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(71) Applicant: **Granqvist Sportartiklar AB**
655 91 Karlstad (SE)

(72) Inventor: **GRANQVIST, Lars**
655 91 KARLSTAD (SE)

(74) Representative: **Bjerkén Hynell KB**
Tulegatan 53
113 53 Stockholm (SE)

(54) FLAME RETARDANT PROTECTIVE GLOVE

(57) This invention relates to a flame retardant protective glove (1), preferably in the form of a finger glove, having an outer shell comprising a palm side (2), a back side (3), an outer side (4) and a thumb side (5), wherein the material in the back side (3), outer side (4) and a thumb side (5) comprises at least one first multilayer material (M1, M3) comprising an outer layer (30A) of a flame retardant material and said palm side (2) comprises a second multilayer material (M2) different than said at least one first multilayer material (M1, M3), wherein said palm side (2) comprises at least one palm part (20) made of said second multilayer material (M2) having an outer layer (20A) of a flame retardant material comprising Chlorosulfonated Polyethylene and a second layer (20B) including at least 80% aramide fibers, suitably Para-aramide fibers, preferably at least 90% aramide fibers and more preferred 100% aramide fibers, wherein said second multilayer material (M2) has a surfacic mass of between 400 to 1200 g/m^2, preferably 500 to 1000 g/m^{2}and a thickness of between 0,5 to 1,5 mm, preferably 0,6 - 1 mm, and is resilient having an elongation at break (ε) of at least 20% in all directions.

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Description

TECHNICAL FIELD

[0001] Flame retardant protective glove, in the form of a finger glove, having an outer shell comprising a back side, a thumb side, an outer side and a palm side, wherein at least the material in the back side, a thumb side and a outer side comprises at least one first multilayer material, comprising an outer layer of a flame retardant material and said palm side comprising a second multilayer material different than said at least one first multilayer material.

STATE OF THE ART

[0002] Flame-retardant protective gloves are a prerequisite for certain professions in order to be able to handle certain occupations that are part of the performance of duties with sufficient security. Examples of such occupational groups are fire fighters, the military, police, ambulance personnel etc. Flameproof gloves are generally known. For example, a protective glove is known from SE 458 254. The protective glove has the shape of a finger glove. The glove consists mainly of leather whose inner surface has been provided with a plastic coating. In addition, the glove is provided with a lining of refractory and heat-insulating material. Such a protective glove becomes relatively awkward due to the plastic-coated leather becoming relatively rigid. In addition, the combination of materials makes it difficult to wash and decontaminate. A similar design is known from DE 10111143.

[0003] From US 5,020,161 and WO97/47212, there are known flame-retardant protective gloves that aim at providing similar properties as the glove mentioned above, but without use of leather. A general problem with this known kind of gloves is that the grip in wet conditions may become bad and therefore may jeopardize safety for users. Further, from US 20190343201 there is known a protective garment, e.g. for gloves, that aims at providing protection against noxious gases.

BRIEF DESCRIPTION OF THE INVENTION

[0004] It is an object of the present invention to find a solution to the above-mentioned problem complex, which is achieved by means of a flameproof protective glove as defined in claim 1.

[0005] Thanks to the invention, a flame-retardant protective glove is obtained which in a surprising way at the same time provides good comfort, good protection, good grip ability, good wear resistance and which may securely be washed and decontaminated.

[0006] According to a further aspect of the invention:

- the second multilayer material (M2) has a larger elongation at break (ε_F) in a length wise direction (F) than the elongation at break (ε_W) in a width wise direction (W), which may provide for extra good strength properties of the glove.
- the second multilayer material (M2) has its largest elongation at break (ε_F) in a length wise direction (F), whereas the first multilayer material (M1) has its largest elongation at break (ε_W in a width wise direction (W), which may provide for extra good strength properties of the glove.
- second multilayer material (M2) has a tensile strength (σ) of at least 15 daN/5cm in all directions, which may provide for extra good strength properties of the glove.
- The palm side (2) comprises at least one palm part (20) and at least one thumb piece part (61) made of said second multilayer material (M2), which may provide for good ergonomic quality of the glove.
- The at least one first multilayer material (M1, M3) includes a first multilayer material (M1) comprising a basic protective layer (30B) including mainly aramide fibers, suitably Para-aramide fibres, and possibly also other fibres, e.g. polybenzimidazole fibres and a coating comprising silicone, wherein the amount of aramide fibers is larger than the amount of other fibres, e.g. polybenzimidazole fibers, which may provide for an extra good combination of strength and heat resistant of the glove, wherein preferably at least a back side part (30) of the outer shell is made with said first multilayer material (M1) and more preferred also a thumb piece part (61).
- The outer shell includes a third multilayer material (M3) comprising around 50-70 % Polyamide fibers and 30-50% aramide fibers, suitably Para-aramide fibers, preferably the amount of polyamide fibers is larger than the amount of aramide fibers, which may provide a combined outer shell optimizing strength, comfort and heat resistance, wherein preferably at least a plurality of finger side part (70-73) of the outer shell is made with said third multilayer material (M3) and more preferred also at least one hand side part (40, 50).
- an insert (9) is arranged within said outer shell, comprising at least one fire blocker layer (91A, 91B) and at least one aramide fiber containing layer (92), suitably Para-aramide fiber, wherein preferably the insert (9) has a larger amount of fire blocker material (91A, 91B) at the back side (3) than at the palm side (2), more preferred a liquid-

tight membrane layer (90), preferable breathable, is arranged in said insert (9).

