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(54) **PIERCEPROOF CLOTHING MATERIAL AND OBJECTS SUCH AS WORK GLOVES AND VESTS MADE ENTIRELY OR PARTLY OF SUCH MATERIAL.**

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Description

The present invention relates to a material for personal clothing which is suitable for resisting piercing by hypodermic needle points and other pointed or sharp objects, and to clothing objects such as gloves and vests made of or provided with such a material. For sanitation workers and many other people who are exposed to manual contact with various types of waste, it is increasingly a serious problem that the waste may contain hypodermic needles which may transfer infection when by accident they pierce the hand, and it is evident that at least protection gloves should be used for lowering the risk.

It has been observed, however, that conventional work gloves do not provide any particularly high degree of protection against piercing by hypodermic needles when a certain amount of pressure occurs between the hand and the needle point which may very well occur already by a somewhat firm gripping of the waste. It has been observed that a substantially improved protection effect may be obtained when the gloves are made in a very heavy ox hide material, the basic problem here of course being that the use of such a heavy glove material makes the glove so unbendable that it becomes very unsuitable as a work glove.

Also in another area there is a need for a pierceproof clothing material, viz. for protection vests for police. There is a tendency for the police force needing stab proof rather than bulletproof clothing, and bulletproof vests give no pierce protection whatsoever. Certain mail materials are already known which protect against piercing by knives, but for one thing these materials will be far too heavy in a really efficient embodiment, and for another thing they offer no protection against piercing by hypodermic needles.

From US-A-3,916,448, it is known to build up a protective glove from several specialized layers, including leather and a metal wire mesh material having a high strength and a high resistance to cutting and tearing. However, the mesh material is proposed to be a knitted stainless steel wire material which in no way will be able to resist penetration of hypodermic needles or pointed stabbing knives, also not when combined with the leather layer.

The present invention as claimed in claim 1 should be seen on this background.

It is the purpose of the invention to provide a protection material which is usable for an efficient protection against piercing, even by hypodermic needles, and which furthermore is reasonably suitable for clothing purposes.

The invention is based on the finding that for a completely different purpose there has been devel-

oped a thin layer material consisting of a very dense metal wire net which is intended for use as filter material, the net being semi-inertly air permeable, and that this net in spite of its pronounced thinness of about 0.2 mm has a very great resistance to piercing by hypodermic needles. Because of its thinness the material is easily bendable or at least sufficiently bendable for forming part of a work glove or a vest without making this so heavy or stiff that it is unusable in practice.

It has been found that it is possible to insert this material in the material portions which are sewn together to form work gloves, preferably thin leather or split, the metal web may being usable as an intermediate layer between an outer material layer which has a protecting and friction-generating surface, while the metal web material has a low degree of surface friction, and an inner covering layer of an appropriate, desirable softness which is of course absent in the metal web.

The metal web is bendable, but it is not the least stretchable, and for this reason a glove provided at both its outer and inner side with the metal net would be very rigid, which is definitely not suitable for such a glove. However, it is realized in connection with the invention that the special barrier layer need only be provided at the inner side of the glove, as there is normally no strong pressure action against the outer side of the glove, and thereby the outer side may well consist of a conventional protecting, but so reasonably stretchable material that in spite of the presence of the bendable and unstretchable metal web layer at its inner side, the glove as a whole is easily bendable and thereby usable in practice.

As to the finger portions of the glove, it is not sufficient to deal with only an inner and an outer side, as the side portions of the finger portions come into consideration by being in the danger zone with regards to piercing risk. On this background it has been found essential to provide the finger portions in such a manner that their inner and side surfaces are constituted by the metal web reinforced glove material, whereas only the outer sides of the finger portions consist of a conventional, fairly stretchable material. Immediately the occurrence of the bendable, but otherwise shape stable metal web does not further a good bendability, but it is seen that the fingers are easily bendable anyway, because the edgeways placed metal web is easily foldable for allowing such a bending.

Optionally the upper side of the outer fingertips may come into the said danger zone, and the glove may very well have these portions covered with reinforced layer portions which will not in general reduce the bendability of the glove.

Used in clothing objects the thin net material will be highly pierceproof, and moreover be advantageous by its easy bendability and almost negligible weight. It is certain that part of the explanation of the pierceproof effect is the total un-
 5 stretchability of the material, and of course this characteristic is not too appropriate in connection with different types of clothing objects; however, as the material is very light and very smooth there are good possibilities of placing it in partially overlap-
 10 ping areas in such a manner that the layers may slide on each other in the space between the adjacent outer cover layers, whereby it is possible anyway to make clothing objects which provide a good degree of freedom of movement.

