



TRANSPARENT COMPONENTS FOR ELECTROSTATIC PHOTOCOPYING

The present invention relates to transparent components, i.e. substrates, comprising a polyester base which are suitable for electrostatic photocopying.

5 It is known that photocopies that can be projected onto a screen by means of an overhead projector are easily obtained from a source document by electrostatic photocopying onto a transparent base. According to this process a uniform, positive or

10 negative electrostatic charge is applied to a photoconductive surface preserving this charge when it is kept sheltered from light, and the image of a subject to be copied (for example text or a drawing) is formed on the said surface by means of an optical

15 system and of a source of light. In the regions where the charged surface is struck by the light the electrical charge is dissipated by earthing, the other regions then forming the electrostatic image of the source document; particles of an electrostatic ink in

20 powder form (referred to hereinafter as toner) of opposite charge to that of the electrostatic surface are then deposited on the latter by electrostatic attraction and the image thus obtained is then placed in contact with a base, for example a transparent one,

25 to which an opposite electrical charge is applied in order to transfer the toner from the electrostatic surface onto the base. The image thus obtained is fixed onto the base by heat treatment and/or by

pressure treatment.

The transparent bases employed for producing projectable electrostatic photocopies must meet various requirements in order to make it possible to obtain
5 projected images of excellent quality, in particular sharp images. They must exhibit particularly a transparency, a dimensional stability and a high slip, a low capacity for accumulating static electricity charges and good adhesion to the image printing
10 material. It is known that these bases must exhibit more particularly a transparency such that the percentage of light scattered by the passage of the ray of light through their thickness, or haze, is lower than or equal to 7 %. It is also known that when these
15 bases are obtained from a biaxially oriented film, especially a polyester, they must exhibit a dimensional stability such that their shrinkage at 150-170°C, that is to say in the temperature conditions needed for fixing the toner, is lower than 1 % in the directions
20 of drawing.

As a result of their excellent mechanical, physical and chemical properties, polyester films constitute a material of choice for producing transparent bases for projectable electrostatic
25 photocopies. However, their low slip, their great ability to accumulate static electricity by rubbing or induction and their relative chemical inertness, which is reflected in a low adhesiveness of the toner to the

base, are the source of problems which have required solutions complicating the manufacture of transparent bases and making it more costly. Thus, the problem of the slip of polyester films cannot be solved by
5 creating a surface roughness by means of particles of a filler dispersed within the polyester. In fact, because of the thickness of the films intended to be used as base for electrostatic photocopying, which lies between 50 and 200 μm , the presence of filler throughout their
10 thickness gives them a high haze which is incompatible with such a use. The transparency can be obtained only at the cost of a decrease in the filler content, which compromises the slip of the bases and consequently the ability of the bases to slide over one another in the
15 reams employed in photocopying machines or to slide over the metal surfaces of the said machines. The low affinity of the polyester films for the toner is reflected in easy removal of the latter when the photocopies are being handled and by a gradual
20 deterioration of the image. For its part, the ability of the polyester base to accumulate static electricity interferes both with the uniform deposition of the toner on the base during the photocopying, which is detrimental to image quality, and with the sheet-by-
25 sheet feed of the bases from a ream.

To solve the problems posed by the adhesion of the toner to the base, the transparency, the slip and the tendency to accumulate charges, it has been

proposed to deposit, by spreading onto at least one face of a filler-free transparent polyester film, a coating consisting of a polymeric binder which has at least a good adhesion to the toner and which contains
5 fillers creating a sufficient roughness on the base to give it the necessary slip and, if appropriate, an antistatic agent; according to an alternative form of this solution, a filled adhesive primer coating is deposited on one face of the polyester film and an
10 antistatic coating on the other face.

Thus, in US Patent 4 526 847 it has been proposed to deposit onto a filler-free polyester film a coating of a composition consisting of a solution of nitrocellulose in an organic solvent (esters, ketone)
15 containing a plasticizer, a filler which has a particle size of 0.3 to 10 μm (for example colloidal silica) and an antistatic agent.

In European Patent Application EP-A-332 183, a description is given of transparent components for
20 electrostatic photocopying, which consist of a filler-free polyester base carrying a layer of a coating of an acrylic binder containing a filler and an antistatic agent. However, it is still necessary to place between the acrylic coating and the polyester a primer
25 facilitating adhesion of the layer intended to receive the toner to the polyester.

In European Patent Application EP-A-104 074 it has also been suggested to deposit on one face of a

polyester base film an acrylic coating containing a filler and providing the adhesion to the toner and, on the other face of the polyester base, a coating consisting of an electrically conductive polymer; the placing of a primer coating between the polyester base and the layer receiving the toner is also recommended.

The solutions proposed in the abovementioned prior art are only partially satisfactory. In fact, the use of compositions based on organic solvents presents safety and hygiene problems. Some of the solutions adopted involve increasing the number of layers of coatings: a) application of a primer which has good adhesiveness to the polyester base and to the layer receiving the toner; b) deposition of a receiving layer providing the adhesiveness to the toner, good slip and, where appropriate, good electrical conductivity; and c) optionally, deposition of an antistatic coating on the face of the base film which is opposite to that receiving the toner. It has been found, furthermore, that the introduction of an antistatic agent into the adhesiveness layer intended to receive the toner may, depending on the nature of the said agent, decrease the effectiveness of the adhesion of the toner to the receptive layer. The presence of fillers in the layer receiving the toner also has the disadvantage of requiring a thickness of the said layer which goes beyond what is needed merely from the viewpoint of the improvement in the adhesion of the toner to the base.

The present invention is intended precisely to solve in a simple manner the problem presented by the manufacture of transparent components for electrostatic photocopying, the said components exhibiting an excellent transparency, good slip, good adhesion of the toner to the base and good electrical conductivity, and being free from the disadvantages of the previous transparent components.

