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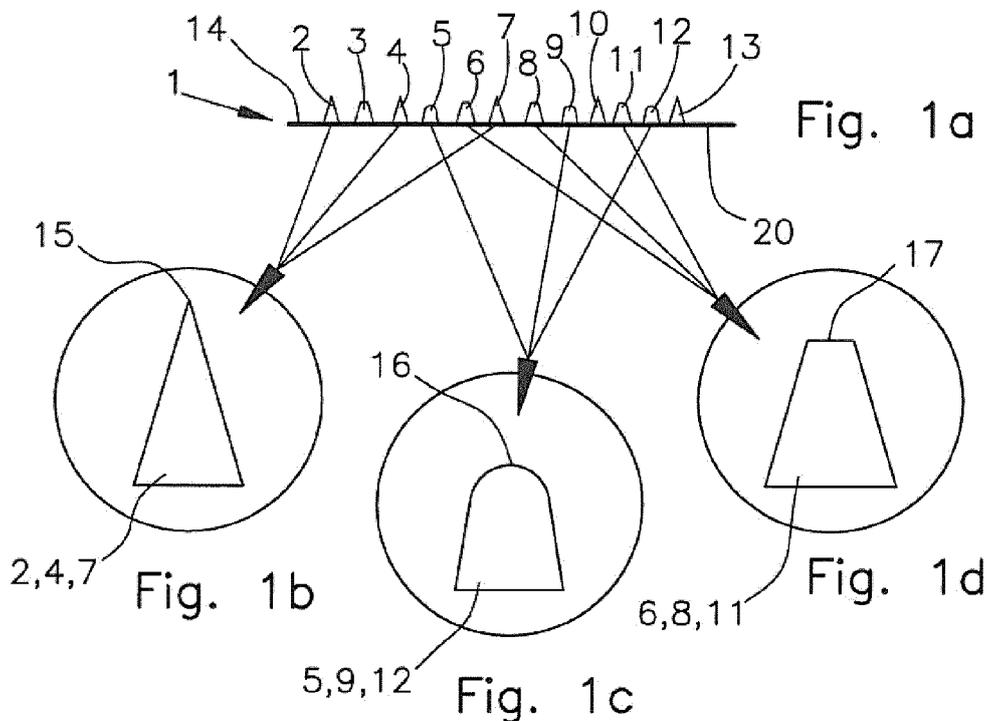
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(54) **Covering in order to increase the sensitivity to touch**

(57) Covering (1), in particular for a garment (30, 50) or a device to be handled manually, in order to increase the sensitivity to touch, comprising a plurality of projections (2 - 13) projecting from a base surface (14), the

projections (2 - 13) being made of an elastically deformable material wherein at least some of the projections (2 - 13) have a flat (17), acute (15) or rounded apex (16).



Description

[0001] The invention relates to a covering, in particular for a garment or a device to be handled manually, in order to increase the sensitivity to touch, comprising a plurality of projections projecting from a base surface.

[0002] In the drive to replace animal based products with synthetic eco friendly material, it has become necessary to develop a surface finish or coating to enhance and in all cases improve effective functionality of the synthetic products.

[0003] Converting to synthetic materials improves manufacturing control, productivity and quality consistency.

[0004] Synthetic woven and knitted fabrics have their limitations to be water repellent, breathable and fireproof, amongst other things, necessitating industrial solutions to improve fabric properties. Furthermore, synthetic fabrics often have negative effects on dexterity and the sensitivity to touch, in particular, if a synthetic material is used for production of a glove.

[0005] The object of the present invention is to provide a means for improving the sensitivity to touch.

[0006] This object is solved by a covering, in particular for a garment or device to be handled manually, in order to increase the sensitivity to touch, comprising a plurality of projections projecting from a base surface, the projections being made of an elastically deformable material, wherein at least some of the projections have a flat, acute or rounded apex.

[0007] By choosing the form of the apex of the projection, the covering can be adapted to the intended use. For example, an acute apex can act like "a feeler". Depending on the intended use, the projections can be in touch with the skin of a user, i. e. they can be on the inside of a garment worn on the skin, thus leaving space for air between the skin and the garment for the reduction of heat co-conductivity or heat transfer. Alternatively, the projections can be on the outside of for example a garment and transfer the feeling of touch through for example a carrier material to the skin of a user. The covering can form a surface 3D-structure. The projections may be made of a polymer. The Shore-Hardness and the strength of the polymer may determine the "grip". The softer, more flexible or elastic the polymer is, the greater is the tendency to penetrate or conform to finer surfaces. Such a covering can be designed to simulate or enhance a finger's contact, adhesive properties and touch. The spacing of the projections allows for air ventilation, moisture wicking and assists with cooling.

