

The present invention relates to a two-phase thermo-adhesive interlining.

Generally, it must be possible to store thermo-adhesive interlinings once the layer of polymer is applied on the textile base and such interlinings are intended to become adhesive so that they can be stuck on another cloth, as a result of the variation of an external parameter.

At present thermo-adhesives are commonly used in the textile industry as for example stiffening fabrics, since their application on lining or cloth makes it possible to modify the fabric characteristics by improving firmness and dash. The used textile bases are of various kinds. They can be woven, knitted or non-woven.

There are many ways of applying the adhesive layer on its base. For many utilisations, a point application which makes it possible to preserve a high flexibility of the fabrics is preferred while, for other utilisations, a continuous layer of adhesive makes it easier to reach the desired properties.

In the case of stiffening fabric, the textile base is coated with the thermo-adhesive substance. At

present, such coating is most often applied by points with a form cylinder. Thermo-adhesive polymers which initially are in the form of powder or paste are heated to a temperature which allows them to melt and to stick
5 onto the base. Another art consists in a transfer coating, which means that the thermo-adhesive polymers are deposited in the form of points by a form cylinder on a blanket cloth treated so as not to be adhesive ; such points are then transferred to the textile base at
10 a lower temperature.

The thermo-adhesive interlining thus obtained is then stored at room temperature. It is then necessary to make sure that the various layers of this product which are in contact with one another do not stick
15 together. The thermo-adhesive interlining must not be tacky or show adhesive properties at room temperature.

During said storage, it also is necessary that the ageing process of the product does not alter the adhesive properties required for the subsequent
20 sticking operation.

The thermo-adhesive interlining is then used by the clothes-makers which apply it onto other fabrics, clothes or linings and thus stick the stiffening fabric onto cloth using a press with pressures ranging from a
25 few decibar to a few bar for relatively short times of the order of 10 to 30 seconds and at temperatures generally exceeding 100°C. During such phase, the thermo-adhesive interlining polymers must recover their adhesive properties. However, their viscosity must not
30 be too low for too long a time during such operation for in that case, polymers would pass through the textile base or the cloth which would result in feedback or penetration problems, which make the obtained products little attractive and often unusable.

Finally, finished clothes and thus, more specifically cloth or linings fitted with stiffening fabric have to support various utilisation modes, washing, ironing, etc. The sticking performed at the preceding step must then resist difficult environments.

Numerous attempts have been made to achieve products well-adapted to the various constraints imposed by all the above mentioned steps.

Thus, it has been proposed for example to make an adhesive composed of two or several layers of polymers having different physical characteristics. By conveniently choosing the viscosity and melting temperature of such different layers, feedback or penetrations can be limited (documents FR-A-2 318 914, DE-A-2 461 845, FR-A-2 576 191). However, the implementation of such techniques reveals a lack of mechanical consistency between the two layers of polymers, or difficulties in the implementation which are delicate to overcome, or a deficient regularity of the second layer.

Document FR-A-2 023 354 discloses a thermo-adhesive underlining composed of a textile structure coated on at least one of its faces with a polymer or mixture of polymers substantially non cross-linked at the time of application. At least a fraction of such coating is transformed into an insoluble plastic material by heating and has a porous or foamy structure at the time of the heat sealing.

More recently, document US-A-3 937 859 discloses a thermo-plastic/thermo-cross-linking composition wherein the thermo-plastic part is a copolymer of olefin and vinyl chloride. The presence of chlorine, a hyper-reactive polymerisation site, raises problems relative

to the control of the cross-linking reaction path and results in a bad ageing of the textile product.

Document EP-A-0 329 493 relates to a thermo-adhesive textile product comprising a textile base and an adhesive layer comprising a thermo-adhesive polymer and a heat-activated cross-linking agent. Such characteristics make it possible to prevent the sticking of the thermo-adhesive textile product without feedback or penetrations, but the problem of the ageing of such a product is not considered.

