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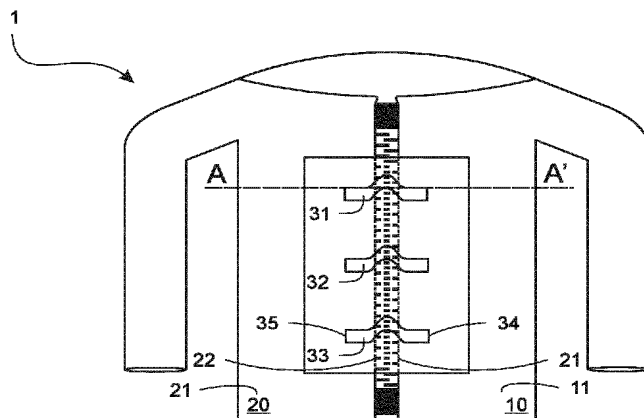


FIG. 1

(57) Abstract: A closure of a textile product is provided. The textile product comprising a first and a second textile surface, both said first and said second textile surface having a first side facing the same direction. The second textile surface has an edge. A first textile strip is coupled to the first side of the first textile surface and extending beyond the edge of the second textile surface over the first side of the second textile surface. The first textile strip is provided with at least one resilient means comprising a spring, holding the first textile strip in front of the first side of the second textile surface.



A CLOSURE OF A TEXTILE PRODUCT

Field of the Invention

5 [01] The present invention generally relates to closures of textile products, such as garment, e.g. jackets, in particular protective garment. The invention further relates to the use of the closures in garments, particularly protective garment, such as jackets and double jacket systems. The invention relates in particular to suits and jackets for firemen, soldiers, policemen and persons working in potentially hazardous environments such as on chemical and petrochemical plants.

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Background of the Invention

[02] Closures for textile products are well known. Typically zippers, buttons or hook-and-loop systems are used to close textile products like garments and alike.

15 [03] For some applications, the closure of a textile product is more critical and has more requirements than couple two textile surfaces one to the other. As a mere example, for firemen jackets, the closure of the jacket at the front side of the jacket has a.o. to be reliable, watertight and fire resistant. A simple zipper system is in this case probably not sufficient. A strip of textile is used to cover the zipper, used to couple the left and right front part of the jacket one to the other. The strip of textile, once provided
20 in front of the zipper system, may be held in place by e.g. a hook-and-loop system, better known as a Velcro system. Closing and keep the closure closed is of importance to ensure the jacket fulfils its function of protective wear also along the zipper part. If for whatever reason the closure is not correctly closed or kept close, the fireman's safety is put in danger.

25 [04] For other uses, e.g. for jackets of soldiers and policemen, in particularly for soldiers of special forces, it might be deadly important that a textile closure, e.g. a closure of a pocket, opens and closes without any sound. A sound made may give away information on their presence. However, in order to keep the stored equipment

in e.g. a pocket of such jacket or battle dress, the pocket needs to be kept close with certainty at all times.

[05] Therefore, there is a need for a textile closure which gives a.o. certainty as to its closed position at all times, and/or which is silent to open and/or close. The closure is to guarantee a closed position and/or should return to a closed position without intervention of a person.

Summary of the Invention

[06] It is the object of the present invention to provide a closure for a textile product which overcomes one or more drawbacks of the prior art. According to a first aspect of the invention, a closure of a textile product is provided. The textile product comprises a first and a second textile surface, both the first and the second textile surface having a first side facing the same direction. The second textile surface has an edge. A first textile strip is provided at, optionally coupled to, the first side of the first textile surface and extends up to or beyond the edge of the second textile surface over the first side of the second textile surface. The first textile strip is provided with at least one resilient means holding the first textile strip in front of, possibly against the first side of the second textile surface. This at least one resilient means comprises a spring. A spring is an elastic object that stores mechanical energy.

[07] Preferably, the at least one resilient means presses the first textile strip to the first side of the second textile surface. It means that, when the first textile strip contacts the first side of the second textile surface, the resilient means is not in a stable position and still exercises a force to the first side of the second textile surface.

[08] Hence, a closure of a textile product is provided. The textile product comprises a first and a second textile surface, both said first and said second textile surface having a first side facing the same direction. The second textile surface has an edge. A first textile strip is provided, possibly a first textile strip is coupled to the first side of the first textile surface and extending beyond the edge of the second textile surface over the first side of the second textile surface. The first textile strip is provided with at

least one resilient means comprising a spring, holding the first textile strip in front of the first side of the second textile surface.

[09] The first side may typically be an outer side of a textile product in use, such as the outer side of a garment, like a jacket, coat, pair of pants, a protective garment like a battle dress or a CBRN garment, such as a CBRN coating, CBRN overall or CBRN coverall, etc., or a functional textile product, e.g. a door or valve from textile material, e.g. in a tent or shelter surface or alike. The textile surfaces both have also a second side, being typically the inner side of the textile product in use.

[10] A first textile strip is provided at the first side of the first textile surface and extends up to or beyond the edge of the second textile surface over the first side of the second textile surface. This first textile strip may be the outer zone of the first textile surface, hence being an integral part of the first textile surface. Hence the first textile strip provides the edges of the first textile surface. So the first textile strip may be an integral part of the first textile surface, the first textile strip providing the edges of the first textile surface, the edges of said first and second textile surface being adjacent one to the other and said first textile strip extending beyond the edge of the first textile surface.

[11] Alternatively, the first textile strip is a separate textile strip which is coupled to the first side of the first textile surface and extends up to or beyond the edge of the second textile surface over the first side of the second textile surface.

[12] The first textile surface may have an edge, the edges of the first and second textile surface being adjacent one to the other and the first textile strip extending beyond the edge of the first textile surface. This may e.g. be the case for closures of jackets, the closure being the front closure between the left and right front part of the jacket. The closure according to the invention may as well be the closure of a pocket of a garment, the first surface being the surface of the garment, the second surface being the textile sheet from which the pocket, such as a patch pocket, is made.

[13] Between the two edges, a space may be provided which space needs to be bridged by the textile strips. The two edges of the first and second textile surface may be mutually parallel, even being equidistant one to the other along part or the whole of the length of the edges.

