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3,674,588

METHOD OF RECORDING AND TRANSFERRING DESIGN INDICIA

Jan Bernard Lambrechts, Antwerp, Belgium, assignor to
Agfa-Gevaert, Mortsel, Belgium

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ABSTRACT OF THE DISCLOSURE

A heat-sensitive recording layer of the type disclosed in USP 3,476,937 and formed essentially of a dispersion of solid hydrophobic thermoplastic polymer particles in a hydrophilic binder, after exposure to a heat pattern to reduce the water permeability in the heated areas of the layer and after washing to remove from the layer the areas thereof of unchanged water-solubility, leaving the heated area thereof in relief, is contacted with a receiving material and substantial mechanical pressure is applied to such remaining portions to cause them to adhere to the receiving material so that when the recording layer and the receiving material are separated by peeling, a stratum of the remaining portions of the recording layer remains adhered to the receiving material forming thereon a reproduction of the original heat pattern applied to the heat-sensitive recording layer. Either or both of the surfaces of the recording layer and receiving material can be provided with a weakly adhesive layer to facilitate transfer of the stratum of the recording layer to the receiving material.

This invention relates to information-recording materials and methods.

It has been proposed to record information by information-wise heating and/or subjecting to pressure a water-permeable recording layer which under the action of such heat and/or pressure becomes water-impermeable or less water-permeable. In consequence of the information-wise heating and/or pressurizing of the layer the information is therefore recorded in terms of a difference in the water-permeabilities of different areas of said recording layer.

The parts of the recording layer in the still water-permeable or most water-permeable areas can then be removed, leaving a record in relief.

The present invention is concerned with improvements and developments of recording methods of this type.

According to the present invention information is recorded by a method as above referred to and at least a stratum of the recording layer in those areas where it has been rendered water-impermeable or less water-permeable by the information-wise heating and/or pressurizing, is transferred by pressure to a receiving surface. The transfer pressure may be exerted by a stylus.

In order that this transfer can occur, the material to be transferred must adhere to the receiving surface sufficiently well to separate from the recording material when this material and the receiving surface are separated following the application of the transfer pressure. In order to promote this adhesion, either the recording material or the receiving surface or both, may bear a layer of ad-

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hesive material, e.g. a waxy adhesive. Suitable waxy adhesives are those referred to in United Kingdom patent specification 906,934 which also relates to the transfer of recorded information but is concerned with the transfer of letters or other indicia which have been printed onto a carrier sheet with a film-forming ink. Further examples of adhesives are given later in this specification.

The present invention also includes information-recording sets comprising (a) a recording material with a water-permeable recording layer which can be rendered water-impermeable or less water-permeable in any selected areas thereof by heating and/or subjecting the layer to pressure in such area, and (b) a receiving material to which, after subjection of a given area or areas of such recording layer to heat and/or pressure as aforesaid, at least a stratum of such recording layer, in that area or areas, will transfer if the materials are placed in contact and subjected to suitable pressure in the areas where the transfer is to take place.

Another factor of importance for the performance of the invention is of course the degree of adhesion between the information-wise heated and/or pressurized portions of the recording layer and the sheet, film or the like constituting the support for such layer. The adhesion should make possible a quick release of the recording layer under pressure against the receiving surface, but must be sufficiently strong to prevent premature separation of the said heated and/or pressurized portions, e.g. during the step of removing the still water-permeable or the more water-permeable parts of the recording layer, if such removal is necessary. A sufficient but not too strong adherence of the recording layer to its support can be realised by the use of an adhesive or subbing layer which holds the recording layer more strongly after such adhesive or subbing layer has been heated to a certain extent. By information-wise heating the recording material the change in the recording layer whereby it becomes water-impermeable or less water-permeable in the heated or most strongly heated areas is accompanied by a strengthening of the anchorage of the recording layer in those areas but not in the other areas. Instead of forming an adhesive or subbing layer in this way, the recording layer may be borne by a self-supporting layer or sheet which reacts to heat in the way described.

An important preferred feature of the invention is the use of a recording layer comprising a network of hydrophobic thermoplastic polymer particles, solid at room temperature, or comprising hydrophobic thermoplastic polymer particles dispersed in a continuous phase hydrophilic binder medium. Preferred recording materials with these features are described in Belgian patent specification 656,713, in the published Dutch Pat. application 6,606,719, and in copending application SN 421,861, filed Dec. 29, 1964, now USP 3,476,937, issued Nov. 4, 1969. The specifications of the said Belgian patent specification and of the said Dutch patent application should be read in conjunction herewith and are deemed to form part of the present disclosure.

