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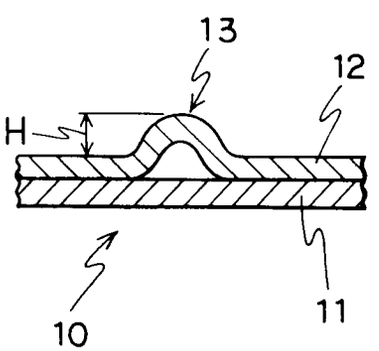
(54) Image receptor for thermal transfer ink.

(57) Disclosed is an image receptor for thermal transfer ink for use in a tape printer which is prevented from producing lifts even if stored under a high-temperature and high-humidity condition or subjected to printing in a low-temperature environment. The image receptor includes a foundation film, an image-receiving layer provided on one side of the foundation film, a pressure-sensitive adhesive layer provided on the other side of the foundation film, and a release material stuck on the surface of the pressure-senstive adhesive layer, the release material including a base member composed of a paper having a density of 1.0 g/cm^3 or smaller, or of a polyester or polyolefin film.

FIG. 1



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The present invention relates to an image receptor for thermal transfer ink and, more particularly, to an image receptor for thermal transfer ink which is advantageously used especially with a so-called "tape printer".

The above-noted tape printer is provided with simple word processing function and printing function, and adapted to form printed images while rewinding an image receptor in the form of a tape which is wound into a pancake-like body. A portion of the image receptor in which the printed images are formed is cut off and the cut piece is stuck onto an object. With the tape printer it is possible to form a heading-printed label, name-printed label and the like with ease.

A thermal transfer printer is usually employed in a printer part of the tape printer because it can be easily scaled down. Therefore, an ink sheet to be used therein is a thermal transfer ink sheet.

As the image receptor in the form of tape (hereinafter referred simply to as "image receptor") for use with such a tape printer, there is known an image receptor of the type which includes a main body comprising: a foundation film, such as polyester film, provided on one side thereof with an image-receiving layer such as made of a polyester resin which allows a thermal transfer ink to exhibit a good fixing property, and on the other side thereof with a pressure-sensitive adhesive layer; and a release material stacked on the pressure-sensitive adhesive layer. With this image receptor, an image is formed on the image-receiving layer, the release material is then exfoliated from the image receptor body, and that portion of the image receptor body in which the image is formed is stuck at its pressure-sensitive layer side on an object.

As the release material in the above conventional image receptor, generally used is one of the type wherein a release layer composed of a silicone resin is provided on one side of glassine paper.

However, when stored under a high-temperature and high-humidity condition, the image receptor including such a release material of which foundation is of glassine paper suffers a phenomenon such that the release material is partially lifted from the image receptor body. Hereinafter the phenomenon is referred to as "lift". If the image receptor with such a lift is used in the tape printer, there is likely to encounter such inconveniences that the image receptor does not smoothly run and, in an extreme case, the image receptor carrying printed images will not come out of the tape printer. Description is to be made on these phenomena with reference to the drawings.

Fig. 1 is an explanatory view for illustrating a lift produced in an image receptor. Numeral 10 denotes an image receptor wherein a release material 12 is partially lifted from an image receptor body 11 and, hence, a lift 13 is produced. In the event, the height of the lift 13 (height H from the general surface of the release material, hereinafter the same) reaches 1 to 2 mm. There may be a case where ten or more of such a lift are produced per 1 m along the length of the image receptor in the form of tape.

Fig. 2 is an explanatory view for illustrating the travelling state of the image receptor in the tape printer, and wherein numeral 20 denotes a driving roller, and numeral 21 a thermal head. The image receptor 10 and a thermal transfer ink sheet 22, which are each wound into a pancake-like shape, are rewound and fed to between the driving roller 20 and the thermal head 21. After printing, the image receptor 10 is separated from the ink sheet 22 and ejected to exterior from a receptor outlet 24 located on a casing 23 of the tape printer.

However, there is likely to occur such an inconvenience that the lift 13 is lodged by the outlet 24 if the lift 13 is too large and the image receptor cannot come out of the tape printer.