[14] The closure according to the invention has the advantage that it may close very silently and smoothly. The closure will be kept closed and will not open except when an external force is applied to the resilient means in order to compensate the resiliency. When this external force is taken away, the closure may close by itself again. As such
5 the closure according to the invention may provide certainty as to the status of the closure at any point in time.

[15] The closure further may comprise a second textile strip coupled to the first side of the second textile surface and extending under the first textile strip beyond the edge of the second and first textile surface. The second textile strip may extend under or
10 over the first side of the first textile surface.

[16] Thus, according to some embodiments, the closure further may comprise a second textile strip coupled to the first side of the second textile surface and extending under the first textile strip beyond the edge of the first textile surface over the first side of the first textile surface.

[17] The first and second textile surface may be of identical textile material as the first textile surface. The first and second textile strips may be of identical textile material, optionally also identical to the textile material of the first and second textile surface. The first and second textile surface may both be part of one textile material. Possibly, the textile material of the first and second textile surface is layered and
15 comprises two or more layers of textile material. The first textile strips may be part of the textile material of the first textile surface.

[18] The at least one resilient means comprises a spring or even is a spring. The at least one resilient means may comprise a torsion spring.

[19] The use of a spring, in particular a torsion spring or bistable spring, is preferred
25 as it is fairly easy to install in the textile product and is reliable as to the force it provides on the first side of the second textile surface by the first textile strip.

[20] The at least one resilient means may comprise a bistable spring.

[21] This bistable spring may be a bistable hinge and may comprise a metal or polymer ribbon. This ribbon may be a bistable spring band or bistable spring blade.

The bistable spring may, at its both sides, be provided with a polymer or metal plate, enlarging the dimension of the bistable spring.

[22] The use of bistable springs has the advantage that the first textile strip can be pressed against the first side of the second textile surface in a first of its two stable positions, preferably its stable position, thereby possibly closing a gap defined by the edge of the second textile surface. In its second position, possibly being its metastable position, the first textile strip is not pressed against the first side of the second textile surface but can leave the edge of the second textile surface accessible. Changing the bistable spring from the first to the second position can be done easily by moving the bistable spring from one of the two positions towards the second of its two positions. Once the bistable spring, being in a given open or closed position, is moved sufficiently far, i.e. one has exercised a sufficiently large amount of work to the bistable spring, the bistable spring will further change to the other position by itself. If no such amount of work is applied, the bistable spring will return to its starting position if the force is taken away. As such, these embodiments of the invention provide closures which have a certitude to be in either the open or closed position.

[23] Alternatively, the resilient means being or comprising a spring may be or comprise an elastomeric volume, like an elastomeric rod or strip of material. The resilient means may be a spring hinge. The spring may comprise two polymeric elements coupled to each other by a hinge or hinging element. According to embodiments, between two polymeric elements an elastomeric rod or strip of material may be present, this elastomeric rod or strip of material being fixed to the two elements and bridging the hinge or hinging element. When the two polymeric elements are turned in view of the hinge or hinging element, the elastomeric rod or strip of material may be stretched and hence force the two polymeric elements to return to their original position. The two polymeric elements and the elastomeric rod or strip of material form a spring, in this embodiment a spring hinge. The two polymeric elements preferably are planar elements, the elastomeric rod or strip of material being unstretched when the two planar elements are in a coplanar position. Possibly the two polymeric, optionally planar elements are hollow, the elastomeric rod or strip of material being housed in, and fixed to the hollow cavity, e.g. at the outer ends of the elastomeric rod or strip of material.

[24] The spring may as well be or comprise a shape memory material, like a shape memory wire, cord, rod, or strip of material. Such shape memory material may be metal or polymer like elastomeric polymers. Alternatively the resilient means may comprise naturel fibres or products such as bamboo fibres or strips. All such means open and close with relatively little to no noise, and with certainty as to the position it is in, i.e. opened of closed.

[25] Further alternatives are resilient means comprising or being a spring, the spring comprising composite materials with a bended shape and being provided with a given resiliency. Still another alternative is the use of an inflatable tube, which returns to a given shape during inflation, thereby bringing, and holding the first textile strip in front of the first side of the second textile surface, even exercising a force to the first side of the second textile surface once inflated.

[26] The number and dimension of the resilient means, comprising or being a spring, depend largely on the properties, like the weight, of the first textile strip which is to be brought in front of the second textile. The distance between adjacent resilient means may e.g. be in the range of 10 to 60 cm centre-to-centre, such as every 15 or 35 cm centre-to-centre.

[27] A force is exercised by the resilient means when brought in its position in front of the first side of the second textile surface.

[28] As an example, a bistable spring being a bistable strip made from bistable metal or polymer plate is used. The length of the strip may be at least, 1.5 to 3 times of the width of the part of the first textile strip which is to be brought in front of the second textile.

[29] The at least one resilient means, in particularly the spring, may be covered partially or completely by means of a textile patch.

[30] The at least one resilient means, e.g. a strip of polymer or metal, or the bistable hinge or bistable spring band, may be located in a pocket. The pocket may comprise a textile bag, or may comprise the textile patch, a part of the first textile surface and a part of the first textile strip. The provision of covering the resilient means has the

advantage that the resilient means can be sheltered from excessive forces or circumstances, like heat, humidity, light and alike.

[31] The at least one resilient means, in particularly the spring, may be coupled to the first textile surface.

5 **[32]** This coupling can be done by sewing the resilient means onto the first textile surface. Optionally, the resilient means is provided with openings through which the sewing thread can pass through spring. According to some alternatives, if the resilient means is covered with a textile patch or is provided in a pocket, the textile patch or
10 pocket may be provided such the resilient means is kept in place by this patch or pocket.

[33] The closure may comprise a plurality of resilient means, at least one, but preferably all comprising or being a spring, the resilient means being spaced apart along the length of the edge of the second textile surface.

15 **[34]** As such, larger edges along one or two textile surfaces may be closed by the closure.

[35] Though basically any kind of textile material can be uses to provide the first and/or second textile surface, and the first and optionally the second textile strip, preferably textile material with a more technical character is used. Textile material which typically has a higher surface weight, and/or which is a layered structure of more
20 than one layer of the sample of different textile sheets can be used.

[36] Textile sheets or textile material with a surface weight in the range of 150 to 800 g/m² may be used. The thickness of the textile sheets or textile material may be in the range of 0.1 to 3 mm.

