

HEAT FUSIBLE TEXTILE FOR STIFFENING AND METHOD OF PRODUCTION

The invention concerns a heat fusible textile for stiffening and its method of production.

Reactions involving polymerisation have been used for many years in the textile industry for the bonding of fabrics : document US-A-2.438.176, published in 1948, describes use of the reaction between polyvinyl alcohols and an aldehyde to bond several textile substrates and produce a fabric which is impermeable to gases.

Similarly, document GB-A-549 451 describes a bonding process for sheets of fabric impregnated with a mixture of polyvinyl alcohol and aldehyde, using heat.

In 1965, document FR-A-1.415.073 described the bonding of two fibrous sheets by means of two constituents hardening at ambient temperature and comprising epoxy or polyamide based resins.

Document GB-A-761 364 proposes a method for bonding two textile sheets, the sheets being impregnated with an unsaturated polyester resin and a catalyst for polymerisation, then wetted with a solution based on a vinyl monomer capable of polymerisation.

The use of heat fusible products is also known in the textile industry, in particular, for lining or stiffening. These heat fusible products comprise, on the one hand, a continuous textile substrate, woven, knitted or non woven and, on the other hand, spots of heat fusible material distributed over one of the outer faces of the substrate. The bonding material comprises polymers (in particular, copolyamides, copolyesters, polyethylenes, polyethylene copolymers or, if applicable, polyvinyl chlorides or polyurethanes) with the

property of melting at relatively low temperatures when subjected to a low pressure. More precisely, these polymers have molecular masses and viscosities, in the molten state, sufficiently low to melt rapidly and more easily under the combined effects of heat and pressure.

These heat fusible products are employed by garment manufacturers, using steam or heat type vaporization presses. The pressure used is approximately a few decibars to several bars, the temperature approximately 120°C to 180°C and the cycle time is relatively short, approximately 10 to 30 seconds.

These heat fusible products generally create the problem of the bonding material penetrating the textile substrate when used by garment manufacturers, due to flow of the polymers comprising this bonding material when it is simultaneously subjected to heat and pressure and, if applicable, to a vaporisation stage.

Up to the present time, various solutions have been considered in order to overcome this problem. A first known solution (patents DE-A-2 214 236 and 2 231 723) consists of superimposing two or more layers of polymers with different physical characteristics (in particular, viscosity and melt temperature). A second solution (patent FR 85 13 143) consists of a special method of combining the heat fusible material with the textile substrate in order to avoid excessive penetration of the heat fusible material into the textile substrate. Document FR-A-2.241.604 proposes a separating layer between the fusible adhesive and the textile support. In accordance with this technique, this layer may be separated, not only gradually but also due to the method of using a thermo adhesive layer.

However, these three solutions possess disadvantages or limitations. In the case of the first and the third solutions, several different polymers and methods of combining the substrate are required. In the case of the second solution, it involves a specific process for producing the heat fusible product.

The purpose of the invention is to overcome these disadvantages or limitations. Its purpose is also to avoid the use and association of two or more different

bonding materials to the textile substrate. Finally, its purpose is to permit the production of this type of heat fusible product in a manner which is as advantageous as possible.

For this reason and in accordance with a first requirement, the invention proposes a heat fusible textile for stiffening comprising, on the one hand, a textile substrate woven, knitted or non woven and, on the other hand, spots of a single component heat fusible material distributed on one of the outer faces of the substrate, more particularly, a polymer based material, characterised in that it comprises at least one reactive material having the property of reacting with a part of the heat fusible material under the effects of at least one reactive means which is a contributor of heat and/or UV irradiation and/or electronic bombardment and which initiates, assures or assists in this reaction in order to partially modify the chemical structure of the heat fusible material in order to prevent the heat fusible material bonding through the substrate under the effects of the heat, pressure or steam.

In accordance with a second requirement, the invention proposes a method of producing a heat fusible textile for stiffening where spots of a heat fusible single component material, in particular, a polymer based material, is distributed over one of the faces of a textile substrate, woven, knitted or non woven, characterised in that at least one reactive material and at least one reactive means which is a contributor of heat and/or UV irradiation and/or electronic bombardment is associated with the heat fusible material to provide a reaction between the reactive material and the heat fusible material, modifying the chemical structure of one part of the heat fusible material in contact with the textile substrate in order to prevent the heat fusible material bonding through the substrate when in use.

