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HEAT-TRANSFERS AND METHOD OF USING SAME

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FIG. 1.

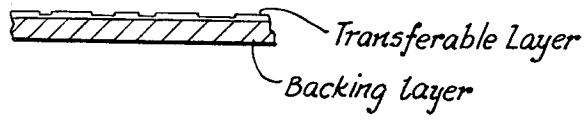
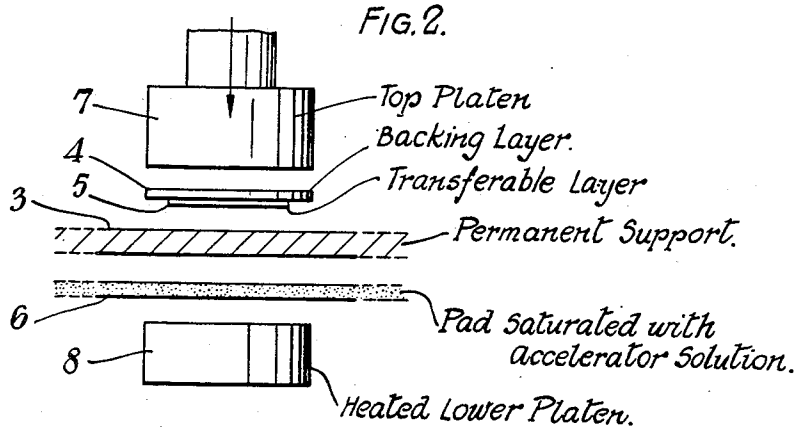


FIG. 2.



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HEAT-TRANSFER AND METHOD OF USING SAME

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18 Claims. (Cl. 154—95)

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This invention relates to heat-transfers, i. e. transfer materials consisting of a temporary support carrying a transferable layer or design on its surface, such layer or design being capable of transfer from the temporary support to a permanent support, e. g. fabric, by the application of heat and at least a slight pressure.

Various methods have been proposed for the production of heat-transfers, and generally it can be said that the best results are obtained by employing transfer compositions containing a condensation product of a thermosetting resin which is capable of being converted into the insoluble and infusible state by the application of heat. In these methods a temporary support, usually paper, carries on its surface the layer or design formed by the condensation product (which may contain pigments, colouring matters, and the like) and the design is transferred by placing the transfer face down on the textile material, applying water by convenient means to the back of the temporary support (such as by covering it with a moist cloth), and pressing the assembly firmly with an iron hot enough to transform part of the water into steam. In this way the transferable layer is caused to separate from the temporary support and become secured to the textile fabric, but only the continued application of heat converts the condensation product into the insoluble and infusible state and renders it fast to repeated laundering with soap and alkali at the temperature of boiling water, and to dry-cleaning with white spirit, trichlorethylene, or other commonly employed solvents.

It will be appreciated that, with these existing methods, either a rather prolonged time is required in the pressing operation in order to obtain satisfactory resistance to laundering or dry-cleaning (which renders the methods impracticable for mechanical application), or this resistance has to be sacrificed to a large extent.

In some cases it is important that the transferred design should have a higher resistance to laundering or dry-cleaning, e. g. where the design is a name or trade-mark applied to linen, sheets and towels owned by hotels and shipping companies, and overalls employed by multiple stores. In order to obtain transferred designs of sufficiently high resistance the time required in the pressing operation is approximately 25 seconds per article, and a hand iron is usually employed in the process.

Where, on the other hand, heat-transfers have to be applied to hosiery and other knitted goods, the transfer operations, to be economical, have

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to be carried out in rapid succession using mechanical means, and the pressing time which can be allowed for each article is comparatively short. As a consequence, these mechanically applied heat-transfers suffer from the disadvantage that the designs produced in this way are not resistant to laundering or dry-cleaning and they are, as a rule, wholly or partly removed from the articles during their first cleansing.

It is an object of the present invention to overcome the foregoing difficulties and to produce heat-transfers which are capable of being applied at an economical speed, which lends itself to a mechanisation of the process, and which yield transferred designs which are highly resistant to laundering and dry-cleaning.