Even if the lift 13 produced during storage is not so large, the following problem will result when printing is carried out in a low-temperature environment. The image receptor 10 is fed by the rotation of the driving roller 20 as shown in Fig. 2 and is, hence, imposed with a substantial pressure thereby. This may cause small lifts to move and to join together, thereby forming a large lift. Such a phenomenon is presumed to be caused because the peel strength of the release material is set to a low level (for example, about 5 g/20 mm) so as to facilitate the peeling of the release material from the image receptor body, and the peel strength thereof decreases further at a low temperature whereby small lifts are moved by the pressure of the driving roller and joined together to form a large lift.

Although it is possible to avoid such a phenomenon by increasing the peel strength of the release material or enhancing the stiffness thereof so as to prevent lifts from moving, it is not preferable to increase the peel strength because the operation of exfoliating the release material is rendered difficult. It is not preferable that glassine paper of an increased thickness is used to enhance the stiffness of the release material, because the total length of the image receptor accommodatable in the tape printer (hereinafter referred to as "winding length") is reduced.

In view of the foregoing, it is an object of the present invention to provide an image receptor in which a lift of the release material will not be produced even if stored in a high-temperature and high-humidity environment or subjected to printing in a low-temperature environment.

This and other objects of the invention will become apparent from the description hereinafter.

According to a first aspect of the present invention, there is provided an image receptor for a thermal transfer ink, comprising a foundation film, an image-receiving layer provided on one side of the foundation film, a pressure-sensitive adhesive layer provided on the other side of the foundation film, and a release material stuck on the surface of the pressure-sensitive adhesive layer, said release material including a paper having a density of 1.0 g/cm^3 or lower as a base member.

Further, according to a second aspect of the present invention, there is provided an image receptor for a thermal transfer ink, comprising a foundation film, an image-receiving layer provided on one side of the foundation film, a pressure-sensitive adhesive layer provided on the other side of the foundation film, and a release material stuck on the surface of the pressure-sensitive adhesive layer, said the release material including a polyester film or a polyolefin film as a base member.

Fig. 1 is an explanatory view for illustrating a lift of a release material in an image receptor; and

Fig. 2 is an explanatory view for illustrating the traveling state of an image receptor in a tape printer.

In the first aspect of the present invention, the release material includes a paper having a density of 1.0 g/cm^3 or lower as a base member. The image receptor of which release material includes the base member composed of a paper of such a low density is essentially free from a lift even if stored under a high-temperature and high-humidity condition. This is conceivably because such a low-density paper is not so densely stuffed with fibers and, hence, absorbs an expansion of itself due to moisture absorption. Note that glassine paper is of a high density as high as 1.1 to 1.2 g/cm^3 and is, hence, presumed to be incapable of absorbing an expansion of itself, which causes a lift of a release material using glassine paper.

Further, since even a small lift is unlikely to be produced in the image receptor, in the case of printing even in a low-temperature environment the image receptor will not suffer from the inconvenience involved in the prior art such that small lifts are moved and joined together to form a large lift.

In the second aspect of the present invention, the release material includes a polyester film or a polyolefin film as a base member and is completely free from a lift.

Description is to be made first on the release material as used in the first aspect of the present invention.

In the first aspect of the present invention, a paper having a density of 1.0 g/cm^3 or lower is used as the base member of the release material. If the density is too low, a satisfactory stiffness cannot be expected, which results in poor operability in exfoliating the release material from the image receptor body. It is, therefore, preferable that the paper has a density of at least 0.7 g/cm^3. Examples of such a paper include woodfree paper, kraft paper, simili paper, paper for copying, and india paper. Synthetic paper is also utilizable. The base member is preferably 40 to 90 μm thick. If the thickess of the base member is larger than that range, the winding length becomes undesirably short, whereas if it is smaller than the range, a satisfactory stiffness cannot be expected, degrading the operability for exfoliation.

In the first aspect of the present invention, there is no particular limitation to the constitution of the release material except that the paper as specified above is used as the base member thereof. However, particularly preferable is a release material comprising the aforesaid base member of paper, a laminated layer formed on the surface of the base member and composed of at least one resin selected from the group consisting of polyolefin resins, polystyrene resins, polyester resins and polyurethane resins, and a release layer provided on the laminated layer (hereinafter referred to as "first mode").

