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3,260,779

PROCESS FOR THE PRODUCTION OF INK TRANSFER MEDIA

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This invention relates to ink transfer media and to a process for the production thereof. More particularly, this invention relates to a process for the production of ink transfer media, such as printing plates, which have excellent ink transfer characteristics, defect-free surfaces and excellent resistivity to the swelling action of practically all of the common ink solvents.

Printing plates having excellent ink transfer characteristics, defect-free surfaces and resistance to the swelling action of ink solvents, are mandatory in printing operations which employ such ink transfer media, in order to produce printed surfaces whereon the print is sharp, clear and legible. In printing operations such as letter-press printing, dry-offset printing and flexographic printing, printing plates receive ink and transfer the ink received to another surface. As an illustration, in both letter-press printing and in flexographic printing, the printing plate receives ink from ink rollers and then transfers the ink to the surface to be printed on, reproducing thereon a mirror image of its, the printing plate's surface. If the printing plate does not have a defect-free surface and excellent resistivity to the swelling action of the ink solvent, the printed surface will be smeared and the reproduction appearing thereon will be imperfect due to the irregular surface of the printing plate. In those instances wherein the printing plate does not have excellent ink transfer characteristics, the printed surface will also be unsatisfactory due to a poor distribution of ink from the printing plate to the surface to be printed on.

In the past, printing plates, especially those used in flexographic printing and in some letter-press printing, have been made of natural or synthetic rubber. Such printing plates are flexible, resilient and exhibit good wear resistance. The use of rubber printing plates has been limited, however, since they have relatively poor resistance to the swelling action of a large number of the common ink solvents. Commonly used ink solvents such as methyl ethyl ketone, acetone, isophorone, cyclohexane and the like cause rubber printing plates to swell to an undesirable degree during the printing operation. An impression of such swelled surface is transferred to the surface being printed thus resulting in the production of an unsatisfactorily printed product.

The present invention provides for ink transfer media which have excellent ink transfer characteristics, defect-free surfaces and excellent resistivity to the swelling action of practically all of the common ink solvents. Also, printing plates of the present invention, when heated to a temperature at which their surfaces become soft, i.e., at their minimum surface softening temperature, lose their surface imprint and return to their original smooth surfaced form without losing their shape. As an additional

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feature, the printing plates of this invention perform in excellent fashion with half tone screens above 110 lines.

The ink transfer media of this invention are formed from cross-linked thermoplastic resin compositions. Cross-linked thermoplastic resin compositions are not truly thermoplastic since they cannot be heated and remolded. The surfaces of cross-linked thermoplastic resin compositions can be softened by heat, however, and in this condition readily distorted. This surface distortion can be "frozen in" by simply cooling the distorted material to a temperature below the softening point thereof.

For purposes of this invention, thermoplastic resin compositions are considered to be cross-linked when at least about 85 percent by weight of a sample thereof is insoluble in boiling benzene after being immersed in boiling benzene for 24 hours.

The process by which the printing plates of the present invention are produced is conducted by shaping and cross-linking a thermoplastic resin composition, softening the surface of the shaped cross-linked article and thereafter imprinting on the softened surface.

Formation of thermoplastic resin compositions into shaped articles can be accomplished by any one of a number of convenient methods, as for example, by extrusion, by casting, by compression molding, by calendering and the like. The exact method used and the conditions under which such method is operated will, of course, depend upon the nature of the composition which is being shaped. The shape and size of the article can approximate that of the ultimate printing plate or the shaped article can be subsequently die cut, generally after being cross-linked, to the desired size. It is to be understood that the "printing plate" can be of any desired shape and is not limited to a "flat plate" structure.

Cross-linking of the thermoplastic resin composition, in the form of a shaped article, is conveniently accomplished by admixing an organic peroxide catalyst with the thermoplastic resin composition prior to its being shaped, forming the resultant composition into a shaped article, and heating the shaped article at a temperature sufficient to effect decomposition of the organic peroxide and to effect cross-linking of the molecules of the thermoplastic resin composition. Cross-linking of the shaped article can be accomplished simultaneously with the shaping of the thermoplastic material or subsequent thereto.

The amount of organic peroxide used is sufficient to effect a cross-linking of the composition with which it has been admixed. Generally, this amount will vary from about 1 percent by weight to about 6 percent by weight, and preferably from about 3 percent by weight to about 4 percent by weight, based on the weight of the thermoplastic resin. More than about 6 percent by weight of organic peroxide can be used but this does not materially affect the cross-linking reaction and is economically undesirable.