The result is that the implementation of thermo-adhesive interlinings meets the following problems :

- interpenetration of the two layers, during the coating operation, by a mixture of the basis of the upper layer point with the peak of the sub-layer point;
- hardening of the textile when the weight of the coating is too important ;
- difficult control of speed and progress of the reactive system cross-linking reaction as well as the ageing of the thermo-adhesive interlining during storage.

A first object of this invention is thus to provide a thermo-adhesive interlining which makes it possible to remedy the above-mentioned disadvantages, on the one hand, and does not go through the cloth and produces no feedback, on the other hand, i.e. does not go through the textile base of the interlining ; whose adhesiveness is increased by an important factor and whose ageing in time is well improved.

More particularly, the aim of this invention is to provide the use of a single adhesive layer having a two-phase structure belonging to the structure of the thermo-adhesive interlining and guaranteeing a correct adhesiveness, eliminating penetrations when exposed to

steam, guaranteeing a correct resistance of the thermo-adhesive-cloth complex to steaming-dry cleaning cycles, and a correct resistance to high temperature washing.

A second object of this invention is to provide a manufacturing process of a thermo-adhesive-cloth complex.

Therefor, the invention firstly provides a thermo-adhesive interlining comprising a textile base combined with a single adhesive layer, for sticking on a cloth.

According to the invention, the adhesive layer associated with the textile base has a two-phase structure comprising :

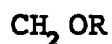
(i) at least one adhesive system in the form of a dense granules thermoplastic powder the main function of which consists in guaranteeing the adherence of the thermo-adhesive interlining on the cloth, when it is stuck ;

(ii) at least one cross-linkable system comprising at least a cross-linkable resin, and at least one hardening agent in the form of an homogeneous matrix, the main function of which consists in coating the thermoplastic powder granules of the adhesive system.

The hardening agent(s) of the cross-linkable system is (are) selected from the group including modified melamine resins in the form of prepolymers.

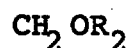
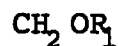
The modified melamine resins prepolymers are selected from the group including prepolymers having a degree of polymerisation between 1 and 3 approximately.

According to a first possible embodiment, the modified melamine resins are selected from the group including the partially alkylated modified melamine resins with a high rate of imin function :



in which the radical R is selected from the group comprising the methyl, ethyl, propyl, butyl, and isobutyl radicals.

- 5 According to a second possible embodiment, the modified melamine resins are selected from the group including the totally alkylated modified melamine resins :



- 10 in which the radicals R_1 and R_2 are similar or different and selected from the group comprising the methyl, ethyl, propyl, butyl, and isobutyl radicals.

The cross-linkable resin of the cross-linkable system is selected from the group including polymers
 15 soluble in water or in a solvent medium. More particularly, the cross-linkable resin is selected from the group comprising the epoxy resins, the alkyd resins, the polyester resins, the acrylic resins, or mixtures thereof.

- 20 Besides the cross-linkable system may comprise a cross-linking catalyst more particularly selected from the group comprising the paratoluene sulphonic acid, the oxalic acid, the phosphoric acid, the ammonium chloride, and the magnesium chloride.

- 25 The thermoplastic powder of the adhesive system is composed of one or more thermo-adhesive thermoplastic polymers selected from the group comprising polyamids, polyesters or mixtures thereof, the polymers being more

particularly selected from the group comprising the polymers whose melting point ranges from 80°C to 130°C, the thermoplastic powder having a grain size distribution ranging from about 1 to 100 μ m.

5 The invention also provides a thermo-adhesive-cloth complex in which the thermoplastic polymer chains of the adhesive system are locked in a cross-linked network formed by the cross-linkable resin and the hardening agent(s) of the cross-linkable system, thus
10 forming semi-interlocked polymer networks.

 The utilisation of an adhesive layer having a two-phase structure comprising an adhesive system in the form of a thermoplastic powder and a cross-linkable system in the form of an homogeneous matrix offers
15 several advantages :

 - the granules of the thermoplastic powder, perfectly coated and bond by the cross-linkable system play the role of a charge which makes it possible to maintain the viscosity of the assembly sufficiently
20 high so as to prevent the penetration thereof into the textile base.