The present invention provides a transparent component suitable for electrostatic photocopying, which comprises a transparent polyester base (S) comprising on at least one of its faces a primer coating (P) for adhesion of toner to the polyester base, wherein the base (S) is a composite comprising:

a) a thick layer (A) of a semicrystalline polyester, and

b) on at least one of the faces of the thick layer (A), a thin layer (B) of polyester, which may be identical to or different from the polyester of layer (A),

and wherein the primer coating (P) has a thickness of equal to or less than $0.3\text{ }\mu\text{m}$ and comprises an acrylic polymer which has a glass transition temperature of from 10°C to 50°C and a free $-\text{COOH}$ carboxylic functional group content of less than 50 millimoles per 100 grams of said acrylic polymer.

The present invention also provides a process for the preparation of a component as defined above

wherein the coating (P) is deposited on at least one of the faces of the polyester base (S).

In the context of the present invention the expression "transparent component suitable for electrostatic photocopying" denotes a component which can be used directly for producing photocopies that can be projected onto a screen and which is in the form of a continuous film or of sheets of appropriate format which can be obtained by cutting the films.

The free carboxylic functional groups are the total free carboxylic functional groups of the acrylic polymer.

The polyesters forming the layers (A) and (B) of the base film (S) may be identical or different, although it is simpler to employ the same polyester for both layers. In this context it is possible, in the case of the layer (A), to use polyesters usually employed for obtaining biaxially oriented semicrystalline films. These are film-forming linear polyesters which can be crystallized by orientation and which are usually obtained from one or more dicarboxylic aromatic acids or their derivatives (for example esters of lower aliphatic alcohols, or halides) and from one or more aliphatic glycols. Examples of aromatic diacids which may be mentioned are phthalic, terephthalic, isophthalic, 2,5-naphthalenedicarboxylic and 2,6-naphthalenedicarboxylic acids. These acids may be used in combination with a minor quantity of one or

more aliphatic dicarboxylic acids such as adipic, azelaic and hexahydroterephthalic acids. Examples of aliphatic diols which may be mentioned are ethylene glycol, 1,3-propanediol and 1,4-butanediol. These diols
5 may be used in combination with a minor quantity of one or more aliphatic diols which are more condensed where carbon is concerned (for example neopentyl glycol) or cycloaliphatic diols (for example cyclohexanedimethanol). The crystallizable film-forming
10 polyesters are preferably polyterephthalates or polynaphthalenedicarboxylates of alkylene diols, and in particular the polyterephthalate of ethylene glycol (PET) or of 1,4-butanediol or copolyesters containing at least 80 mol% of alkylene glycol terephthalate or
15 naphthalenedicarboxylate units. The polyester is advantageously a polyethylene terephthalate whose viscosity index, measured in a 50/50 mixture by weight of phenol and of 1,2-dichlorobenzene according to ISO standard 1628-5, is from 55 ml/g to 75 ml/g.

20 The thin layer (B) may consist of the same crystallizable polyester as the layer (A) or of a polyester which is not crystallizable or less crystallizable than the polyester forming the layer (A). Use is then made of polyesters containing
25 larger or smaller quantities of units producing amorphousness, such as those derived from isophthalic acid, from neopentyl glycol or from cyclohexanedimethanol. It would not constitute a

departure from the scope of the present invention to employ a mixture of a crystallizable polyester and of a polyester containing units imparting amorphousness in order to produce the thin, optionally filled, layer (B). It would thus be possible to employ mixtures containing from 20 to 80 % by weight of a crystallizable polyester and from 80 to 20 % by weight of a polyester containing units imparting amorphousness. The layer (B) could also consist of a copolyester exhibiting a plurality of sulphonic groups or their alkali or alkaline-earth metal or ammonium salts (hereinafter called sulphonated copolyesters), or of mixtures of copolyesters of this type with one or more polyesters not containing any sulphonic group, such as the semicrystallizable polyesters or the polyesters containing units imparting amorphousness.

The acrylic polymer generally comprises units selected from the units derived from acrylic acid, methacrylic acid, alkyl acrylates, alkyl methacrylates, acrylonitrile, methacrylonitrile, acrylamide, methacrylamide, N-methylolacrylamide, N-methoxymethacrylamide, styrene, butadiene or vinyl esters, at least some of these units originating from an alkyl acrylate and/or an alkyl methacrylate.

The acrylic polymer used in the invention preferably comprises at least units derived from alkyl acrylates chosen from methyl acrylate, ethyl acrylate, propyl acrylates and butyl acrylates and/or units

derived from alkyl methacrylates chosen from methyl methacrylate, ethyl methacrylate, propyl methacrylates and butyl methacrylates. The acrylic copolymers containing units derived from methyl and/or ethyl acrylate and from methyl and/or ethyl methacrylate are particularly suitable for forming the primer coating (P) of the transparent components of the invention. The acrylic polymer may also contain acrylic acid and/or methacrylic acid units, insofar as the content of free carboxylic acid functional groups is less than 50 millimoles per 100 grams of said acrylic polymer and preferably remains less than or equal to 30 millimoles per 100 g.

The acrylic polymer forming part of the composition of the primer coating (P) of the components of the invention advantageously has a glass transition temperature of from 15°C to 30°C.

The antistatic nature of the components for electrostatic photocopying is an important parameter.

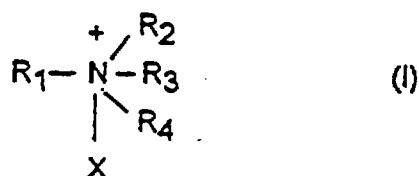
To improve this antistatic nature the acrylic polymer forming the primer (P) of the components for photocopying may contain up to 25 % by weight of a monomer or polymer compound containing quaternary ammonium groups.

This compound containing quaternary ammonium groups may be present as a mixture with the acrylic polymer described above or may form part of the units of said acrylic polymer. In other words, it is possible

to use a mixture of the acrylic polymer with a compound containing quaternary ammonium groups or a copolymer containing the units described above in the case of the acrylic polymer and units containing quaternary ammonium groups.

The compound containing quaternary ammonium groups preferably represents from 2 % to 15 % by weight relative to the weight of the combination of acrylic polymer and compound containing quaternary ammonium groups.