BRIEF DESCRIPTION OF FIGURES

[0007] In the following, the invention will be described in more detail with reference to the accompanying figures, in which:

Fig. 1 shows a perspective view of a preferred embodiment of a glove according to the invention seen from above,
Fig. 2 shows a perspective view from below of the preferred embodiment of the glove according to the invention,
Fig. 3 shows a cross-sectional view along A-A in Fig. 1,
Fig. 4 shows a cross-sectional view along B-B in Fig. 3,
Fig. 5 shows a preferred embodiment of a back-side part of the preferred embodiment of a glove according to the invention,
Fig. 6 shows a preferred embodiment of a palm-side part of the preferred embodiment of a glove according to the invention,
Fig. 7 shows a preferred embodiment of a first thumb piece part of the preferred embodiment of a glove according to the invention,
Fig. 8 shows a preferred embodiment of a second thumb piece part of the preferred embodiment of a glove according to the invention,
Fig. 9 shows a preferred embodiment of a plurality of parts for the preferred embodiment of a glove according to the invention, one thumb piece part, two side parts and four finger side parts.

DETAILED DESCRIPTION

[0008] Figs. 1 and 2 shows a preferred embodiment of a glove according to the invention from above and below, mainly intended for fire fighters and similar use. The glove is partly made of elastic material, which makes the glove easy to put on and take off and provides good comfort. Through many years of testing of different types of designs and materials, the inventors have arrived at a preferred combination of layers for use in the palm side 2 of an elastic multilayer material, which well meets these complex requirements for fire fighter gloves and similar uses, e.g. meeting the requirements of European standards 420,659 and 388.

[0009] In Fig. 1 and Fig. 2 there are shown two perspective views of an exemplary fire figter glove in accordance with the invention. The glove comprises a palm side 2, a backside 3, an outer side 4 and a thumb side 5. The thumb is marked with reference sign 6 and the remaining fingers are given reference number 7. Further, there is shown that the glove also includes a cuff 8.

[0010] The glove basically includes three different materials in the outer shell. There is a first material M1 that is used for the backside 3 in the form of a relatively large backside piece 30. There is also a part 60 made in the first material M1 that is used as one of a plurality of pieces for the thumb 6. Further, the first material M1 may also be used for the cuff 8.

[0011] The second material M2 is used for the major part 20 of the palm side 2 and also for an inner piece 61 for the thumb 6.

[0012] The third material M3 is used in the form of a first side piece 50 on the thumb side 5 of the glove and a second side piece 40 on the outer side 4 of the glove. Furthermore, the third material M3 is used for a plurality of finger side pieces 70, 71, 72, 73. Finally, the third material M3 is used for a third piece 63 of the thumb 6.

[0013] There may also be made use of a fourth material 83 for the cuff edge and for the transition zone between the cuff and the glove part. Preferably, made of the same fourth material there is positioned an eyelet device 81 along the palm side of the cuff 8 to assist in putting the glove on.

[0014] In Fig. 3 there is shown a cross-sectional schematic view of the glove according to Figs. 1 and 2 along line A-A. It is shown that the glove basically comprises an outer protective shell and an inner protective insert 9. Preferably, the insert 9 is fixated to the outer glove shell by means of seams (not shown) at the fingertip points and also a resilient seam/s 95, preferably Nomex thread, corresponding to a position adjacent the wrist.

[0015] In Fig. 4 there is shown a more detailed cross-sectional view along lines B-B in Fig. 3, in order to in more detail explain the different materials used for a glove according to the invention. Firstly, it must be mentioned that the inset 9 may be produced in a large variety of different materials in accordance with the invention, depending on different needs for different uses of a glove according to the invention. In the shown exemplary embodiment the glove is intended for firefighting purposes and provided with preferred combination of materials, without any limitation to such a combination, wherein the combination of materials of the glove 1 may provide protection against harmful biological agents, cuts by hand-held chainsaws, high-pressure jets and bullet wounds or knife stabs.