 - the drying of the thermo-adhesive interlining at a temperature lower than the cross-linking temperature makes it possible to slightly soften the thermoplastic
25 powder which remains in the form of granules and to sufficiently stick the adhesive layer onto the textile base.

 - the high rate of the imin function (-NH) in the modified melamine, besides the reactive groups
30 (hydroxyl, carboxyl, etc.) of the cross-linkable resin gives the cross-linkable system of the adhesive layer of the thermo-adhesive interlining a high reactivity.

 Now, it is well known that the adhesiveness directly depends on the progress of the cross-

linking reaction. The higher the reactivity of the cross-linkable system in the adhesive layer, the greater the increase in the adhesiveness after cross-linking.

5 The efficiency of such cross-linking reaction results in :

- increased adhesiveness ;
- no penetration upon steaming ;
- a correct resistance of the thermo-adhesive-
- 10 cloth complex to steaming-dry cleaning cycles, with no swelling,
- a correct resistance to washing at a high temperature higher than or equal to 45°C.

Other characteristics and advantages of the
15 invention will become apparent when reading the detailed description and subsequent examples.

The thermo-adhesive interlining according to the invention comprises a textile base combined with a single adhesive layer. It is intended for sticking on a
20 cloth. The used textile base can be of various kinds. It can be woven, knitted or non-woven.

The adhesive layer is thus associated with the textile base, which means it is in contact with the textile base.

25 The single adhesive layer is made of plastic material and is substantially composed of two systems whose expected functions are different.

More particularly, the single adhesive layer has a two-phase structure comprising :

- 30 - at least one adhesive system in the form of a dense granules thermoplastic powder the main function of which consists in guaranteeing the adherence of the thermo-adhesive interlining on the cloth, when it is stuck ;

at least one cross-linkable system comprising at least a cross-linkable resin, and at least one hardening agent in the form of an homogeneous matrix, the main function of which consists in coating the thermoplastic powder granules of the adhesive system.

According to the invention, the adhesive system is then in the form of thermoplastic powder made of dense granules.

Dense granules refer to granules, which when in contact with the cross-linkable homogeneous matrix or when submitted to a drying temperature lower than that starting the cross-linking reaction, do not dissolve, and whose degree of compaction remains substantially the same as the initial one.

The grain size distribution of the thermoplastic powder of dense granules ranges from about 1 to 100 μm .

It is generally composed of one thermo-adhesive thermoplastic polymer or a mixture thereof.

Such thermoplastics have a linear chemical structure and contain no reactive chemical function likely to cause a chemical transformation, i.e. a cross-linking reaction.

They soften when heated and harden when submitted to cold, in a reversible way.

The thermoplastic powder of the adhesive system is composed of one or more thermo-adhesive thermoplastic polymer(s) selected from the group comprising the polyamids, polyesters, or a mixture thereof.

The polymers of the thermoplastic powder are selected from the group comprising polymers whose melting point ranges from 80°C to 130°C.

The single adhesive layer having a two-phase structure also comprises a cross-linkable system whose

main function consists in coating the dense granules of the thermoplastic powder.

Such cross-linkable system is intended for reacting to heat and to pressure resulting in the
5 hardening of the adhesive layer.

Once cross-linked, such system limits or even prevents the penetrations during steaming, and gives the thermo-adhesive-cloth complex a correct resistance to wear, more particularly caused by clothes cleaning
10 agents and to high temperature washing, at temperatures higher than or equal to 45°C.

The cross-linkable systems comprises at least one cross-linkable resin and at least one hardening agent in the form of an homogeneous matrix.

15 The cross-linkable resin of the type mentioned in the invention is selected from the group comprising the polymers soluble in water or in a solvent medium.

More particularly, the cross-linkable resin of the type mentioned in the invention is selected from
20 the group comprising the epoxy resins, the alkyd resins, the polyester resins, the acrylic resins, or mixtures thereof.

