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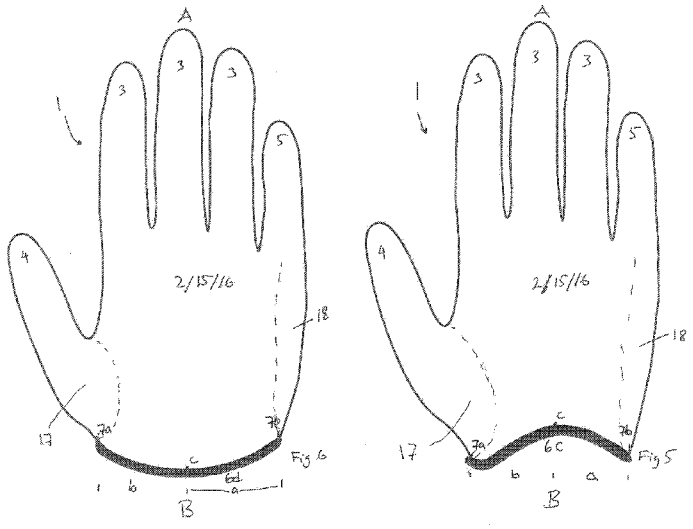
(54) Title: PROTECTIVE WORKING GLOVE, A METHOD FOR MAKING A PROTECTIVE WORKING GLOVE AND USE OF PROTECTIVE WORKING GLOVE



(57) Abstract: The invention relates to a protective working glove and a method for making a protective working glove. The protective working glove is for protecting the hands against physical or mechanical impact, such as wear, cuts and/or stabs and to some extent protection from certain chemicals, water, oils or lubricants and/or detergents. The protective working glove (1) comprises a knitted glove liner (13), the glove liner provided with a grip enhancing coating (12) of a polymeric material covering at least the palm side (15) of the hand and the fingers (3, 4, 5) of the glove liner. The wrist end of the glove is cut off at an area surrounding the carpal bones of the hand for improving freedom of movement of the hand and lessening irritations from the cuff end (7) at the carpal area while wearing the glove.

Protective working glove, a method for making a protective working glove and use of protective working glove.

Field of the Invention

The present invention relates to protective gloves.

In addition, the present invention relates to a method for making a protective glove.

Finally, the present invention relates to use of a protective glove.

Background of the Invention

Protective gloves are widely used in the industry when assembling, repairing or working with mechanical apparatus, e.g. in the automotive industry or various apparatus for mechanically working up metals, plastics or wood or the like.

Such gloves mainly protect the hands against wear from the machines or tools used and provide an improved grip for the user.

In addition such gloves may provide protection towards cuts from sharp edges or, punctures or stabs from pointed items. Depending on the coating such gloves may also provide some protection against chemical substances, e.g. liquids such as water, certain chemicals or detergents or oils, which the user may come into contact with during work.

Prior art gloves are manufactured by providing a substrate, preferably a glove liner knitted of yarn made of natural or synthetic fibres or a combination of natural or synthetic fibres. The glove liner is knitted into a shape corresponding to the hand, i.e. having fingers for each finger of the hand and an elastic cuff, with a width of e.g. 4-7 cm, which is knitted together with the remaining part of the glove liner in order to attaching the glove to the under arm near the wrist during use. Examples of natural fibres are cotton, bamboo or mixtures thereof and examples of suitable synthetic fibres are e.g. of polyolefins, such as polyethylene (PE) or polypropylene (PP), polyester, i.e.

polyethylene terephthalate (PET), polyacrylics, i.e. polyacrylonitrile, polyamide (e.g. Nylon) or similar commonly used synthetic fibres used in garment industry, and especially fibres used for making protective gloves or mixtures thereof. In addition mixtures of the above mentioned natural fibres and synthetic fibres may be used. Preferably, the fibres comprise minor amounts of a material which provides elastic properties to the glove liner, e.g. lycra™ or spandex, i.e. a polyurethane-polyurea copolymer, or similar elastic fibres commonly used as additional fibres for enhancing elasticity of fabrics, e.g. knitted fabrics.

The glove liner is then provided with a protective coating on a part of the glove, especially in the finger and palm area. Optionally the protective coating covers a part of the dorsal side of the hand as well or optionally the protective coating covers the entire glove. Such coatings are typically provided by mounting the glove on a hand shaped mould and dipping the knitted glove into a liquid polymeric composition to ensure that the coating covers the relevant area of the glove as discussed above. If necessary, the dipped glove is cured.

Examples of polymeric coatings are e.g. natural latex, polyurethane (PU), polyvinyl chloride (PVC), nitrile butadiene rubber (nitrile rubber or NBR), neoprene (polychloroprene) polyvinylacetate (PVA) or mixtures thereof, in particular mixtures of nitrile rubber and PU. In addition, two or more layers of different polymeric coatings may be applied on top of each other. As an example, an inner PU layer and an outer layer of nitrile rubber may provide a waterproof protective coating.

The polymeric material may be applied to the knitted glove as an aerated or foamed composition, which results in reduced or use or elimination of use of organic solvents thereby providing a more environmental friendly protective glove which also provides reduced health risk for the user of the glove because it does not contain residues of an organic solvent.

Especially preferred are rubbers, e.g. PVC- rubbers, PU-rubbers or nitrile rubbers, as they provide a significantly improved grip for the user wearing the gloves. In addition, different resins and rubbers, e.g. nitrile rubber, provide some protection against water and/or certain chemicals, e.g. oils or lubricants.

The material also allows perspiration to escape and reduces heat buildup inside the glove, thus enabling an improved comfort for the user.

An example for making such a protective glove is described in e.g. EP 1608808 A. Such a glove provides a good grip and protection for the user. This glove is provided with a cuff of substantial length. In addition, although the cuff is elastic, it does not always fit smoothly around the user's wrist. Thereby the cuff may be caught in machinery etc. during use resulting in potential injury of the user. In addition a cuff of a certain size may fold during use, especially when the user flexes the wrist joint during work. This may irritate the user during use of the protective working glove, especially around sinews/tendons in the wrist area when the user is applying manual force and/or flexes his wrist during work.

Similarly, JP-H-02-104706 A describes a protective glove with an oil repellent surface.

JP 2000-290813 A describes a protective working glove for "finger work". The glove is made of a rubber knit, and is thus not coated with a protective coating. The body of the glove comprises a rib part which extends into the palm area and may cover the entire palm area to the fingers of the glove. The glove is cut off in the wrist end at a line across the palm side and the dorsal side of the hand, and does thus not cover the entire palm area of the hand. Thus the glove is specifically designed for work in which only the fingers are used, and is clearly not suitable for protection when the entire hand, in particular the palm, is used during work, e.g. during a mechanics repair of an engine, carpentry, bricklaying etc. In addition, when the rib extends into the palm area, the glove liner is thicker in the palm area, which may reduce the users touch with the work he or she performs and/or the tools held in the hand carrying this glove.

Another example of a protective glove of a knitted base material is disclosed in KR20090011376U, in which a larger cuff, i.e. of increased length and thickness, is provided for extra protection in the wrist area. This protective glove has the same disadvantages as the above mentioned glove.

Object of the Invention

It is an object of the present invention to overcome the above mentioned disadvantages and provide an improved protective working glove, which provides protection and improved grip for the user, while also improving ergonomics for the wearer of the glove by reducing risk of the user being irritated at the skin around sinews/tendons in the wrist area during work, e.g. when flexing the wrist joint and/or when applying manual force during work.

