(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 314 205 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **88201709.8**

(51) Int. Cl.4: **B41J 31/00 , B41M 5/26**

(22) Date of filing: **17.07.85**

(30) Priority: **18.07.84 JP 147580/84**
21.08.84 JP 172382/84

(43) Date of publication of application:
03.05.89 Bulletin 89/18

(60) Publication number of the earlier application in accordance with Art.76 EPC: **0 169 705**

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI LU NL

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(54) Heat-sensitive transfer recording medium.

(57) A heat-sensitive transfer recording medium comprises a base film (2), a heat melting ink layer (3) provided on the under surface of the base film, and a conveyance improving layer (1) provided on the upper surface of the base film, the conveyance improving layer (1) comprising an ultraviolet ray-curable resin.

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HEAT-SENSITIVE TRANSFER RECORDING MEDIUM

This invention relates to a heat-sensitive transfer recording medium.

Heat-sensitive transfer recording systems have many advantages as compared with prior art impact recording systems, for example the heat-sensitive transfer recording system permits noiseless printing and the printed letters are clear, of high quality and highly durable. Heat-sensitive transfer recording systems have therefore recently been extensively developed and are now widely used for printers and typewriters.

The base material of prior art heat-sensitive transfer recording media was paper but since paper has poor humidity resistance and gives poor printed letter sharpness, there have been recently used film bases, especially of PET (polyethylene telephthalate). Among various suitable films, PET has a relatively high melting point. However, during printing, the surface temperature of the thermal printing heads reaches 300° C or higher and therefore, the so-called "stick" phenomenon is liable to occur, that is, the PET film is partly melted and fused to the thermal heads resulting in film movement past the heads being interrupted and at worst, being completely stopped to make printing impossible.

In order to improve film conveyance, it has been proposed to apply silicone or paraffin to the surface of the film or to form a heat resistant thermosetting resin layer, such as a urethane resin layer, or epoxy resin layer on the surface of the film. However, such countermeasures either cannot completely prevent "stick", or require prolonged heat treatment at high temperatures to cause curing and therefore, the working efficiency is very poor and the countermeasures are not useful in practice.

In addition, even when stick prevention is adequate, if film-shapeability of the coating material and adhesivity to the PET surface are poor, the coating material can be abraded off due to rubbing with the thermal heads and deposit on the thermal heads, resulting in formation of poor printed letters.

Another prior art method for improving the conveyance property is to use silicone resin, melamine resin or similar thermosetting resins for heat-sensitive paper and heat-sensitive transfer recording members, but this involves chemical reactions which are laborious; further the resulting coated recording medium suffers from curling.

The present invention seeks to provide a heat-sensitive transfer recording medium having a conveyance improving layer capable of preventing "stick", having a high film shapeability, not suffering from abrasion at the thermal heads and of high productivity and which is free from curling, and in which formation of the conveyance improving layer is simple to achieve.

According to the present invention, there is provided a heat-sensitive transfer recording medium comprising a base film, a heat melting ink layer provided on the under surface of the base film, and a conveyance improving layer provided on the upper surface of the base film, the conveyance improving layer comprising an ultraviolet ray-curable resin.

The accompanying drawing schematically shows a sectional view of a heat-sensitive transfer recording medium in accordance with the present invention.

Referring to the drawing, the heat-sensitive transfer recording medium is constituted by a heat melting ink layer 3, a base film 2 overlying the heat melting ink layer 3 and a conveyance improving layer 1 overlying the base film 2.

Various UV curable resins may be used without any particular limitation in the present invention. From the viewpoints of coating film strength and adhesion to the base film, there are preferably used for example polyester acrylates, polyurethane acrylates and epoxy acrylates. In particular, when PET is used as the base film, polyester acrylate is preferred with respect to adhesion.

For the purpose of controlling the viscosity upon applying the resin to the surface of the base film and for improving the physical properties after curing, a bifunctional and/or a trifunctional acrylate monomer may be incorporated.

As the bifunctional monomer, there may be used, for example, neopentyl glycol diacrylate and diethyleneglycol diacrylate. As the trifunctional monomer, there may be used, for example, pentaerythritol triacrylate and trimethylolpropane triacrylate.

Incorporation of the bifunctional monomer results in lowering of the viscosity and improvement in workability while incorporation of the trifunctional monomer results in increase in cross-linking density and improvement in physical properties of the film after curing.

A photosensitizer may be added so as to more efficiently form radicals upon UV irradiation.

As the photosensitizer, there may be used, for example, biacetyl, acetophenone, benzophenone, Michler's ketone, benzil, benzoin, benzoin ethyl ether, benzoyl peroxide, benzoin isobutyl ether, benzyl dimethyl ketal, tetramethyl thiuram sulfide, azobis-isobutylonitrile, di-tert-butyl peroxide, 1-hydrox-

ycyclohexyl phenyl ketone, 2-hydroxy-2-methyl-1-phentylpropan-1-one, 1,4-isopropylpenyl-2-hydroxy-2-methylpropan-1-one and methylbenzoyl formate.