[0016] Starting from the backside 3 there is a first shell material M1 comprising an outer protective layer part 30, se Fig. 5, comprising a basic protective layer 30B and coating 30A. In the shown preferred embodiment the first shell

material M1 comprises a basic protective layer 30B including 70-80% aramide fibers, suitably Para-aramide fibres, and 20-30% other strong fibres, e.g. polybenzimidazole fibres, preferably in the form of a half cardigan stitch-knitted fabric. Preferably the aramide fibers are para Aramide fibers. The coating 30A preferably comprises silicone. The weight being in the range of 300 - 600 g/m^2, preferably at least 400 g/m^2 and a thickness of between 0,8 to 1,8 mm, preferably larger than 1 mm and maximum 1,5 mm. The elongation at break ε is of at least 50% in all directions, preferably at least 70% in all directions. Preferably, the first multilayer material M1 has a larger elongation at break ε_W in a width wise direction W than the elongation at break ε_F in a length wise direction W, wherein preferably $\varepsilon_w > 1,1 - 2\ \varepsilon_F$.

[0017] As shown in Figs. 1, 2 and 3 also the cuff piece 80 and a thumb piece part 61 may be made in the same material M1.

[0018] As shown in Figs. 1-3 the outer shell of the palm side 2 of the glove comprises two parts 20, 61 made of the second material M2. The large palm part 20, see Fig 5, covers most of the palm of the hand and also includes an inner part for the fingers 7. Preferably also a thumb piece part 61, see Fig 8, is also made of the second material M2, to provide a really good grip.

[0019] The second material M2 comprises a multilayer, cohesive material, having an outer coated layer 20A of a flame retardant resilient material comprising Chlorosulfonated Polyethylene and a second, base layer 20B including at least 80% aramide fibers, suitably Para-aramide fibers, preferably at least 90% Para-aramide fibers and more preferred 100% Para-aramide fibers. Preferably the Aramide fibers are para Aramide fibers. The second multilayer material M2 preferably is in the form of an interlock knitted fabric, which provides very good bond for the coated outer layer 20A. has a surfacic mass of between 400 to 1200 g/m^2, preferably 500 to 1000 g/m^2 and a thickness of between 0,5 to 1,5 mm, preferably 0,6 - 1 mm. The elongation at break ε is of at least 20% in all directions, preferably at least 40% in all directions. Preferably, the second multilayer material M2 has a larger elongation at break ε_F in a length wise direction F than the elongation at break ε_W in a width wise direction W, wherein preferably $\varepsilon_F > 2\ \varepsilon_W$, more preferred $\varepsilon_F = 3 - 6\ \varepsilon_W$.

[0020] The second multilayer material M2 has a tensile strength σ of at least 15 daN/5cm, in all directions, preferably at least 20 daN/5cm, wherein preferably the tensile strength σ_F in a length wise direction F is larger than the tensile strength σ_W in a width wise direction W, more preferred $\sigma_F > 2\ \sigma_W$, and even more preferred $\sigma_F = 3 - 6\ \sigma_W$. Hence, preferably the second multilayer material M2 has its largest elongation at break ε_F in a length wise direction F, whereas the first multilayer material M1 has its largest elongation at break ε_W in a width wise direction W.

[0021] The third material M3 in the outer shell also comprises a multilayer, cohesive material, having an outer layer of a flame retardant material comprising Polyamide fibers and a second layer comprising aramide fibres. Preferably the Aramide fibers are para Aramide fibers. Preferably the third material M3 includes around 50-70 % Polyamide fibers and 30-50% Para-aramide fibers, Preferably the amount of Polyamide fibers is larger than the amount of Para-aramide fibers. The third multilayer material M3 has a surfacic mass of between 300 to 800 g/m^2, preferably 400 to 600 g/m^2.

[0022] The seams between the parts are preferably made as double seams, and by the use of a sewing thread made from 90-100% spun meta aramid fiber, preferably using a vertically integrated aramid manufacturing system.

[0023] As shown in Fig. 4 regarding the insert 9 there is positioned a membrane 90, arranged as an outer layer all around the insert 9. Preferably, it is a copolyamide membrane 90 that is elastic in all directions with high vapor permeability, having a melting temperature above 100 ° C, suitably up to 120° C, and a wash resistance of at least 60° C. Conveniently, the membrane is also completely fogging-free.

[0024] Next, the insert 9 at the back side 3 includes two layers 91A, 91B of a heat resistant material, preferably PAN/PES of about 120 to 200 g/m^2.

[0025] Closest to the hand there is a liner 92, preferably including about 50 -70% Aramid and 30-50% glass, of about 250 to 350 g/m^2.

[0026] Moving to the palm side 2 preferably exactly the same layers are being used as for the backside except for using merely one layer 91A of heat resistant material and that the outer shell includes a palm piece 20 that comprises a specific composite layer 20A and a specific coating 20B in accordance with the invention. Hence, the insert 9 preferably has a larger amount of heat resistant material at the back side 3 than at the palm side 2.