The invention may be distinguished from the present state of the art in that those heat fusible properties of the heat fusible material which are not required and which cause, for example, an undesirable penetration of the substrate, are eliminated or at least reduced by direct action on the heat fusible material rather than by the addition of other different heat fusible materials or by the use of special production methods which are basically physical.

The invention will be more fully understood on reading the following description.

A heat fusible textile for stiffening, in accordance with the invention comprises, on the one hand, a textile substrate, woven, knitted or non woven and, on the other hand, spots of a single component heat fusible material distributed over one of the outer faces of the substrate, more particularly a polymer based material also comprising a means, of a chemical nature, acting on the heat fusible material in order to partially modify its chemical structure, at the interface with the substrate and prevent the heat fusible material bonding through the substrate under the effects of heat and/or pressure.

As the textile substrate is already known to persons experienced in this field, it does not form part of the invention and, for that reason, is not described here in more detail.

This is also applicable to the general structure of the heat fusible product, comprising a heat fusible material distributed in the form of spots over the substrate.

The substantially chemical means used to modify the chemical structure of the heat fusible material comprises at least one reactive material, together with at least one reactive means suitable to initiate, ensure and assist in the reaction between the reactive material and the heat fusible material.

The reactive material may belong to different categories and, in particular, the category of aminoplastic thermohardening products, in particular, the urea formaldehydes and melamine formaldehydes, the category comprising single molecules or polymers with at least one isocyanate function, blocked or not blocked, the category comprising single molecules or polymers with at least one aziridine function, the category of modified polymers with at least one reactive chemical function. In this latter case, the reactive function is, in particular, an epoxy function or a vinylic function.

The reactive means comprises a contributor of heat and/or UV irradiation

and/or electronic bombardment, or any equivalent means.

The reactive means may be used in the presence of catalysts : acid catalyst and/or ammonium salt and/or magnesium salt (aminoplastic thermohardening product), acid or alkaline catalyst (isocyanate function), basic catalyst (aziridine function).

The reactive means used for the cross linking reaction of the modified polymer with an epoxy reactive function is that it is placed in contact with molecules of a ternary amine and/or polyamine and/or anhydride.

The reactive means for the cross linking reaction of the heat fusible polymer and the modified polymer with a vinylic reactive function is that it is placed in contact with products in the category of peroxides, in the presence of heat.

The reactive means for the cross linking reaction of the heat fusible polymer and the modified polymer with a vinylic reactive function is that it is placed in contact with photo-initiator products, in the presence of UV irradiation.

Preferentially, in this latter case, at least one photo inhibitor agent, associated with the reactive means, is specified in order to limit the cross linking reaction.

The heat fusible product may also comprise a thermo hardening polymer.

Preferentially, the heat fusible material is a polymer which belongs to the category of copolyamides, copolyesters, polyethylenes, polyethylene copolymers, polyurethanes or polyvinyl chlorides.

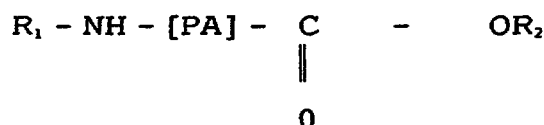
The heat fusible material with a modified structure, following application of the reactive material and the reactive means, is either a thermoplastic polymer with physico-chemical properties, in particular, flow, viscosity at melt temperature, different to those for the unmodified heat fusible material, or a non fusible thermohardening polymer.

The invention will be more fully understood following consideration of the several examples given below, these being explanatory only and in no way limiting, in the particular case of a heat fusible material comprising copolyamides. These copolyamides (6, 6.6, 11, 12, etc.) may be represented as follows :



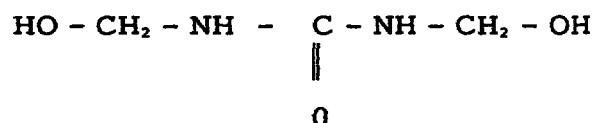
As the symbol PA represents an aliphatic or aromatic chain of n single symbols, it may comprise between several hundred and several thousand symbols.