A liquid composition prepared as mentioned above may be applied as a thin coating to the film base and irradiated with ultraviolet rays; curing is complete in several seconds to produce a hard film. The cured film contains three dimensional cross-linking so that it has excellent heat resistance and good film-shapeability and can sufficiently withstand heating by the thermal printing heads. Different from thermosetting resins, the ultraviolet curable resins can be completely cured instantly so that the production efficiency is high and a roll film can be continuously treated and wound up immediately after treatment. Since high temperature treatment is not necessary, the base film is not subjected to any damage.

The resulting heat-sensitive transfer recording medium provided with a heat resistive conveyance improving layer composed of an ultraviolet cured resin on the reverse side, does not suffer from so-called "stick" phenomena and exhibits a very high production efficiency.

In particular, where PET is used as the base film and a polyester acrylate is used as the ultraviolet curable resin, the resulting conveyance improving layer strongly adheres to the base film and does not peel off or fall off when rubbed with guide rolls or thermal print heads.

As the base film, there may be used for example, polyethylene terephthalate as mentioned above, polyethylene, polypropylene, polystyrene, polyesters, polyimides, triacetylcellulose, nylon and polycarbonates.

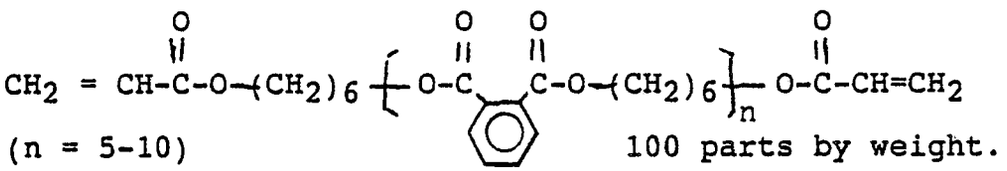
According to the invention, the medium is almost free from curling in addition to various advantages such as prevention of poor conveyance and easy and simple coating formation of the conveyance improving layer.

The following Example illustrates the invention.

Example

A resin liquid of the following formulation was prepared:

Neopentylglycol diacrylate 30 parts by weight
Pentaerythritol triacrylate 20 parts by weight
Benzophenone 3 parts by weight
Xylene 100 parts by weight
Polyester acrylate of formula



(n = 5-10) 100 parts by weight.

The polyester acrylate may be a mixture of compounds of various n values, in which n may be 2 - 20.

The resin liquid was applied to one surface of a 6 µm PET film by means of a roll-coater, to a thickness of 2 µm (when dried) at a speed of 20 m/minute, dried and exposed to UV radiation from two high pressure mercury lamps each of which had a capacity of 80 W/cm, and then the coated PET film was wound up in a form of a roll.

To the other surface of the PET film was applied a 4 µm coating of a hot melt ink of the following formulation by using a roll coater. Wax 70 parts by weight
Carbon black 15 parts by weight
Fatty acid amide 15 parts by weight

A printing test was carried out on the resulting heat-sensitive transfer recording medium using a P6 printer (manufactured by Fuji Xerox Co., Japan) and 1000 sheets of B-4 paper were printed. No sticking occurred and no materials became adhered to the guide rolls or the thermal print head during the course of the test. Good printing quality ,was obtained to the end of the test.

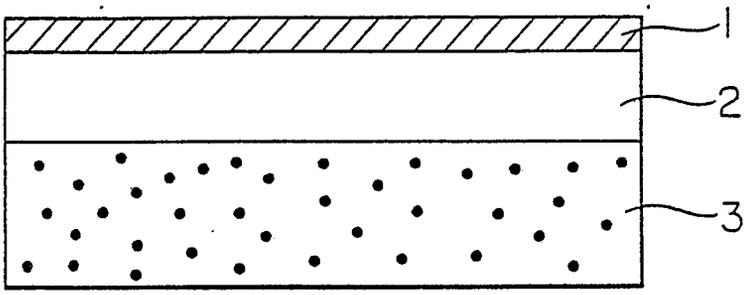
Claims

1. A heat-sensitive transfer recording medium which comprises a base film, a heat melting ink layer provided on the under surface of the base film, and a conveyance improving layer provided on the upper surface of the base film, the conveyance improving layer comprising an ultraviolet ray-curable resin.

2. A recording medium according to claim 1, wherein the ultraviolet ray-curable resin comprises a base polymer selected from polyester acrylates, polyurethane acrylates and epoxy acrylates, a reactive diluent composed of at least one selected from bifunctional acrylate monomers and trifunctional acrylate monomers, and a photosensitizer.

3. A recording medium according to claim 1 or claim 2, wherein the base polymer is polyester acrylate.

4. A recording medium according to any preceding claim, wherein the base film is polyethylene terephthalate.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European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 20 1709

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.3)
A	EP-A-0 093 858 (IBM CORP.) * abstract * ---	1,4	B 41 J 31/00 B 41 M 5/26
A	IBM TECHNICAL DISCLOSURE BULLETIN, vol. 25, no. 7B, December 1982, page 3700, New York, US; L.S. CHANG et al.: "E-beam curable formulations for the resistive ribbon of thermal transfer printing" * complete document * -----	1,4	

TECHNICAL FIELDS SEARCHED (Int. Cl.3)

B 41 J 31/00
B 41 M 5/00

The present seareh report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	13-12-1988	ZOPF K

CATEGORY OF CITED DOCUMENTS

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