Such polymer chains, which are soluble in water or in a solvent medium contain carboxylic, hydroxy or
25 amide groups which allow them to be submitted to an irreversible chemical reaction, called cross-linking reaction, when heated at a defined temperature, called cross-linking or hardening temperature.

Such process is generally caused and accelerated
30 by the addition of a hardening agent or a catalyst.

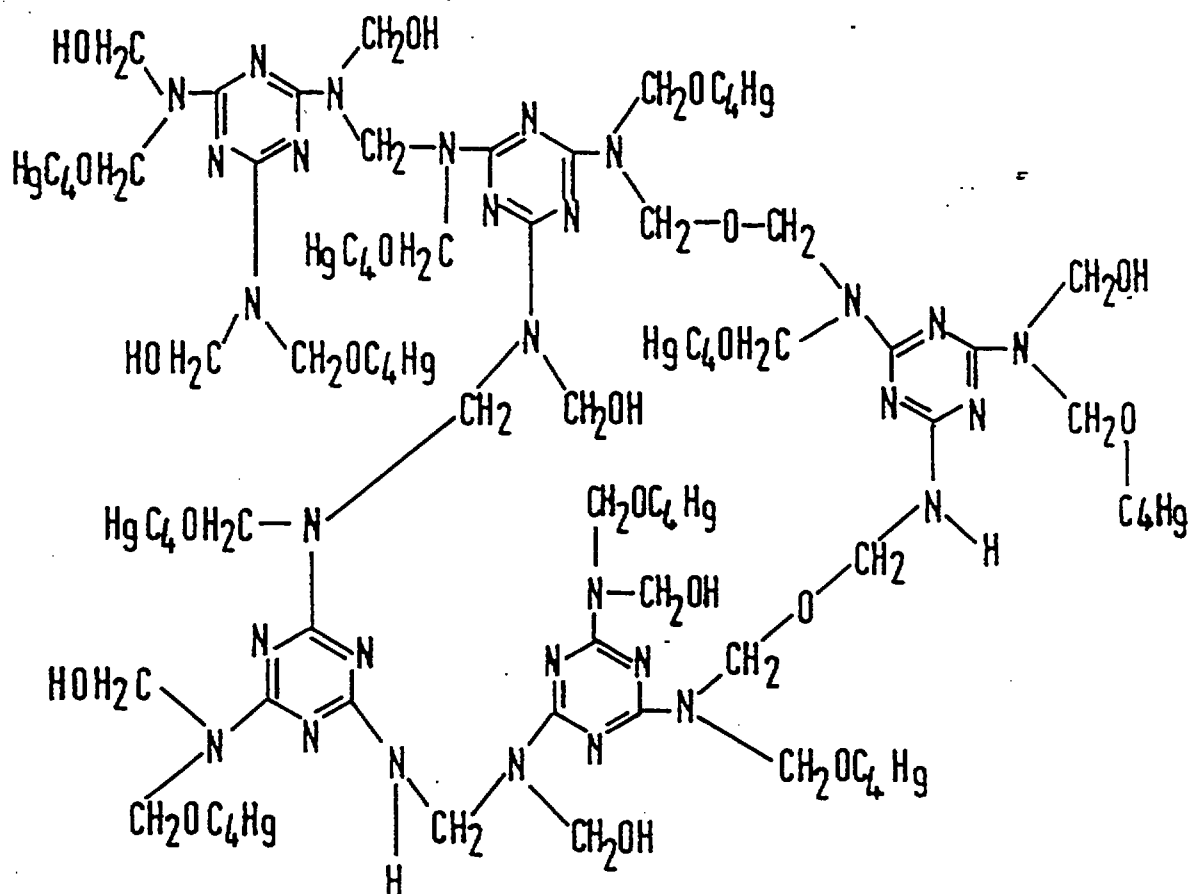
The hardening agent(s) or cross-linking agent(s) is (are) selected from the group including modified melamine resins in the form of prepolymers.

The modified melamine resins prepolymers are selected from the group including prepolymers having a degree of polymerisation between 1 and 3 approximately.