With the first mode of the release material, the presence of the laminated layer of resin will suppress an expansion of the base member of paper and, hence, prevent the production of lifts almost completely.

Examples of the polyolefin resins for the laminated layer include polyethylene resins, polypropylene resins, ethylene-vinyl acetate copolymers, ethylene-ethyl acrylate copolymers, ethylene-methyl methacrylate copolymers, ethylene-acrylic acid copolymers, and ethylene-vinyl alcohol copolymers. The laminated layer of resin is preferably 5 to 25 μm thick. With the laminated layer of a thickness smaller than that range, it is difficult to sufficiently suppress an expansion of the base member of paper. With the laminated layer of a thickness larger than the range, on the other hand, the winding length of the image receptor is shortened undesirably. As the lamination method, any known method can be employed, but usually employed is an extrusion laminating method.

The releasing agent for the release layer is not particularly limited. Although there can be used various releasing agents such as silicone resin type, olefin resin type, long-chain-alkyl-containing polymer type and fluorine-containing resin type, usually silicone resin type releasing agents are preferably used. The release layer is usually about 0.1 to 2 μm thick.

In the first aspect, there can be advantageously used an alternative release material comprising the aforesaid base member of paper, a resin coat layer formed on the surface of the base member, and a release layer provided on the resin coat layer (hereinafter referred to as "second mode").

In the second mode too, the presence of the resin coat layer can suppress an expansion of the base member of paper.

As the resin for use in the resin coat layer, there can be used, without particular limitations, nonhygroscopic resins or resins which will not expand even when they absorb moisture. Examples of such resins include polyacrylic alkyl esters, polymethacrylic alkyl esters, polyacrylamide, polystyrene, polyvinyl butyral, polyvinyl acetate, polyvinyl chloride, polyvinylidene chloride, polyurethanes, polyesters, carboxymethyl cellulose, urea resins, and melamine resins. These resins may be used either alone or as a mixture. The resin coat layer is suitably 0.5 to 25 μm thick. If the thickness of the resin coat layer is smaller than that range, an expansion of the base member of paper cannot be suppressed sufficiently, while if it exceeds the range, the winding length of the image receptor becomes undesirably short.

In the second mode of the first aspect, there can be used a release layer of the same type as that in the first mode.

The release material for use in the second aspect of the present invention is that which includes a polyester film or a polyolefin film as a base member.

Specifically the polyester film is of polyethylene terephthalate, polybutylene terephthalate, polyethylene naphthalate or the like. The polyolefin film is of polyethylene, polypropylene or the like. These films may be unstretched or uni- or biaxially stretched. The film base member is suitably about 15 to about 100 μm thick. If the thickness of the film base member is smaller than that range, the operability for exfoliation is degraded, while on the other hand if it exceeds the range, the winding length becomes undesirably short.

In the second aspect, the release layer is directly formed on one side of the film base member. As the release layer for use in the second aspect, there can be used a release layer of the same type as that in the first aspect.

In either the first or second aspect of the present invention, the release material is preferably 50 to 100 μm thick so as to assure a desired winding length and a high operability for exfoliation. The release material in the second aspect is more preferably 15 to 100 μm thick. The peel strength of the release material from the image receptor body is preferably about 2 to about 10 g/20 mm (at a peeling rate of 0.15 m/min) so as to assure a good operability for exfoliation.

In either aspect the image receptor body may be of any constitution, provided that it comprises a foundation film, an image-receiving layer composed of a resin of a good fixing property for a thermal transfer ink and formed on one side of the foundation film, and a pressure-sensitive adhesive layer formed on the other side of the foundation film.

Preferably, the foundation film of the image receptor body is, for example, a polyester film such as a polyethylene terephthalate film, in view of its strength and and good adhesiveness with the image-receiving layer. Besides, usable therefor are a polyvinyl chloride film, polycarbonate film, triacetyl cellulose film, polyamide film, polyimide film, aramid film, or a like film. The foundation film is preferably about 20 to about 60 μm thick, in view of the handling property in sticking to an object or in a like operation.