25 **[37]** The textile material may comprise at least one to four textile sheets or layers, the first, outer layer being the functional layer, e.g. having fire resistant properties, the second layer being a filtering membrane, such as a membrane comprising PTFE fibres, filtering chemically harmful particles from e.g. smoke, and an inner textile layer, a third layer being a non-woven out of aramid fibres, and a fourth layer being e.g. a lining material. This is in particularly the case for firemen's garments.

[38] More particular, the first outer layer may be a fabric of 220 g/m² made of meta-aramid fibres and para-aramid fibres

[39] The intermediate, second layer may be a filtering material comprising PTFE fibres, such as a Gore-Tex layer, with high moisture/vapour breathable options

5 **[40]** A third layer may be a non-woven of aramid fibres

[41] The inner layer, functioning as liner, may be a 40-100 g/m² cotton fabric, aramid/viscose fabric, aramid fabric or any combination thereof.

[42] The closure may be used as closure of garment or clothing pieces, such as jackets, protective garments like battle dresses, fire resistant garments, CBRN
10 garments, safety jackets or garments, fireman jackets or pair of pants, police jackets, bullet proof jackets, or even ski jackets and alike. Alternative uses are the use of the closure for garment for animals, e.g. safety garment for dogs or horses. Still alternative uses are closures for pockets in the above-mentioned garment, closure of bags, backpacks tents, shelters, etc... Particular uses are the use of the textile product for
15 firemen or fire-fighter suits like fire-fighter jackets, pants, overalls, coveralls, and alike, and soldiers and/or policemen or soldiers suits like battle dress or jackets, pants, overalls, coveralls, and alike.

[43] The garments and textile products thus may be used by firemen, safety workers, policemen, soldiers, suits in petrochemical and chemical installations and many more.

20 **[44]** The textile product may be a jacket, the first and second textile surface being the jacket front parts.

[45] The first textile surface may have an edge, the edges of the first and second textile surface being adjacent one to the other, the edge of the first textile surface has a first coupling means to couple the edge of the first textile surface to an underlying
25 surface, the edge of the second textile surface has a second coupling means to couple the edge of the second textile surface to the underlying surface. The closure may cover the coupling means.

[46] The underlying surface may be the textile surface of an inner jacket of a double jacket system, such as the two front parts of the inner jacket. The first and second

textile surfaces may be the two front parts of the outer jacket. The two front parts of the inner jacket can be closed by means of a third coupling means.

[47] The first, second and third coupling means may be based upon a zipper or hook-and-loop system.

5 **[48]** According to a second aspect of the invention, the closure according to the first aspect of the invention is used in protective garment. In particular, the closure is used in firemen suits such as firemen jackets, such as the closure if the front parts of the jacket, or in soldiers battle dresses, like soldier's battle dress or jackets, such as closures of patch pockets on such battle suits.

10 **[49]** According to a third aspect of the invention, a double jacket system is provided. The system comprises an outer jacket and an inner jacket, the inner jacket and outer jacket each comprising a closure at the front side of the jacket system, the outer jacket having a closure, such as a closure between the left and right front of the outer jacket, this closure being according to the first aspect of the invention.

15 **[50]** The inner jacket may have a closure based upon a zipper or hook-and-loop system.

[51] The closure of the outer jacket may cover the closure of the inner jacket.

20 **[52]** The edge of the first textile surface of the outer jacket may be fastened to the inner jacket along the closure of the inner jacket with a first fastening means, the edge of the second textile surface of the outer jacket is fastened to the inner jacket along the closure of the inner jacket with a second fastening means.

[53] The part of the first fastening means coupled to the first textile surface may be incompatible with the part of the second fastening means coupled to the second textile surface.

25 **[54]** The first and second fastening means may be e.g. a hook-and-loop fastening system or may be a zipper. The part of the first and second fastening means coupled to the outer jacket textile surfaces may each time be the hook or the loop side of the hook and loop fastening means.

[55] In case of zippers being used for the fastening means, the part of the first and second fastening means coupled to the outer jacket textile surfaces may each time be either the male or the female side of the zipper.

[56] If the inner jackets closure is a zipper as well, the zipper of the inner jacket may close from the bottom of the jacket system upwards, while the zippers of the first and second fastening means coupled to the outer jacket close from the top of the jacket system downwards. Alternatively, if the inner jackets closure is a zipper as well, the zipper of the inner jacket may close from the top of the jacket system downwards, while the zippers of the first and second fastening means coupled to the outer jacket close from the bottom of the jacket system upwards.

[57] The double jacket system may be a protective jacket system to protect staff from different dangers or risks. It may e.g. be a protective jacket system for firemen.

[58] As an example, the inner jacket may provide the wearer sufficient protection to a first type of danger or risk, e.g. firemen clothing for technical rescue or wildland firefighting. The inner jacket's textile surface fulfils e.g. the standard EN 16689, EN15384. The inner jacket can be worn as such if the intervention will subject the wearer to only these kinds of risks or danger. The inner jacket can be a layered jacket comprising an outer layer, one or more intermediate layers and an inner layer or lining. The outer layer may be meta-aramid/viscose fabric, the intermediate layers may comprise aramid, viscose, modacrylic or cotton fibers

[59] The outer jacket's textile surface may be fit to protect the wearer to a second kind of danger or risks; the outer jacket, when worn together with the inner jacket underneath, fulfils e.g. the standard EN 469 or being resistant to high risk of flames and heat and chemical penetration. The outer jacket is a layered jacket comprising an outer layer, one or more intermediate layers and an inner layer or lining. The outer layer may be a 100% meta-aramid fabric, the intermediate layers may comprise a PTFE membrane and aramid non-woven and an aramid/viscose inner liner fabric.

[60] The outer jacket can be worn over the inner jacket if the intervention will subject the wearer to these second kinds of risks or danger. The specific closure according to the first aspect of the invention provided to the outer jacket may close the outer jacket but will feel inappropriate when the outer jacket is worn alone, i.e. without the

underlying inner jacket. As such the wearer is reminded to the fact that (s)he is to wear both jackers in proper order to have sufficient protection for his or her intervention.

[61] The closure of the outer jacket, when worn over the inner jacket, will function appropriately and gives a sufficient protection to the danger and risk it is intended for.

5 **[62]** According to a fourth aspect of the invention, a double jacket system according to the third aspect of the invention is used as a protective jacket system.