[0008] The projections may have different heights measured from the base surface. This has the benefit that the projections can penetrate through a substance, for example a liquid, covering an item to be touched. The substance can be penetrated by different extents by projections having different heights. Also, the sensitivity can be improved by projections having different heights.

[0009] In a preferred embodiment, the covering may

comprise a carrier material, the top surface of the carrier material forming the base surface, and at least some projections being attached to the carrier material. Hence, the covering can be attached directly onto a carrier, such as a fabric, or as a patch in a designated area to improve the dexterity, contact and specific operational movement and control issues. The projections can be coated, injected, moulded, cast or centrifugally injection moulded directly or indirectly onto the product, such as a textile or a carrier. The projections can be applied both as a male (against the skin), as used for glove insides and insoles, or they can be used as a female application (against an object), when used at the outside of gloves, elbow or knee pads, on grips, handlebars etc.

[0010] At least some projections may at least partially penetrate the carrier material. For example, a fabric may be used as carrier material. The touch sensation of such a material can be improved by impregnating the projections through the carrier, which stabilizes, softens, and reduces/flattens the carrier, in particular fabric, into a thinner, more compressed form, without damaging the surface of the carrier or fabric fibres. This single layered application or coating transforms the characteristics of a carrier material without damaging the carrier material, in particular, a knit.

[0011] The projections improve the touch sensation from the apex of a projection onto the carrier. The carrier acts like a resonance body and resonates against the skin, thus improving touch and sensitivity. The compression of the carrier material improves the transfer of the touch sensation.

[0012] This sensitivity can be improved and indeed engineered if at least some projections penetrate the carrier material to different extents. In particular, the projections can penetrate the carrier material to different extents in different regions of the carrier material.

[0013] In one preferred embodiment, some projections may be arranged to form ridges. For example, the projections may be arranged to form circular, oval, or oblong ridges. For example, circular ridges may be formed around a central contact point, to which a specific pressure needs to be applied, balancing out multidirectional pressure.

[0014] In an alternative embodiment, some projections may be arranged to imitate epidermal ridges. Thus, the projections can be used to simulate or enhance the finger's contact, adhesive properties and touch.

[0015] In an advantageous embodiment, some projections may comprise carbon and/or metal particles. In particular, a polymer may be mixed with nano carbon or carbon tubes, which transfer electrical impulses through the projections and in particular the covering. In particular, the transfer can be from a user's skin to the outside of the covering. By using nano carbon or carbon tubes in the polymer, i. e. in the projections, the covering may be used to operate touch screens.

[0016] In a further embodiment, some projections may comprise gas bubbles, in particular air bubbles. By incor-

porating gas bubbles into the projections, the elasticity of the projections can be modified and engineered.

[0017] At least some of the projections may be designed as micro-craters. Those micro-craters may have a hollow tip. These structures can be used to accommodate vibrations, thus improving the comfort of a user.

[0018] Further advantages arise, if at least some projections are tapered. In particular, the projections may have a wider base and then taper towards a tip of the projections. This construction improves stability of the projections.

[0019] The covering may comprise regions having projections of different size and/or height and/or apex form and/or different densities of projections. Hence, there are many parameters for designing an ideal covering for an intended purpose. In particular, the covering may be used for improving the handling properties and dexterity to manipulate fine objects through increased sensitivity and at the same time allowing full sensitivity and electrical/static transfer through the carrier. Thus, the covering according to the invention has many advantages over previously known materials, such as leather. For example, the projections having an acute, rounded or flattened apex can be used in the regions of the fingertips of a glove, thus improving dexterity and sensitivity. On the other hand, projections having a micro-crater form may be used in the area of a palm of a hand, where vibrations may have to be absorbed.

[0020] The invention also relates to a garment having a covering according to the invention.