[0027] Thanks to the invention there is achieved an extremely good grip ability by means of using the novel material M2 in the palm side 2 of the outer shell, e.g. for the pieces 20, 60 at the palm side 2. There has surprisingly been identified that the grip ability when using the material in accordance to the invention is extremely much better than conventional non-leather materials, especially in wet conditions, as presented below.

GRIP ABILITY	DRY	WET
Traditional glove using leather in palm side	5	5
Traditional glove using coated textile in palm side	5	2
Glove according to invention	5	5

COMPLIANCY		DRY	WET
Traditional glove using leather in palm side		4	5
Traditional glove using coated textile in palm side		5	5
Glove according to invention		5	5

WASH ABILITY	DRY
Traditional glove using leather in palm side	3
Traditional glove using coated textile in palm side	4
Glove according to invention	5

[0028] As noted above a glove according to the invention presents a surprising combination of desired properties for a flame retardant glove, for which there has been a long felt need.

[0029] The invention is not limited by the above shown but can be varied within the scope of the appended claims. Those skilled in the art will recognize, for example, that the exact design of various components may be varied in many ways. Thus, it is understood, for example, that the glove also retains its basic functionality if having two or more of the fingers integrated to form a common space for two or more fingers, e.g. in the form of a thumb glove.

[0030] One variant is, for example, to leave only the index finger and thumb free while the little finger, ring finger and middle finger are combined in a wide finger. Another variant is that only the little finger and ring finger 3 are integrated into one and the same space.

[0031] Furthermore, it is understood that materials indicated above with trademarks are only examples of materials with suitable properties and that these can be exchanged for other kinds of materials with the same or similar properties.

Claims

1. Flame retardant protective glove (1), preferably in the form of a finger glove, having an outer shell comprising a palm side (2), a back side (3), an outer side (4) and a thumb side (5), wherein the material in the back side (3), outer side (4) and a thumb side (5) comprises at least one first multilayer material (M1, M3) comprising an outer layer (30A) of a flame retardant material and said palm side (2) comprises a second multilayer material (M2) different than said at least one first multilayer material (M1, M3), **characterized in that** said palm side (2) comprises at least one palm part (20) made of said second multilayer material (M2) having an outer coated layer (20A) of a flame retardant material comprising Chlorosulfonated Polyethylene and a second layer (20B) including at least 80% aramide fibers, suitably para-aramide fibers, wherein said second multilayer material (M2) is in the form of an interlock knitted fabric and_has a surfacic mass of between 400 to 1200 g/m^2, and a thickness of between 0,5 to 1,5 mm, and is resilient having an elongation at break (ε) of at least 20% in all directions.

2. Flame retardant protective glove according to claim 1, **characterized in that** said second multilayer material (M2) has a larger elongation at break (ε_F) in a length wise direction (F) than the elongation at break (ε_W) in a width wise direction (W), wherein preferably $\varepsilon_F > 2\ \varepsilon_W$, more preferred $\varepsilon_F = 3 - 6\ \varepsilon_W$.

3. Flame retardant protective glove according to claim 1 or 2, **characterized in that** said the second multilayer material (M2) has its largest elongation at break (ε_F) in a length wise direction (F), whereas the first multilayer material (M1) has its largest elongation at break (ε_W in a width wise direction (W).

4. Flameproof protective glove according to any of claims 1-3, **characterized in that** said second multilayer material (M2) has a tensile strength (σ) of at least 15 daN/5cm in all directions, wherein preferably the tensile strength (σ_F) in a length wise direction (F) is larger than the tensile strength (σ_W) in a width wise direction (W), more preferred $\sigma_F > 2\ \sigma_W$, and even more preferred $\sigma_F = 3 - 6\ \sigma_W$.

5. Flameproof protective glove according to any of claims 1-4, **characterized in that** said palm side (2) comprises at least one palm part (20) and at least one thumb piece part (61) made of said second multilayer material (M2).

6. Flameproof protective glove according to any of claims 1-5, **characterized in that** said at least one first multilayer material (M1, M3) includes a first multilayer material (M1) comprising a basic protective layer (30B) including aramide fibers, suitably para-aramide fibres, and other strong fibres, e.g. polybenzimidazole fibres and a coating comprising silicone, wherein the amount of aramide fibers is larger than the amount of other strong fibres, e.g. polybenzimidazole fibers, preferably including 70-80% aramide fibres and 20-30% other strong fibres, e.g. polybenzimidazole fibres, wherein more preferred the weight of said first material (M1) is in the range of 400 - 600 g/m^2.

7. Flameproof protective glove according to claim 6, **characterized in that** at least a back side part (30) of the outer shell is made with said first multilayer material (M1) and preferably also a thumb piece part (61), wherein more preferred also a cuff part (80) is made with said first multilayer material (M1).

8. Flameproof protective glove according to any of claims 6 or 7, **characterized in that** said outer shell includes a third multilayer material (M3) comprising around 50-70 % Polyamide fibers and 30-50% aramide fibers, suitably para-aramide fibers, preferably the amount of Polyamide fibers is larger than the amount of aramide fibers, more preferred the third multilayer material (M)3 has a surfacic mass of between 300 to 800 g/m^2, preferably 400 to 600 g/m^2.

