determined. The functional layer is considered water vapor permeable or breathable if the WVP is greater than or equal to 0,01 g/(Pa*m^2*h). If the required size of the sample cannot be obtained, a smaller sample may be used for the measurement using a smaller cup containing half the amount of potassium acetate specified in the Norm, i.e. 50g instead of 100g and mixed with 15,6g of water. In case a smaller cup is used, the applied area in the calculation needs to be adjusted, accordingly.

[0041] A functional layer may be considered waterproof in case a 100 cm^2 sample of the material under investigation is able to withstand a water ingress pressure of at least 0.05 bar. Particularly, the material may even withstand a water pressure of at least 1 bar. The method for carrying out this test is described in the ISO Standard No. 811 (1981) (EN 20811 (1992)). The measurement is carried out by exposing a 100 cm^2 sample of the material under investigation to a rising water pressure. For this purpose, distilled water having a temperature of 20±2°C is used. The rise in the water pressure is 60±3 cm H_2O/min. The water ingress pressure of the sample under investigation is that pressure at which water passes through the opposite side of the sample under investigation. If a 100 cm^2 sample cannot be obtained, a smaller sample may be used for the measurement. There is a linear correlation between sample size and water ingress pressure, so that the water ingress pressure may be calculated for a 100 cm^2 sample.

[0042] The water vapor permeable and waterproof membrane is attached to a textile layer in such a way that the water vapor permeable and waterproof functional layer 12 has the configuration of an elastic laminate having at least one direction of elasticity, usually in the machine direction. In some configurations, the water vapor permeable and waterproof functional layer may have elasticity in two directions, as shown in US 5,804,011, for example. To impose elastic characteristics to the laminate, the textile layer may have an elastic textile configuration, e.g may be made as a knit having an elastic knit pattern (like a tricot, warp knit, or similar knit pattern). In such case the textile need not necessarily include elastic threads to provide the desired elastic characteristics. However, in a number of configurations, it may be helpful if the textile layer comprises elastic filaments, e.g. made from elasthane to further enhance the elasticity of the textile layer. In Figs. 1 to 3, the main direction of elasticity of the water vapor permeable and waterproof functional

layer 12 is indicated by the arrow A. The main direction of elasticity of the water vapor permeable and waterproof functional layer 12 is directed in the direction where the most elongation and flexibility is required when donning or doffing a footwear article with the footwear assembly 12 having the configuration of a bootie. Tests have shown that such direction of most elongation and flexibility is the direction from the heel to the toe of the bootie for all bootie configurations shown in Figs. 1 to 3.

[0043] In all embodiments shown in Figs. 1 to 3, the main direction of elasticity of the functional layer laminate 12 and the main direction of elasticity of the collar layer 14 are directed parallel to the direction A in which most flexibility and elongation is required for donning and doffing. Also the elastic seam 18 connecting the functional layer laminate 12 with the collar layer 14 is directed parallel to such direction A in which most flexibility and elongation is required for donning and doffing. The elastic seam 18 has the configuration of a zig zag stitch which provided for elasticity irrespective of whether an elastic thread is used to carry out the stitches.

[0044] There is a difference between the low cut bootie 10 shown in Fig. 1, the mid cut bootie 10 shown in Fig 2, and the high cut bootie 10 shown in Fig. 3 with respect to the height where the most elongation and flexibility is required when donning or doffing. In the low cut bootie 10 (see Fig. 1), the most flexibility is required at a height substantially equal to the height of the instep opening 8, as the bootie only extends up to a height slightly below the ankle of the foot and roughly up to the height of the instep of the foot. Also for the mid cut bootie 10 shown in Fig. 2, the most flexibility for donning and doffing is required at a height roughly equal to the height of the instep of the foot. However, in this configuration, the bootie extends up to a height slightly above the ankle of the foot, and hence the height of maximum elongation and flexibility is at some distance below the height of the instep opening 8. For the high cut bootie 10 shown in Fig. 3, the bootie extends up to a height well above the ankle of the foot. In this configuration, it has turned out that the height of maximum elongation for donning and doffing is only slightly above the ankle of the foot, and thus is substantially lower than the height of the instep opening 8. In all embodiments as shown in Figs. 1 to 3, the functional layer laminate 12 extends up to such a height that the elastic seam 18 connecting the functional layer laminate 12 and the collar layer 14 is roughly in the same height as the height of maximum elongation when donning or doffing a footwear including the respective bootie 10. Such configuration allows to optimally use the elasticity provided by the collar layer 14 to provide flexibility for donning and doffing, and fit the foot in the region around the ankle, when the footwear is used. It is however important in such configuration that the seam 18 provides sufficient elasticity to avoid losing the additional elasticity provided by the collar layer 14.

