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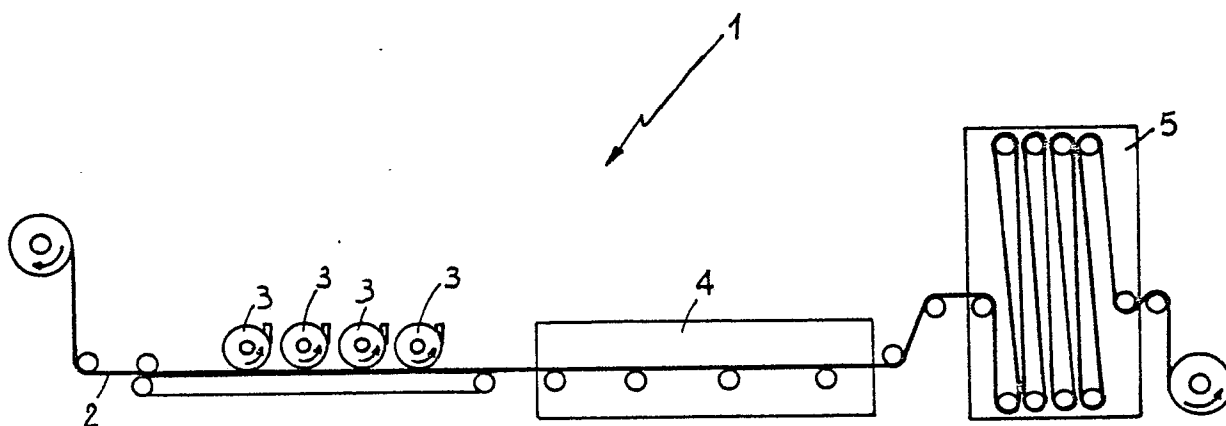
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54 **Camouflage covering and process for its manufacture.**

57 A camouflage covering constituted by a supporting sheet (2) of flexible material on which a coloured camouflage layer is applied; all colours of said layer are constituted by an aqueous dispersion of polymers in combination with conventional additives and adjuvants. A process for applying the camouflage layer on the supporting sheet.

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CAMOUFLAGE COVERING AND PROCESS FOR ITS MANUFACTURE

The present invention concerns a camouflage covering of the type comprising a supporting sheet on which at least a coloured camouflage layer is applied, and the process for obtaining said camouflage covering.

As known, in order to make difficult the visual identification and/or the photographic reproduction of vehicles, armour, arms or the like, usually appropriate camouflage coverings in the form of sheets or nets are used, said coverings being suitable for covering the surface of the objects to be camouflaged.

These camouflage coverings are mainly constituted by a supporting sheet of flexible material, such as textile or plastic material on which at least a camouflage layer of various colours is applied, for instance through a silk-screen process.

The camouflage layer has the purpose of giving a visual appearance to the supporting sheet which is as like as possible to that of the ambient where there are the objects to be camouflaged.

From the above it is evident that the camouflage coverings must necessarily have, as essential characteristics, a high flexibility to easily conform to the shape of the objects to be covered, as well as, for obvious reasons, a good tear resistance. Moreover, the camouflage coverings must be formed in such a way as to preserve unchanged in time their characteristics of mechanical resistance and their chromatic aspect. Moreover it is to be noted that the camouflage coverings, when not utilized, are often folded and put, for instance, inside the vehicles whereon use is to be made.

Therefore, they have to maintain unchanged their physical and chromatic characteristics also in conditions of high temperature and in the presence of various chemical agents, as for example those present in oils, gasoline, petroleum naphtha and petroliferous products in general.

At present, the material mostly used for obtaining camouflage coverings is polyvinylchloride (PVC).

The use of PVC is often foreseen to obtain both the supporting sheet and the camouflage layer applied thereon. In other cases, where the supporting sheet is made of textile material or other plastic materials, the PVC is only used for the camouflage layer.

It is well-known that PVC is a quite rigid material. It follows that to give the required flexibility to the camouflage covering, it is necessary that plasticisers are added to PVC, in a quantity that in some cases can reach 100-200 parts by weight for 100 parts by weight of PVC.

The addition of plasticizers is made necessary to give a sufficient viscosity to PVC which is applied on the supporting layer through a silk-screen process, in the form of a camouflage layer.

Always in order to provide PVC with an adequate viscosity to make the silk-screen process easy, it is necessary to add proper solvents.

It has been found that the use of the above said plasticizers and solvents originates different drawbacks.