Once the organic peroxide is admixed with the thermoplastic resin composition and the resultant composition formed into a shaped structure, the shaped structure is heated at temperatures sufficiently high to decompose enough of the organic peroxide to effect cross-linking of the thermoplastic resin composition. Ordinarily the shaped structures are heated at a temperature of at least about 150° C., and generally at a temperature of about

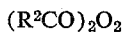
150° C. to about 200° C. and preferably at a temperature of about 175° C. to about 190° C. The actual time of the heating cycle will, of course, vary depending upon the organic peroxide used as well as the thermoplastic resin composition which is being cross-linked.

Any organic peroxide which will preferably decompose at a temperature above but not below about 150° C. is suitable for effecting cross-linking of the thermoplastic resin compositions.

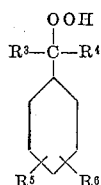
Illustrative of suitable peroxides are the polymer hydroperoxides, such as polyethylene hydroperoxide, and other such polymer hydroperoxides, as for example are disclosed in U.S. Patent No. 2,911,398, issued November 3, 1959 to Edwin J. Vandenberg; the perester peroxides, such as t-butyl peracetate, t-butyl peroxyisobutyrate, di-t-butyl diperphthalate, t-butyl perbenzoate, di-t-butyl dipermethyl malonate, di-t-amyl dipermethyl malonate, di-t-hexyl diperethyl succinate, di-t-hexyl dipergluturate, di-t-amyl dipersuccinate and the like, for instance as are disclosed in U.S. Patent No. 2,763,635, issued September 18, 1956 to Charles M. Lucher et al., and as are disclosed in U.S. Patent No. 2,698,863, issued January 4, 1955 to Frank H. Dickey; diacyl aromatic peroxides exemplary of which are the peroxides having the formula:



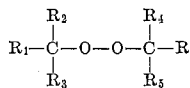
wherein R' is an aryl radical, such as benzoyl peroxide, 2,4-dichlorobenzoyl peroxide, p-chlorobenzoyl peroxide and the like; diacyl aliphatic peroxides, such as those having the formula:



wherein R² is an alkyl group, as for example, acetyl peroxide, caprylyl peroxide, myristoyl peroxide, lauroyl peroxide and the like; dibasic acid peroxides, such as succinic acid peroxide; the ketone peroxides, such as methyl ethyl ketone peroxide, cyclohexanone peroxide and the like; the aldehyde peroxides, such as hydroheptyl peroxide and the like; peroxides having the formula:



wherein R³ and R⁴ are alkyl groups, R⁵ is dialkyl methyl or trialkyl methyl; with the alkyl group in each case containing a maximum of 8 carbon atoms and R⁶ is hydrogen or an alkyl group containing a maximum of 8 carbon atoms such as 1,1-dimethyl-1-(isopropyl cyclohexyl)methyl hydroperoxide, 1,1-dimethyl-1-(diisopropyl cyclohexyl)methyl hydroperoxide and the like as are further disclosed in U.S. Patent No. 2,776,954 to Milton A. Taves; di(aralkyl) peroxides of the formula:



wherein R₁ is aryl, R₂, R₃, R₄ and R₅ are hydrogen or alkyl groups of less than 4 carbon atoms and R₆ is aryl, such as dibenzyl peroxide, bis-(α-methylbenzyl)peroxide, bis-(α,α - dimethylbenzyl)peroxide, bis-(α - propylbenzyl) peroxide, benzyl-(α - methylbenzyl)peroxide, benzyl - (α-methyl-p-methylbenzyl)peroxide, benzyl-(α-methyl-p-isopropylbenzyl)peroxide and the like as are further disclosed in U.S. Patent No. 2,826,570, issued March 11, 1958 to Reginald W. Ivett; hydroperoxides, such as 2,5-dimethylhexane-2,5-dihydroperoxide, p-menthane hydroperoxide, t-butylhydroperoxide, benzoin peroxide and the like; di-tertiary alkyl peroxides such as di-t-butyl peroxide, 2,5-bis-(tert-butylperoxy)-2,5-dimethylhexane and the like.

Once the composition in the form of a shaped article

is cross-linked, the surface of the shaped article is softened to a degree such that it can be imprinted on. This is accomplished, in general, by heating the shaped article to its minimum surface softening temperature. At this temperature, the shaped article will retain its shape although its surface will become soft enough to be imprinted on. The temperature at which each shaped structure is heated will depend upon the nature of the composition from which the shaped article was produced. As a general rule, these temperatures are at least 125° C., generally about 125° C. to about 200° C. and preferably about 150° C. to about 180° C. The time of the heating cycle will vary and depend upon the composition of the shaped structure.