[0045] Moreover, the configuration of the height of the elastic seam 18 as shown in Figs. 1 to 3 allows the waterproof functional layer laminate 12 to extend up to a height as far as possible, thereby ensuring maximum waterproofness of the footwear. This even applies for the low cut bootie of Fig. 1, since in this configuration the functional layer laminate may extend almost up the maximum height of the bootie (e.g. the functional layer laminate may extend up to 90 %, or even up to 95 %, of the height of the bootie below the instep opening 8). For the mid cut bootie of Fig. 2, the functional layer laminate may extend up to about 70 % to 90 %, in most cases up to about 75 to 85 %, of the height of the bootie 10 at the instep opening 8. However, in absolute height this is still the same height, or even higher, than with the low cut bootie 10, in any case the functional layer laminate 12 always may extend up to a height roughly comparable to the instep of the foot. With respect to the high cut bootie 10 shown in Fig. 3, in order to allow easy donning and doffing it is advisable to allow the collar layer 14 to extend at a substantial vertical portion below the instep opening 8, down to a height slightly above the ankle of the foot where the maximum elongation during donning and doffing will be required (see the constriction in the bootie cross section visible in Fig. 3). Therefore, the functional layer laminate will extend into much less height when expressed in relative terms with respect to the height of the instep opening, roughly up to a height of 60 % to 80 %, particularly up to a height of 65 % to 75 % of the height of the instep opening. However, such height is still well above the ankle and thus provides for sufficient waterproofness.

[0046] In the embodiments shown in the Figs. 1 to 3 the footwear assembly 10 forms an upper lining bootie to be attached to the inner side of an upper material 30 (see Figs 4 - 6) of an upper assembly. The upper lining bootie 10 has a sock shape configuration formed by two of the water vapor permeable and waterproof functional layers 12 and an upper bottom functional layer 22. As more clearly visible in Fig. 5 the water vapor permeable and waterproof functional layer 12 forms one of two upper side parts 12 of the bootie 10. Both upper side parts 12, 12 are connected with each other by a longitudinally extending seam 13 which is sealed by a seam tape (not shown). The upper bottom layer functional layer 22 is connected to each of the two water vapor permeable and waterproof functional layers 12, 12 also by way of seams which are sealed by respective seam tapes (not shown).

[0047] Also visible in Figs. 1 and 2 is a tongue portion 16 formed by the collar layer 14. The tongue portion 16 is also connected to the water vapor permeable and waterproof functional layer laminate 12 by way of an elastic seam 20. As more clearly shown in Figs. 4 to 6, the tongue portion 16 comprises an extension portion 26 which is folded over at the instep opening 8 such that the folded over section 26 may be connected to the inner side of an upper material 30, and thus forms a water gusset portion (see particularly Figs. 4 and 5). As the material of the collar layer 14 is highly elastic, such water gusset portions 26 allow a foldfree fit of the tongue portion 26 to the foot

at each time, including donning and doffing. Conventional water gussets, which would lead to folds, are completely superfluous. This increases comfort.

[0048] Fig. 4 shows a highly simplified and schematic view of a mid cut footwear assembly having the configuration of a water vapor permeable and waterproof functional layer bootie 10 for a mid cut shoe with an upper material layer 30 attached to the footwear assembly. Fig. 5 shows a highly simplified and schematic view of the footwear assembly of Fig. 4 in a view from the toe portion of the footwear. Fig. 6 shows a highly simplified and schematic view of the mid cut footwear comprising the footwear assembly of Figs. 4 and 5, in a completed state.

[0049] As can be seen in Figs. 4 to 6, the upper material layer 30 is attached to the footwear assembly 10 in the region of the instep opening 8. Thus, it is particularly helpful in case the collar layer 14 comprises elastic extensions 24, 26, 28 on its side opposite the water proof and water vapor permeable functional layer 12. These extensions 24, 26, 28 are be configured to be folded over and attached to the upper material layer 30 on an inner side thereof. Thereby, the extensions 24, 26, 28 form a backing layer covering openable portions (like the zipper portion 32 of the upper material 30 visible in Fig. 6), tongue portions and/or water gusset portions of the upper material layer 30. In such configurations, the collar layer 14 may be folded over at the periphery of the instep opening 8 such that the extensions 24, 26, 28 extend from the instep opening 8 downwards. The extensions may be arranged between the upper material and the footwear assembly. The downwards extending portions 24, 26, 28 are attached to the inner side of the upper material layer 30 and thereby allow to cover any openable portions in the upper material layer 30 by an elastic layer on the inner side. This is a particularly elegant design to cover openings or slits in the upper material 30, which would otherwise have to be covered by some flexible material. E.g.water gusset portions required laterally from a tongue in conventional footwear designs might be replaced completely by such folded over extensions 24, 26 of the elastic collar layer. The same applies to any portions in the upper material layer where zippers 32 are provided. The slits in the upper material being created when the zipper 32 is opened might be easily backed by the elastic material of the folded over extensions 28 of the collar layer 14.