When using a recording layer comprising hydrophobic thermoplastic polymer particles, a good but not too strong adhesion of the recording layer to the support in the areas which are information-wise heated and/or subjected to pressure can be achieved by applying the recording layer to an interlayer or self-supporting sheet composed of or comprising substance(s) having a melting or softening

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point lower than, equal to or not substantially higher than that of the hydrophobic thermoplastic particles contained in the hydrophilic binder of the recording layer. Preferably said interlayer or self-supporting sheet comprises a hydrophobic thermoplastic polymer or polymers having a softening or melting point lower than that of the hydrophobic thermoplastic polymer particles in the recording layer so that such thermoplastic substance(s) in the underlying layer can be softened by the heat to which that layer is exposed during information-wise heating of the recording layer. A certain content of wetting agent and/or hydrophilic binder may be incorporated in the interlayer or applied to the self-supporting sheet to provide a good anchorage. The interlayer preferably comprises a dispersion of thermoplastic polymer particles (latex) in a continuous phase, e.g. a hydrophilic binder, preferably a hydrophilic binder which is less soluble in water than the hydrophilic binder (if any) in the recording layer. Further information concerning suitable adhesive interlayers or self-supporting sheets for bearing the recording layer is given in the specifications filed in Belgian patent specification 692,422.

It is preferred to use a recording layer at least the greater part by volume of which is formed by a dispersion of particles wholly or mainly consisting of a hydrophobic thermoplastic polymeric material, solid at room temperature, in a hydrophilic binder, the weight ratio of the polymer particles to the binder being in excess of 1:1. It is also preferred for the recording layer to be normally water-soluble, i.e. a recording layer from which the non-heated or only slightly heated portions can be removed by a washing treatment after the layer has been information-wise heated.

In general, it is intended that the recording layer will contain pigment or dye so that a clearly "readable" record of the information exists when the still water-permeable portions of the recording layer have been removed following the information-wise heating and/or pressurizing. By the transfer of the remaining portions of the recording layer, or a stratum thereof, a likewise visible record is formed on the receiving surface.

Instead of removing the still water-permeable portions of the recording layer containing a dye or pigment, a "readable" record can be formed following the information-wise heating and/or pressurizing, by treatment with a bleaching solution or other substance which destroys or transforms the colour in the still water-permeable areas of the recording layer, i.e. in the areas into which the agent can penetrate during the treatment. It is also possible to form a pigment in situ in the recording material. Thus, a recording material can be used which, as described in the Dutch and Belgian patent specifications hereinbefore referred to and in the aforesaid corresponding United Kingdom specifications, comprises a light-sensitive ingredient such as a silver halide emulsion, from which a visible image-forming substance can be formed by exposure of the recording material to light. If such a recording material is record-wise irradiated with light, a visible image forms in the irradiated areas and if the recording layer is simultaneously or subsequently heated in those areas to render them water-impermeable or less water-permeable, the transfer of the image portions to the receiving surface can be achieved without previously removing substance from the recording layer in the other areas. These procedures constitute modification of the recording method hereinbefore defined and the invention includes this modification.

If the recording layer can be rendered selectively water-impermeable by record-wise subjecting it to pressure, the pressure can be exerted by mechanical means such as typewriter keys. The present invention is however mainly concerned with recording involving record-wise heating of the recording layer. Record-wise heating can be achieved by heat conduction from an original during contact of the recording material with the original while this is exposed

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to infrared radiation, provided the original has infrared-absorbing indicia. Certain preferred embodiments of the invention however use a recording material in which the recording layer or a layer in heat-conductive relationship therewith contains distributed radiation-absorbing substance so that the recording layer can be record-wise heated by record-wise exposing the recording material to radiation of sufficient intensity. The irradiation can be with infrared or other radiation which can be absorbed by the distributed substance and converted thereby to heat. Special importance attaches to the use of light-absorbing substances and record-wise exposure of the recording material to high-intensity light radiation (e.g. flash exposure). If the radiation absorbing substance is distributed over the whole area of the recording material the exposure to radiation must be a record-wise exposure but if the radiation-absorbing substance is distributed record-wise in the recording material, as in the case where this substance is formed in situ from a record-wise exposed light-sensitive ingredient, then the required record in terms of a difference in the water-permeabilities of different areas of the recording layer can be created by an overall non-differential irradiation of the recording material. In connection with these embodiments of the invention reference is made to the aforesaid Belgian and Dutch specifications and the corresponding United Kingdom patent specifications, and also to the Belgian patent specification 681,138, which discloses recording materials containing distributed substances which absorb light in a part only of the visible light spectrum.