The compound containing quaternary ammonium groups, which is used or which is the source of a polymer containing quaternary ammonium groups which is itself used, for example has the formula (I):



in which:

- R₁ denotes an acyloxyalkyl radical containing a saturated acyl group or containing a carbon-carbon ethylenic double bond, an alkoxyalkyl radical, an aryloxyalkyl radical, an alkylaryloxyalkyl radical, an alkenyloxyalkyl radical or an alkenylaryloxyalkyl radical,
- R₂, R₃ and R₄, which may be identical or different, each denotes an alkyl radical

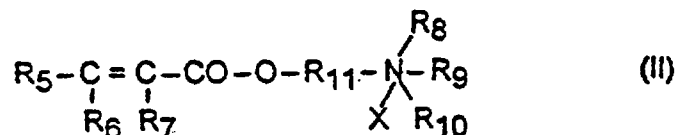
containing from 1 to 6 carbon atoms or a polyoxyethylene radical $-(CH_2-CH_2-O)_n-H$ or $-(CH_2-CH_2-O)_n-CH_3$ with n denoting a number from 1 to 12, and.

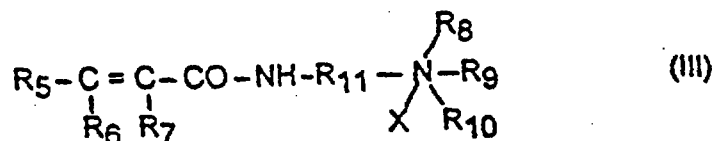
- 5 - X denotes an anion such as a halide, in particular chloride, sulphate, sulphonate, alkyl sulphonate such as methyl sulphonate, arylsulphonate, arylalkyl sulphonate, carbonate, alkyl carbonate such as methyl
10 carbonate, nitrate, phosphate, alkyl phosphate or a mixture thereof.

Depending on whether the radical R_1 contains an ethylenic double bond or not, the compound containing quaternary ammonium groups of formula (I)
15 will be copolymerizable with the acrylic polymer or will be employed as a mixture with the said acrylic polymer.

Stearamidopropyldimethyl- β -hydroxyethyl-ammonium nitrate may be mentioned among the
20 nonpolymerizable compounds of formula (I).

Among the polymerizable compounds of formula (I) there may be mentioned more particularly the monomers of formula (II) or (III):





in which:

- R_5 , R_6 and R_7 , which are identical or different, denote a hydrogen atom, a methyl radical or an ethyl radical,
- R_8 , R_9 and R_{10} , which may be identical or different, each denotes an alkyl radical containing 1 to 4 carbon atoms, or a polyoxyethylene radical $-(\text{CH}_2-\text{CH}_2-\text{O})_m-\text{H}$ or $-(\text{CH}_2-\text{CH}_2-\text{O})_m-\text{CH}_3$ with m denoting a number from 1 to 8, and
- R_{11} denotes a divalent radical such as a polyethylene radical or hydroxyalkylene radical containing 1 to 8 carbon atoms, and
- X denotes an anion such as a halide, in particular chloride, sulphate, sulphonate, alkyl sulphonate such as methyl sulphonate, arylsulphonate, arylalkylsulphonate, carbonate, alkyl carbonate such as methyl carbonate, nitrate, phosphate, alkyl phosphate or a mixture thereof.

When a compound containing quaternary

ammonium groups is employed the acrylic polymer does not contain any free carboxylic acid functional group.

The antistatic nature is evaluated from the measurement of a half-discharge time. The surface of the film is charged with a corona treatment to a potential of 500 V. The corona charge device is stopped and the decrease in the surface potential is observed. The measurement marks the time for reaching a surface potential of 250 V. The shorter the time, the more antistatic is the film. It is generally considered that a satisfactory level of antistatic nature is reached when this half-discharge time is shorter than or equal to 20 seconds and preferably shorter than or equal to 10 seconds.

The thickness of the primer coating (P) is preferably equal to or less than 0.2 μm .

It is generally preferable that there should be no filler particles in the thick layer (A) and that the said fillers should be present in the thin layers (B), in order that the base films should have a transparency that is as high as possible, that is to say a haze (or cloudiness) of less than or equal to 7 %.

The nature of the fillers present in the layer (B) is not critical and it is possible to make use of the fillers usually employed for imparting to polyester films a roughness which is sufficient to provide them with good machinability. Use is preferably

made of inorganic fillers such as oxides and salts of the elements of groups II, III and IV of the Periodic Classification. Metal salts such as calcium carbonate or barium sulphate, and oxides such as silica, alumina, zirconia, and mixtures of oxides, silicates or aluminosilicates may be mentioned by way of illustration. These fillers may have been subjected to a treatment intended to limit or to prevent the agglomeration of the particles of which they are composed and/or to limit or to prevent the loss of cohesion at the polyester/particle interface.

The particle concentration is generally chosen so as to provide the base film both with a haze which is less than or equal to 7 % and a sufficient roughness (R_z less than or equal to $0.6 \mu m$). In general, the concentration and the particle size of the fillers are chosen as a function of the thickness of the layer (B) and of the melting point of the polymer(s) of which it consists and can be determined by a person skilled in the art, in order to impart the desired transparency and roughness to the components. Reference may be made very particularly to the teaching of EP-A-0 260 258, which describes films that can be extremely suitable as a transparent polyester base for the transparent component suitable for electrostatic photocopying of the present invention.

It is particularly advantageous to make use of fillers which have a relatively narrow particle

diameter distribution, that is to say monodisperse fillers.

The shape of the particles of the fillers introduced into the layer(s) (B) is not critical and
5 fillers of various shapes, spherical or otherwise, can be used.

When a layer (B) is placed onto both faces of the layer (A), the two layers (B) may differ from each other in their thickness and the nature, the
10 concentration or the particle diameter of the filler. For obvious reasons of simplicity, the two layers (B) are preferably identical.