In addition, it is an object of the present invention to eliminate or at least reduce the risk for cuffs of protective working gloves to be caught in machinery etc. during use resulting in potential injury of the user.

It is also an object of the present invention to provide a method for manufacturing such a protective working glove which adapts the shape of the cuff end of the glove according to the general shape of the hand at the wrist area.

In addition, it is an object of the present invention to provide a use of the protective glove providing protection and improved grip for the user, while also improving ergonomics for the wearer of the glove by reducing risk of the user being irritated at the skin around sinews/tendons in the wrist area during work, e.g. when flexing the wrist joint and/or when applying manual force during work.

Description of the Invention

These objects are achieved by providing a protective working glove (in the following also just mentioned as glove or working glove) comprising a knitted glove liner, the glove liner comprising fingers for each finger of a hand, and which glove liner is provided with a grip enhancing coating of a polymeric material covering at least the palm side of the hand and the palm side of the fingers of the glove liner. The glove according to the present invention has a cuff at the wrist end of the glove, which is elastic and is cut off at an area surrounding the carpal bones of the hand.

When the cuff, in particular an elastic cuff, is short (in relation to a prior art protective glove's cuff) and only extends to the area covering the carpal bones of the hand, an

improved ergonomics for the wearer of the protective glove is obtained by reducing risk of the user being irritated at the skin around sinews/tendons in the wrist area during work, e.g. when flexing the wrist joint and/or when applying manual force during work.

The protective working glove according to the invention is thus adapted to the ergonomics of the hand and stays on the hand during working situations. Thus the reduced size of the cuff of the protective working glove according to the invention does not reduce the ability to stay on the hand during work when compared to prior art protective working gloves.

In addition the protective working glove according to the invention does not extend on to the under arm of the user and does not cover the wrist area. The wrist area of the hands/arms is quite sensitive to influence of heat, and covering the wrist area with a polymer coated material may cause the wearer to sweat at the hands when performing physical work. Although the coated working gloves usually allow for some transport of humidity across the coating barrier, i.e. the coated working gloves are breathable, it is likely that the wearer may sweat under the gloves when performing physical work. By reducing the size of the cuffs of the protective working gloves to a minimum, the wearer still experiences a reduced tendency to sweat when wearing or during normal use of the gloves according to the invention because the wrist area of the arm is not covered by the protective working glove. This provides improved comfort for the wearer of the glove without compromising the protective properties of the protective working glove.

When mechanics or operators of mechanical machinery produces, operate or repair machinery during work, it is common practice using protective working gloves to provide improved grip and to protect the hands against wear from machines or from tools used to construct or repair the machinery. In addition, such protective gloves may give some protection against stabs and /or cuts and may provide water proofing and/or some resistance to chemical impacts from e.g. certain oils or lubricants, which the user may come into contact with during work.

The protective working gloves are manufactured by providing a substrate, preferably a glove liner knitted of yarn made of natural or synthetic fibres or a combination of natural or synthetic fibres. The glove liner is knitted into a shape corresponding to the hand, i.e. having fingers for each finger of the hand and a cuff for attaching the glove to the area surrounding the carpal bones of the hand.

Non-limiting examples of natural fibres are cotton or bamboo or mixtures thereof. Non-limiting examples of suitable synthetic fibres are e.g. made of polyolefins, such as polyethylene (PE) or polypropylene (PP), polyester, i.e. polyethylene terephthalate (PET), polyacrylics, i.e. polyacrylonitrile, polyamide (e.g. Nylon) or similar commonly used synthetic fibres used in garment industry, and especially fibres used for making protective gloves and mixtures thereof. In addition, mixtures of natural and synthetic fibres may be used. Preferably, the fibres comprise minor amounts of a material which provides elastic properties to the glove liner in order to provide a glove which adapts to the shape of the wearer's hands and provides a snug and secure fit. Examples of fibres providing elastic properties are e.g. lycra™ or spandex, i.e. a polyurethane-polyurea-copolymer, or similar elastic fibres commonly used as additional fibres for enhancing elasticity of fabrics, e.g. knitted fabrics.

The cuff of the glove, if any, is likewise preferably elastic as indicated above, because it assists in ensuring that the glove stays on the hand during normal working conditions.

The glove liner is provided with a polymeric coating on a part of the glove liner, especially on the palm side of the fingers and in palm area for enhancing the grip when the user wears the protective working glove. Preferably the dorsal side of the fingers on the glove liner are also covered by the polymeric coating. Optionally, the dorsal side of the hand of the glove liner is also covered partly or entirely by the polymeric coating. Such coatings are typically provided by mounting the glove on a hand shaped mould and dipping the knitted glove into a liquid polymeric composition. If necessary, the dipped glove is cured.

Examples of suitable polymeric coatings are e.g. natural latex, polyurethane (PU), polyvinyl chloride (PVC), nitrile butadiene rubber (nitrile rubber or NBR), neoprene

(polychloroprene) polyvinylacetate (PVA) or mixtures thereof, in particular mixtures of nitrile rubber and PU. In addition, two or more layers of different polymeric coatings may be applied on top of each other. As an example, an inner PU layer and an outer layer of nitrile rubber may provide a waterproof protective coating.

The polymeric material may be applied to the knitted glove as an aerated or foamed composition, which results in reduced or use or elimination of use of organic solvents thereby providing a more environmental friendly protective glove which also provides reduced health risk for the user of the glove because it does not contain residues of an organic solvent.

Especially preferred are rubbers, e.g. natural rubber, PVC- rubbers, PU-rubbers or nitrile rubbers, as they provide a significantly improved grip for the user wearing the gloves.

In addition, different resins and rubbers, e.g. nitrile rubber, provide some protection against water and/or certain chemicals, e.g. oils or lubricants.

The glove may comprise an additional grip enhancing layer applied as discrete geometrical figures, e.g. dots or more complex figures, e.g. wave shapes, in the palm area and the palm side of all fingers of the glove. Alternatively, a pattern may be stamped into the grip enhancing coating on the palm side of the glove for enhancing grip even further. Alternatively a pattern of discrete geometrical figures of increased thickness are applied on the dorsal side of the glove for protecting the dorsal side of the glove against mechanical impacts during working operations. The material for making the discrete figures may be e.g. PVC rubber or any other rubber mentioned above.

In one embodiment of the protective working glove according to the invention, the cuff is cut off at a curve extending into the palm side and/or the dorsal side of the glove. When the user of the glove flexes his wrist joint in the dorsal or in the palm direction the skin tends to fold or wrinkle in the wrist area.

When the cuff is cut off at a curve extending into the palm side and/or the dorsal side of the glove, this particular area over the area over the carpal bones of the dorsal

and/or palm side of the hand, i.e. the area of the wrist joint, is kept free from the cuff and/or glove material. The cuff cannot fold together with the skin or in separate folds, especially when the cuff is elastic and fits snugly over the wrist area. Thus, the skin is not subjected to pressure from folds in the gloves or the cuff, and the user does not experience any irritation of the skin in that area. In addition, the sinews or tendons, connected to muscles in the hand, i.e. in the hand itself or the fingers, or connected to the muscles in the under arm which are very close to the skin in this particular area, will not be subjected to pressure from the glove or from folds in the glove or the cuff.