Imprinting on the softened surface of the shaped article is usually effected by bringing the shaped article into contact with the surface of a matrix board whose surface is to be imprinted onto the surface of the shaped article. The imprinting operation is usually conducted in a press wherein the matrix board and the shaped article are forced into intimate surface contact with each other under sufficient pressure so that the surface of the matrix board is imprinted on the surface of the shaped article. Once the surface of the matrix board is imprinted on the surface of the shaped article, appearing as a mirror image thereon, the shaped article is cooled to hardness, usually to room temperature, about 23° C., removed from the press and then separated from the matrix board.

Illustrative of thermoplastic resins which can be used in accordance with this invention are those formed by polymerizing one, or a mixture of the following monomers: vinyl aryls such as styrene, o-methoxystyrene, p-methoxystyrene, m-methoxystyrene, o-nitrostyrene, m-nitrostyrene, o-methylstyrene, p-methylstyrene, m-methylstyrene, p-phenylstyrene, o-phenylstyrene, m-phenylstyrene, vinyl naphthalene and the like; vinyl and vinylidene halides such as vinyl chloride, vinylidene chloride, vinylidene bromide and the like; vinyl esters such as vinyl acetate, vinyl propionate, vinyl butyrate, vinyl chloroacetate, vinyl chloropropionate, vinyl benzoate, vinyl chlorobenzoate and the like; acrylic and alpha-alkyl acrylic acids, their alkyl esters, their amides and their nitriles such as acrylic acid, chloroacrylic acid, methacrylic acid, ethacrylic acid, methyl acrylate, ethyl acrylate, butyl acrylate, n-octyl acrylate, 2-ethylhexyl acrylate, n-decyl acrylate, methyl methacrylate, butyl methacrylate, methyl ethacrylate, ethyl ethacrylate, acrylamide, N-methyl acrylamide, N,N-dimethylacrylamide, methacrylamide, N-methyl methacrylamide, N,N-dimethyl methacrylamide, acrylonitrile, chloroacrylonitrile, methacrylonitrile, ethacrylonitrile and the like; alkyl esters of maleic and fumaric acid such as dimethyl maleate, diethyl maleate and the like; vinyl alkyl esters and ketones such as vinyl methyl ether, vinyl ethyl ether, vinyl isobutyl ether, 2-chloroethyl vinyl ether, methyl vinyl ketone, ethyl vinyl ketone, isobutyl vinyl ketone and the like; also vinyl pyridine, N-vinyl carbazole, N-vinyl pyrrolidine, ethyl methylene malonate; ethylene, propylene and the like. If desired, a mixture of thermoplastic resins can be used. By using a mixture of resins of different densities the hardness of the end products can be varied as desired.

If desired, various additives can be added to the thermoplastic resins as is well-known in the art. Exemplary of such additives are dyes, pigments such as titanium dioxide, stabilizers, lubricants, antioxidants such as 4,4'-thio-bis-(3-methyl-tert-butylphenol), fillers such as carbon black, talc, clay, wollastonite and the like.

The examples which follow are intended to illustrate the present invention, and are not intended to limit the scope thereof in any manner.

Example I

This example illustrates the excellent printing plates that can be produced according to the present invention. Compositions, whose formulations are shown in the

table below, were compounded and formed into printing plates in a manner which will be described subsequently. The matrix board used in each of the examples contained screens of 65 to 150 lines and contained various types, sizes and faces. The matrix board was a standard matrix board for type reproductions, supplied by Williamson and Company of Caldwell, New Jersey.

	Parts by Weight						
	1	2	3	4	5	6	7
Polyethylene, 0.95 Density, 6 Melt Index.....	1, 225						
Polyethylene, 0.914 Density, 1.25 Melt Index.....							1, 500
Ethylene-Ethyl Acrylate Copolymer, 10 Melt Index, 14 Weight Percent Combined Ethyl Acrylate.....				1, 450	2, 125	2, 000	
Ethylene-Ethyl Acrylate Copolymer, 16 Melt Index, 20 Weight Percent Combined Ethyl Acrylate.....			1, 450				
Ethylene-Ethyl Acrylate Copolymer, 0.1 Melt Index, 12 Weight Percent Combined Ethyl Acrylate.....		1, 500					
Electrically Non-Conductive Carbon Black.....	1, 225	1, 500					1, 500
Electrically Conductive Carbon Black.....			1, 050	1, 050	375	500	
Bis (α,α -dimethylbenzyl) peroxide.....	73.5	45	43.5	43.4	63.75	60	60
4,4'-Thio Bis-(3-methyl-6-t-butylphenol).....	12	7.5	7.25	7.25	10.63	10	1.5

played in a flat-bed, letter-press. Printed paper sheets of excellent quality were obtained.