The foregoing object is achieved according to the present invention by employing, as the composition forming the basis of the transferable layer or design, a blend of 50 to 95% by weight solvent-soluble melamine-aldehyde resin and 5 to 50% by weight solvent-soluble alkyd resin, both being thermosetting resins in the solvent-soluble state, convertible to an insoluble and infusible form by application of heat and pressure.

It has been found that melamine-aldehyde type resins are alone not entirely satisfactory as media for the transfer material since they harden relatively slowly on application of heat and pressure. Alkyd resins, on the other hand, are also not entirely satisfactory when used alone since, though they harden rapidly on application of heat and pressure, the transfers obtained by their use have not a sufficient colour-fastness. By using the two resins together, however, it has been found that the transfer material hardens rapidly under heat and pressure to yield a transfer which is highly resistant to laundering and dry-cleaning, as well as to the mechanical stresses to which it is subjected in the course of such cleaning operations, and which is of very good colour-fastness.

In regard to the melamine-aldehyde resin employed, it is to be observed that though such resins may be obtained using various aldehydes, the preferred resins according to the present invention are those obtained by condensing melamines with formaldehyde. Resins from substituted melamines, e. g. alkylated melamine formaldehyde resins, may also be usefully employed.

The alkyd type resin may be any resin formed by the condensation of polyhydric alcohol with a polybasic acid, and, in particular, the glyceryl

phthalate resins sold under the registered trademark "Glyptal" and the oil-modified alkyd resins, are suitable.

The composition may contain pigments, dyestuffs or other materials adapted to create the required visual impression in the transferred layer or design. In formulating the composition the resins are preferably dissolved in appropriate solvents and the solutions obtained then mixed together. For example, the melamine-aldehyde resin may be dissolved in butyl alcohol and the alkyd resins dissolved in xylol. The pigments or dyestuffs or other materials which are to be added may be included in either solution or in the mixed solution. The concentration of the ingredients is adjusted to achieve a consistency in the composition, such that it may readily be applied by any of the well-known reproduction methods such as silk-screening, printing, roller coating, and the like, to a temporary support such as paper. On evaporation of the solvents the composition sets on the paper in the required design.

It is also possible to include in the composition a catalyst which will serve to accelerate the rate at which the composition hardens under heat and pressure, but this is undesirable if the compositions are to be kept for any substantial length of time before actually being used in a transfer operation since the accelerator tends in many cases to cause a slow hardening of the composition to take place on keeping even without the application of heat and pressure. If this happens the transferable layer may become difficult or impossible to transfer.

According to the preferred form of the present invention, therefore, an accelerator for the hardening of the composition is applied to the transfer material immediately before or during the actual transfer operation. Generally speaking salts of strong acids with weak bases and also organic acids and esters thereof serve to act as accelerators and it is convenient, therefore, to apply these salts or acids in the form of dilute solutions or dispersions to the transfer material or the fabric immediately preceding the transfer operation. The accelerator is thus only brought into play when it is actually required to accelerate the hardening of the composition and in this way a very rapid hardening may be achieved without the danger of a slow hardening in the transfer material itself during its shelf life. The accelerators include ammonium sulphate, sodium bisulphate, zinc sulphate, aluminium sulphate, ammonium chloride, formic acid, acetic acid, oxalic acid, benzoic acid, ethyl hydrogen-phosphate, dioctyl succinate, trimethylamine hydrochloride.

Whereas with existing methods it is usual to place the fabric on a supporting table, place the transfer on the fabric with the transferable layer in contact with the fabric, lay over the transfer material a piece of cloth soaked in water, and apply heat and pressure, e. g. by means of a hot iron, to the surface of the moist cloth, an alteration of this order is preferred in the present invention in order to bring the accelerator into play. This alteration consists of applying heat through the medium of a pad moistened with accelerator solution to the reverse side of the fabric and placing the transfer so that its transferable layer is directed towards the source of heat. It is immaterial as to whether the heat is applied from above or below, or from both directions, as long as the various layers are arranged in this order. The assembly should, of course, be held together under some pressure during the transfer operation.