A preferred embodiment of the glove, the wrist end of the glove is cut off at a curve extending into the palm side of the glove. The curve defining the cut in the cuff end of the glove may resemble a flat parabola which extends towards the palm between a point below the thumb muscles (thenar muscles) and another point below the little finger muscles (hypothenar muscles) because these muscles provide a natural "stop" for the cuff end of the protective working glove. The curve may resemble a substantially symmetric parabola, which is symmetric around a longitudinal axis of the glove. Alternatively the curve may be asymmetric around the longitudinal axis of the glove, i.e. one part of the curve may resemble one parabola, e.g. a flat parabola, and another part of the curve may resemble another more or less flat parabola. Substantially symmetric is defined as resembling the symmetry of the relevant curve mentioned above, and including also deviations from symmetry, which can be identified visually. The actual shape of the curve may vary with the different sizes of the gloves.

Alternatively the wrist end of the glove is cut off at a curve extending into the dorsal side of the glove in a manner as described above for the palm side.

The wrist end of the glove may be cut of in curve which is displaced towards the thumb side of the hand, e.g. on the dorsal side of the glove, which improves the freedom of movement and lessens irritations from the cuff end at the carpal area on the dorsal side of the hand.

Similarly, the wrist end of the glove may be cut of in curve which is displaced towards the little finger side of the hand, e.g. on the palm side of the glove, which ensures that

the glove protects the thenar muscles of the thumb and at the same time provides freedom of movement in the wrist joint.

The glove may comprise a wrist end which is cut off in a curve at both the palm side and the dorsal side as described above.

In yet another embodiment, the glove comprises a curve extending into the palm side and the dorsal side of the glove, which provides freedom of movement of the hands when flexing the hands in either direction.

In another embodiment of the protective working glove according to the invention, the cuff end extends at a curve towards the under arm on the palm side and/or the dorsal side of the glove.

Thereby the cuff end covers part of the wrist area, e.g. at the palm side or the dorsal side of the wrist. The curve defining the extension of the cuff end of the glove may resemble a flat parabola which extends towards the under arm between a point below the thumb muscles (thenar muscles) and another point below the little finger muscles (hypothenar muscles) because these muscles provide a natural "stop" for the cuff end of the protective working glove. The curve may be substantially symmetric around a longitudinal axis of the glove. Alternatively the curve may be asymmetric around the longitudinal axis of the glove. The palm side of the wrist is particularly sensitive to cuts, stabs etc. because the skin is thin in this area and because tendons, nerves and blood veins and arteries lie close to the skin in this area and thus if the cuff end extends in a curve at the palm side of the glove, some protection against injury in this area is provided. Similarly the dorsal side of the hand or both the dorsal and the palm side of the wrist end of the glove may extend in a curve in order to provide protection in the wrist region. The actual shape of the curve may vary with the different sizes of the gloves.

The glove may comprise a combination of an extension of the cuff end at one side of the glove, preferably the palm side of the glove, and a cut at the other side, preferably the dorsal side of the glove, which provides optimal protection of the wrist area while at the same time providing freedom of movement of the hand.

In another embodiment of the protective working glove according to the present invention the cuff is cut off at a substantially straight line substantially perpendicular to the longitudinal axis of the protective glove on the palm side and/or the dorsal side of the glove. This results in a simplified and faster production of the protective glove because the knitting process of the glove liner is simplified.

In a preferred embodiment the protective working glove optionally further comprises a rigid protective cuff attached to the glove at the area of the elastic cuff, in particular to the straight cut cuff described above. The rigid cuff is preferably similar to conventionally used rigid cuffs on working gloves and are e.g. made of a rigid bendable strip of polymeric material, e.g. of polyethylene, polypropylene, polyester, nylon or PVC or mixtures thereof. The bendable strip is preferably covered by a fabric, e.g. of the same material as the glove liner or another conventionally used material, e.g. cotton, bamboo or a fabric similar to the glove liner material. The bendable strip is e.g. applied when the elastic edging is applied to the wrist end of the glove, e.g. by sewing, or it is sewn onto the wrist end in a separate step. Preferably, the rigid cuff has a larger diameter at the distal end of the cuff in relation to the hand end of the cuff, which improves the freedom of movement of the hand.

It may be necessary to protect the wrist area when the user may risk cuts or stabs the wrist area during work, e.g. with hand tools or from the machinery which is assembled, operated or repaired. Thus the working glove with the protective rigid cuff provides a protective glove with efficient protection of the wrist area, without compromising the enhanced grip properties, the protective properties or the freedom of movement of the user's hand when wearing the protective glove during work.

The present invention also relates to a method for making the protective glove described above. The method comprises the steps of providing a knitted glove liner comprising fingers for each finger of a hand, and a cuff, preferably an elastic cuff at the wrist end of the glove, wherein the elastic cuff is cut off at an area surrounding the carpal bones of the hand, and coating the glove liner with a grip enhancing coating of a polymeric material covering at least the palm side of the hand and the palm side of the fingers of the glove liner.

This results in a grip enhancing protective working glove in which the user has freedom of movement and is less likely to irritations from the elastic cuff of a protective glove around the wrist area as indicated above.

The method further comprises that the elastic cuff is cut off at a curve extending into the palm side and/or the dorsal side of the glove as discussed above.

Alternatively, the method further comprises that the end of the elastic cuff extends at a curve towards the under arm on the palm side and/or the dorsal side of the glove as discussed above.

Similarly, the elastic cuff can be cut off at a substantially straight line substantially perpendicular to the longitudinal axis of the protective glove on the palm side and/or the dorsal side of the glove as discussed above.

In one embodiment of the method, the shape of the cuff end of the glove is created during knitting of the glove liner. This results in a slightly more complicated knitting process. However, since knitting of the glove liner is usually entirely automated and controlled by a control unit, this will not provide any additional costs once the programming for the knitting step is implemented. This reduces the subsequent processing steps of the glove liner, since the glove liner is automatically knitted into the desired shape.

In an alternative embodiment of the method, the shape of the cuff end of the glove is created by cutting the wrist end of coated glove liner into the desired shape and subsequently applying an elastic edging at the wrist end of the coated glove liner. The elastic edging is e.g. a separate cuff, which is applied at the wrist end of the coated glove liner.

Alternatively, the elastic edging is applied by sewing a seam at the wrist end of the coated glove liner using elastic sewing thread, e.g. by providing a seam by using a so called overlock sewing machine. Hereby the existing production of conventional grip

enhancing working gloves can be easily adapted to the present invention and the above mentioned reprogramming of the knitting machine is superfluous.

The seam discussed above may be applied in various colours, wherein each colour represents a visible code for the relevant size of the glove. The seam may also be applied to any other version of the glove discussed above in various colours as a code for indicating the size of the glove.

In a further embodiment, the method further comprises attaching a rigid protective cuff to the glove at the area of the cuff as described above.

Finally, the present invention relates to the use of protective working gloves or a protective working glove as described above or provided by the above mentioned method for protecting the hands against physical or mechanical impact, such as wear, cuts and/or stabs.

Description of the Drawing

The present invention will be described in detail with reference to the drawings in which

Fig. 1 shows a palm view or dorsal view of a first embodiment of the protective working glove in which the wrist end of the glove is cut in a substantial straight line,

Fig. 2 shows a palm view or dorsal view of another embodiment in which the wrist end of the glove is cut in a substantial straight line and a rigid cuff is applied to the wrist end of the protective working glove,

Fig. 3 shows a palm view or dorsal view of another embodiment in which the wrist end of the glove is cut off in a first version of a curved manner,

Fig. 4 shows a palm view or dorsal view of another embodiment in which the wrist end of the glove is cut off in another curved manner,

Fig. 5 shows a palm view or dorsal view of another embodiment in which the wrist end of the glove is cut off in yet another curved manner,

Fig. 6 shows a palm view or dorsal view of another embodiment in which the wrist end of the glove extends towards the wrist and under arm in a curved manner,

Fig. 7 shows the protective glove seen from the thumb side of an embodiment in which the wrist end of the glove is cut off in a curved manner on the dorsal side of the glove,

Fig. 8 shows the protective glove seen from the thumb side of an embodiment in which the wrist end of the glove is cut off in another curved manner on the dorsal side of the glove,

Fig. 9 shows an additional protective coating applied in a discrete pattern at the dorsal side of the glove, and

Fig. 10 shows an additional protective coating applied in a discrete pattern at the palm side of the glove.