[63] The closure may be used as closure of jackets, e.g. protective and/or safety jackets, fireman jackets, soldiers battle jacket or dress, police jackets, bullet proof jackets, or even ski jackets and alike. Particular uses are the use of the double jackets
10 for firemen or fire-fighter, soldiers and/or policemen and staff members working in chemical or petrochemical plants in the chemical or petrochemical industry.

Brief Description of the Drawings

[64] Fig. 1 shows schematically a fireman's jacket comprising a closure according to
15 the invention.

[65] Fig. 2 shows schematically a cross section of the closure of figure 1.

[66] Fig. 3 shows schematically a part of a battledress comprising a closure according to the invention.

[67] Fig. 4 shows schematically a cross section of the closure of figure 3.

20 **[68]** Fig. 5 shows schematically a double jacket system comprising a closure according to the invention.

[69] Fig. 6 shows schematically a cross section of the closure of figure 5.

[70] In the figures, the same reference number refers to the same or to a similar feature.

25 **Detailed Description of Embodiment(s)**

[71] Figure 1 shows a closure of a textile product being the closure of two fronts of a jacket. The jacket may be a fireman's jacket 1. A cross section according to plane AA' of this closure is shown in figure 2.

[72] The textile product comprises a first 10 and a second 20 textile surface, in this embodiment the left and right front of the jacket 1. The first surface 10 has a first side 11 and the second textile surface having a first side 21, both facing the same direction. These first sides are the outer sides of the jacket 1. The second textile surface 20 has an edge 22. A first textile strip 30 is coupled to the first side 11 of the first textile surface 10 and extends beyond the edge 22 of the second textile surface 20 over the first side 21 of the second textile surface 20. The first textile strip 30 is provided with resilient means 31, 32 and 33, spaced at about 40cm centre-to-centre, and holding the first textile strip 30 in front of, even against the first side 21 of the second textile surface 20.

[73] The first textile surface 10 has an edge 12, the edges 12 and 22 of the first and second textile surface are adjacent one to the other. The first textile strip 30 extending beyond the edge 12 of the first textile surface 10.

[74] The flexible textile strip 30 comprises resilient means 31, 32 and 33 comprises bistable metal springs (also referred to as bistable metal strips), in the form of blades. One outer edge 34 of the bistable metal strip or spring is contacting the zone of the textile strip 30 where it is covering the first textile surface 10. The bistable metal strip is coupled to the first textile surface and optionally to the textile strip 30 by sewing through small apertures which receive the sewing yarn 41. The other edge 35 of the bistable metal spring is located in the zone of the textile strip 30 where it is covering the second textile surface 20; the bistable metal strip is not coupled to the textile strip 30 here.

[75] The bistable metal strip, when plied such that the bistable metal strip is not substantially planar, but has an angled shape, provides an open closure. The bistable metal strip is in a first metastable position. When the outer end 35 of the bistable metal strip is pushed towards the second textile surface, the bistable metal strip springs in the other, stable position, the closure being closed.

[76] An additional zipper 40 may be used to couple the two textile surfaces, in particular if this jacket is a single jacket.

[77] The textile surfaces are e.g. a woven fabric composed of meta-aramid/para-aramid/anti-static fiber 70/28/2% with a specific weight of 225 g/m².

[78] Figure 3 shows a closure of a textile product being the closure of a pocket 140 of a soldier's battle dress 2. A cross section according to plane BB' of this closure is shown in figure 4.

[79] The textile product comprises a first 110 and a second 120 textile surface. The first textile surface 110 is a front part of the battle dress. The second textile surface 120 is the patch of a patch pocket 140 on this front part of the battle dress. The first surface 110 has a first side 111 and the second textile surface having a first side 121, both facing the same direction. The second textile surface 120 has an edge 122. A first textile strip 130 is coupled to the first side 111 of the first textile surface 110 and extending beyond the edge 122 of the second textile surface 121 of the second textile surface 120. The first textile strip 130 is provided with two resilient means 132 and 133 holding the first textile strip 130 in front of, even against the first side 121 of the second textile surface 120.

[80] The resilient means 132 and 133 are bistable metal springs, in the form of blades. One outer edge 134 of the bistable metal strip is contacting the zone of the textile strip 130 where it is covering the first textile surface 110. The bistable metal strip is coupled to the first textile surface 110 and optionally to the textile strip 130 by sewing through small apertures which receive the sewing yarn at the first end 134. The other edge 135 of the bistable metal spring is located in the zone of the textile strip 130 where it is covering the second textile surface 120; the bistable metal strip is not but may be coupled here to the textile strip 130.

[81] The bistable metal strip, when plied such that the bistable metal strip is not substantially planar, but has an inclined shape, provides an open closure and an open pocket 140. The bistable metal strip is in a first metastable position. When the outer end 135 of the bistable metal strip is pushed towards the second textile surface 120, the bistable metal strip springs to its the other, stable position, the pocket 140 being closed. This closing goes with a minimum level of noise, if any. The strength of the resilient means 132 and 133 cause the pocket 140 to be kept firmly closed. To open,

the user is to lift the strip 130 and thereby ply the bistable metal strips 132 and 133. Also this goes with making very little to no noise.

[82] The textile surfaces are typically polyester/cotton or polyamide cotton fabrics with a specific weight of 180 to 220 g/m².

5 **[83]** A double jacket system 3 of a fireman's outfit is shown in figure 5. A cross section according to the plane CC' of the closure system of the inner and outer jacket is shown in figure 6.

[84] The double jacket system 3 comprises an outer jacket 310, and an inner jacket 320. The two front parts 321 and 322 of the inner jacket 320, when worn alone, is
10 closed by a closure being nothing more but a zipper 330.

[85] The outer jacket 310 has a closure according to the invention. The two front parts 311 and 312 of the outer jacket 310 are adjacent one to the other but spaced apart. When worn in combination with the inner jacket 320, the one front part 311 is coupled to the first front part 321 of the inner jacket 320 by means of a zipper 331. The
15 other front part 312 is coupled to the second front part 322 of the inner jacket 320 by means of a zipper 332. The orientation of the zippers 331 and 332 are chosen such that the zipper part coupled to the first part of the outer jacket does not match with the zipper part coupled to the second part of the outer jacket. As an example, both parts of the zippers are the male part of the zippers, or both are the female part of the zippers.
20 As such, a person wearing the outer jacket only, cannot close the zipper parts present on the two front parts of the outer jacket. As such, mistakes on wearing the outer jacket only are prevented. Further, the zippers 331 and 332 close in a given direction, as shown from the upper side downwards, while the zipper 330 of the inner jacket closes in the opposite direction, e.g. from the lower side upwards. As such, mistakes in making
25 incorrect combinations of two parts of a zipper system are prevented.