The preferred method is illustrated more particularly in the accompanying drawings, in which

Figure 1 illustrates, in section, a backing layer to which a transferable layer has been applied;

Figure 2 is a side elevation showing simple equipment for applying the transferable layer to the permanent support.

Two forms of apparatus for applying the transfers are shown by way of example on Figures 1 and 2 of the drawings, in which the permanent support to which the transfer is to be applied is shown at 3. The transfer comprises a backing 4 and a transferable layer 5. A pad of absorbent material is shown at 6, this pad being moistened with the accelerator solution, and it will be observed that it is placed on the opposite side of the permanent support to the transfer. The application of the transfer is effected by upper and lower platens 7, 8 respectively and it will be noted that preferably the platen 8 is heated while the platen 7 may not be heated or it may be heated to a lower temperature than the platen 8. After the application of heat and pressure by the platens 7 and 8 in the manner above described for a short period of "dwell" the platens are separated and the backing layer 4 removed. The support 3, with the transfer layer 5 firmly fixed thereto and converted into the insoluble and infusible state, can be removed from the apparatus.

The arrangements just described have been found to yield appreciably better results and though the reason for the improvement resulting from this technique remains uncertain, and the applicant is not to be regarded as being restricted to any theory in this matter, it is believed that the improvement is due either to the fact that the heat reaches the transferable layer together with the accelerator or alternatively (or in addition) because the transfer is in a direction towards the source of heat and pressure rather than away from it. Thus the side of the transferable layer which is to become intimately associated with the textile fabric is the side which is reached first by the applied heat and this may cause it to melt temporarily and adhere very firmly to the fabric.

By reason of the improvements which may be effected in accordance with the present invention, it becomes possible to apply heat-transfers, manufactured in accordance with this invention, by a rapidly operating transfer machine. The actual time required for a satisfactory transfer will vary with the particular blend of resins employed and with the particular accelerator used, but it has been found that transfer may be effected by single stage heat pressing operations lasting only ½ to 5 seconds each.

The duration of the heat pressing treatment will vary with the temperature employed. Generally a temperature of at least 120° C. is employed and whereas, using that temperature, a pressing time of 8 seconds is satisfactory, this may be reduced to 2 seconds by increasing the temperature to 160° C., other factors remaining the same. The pressure required varies with the thickness and type of material to which the design is transferred. A pressure of 4 to 5 lbs. per square inch is suitable for a smooth thin material, and a thicker rougher material, such as woollen fabric, may require 15 to 20 lbs. per square inch pressure.

One of the advantages to be derived from the present invention is that designs can be produced

on a variety of textile fabrics having the appearance of garment labels. These labels, which are used in the making-up of coats, suits, ladies' blouses, shirts, neckties, underwear and the like, usually consist of a cotton, silk or artificial silk fabric with a woven or printed design and they are attached to the garments by sewing. This sewing-on does not usually form a special operation but is carried out during some stage in the making-up of the garments. It follows that, if the conventional garment label is to be replaced by a heat-transfer design, the latter must be capable of being transferred quickly and to withstand all laundering and dry-cleaning operations to which the garments are normally subjected.

The following examples will serve to illustrate the invention:

Example I

48 parts by weight of 60% by weight solution of butylated melamine-formaldehyde resin in butanol are mixed with 16 parts by weight of a 60% by weight solution of a non-drying castor-oil-modified alkyd condensation product (acid value 10 to 15) in xylol. To the mixture are added 3 parts by weight of the aniline pigment known as Irgalite PRR, and the whole thoroughly dispersed on a triple roll mill. The resulting printing ink is applied by any of the usual printing techniques onto paper, and the paper dried at a moderate temperature. The transfer paper, thus prepared, is placed on a support with the design facing upwards, and white cotton fabric is placed on top. A pad moistened with a 10% solution of ammonium sulphate in water is placed on the fabric. On subjecting the assembly to a temperature of 150° C. and a pressure of 15 lbs. per square inch for 5 seconds, the design is transferred from the paper on to the fabric and very little of the printing ink remains on the paper base. On boiling the fabric carrying the transferred design for 30 minutes in an aqueous solution containing 1% by weight of soap and 0.5% by weight of sodium carbonate, the brilliance of the colour is unaffected, there is no bleeding of the colour into the parts of the fabric surrounding the transfer, and the wash water is unstained. The boiling can be repeated a number of times without showing any effect on the transfer.