[0021] Other advantages and features of the invention will be appreciated from the following description of embodiments with reference to the figures of the drawings, which show significant details, and from the claims. The individual features may each be carried out individually or carried out together in any combination in variants of the invention.

Fig. 1a shows a cross section of an inventive covering;

Fig. 1b shows a projection having an acute apex;

Fig. 1c shows a projection having a rounded apex;

Fig. 1d shows a projection having a flat apex;

Fig.2 shows an arrangement of projections forming epidermal ridges;

Fig.3 shows a covering having epidermal ridges;

Fig. 4 shows the garment, in particular a glove, having regions with different kinds of projections.

[0022] Fig. 1a shows a covering 1 comprising a plurality of projections 2 to 13 projecting from a base surface 14. As can be seen in the enlarged representation of

projections 2, 4, 7 in Fig. 1b, some projections have an acute apex 15. Other projections 5, 9, 12, which are represented in an enlargement in Fig. 1c, have a rounded apex 16. Some projections 6, 8, 10, which are represented in a better view in Fig. 1d, have a flat apex 17. From Figs. 1b to 1d it is clear, that the projections 2 to 13 have a fairly broad base and are tapered towards their apex 15, 16, 17.

[0023] Furthermore, from Fig. 1a it can be seen that the projections 2 to 13 may have different heights. The projections 2 to 13 are made of elastically deformable material. In particular, the material can be a polymer. The polymer can be designed to achieve special effects. In particular, the polymer can be designed to withstand weather conditions such as extreme heat or cold, dry or wet weather conditions. Furthermore, the polymer can be designed to be fireproof, antistatic, cut-proof, histamine free, to be infrared non-detectable, to form a ballistic protection and for increased electrical conductivity. Furthermore, the polymer may comprise additives such as ceramic or silicate particles preventing needle penetration as puncture resistance. Also, additives may comprise glass beads for reflectivity and/or additives for retro-reflectivity. Advantageously, IR sensitive markers may be mixed into the polymer, making it possible for light enhancing "night vision" equipment to distinguish between friend and foe in a combat situation.

[0024] The base surface 14 can be the top surface of a carrier material 20. The protections 2 to 13 can penetrate the carrier material 20 to different extents. The carrier material 20 may be a fabric, such as a knitted material or a woven material. In particular, the carrier material 20 may be a synthetic material. By penetrating the carrier material 20, the carrier material 20 is compressed. Furthermore, the compressed carrier material 20 may form a resonant body, thus transferring information from the apex 15, 16, 17 of projections 2 to 13 to the skin of a person touching the carrier material 20 from below.

[0025] As can be seen from Fig. 2, Fig. 1a is a cross sectional view of the covering 1 shown in Fig. 2. The projections 2 to 13 can be arranged to form ridges 25, in particular they can be arranged to form epidermal ridges to imitate the skin of for example a finger of a human being. The ridges 25 can have different heights, corresponding to different heights of the projections 2 to 13. The projections forming a particular ridge 25 may have the same height above the base surface 14 or may have varying heights. They may form wave-like serrated patterns. Thus, the covering 1 can be designed according to the intended purpose. In particular, if items having a special surface or being covered, for example, by a layer of liquid or paste have to be touched, the height of the projections 2 to 13 can be selected accordingly, in order to penetrate the layer, such as oil, to different extents. The grooving pattern can assist in the displacement of water or liquids, thus improving "wet grip". Furthermore, using projections having different heights helps with penetration of substances. The heights and depressions pat-

terns increase the "surface contact area" which improves "dry grip" with higher pressure (due to polymer flexibility).

[0026] Fig. 3 shows a part of a garment 30 having a covering 1. In particular, the covering can be part of the garment, i. e. the projections 2 to 13 can penetrate a fabric forming the garment 30. In the alternative, the covering 1 can be a separate part attached to a garment.

[0027] Fig. 4 shows a part of a garment 50, in particular the inner hand of a glove. As can be seen from Fig. 4, projections can be arranged in different shapes and in different parts of the garment. For example, in the finger tips 51 to 54 protections can be arranged to imitate epidermal ridges. This can be seen in the regions 51, 52, 53, 54. Those regions are very sensitive to touch. On the other hand, in other regions such as in a palm region 55, different kinds of projections can be used, such as micro-craters, i. e. projections having a hollow tip. Those projections are particularly suitable to absorb vibrations. Hence, the comfort of a wearer of the garment 50 can be improved.