As the resin for the image-receiving layer, a polyester resin is advantageously used, but another resin is usable if it has a good affinity with the vehicle of the thermal transfer ink. The image-receiving layer may be incorporated with a small amount of an extender such as silica or titanium oxide. The amount of the image-receiving layer to be applied is usually about 0.08 to about 2 g/m^2. The amount thereof in excess of that range will degrade the anti-blocking property, whereas the amount thereof smaller than the range results in a printed image with poor fixing property.

On the foundation at the side opposite to the side formed with the image-receiving layer, a color coat layer may be provided as required. Otherwise, the foundation may be colored instead of the provision of such a color coat layer.

The pressure-sensitive adhesive layer is formed on the foundation at the side free of the image-receiving layer. The pressure-sensitive adhesive layer can be formed of any conventional pressure-sensitive adhesive such as an acrylic resin-type pressure-sensitive adhesive without particular limitations. The aforesaid release material is stacked on the surface of the pressure-sensitive adhesive layer. Note that it is preferable to select the pressure-sensitive adhesive layer of the image receptor body and the release layer of the release material so that the peel strength therebetween would be within the aforesaid range.

In the present invention any conventional thermal transfer ink sheet can be used to form a printed image on the image receptor without particular limitations.

The present invention will be described in more detail by means of the following Examples and Comparative Example. It is to be understood that the present invention is not limited to the Examples, and various changes and modifications may be made in the invention without departing from the spirit and scope thereof.

Examples 1 to 4 and Comparative Example

On one side of a 38 μm-thick polyethylene terephthalate film was applied a 5% (by weight) solution of a polyester resin (UE-3210, a product of UNITIKA Ltd., glass transition point: 45 °C, molecular weight: 20,000) in a toluene-methyl ethyl ketone mixed solvent (2 : 3 in weight ratio), followed by drying to form an image-receiving layer. The coating amount of the receiving layer when dried was 0.2 g/m^2. On the other side of the film was formed a 15 μm-thick pressure-sensitive adhesive layer of an acrylic resin type. Thus, an image receptor body was given.

Onto the pressure-sensitive adhesive layer of the image receptor body was stuck each of the following release materials so that the release layer of the release material would be brought into contact with the adhesive layer, thus completing an image receptor.

Release material in Example 1

On one side of a 60 μm-thick woodfree paper (density: 0.85 g/cm^3) was extrusion-laminated a 15 μm-thick polyethylene film, on which a 0.5 μm-thick release layer of silicone resin was then formed.

Release material in Example 2

A 70 μm-thick kraft paper (density: 0.8 g/cm^3) was used instead of the above woodfree paper.

Release material in Example 3

On one side of a 60 μm-thick woodfree paper (density: 0.85 g/cm^3) was formed a 8 μm-thick coat layer of methyl acrylate resin, on which a 0.5 μm-thick release layer of silicone resin was then formed.

Release material in Example 4

On one side of a 50 μm-thick, biaxial-stretched polypropylene film was formed a 0.7 μm-thick release layer of silicone resin.

Release material in Comparative Example

On one side of a 65 μm-thick glassine paper (density: 1.15 g/cm^3) was formed a 0.5 μm-thick release layer of silicone resin.

Each of the image receptors thus fabricated was wound around a core while being slitted to have a width of 18 mm, to form a pancake-like image receptor sample (winding length: 8m).

Each sample was allowed to stand at 60 °C, 90%RH for 96 hrs., then rewound, and examined for production of lifts.

Separately, each sample was allowed to stand at 25 °C, 50%RH for 24 hrs. (at that time no lift was observed with naked eye in any of the samples), then set in a commercially-available tape printer, and subjected to a printing test in an atmosphere at -5 °C so as to examine the running state of the image receptor.

The results of the above tests are shown in Table 1.

Table 1

	Lift		Printing test at -5 ° C
	Height H*	Number	
Ex.1	A B C	0 0 0	No running and printing abnormalities
Ex.2	A B C	0 0 0	ditto
Ex.3	A B C	0 0 0	ditto
Ex.4	A B C	0 0 0	ditto
Comp. Ex.	A B C	7 21 12	Jammed at the outlet, ran obliquely, impossibility of continuous printing

(* Note) A: H<0.5 mm
B: 0.5 mm≦H<1.0mm
C: 1.0 mm≦H<1.5mm

As can be undestood from the results, the image receptor of the present invention is free from lifts and hence, runs smoothly even if stored under a high-temperature and high-humidity condition or subjected to printing in a low-temperature environment.