Detailed Description of the Invention

Figs 1-8 disclose various embodiments of a protective working glove according to the invention. It is understood that the working gloves come in pairs and the gloves may be suited for applying to either the right or the left hand. Alternatively, the glove is designed to fit the right as well as the left hand.

Below and above the term "cut" is to be understood as the shape in which the cuff end of the glove is designed, unless it is clear from the text that an actual cutting step is described. Thus the glove need not to be cut into shape, but may also be knitted into the "cut" shape discussed.

Below and above the term "substantially symmetric" is defined as resembling the symmetry which of the mentioned curve including also deviations from symmetry, which can be identified visually.

The glove 1 comprises a knitted glove liner 13 (indicated as the grey area 13 at fig. 7-8), the glove liner comprising fingers, 3, 4, 5 for each finger of a hand. The glove liner is provided with a grip enhancing coating 12 of a polymeric material covering at least the palm side 15 of the hand and the palm side of the fingers of the glove liner 13. The cuff 7 at the wrist end of the glove is cut off at an area surrounding the carpal bones of the hand.

The grip enhancing protective working gloves 1 comprise a substrate, preferably a knitted glove liner indicated by the grey area 13 in figs. 7-8. The glove liner 13 is knitted into a shape corresponding to a human hand, i.e. having fingers 3, 4, 5 for each finger of the hand and comprising a cuff 7 for attaching the glove 1 to the area surrounding the carpal bones of the hand.

The glove liner 13 is preferably elastic in order to adapt to variations of the form of the human hand, e.g. length or thickness of fingers etc.

The cuff 7 of the glove 1, if any, is likewise preferably elastic as indicated above, because it assists in ensuring that the glove 1 stays on the hand during normal working conditions.

The glove liner is provided with a polymeric coating 12 as discussed above on at least a part of the glove liner 13, especially on the palm side of the fingers and in palm area for enhancing the grip when the user wears the protective working glove. The grip enhancing coating is indicated as the white area 12 on the gloves at fig. 7-8.

In its most simple form of the glove 1, see fig. 1, the cuff 7 is "cut" off at a substantially straight line from a point 7a below the thumb muscles 17 of the hand to a point 7b below the little finger muscles 18 of the hand, i.e. in a straight line which is approximately perpendicular to the longitudinal axis A-B of the protective glove 1. The straight "cut" of the cuff 7 may be applied on the palm side 15 and/or the dorsal side 16 of the glove.

In one embodiment, the glove 1 further comprises a rigid protective cuff 8 attached to the glove 1 at the area of the elastic cuff 7, see fig. 2. The rigid cuff 8 is applied to the straight cut cuff described above. The rigid cuff 8 is preferably similar to conventionally used rigid cuffs on working gloves and is e.g. made of a rigid bendable strip of polymeric material as indicated above. The rigid cuff 8 is preferably applied when an elastic edging 7 is applied to the wrist end B of the glove, e.g. by sewing, or the rigid cuff 8 is sewn onto the wrist end B of the glove 1 in a separate step. Preferably, the rigid cuff 8 has a larger diameter at the distal end 11 of the cuff in relation to the hand end 10 of the cuff 8.

Figs. 3-4 show a ghost line illustration of another embodiment of the glove 1 in which the cuff 7 is "cut" off at a curve 6a. The curve 6a extends into the palm side 15 and/or the dorsal side 16 of the glove 1. The wrist end B of the glove is "cut" off at a curve extending into the palm side 15 of the glove 1. The curve 6a defining the "cut" in the cuff end B of the glove may resemble an arc of a circle 6a as indicated in fig. 3 or parabola like curve 6b which extends towards the palm 15 between a point 7a below the thumb muscles (thenar muscles) and another point 7b below the little finger muscles (hypothenar muscles), because these muscles provide a natural "stop" for the cuff end of the protective working glove 1. The curve may resemble a substantially symmetric arc or parabola like curve as indicated in fig. 3 or fig. 4, which is symmetric around a longitudinal axis A-B of the glove. Alternatively, the curve 6a-6c, 6e may be asymmetric around the longitudinal axis A-B of the glove 1 as indicated in fig. 5, i.e. one part of the curve 6c may resemble one parabola curve, e.g. a flat parabola, and another part b of the curve 6c may resemble another more or less flat parabola.

Alternatively, the wrist end B of the glove is cut off at a curve 6a-6c, 6e extending into the dorsal side 16 of the glove 1 in a manner as described in the preceding paragraph for the palm side 15.

The wrist end B of the glove 1 may alternatively be cut off in a curve 6e, 6f which top point c of the curve is displaced towards the thumb side of the hand, e.g. on the dorsal side of the glove, which improves the freedom of movement and lessens irritations from the cuff end at the carpal area on the dorsal side of the hand.

Similarly, the wrist end of the glove may be cut off in a curve which is displaced towards the little finger side of the hand, e.g. on the palm side of the glove, which then ensures that the glove protects the thenar muscles of the thumb and at the same time provides freedom of movement in the wrist joint.

The glove may comprise a wrist end which is cut off in a curve at both the palm side and the dorsal side as described above.

The top point c of the arc or parabola like or the part of a circle arc of the curved cut 6a-6c, 6e-6f is e.g. displaced towards the finger end A of the glove 1 at e.g. up to 1-2 cm, preferably 0.5-1.5 cm in relation to the line connecting the points 7a and 7b, in particular at the palm side 15 of the glove. At the dorsal side 16 of the glove the curved cuts top point c may be displaced even further, e.g. up to 2-3 cm, preferably 0.5-2.5 cm or 0.5-1.5 cm.

In yet another embodiment, the glove comprises a curve 6a-6c, 6e-6f extending into the palm side 15 as well as the dorsal side 16 of the glove 1, which provides freedom of movement of the hands when flexing the hands in either direction.

In another embodiment of the protective working glove the cuff 7 end extends at a curve 6d towards the under arm on the palm side 15 and/or the dorsal side 16 of the glove 1 .

Thereby the cuff end B covers part of the wrist joint area, e.g. at the palm side 15 and/or the dorsal side 16 of the wrist joint. The curve 6d defining the extension of the cuff end B of the glove 1 may resemble an arc of a circle or a parabola like curve 6d which top point c extends towards the under arm between a point 7a below the thumb muscles (thenar muscles) and another point 7b below the little finger muscles (hypothenar muscles) because these muscles provide a natural “stop” for the cuff end of the glove 1. The curve 6d may be substantially symmetric around the top point c of the curve 6d. Alternatively, the curve 6d may be asymmetric around the longitudinal axis A-B of the glove, where a part of the curve 6d on one side of the top point resembles one parabola or arc shape, while the other part of the curve 6d on the other side of the top point c resembles another parabola like curve or arc or a circle. The palm side 15 of the wrist joint area is particular sensitive to cuts, stabs etc., because the skin is thin in this area and because tendons, nerves and blood veins and arteries lie close to the skin in this area, and thus if the cuff end extends in a curve at the palm side of the glove, some protection against injury in this area is provided. Similarly, the dorsal side of the hand or both the dorsal and the palm side of the wrist end of the glove may extend in a curve in order to provide protection in the wrist region.