Although the composite polyester base film can be obtained by any known processes for obtaining
15 composite films, use is preferably made of composite films obtained by coextrusion, which exhibit an excellent cohesion at the interface of the layer (A) and of the layer(s) (B).

To this end, a flow of crystallizable
20 polyester (A) is extruded with the aid of a first extruder and, simultaneously, a flow of the polyester (B) intended to form the layer(s) (B) is extruded with the aid of a second extruder. The two extruders are connected to a coextrusion adapter in which the flow
25 (B) may, if appropriate, be divided into two flows (B). The polymer melt streams are converted into an amorphous multilayer film by passing through a flat die and the amorphous film thus obtained is subjected to

the usual film manufacturing operations such as quenching, drawing, heat-setting and reeling.

The film production conditions are those usually employed industrially to obtain oriented
5 semicrystalline polyester films. On leaving the die the amorphous composite film is preferably cooled to a temperature of between 10°C and 45°C on a casting drum.

The conditions for drawing the extruded composite film are those usually applied in the
10 manufacture of semicrystalline polyester films. It is thus possible to undertake a monoaxial drawing or a biaxial drawing performed successively or simultaneously in two directions which are generally at right angles, or else using sequences of at least 3
15 drawing operations where the drawing direction is changed in each sequence. Furthermore, each unidirectional drawing itself can be performed in a number of steps. It will thus be possible to combine drawing sequences, such as, for example, two successive
20 biaxial drawing treatments, it being possible for each drawing to be performed in a number of stages.

The composite film is preferably subjected to a biaxial drawing in two perpendicular directions. It is possible, for example, to undertake first of all a
25 drawing operation in the direction of travel of the film (lengthwise drawing) and then a drawing operation in a perpendicular direction (transverse drawing), or vice versa. In general the lengthwise drawing is

performed with a ratio of 3:1 to 5:1 (that is to say that the length of the drawn film represents from 3 to 5 times the length of the amorphous film) and at a temperature of 80 to 135°C and the transverse drawing is performed with a ratio of 3:1 to 5:1 at a temperature of 90 to 135°C, preferably from 100 to 125°C.

After drawing, the composite film may be subjected to a heat treatment, preferably at a temperature of from 160 to 240°C.

The drawing may also be performed simultaneously, that is to say in the lengthwise direction and in the transverse direction at the same time, for example with a draw ratio of 3:1 to 5:1 and at a temperature of 80 to 120°C.

The throughput of the extruders depends on the desired thicknesses of the layers (A) and (B) after drawing.

The thickness t_A of the layer (A) may vary within wide limits; it is generally from 50 μm to 150 μm . Although the thickness t_B of the layer (B) is not critical, it must be chosen so that the base film retains an excellent transparency and in particular a haze of less than or equal to 5 % and preferably less than or equal to 4 %. The thickness which enables this objective to be met depends to some extent on the concentration and on the particle size of the filler present in the layer (B); in general, it is preferable

that the thickness of the layer (B) should be equal to or less than 3 μm . t_B is preferably from 0.5 μm to 1.5 μm .

Because of the temperatures to which the transparent components are subjected during electrostatic photocopying operations, the polyester base must have an excellent dimensional stability at 150°C. More specifically, the base must have a shrinkage ratio at 150°C in both drawing directions which is less than or equal to 1 % and preferably less than or equal to 0.7 %. This objective is met by subjecting the biaxially drawn and heat-set film to a relaxation treatment in the transverse direction and in the lengthwise direction, in accordance with the usual methods which are well known to a person skilled in the art. The shrinkage ratios in the lengthwise direction and in the transverse direction are preferably chosen so as not to differ too greatly in value, in order to prevent the formation of microripples in the transparent components after they have passed through the photocopying machines. It is preferable that the difference in the shrinkage values in the two directions should be less than or equal to 0.3 %.

In the transparent component suitable for electrostatic photocopying according to the invention the composite polyester base (S) preferably has a haze of less than or equal to 7 %, a shrinkage ratio in the lengthwise and transverse drawing directions at 150°C

which is less than or equal to 1 % and a total roughness Rz which is less than or equal to 0.6 μm .

The deposition of the coating (P) on the composite polyester film may be carried out using the various techniques which are known to a person skilled in the art. Thus, an aqueous dispersion or solution of the chosen acrylic polymer may be deposited by gravity from a slot caster or by passing the film through the emulsion or the solution or else by means of transfer rolls. The thickness of the layer is controlled by any suitable means. The deposition of the coating may take place either before any drawing of the film (in-line coating) or after drawing, before or after heat-setting (out-of-line coating). It is preferred, however, to perform the coating of the polyester film before the drawing or between two drawing operations.

An acrylic polymer latex will be preferably used, prepared by emulsion or microemulsion polymerization or, if appropriate, by polymerization in an organic medium. These techniques, which are familiar to a person skilled in the art, will not be recalled here.

The acrylic polymers employed within the scope of the present invention are therefore preferably applied in the form of stable dispersions, or latices, in water or in a hydroorganic medium. When the polymer does not contain any hydrophilic group allowing a latex to be easily obtained, it may be used in combination

with one or a number of ionic or nonionic surfactants, such as those usually employed to obtain aqueous dispersions and well known to a person skilled in the art. To obtain particles, the polymer content of the
5 latices is not critical and may vary within wide limits. In general, latices containing from 1 to 50 % by weight of polymer are suited; use is preferably made of latices containing from 5 to 30 % by weight of polymer. The particle size of the polymer forming the
10 latex is chosen so that the final thickness of the coating (P) should not obliterate the roughness of the underlying filled layer (B); latices in which the polymer particle diameter is from 0.01 μm to 0.3 μm and preferably from 0.05 μm to 0.15 μm are generally used.

15 The quantity of aqueous coating composition deposited on the film depends, on the one hand, on its solids content and, on the other hand, on the desired thickness of the coating of the finished film, that is to say after drawing and heat-setting when the coating
20 takes place in line. This quantity also depends on the timing of the coating; the change in the thickness of the coating before and after drawing must obviously be taken into account when the coating is carried out before drawing.