In addition to the materials and ingredients used in the Examples, other materials and ingredients can be used in the Examples as set forth in the specification to obtain substnatially the same results.

Claims

1. An image receptor for a thermal transfer ink, comprising a foundation film, an image-receiving layer provided on one side of the foundation film, a pressure-sensitive adhesive layer provided on the other side of the foundation film, and a release material stuck on the surface of the pressure-sensitive adhesive layer, said release material including a paper having a density of 1.0 g/cm^3 or lower as a base member.

2. The image receptor of Claim 1, wherein said release material comprises on said base member a laminated layer comprising at least one resin selected from the group consisting of polyolefin resins, polystyrene resins, polyester resins and polyurethane resins, and a release layer provided on the laminated layer.

3. The image receptor of Claim 1, wherein said release material comprises a resin coat layer on said base member, and a release layer provided on the resin coat layer.

4. The image receptor of Claim 1, wherein said release material is 50 to 100 μm thick.

5. The image receptor of Claim 2, wherein said release material is 50 to 100 μm thick.

6. The image receptor of Claim 3, wherein said release material is 50 to 100 μm thick.

7. An image receptor for a thermal transfer ink, comprising a foundation film, an image-receiving layer provided on one side of the foundation film, a pressure-sensitive adhesive layer provided on the other side of the foundation film, and a release material stuck on the surface of the pressure-sensitive

adhesive layer, said release material including a polyester film or a polyolefin film as a base member.

8. The image receptor of Claim 7, wherein said release material is 15 to 100 μm thick.

FIG. 1

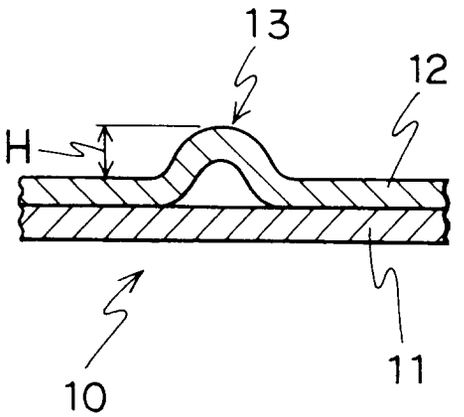
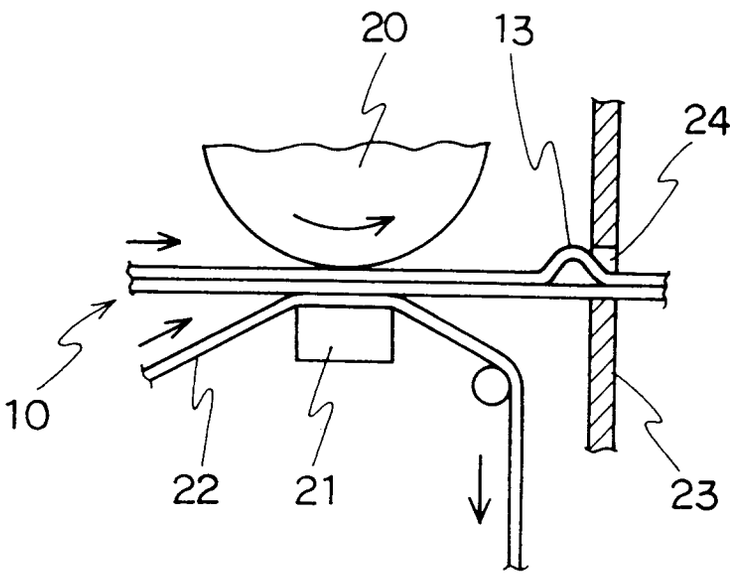


FIG. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 93 10 8052

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.5)
A	EPO 428 336 (SONY) * claims 1-7 * ---	1-8	B41M5/00 B41M5/30 G09F3/02
A	GB-A-2 192 288 (RICOH) * claims 1-19 * -----	1-8	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B41M
G09F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	03 SEPTEMBER 1993	FOUQUIER J.

CATEGORY OF CITED DOCUMENTS

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