The glove may comprise a combination of an extension of the cuff end at one side of the glove, preferably the palm side of the glove, and a cut at the other side, preferably the dorsal side of the glove, which provides optimal protection of the wrist area while at the same time providing freedom of movement of the hand.

The present invention also relates to a method for making the protective glove described above. The method comprises the steps of providing a knitted glove liner comprising fingers for each finger of a hand, and a cuff, preferably an elastic cuff, at the wrist end of the glove, which is cut off at an area surrounding the carpal bones of the hand, and coating the glove liner with a grip enhancing coating of a polymeric material covering at least the palm side of the hand and the palm side of the fingers of the glove liner.

In one embodiment of the method, the shape of the cuff end B of the glove is created during knitting of the glove liner. Knitting of the glove liner is usually entirely automated and controlled by a control unit, normally by knitting the glove in a circular manner from cuff end to finger end. When a cut out 6a-6c, 6e-6f in the cuff end of the glove is desired, e.g as shown in figs. 3-5, 7-10, it may be obtained by programming the control unit to perform additional rows knitted back and forward in the area surrounding the thenar muscles 17 on the palm side 15 and dorsal side 16 of the hand and in the area surrounding the hypothenar muscles 18, i.e. around point 7a at the palm side and the dorsal side of the hand at the little finger side, i.e. around the point 7b.

This results in a downward extending curve in this area, thus creating the cut around the point c in the cuff end of the glove 1.

In an alternative embodiment of the method, the shape of the cuff end B of the glove 1 is created by cutting the wrist end B of a coated glove liner 1 into the desired shape, i.e. cutting the parabola/part of a circle arc 6a-6c, 6e-6f into shape and subsequently applying an elastic edging 7 at the wrist end of the coated glove liner. The elastic edging 7 is e.g. a separate cuff, which is applied at the wrist end of the coated glove liner 1. Alternatively, the elastic edging is applied by sewing a seam at the wrist end of the coated glove liner using elastic sewing thread. The seam at the edge of the wrist end of the glove is provided by using elastic threads, e.g. by providing an end seam using

a so called overlock sewing machine. Similarly, the downward extending area 6d of the glove can be provided by controlling the knitting machine to provide extra rows in the area of the downward extending area 6d or by cutting off the surrounding area of the coated glove 1.

When a coated glove 1 is subsequently cut into the desired shape, the existing production of conventional grip enhancing working gloves can be easily adapted to the present invention and the above mentioned reprogramming of the knitting machine is superfluous.

The grip enhancing protective working gloves 1 are manufactured by providing a substrate, preferably a knitted glove liner indicated by the grey area 13 in figs. 7-8. The glove liner 13 is knitted into a shape corresponding to a human hand, i.e. having fingers 3, 4, 5 for each finger of the hand and a cuff 7 for attaching the glove to the area surrounding the carpal bones of the hand.

The glove liner is provided with a polymeric coating 12 as discussed above on at least a part of the glove liner 13, especially on the palm side of the fingers and in palm area for enhancing the grip when the user wears the protective working glove. The grip enhancing coating is indicated as the white area 12 on the gloves at fig. 7-8. Preferably, at least the outer end of the dorsal side 16 of the fingers on the glove liner is also covered by the polymeric coating 12. Optionally, the dorsal side 16 of the hand of the glove liner is also covered partly or entirely by the polymeric coating 12.

Such coatings are typically provided by mounting the glove on a hand shaped mould and dipping the knitted glove into a liquid polymeric composition. If necessary, the dipped glove is cured.

The glove may comprise an additional grip enhancing layer 14 applied as discrete geometrical figures, e.g. dots squares, rectangles or other polygonal figures or alternatively more complex figures, e.g. wave shapes 14 (see fig. 7-8 and 10), in the palm area 15 and the palm side of all fingers of the glove 1. Alternatively, a pattern (not shown) may be stamped into the grip enhancing coating 12 on the palm side 15 of the glove for enhancing grip even further. Alternatively, a pattern of discrete geometrical

figures of increased thickness 19, fig. 9, are applied on the dorsal side 16 of the glove 1 for protecting the dorsal side of the hand against mechanical impacts during working operations.

The seam discussed above, may be applied in various colours, wherein each colour represents a visible code for the relevant size of the glove. The seam may also be applied to any other version of the glove discussed above in various colours as a code for indicating the size of the glove.

In a further embodiment, the method further comprises attaching a rigid protective cuff to the glove at the area of the cuff as described above.

As discussed above, the protective working gloves are used for protecting the hands against physical or mechanical impact, such as wear, cuts and/or stabs, from machines, tools and/or items, and to some extent protection from water, oils or lubricants and/or certain chemicals, e.g. detergents.

CLAIMS

1. A protective working glove comprising a knitted glove liner, the glove liner comprising fingers for each finger of a hand, and which glove liner is provided with a grip enhancing coating of a polymeric material covering at least the palm side of the hand and the palm side of the fingers of the glove liner, **wherein** an elastic cuff at the wrist end of the glove is being cut off at an area surrounding the carpal bones of the hand.

2. A protective working glove according to claim 1, **wherein** the elastic cuff is cut off at a curve extending into the palm side and/or the dorsal side of the glove.

3. A protective working glove according to claim 1 or 2, **wherein** the end of the elastic cuff extends at a curve towards the under arm on the palm side and/or the dorsal side of the glove.

4. A protective working glove according to any of the claims 1-3, **wherein** the elastic cuff is cut off at a substantially straight line substantially perpendicular to the longitudinal axis of the protective glove on the palm side and/or the dorsal side of the glove.

5. A protective working glove according to claim 1, **wherein** the protective glove further comprises a protective cuff attached to the glove at the area of the elastic cuff.

6. A method for making a protective working glove comprising the steps of providing a knitted glove liner comprising fingers for each finger of a hand, and a cuff at the wrist end of the glove, which elastic cuff is cut off at an area surrounding the carpal bones of the hand, and coating the glove liner with a grip enhancing coating of a polymeric material covering at least the palm side of the hand and the palm side of the fingers of the glove liner.

7. A method according to claim 6, **wherein** the shape of the elastic cuff end of the glove is created during knitting of the glove liner.

8. A method according to claim 6, **wherein** the shape of the elastic cuff end of the glove is created by cutting the wrist end of the elastic cuff of a coated glove liner into the desired shape.

9. A method according to any of the claims 6-8, **wherein** the method further comprises applying an elastic edging at the wrist end of the cuff of a coated glove liner.

10. A method according to any of the claims 6-9, **wherein** the elastic cuff is cut off at a curve extending into the palm side and/or the dorsal side of the glove.

11. A method according to any of the claims 6-9, **wherein** the end of the elastic cuff extends at a curve towards the under arm on the palm side and/or the dorsal side of the glove.

12. A method according to any of the claims 6-9, **wherein** the elastic cuff is cut off at a substantially straight line substantially perpendicular to the longitudinal axis of the protective glove on the palm side and/or the dorsal side of the glove.

13. A method according to any of the claims 6-12, further comprising attaching a protective cuff to the glove at the area of the elastic cuff.