25 After coating, the polyester film is heat-treated to remove the water present in the coating and, if appropriate, to induce the crosslinking of the polymer. In the case of in-line coating it is generally

unnecessary to undertake a heat treatment; the drying and possibly the crosslinking are carried out during the drawing and the heat-setting. However, it would not constitute a departure from the present invention to
5 undertake, in this case, a sufficient heat treatment, prior to the drawing and to the heat-setting, to induce the drying of the coated layer.

The thickness t_P of the coating layer (P) is such that it does not obliterate the roughness of the
10 underlying filled layer (B). Resorting to in-line coating and the choice of the acrylic polymer enable this objective to be met without, however, impairing the adhesion of the toner. In general, t_P is from 0.02 to 0.2 μm and preferably from 0.02 to 0.15 μm .

15 Resorting to a base (S) consisting of a thick unfilled layer (A) and of at least one thin layer (B) preferably containing a filler allows easy access, after deposition of the adhesion layer (P), to transparent components for electrostatic photocopying
20 which exhibit the required combination of the properties of transparency, machinability and adhesion to the toner. Finally, there is no need to increase the number of depositions of adhesion layers on the base (S), for example an adhesion primer and then a layer
25 receiving the toner, or to introduce into the latter fillers which may be subject to abrasion when the transparencies are being employed. Furthermore, resorting to a coextruded composite base (S) makes it

possible without difficulty to achieve a good compromise between transparency and machinability.

The Examples which follow illustrate the invention.

5 Example 1

The following are introduced into a 1.5-litre reactor fitted with an anchor stirrer:

- water	853 g
- sodium lauryl sulphate	1.5 g

10 The solution is heated to 80°C.

1.05 g of ammonium persulphate dissolved in 18.95 g of water is added.

The following are then introduced continuously:

15 a) during 7 h, the following mixture:

- ethyl acrylate	175.5 g
- methyl methacrylate	117.9 g
- methacrylic acid	4.5 g
- ethylene glycol dimethacrylate	2.1 g

20 b) during 8 h, the following solution:

- ammonium persulphate	0.84 g
- sodium bicarbonate	1.23 g
- sodium lauryl sulphate	1.5 g
- water	46.4 g

25 The reaction mixture is kept at 80°C for 1 h and is then cooled.

A latex A with a solids content of 25 % is obtained.

The acrylic polymer has a glass transition temperature of 20°C and a free carboxylic functional group content of 17 millimoles per 100 g of polymer.

Example 2

5 The following are introduced into a 1.5-litre reactor fitted with an anchor stirrer:

	- water	730 g
	- emulsifier containing an amine functional group quaternized by	
10	hydroxyethyl groups (Ethoquad C12®)	1.5 g
	- ethyl acrylate	13.8 g
	- methyl methacrylate	10.2 g

The solution is heated to 75°C.

0.30 g of water-soluble initiator of the
15 diazo compound type containing a quaternary ammonium group (V50), dissolved in 9.7 g of water, is added.

The following are then introduced continuously:

a) during 7 h, the following mixtures:

20	- ethyl acrylate	124.2 g
	- methyl methacrylate	91.8 g

and

	- acryloyloxyethyltrimethylammonium chloride	75 g
25	- water	45 g

b) during 8 h, the following solution:

	- V50 initiator	3.6 g
	- Ethoquad C12® emulsifier	1.5 g

- water 50 g

The reaction mixture is kept at 75°C for 1 h and is then cooled.

A latex B with a solids content of 26 % is
5 obtained.

The acrylic polymer has a glass transition temperature of 21°C and a free carboxylic functional group content of 0 millimole per 100 g of polymer.

Example 3

10 The following are introduced into a 1.5-litre reactor fitted with an anchor stirrer:

- water 760 g
- Ethoquad C12® emulsifier 1.5 g

The solution is heated to 60°C.

15 0.30 g of V50 initiator dissolved in 9.7 g of water is added.

The following are then introduced continuously:

a) during 7 h, the following mixture:

20 - ethyl acrylate 172.8 g
- methyl methacrylate 127.2 g

b) during 8 h, the following solution:

- V50 initiator 3.6 g
- Ethoquad C12® emulsifier 1.5 g
25 - water 50 g

The reaction mixture is kept at 60°C for 1 h and is then cooled.

A latex C with a solids content of 27 % is

obtained.

The acrylic polymer has a glass transition temperature of 20°C and a free carboxylic functional group content of 0 millimole per 100 g of polymer.

5 Two mixtures are prepared from this latex, containing 1.6 % (C1) and 3.6 % (C2) by weight, respectively, of stearamidopropyldimethyl- β -hydroxyethylammonium nitrate relative to the total weight of the latex (in order to have, after dilution
10 to a total solids content of 17 %, 1 % and 2 % of the quaternary ammonium compound respectively).

Example 4

The following are introduced into a 1.5-litre reactor fitted with an anchor stirrer:

15	- water	730 g
	- Ethoquad C12® emulsifier	1.5 g
	- ethyl acrylate	16.5 g
	- methyl methacrylate	12 g

The solution is heated to 75°C.

20 0.30 g of V50 water-soluble initiator dissolved in 9.7 g of water is added.

The following are then introduced continuously:

a) during 7 h, the following mixtures:

25	- ethyl acrylate	148.5 g
	- methyl methacrylate	108 g

and

- acryloyloxyethyltrimethylammonium

chloride	19 g
- water	30 g

b) during 8 h, the following solution:

- V50 initiator	3 g
5 - Ethoquad C12® emulsifier	1.5 g
- water	50 g

The reaction mixture is kept at 75°C for 1 h and then cooled.

A latex D with a solids content of 27 % is
10 obtained.

The acrylic polymer has a glass transition temperature of 23°C and a free carboxylic functional group content of 0 millimole per 100 g of polymer.

Example 5

15 The following are introduced into a 1.5-litre reactor fitted with an anchor stirrer:

- water	665 g
- Ethoquad C12® emulsifier	1.5 g
- ethyl acrylate	10.5 g
20 - methyl methacrylate	7.5 g

The solution is heated to 75°C.