According to an embodiment described in said published Dutch patent specification for recording and producing a copy of an original, an image-wise differential in water-solubility of the recording layer is utilised for removing the recording layer in the non-heated or insufficiently heated areas e.g. by washing away or degrading the hydrophilic binder. A copy of the original built up by coloured image portions left after the washing of the non-exposed portions is obtained.

So, a preferred method of recording and transferring indicia or half-tone designs according to the present invention contains the steps of:

- (a) providing a thermosensitive recording material that contains a heat-sensitive water-permeable layer, which by the action of heat becomes less permeable to water and less soluble in water and comprises for the greater part by volume a dispersion containing thermoplastic particles dispersed in a hydrophilic binder preferably in a weight ratio greater than 1:1.
- (b) heating the heat-sensitive layer in conformity with the indicia or design to be transferred whereby the heated portions become less soluble in water.
- (c) washing away only the non-heated portions of the recording layer.
- (d) bringing the heated portions of the recording layer in contact with a receptor material and applying substantial pressure by means of e.g. a stylus to the portions corresponding with the indicia selected to be transferred so that by peeling apart the recording layer and receptor sheet, a stratum of the recording layer corresponding with the pressed portions is left on the receptor sheet.

The support of the heat-sensitive recording material has to make possible a quick release of the recording layer by pressure and to possess a sufficient adherence to the recording layer to prevent total removal of the recording layer in the washing away step. As already mentioned, suitable adhesive or subbing layers for obtaining a sufficient but not too strong adherence to the support are described in the Belgian patent specification 692,422. Preferred supports are of the resin type e.g. polyethylene terephthalate.

Particulars about the type of thermoplastic particles and the hydrophilic binder wherein they are dispersed

can be found in the Belgian patent specifications 656,713 and 681,138. Preferably the heat-sensitive layer used in the present invention incorporates particles of hydrophobic thermoplastic polymeric material which is solid at room temperature (20° C.) and which have been applied as a latex. The hydrophilic binder is preferably soluble in water at room temperature, so that in view of this aim poly-N-vinyl-pyrrolidone is preferred.

As colouring material in the recording material, pigments or soluble dyes can be used, preferably in an amount sufficient to reach an optical density of at least 1. Preferably carbon black is incorporated into the recording layer when black prints have to be obtained. In order to obtain coloured prints, dyes or pigments absorbing the desired wavelength part of the visible spectrum are applied in the recording layer. For obtaining smudge-free transfer prints diffusion-fast pigments e.g. "Pigmosol dyes" ("Pigmosol" is a registered trademark of Badische Anilin- & Soda-Fabrik A.G. Ludwigshafen (Rhine), Germany, for organic pigment dyes which are mixed with a dispersing agent for aqueous medium), are used.

Either the recording material containing already the indicia or the receptor sheet may be provided with a waxy adhesive so that the transfer will occur more easily. Waxy adhesives suited for that purpose are described in the United Kingdom patent specification 906,934 and are mentioned in the examples of the present description of the invention. Other adhesives having pressure-sensitive properties are well known to those skilled in the art. In this respect reference is made particularly to the adhesives known as "paracons" described in the United States Patent Specification 2,443,613.

Heat recording wherein recording materials according to the present invention are used can proceed in different ways according to the method by which heat is supplied to the recording element.

According to a common heat-recording process the heat accumulated in the image areas of an original by infrared irradiation may be used to produce the necessary image differentiation in the heat-recording layer.

In another heat-recording technique the light-absorbing and heat-generating properties of substances dispersed or dissolved in the hydrophilic binder of the recording layer are used. By irradiating the recording layer containing substance(s) that absorb(s) copying light (infrared radiation and visible light, or visible light alone) and convert(s) that light radiation into heat, an internal image-wise heating effects the desired differentiation in water-absorption power and water-solubility of the recording layer.