14. Use of protective working gloves according to any of claims 1-2 or a protective working glove provided by the method of any of the claims 3-5 for protecting the hands against physical or mechanical impact, such as wear, cuts and/or stabs and to some extent protection from certain chemicals, water, oils or lubricants and/or detergents.

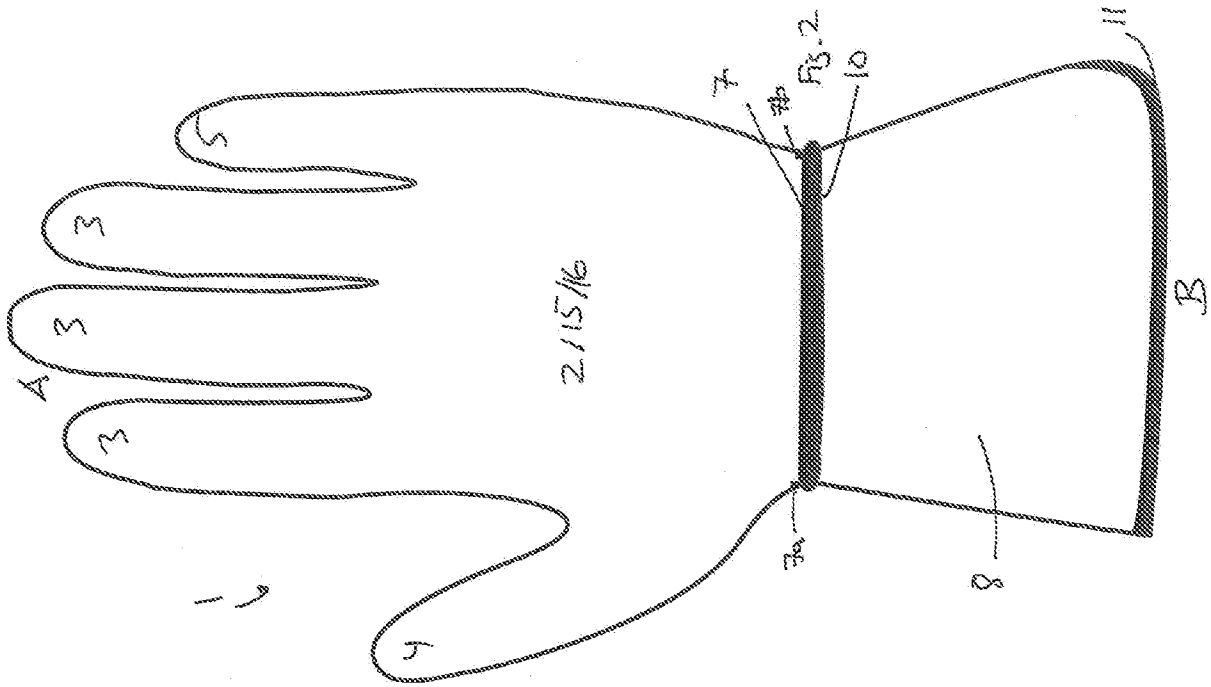


Fig. 2
A
B
2/15/16
3
4
5
7
8
10
11

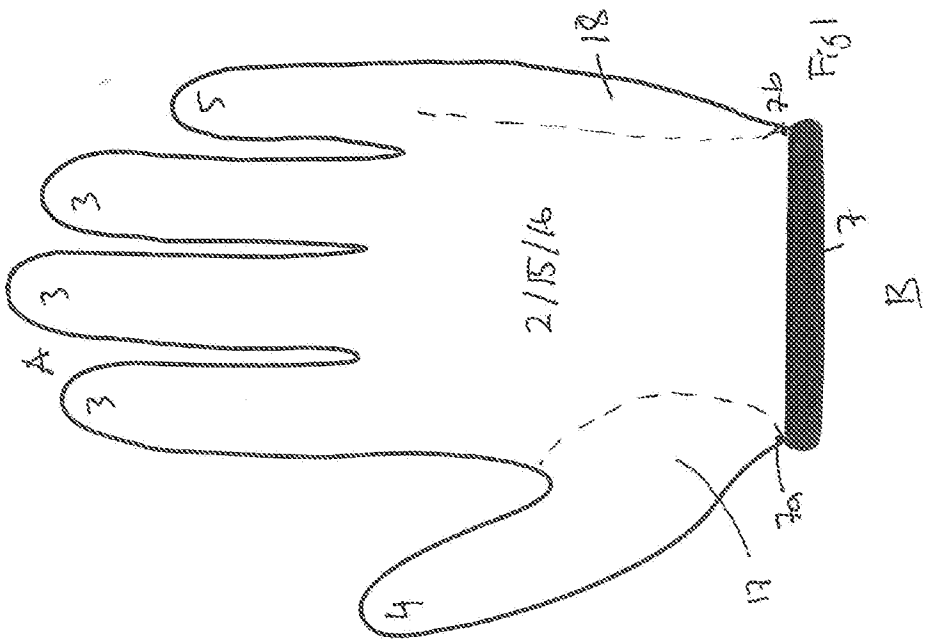


Fig 1
A
B
2/15/16
3
4
5
17
18

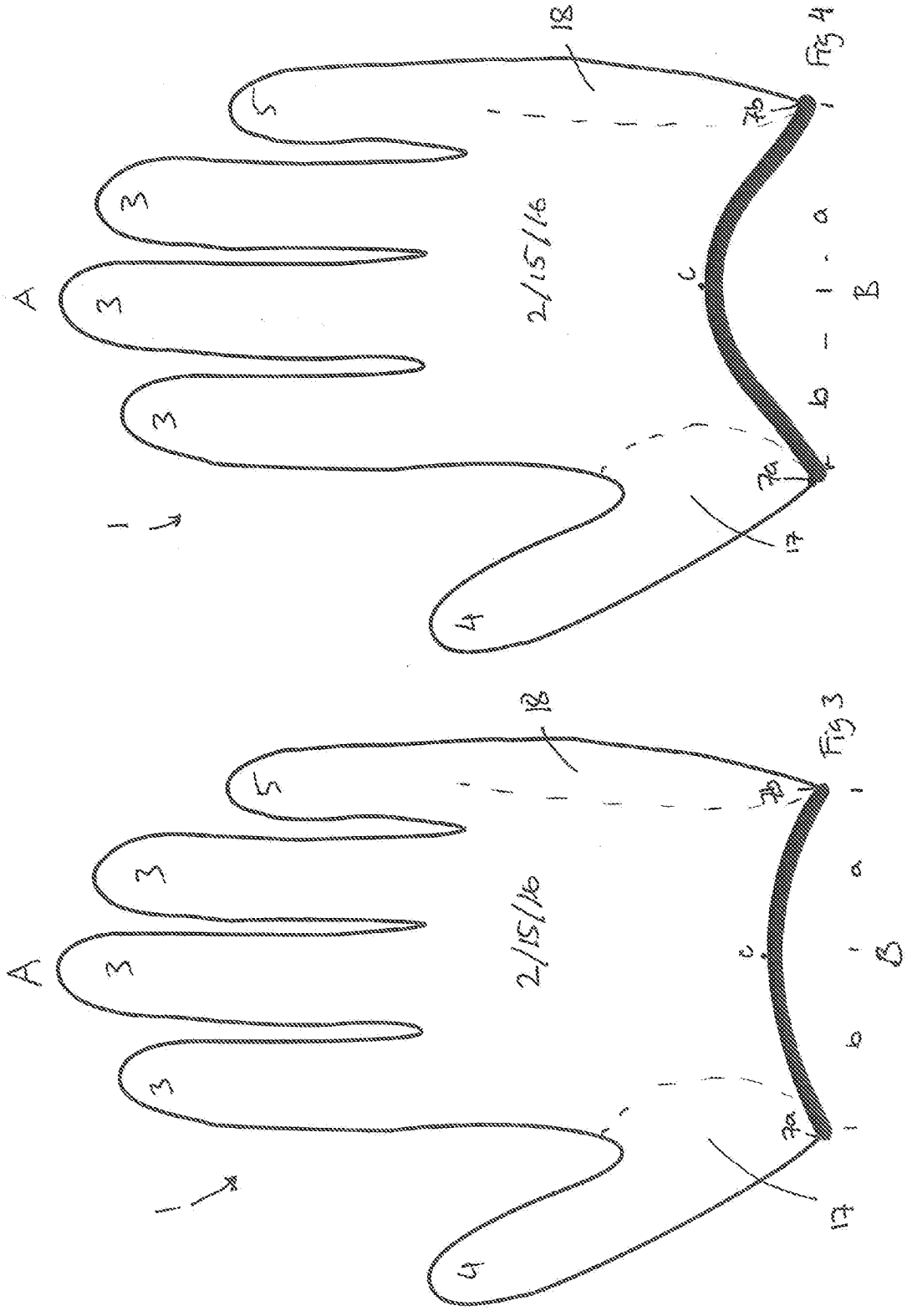


Fig 4
18
2/1S/16
A
B
Fig 3
12
2/1S/16
A
B