Example II

A mixture is prepared from 16 parts by weight of a 60% by weight solution of butylated melamine-formaldehyde resin in butanol and 1 part by weight of a 60% by weight solution of a non-drying castor-oil-modified alkyd in xylol. To half of this mixture is added 5% by weight of the aniline pigment known as Monastral Fast Blue L. B. S. and to the reset 6.5% by weight of titanium dioxide, and both inks are thoroughly ground. The blue printing ink is printed onto paper to form a design and dried. The white printing ink is then applied over the whole surface of the paper bearing the blue design, e. g. by roller coating, and dried. The paper carrying the printed transfer is cut to the size of a garment label and placed on a support with the design facing upwards. A striped fabric consisting of a blend of viscose and cellulose acetate yarns is placed over the design and an absorbent fabric or paper moistened with a 5% by weight mixture of mono-octyl succinate and 95% by weight methylated spirit is placed on top. The assembled layers are then subjected to a temperature of 150° C. applied to the absorbent fabric or paper and to a pressure of 15 lbs. per square inch for 5 seconds in order to transfer the design from the paper support to the fabric. The appearance of a garment label is created by the fact that the white print forms a background by obliterating the striped pattern of the fabric, with the blue printing appearing on the face of it. The fastness and brilliance of the colours of the transferred layer and design are not affected in any way by repeated dry-cleaning with trichlorethylene.

Example III

A mixture is prepared of 10 parts of a 60% by weight solution of a butylated melamine-formaldehyde resin in butanol, 10 parts of 60% by weight solution of a non-drying castor-oil-modified alkyd resin in xylol, 11.5 parts by weight of benzyl alcohol (serving as high boiling solvent to maintain fluidity) and 18.5 parts by weight of titanium dioxide. The whole is thoroughly ground and the resulting mixture printed on to paper and dried. The transfer so produced is placed on a support with the design facing upwards and covered with a piece of woolen fabric. Over this is placed an absorbent fabric or paper moistened with a 10% aqueous solution of formic acid, and the whole assembly subjected to a pressure of 15 lbs. per square inch and a temperature of 150° C., applied to the absorbent fabric or paper, for 5 seconds. The design is thereby transferred from the paper to the fabric and is unaffected by repeated washing or dry-cleaning.

I claim:

1. A heat transfer material comprising a temporary support carrying a transferable layer on its surface, such layer being capable of transfer from the temporary support to a permanent support by the application of heat and at least a slight pressure, the said transferable layer consisting essentially of a blend of 50–95% by weight melamine-aldehyde resin and 50–5% by weight alkyd resin both said resins being thermosetting resins in the solvent-soluble state convertible to an insoluble and infusible form by the said application of heat and pressure.

2. A heat transfer material comprising a temporary support carrying a transferable layer on its surface, such layer being capable of transfer from the temporary support to a permanent support by the application of heat and at least a slight pressure, the said transferable layer consisting essentially of a blend of 50–95% by weight melamine-formaldehyde resin and 50–5% by weight alkyd resin both said resins being thermosetting resins in the solvent-soluble state convertible to an insoluble and infusible form by the said application of heat and pressure.

3. A heat transfer material comprising a temporary support carrying a transferable layer on its surface, such layer being capable of transfer from the temporary support to a permanent support by the application of heat and at least a slight pressure, the said transferable layer consisting essentially of a blend of 50–95% by weight melamine-aldehyde resin and 50–5% by weight oil-modified alkyd resin both said resins being thermosetting resins in the solvent-soluble state convertible to an insoluble and infusible form by the said application of heat and pressure.