As regards the plasticizers, it is noted that with the passing of time and above all in conditions of quite high room temperature, they tend to "exude" from the camouflage covering.

As a consequence, the flexibility and mechanical resistance characteristics of the camouflage covering, as well as its chromatic aspect, are considerably altered.

Moreover, since these plasticizers are in general constituted by oils or anyhow by easily inflammable substances, their use requires the installation of expensive plants in the places where the camouflage coverings are manufactured, for removing the vapors or avoiding fire risks.

On their turn, the solvents originate drawbacks in the product processing.

More particularly, when low-boiling solvents are utilized, it is easy to run into the formation of films that obstruct the holes of the silk-screen cylinders used for applying the camouflage layer on the supporting sheet.

As a consequence, the designs reproduced on the supporting sheet will be altered and irregular and in any case not corresponding to what required. It has been tried to obviate said drawback by using high-boiling solvents, as for example toluene.

These types of solvents must be used with a high concentration and this produces serious health safety problems in the work ambient.

The camouflage coverings made according to the known technique involve also different problems when they have to be purified.

The purifying processes usually utilized make use of caustic soda, combined with solvents as methylcellosolve or diethylenetriamine that easily attacks PVC, altering consequently the technical-functional characteristics of the camouflage coverings.

The main object of the present invention is that of overcoming the above said drawbacks and consequently of obtaining a camouflage covering which has a high flexibility and a high mechanical

resistance without making recourse to the use of plasticizers and solvents so as to maintain unchanged in time its technical-functional characteristics and does not alter in consequence of purifying processes carried out with caustic soda or the like.

The basic inventive concept is that of obtaining a camouflage layer by making use of an aqueous dispersion of polymers in place of PVC used in the known technique.

The aqueous dispersions of polymers are per se known but their use in preparing the camouflage coverings, with all the deriving procedure alternatives, is novel and has never been suggested or described previously in relation to the drawbacks that it is desired to overcome.

Therefore the aims of the present invention are achieved by means of a camouflage covering of the type comprising a supporting sheet on which at least a coloured camouflage layer is applied, characterized by the fact that all colours of said camouflage layer are formed by an aqueous dispersion of polymers.

Said camouflage covering is manufactured, always according to the present invention, by means of a process comprising the following steps: a) to apply on a flexible supporting sheet a many-coloured camouflage layer of which all colours are formed by an aqueous dispersion of polymers; b) to dry the camouflage layer applied on the supporting sheet; c) to cure the camouflage layer.

Further characteristics and advantages will be better understood by the detailed description of a process for obtaining a camouflage covering, according to the invention, as well as of the camouflage covering so obtained.

Said description will be made with reference to the attached sheet of drawing, of the single figure which shows very schematically since not relevant for the purposes of the invention, an apparatus for accomplishing the process for manufacturing the above said camouflage covering.

With reference to the above said figures, reference numeral 1 indicates the whole apparatus for obtaining camouflage coverings in accordance with a process according to the present invention.

Said process foresees at first a step wherein at least a many-coloured camouflage layer is applied on a flexible supporting sheet 2, for instance constituted by a fabric of nylon or other suitable material; all colours of said layer are formed by an aqueous dispersion of polymers.

In the shown example, this step is made by subjecting the supporting sheet 2 to the action of a plurality of silk-screen rollers 3, each one having the task of applying a determinate colour.

In order to obtain strips or designs of different colours, the silk-screen rollers may be arranged on different rows, staggered and spaced from one another.

As polymers to be used for the named aqueous dispersions, the following ones can be mentioned: polychloroprene, chlorosulphonated polyethylene, chlorinated polyethylene, halogenated polybutyl, polyurethanes, epichlorohydrinic elastomers, acrylic elastomers, nitril elastomers, carboxyl elastomers, polycarbonates, silicone elastomers and so on.

Besides the polymer, the aqueous dispersion contains also proper additions of various substances necessary to give determinate physical-mechanical characteristics to the camouflage layer, either to obtain the required properties at the finished product, or to facilitate the application of the camouflage layer.

Among these substances the following ones are mentioned: stabilizers, protective agents, antiblocking agents, antiscratch agents, pigments, wetting agents, opacifiers, antifoaming agents, thickening agents, cross-linking agents, cross-linking activators, accelerators and so on.

More precise explanations about the constitution of said substances will be apparent from the examples of formulae given hereinafter only as information.

For the purposes of the present invention the quantities of these substances are conveniently comprised between 0.5 to 10 parts by weight for 100 parts by weight of polymer, except for the pigments whose quantities are comprised between 40 and 100 parts by weight for 100 parts by weight of polymer.