9. Flameproof protective glove according to claim 6, **characterized in that** at least a plurality of finger side part (70-73) of the outer shell is made with said third multilayer material (M3) and preferably also at least one hand side part (40, 50), and more preferred also a thumb piece part (62).

10. Flameproof protective glove according to any proceeding claim, **characterized in that** an insert (9) is arranged within said outer shell, comprising at least one fire blocker layer (91A, 91B) and at least one aramide fiber containing layer (92), suitably para-aramide.

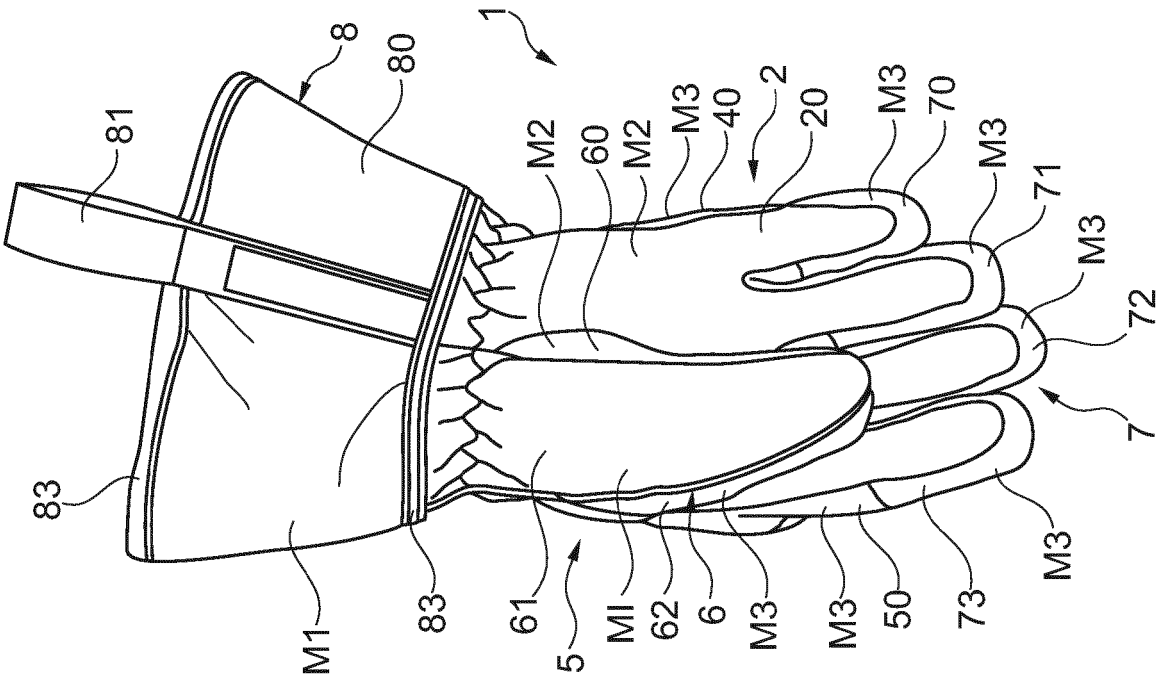
11. Flame retardant protective glove according to claim 10, **characterized in that** said insert (9) has a larger amount of fire blocker material (91A, 91B) at the back side (3) than at the palm side (2).

12. Flame retardant protective glove according to claim 10 or 11, **characterized in that** a liquid-tight membrane layer (90), preferable breathable, is arranged in said insert (9).

13. Flameproof protective glove according to claim 1, **characterized by** said second layer (20B) including at least 90% aramide fibers and more preferred 100% aramide fibers.

14. Flameproof protective glove according to claim 1, **characterized by** said second multilayer material (M2)_having a surfacic mass of between 500 to 1000 g/m^2.