4. A heat transfer material comprising a temporary support carrying a transferable layer on its surface, such layer being capable of transfer from the temporary support to a permanent support by the application of heat and at least a slight pressure, the said transferable layer con-

sisting essentially of a blend of 50–95% by weight melamine-formaldehyde resin and 50–5% by weight oil-modified alkyd resin both said resins being thermosetting resins in the solvent-soluble state convertible to an insoluble and infusible form by the said application of heat and pressure.

5. A heat transfer material comprising a temporary support carrying a transferable layer on its surface, such layer being capable of transfer from the temporary support to a permanent support by the application of heat and at least a slight pressure, the said transferable layer consisting essentially of a blend of 50–95% by weight butylated melamine-formaldehyde resin and 50–5% by weight castor-oil-modified alkyd resin both said resins being thermosetting resins in the solvent-soluble state convertible to an insoluble and infusible form by the said application of heat and pressure.

6. A heat transfer material comprising a temporary support carrying a transferable layer on its surface, such layer being capable of transfer from the temporary support to a permanent support by the application of heat and at least a slight pressure, the said transferable layer consisting essentially of a blend of 50–95% by weight melamine-aldehyde resin and 50–5% by weight alkyd resin, the said layer further containing colouring material both said resins being thermosetting resins in the solvent-soluble state convertible to an insoluble and infusible form by the said application of heat and pressure.

7. A heat transfer material comprising a temporary support carrying a transferable layer on its surface, such layer being capable of transfer from the temporary support to a permanent support by the application of heat and at least a slight pressure, the said transferable layer consisting essentially of a blend of 50–95% by weight melamine-formaldehyde resin and 50–5% by weight oil-modified alkyd resin, the said layer further containing colouring material both said resins being thermosetting resins in the solvent-soluble state convertible to an insoluble and infusible form by the said application of heat and pressure.

8. A heat transfer material comprising a temporary support carrying a transferable layer on its surface, such layer being capable of transfer from the temporary support to a permanent support by the application of heat and at least a slight pressure, the said transferable layer consisting essentially of a blend of 50–95% by weight butylated melamine-formaldehyde resin and 50–5% by weight castor-oil-modified alkyd resin, the said layer further containing colouring material both said resins being thermosetting resins in the solvent-soluble state convertible to an insoluble and infusible form by the said application of heat and pressure.

9. A heat transfer material comprising a temporary support carrying a transferable layer on its surface, such layer being capable of transfer from the temporary support to a permanent support by the application of heat and at least a slight pressure, the said transferable layer consisting essentially of a blend of 50–95% by weight melamine-aldehyde resin and 50–5% by weight alkyd resin, the said layer further containing colouring material and being discontinuous and in the form of a design both said resins being thermosetting resins in the solvent-soluble state convertible to an insoluble and infusible form by the said application of heat and pressure.

10. A heat transfer material comprising a temporary support carrying a transferable layer on its surface, such layer being capable of transfer from the temporary support to a permanent support by the application of heat and at least a slight pressure, the said transferable layer consisting essentially of a blend of 50–95% by weight butylated melamine-formaldehyde resin and 50–5% by weight castor-oil-modified alkyd resin, the said layer further containing colouring material and being discontinuous and in the form of a design both said resins being thermosetting resins in the solvent-soluble state convertible to an insoluble and infusible form by the said application of heat and pressure.

11. A method of applying a heat transfer consisting of a temporary support carrying a transferable layer on its surface, such layer consisting essentially of a blend of 50–95% by weight melamine-aldehyde resin and 50–5% by weight alkyd resin, both said resins being thermosetting resins in the solvent-soluble form, which comprises bringing the said layer into contact with a permanent support, applying heat and at least slight pressure thereto to effect the transfer of the said layer to said permanent support and the conversion of the transferred layer into an insoluble and infusible form on the permanent support.