Claims

1. Footwear assembly (10) for forming at least part of an upper assembly of footwear, the footwear assembly (10) defining an instep opening (8) and comprising:

   - a water vapor permeable and waterproof functional layer (12) having a first elasticity, and
   - a collar layer (14) attached to the water vapor permeable and waterproof functional layer (12) such as to define at least part of the instep opening (8), the collar layer (14) having a second elasticity.

2. The footwear assembly (10) according to claim 1, wherein the collar layer (14) has elastic properties in more than one direction.

3. The footwear assembly (10) according to claim 1 or 2, wherein the second elasticity is equal to, or larger, than a predetermined threshold.

4. The footwear assembly (10) according to any of claims 1 to 3, wherein the second elasticity is equal to, or larger, than the first elasticity.

5. The footwear assembly (10) according to any of claims 1 to 4, wherein the collar layer (14) extends along at least 30% of the instep opening (8), particularly along at least 60 % of the instep opening (8), particularly along at least 2/3 of the instep opening (8).

6. The footwear assembly (10) according to any of claims 1 to 5, wherein the collar layer (14) is attached to the water vapor permeable and waterproof functional layer (12) by means of an elastic seam (18).

7. The footwear assembly (10) according to claim 6, wherein the elastic seam (18) is formed by a thread having a third elasticity.

8. The footwear assembly (10) according to claim 6 or 7, wherein the elastic seam (18) is formed by a stitch pattern providing elastic characteristics.

9. The footwear assembly (10) according to any of claims 6 to 8, wherein the elastic seam (18) extends along at least 30% of the circumference of the instep opening (8), particularly along at least 60% of the circumference of the instep opening (8), particularly along at least 2/3 of the circumference of the instep opening (8).

10. The footwear assembly (10) according to any of claims 1 to 9, wherein the first elasticity and the second elasticity are measured in the same direction.

11. The footwear assembly (10) according to any of claims 1 to 10, wherein the first elasticity and the second elasticity are measured in a direction parallel to the horizontal direction.

12. The footwear assembly (10) according to claim 10 or 11, wherein the water vapor permeable and waterproof functional layer (12) and the collar layer (14) are attached to each other via a seam (18) and the

first elasticity and the second elasticity are measured in direction parallel the seam (18).

13. The footwear assembly (10) according to any of claims 1 to 12, wherein a composite sample piece made of the water vapor permeable and waterproof functional layer (12) and the collar layer (14) attached to each other by a seam (18) has a fourth elasticity, the fourth elasticity being equal to, or larger, than a predetermined threshold.

14. The footwear assembly (10) according to any of claims 1 to 13, wherein the water vapor permeable and waterproof functional layer (12) has the configuration of a laminate made up with a water vapor permeable and waterproof membrane and a textile layer attached to the water vapor permeable and waterproof membrane.

15. The footwear assembly (10) according to claim 14, wherein the textile layer has an elastic textile configuration.

16. The footwear assembly (10) according to claim 13 or 14, wherein the textile layer comprises elastic filaments.

17. The footwear assembly (10) according to any of claims 1 to 16, wherein the water vapor permeable and waterproof functional layer includes a water vapor permeable and waterproof film made of a fluoropolymer, particularly ePTFE.

18. The footwear assembly (10) according to any of claims 1 to 17, wherein the collar layer (14) is water vapor permeable, but not waterproof.

19. The footwear assembly (10) according to any of claims 1 to 18, having the configuration of an upper lining.

20. The footwear assembly (10) according to claim 19, having the configuration of a water vapor permeable and waterproof sock.

21. The footwear assembly (10) according to claim 18, having the configuration of a water vapor permeable and waterproof upper lining to be attached to a waterproof upper bottom.

22. The footwear assembly (10) according to any of claims 1 to 21, wherein the water vapor permeable and waterproof functional layer (12) extends to a height of at least 20 % of the height of the footwear assembly (10), particularly to a height of at least 65 % of the footwear assembly (10), particularly to a height of at least 95 % of the footwear assembly (10).