According to a particular embodiment, an image of heat-absorbing material is produced in the interlayer or recording layer by means of light-sensitive silver halide contained in both or one of said layers. The said silver halide is image-wise exposed and developed. The silver image obtained acts as a heat-absorbing image for producing by an overall exposure to light, e.g. infrared radiation, the desired useful differentiation of water-solubility.

In the above embodiments transmission exposure or contact-exposure as well as reflex exposure can be applied. When applying a reflex exposure, the intensity of exposure, the concentration of coloured substances absorbing copying light, and the thermoplastic polymer particles present in the recording layer are chosen in such a way, that the heating resulting from the absorption of the light rays directed to the original and striking undifferentially the heat-sensitive layer causes practically no or only a slight loss of water-permeability and/or water-solubility in the heat-sensitive recording layer. In other words, the image-wise heat resulting from the image-wise reflected light must produce in the recording layer the practically useful differentiation in water-solubility. Reflex copying, however is not very interesting here, since due to the need of a partial transmittance of the recording layer no very dense transfer prints can be obtained.

When applying a transmission or contact printing proc-

ess however, the recording layer can have an optical density of at least 1 resulting from the coloured substance(s) to be transferred in the stratum of the recording layer.

According to a special embodiment light-absorbing substances that convert absorbed light into heat and which can be bleached or leached out over the whole area of the recording material, i.e. alike in the information-wise heated and in the non-heated areas, e.g. during the washing away of the water-soluble or most water-soluble portions of the recording layer, are used. If, together with said substance, pigments or dyes are incorporated which are not removed or bleached by the liquid treatment, dye images in any colour (e.g. also yellow) without dark or grey background (resulting from the light absorbing heat-generating dyes) can be produced (see our co-pending U.S. patent application No. 764,622 filed on even date herewith).

Multicolour images can be produced by transfer in register of coloured part images corresponding with the subtractive colours (cyan, magenta, yellow) of a multicoloured original.

Such a multicolour reproduction offers an interesting application in the field of printing correction known as "color proofing."

"Color proofing" materials serve to form a proof for submission to the printer or client to give an idea of a multicolour reproduction as will be produced by image-wise over-printing of three coloured inks (yellow, magenta, cyan) and black, printed at the strength normally used in practice. The proof obtained with a "color proofing" material allows to determine the necessary corrections of the internegatives used in preparing the etching resists and to adapt the exposure conditions.

In a method for preparing such a colour proof use can be made of a multicolour silver halide photographic material which is exposed through the screened black-and-white internegative transparencies which respectively correspond with the cyan, magenta, and yellow part images of a multicolour original. The difficulty associated with said method resides in finding the right colour couplers for forming dyes having an absorption spectrum practically identical to that of the printing dyes or pigments used. The method of the present invention offers a solution to that problem in that properly selected dyestuffs or pigments with the right absorption spectrum can be incorporated in non-migratory state into the heat-sensitive recording layer. The production of a multi-colour proof according to the present invention is realized by successively transferring in register heated non-washed away coloured portions (black, cyan, magenta, yellow) of four hydrophilic thermographic layers suited for water-solubility differentiation by heating and containing respectively a black, a cyan, a magenta and yellow pigment or pigment composition. The black toner can be a black or grey pigment e.g. carbon or dark-coloured metal particles, the sulphides and oxides thereof e.g. nickel, lead, silver, bismuth, lead dioxide, copper (II) oxide, and copper (II) sulphide. The black-toned material preferably contains carbon black in the heat-sensitive layer, which preferably is applied to a subbing or interlayer of the type described in the Belgian patent specification 692,422. The cyan, magenta and yellow coloured thermographic layers contain together with dark heat generating water-soluble dyes (see the United States patent application 764,622) a dye or pigment, which is resistant to diffusion and which has an absorption spectrum as close as possible to that of the colour of the printing dye selected for each printing step (cyan, magenta, yellow).

As is known, the magenta ink pigments have unwanted absorptions in the blue spectral region, and to a much less extent in the red; the magenta ink prints as if it were a true magenta ink plus yellow and a little cyan. Normally sufficient correction is obtained by reducing the

amount of yellow in proportion to the amount of magenta printed.

In color-proofing the correction must therefore be applied to the density or concentration of the yellow dye in the thermosensitive layer containing that dye.