The degree of polymerisation means the average
5 number of triazine units per molecule.

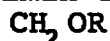
The modified melamine resins of the type of those used in the present invention have the following general formula :

EXAMPLE OF MELAMINE STRUCTURE



Various modified melamine resins have been used in the present invention.

According to a first possible embodiment, the modified melamine resins are selected from the group including the partially alkylated modified melamine resins with a high rate of imin function :

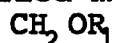


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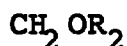
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in which the radical R is selected from the group comprising the methyl, ethyl, propyl, butyl, and isobutyl radicals.

According to a second possible embodiment, the melamine resins are selected from the group including the totally alkylated modified melamine resins :



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in which the radicals R_1 and R_2 are similar or different and selected from the group comprising the methyl, ethyl, propyl, butyl, and isobutyl radicals.

The nature and degree of alkylation have a great influence on the velocity of the cross-linking reaction of the cross-linkable system as well as on the ageing of the finished thermo-adhesive interlining at the time of storage.

The cross-linkable system may further comprise a cross-linking catalyst.

Said cross-linking catalyst is selected from the group comprising the paratoluene sulphonic acid, the oxalic acid, the phosphoric acid, the ammonium chloride, and the magnesium chloride.

The invention also relates to a thermo-adhesive-cloth complex such that it is composed of a thermo-adhesive interlining of the type described hereabove wherein the thermoplastic polymer chains are locked in
5 a cross-linked network formed by the cross-linkable resin and the hardening agent(s) of the cross-linkable system.

Semi-interlocked polymer networks are thus formed.

Finally, the invention relates to a manufacturing
10 process of a thermo-adhesive-cloth complex wherein a textile base is coated by points with an adhesive layer by a form cylinder (screen printing frame and heliographic cylinder).

In such process :

15 A cross-linkable system is prepared which comprises at least one cross-linkable resin and at least one hardening agent in the form of an homogeneous material.

Then, the coating paste is prepared by dispersing
20 a thermoplastic powder in said matrix.

The coating paste thus prepared is thereby applied onto a textile base and coated by points, with a rotary frame.

Then the assembly (textile base + coating paste)
25 is submitted to a drying temperature lower than that of the starting of the cross-linking reaction.

Such step of the process makes it possible to evaporate water and eventually solvents, to soften the thermoplastic powder without the thermoplastic material
30 composing it being totally molten, so as to sufficiently stick the adhesive layer onto the textile base.

The thermoplastic powder granules soften at the drying temperature. It can thus be understood that the

thermoplastic powder remains in the form of granules once the drying step is completed, but the consistency of the granules is a little less dense than it initially was.

5 The thermoplastic powder granules used in the present invention play two roles :

- on the one hand, they make it possible to stick the adhesive powder onto the textile base ;

10 - on the other hand, such thermoplastic powder granules, perfectly coated and bond by the cross-linkable system play the role of a charge which makes it possible to maintain the viscosity of the system sufficiently high to prevent and minimise the penetration thereof into the textile base.

15 Once dried, the adhesive layer has a two-phase structure, with dense granules made of thermoplastic material, in an homogeneous matrix composed of the cross-linkable polymer, the hardening agent or the cross-linking agent and possibly of the catalyst.

20 The thermo-adhesive textile interlining obtained after such first step can then be stored at room temperature.

25 At the time when the thermo-adhesive is stuck on the cloth, the cross-linking reaction is started by passing the product on a continuous press heated at a temperature of the order of 130°C, under a pressure of a few bars and for a relatively short time, of the order of 15 seconds.

30 According to a significant characteristic of the invention, the cross-linking reaction is completed by a passage of the thermo-adhesive-cloth complex in an oven heated to a temperature of the order of 150°C for a time ranging from 30 to 60 seconds.

Further to the preparation of the coating paste by dispersing the thermoplastic powder in the homogeneous matrix, the paste can also be thickened by means of a thickening agent.