These two important reactive sites : the carboxylic site COOH and the primary amine site NH may react chemically with the reactive material in order to form modified products which may be represented as follows :

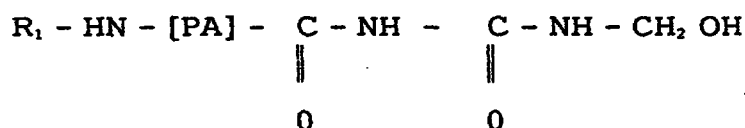


Where R and R are mono, di or tri functional molecules, saturated or unsaturated, aliphatic or aromatic and/or containing or not containing hetero atoms.

Example 1 : Methylolurea, general formula

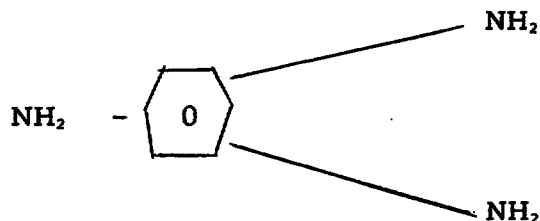


Reacting with the acid function of the heat fusible polyamide to give a new difunctional polymer of the following type :

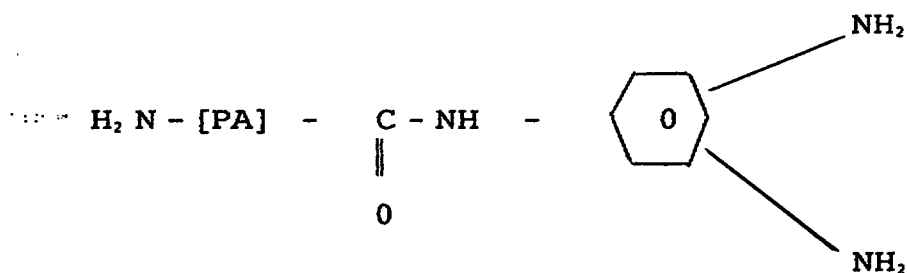


Again possessing two reactive functions (-NH and/or -OH).

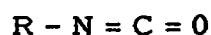
Example 2 : Melamine, general formula



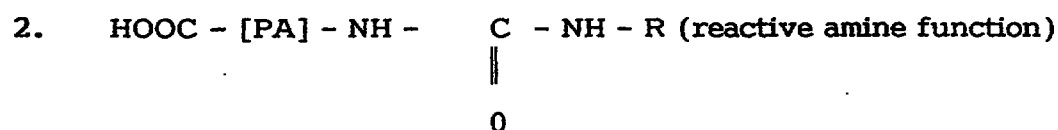
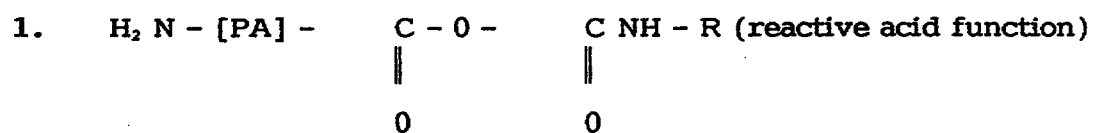
Reacting with 1, 2 or 3 macro molecules of heat fusible polyamide to give new mono, di or tri dimensional polymers of the following type :



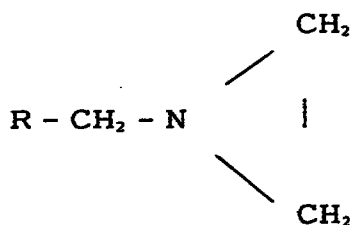
Example 3 : Isocyanates and polyisocyanates, general formula



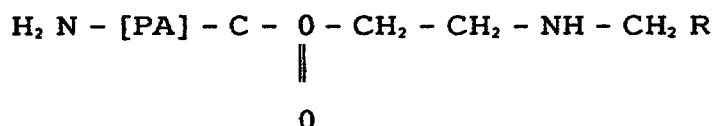
Where R may include one or more isocyanate symbols reacting with the heat fusible polyamide to give mono, di or tri dimensional polymers of the following type :