The cyan ink pigments have unwanted absorptions in the blue and green spectral regions; the cyan ink prints as if it were a true cyan ink plus magenta and yellow. Correction can be made by reducing the amount of magenta in the magenta layer in proportion to the amount of cyan and by reducing the amount of yellow in the yellow layer in proportion to the amount of cyan in the cyan layer.

The yellow ink pigments normally approaches the "ideal" and no correction is necessary unless it is a specially "warm-ink" (orange yellow) in which case it may be desirable to strengthen the magenta printed in the yellow areas.

The black printer tends to have excess density in colour areas. This can be corrected by reducing the overall density of the black pigment and exposing the black toned thermosensitive layer in register through the three separate black-and-white screened internegatives respectively corresponding with the cyan, magenta, and yellow part images of the multicolour original.

Diffusion-resistant pigments suitable for use in the "color proofing" system of the invention are the already mentioned "Pigmosol" dyes (trade name). These pigment dyes are very resistant to light, heat, acidity, and alkalinity. They are insoluble in hydrophilic colloids e.g. gelatin and poly-N-vinyl pyrrolidone, which colloids are preferably used in thermosensitive layers intended for use in the washing away technique.

In order to produce very sharp images one has to prevent lateral diffusion of heat during the exposure. This can be realized by keeping the exposure time very short, preferably not exceeding 10^{-1} sec.

Suitable radiation sources producing copying light of high intensity in a very small lapse of time and which are very suitable for application with recording materials containing light-absorbing substances converting that light into heat are the so-called flash lamps. Good results are obtained with xenon gas discharge lamps, which can supply a light energy of 100 to 1000 watt. sec. in a time interval of 10^{-5} to 10^{-2} seconds. These flash lamps emit a greater part of energy as visible light than as infrared light. Details on copying apparatus containing such a discharge lamp can be found in the Belgian patent specification 664,868.

Self-evidently gas discharge lamps with a lower energy output can be used if the emitted energy is focused onto a relatively small heat-sensitive area. So, e.g., a gas discharge lamp with an energy output of 40 watt. sec. is suited for copying 6 cm. x 6 cm. and 6 cm. x 9 cm. originals on heat-sensitive materials as described in the present invention. For materials having an optical density of at least 1 resulting from the presence in the recording layer of light-absorbing substances, a light energy of at least 0.1 watt. sec. per sq. cm. will be required for the desired image differentiation. In practice an exposure of 0.3 watt. sec. per sq. cm. will provide satisfactory results. It is further self-explanatory that the exposure may be carried out progressively or intermittently. In other words the original may be scanned, e.g. by a high-intensity light spot rapidly line-wise scanning the original, or may be progressively exposed through a slit wherein, e.g. copying light of a tube-like radiation source is focused.

It is evident that the heat-sensitive recording material, before or during the creation of the image-wise heat differentiation, can be subjected to overall heating to a certain temperature below the temperature at which a substantial decrease in permeability for water or solubility in water takes place.

The following examples illustrate the present invention without, however, limiting it thereto.

EXAMPLE 1

A poly(ethylene terephthalate) support of 0.1 mm. thickness provided a subbing layer is coated with the following composition pro rata of 15 g. per sq. m.

5		G.
	40% aqueous dispersion of polyethylene having a particle size of 0.1μ , an average molecular weight of 2000, and a melting point between 95 and 110° C. -----	37.5
10	20% aqueous dispersion of the copolymer obtained from the mixture of 88% by weight of vinylidene chloride, 10% of N-butylmaleimide and 2% of itaconic acid -----	37.5
15	30% aqueous dispersion of silica with a particle size of 0.025μ -----	37.5
	Ethanol -----	80
	Water to make -----	1000

The coated layer was dried at 30° C. A thermo-sensitive layer comprising the following ingredients was applied thereto pro rata of 20 g. per sq. m.:

		G.
	40% aqueous dispersion of polyethylene as described above -----	86
25	20% aqueous solution of poly(N-vinyl pyrrolidone) -----	100
	16% carbon dispersion composed of 2% of poly (N-vinyl pyrrolidone) and 16% of carbon having a particle size less than 0.1μ -----	600
30	10% aqueous solution of Antarox B 290 dispersing agent sold by Antara Chemicals, a division of General Aniline and Film Corp. New York, USA -----	50
35	Water to make -----	1000

The resulting layer was dried at 30° C. The material formed was then brought in contact with a negative comprising indicia letters, figures, etc. and exposed by means of a xenon vapour discharge lamp of 1000 joule. The unexposed areas were washed away by means of a foam rubber sponge soaked with water. The positive indicia left were transferred to a receiving paper by rubbing the backside of the recording material by means of a pointed object.