15. Flameproof protective glove according to claim 1, **characterized by** said second multilayer material (M2) having a thickness of between 0,6 - 1 mm.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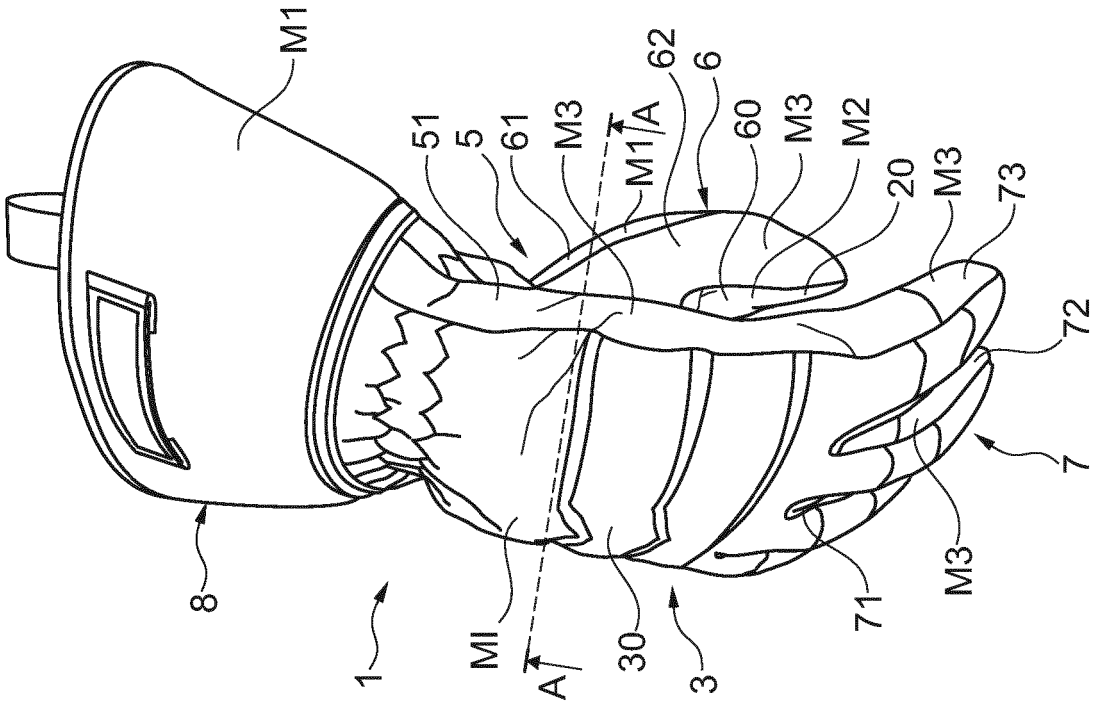
M3

Fig. 2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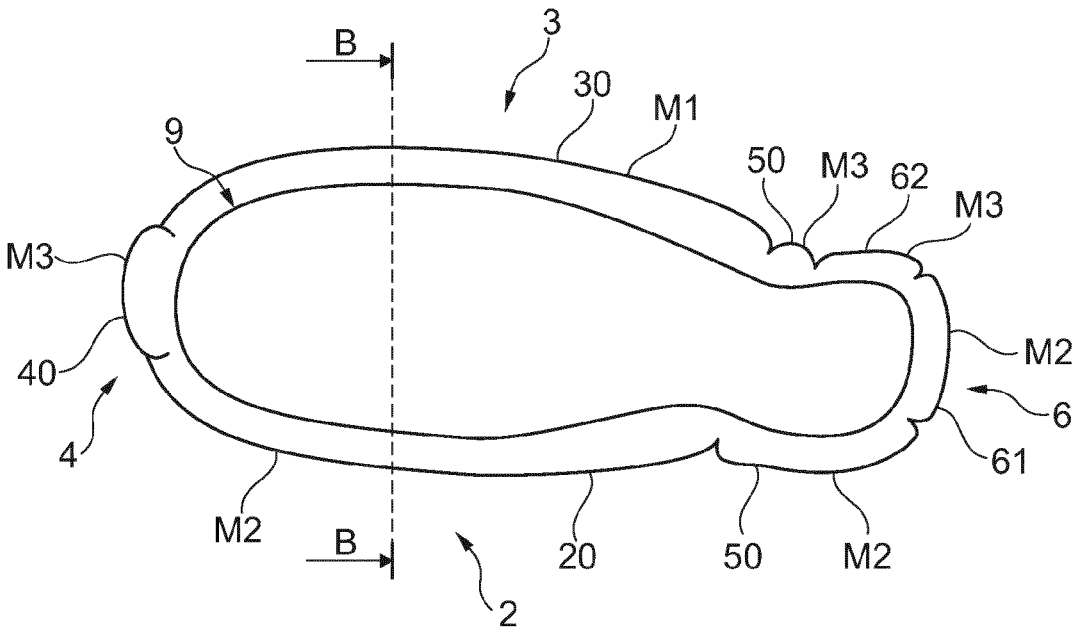
M3