23. The footwear assembly (10) according to any of claims 1 to 22, wherein the collar layer (14) comprises elastic extensions (24, 26, 28) on its side opposite the water vapor permeable functional layer (12), the extensions (24, 26, 28) being configured to be folded over and attached to an upper material layer (30), such as to form a backing layer covering openable portions (32), tongue portions and/or gusset portions of the upper material layer (30).

24. Upper assembly of footwear, the upper assembly comprising

- an upper material layer (30) surrounding at least an upper portion of a foot, and
- the footwear assembly (10) according to any of the previous claims, wherein the footwear assembly (10) according any of the previous claims forms an upper lining arranged on an inner side of the upper material layer (30), the upper lining being independent of the upper material (30) to such extent that the upper lining at least in the region of the first functional layer (12) and the elastic collar (14) is able to adapt its shape independent of the upper material layer (30).

25. The upper assembly according to claim 24, wherein the upper material layer (30) and/or the upper lining layer is configured to be attached to an upper bottom layer in such a way as to form a waterproof and water vapor permeable upper assembly.

26. The upper assembly according claim 24 or 25, wherein the upper material layer (30) comprises at least one openable portion (32), tongue portion and/or gusset portion, and the collar layer (14) of the upper lining layer comprises elastic extensions (24, 26, 28) on its side opposite the water vapor permeable and waterproof functional layer (12), the extensions (24, 26, 28) being folded over and attached to the upper material layer (30), such as to form a backing layer covering the at least one openable portion (32), tongue portions and/or gusset portions of the upper material layer (30).