EXAMPLE 2

A poly(ethylene terephthalate) support of 0.100 mm. thickness provided with a subbing layer was coated with the composition described in Example 1 pro rata of 15 g. per sq. m.

The coated layer was dried at 30° C. A thermosensitive layer comprising the following ingredients was applied thereto pro rata of 20 g./sq.m.

		G.
55	20% aqueous dispersion of polyethylene having an average molecular weight of 7000 and a melting point of 130° C. -----	172
	20% aqueous solution of poly-N-vinyl pyrrolidone -----	67
60	16% carbon dispersion as described in Example 1	600
	10% aqueous solution Antarox B 290 (trade name) -----	50
	Water to make -----	1000

The layer was dried at 30° C.

The resulting material was exposed and developed as described in Example 1. The positive black indicia left were transferred to a receiving paper by rubbing the backside of the recording material with a pointed object.

EXAMPLE 3

A cellulose triacetate support of 0.1 mm. thickness was coated with a subbing layer having the composition described in Example 1. A thermo-sensitive layer compris-

ing the following ingredients was applied thereto pro rata of 20 g./sq. m.:

	G.
20% aqueous dispersion of polyethylene having a molecular weight of 7000 μ and a melting point of 130° C. -----	172
20% aqueous solution of poly-N-vinyl pyrrolidone -----	100
16% carbon dispersion as described in Example 1. -----	600
10% aqueous solution of Antarox B 290 (trade name) -----	50
Water to make -----	1000

The coated layer was dried at 30° C.

The resulting material was exposed and developed as described in Example 1. The positive indicia left after the washing step were transferred to a receiving paper by rubbing the backside of the recording material by means of a pointed object.

EXAMPLE 4

A poly(ethylene terephthalate) support having a thickness of 0.1 mm. was coated with a subbing layer as described in Example 1. A thermo-sensitive layer comprising the following ingredients was applied thereto pro rata of 20 g./sq. m.:

	G.
20% aqueous dispersion of polyethylene containing a non-ionogenic wetting agent, the polyethylene having an average molecular weight of 7000 and a melting point of 130° C. -----	150
30% aqueous dispersion of polyethylene having an average molecular weight of 7000 and a melting point of 120 to 130° C. and containing an anionic wetting agent -----	15
16% carbon dispersion as described in Example 1 --	600
10% aqueous solution of Antarox B 290 (trade name) -----	50

The coated layer was dried at 30° C. The resulting material was exposed and developed as described in Example 1. The positive black indicia left after the washing step were transferred to a receiving paper by rubbing the backside with a pointed object.

EXAMPLE 5

A poly(ethylene terephthalate) support of 0.1 mm. thickness was provided with a subbing layer as described in Example 1 pro rata of 20 g. per sq. m. The coated layer was dried at 45° C. A thermo-sensitive layer comprising the following ingredients was applied thereto pro rata of 13 g. per sq. m.:

	G.
40% aqueous dispersion of polyethylene containing a non-ionogenic wetting agent and traces of an anionic wetting agent, the polyethylene having a particle size of 0.1 μ , an average molecular weight of 2000 and a melting point of 95 to 110° C. ---	195
20% aqueous solution of poly-N-vinyl pyrrolidone -----	90
Permanent Carmin FBB Colanyl Teig (a pigment sold by Farbwerke Hoechst A.G., Frankfurt/Main, Germany) -----	160
5% aqueous solution of Tergitol 4 dispersing agent (trade name for sodium tetradecyl sulphate sold by Union Carbide & Carbon Corporation, New York, N.Y., U.S.A. -----	45
Water to -----	1000

The coated layer was dried at 30° C.

The resulting thermo-sensitive material was exposed reflectographically while in contact with a positive line original in a common thermographic apparatus, e.g. a Thermofax apparatus type "Secretary" (trade name). The areas corresponding with the image areas were heated and become insoluble. The unheated portions were washed away with water, and the material was dried. A positive

purple image legible through the back of the recording material was obtained. The purple image portions were transferred to a receiving paper by rubbing the back of the recording material with a pointed object.