Example 4 : Aziridine and polyaziridine, general formula



Where R may include one or more aziridine symbols reacting with the acid function of the heat fusible polyamide to give mono, di or tri dimensional polymers of the following type :

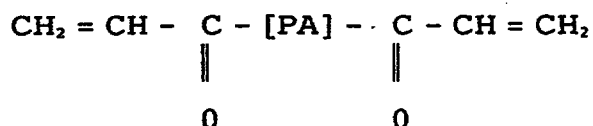


As a variant, in place of the polyamide, it is possible to also use modified polyamides comprising highly reactive sites as the heat fusible material.

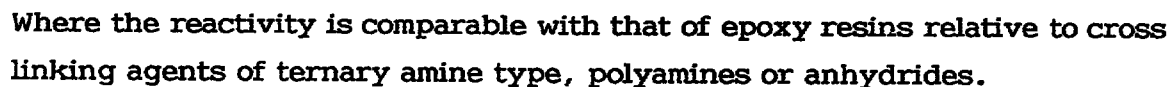
The preferred composition of the reactive material is then as follows :

- 20% of polyfunctional aziridine
- 10% of acrylic thickener
- 0.5% of 10% ammonia
- 69.5% of water with a pH between 7 and 9

Example 5 : Polyamides, vinylic groups, general formula :



Which, in the presence of peroxides or photo initiators may give new polydimensional macro molecules.



The invention also concerns a method of producing a heat fusible textile for stiffening in which spots of a heat fusible material, more particularly, a polymer based material are distributed, in particular, in the form of powder or a paste, on one of the faces of a textile substrate, woven, knitted or non woven, characterised in that the heat fusible material is combined with a means, basically chemical, in particular, comprising at least one reactive material and at least one reactive means which is a contributor of heat and/or UV irradiation and/or electronic bombardment, in order to provide a reaction between the reactive material and the heat fusible material, at least partially modifying the chemical structure of the heat fusible material.

In accordance with a possible variant, the reaction for modification of the heat fusible material is carried out before distributing the spots of heat fusible material on the substrate.

In accordance with another possible variant, the reaction for modification of the heat fusible material is carried out after having distributed the spots of heat fusible material on the substrate.

For example, the reactive material is first combined with the substrate, then with the heat fusible material. Or, again, the heat fusible material is first combined with the substrate, then with the reactive material.

In accordance with an improvement in the invention, following the reaction for modification of the heat fusible material, a thermohardening polymer is combined with the heat fusible product.

In accordance with a possible variant, the heat fusible material and the reactive material are combined on the same face of the substrate.

In accordance with another possible variant, the heat fusible material and the reactive material are combined on the two opposite faces of the substrate.

Therefore, in accordance with a possible method of producing the invention, the reactive material is first combined with the substrate, in particular, by sizing or deposition, using a suspension in a foam, then the spots of heat fusible material are deposited on the substrate, in particular, by coating.

In accordance with another possible method of production, the spots of heat fusible material are first deposited on the substrate, in particular, by coating, then the reactive material is combined with the substrate, in particular, by vaporisation, a smoothing method or contact.

Five methods of producing the invention will now be described in more detail.

In accordance with a first method of production (saturated solution with chemical modification following coating), soluble reactive materials in water or a single solvent (alcohol, chlorinated solvent, etc.) are used. The substrate is treated with the reactive material, in the presence of a reaction catalyst, before deposition of the spots of heat fusible material, using any priming technique, in particular, sizing or an extraction method. Following this, the spots of heat fusible material are deposited.

The reaction for modification of the chemical structure of the heat fusible material is initiated using a suitable reactive means, such as, heat. The nature and scale of this reactive means are determined in accordance with simple operations known to persons experienced in this field, in order to comply with the following requirements : permit at least initiation of the reaction, not permit self cross linking of the reactive material, not permit degradation of the heat fusible material and the substrate.