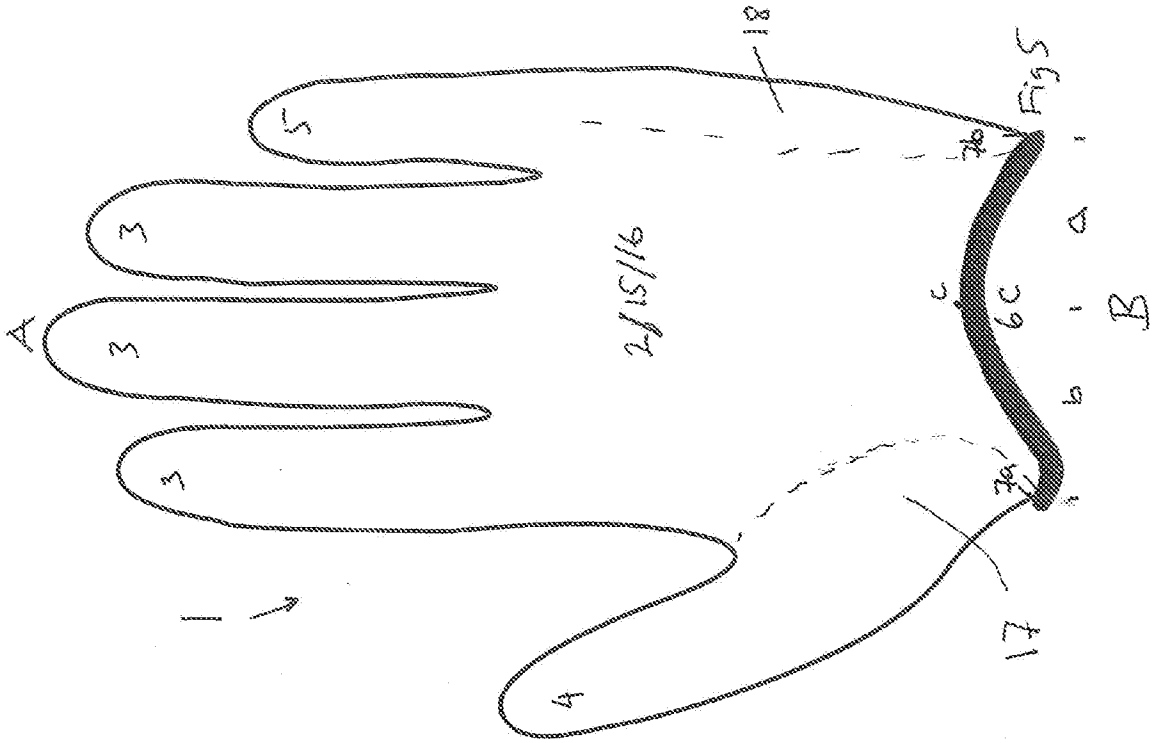


Fig 5
18
A
3
3
3
2/1 5/1 6
5
4
1
17
B
a
b
c
6c
7a
7b

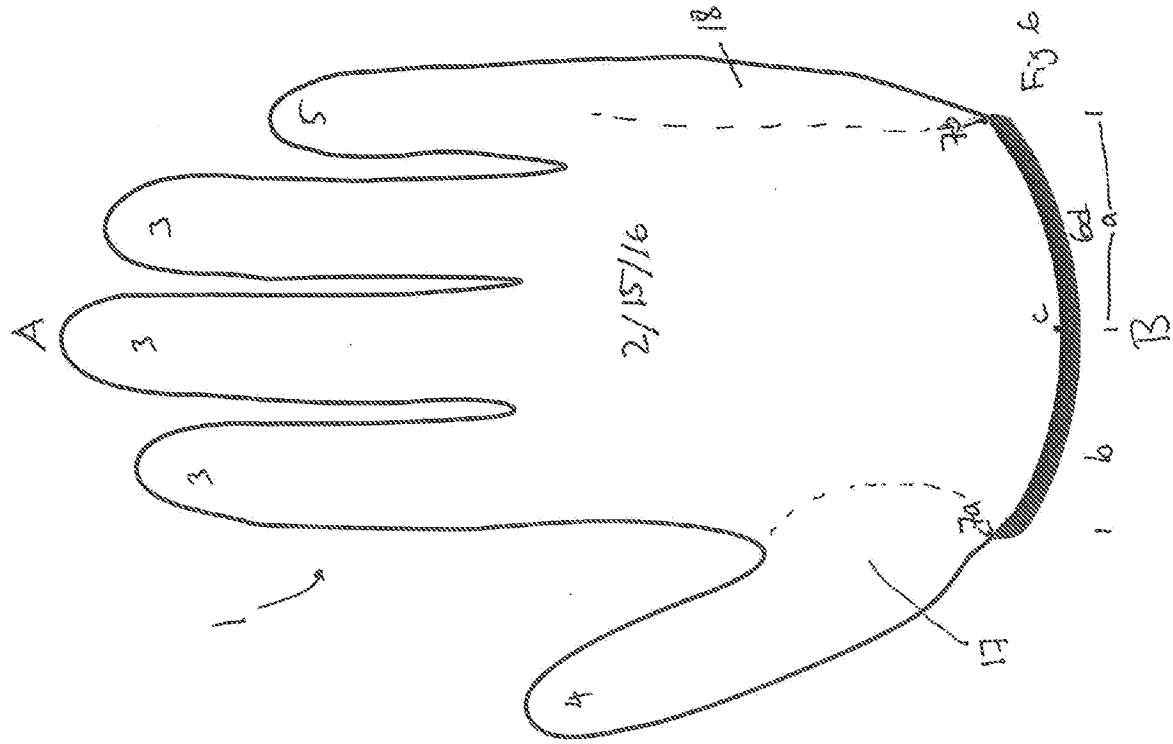


Fig 6
18
A
3
3
3
2/1 5/1 6
5
4
1
17
B
a
b
c
6d
7a
7b

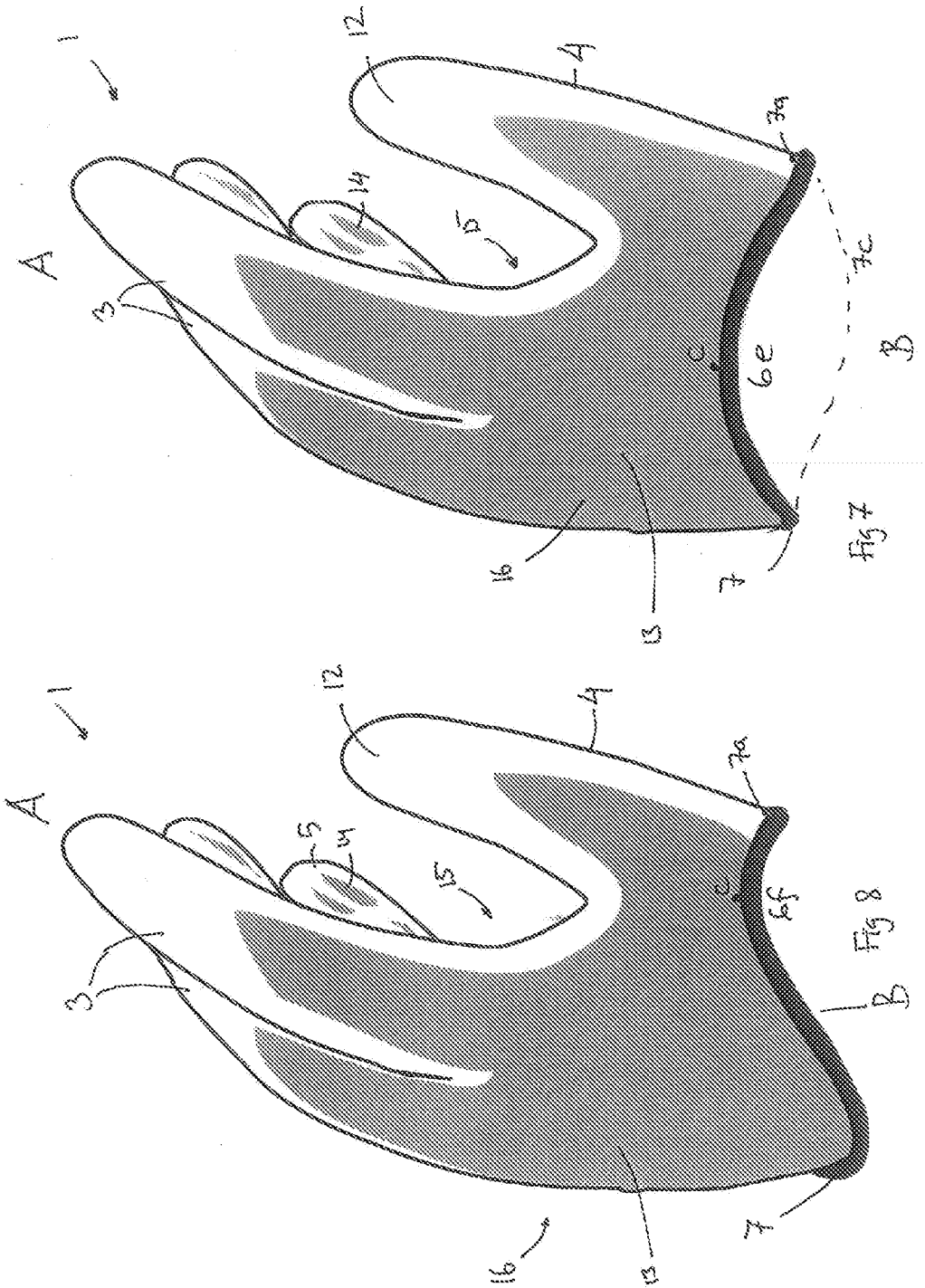


Fig 7

Fig 8

Fig.10

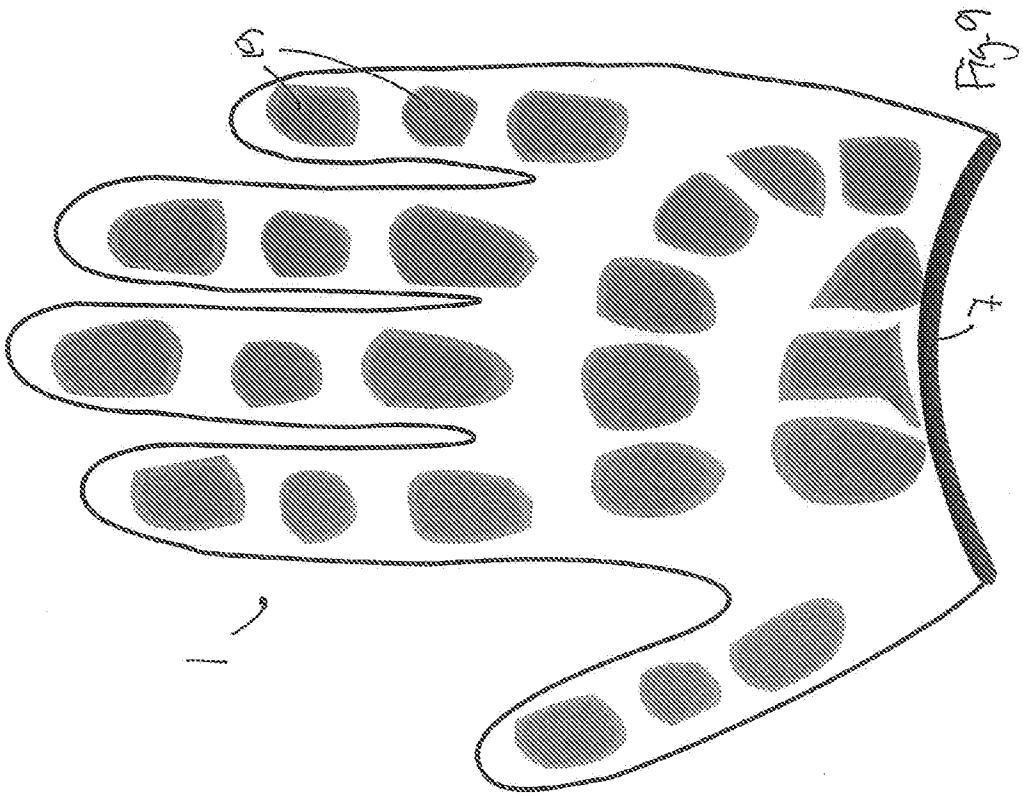


Fig.9

INTERNATIONAL SEARCH REPORT

International application No
PCT/DK2014/050318

A. CLASSIFICATION OF SUBJECT MATTER
INV. A41D19/00
ADD.

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)
A41D

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2009/055992 A1 (THOMPSON ERIC [US] ET AL) 5 March 2009 (2009-03-05) paragraphs [0023], [0027]; figure 1	1-14
Y	JP 2000 290813 A (ASAI MASATO) 17 October 2000 (2000-10-17) cited in the application abstract; figure 3	1-14
A	US 2009/211305 A1 (THOMPSON ERIC [US] ET AL) 27 August 2009 (2009-08-27) paragraph [0036]	1,6,14
A	US 4 519 097 A (CHAPPELL JR JOHNNY L [US] ET AL) 28 May 1985 (1985-05-28) column 1, lines 40-42; figure 1	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 December 2014	23/12/2014

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/DK2014/050318

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