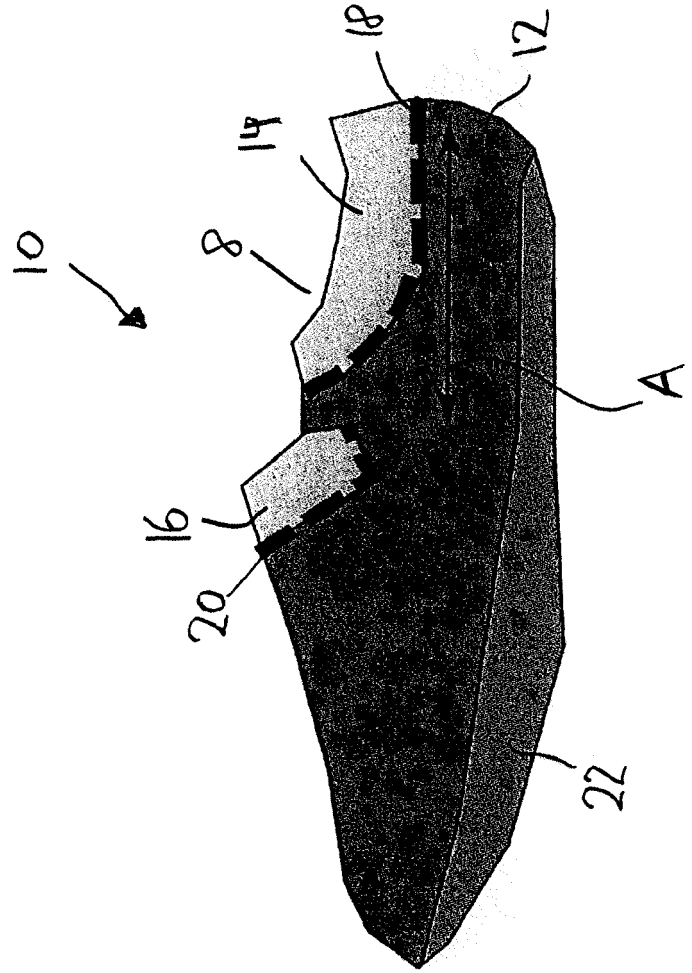

Fig. 1

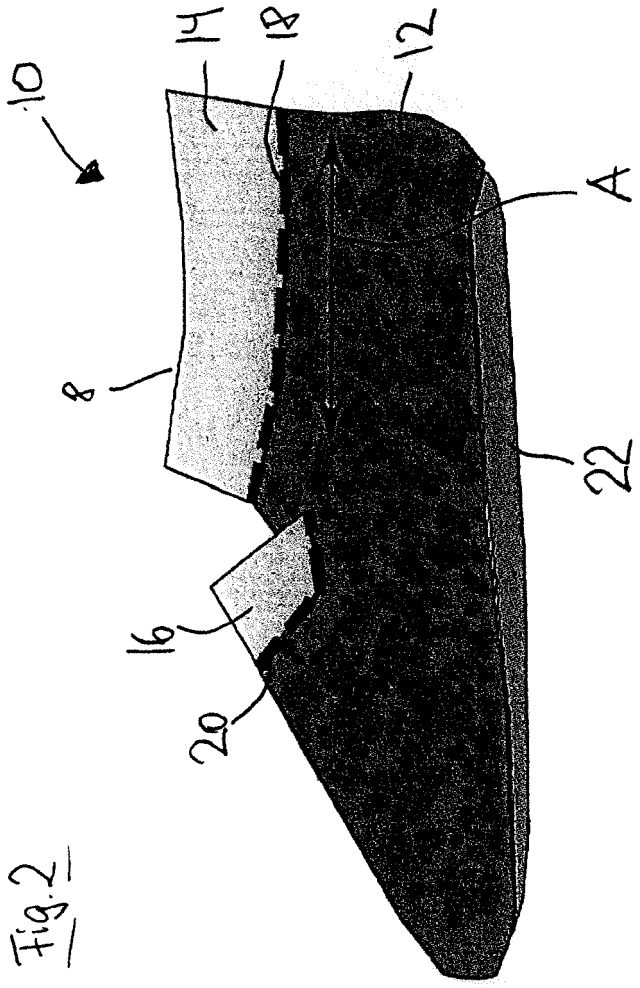

Fig.2

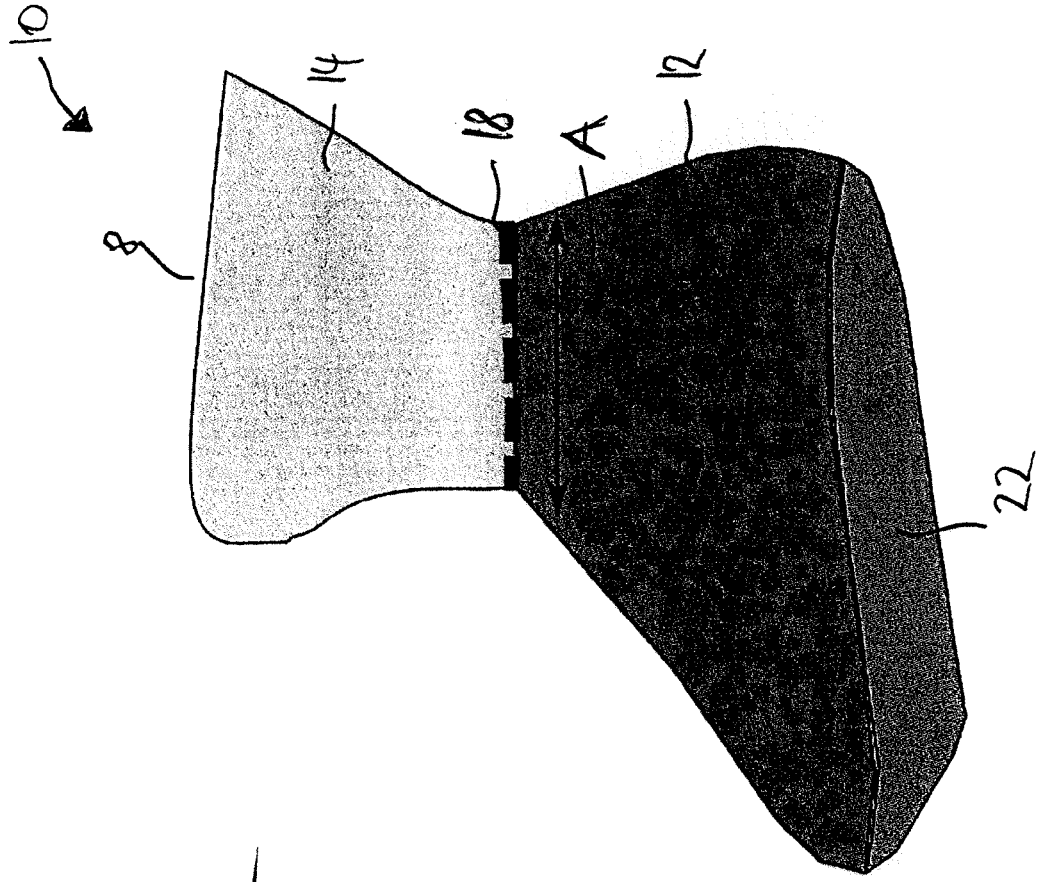

Fig. 3

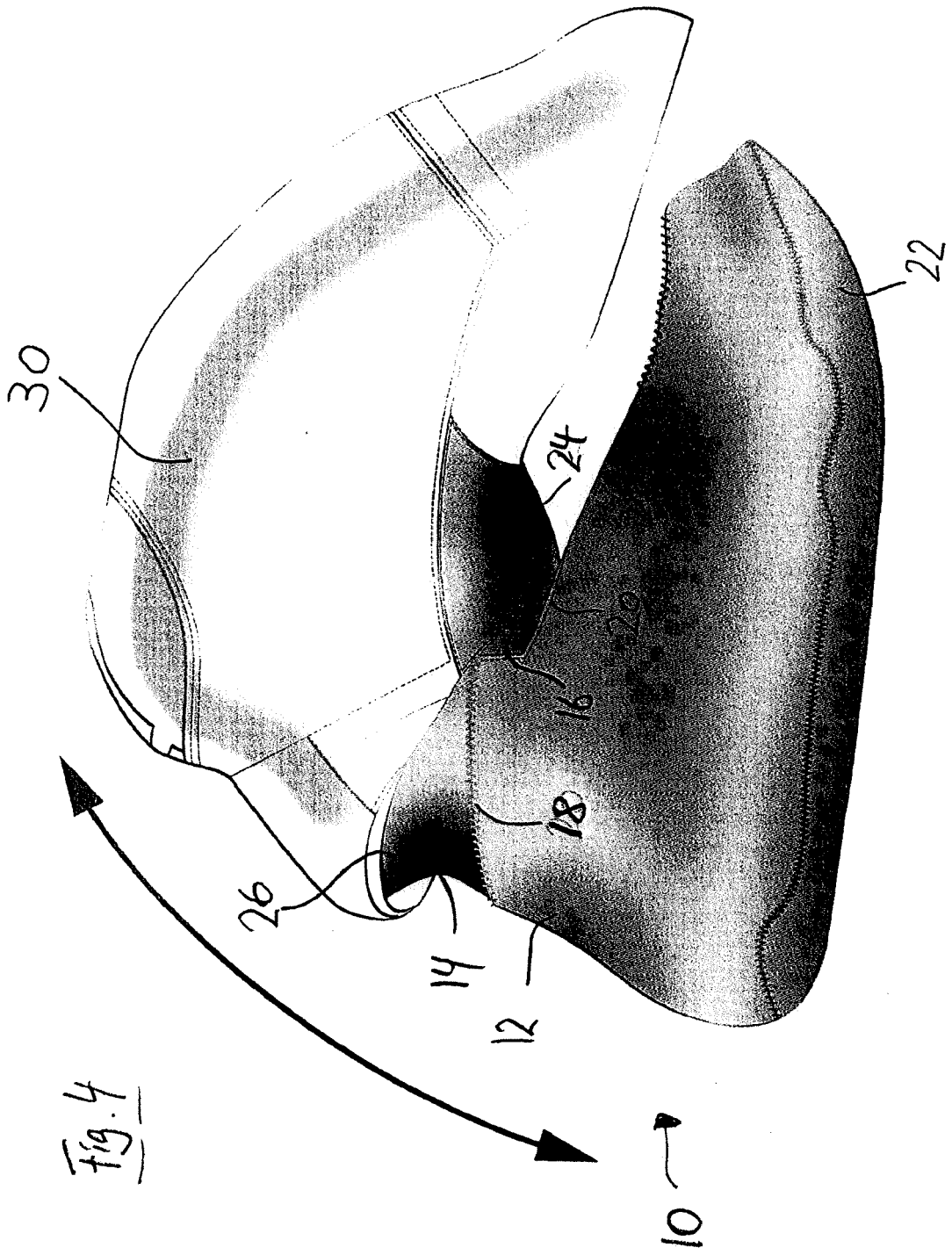

Fig. 4

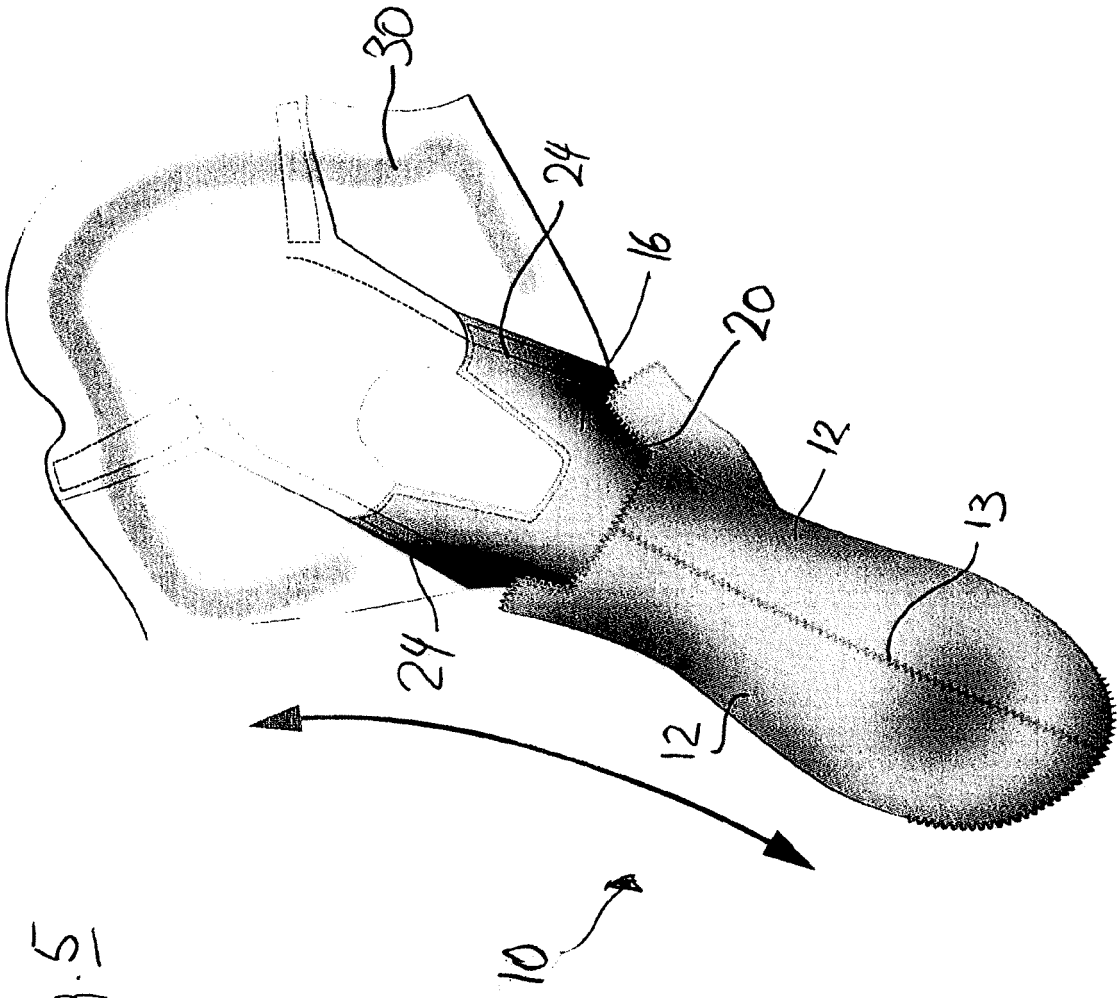

Fig. 5

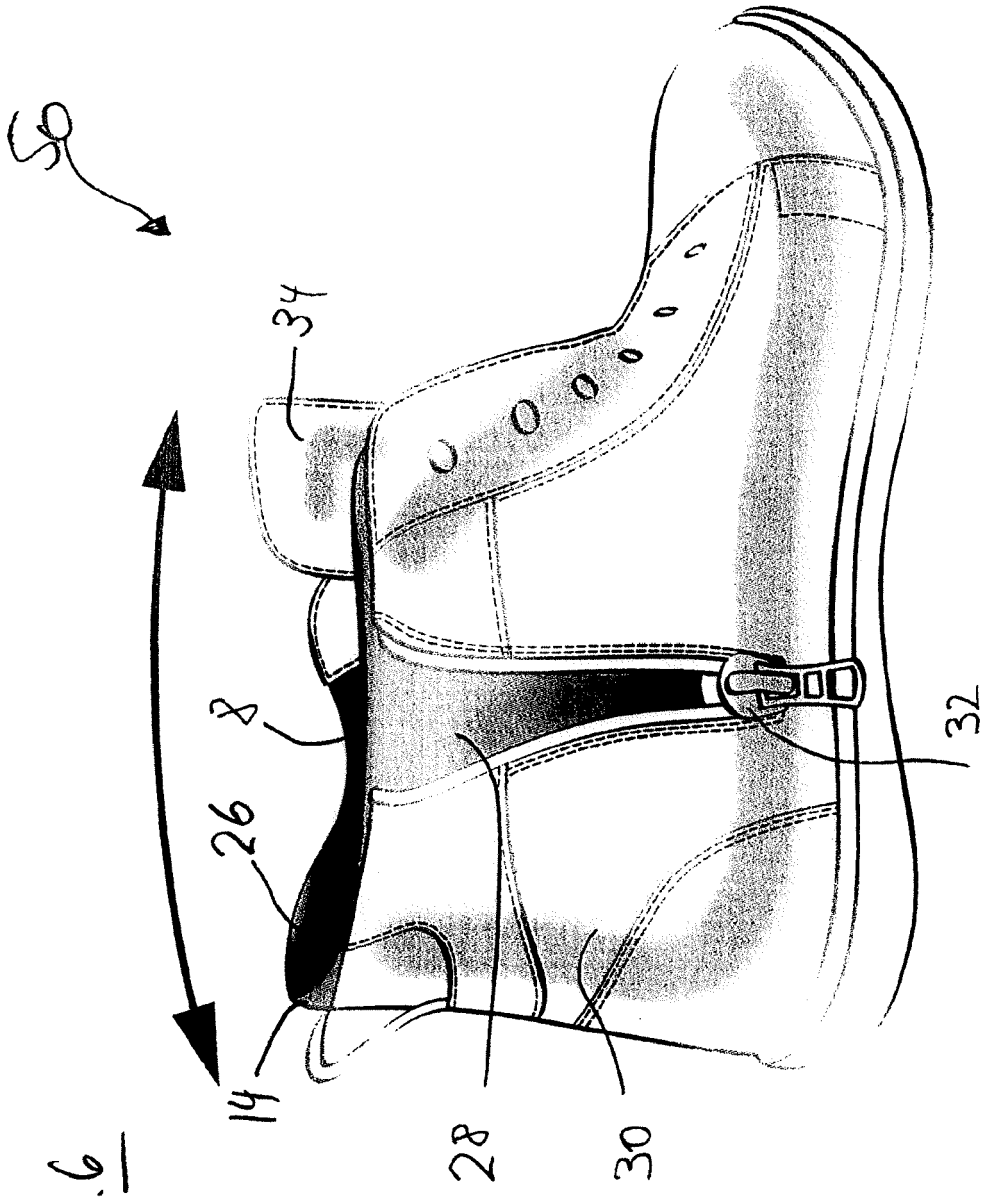

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 16 18 1440

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2013/008051 A1 (MEYER GREG [US] ET AL) 10 January 2013 (2013-01-10) * paragraphs [0024] - [0029]; figures *	1-26	INV. A43B7/12 A43B23/07 A43B23/02