[86] The closure of the outer jacket 310 comprises a first textile strip 340 and a second textile strip 350. The first textile strip 340 is coupled to the first, outer side 315 of the first textile surface 313 from the first front part 311. It extends beyond the edge 317 of this first textile surface 313, over the zipper part of the inner jacket 320 and up
30 to, even slightly beyond the edge 327 of the outer side 325 of the first textile surface 323 from the second front part 312. A second textile strip 350 is coupled to the outer

side 325 of the second textile surface 323 from the first front part 312. It extends beyond the edge 327 of this second textile surface 323, over the zipper part 330 of the inner jacket 320 and up to, even slightly beyond the edge 317 of the outer side 315 of the first textile surface 313 from the first front part 311. The second textile strip 350 is positioned under the first textile strip 340. The first textile strip 340 is provided with resilient means 351 and holding the first textile strip 340 in front of, even against the first side 325 of the second textile surface 323.

[87] The resilient means is again a bistable polymer strip. It is enveloped by the textile material from which the first textile strip 340 is made. As shown in figure 6, the bistable polymer strip is at both sides provided with two polymer blades 341 and 342, which are hinged by a bistable polymer hinge or spring 343. The blade 342 is sewn to the first textile surface 313. The polymer blades are made from thermoplastic elastomers such as TPU. The bistable polymer hinge is provided from a TPU with a higher flexibility than the TPU used for the bistable polymer

[88] Along the closure of the outer jacket, several such resilient means are provided. As an example, every 40 cm, a resilient means is provided along the edge 317.

[89] The inner jacket is provided from meta-aramid/modacrylic/viscose/para-aramid/Polyamide HT/anti-static fibre 36/26/18/12/7/1% with a specific weight of 230 g/m²

[90] The outer jacket is provided from a woven fabric composed of meta-aramid/para-aramid/anti-static fiber 70/28/2% with a specific weight of 225 g/m².

[91] The first and second textile strip are provided from the same material as used in the outer jacket.

[92] As alternative embodiments, in all the above embodiments, the bistable metal strip may be replaced by alternative springs, like bistable polymer strip, an elastomeric volume, like an elastomeric rod or strip of material, a shape memory material, like a shape memory wire, cord, rod or strip of material, the shape memory material being made from metal or polymer like elastomeric polymers.

[93] Such an, alternative spring 400 adapted for use in embodiments of the present invention, is schematically shown in figure 7, having a hinge structure. The spring 400 is a spring hinge, returning to its open position due to its resiliency.

[94] The spring 400 may comprise two polymeric elements 411 and 412 coupled to each other by a hinging element 420. Between the two polymeric elements, 411 and 412, an elastomeric rod or strip 430 of material is present, this elastomeric rod or strip of material 430 being fixed to the two elements 411 and 412 and bridging the hinge element 420. When the two polymeric elements 411 and 412 are turned in view of the hinging element 420, more particularly around the axis 422 of the hinging element 420 to the side away from the elastomeric rod or strip of material 430, the elastomeric rod or strip of material 430 is stretched and force the two polymeric elements 411 and 412 to return to their original position. The two polymeric elements 411 and 412, the hinging element 420 and the elastomeric rod or strip of material 430 form a spring 400. The two polymeric elements are planar elements 411 and 412, the elastomeric rod or strip of material being unstretched when the two planar elements are in a coplanar position. In the embodiment shown in figure 7, the two polymeric, planar elements 411 and 412 are hollow, the elastomeric rod or strip of material 430 being housed in and fixed to the hollow cavity 414. This connection may be achieved by e.g. a fastening means like a screw, the application of a glue, rivets, etc... The connection is preferably provided at the outer ends of the elastomeric rod or strip of material 430.

[95] A further alternative spring 401 adapted for use in embodiments of the present invention, is shown schematically in figure 8. Again, this resilient element, being a spring hinge, has an elastomeric rod or strip 430 of material being present between the two polymeric elements 411 and 412. This elastomeric rod or strip of material 430 is fixed to the two elements 411 and 412 and bridging the hinge element 420. The spring 401 functions in the same way as string 400. The elastomeric rod or strip 430 of material is connected to both polymeric elements 411 and 412 at a recess 416 in the bottom side 415 of the polymeric elements 411 and 412. This connection may be achieved by e.g. a fastening means 440, like a screw, the application of a glue, rivets, etc... The connection is preferably provided at the outer ends of the elastomeric rod or strip of material 430.

[96] For both springs 400 and 401, one or both the two elements 411 and 412 may be connected to the textile strip or surface by the sides oriented away from the hinging element 420, and this in a way similar to the one set out for the resilient means 31, 32 and 33 the other figures.

5 [97] Although the present invention has been illustrated by reference to specific embodiments, it will be apparent to those skilled in the art that the invention is not limited to the details of the foregoing illustrative embodiments, and that the present invention may be embodied with various changes and modifications without departing from the scope thereof. The present embodiments are therefore to be considered in all
10 respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein. In other words, it is contemplated to cover any and all modifications, variations or equivalents that fall within the scope of the basic underlying
15 principles and whose essential attributes are claimed in this patent application. It will furthermore be understood by the reader of this patent application that the words "comprising" or "comprise" do not exclude other elements or steps, that the words "a" or "an" do not exclude a plurality, and that a single element, such as a computer system, a processor, or another integrated unit may fulfil the functions of several
20 means recited in the claims. Any reference signs in the claims shall not be construed as limiting the respective claims concerned. The terms "first", "second", "third", "a", "b", "c", and the like, when used in the description or in the claims are introduced to distinguish between similar elements or steps and are not necessarily describing a sequential or chronological order. Similarly, the terms "top", "bottom", "over", "under",
25 and the like are introduced for descriptive purposes and not necessarily to denote relative positions. It is to be understood that the terms so used are interchangeable under appropriate circumstances and embodiments of the invention are capable of operating according to the present invention in other sequences, or in orientations different from the one(s) described or illustrated above.