5 The product of the present invention requires an accurate mixture of resin, hardening agent and catalyst.

The time required for the cross-linking then depends on the temperature applied, on the quantity and
10 nature of the hardening agent and the catalyst introduced into the cross-linkable system, and can vary from a few seconds to a few minutes.

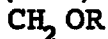
As a non-limitative example, the following experimental results obtained with a thermo-adhesive
15 interlining whose adhesive layer has the following typical formulation can be mentioned :

	Acrylic resin	20 %
	Modified melamine	6 %
	Catalyst	1 %
20	Polyamid	30 %
	Water + additives	42 %
	Thickening agent	1 %

The weight of the coating agent generally ranges from 10 to 30 g/m².

25 EXAMPLE 1

The modified melamine resins mentioned in the present example, whose degree of polymerisation is of the order of 2 to 3, are partially alkylated with a high rate of imin function (-NH) :



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in which the radical R is selected from the group comprising the methyl, ethyl, propyl, or isobutyl.

The weight of the coating paste is of the order of 15 g/m².

5 Results are shown in the table hereinunder :

	Adhesiveness (g/cm) prior to cross-linking	Penetrations during steaming, prior to cross-linking (g/cm)	Adhesiveness after cross-linking 1' at 150°C (g/cm)	Penetrations during steaming, after cross-linking (g/cm)
Prior to ageing	250	50	500	0
After ageing for 3 months at 25°C	125	20	150	10
% loss	50 %		70 %	

10 The high rate of imin function in the modified melamine, with that of reactive groups (hydroxyl, carboxyl, etc.) of the acrylic resin gives the reactive system (cross-linkable system) of the adhesive layer of the thermo-adhesive interlining a high reactivity.

15 The cross-linking reaction of such reactive system is started while the thermo-adhesive interlining is stuck onto the cloth, which is performed on a continuous press heated at a temperature of the order of 130°C, under a pressure of a few bars and for a relatively short time, of the order of 15 seconds.

20 Such hardening reaction will be completed by passing the thermo-adhesive-cloth complex in an oven heated at 150°C for example, for a time interval ranging from 30 seconds to 60 seconds.

25 Actually, during said sticking, the thermoplastic powder becomes a fused mass, which allows the polymer chains of the polyamid to interpenetrate those of the

acrylic resin while mechanically sticking onto the textile fibers.

The cross-linking reaction of the acrylic resin in the presence of the modified melamine and the catalyst
5 strengthens such mechanical sticking, which explains the increased adhesiveness after the cross-linking of the reactive system.

Then, semi-interlocked polymer networks are formed, i.e. the thermoplastic polymer chains
10 (polyamid) are locked in a cross-linked network formed by the acrylic resin and the modified melamine.

As mentioned above, such increased adhesiveness directly depends on the progress of the cross-linking reaction.

15 The higher the reactivity of the reactive system in the adhesive layer, the greater the increase in the adhesiveness after the cross-linking (refer to the above table and to example 2).

The efficiency of such cross-linking reaction
20 results in :

- increased adhesiveness, from 250 g/cm to 500 g/cm ;
- no penetration upon steaming ;
- a correct resistance of the thermo-adhesive-cloth complex to steaming-dry cleaning cycles, with no
25 swelling (20 cycles) ;
- a correct resistance to washing at a high temperature higher than or equal to 45°C.

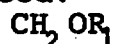
Such high reactivity of the cross-linkable system
30 in the adhesive layer of the thermo-adhesive product accelerates the ageing process and makes the thermo-adhesive product almost unusable after a relatively short time of the order of three months at room temperature (25°C).

Such bad ageing in time results in a loss in adhesiveness by 50 % for a non cross-linked product and by 70 % for the same cross-linked product, and in renewed penetrations during steaming, even for the complex, after its passage in the cross-linking oven.

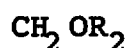
The thermo-adhesive interlining described in this example is thus rather intended for the case when such interlining is to be stored for about three months.

EXAMPLE 2

The modified melamine resins mentioned in this example, whose degree of polymerisation ranges from 1.6 and 2.9 are totally alkylated.