Claims

1. Covering (1), in particular for a garment (30, 50) or a device to be handled manually, in order to increase the sensitivity to touch, comprising a plurality of projections (2 - 13) projecting from a base surface (14), the projections (2 - 13) being made of an elastically deformable material wherein at least some of the projections (2 - 13) have a flat (17), acute (15) or rounded apex (16).
2. Covering according to claim 1, wherein some of the projections (2 - 13) have different heights measured from the base surface (14).
3. Covering according to any of the preceding claims, wherein the covering (1) comprises a carrier material (20), the top surface of the carrier material (20) forming the base surface (14) and at least some projections (2 - 13) being attached to the carrier material (20).
4. Covering according to claim 3, wherein at least some projections (2 - 13) at least partially penetrate the carrier material (20).
5. Covering according to claim 4, wherein at least some projections (2 - 13) penetrate the carrier material (20) to different extents.
6. Covering according to any of the preceding claims, wherein some projections (2 - 13) are arranged to form ridges (25).
7. Covering according to claim 6, wherein some projections (2 - 13) are arranged to imitate epidermal ridges.
8. Covering according to any of the preceding claims, wherein some projections (2 - 13) comprise carbon particles.
9. Covering according to any of the preceding claims, wherein some projections (2 - 13) comprise metal particles.
10. Covering according to any of the preceding claims, wherein some projections (2 - 13) comprise gas bubbles, in particular air bubbles.
11. Covering according to any of the preceding claims, wherein at least some projections (2 - 13) are designed as micro-craters.
12. Covering according to any of the preceding claims, wherein some projections (2 - 13) are tapered.
13. Covering according to any of the preceding claims, wherein the covering (1) comprises regions having projections (2 - 13) of different size and/or height and/or apex form and/or different densities of projections (2 - 13).
14. Garment (30, 50) having a covering (1) according to any of the preceding claims.

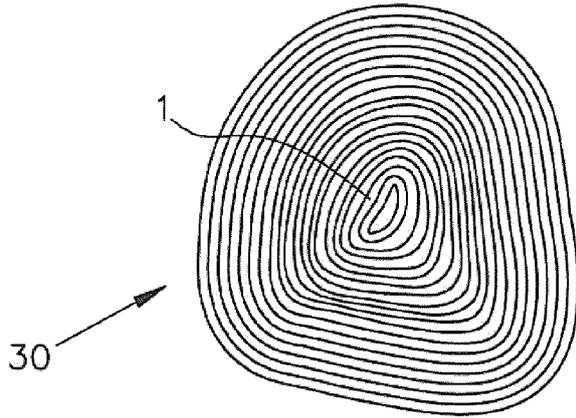


Fig. 3

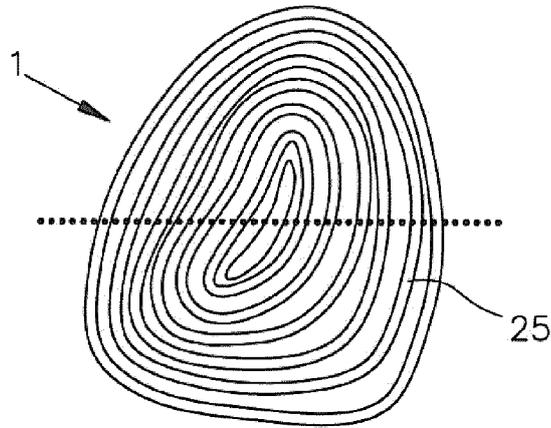
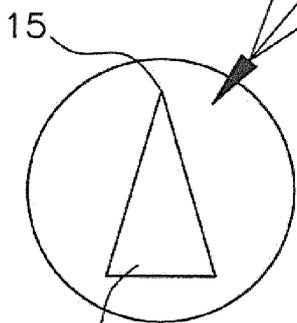