CLAIMS

- 1.- A closure of a textile product, the textile product comprising a first and a second textile surface, both said first and said second textile surface having a first side facing the same direction, said second textile surface having an edge, a first textile strip being provided at the first side of the first textile surface and extending up to or beyond the edge of the second textile surface over the first side of the second textile surface, characterised in that said first textile strip is provided with at least one resilient means, holding said first textile strip in front of the first side of said second textile surface, said at least one resilience means comprising a spring.
- 2.- A closure of a textile product according to claim 1, wherein said first textile strip being a separate textile strip coupled to the first side of the first textile surface, said first textile surface has an edge, the edges of said first and second textile surface being adjacent one to the other and said first textile strip extending beyond the edge of the first textile surface.
- 3.- A closure of a textile product according to claim 1, wherein said first textile strip is an integral part of the first textile surface, the first textile strip providing the edges of the first textile surface, the edges of said first and second textile surface being adjacent one to the other and said first textile strip extending beyond the edge of the first textile surface.
- 4.- A closure of a textile product according to any one of the claims 2 and 3, the closure further comprising a second textile strip coupled to the first side of the second textile surface and extending under the first textile strip beyond the edge of the first textile surface over the first side of the first textile surface.
- 5.- A closure of a textile product according to any one of the preceding claims, wherein said at least one resilient means comprises a torsion spring.
- 6.- A closure of a textile product according to any one of the preceding claims, wherein said at least one resilient means comprises a bistable spring.

7.- A closure of a textile product according to any one of the preceding claims, wherein said at least one resilient means comprises a spring hinge.

8.- A closure of a textile product according to any one of the preceding claims, wherein said at least one resilient means is covered by means of a textile patch.

5 9.- A closure of a textile product according to any one of the preceding claims, wherein said at least one resilient means is coupled to the first textile surface.

10.- A closure of a textile product according to any one of the preceding claims, wherein said closure comprises a plurality of resilient means, the resilient means being spaced apart along the length of the edge of said second textile surface.

10 11.- A closure of a textile product according to any one of the preceding claims, wherein said textile product is a jacket, the first and second textile surface being the jacket front parts.

12.- A closure of a textile product according to any one of the preceding claims, wherein said first textile surface has an edge, the edges of said first and second textile surface being adjacent one to the other, the edge of the first textile surface has a first coupling means to couple the edge of said first textile surface to an underlying surface, the edge of the second textile surface has a second coupling means to couple the edge of said second textile surface to said underlying surface.

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13.- The use of a closure according to any one of the preceding claims, in protective garment.

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14.- A double jacket system, comprising an outer jacket and an inner jacket, the inner jacket and outer jacket each comprising a closure at the front side of the jacket system, the outer jacket having a closure according to any one of the claims 1 to 12.

15.- A double jacket system according to claim 14, wherein the closure of the outer jacket covers the closure of the inner jacket.

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16.- A double jacket system according to any one of the claims 14 to 15, wherein the edge of the first textile surface of the outer jacket is fastened to the inner jacket along the closure of the inner jacket with a first fastening means, the edge of the second

textile surface of the outer jacket is fastened to the inner jacket along the closure of the inner jacket with a second fastening means.

17.- A double jacket system according to claim 16, wherein the part of the first fastening means coupled to the first textile surface is incompatible with the part of the
5 second fastening means coupled to the second textile surface.

18.- The use of a double jacket system according to any one of the claims 14 to 17, as a protective jacket system.