EXAMPLE 6

A poly(ethylene terephthalate) support having a thickness of 0.1 mm. was coated with a subbing layer having the following composition pro rata of 15 g./sq. m.:

	G.
40% aqueous dispersion of polyethylene containing a non-ionogenic wetting agent and traces of an anionic wetting agent, the polyethylene having a particle size of 0.1 μ , an average molecular weight of 2000 and a melting point of 95-110° C. ----	37.5
20% aqueous dispersion of polyethylacrylate with a particle size of 0.05 μ and containing as wetting agent the sodium salt of oleylmethyltauride ----	37.5
30% aqueous dispersion of silicon dioxide with a particle size of 0.025 μ -----	37.5
Ethanol -----	80
Water to -----	1000

The resulting layer was dried at 30° C. A thermo-sensitive layer comprising the following ingredients was applied thereto pro rata of 25 g./sq. m.:

	G.
20% aqueous dispersion of polyethylene having a molecular weight of 7000, a melting point of 130° C., and comprising a non-ionogenic wetting agent -----	100
30% aqueous dispersion of polyethylene having a molecular weight of 7000, a melting point of 120 to 130° C., and comprising an anionic wetting agent -----	48
16% carbon dispersion as described in Example 1 --	600
10% aqueous solution of Antarox B 290 (trade name) -----	50

The resulting layer was dried at 30° C.

The exposure and development steps were analogous to those described in Example 1. The positive black indicia left after the washing step were transferred to a receiving paper by rubbing the backside of the recording material by means of a pointed object.

EXAMPLE 7

For improving the transfer of the recording layer indicia, formed as described in Examples 1, 2 and 3, the recording layer indicia were coated with a subbing layer from a coating solution of 2.5% of co(n-butyl acrylate/vinyl acetate) (80/20) in acetone pro rata of 10 g. per sq. m.

EXAMPLE 8

For improving the transfer to the receiving paper of the recording layer indicia formed as described in the Examples 1, 2, 3 and 4 the recording layer indicia were coated with a subbing layer from a 2.5% solution in acetone of copoly(n-butyl acrylate/vinyl acetate) (80/20) pro rata of 10 g./sq. m. The coated layer was dried at 20 to 30° C.

EXAMPLE 9

Example 8 was repeated, with the modification however, that a 5% solution in acetone of poly(isobutyl methacrylate) was used for preparing the subbing layer.

I claim:

1. A process of reproduction by the transfer of selected portions of a developed heat-sensitive recording layer, said process containing the steps of:

(a) providing a thermosensitive recording material including a heat-sensitive water-permeable recording layer formed essentially of a dispersion of solid hydrophobic thermoplastic polymer particles in a hydrophilic binder in a weight ratio of at least about 1:1, said layer when subjected to heat becoming less permeable to water and less soluble in water,

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- (b) applying a heat pattern corresponding to the portions to be transferred to said heat-sensitive layer, whereby the heated portions become less soluble in water,
- (c) washing away the portions of the heat-sensitive layer of unchanged water-solubility,
- (d) contacting the remaining portions of the recording layer with a receiving material and applying substantial mechanical pressure to such portions so that by peeling apart the recording layer and receiving material a stratum of the recording layer corresponding with the pressed portions adheres to the receiving material.
2. A process according to claim 1, wherein the non-heated portions of the recording layer are removed by abrasion when wet with water.
3. A process according to claim 1, wherein the recording layer contains substances absorbing radiation in the range from visible light to infrared and said heat pattern is created internally of the layer by image-wise exposing the recording layer to such radiation which is transformed therein into heat.
4. A process according to claim 3, wherein the recording layer contains dispersed carbon particles in sufficient amount to impart to the layer an optical density of at least about 1.
5. A process according to claim 1, wherein the recording layer contains water-soluble dyes, which are removed from said layer by washing away the non-heated portions of the recording layer.
6. A process according to claim 1, wherein the said thermoplastic particles are applied from a latex.

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7. A process according to claim 1, wherein the hydrophilic binder present in the recording layer is soluble in water.
8. The process of claim 1 wherein said receiving material carries a layer of a weak adhesive which is brought into contact with the remaining portions of said recording layer.
9. The process of claim 8 wherein said adhesive is a waxy material.

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WILLIAM D. MARTIN, Primary Examiner

M. SOFOCLEOUS, Assistant Examiner

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