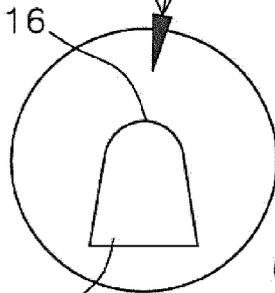
Fig. 2



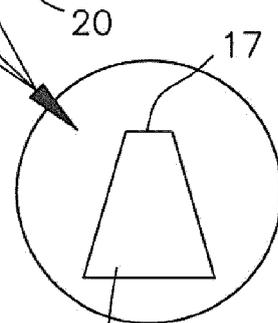
Fig. 1a



2,4,7 Fig. 1b



5,9,12 Fig. 1c



6,8,11 Fig. 1d

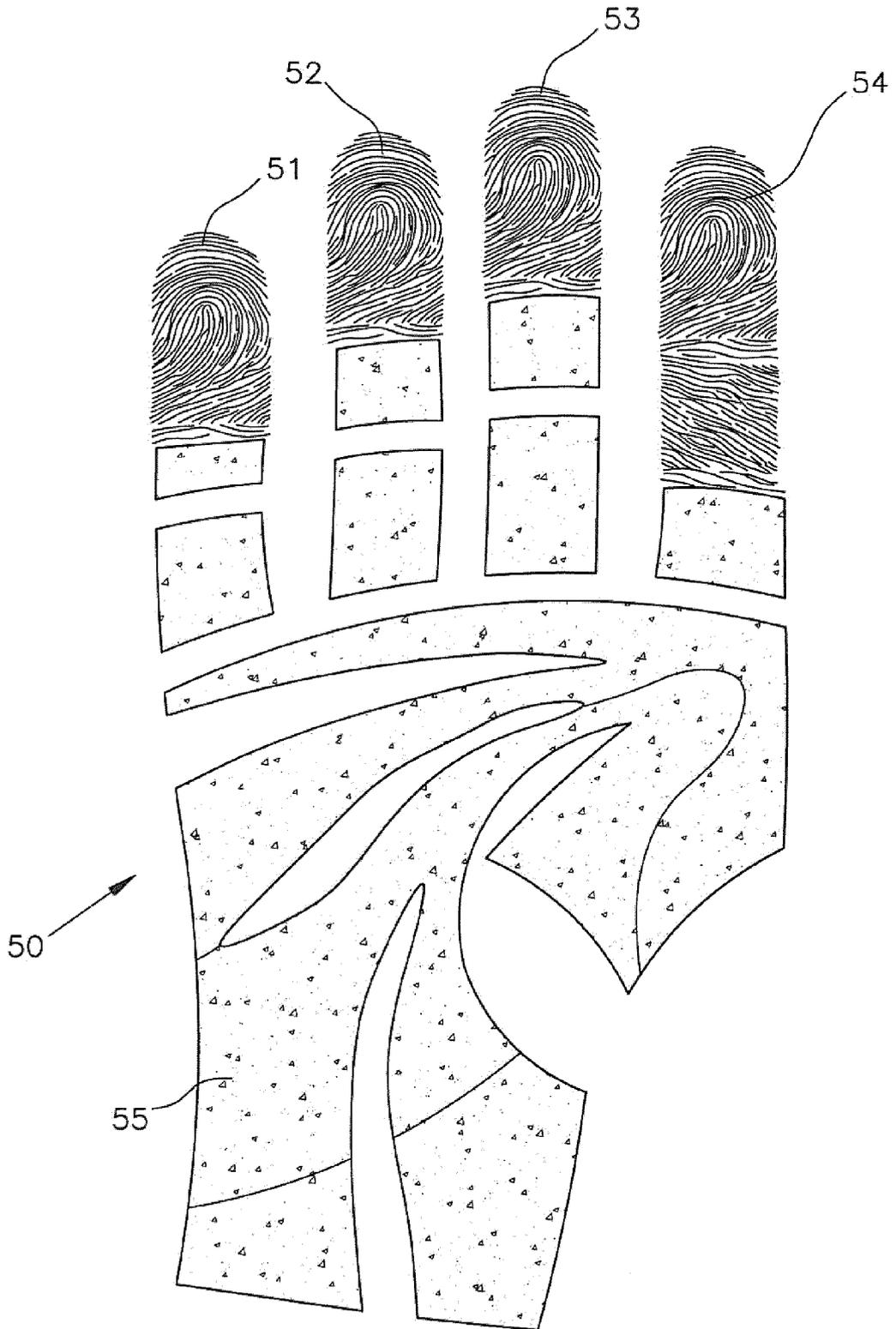


Fig. 4



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Application Number
EP 13 15 0249

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