In the aqueous dispersions the pigments used to obtain the desired colorings can be of inorganic type as for example the titanium dioxide, iron oxides, cadmium sulphides and/or of organic type as for example the pthalocyanines.

Preferably, the thickening agents are comprised between 1 and 10 parts by weight for 100 parts by weight of polymer.

The viscosity of the latex polymers that can be used for the purposes of the present invention can vary from 500 to 3000 Centipoises. Moreover the overall viscosity of the compound containing the base polymer and the other substances, in particular for forming the camouflage nets through the silk-screen processes, can vary from 5000 to 15000 Centipoises.

In this case the viscosity is measured by means of a viscosimeter known with the name "Brookfield".

The known viscosimeter is formed by a support on which a variable speed steel shaft is assembled.

The shaft is immersed in the solution and indicates on a graduated scale the viscosity value which is given by the force necessary to rotate the shaft itself at a known speed.

The application of the camouflage layer is followed by the drying step which is made in a drying chamber 4 at a temperature of the order of 100-120° C during which the camouflage layer is dried.

Therefore, always in accordance with the process forming the object of the present invention, the camouflage layer is subject to the curing step. To this end, the product passes across a curing chamber 5 inside which it is subject to a temperature of the order of 150-170° C, so as to determine the cross-linking of the camouflage layer thanks to the action of the cross-linking agents present therein.

The application of the camouflage layer on both surfaces of the supporting sheet 2 is possible. Consequently, at the end of the curing step the product can be subject to a second application of a camouflage layer on the surface not yet treated and, to a second drying process and a second curing step.

Alternatively, it is possible that after the first drying step the product is subject to the second application of the camouflage layer, to the second drying step and consequently to only one curing step wherein the cross-linking of both camouflage layers applied on the two surfaces of the supporting sheet 2 takes place.

Also, it is possible to unwind a raw fabric from a suitable drum, then to apply on the fabric a basic colour covering it with a latex compound of an elastomeric polymer and finally to provide to the drying step.

Subsequently the fabric is sent to the apparatus shown in figure 2 to obtain at least a many-coloured layer applied on the basic colour which is softer with respect to the other ones.

The invention is now illustrated by means of some examples of formulae for latex compounds that can be utilized for obtaining the camouflage layer.

EXAMPLE 1	
- BASE POLYMER	PHR (parts by weight for 100 parts by weight of polymer)
ACRYLIC POLYMER	100
- AMMONIA (STABILIZER)	0.5/5
- POLYURETHANE WAX OR POLYXYLOXANE-POLYETHER COPOLYMER (PROTECTIVE, ANTIBLOCKING, ANTISCRATCH AGENT)	0.5/5
- INORGANIC AND ORGANIC PIGMENTS (PIGMENTATION)	40/100
- POLYXYLOXANE-POLYETHER COPOLYMER (WETTING AGENT)	0.5/5
- HIGH MOLECULAR WEIGHT SYNTHETIC POLYMERS (OPACIFIER)	1/10
- SILICONE EMULSIONS (ANTIFOAMING AGENT)	0.05/5
- AMMONIUM OR SODIUM POLYURETHANE OR POLYACRILIC RESINS (THICKENING AGENT)	1/10
- AZIRIDINE OR MELAMINE RESIN/FORMALDEHYDE (CROSS-LINKING AGENT)	1/10

EXAMPLE 2

5	- BASE POLYMER	PHR (parts by weight for 100 parts by weight of polymer)
	URETHANE POLYMER	100
10	- AMMONIA (STABILIZER)	0.5/5
	- POLYURETHANE WAX OR POLYXYLOXANE-POLYETHER	
15	COPOLYMER (PROTECTIVE, ANTIBLOCKING, ANTISCRATCH AGENT)	0.5/5
20	- INORGANIC AND ORGANIC PIGMENTS (PIGMENTATION)	40/100
25	- POLYXYLOXANE-POLYETHER COPOLYMER (WETTING AGENT)	0.5/5
	- HIGH MOLECULAR WEIGHT SYNTHETIC POLYMERS (OPACIFIER)	1/10
30	- SILICONE EMULSIONS (ANTIFOAMING AGENT)	0.05/5
35	- AMMONIUM OR SODIUM POLYURETHANE OR POLYACRYLIC	
40	RESINS (THICKENING AGENT)	1/10