0.30 g of V50 water-soluble initiator dissolved in 9.7 g of water is added.

The following are then introduced
25 continuously:

a) during 7 h, the following mixtures:

- ethyl acrylate	94.5 g
- methyl methacrylate	67.5 g

and

- acryloyloxyethyltrimethylammonium chloride 150 g
- water 60 g

5 b) during 8 h, the following solution:

- V50 initiator 3.6 g
- Ethoquad C12® emulsifier 1.5 g
- water 50 g

The reaction mixture is kept at 75°C for 1 h
10 and is then cooled.

A latex E with a solids content of 27 % is obtained.

The acrylic polymer has a glass transition temperature of 17°C and a free carboxylic functional
15 group content of 0 millimole per 100 g of polymer.

Comparative test 1

The following are introduced into a 1.5-litre reactor fitted with an anchor stirrer:

- water 848.5 g
- 20 - sodium lauryl sulphate 1.5 g

The solution is heated to 80°C.

1.05 g of ammonium persulphate dissolved in
18.95 g of water is added.

The following are then introduced
25 continuously:

a) during 7 h, the following mixture:

- ethyl acrylate 162 g
- methyl methacrylate 99 g

- methacrylic acid 39 g

b) during 8 h, the following solution:

	- ammonium persulphate	0.84 g
	- sodium bicarbonate	1.23 g
5	- sodium lauryl sulphate	1.5 g
	- water	46.4 g

The reaction mixture is kept at 80°C for 1 h and is then cooled.

A latex I with a solids content of 25 % is
10 obtained.

The acrylic polymer has a glass transition temperature of 33°C and a free carboxylic functional group content of 150 millimoles per 100 g of polymer.

Comparative test 2

15 The following are introduced into a 1.5-litre reactor fitted with an anchor stirrer:

	- water	751 g
	- sodium lauryl sulphate	1.5 g
	- water-dispersible polyester	93 g

20 The water-dispersible polyester employed is a copolyester containing units derived from terephthalic acid, isophthalic acid, Na isophthalic acid 5-sulphonate and from ethylene glycol, marketed under the trademark Gérol PS20.

25 The solution is heated to 80°C.

0.72 g of ammonium persulphate dissolved in 19.28 g of water is added.

The following are then introduced

continuously:

a) during 7 h, the following mixture:

	- ethyl acrylate	58.5 g
	- methyl methacrylate	120 g
5	- methacrylic acid	26.4 g
	- ethylene glycol dimethacrylate	2.1 g

b) during 8 h, the following solution:

	- ammonium persulphate	0.58 g
	- sodium bicarbonate	0.85 g
10	- sodium lauryl sulphate	1.05 g
	- water	47.52 g

The reaction mixture is kept at 80°C for 1 h and is then cooled.

A latex J with a solids content of 27 % is obtained.

The acrylic polymer has a glass transition temperature of 30°C and a free carboxylic functional group content of 102 millimoles per 100 g of polymer.

Comparative test 3

The following are introduced into a 1.5-litre reactor fitted with an anchor stirrer:

- water	848.5 g
- sodium lauryl sulphate	1.5 g

The solution is heated to 80°C.

1.05 g of ammonium persulphate dissolved in 18.95 g of water is added.

The following are then introduced continuously:

a) during 7 h, the following mixture:

- ethyl acrylate	105.6 g
- methyl methacrylate	181.5 g
- methacrylic acid	12.9 g

5 b) during 8 h, the following solution:

- ammonium persulphate	0.84 g
- sodium bicarbonate	1.23 g
- sodium lauryl sulphate	1.5 g
- water	46.4 g

10 The reaction mixture is kept at 80°C for 1 h and is then cooled.

A latex K with a solids content of 25 % is obtained.

15 The acrylic polymer has a glass transition temperature of 56°C and a free carboxylic functional group content of 50 millimoles per 100 g of polymer.

Comparative test 4

The following are introduced into a 1.5-litre reactor fitted with an anchor stirrer:

20	- water	848.5 g
	- sodium lauryl sulphate	1.5 g

The solution is heated to 80°C.

1.05 g of ammonium persulphate dissolved in 18.95 g of water is added.

25 The following are then introduced continuously:

a) during 7 h, the following mixture:

- ethyl acrylate	111 g
------------------	-------

- methyl methacrylate	163 g
- methacrylic acid	26 g

b) during 8 h, the following solution:

- ammonium persulphate	0.84 g
5 - sodium bicarbonate	1.23 g
- sodium lauryl sulphate	1.5 g
- water	46.4 g

The reaction mixture is kept at 80°C for 1 h and is then cooled.

10 A latex L with a solids content of 25 % is obtained.

The acrylic polymer has a glass transition temperature of 58°C and a free carboxylic functional group content of 100 millimoles per 100 g of polymer.

15 Comparative test 5

The following are introduced into a 1.5-litre reactor fitted with an anchor stirrer:

- water	848.5 g
- sodium lauryl sulphate	1.5 g

20 The solution is heated to 80°C.

1.05 g of ammonium persulphate dissolved in 18.95 g of water is added.

The following are then introduced continuously:

25 a) during 7 h, the following mixture:

- ethyl acrylate	85.5 g
- methyl methacrylate	175.8 g
- methacrylic acid	38.7 g

b) during 8 h, the following solution:

	- ammonium persulphate	0.84 g
	- sodium bicarbonate	1.23 g
	- sodium lauryl sulphate	1.5 g
5	- water	46.4 g

The reaction mixture is kept at 80°C for 1 h and is then cooled.

A latex M with a solids content of 25 % is obtained.

10 The acrylic polymer has a glass transition temperature of 61°C and a free carboxylic functional group content of 150 millimoles per 100 g of polymer.

Examples 6 to 11 and comparative tests 6 to 10.

Preparation of transparent components for photocopying.