Fig. 1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M2
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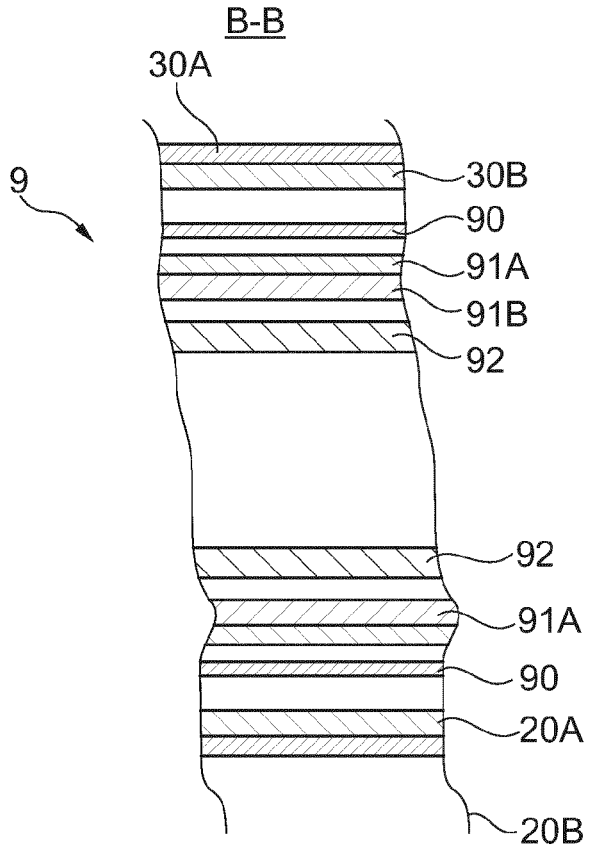
Fig. 3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30B
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91B
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92
91A
90
20A
20B