In accordance with a second method of producing the invention (vaporisation),

a mist comprising a solution of the reactive material is vaporised or sprayed on the face of the substrate opposite to that where the spots of heat fusible material have already been deposited. This method of production has the advantage of limiting the level of reactive material deposited on the substrate and of directing the reactive material towards the heat fusible material through the holes or perforations in the substrate.

In accordance with the third method of production, the heat fusible material and the reactive material are thoroughly mixed and the mixture is then deposited on one of the faces of the substrate. The chemical reaction for modification is initiated using a reactive means, such as, heat treatment, UV irradiation or electronic bombardment.

In the case of the variant where the reactive means comprises a heat treatment, the substrate coated with the mixture of heat fusible material and reactive material passes over a roll heated to a temperature of 110°C to 180°C, for a period of time necessary to permit initiation of the reaction but not cross linking of the reactive material or degradation of the heat fusible material or the substrate.

In the case of the variant using electronic bombardment, a photo inhibitor agent is added to the mixture comprising the heat fusible material and the reactive material in order to limit the propagation of the chemical reaction for modification. Application of the method consists of passing the substrate, coated with the mixture, in front of a photonic or electronic source situated on the side of the uncoated face of the substrate, so that the particles preferentially bombard those zones which require this treatment, that is, the holes or perforations in the substrate, relative to the heat fusible material. The period of time for this bombardment is determined by means of simple operations known to persons experienced in this field, depending on the power of the source of radiation, the nature of the substrate and the heat fusible material/reactive material/photo inhibitor agent ratios.

In accordance with a fourth method of producing the invention, the substrate is first coated with the heat fusible material to which is mixed the reactive

material. Following this, the reactive means permitting the reaction for modification is introduced, in particular, as described for the third method of production, until complete cross linking of the coated heat fusible material occurs. Following this, a second coat is applied to the first coat, using the unmodified heat fusible material. This method of production is different to the known technique for coating two totally different heat fusible materials. It has the advantage of facilitating the application of the heat fusible product by the garment manufacturer.

In accordance with a fifth method of production, a coating of heat fusible material, in the form of spots, is applied to a non adherent belt, for example, perfluorinated or silicon treated. This application is carried out using a rotary frame.

The heat fusible material, initially dispersed in aqueous form or dissolved in a solvent, is dried. This drying stage is achieved by passing the silicon treated belt through an oven maintained at an approximate temperature of 160°C. This evaporates the water or solvent and permits a uniform melt point to be obtained for the heat fusible polymer.

On leaving the oven, a controlled quantity of reactive material is deposited on the surface of the heat fusible spots, using a smoothing roll.

The textile substrate is then applied to the upper surface of the spots and the assembly is passed under a calender in order to transfer all the spots onto the textile substrate.

The heat fusible spots for the textile substrate are then coated with an intermediate layer of reactive material.

This is passed through an oven maintained at a temperature of between 110°C and 130°C in order that the reactive material may partially react with the heat fusible polymer.

Other methods of producing the invention may also be considered : deposition

of the reactive material in the form of a foam, on one or other of the faces of the substrate, before or after coating with the heat fusible material; smoothing using a plain or perforated roll before depositing the reactive material on one or other of the faces of the substrate; smoothing using a plain roll covered or not covered with a silicon rubber coated with the reactive material; combing one or other of the faces of the substrate using bristles impregnated with the reactive material; deposition of drops of reactive material solution immediately above and on the face opposite to that where the material has been deposited.



CLAIMS

1. Heat fusible textile for stiffening comprising, on the one hand, a textile substrate woven, knitted or non woven and, on the other hand, spots of a single component heat fusible material distributed on one of the outer faces of the substrate, more particularly, a polymer based material, characterised in that it comprises at least one reactive material having the property of reacting with a part of the heat fusible material under the effects of least one reactive means which is a contributor of heat and/or UV irradiation and/or electronic bombardment and which initiates, assures or assists in this reaction in order to partially modify the chemical structure of the heat fusible material in order to prevent the heat fusible material bonding through the substrate under the effects of the heat, pressure or steam.
2. Heat fusible textile for stiffening in accordance with claim 1, characterised in that the reactive material belongs to the category of aminoplastic thermohardening products, in particular, urea formaldehydes or melamine formaldehydes and that the reactive means is used in the presence of a mixture comprising at least one acid catalyst or an ammonium salt or a magnesium salt.
3. Heat fusible textile for stiffening in accordance with claim 1, characterised in that the reactive material belongs to the category comprising single molecules or polymers with at least one isocyanate function, blocked or not blocked and that the reactive means is used in the presence of an alkaline catalyst.
4. Heat fusible textile for stiffening in accordance with claim 1, characterised in that the reactive material belongs to the category comprising single molecules for polymers with at least one aziridine function and that the reactive means is used in the presence of a basic catalyst.
5. Heat fusible textile for stiffening in accordance with claim 1, characterised in that the reactive material belongs to the category of polymers with at least