15 The base film in the Examples which follow is a biaxially drawn polyethylene terephthalate (PET) film which has a total thickness of 100 μm , made up of a middle layer A of 98.4 μm of unfilled PET film and on each of the faces of layer A of a layer of 0.8 μm of
20 PET containing 0.3000 % of an inorganic filler of 3.5 μm mean diameter (silica of Sylobloc® type), the particle size having been measured with a laser particle size analyser of Sympathec® trademark and of Helos type.

25 The preparation is performed as follows. The coextruded amorphous film is first of all drawn monoaxially in the lengthwise direction with a ratio of 3.8 : 1 and is then coated on one of its faces with a

latex as prepared in the Examples and Comparative Tests described above (after dilution, to have a solids content of 17 % by weight), in a proportion of 1.4 g/m² (in the wet state).

5 The coating is dried and the film is then drawn in the transverse direction with a ratio of 3.8 : 1. The final acrylic polymer layer is 0.06 μm thick.

The biaxially drawn film is heat-set at 235°C.

10 The film thus obtained has a haze of 4.5, a total roughness Rz of 0.45 μ m and shrinkages at 150°C of 0.6 % in the lengthwise and transverse directions.

The toner adhesion and the half-discharge time (representing the antistatic nature) are measured on each of the transparent components for photocopying which are thus obtained.

The toner adhesion is measured by photocopying a test card with the aid of a Toshiba® BD 2810 photocopier. It is scored from 0 to 10, from the evaluation of the quantity of toner torn away from the transparent component after folding and scratching:

- 0 corresponds to toner which is completely torn away (very bad)

- 10 corresponds to toner which is not torn
25 away at all (excellent)

- values from 8 to 10 are considered to be satisfactory.

The main characteristics of the lattices

employed for coating the films and the results of toner adhesion and half-charge time measurements are collated in the table below.

5	Examples and comparative tests	Latex employed	COOH of the latex	Tg°C of the latex	Toner adhesion	Half-discharge time
10	Example 6	A	17	20	9	>100 s
	Example 7	B	0	21	9	1.5 s
	Example 8	C1	0	20	9	15 s
15	Example 9	C2	0	20	9	4 s
	Example 10	D	0	23	9	>100 s
20	Example 11	E	0	17	9	<1 s
	Test 6	I	150	33	3	>100 s
	Test 7	J	102	30	4	>100 s
	Test 8	K	50	56	7	>100 s
	Test 9	L	100	58	6	>100 s
25	Test 10	M	150	61	3	>100 s

CLAIMS

1. A transparent component suitable for electrostatic photocopying, which comprises a transparent polyester base (S) comprising on at least one of its faces a primer coating (P) for adhesion of toner to the polyester base, wherein the base (S) is a composite comprising:
- a) a thick layer (A) of a semicrystalline polyester, and
- b) on at least one of the faces of the thick layer (A), a thin layer (B) of polyester, which may be identical to or different from the polyester of layer (A),
- and wherein the primer coating (P) has a thickness of equal to or less than $0.3\text{ }\mu\text{m}$ and comprises an acrylic polymer which has a glass transition temperature of from 10°C to 50°C and a free $-\text{COOH}$ carboxylic functional group content of less than 50 millimoles per 100 grams of said acrylic polymer.
2. A component according to claim 1 wherein the polyesters forming the layers (A) and (B) are crystallizable film-forming polyesters selected from polyterephthalates and polynaphthalenedicarboxylates of alkylenediols, and copolyesters containing at least 80 mol% of alkylene glycol terephthalate or naphthalenedicarboxylate units.
3. A component according to claim 2 wherein the polyesters forming the layers (A) and (B) are



polyterephthalates of ethylene glycol or of 1,4-butanediol.

4. A component according to any one of the preceding claims wherein the acrylic polymer comprises
5 units selected from units derived from acrylic acid, methacrylic acid, alkyl acrylates, alkyl methacrylates, acrylonitrile, methacrylonitrile, acrylamide, methacrylamide, N-methylolacrylamide, N-methoxymethacrylamide, styrene, butadiene or vinyl
10 esters, at least some of these units originating from an alkyl acrylate and/or an alkyl methacrylate.

5. A component according to claim 4 wherein the acrylic polymer comprises at least units derived from alkyl acrylates chosen from methyl acrylate, ethyl
15 acrylate, propyl acrylates and butyl acrylates and/or units derived from alkyl methacrylates chosen from methyl methacrylate, ethyl methacrylate, propyl methacrylates and butyl methacrylates.

6. A component according to claim 5 wherein
20 the acrylic polymer comprises units derived from methyl and/or ethyl acrylate and from methyl and/or ethyl methacrylate.

7. A component according to any one of the preceding claims wherein the molar quantity of free
25 COOH carboxylic functional groups in the acrylic polymer is equal to or less than 30 millimoles per 100 grams of said acrylic polymer.

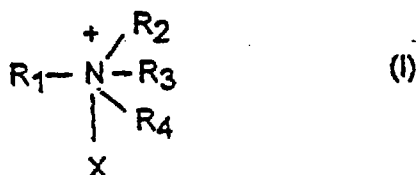
8. A component according to any one of the



preceding claims wherein the acrylic polymer has a glass transition temperature of from 15°C to 30°C.

9. A component according to any one of the preceding claims wherein the acrylic polymer forming the primer (P) comprises up to 25 % by weight of a monomer or polymer compound containing quaternary ammonium groups.

10. A component according to claim 9 wherein the compound containing quaternary ammonium groups, which is used or which is the source of a polymer containing quaternary ammonium groups which is itself used, has the formula (I):



in which:

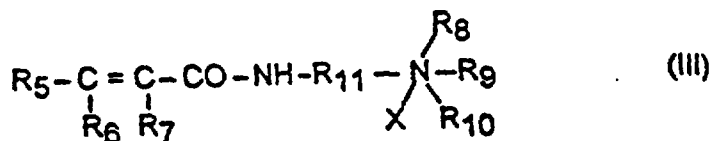
- R₁ denotes an acyloxyalkyl radical containing a saturated acyl group or containing a carbon-carbon ethylenic double bond, an alkoxyalkyl radical, an aryloxyalkyl radical, an alkylaryloxyalkyl radical, an alkenyloxyalkyl radical or an alkenylaryloxyalkyl radical,
- R₂, R₃ and R₄, which may be identical or different, each denotes an alkyl radical containing from 1 to 6 carbon atoms or a polyoxyethylene radical $-(\text{CH}_2-\text{CH}_2-\text{O})_n-\text{H}$ or

- X denotes an anion.