Fig. 4

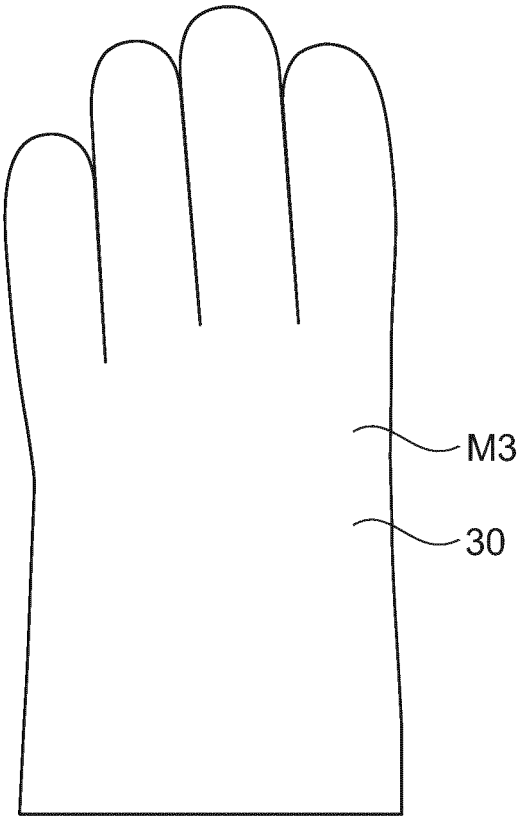

Fig. 5

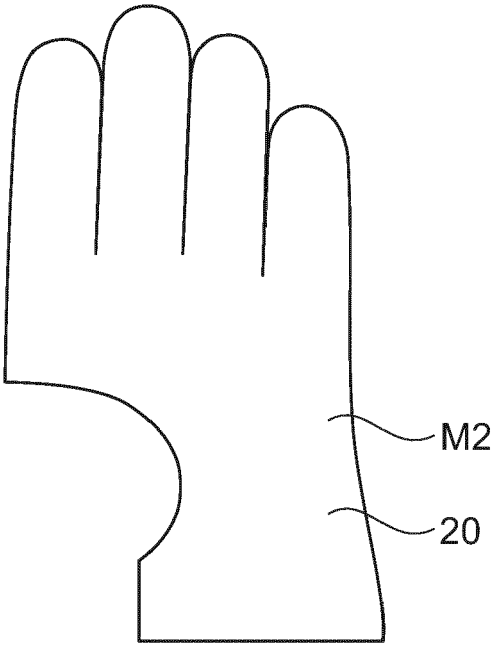

Fig. 6

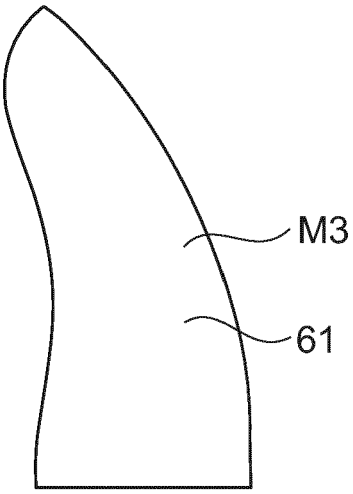

Fig. 7

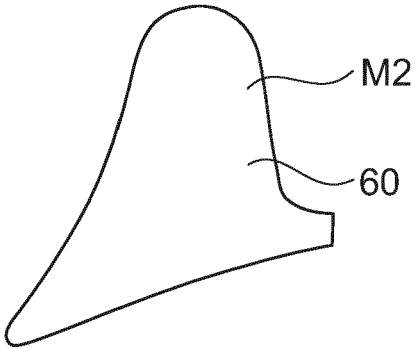

Fig. 8

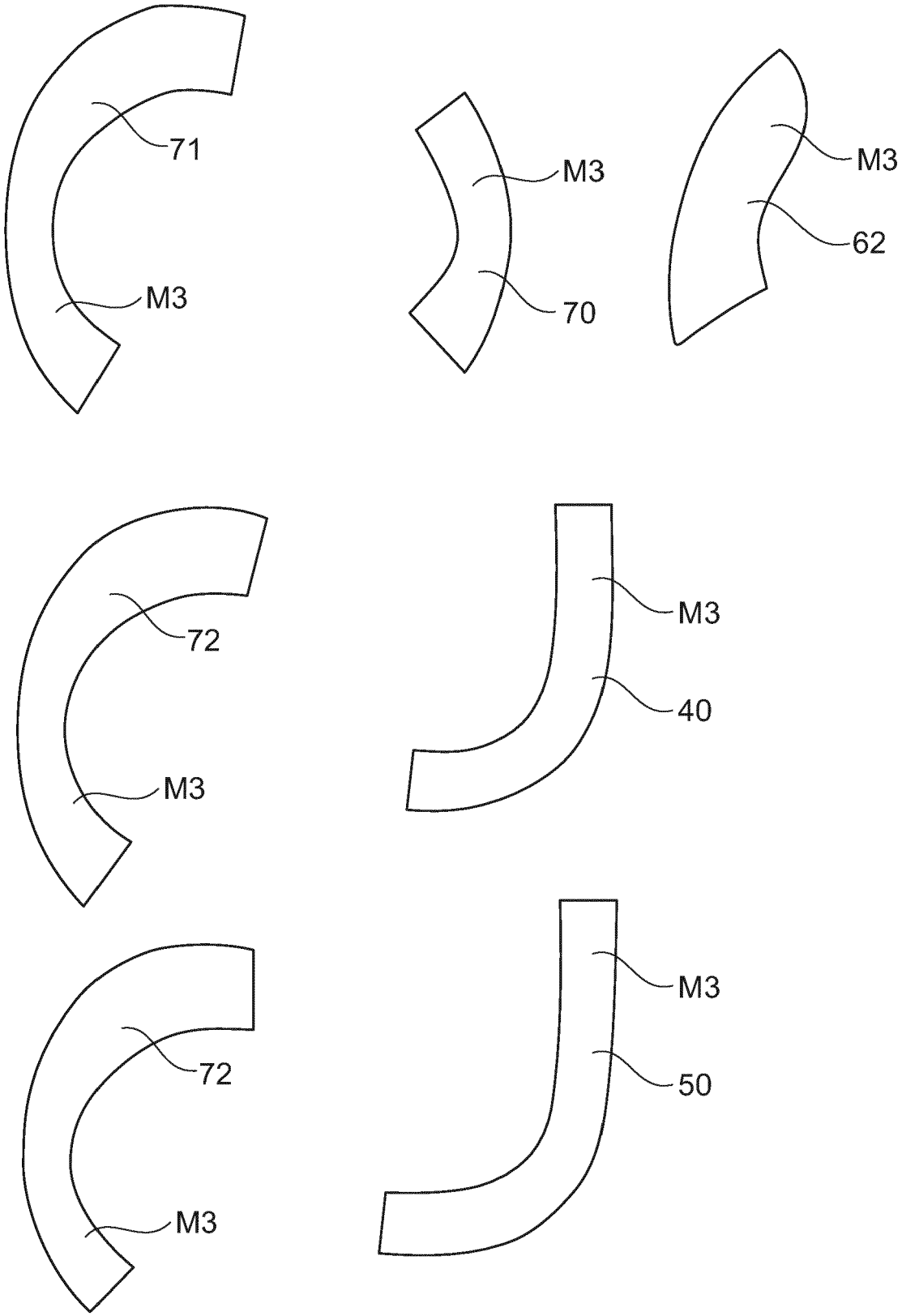

Fig. 9

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European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 22 15 2740

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2009/222980 A1 (KLUG HELMUT [DE] ET AL) 10 September 2009 (2009-09-10) * paragraphs [0030], [0032], [0129]; claims; figures *	1-15	INV. A41D19/015 A62B17/00
A,D	US 2019/343201 A1 (VANDENBOSCH JILL [CA] ET AL) 14 November 2019 (2019-11-14) * paragraphs [0074], [0082], [0088]; claims; figures *	1-15	
A,D	DE 101 11 143 A1 (WATEX GMBH [DE]) 26 September 2002 (2002-09-26) * paragraphs [0020] - [0024]; claim 1; figures *	1-15	
A	US 2017/280795 A1 (TAKAGI RYO [JP] ET AL) 5 October 2017 (2017-10-05) * paragraphs [0022], [0026], [0027], [0080]; claims; figures *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

A41D
A62B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	19 July 2022	Claudel, Benoît

CATEGORY OF CITED DOCUMENTS

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L : document cited for other reasons

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