X Y	US 4 550 446 A (HERMAN JACK [US]) 5 November 1985 (1985-11-05) * the whole document *	1-23 24-26	
Y A	US 2013/232825 A1 (WIENER ROBERT J [US] ET AL) 12 September 2013 (2013-09-12) * the whole document *	24-26 1-23	
A	US 2013/291293 A1 (JESSIMAN ALEXANDER W [US] ET AL) 7 November 2013 (2013-11-07) * the whole document *	1-26	
A	DE 91 13 139 U1 (W.L. GORE & ASSOCIATES GMBH, 8011 PUTZBRUNN, DE) 18 February 1993 (1993-02-18) * the whole document *	1-23	
A	US 5 970 629 A (TUCKER SCOTT L [US] ET AL) 26 October 1999 (1999-10-26) * the whole document *	1-26	TECHNICAL FIELDS SEARCHED (IPC) A43B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24 November 2016	Cianci, Sabino

CATEGORY OF CITED DOCUMENTS

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24-11-2016

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2013008051 A1	10-01-2013	NONE	
US 4550446 A	05-11-1985	NONE	
US 2013232825 A1	12-09-2013	CA 2865423 A1	12-09-2013
		CN 104379012 A	25-02-2015
		EP 2822413 A1	14-01-2015
		HK 1204755 A1	04-12-2015
		JP 2015512689 A	30-04-2015
		KR 20140135807 A	26-11-2014
		RU 2014140299 A	27-04-2016
		US 2013232825 A1	12-09-2013
		WO 2013134447 A1	12-09-2013
US 2013291293 A1	07-11-2013	NONE	
DE 9113139 U1	18-02-1993	NONE	
US 5970629 A	26-10-1999	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 5804011 A **[0026] [0039] [0042]**
- US 3953566 A **[0027] [0039]**
- US 4187390 A, Gore **[0027] [0039]**
- US 4194041 A **[0027] [0039]**
- US 4942214 A **[0027] [0039]**