5 wherein X denotes a halide, sulphate, sulphonate, alkyl
sulphonate, arylsulphonate, arylalkyl sulphonate,
carbonate, alkyl carbonate, nitrate, phosphate or alkyl
phosphate anion or a mixture thereof.

10 wherein X denotes a halide, methyl sulphonate or methyl carbonate anion or a mixture thereof.

15 14. A component according to claim 13
wherein the compound of formula (I) is
stearamidopropyldimethyl- β -hydroxyethylammonium
nitrate.

$$\begin{array}{c} \text{R}_5 - \text{C} = \text{C} - \text{CO} - \text{O} - \text{R}_{11} - \text{N} \begin{array}{l} \text{R}_8 \\ \text{R}_9 \\ \text{X} \text{ R}_{10} \end{array} \end{array} \quad (\text{III})$$




in which:

- R_5 , R_6 and R_7 , which may be identical or different, each denotes a hydrogen atom, a methyl radical or an ethyl radical,
 - 5 - R_8 , R_9 and R_{10} , which may be identical or different, each denotes an alkyl radical containing 1 to 4 carbon atoms, or a polyoxyethylene radical $-(CH_2-CH_2-O-)_m-H$ or $-(CH_2-CH_2-O-)_m-CH_3$ with m denoting a number
10 from 1 to 8,
 - R_{11} denotes a divalent radical, and
 - X denotes an anion.
16. A component according to claim 15 wherein R_{11} denotes a polyethylene radical or
15 hydroxyalkylene radical containing 1 to 8 carbon atoms.
17. A component according to any one of claims 9 to 16 wherein the compound containing quaternary ammonium groups represents from 2 % to 15 % by weight relative to the weight of the combination of
20 acrylic polymer and compound containing quaternary ammonium groups and wherein the acrylic polymer does not contain any free carboxylic acid functional group.
18. A component according to any one of the preceding claims wherein the thickness e_P of the primer
25 coating (P) is from 0.02 μm to 0.2 μm .
19. A component according to claim 18 wherein the thickness e_P of the primer coating (P) is from 0.02 μm to 0.15 μm .



20. A component according to any one of the preceding claims wherein there are no filler particles in the thick layer (A) and wherein fillers are present in the thin layer(s) (B) such that the film has a haze
5 (or cloudiness) or less than or equal to 7 %.

21. A component according to any one of the preceding claims wherein the thickness t_A of the layer (A) is from 50 μm to 150 μm and the thickness t_B of the layer (B) is equal to or less than 3 μm .

10 22. A component according to claim 21 wherein the thickness t_B of the layer (B) is from 0.5 μm to 1.5 μm .

23. A component according to any one of the preceding claims wherein the composite polyester base
15 (S) has a haze of less than or equal to 7 %, a shrinkage ratio in the lengthwise and transverse drawing directions at 150°C which is less than or equal to 1 % and a total roughness R_z of less than or equal to 0.6 μm .

20 24. A process for the preparation of a component as defined in any one of the preceding claims wherein the coating (P) is deposited on at least one of the faces of the polyester base (S).

25 25. A process according to claim 24 wherein the composite polyester base film (S) is obtained by a coextrusion process in which a flow of crystallizable polyester (A) is extruded with the aid of a first extruder and, simultaneously, a flow of the polyester



(B) intended to form the layer(s) (B) is extruded with the aid of a second extruder, the two extruders being connected to a coextrusion adapter in which the flow (B) may, if appropriate, be divided into two flows (B), the polymer melt streams being converted into an amorphous multilayer film by passing through a flat die and the amorphous film thus obtained being subjected to the usual film manufacturing operations such as quenching, drawing, heat-setting and reeling.

26. A process according to claim 25 wherein the extruded amorphous composite film is subjected to biaxial drawing in two perpendicular directions, firstly to a lengthwise drawing and then to a transverse drawing, or vice versa, the lengthwise drawing being performed with a ratio of 3:1 to 5:1 and at a temperature of 80 to 135°C and the transverse drawing being performed with a ratio of 3:1 to 5:1 and at a temperature of 90 to 135°C, the composite film being subjected after drawing to a heat treatment at a temperature of from 160 to 240°C.

27. A process according to claim 26 wherein the transverse drawing is performed at a temperature of from 100 to 125°C.

28. A process according to any one of claims 24 to 27 wherein the deposition of the coating (P) on the composite polyester film (S) is carried out by deposition of an aqueous dispersion or solution of the acrylic polymer, by gravity from a slot caster or by



passing the composite polyester film through the emulsion or the solution or else by means of transfer rolls, the thickness of the layer being controlled by any suitable means and it being possible for the
5 deposition of the coating to take place either before any drawing of the film (in-line coating), after drawing or between two drawings or before or after heat-setting (out-of-line coating).

29. A process according to claim 28 wherein
10 the deposition takes place before the drawing operation or between two drawings.

30. A process according to claim 28 or 29 wherein a stable dispersion, or latex, in water or in a hydroorganic medium, of the acrylic polymer is used to
15 carry out the deposition of the coating (P).

31. A process according to claim 30 wherein the latex comprises from 1 to 50 % by weight of acrylic polymer.

32. A process according to claim 31 wherein
20 the latex comprises from 5 to 30% by weight of acrylic polymer.

33. A process according to any one of claims 30 to 32 wherein the diameter of the particles of the acrylic polymer forming the latex is from 0.01 μm to
25 0.3 μm .

34. A process according to claim 33 wherein the diameter of the acrylic polymer forming the latex is from 0.05 μm to 0.15 μm .



35. A transparent component obtained by a process as defined in any one of claims 24 to 34.