Also in connection with clothing objects it is important that the outside of the metal web be provided with a leather-like material, but it will be possible to effect a differentiation of the material choice, here also the choice of metal web quality,
 20 for optimizing the clothing object as a whole. Different areas of the body may need different degrees of protection, and the clothing object may be designed in a differentiated manner taking into consideration both these needs, e.g. by area-wise insertion of several layers of the material, and other requirements as to the bendability and softness of the single areas. The leather may be used with different degrees of thickness and be tanned more or less soft as needed.

Even a hand-held pin will hardly be able to pierce the metal web when applied with normal manual force, and it is a fact that a hypodermic needle point is not a "point" but a cutting edge of a certain width, such that this point actually has to
 35 cut several of the fine, hard metal wires, which demands considerable force. It is a remarkable fact that the necessary piercing force has to be even considerably greater when the hypodermic needle first has to pierce through an outer covering layer of leather or suede which it is normally relatively easy for the needle pierce; it is possible that the piercing of the leather layer is made difficult by the presence of the supporting metal web layer, and that hereby some leather fibres may be present in
 40 front of the hypodermic needle point, which fibres may have a blunting effect on the sharpness of the needle edge pressed towards the metal web. At any rate the result is that it takes far more than an ordinary accident for making e.g. a glove user experience that a loose hypodermic needle pierces the reinforced glove area.

For knife stab protection may be chosen a slightly heavier metal web as there should here be anticipated a higher and even blow-like piercing
 55 pressure.

The said metal web material for filter use occurs in practice with the designation "micro filter

web". What is concerned here is a stainless wire net with warp threads of about 0.04 mm placed with a mutual distance of a few millimeters and with extremely closely placed weft threads of about
 5 0.03 mm, indicated by the expression 0.04/0.03. It is believed that qualities in the scope 0.025/0.02 - 0.07/0.05 will satisfy most requirements in the present connection. It can be referred that the corresponding scope of variation for the absolute filter fineness is 6-25 micron and for the nominal filter fineness it is 1-15 micron, but it should be considered that this is not representative of a permeability as relevant here. The material can only be penetrated by light to a very low degree.

However, the invention is not limited to the use of exactly this material. The need for "hypodermic needle proof" and stab proof clothing, respectively, is so great that there may be grounds for a production of materials which are optimized directly to various purposes of use, where it is not necessarily
 20 decisive that the threads be placed so extremely close to each other that not even the tip of a pin may get a 'foothold' in the web meshes. With regards to hypodermic needles it is just very important to ensure that the threads be difficult to cut, though they should still be placed very closely together in order not to allow the needle to pass by simple expansion of the mesh. By using even only slightly thicker threads or threads of a harder material it is probable that the cut-resistance of the threads can be increased noticeably without the flexibility of the material being reduced so as to be unusable. It is worth noticing that already in the said existing material a forced piercing by a hypodermic needle entails that the cutting needle tip is bent out of shape, bending over backwards and thus no longer being directly cutting; however, it is not clear in which phase of the piercing this takes place, but if it can happen before an initial cutting
 35 into the metal wire, the protection will also better resist to simple tearing caused by impression of the hypodermic needle.

It is to be emphasized, however, that the protection effect is increased considerably when the web is covered by a layer of leather or suede. It is conceivable that the leather layer may be replaced by another material, which should be correspondingly tough and fibrous, e.g. closely-woven canvas. For many purposes the said metal web material should not be so extremely pierceproof that it does not even allow piercing by a sewing machine needle applied with force as, at least in connection with gloves, it is desirable that the material can be cut in the same manner as the outer and inner side layers and be joined with these for welt sewing of the glove in an otherwise conventional manner. The sewing machine needle will stick its way through the net material with a strong lateral displacement

of the mesh threads, and therefore it will not be deformed by the piercing as would an hypodermic needle point.

The metal web insert, as mentioned, may well be present in seam areas of the glove, where it perfectly well can be penetrated by a really pointed sewing machine needle.