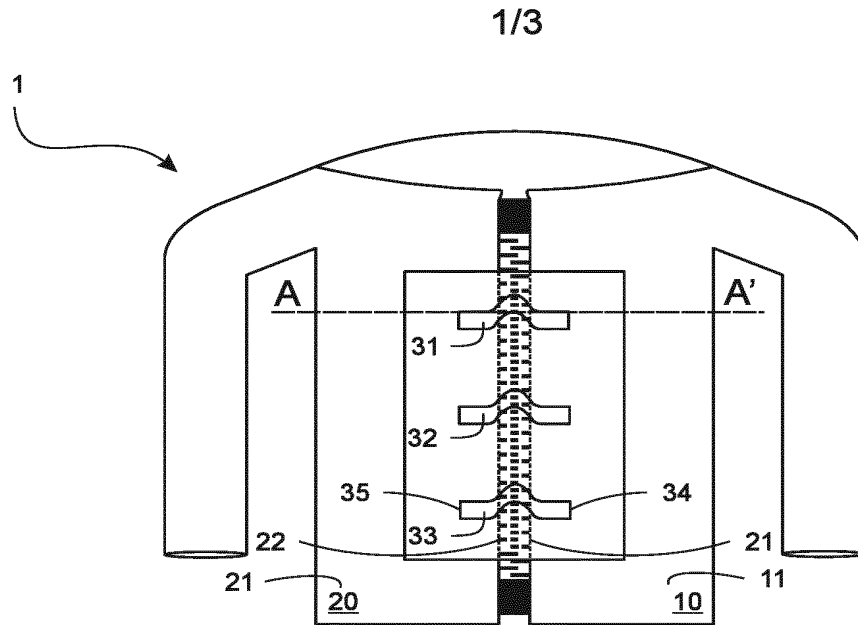


FIG. 1

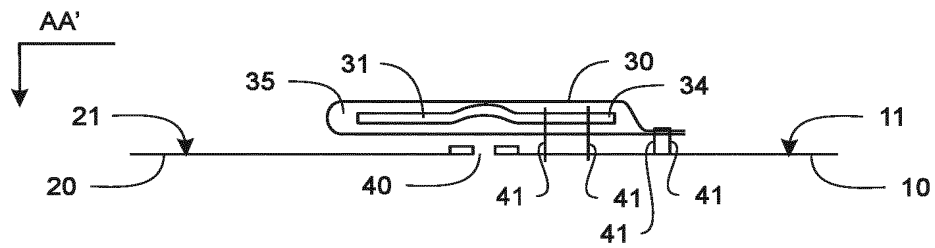


FIG. 2

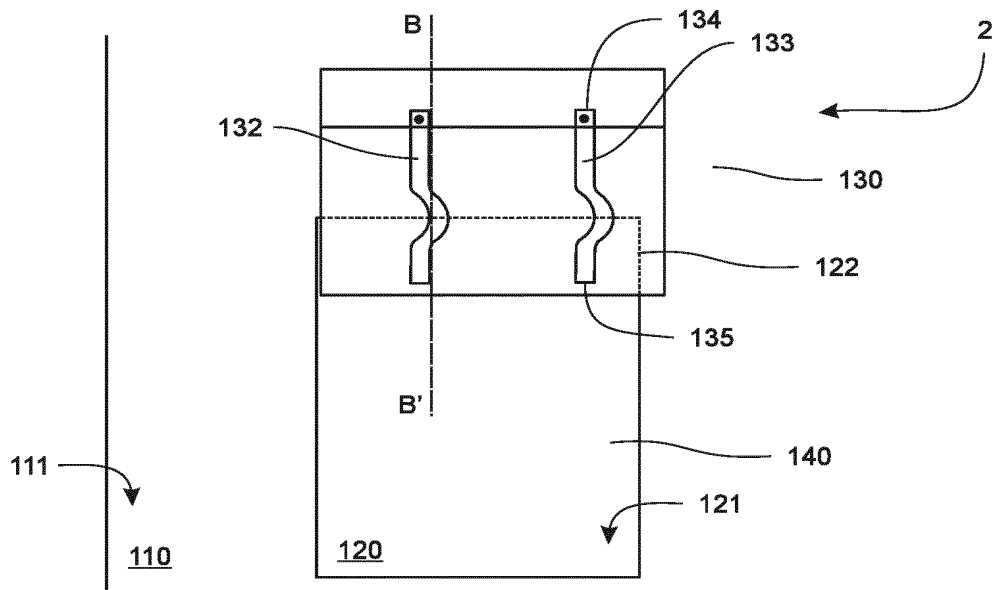


FIG. 3

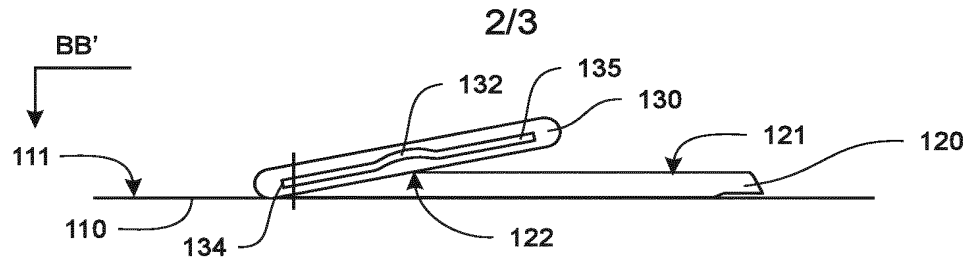


FIG. 4

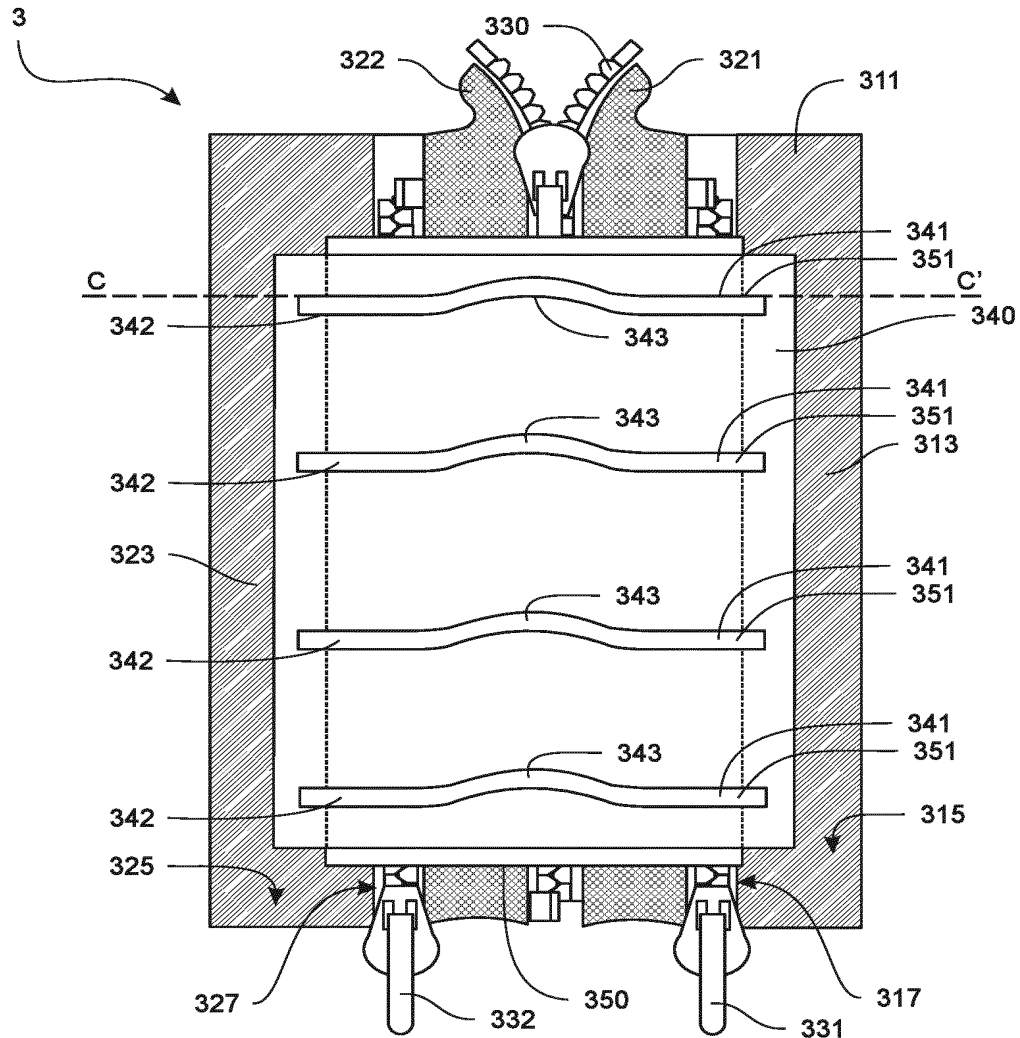


FIG. 5

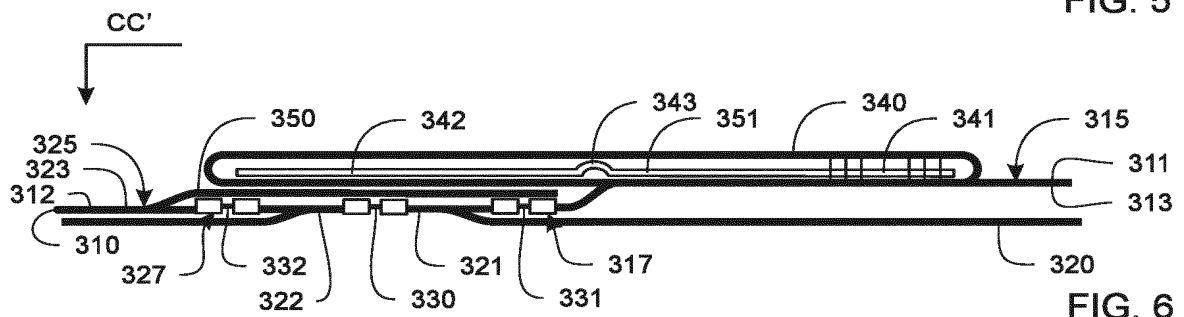


FIG. 6

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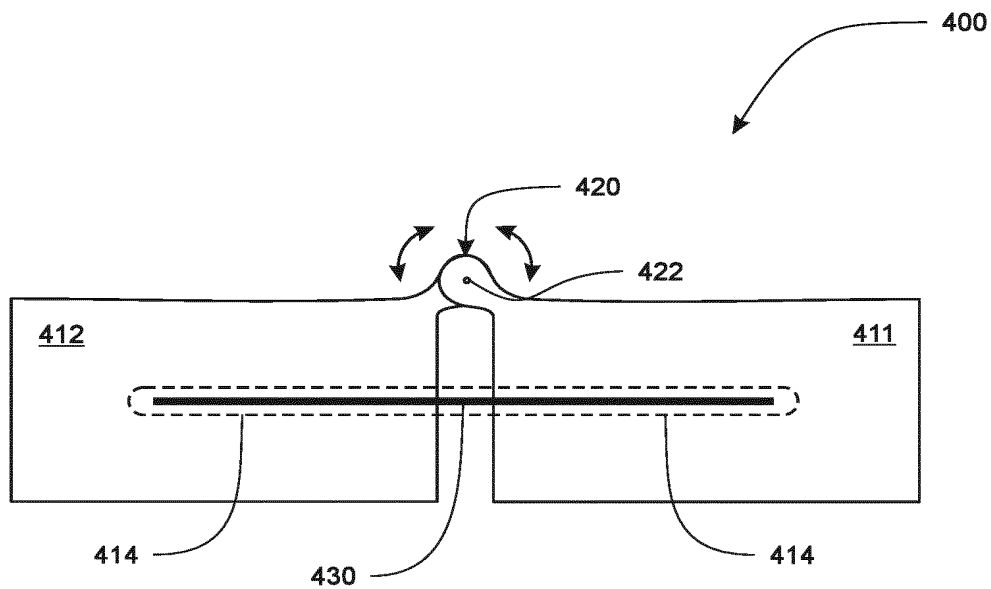


FIG. 7

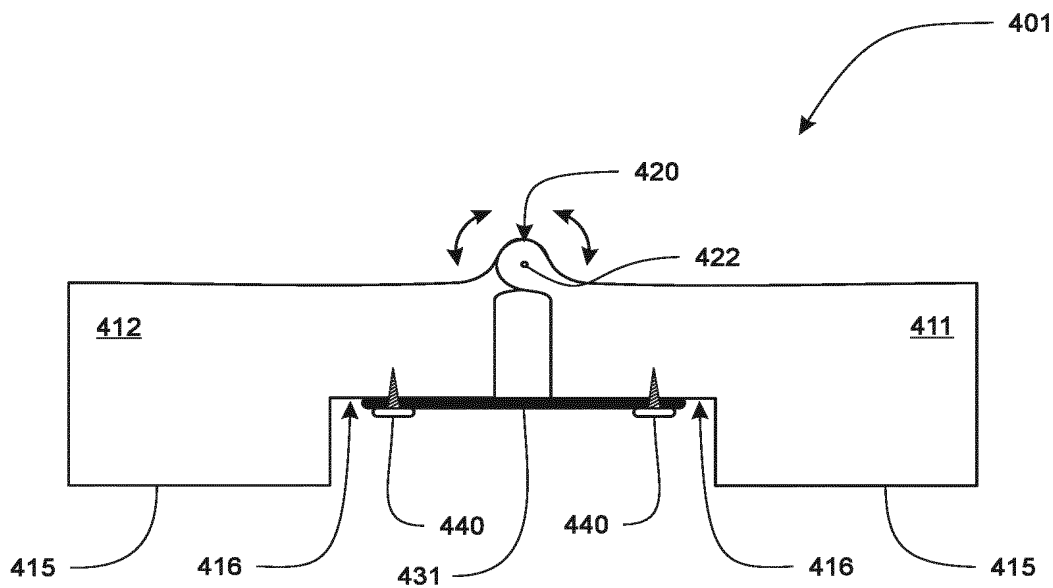


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2022/060191

A. CLASSIFICATION OF SUBJECT MATTER

INV. A41D3/00 A41F1/00 A41D13/00 A62B17/00
ADD. A41D27/22 A44B19/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A44B A41D A62C A62B A41F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 3 165 258 A1 (SIOEN NV [BE]) 10 May 2017 (2017-05-10) figures 5-10 -----	1-18
A	EP 0 581 186 B1 (GORE W L & ASS GMBH [DE]) 23 October 1996 (1996-10-23) figure 1 -----	1-18
A	FR 3 081 091 A1 (DECATHLON SA [FR]) 22 November 2019 (2019-11-22) figure 4 -----	1-18
A	US 5 365 614 A (PERKINS DAVID D [US]) 22 November 1994 (1994-11-22) figures 2,3 -----	1-18



Further documents are listed in the continuation of Box C.



See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

6 July 2022

Date of mailing of the international search report

19/07/2022

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2022/060191

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