EXAMPLE 3	
- BASE POLYMER	PHR (parts by weight for 100 parts by weight of polymer)
CHLOROSULPHONATED ETHYLENE POLYMER	100
- AMMONIA (STABILIZER)	0.5/5
- POLYURETHANE WAX OR POLYXYLOXANE-POLYETHER COPOLYMER (PROTECTIVE, ANTIBLOCKING, ANTISCRATCH AGENT)	0.5/5
- INORGANIC AND ORGANIC PIGMENTS (PIGMENTATION)	40/100
- POLYXYLOXANE-POLYETHER COPOLYMER (WETTING AGENT)	0.5/5
- HIGH MOLECULAR WEIGHT SYNTHETIC POLYMERS (OPACIFIER)	1/10
- SILICONE EMULSIONS (ANTIFOAMING AGENT)	0.05/5
- AMMONIUM OR SODIUM POLYURETHANE OR POLYACRYLIC RESINS (THICKENING AGENT)	1/10
- AZIRIDINE OR MELAMINE RESIN/FORMALDEHYDE (CROSS-LINKING AGENT)	1/10
- PENTAERYTHRIT DISPERION (CROSS-LINKING ACTIVATOR)	1/10
- THIURAM SULPHIDE DISPERION/CARBAMIDE SALTS (ACCELERATOR)	0.1/3

The parts of every component of the compounds are referred to the dry state.

Moreover the base polymer can be dispersed in water and comprise such characteristics as to have a determinate dry content, for instance of 40% or 60% or also the base polymer could be a ultrapure liquid elastomeric polymer in the dry state.

The present invention achieves the aimed purposes.

In fact it is to be noted that the camouflage layer associated to the camouflage covering forming the object of the present invention is applied without the aid of solvents and in the substantial absence of plasticizers. The term "substantial absence of plasticizers" is intended to indicate the fact that to improve the flexibility of the cross-linked film after the water drying, it would be possible to add from 1 to a maximum of 10 parts by weight of plasticizers every 100 parts by weight of base polymer.

The absence of the cited substances is made possible by the fact that the viscosity of the aqueous dispersion of polymers can be easily regulated in order to have an accurate silk-screen application on the supporting sheet.

Moreover after the curing step the camouflage layer obtained as disclosed, still has excellent characteristics of flexibility, elasticity and tear or break resistance.

The direct consequence of the total elimination of the solvents and the substantial elimination of the plasticizers is the elimination of all the drawbacks produced by the presence of said substances.

In particular the camouflage coverings obtained in accordance with the present invention will have improved characteristics of use reliability in time, since they will not be subject to alterations determined, in the known camouflage coverings, by the escape of the plasticizers, present also up to 200 parts for 100 parts by weight of PVC, due to the exudation.

Moreover, thanks to the use of aqueous dispersions of polymers, the productive processes in connection with the application of the camouflage layers are considerably facilitated.

On this subject the attention is drawn on the fact that the absence of inflammables in high quantities permits to reduce the fire prevention measures necessary in the known technique.

Also the absence of the solvents conventionally used to regulate the viscosity of the camouflage layer during its application facilitates considerably the productive processes.

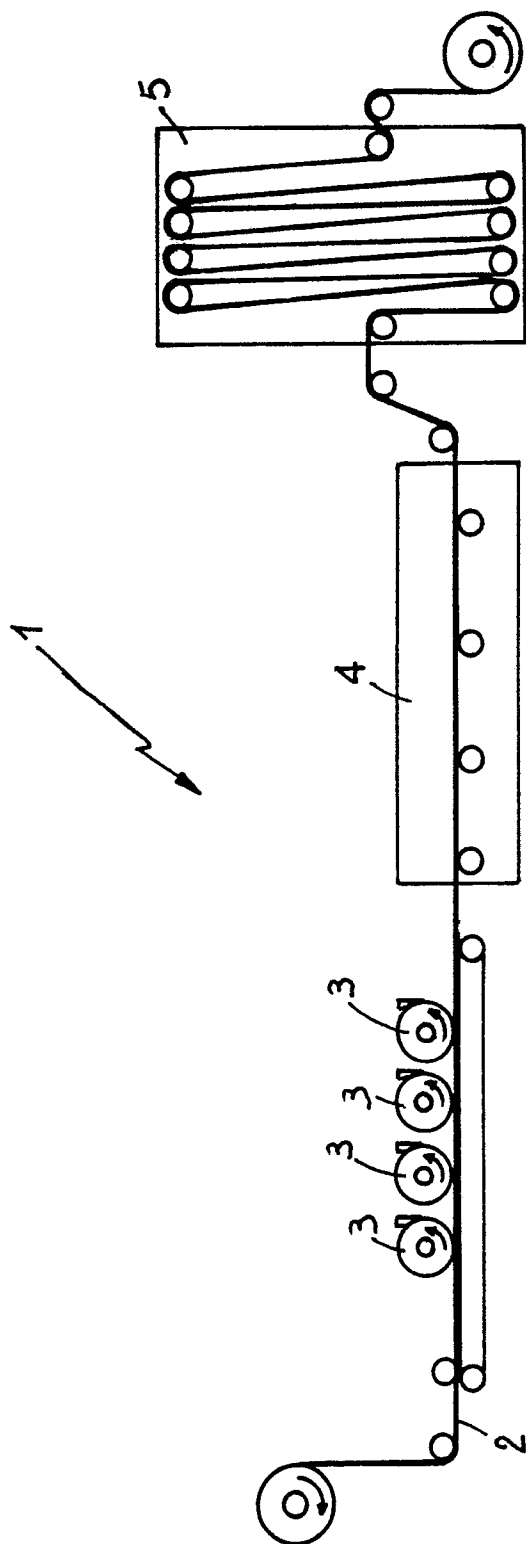
Of course, the invention as described can include any other modification and variant without departing from its inventive concept; for instance the camouflage covering described in respect of at least a many-coloured layer could comprise a limited number of colours up to a minimum of one colour.