12. A method of applying a heat transfer according to claim 11 including the step of simultaneously applying an accelerator for assisting the hardening of the said blend of resins.

13. A method of applying a heat transfer consisting of a temporary support carrying a transferable layer on its surface, such layer consisting essentially of a blend of 50–95% by weight melamine-aldehyde resin and 50–5% by weight alkyd resin, both said resins being thermosetting resins in the solvent-soluble form, which comprises assembling the said heat transfer with a permanent support such that the said layer is in contact with one side of the said permanent support, applying to the assembly an absorbent pad containing a solution of an accelerator for the hardening of the said resins, and applying heat and at least slight pressure to the assembly to effect the transfer of the said layer to the permanent support and the simultaneous hardening of the said layer by conversion of said resins into an insoluble and infusible state.

14. A method of applying a heat transfer consisting of a temporary support carrying a transferable layer on its surface, such layer consisting essentially of a blend of 50–95% by weight melamine-aldehyde resin and 50–5% by weight alkyd resin, both said resins being thermosetting resins in the solvent-soluble form, which comprises assembling the said heat transfer with a permanent support such that the said layer is in contact with one side of the said permanent support, applying to the other side of said permanent support an absorbent pad containing a solution of an accelerator for the hardening of the said resins, and applying heat and at least slight pressure to the assembly to effect the transfer of the said layer to the permanent support and the simultaneous hardening of the said layer by conversion of said resins into an insoluble and infusible state.

15. A method of applying a heat transfer consisting of a temporary support carrying a transferable layer on its surface, such layer consisting essentially of a blend of 50–95% by weight melamine-aldehyde resin and 50–5% by weight alkyd resin, both said resins being thermosetting resins in the solvent-soluble form, which comprises bringing the said layer into contact with a perma-

nent support, heating the assembly to 120–160° C. under slight pressure to effect the transfer of the said layer to said permanent support and simultaneously applying thereto an accelerator for the hardening of the said resins by conversion of said resins into an insoluble and infusible state.

16. A method of applying a heat transfer consisting of a temporary support carrying a transferable layer on its surface, such layer consisting essentially of a blend of 50–95% by weight melamine-aldehyde resin and 50–5% by weight alkyd resin, both said resins being thermosetting resins in the solvent-soluble form, which comprises bringing the said layer into contact with a permanent support, heating the assembly to 120–160° C. under a pressure of 4–20 lbs. per square inch to effect the transfer of the said layer to said permanent support and simultaneously applying thereto an accelerator for the hardening of the said resins by conversion of said resins into an insoluble and infusible state.

17. A method of applying a heat transfer consisting of a temporary support carrying a transferable layer on its surface, such layer consisting essentially of a blend of 50–95% by weight melamine-aldehyde resin and 50–5% by weight alkyd resin, both said resins being thermosetting resins in the solvent-soluble form, which comprises assembling the said heat transfer with a permanent support such that the said layer is in contact with one side of the said permanent support, applying to the assembly an absorbent pad containing a solution of an accelerator for the hardening of the said resins, and heating the assembly to 120–160° C. under a pressure of 4–20 lbs. per square inch to effect the transfer of the said layer to the permanent support and the simultaneous hardening of the said layer by conversion of said resins into an insoluble and infusible state.

18. A method of applying a heat transfer consisting of a temporary support carrying a transferable layer on its surface, such layer consisting essentially of a blend of 50–95% by weight melamine-aldehyde resin and 50–5% by weight alkyd resin, both said resins being thermosetting resins in the solvent-soluble form, which comprises assembling the said heat transfer with a permanent support such that the said layer is in contact with one side of the said permanent support, applying to the other side of said permanent support an absorbent pad containing a solution of an accelerator for the hardening of the said resins, and heating the assembly to 120–160° C. under a pressure of 4–20 lbs. per square inch to effect the transfer of the said layer to the permanent support and the simultaneous hardening of the said layer by conversion of said resins into an insoluble and infusible state.

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