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in which the radicals R_1 and R_2 are similar or different and selected from the group comprising the methyl, ethyl, propyl, butyl, and isobutyl radicals.

The weight of the coating paste is of the order of 15 g/m².

Results are shown in the table hereinunder :

	Adhesiveness (g/cm) prior to cross-linking	Penetrations during steaming, prior to cross-linking (g/cm)	Adhesiveness after cross-linking 1' at 150°C (g/cm)	Penetrations during steaming, after cross-linking (g/cm)
Prior to ageing	250	60	400	0
After ageing for 3 months at 25°C	250	60	400	0
After ageing for 1 year at 25°C	200	40	360	0
% loss	20 %		10 %	

The totally alkylated melamine resins of example 2 result in thermo-adhesive products as efficient as those obtained from the partially alkylated resins mentioned in example 1, but their ageing is
5 significantly improved in time.

In example 2, the loss in adhesiveness (20 % for a sticking prior to cross-linking and 10 % for a sticking after cross-linking) after 1 year's ageing at room temperature (25°C) are not significant since the
10 sticking efficiency of the thermo-adhesive product and its resistance to treatment once stuck onto a cloth remain practically the same.

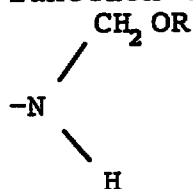
CLAIMS

1. A thermo-adhesive interlining comprising a textile base combined with a single adhesive layer, for sticking on a cloth, characterised in that the adhesive layer has a two-phase structure comprising :

(i) at least one adhesive system in the form of a dense granules thermoplastic powder the main function of which consists in guaranteeing the adherence of the thermo-adhesive interlining on the cloth, when it is stuck ;

(ii) at least one cross-linkable system comprising at least a cross-linkable resin, at least one hardening agent and a cross-linking catalyst in the form of an homogeneous matrix, the main function of which consists in coating the thermoplastic powder granules of the adhesive system, the hardening agent(s) being selected from the group including modified melamine resins in the form of prepolymers, whose degree of polymerisation is between 1 and 3 approximately, so as to control the cross-linking reaction and have an improved ageing in time.

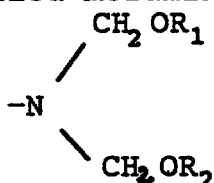
2. The thermo-adhesive interlining of claim 1, characterised in that the modified melamine resins are selected from the group including the partially alkylated modified melamine resins with a high rate of imin function :



in which the radical R is selected from the group comprising the methyl, ethyl, propyl, butyl, and isobutyl radicals.



3. The thermo-adhesive interlining of claim 1, characterised in that the modified melamine resins are selected from the group including the totally alkylated modified melamine resins :



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in which the radicals R_1 and R_2 are similar or different and selected from the group comprising the methyl, ethyl, propyl, butyl, and isobutyl radicals.

4. The thermo-adhesive interlining of any of claims 1 to 3, characterised in that the cross-linkable resin is selected from the group comprising the epoxy resins, the alkyd resins, the polyester resins, the acrylic resins, or mixtures thereof.

5. The thermo-adhesive interlining of any of claims 1 to 4, characterised in that the cross-linking catalyst is selected from the group comprising the paratoluene sulphonic acid, the oxalic acid, the phosphoric acid, the ammonium chloride, and the magnesium chloride.

6. The thermo-adhesive interlining of any of claims 1 to 5, characterised in that the thermoplastic powder of the adhesive system is composed of one or more thermo-adhesive thermoplastic polymers selected from the group comprising polyamids, polyesters or mixtures thereof.

7. The thermo-adhesive interlining of claim 6 characterised in that the thermoplastic powder polymers are selected from the group comprising the polymers whose melting point is between 80°C and 130°C .

8. A thermo-adhesive-cloth complex, characterised in that it is composed of a thermo-adhesive interlining



of any of claims 1 to 7 in which the thermoplastic polymers chains are locked in a cross-linked network formed by the cross-linkable resin and the hardening agent(s) of the cross-linkable system, thus forming

5 semi-interlocked polymer networks.



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