Claims

1. Camouflage covering comprising a flexible supporting sheet (2) on which at least a coloured camouflage layer is applied characterized by the fact that all colours of said camouflage layer are formed by an aqueous dispersion of polymers.
2. Camouflage covering according to claim 1, characterized by the fact that said aqueous dispersion of polymers comprises also from 1 to 10 parts by weight of thickening agent for 100 parts by weight of polymer.
3. Camouflage covering according to claim 1, characterized by the fact that said aqueous dispersion of polymers comprises also stabilizers, protective agents, wetting agents, opacifiers, antifoaming agents, thickening agents, cross-linking agents, cross-linking activators and accelerators in quantities comprises between 0.5 to 10 parts by weight for 100 parts by weight of polymer.
4. Camouflage covering according to claim 1, characterized by the fact that said aqueous dispersion comprises pigments in a quantity comprised between 40 and 100 parts by weight for 100 parts by weight of polymer.
5. Camouflage covering according to claim 1, characterized by the fact that said polymer is selected from the group comprising polychloroprene, chlorosulphonated polyethylene chlorinated polyethylene, halogenated polybutyl, polyurethanes, epichlorohydrinic elastomers, acrylic elastomers, nitril elastomers, carboxyl elastomers, polycarbonates, silicone elastomers.
6. Process for obtaining camouflage coverings comprising a flexible supporting sheet (2) on which at least a coloured camouflage layer is applied, characterized by the fact of comprising the following steps:
 - a) to apply at least a many-coloured camouflage layer on the flexible supporting sheet, all colours of said layer being formed by an aqueous dispersion of polymers;
 - b) to dry (4) the camouflage layer applied on the supporting sheet;
 - c) to cure (5) the camouflage layer.
7. Process according to claim 6, characterized by the fact that, when the curing step has been completed, a second application, a second drying step, a second curing step of a second camouflage layer are carried out on the surface of the supporting sheet opposite to that previously treated.
8. Process according to claim 6, characterized by the fact that following the drying step, a second application and a second drying step of a second camouflage layer are carried out on the surface of the supporting sheet opposite to that previously treated, said steps being followed by a curing step wherein the cross-linking of both applied camouflage layers is obtained.
9. Process according to claim 6, characterized by the fact that the drying step is carried out by subjecting the product to a temperature comprised between 100 and 120 °C.
10. Process according to claim 6, characterised by the fact that said curing step is carried out by subjecting the product to a temperature comprised between 150 and 170 °C.
11. Camouflage covering and process for its manufacture according to the preceding claims and what disclosed and illustrated for the mentioned purposes.

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EP 89118464.0

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.) ⁵
A	<u>GB - A - 2 147 978</u> (HOYBOND LTD.) * Claims * ---	1,6	F 41 H 3/02 F 41 H 3/00
A	<u>DE - A1 - 3 041 797</u> (HIRAOKA & CO., LTD.) * Claims 1,2,3,4,5 * -----	1,6	
			TECHNICAL FIELDS SEARCHED (Int. Cl.) ⁵
			F 41 H 3/00
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 19-12-1989	Examiner JASICEK
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	