Claims

1. A personal clothing material of a pierceproof type, containing a bendable reinforcement layer of a metal wire material placed in one or more layers and covered by an outer shell-material of leather or suede or a correspondingly tough, fibrous material, characterized in that the reinforcement layer is a non-stretchable metal wire mesh of the type "micro filter web", i.e. a web having closely juxtaposed warp and weft threads of a thickness within the range of 0.02/0.02 - 0.1/0.08 mm, preferably within the range of 0.025/0.02 - 0.07/0.05 mm.
2. A clothing object made of or containing the material according to claim 1, the material being provided everywhere on the object or only in one or more partial areas thereof.
3. A clothing object according to claim 2, characterized in that it is embodied as a pierceproof work glove protecting from piercing by hypodermic needles, preferably provided with the metal web insert at both side surfaces of the glove fingers and optionally on the outer side of the outer finger joint area.
4. A clothing object according to claim 2, characterized in that the metal web insert is used in seam areas.
5. A clothing object according to claim 2, characterized in that in the shape of a pierce and stab-proof vest or similar clothing objects it is made with differentiated use of different metal web and cover layer qualities and/or with areas having different numbers of layers of the metal web.

Patentansprüche

1. Ein gegen Durchstechen widerstandsfähiges Personen-Bekleidungsmaterial, umfassend eine biegbare Verstärkungsschicht aus einem Metalldrahtmaterial, das in einer oder mehreren Schichten angeordnet und von einem äußeren Hüllmaterial aus Leder oder Wildleder oder einem entsprechend zähen, fibrösen Material bedeckt ist, dadurch gekennzeichnet, daß die

Verstärkungsschicht ein nicht dehnbares Metalldrahtnetz der Art "Mikrofiltergewebe", d.h. ein Gewebe mit eng nebeneinanderliegenden Kett- und Schußfäden einer Stärke innerhalb des Bereiches von 0.02/0.02 bis 0.1/0.08 mm, vorzugsweise innerhalb des Bereiches von 0.025/0.02 bis 0.07/0.05 mm, ist.

2. Ein Bekleidungsgegenstand, hergestellt aus dem oder enthaltend das Material nach Anspruch 1, wobei das Material allenthalben auf dem Gegenstand oder nur in einem oder mehreren Teilbereichen desselben vorgesehen ist.
3. Ein Bekleidungsgegenstand nach Anspruch 2, dadurch gekennzeichnet, daß er als gegen Durchstechen beständiger Arbeitshandschuh verkörpert ist, der gegen das Durchdringen hypodermischer Nadeln schützt, wobei er bevorzugt mit der Metallgewebeeinlage an beiden Seitenflächen der Handschuhfinger und vorzugsweise an der Außenseite der äußeren Fingerverbindung versehen ist.
4. Ein Bekleidungsgegenstand nach Anspruch 2, dadurch gekennzeichnet, daß die Metallgewebeeinlage in den Nahtbereichen verwendet ist.
5. Ein Bekleidungsgegenstand nach Anspruch 2, dadurch gekennzeichnet, daß er in Form einer durchdringungs- und stichfesten Weste oder ähnlicher Bekleidungsgegenstände unter differenzierter Verwendung verschiedener Metallgewebe- und Deckschichtqualitäten und/oder mit Bereichen unterschiedlicher Anzahl Schichten des Metallgewebes hergestellt ist.

Revendications

1. Matière pour vêtement personnel du type résistant au perçage, contenant une couche de renforcement déformable d'une matière en fil métallique placée en une ou plusieurs couches et recouverte par une matière externe en cuir ou en daim, ou une matière fibreuse, solide de façon correspondante, caractérisée en ce que la couche de renforcement est une toile métallique non étirable du type "tissu micro filtre", c'est-à-dire un tissu ayant des fils de chaîne et de trame étroitement juxtaposés, d'une épaisseur dans la plage de 0,02/0,02 - 0,1/0,08 mm, de préférence dans la plage de 0,025/0,02 - 0,07/0,05 mm.
2. Vêtement réalisé ou contenant la matière selon la revendication 1, la matière étant prévue partout sur le vêtement ou seulement sur une ou plusieurs zones partielles de celui-ci.

3. Vêtement selon la revendication 2, caractérisé en ce qu'il est réalisé en tant que gant de travail résistant au perçage, protégeant du perçage par des aiguilles hypodermiques, de préférence muni de l'insert en toile métallique sur les deux surfaces latérales des doigts du gant et, éventuellement, sur la face externe de la zone externe de jonction des doigts. 5
4. Vêtement selon la revendication 2, caractérisé en ce que l'insert en toile métallique est utilisé dans des zones de couture. 10
5. Vêtement selon la revendication 2, caractérisé en ce que, sous la forme d'une veste résistant au perçage et au piquage ou vêtements similaires, il est réalisé avec un usage différencié de qualités de toile métallique et de couche de recouvrement différentes et/ou avec des zones ayant des nombres différents de couches de toile métallique. 15
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