one reactive chemical function.

6. Heat fusible textile for stiffening in accordance with claim 5, characterised in that the reactive chemical function is an epoxy function and that the reactive means for the reaction for cross linking of the heat fusible polymer and the modified polymer with an epoxy reactive function is placed in contact with the molecules of a ternary amine and/or a polyamide and/or an anhydride.

7. Heat fusible textile for stiffening in accordance with claim 5, characterised in that the reactive chemical function is a vinylic function and that the reactive means for the reaction for cross linking of the heat fusible polymer and the modified polymer with a vinylic reactive function is that products in the category of peroxides are placed in contact with heat.

8. Heat fusible textile for stiffening in accordance with claim 5, characterised in that the reactive chemical function is a vinylic function and that the reactive means for the reaction for cross linking of the modified polymer with a reactive vinylic function is that photo-initiator products are placed in contact with UV irradiation.

9. Heat fusible textile for stiffening in accordance with claim 8, characterised in that at least one photo-inhibitor agent is associated with the reactive means in order to limit the reaction for cross linking.

10. Heat fusible textile for stiffening in accordance with any one of claims 1 to 9, characterised in that it is associated with a thermohardening polymer following a chemical reaction.

11. Heat fusible textile for stiffening in accordance with any one of claims 1 to 10, characterised in that the heat fusible material comprises a polymer which belongs to the category of copolyamides, copolyesters, polyethylenes, polyethylene copolymers, polyurethanes or polyvinyl chlorides.

12. Heat fusible textile for stiffening in accordance with any one of claims 1 to 11, characterised in that the heat fusible material with a modified structure is



either a thermoplastic polymer with physico-chemical properties, in particular, flow, viscosity, melt temperature, different to those of the unmodified heat fusible material or a non fusible thermohardening polymer.

13. Method for producing a heat fusible textile for stiffening in which spots of a heat fusible single component material, in particular, a polymer based material, is distributed over one of the faces of a textile substrate, woven, knitted or non woven, characterised in that at least one reactive material and at least one reactive means which is a contributor of heat and/or UV irradiation and/or electronic bombardment is associated with the heat fusible material to provide a reaction between the reactive material and the heat fusible material, modifying the chemical structure of one part of the heat fusible material in contact with the textile substrate in order to prevent the heat fusible material bonding through the substrate when in use.

14. Method in accordance with claim 13, characterised in that the heat fusible product is associated with a thermohardening polymer following the reaction for modification of the heat fusible material.

15. Method in accordance with any one of claims 13 and 14, characterised in that the reactive material is first associated with the substrate, by sizing or deposition, by means of a suspension in a foam, the spots of heat fusible material then being deposited on the substrate by coating.

16. Method in accordance with any one of claims 13 and 14, characterised in that the spots of heat fusible material are first deposited on the substrate by coating, the reactive material then being associated by vaporisation, smoothing or contact.

17. Method in accordance with claim 13, characterised in that the heat fusible material is deposited by coating, in the form of spots on a non adherent belt by means of a rotary frame, the said non adherent belt being silicon treated and passed through an oven at 160°C in order to dry the heat fusible material, a controlled quantity of reactive material being deposited by a smoothing roll on the heat fusible spots, the textile substrate then being applied to the upper



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surface of the spots and the assembly being passed under a calender in order to transfer the spots to the textile, the assembly being passed through an oven at a temperature of between 110°C and 130°C in order to permit a partial reaction between the heat fusible material and the reactive material.