In order to demonstrate the necessity of cross-linking shaped articles before imprinting thereon, compositions were formulated and the compositions formed into blanks. The blanks were imprinted on without first being cross-linked.

	Parts by Weight		
	Control 1	Control 2	Control 3
Ethylene-ethyl acrylate copolymer 10 Melt Index.			
14 weight percent combined ethyl acrylate.....	2, 125	2, 000	1, 450
Electrically conductive carbon black.....	375	500	
Electrically non-conductive carbon black.....			1, 050
Bis (α,α -dimethylbenzyl) peroxide.....	63.75	60	43.4

Each composition noted in the table above, less the organic peroxide, was fluxed in a Banbury mixer at a batch temperature of from 110° C. to 125° C. to a blend. The organic peroxide was then added to each composition and each composition was again fluxed in the Banbury mixer at a batch temperature of from 110° C. to 125° C. for 2 minutes. Each composition was then removed from the Banbury mixer and given 5 end-passes on a 16 inch by 24 inch two-roll mill whose rolls surface temperature was 110° C. Each sheeted composition was then cooled to room temperature, about 23° C. and cut into blanks having the following dimensions: 4 inches by 4 inches by 0.75 inch. The blanks were cross-linked by the following procedure: each blank was placed between two cellophane sheets which were in a mold and which conformed to the surface of the mold. The mold itself, with the blank therein, was mounted in a heated press which was at a temperature of 175° C. Each blank was allowed to remain in the heated press under a pressure of 300 p.s.i. absolute to 600 p.s.i. absolute for 10 minutes. Each blank was then cooled to room temperature, about 23° C. and removed from the mold.

Each cross-link blank was placed onto the surface of a matrix board, having lettering imprinted thereon, which was approximately the same size as the cross-linked blank. The cross-linked blank, resting on the surface of the matrix board, was heated at 175° C. for 5 minutes with the result that the surface of the blank softened. At this point the cross-linked blank and the matrix board were placed in a cold press and pressed into intimate surface contact under pressure. The blank was then allowed to cool to room temperature, about 23° C. while still in contact, under pressure, with the matrix board in the press, removed from the press along with the matrix board and then separated from the matrix board.

All of the printing plates so produced had imprinted on their surfaces a perfect mirror image of the lettering of the matrix board. The imprinted surface of each printing plate was free from any surface defects.

Printing plates formed from Composition 4 were em-

Each composition noted in the table above, less the organic peroxide, was fluxed in a Banbury mixer at a batch temperature of from 110° C. to 125° C. to a blend. The organic peroxide was then added to each composition and each composition was again fluxed in the Banbury mixer at a batch temperature of from 110° C. to 125° C. for 2 minutes. Each composition was then removed from the Banbury mixer and given 5 end-passes on a 16 inch by 24 inch two-roll mill whose rolls surface temperature was 110° C. Each sheeted composition was then cooled to room temperature, about 23° C. and cut into four inch square blanks. A blank, corresponding in size to that of a matrix board, which had lettering thereon and which was used to imprint that lettering onto the blank, was placed in surface contact with the matrix board.

Each blank, in intimate surface contact with the matrix board under pressure was heated at 175° C. for 10 minutes. The blank was then allowed to cool to room temperature, about 23° C., then separated from the matrix board.

All of the printing plates so produced had undesirable surface fissures which rendered them useless for obtaining therefrom acceptable printed material such as printed paper sheets.

Example II

This example illustrates the excellent resistance to the swelling effects of the common ink solvents possessed by printing plates of the present invention as compared to rubber printing plates.

Small samples from printing plates formed from compositions identified as 1, 2 and 7 in Example I, and produced according to the procedure described in Example I were submerged in various solvents for 24 hours at 23° C. After 24 hours each sample was removed from the solvent and its percent volume change determined using a micrometer. Samples from printing plates formed from synthetic rubber (polymer of acrylonitrile and 1,3-butadiene), and from natural rubber (caoutchouc) were also immersed in various solvents for 24 hours at 23° C., removed therefrom and their percent volume change determined. The

rubber printing plates were supplied by Moss Type Corporation.

Type of solvents used and the percent volume change of each sample are noted in the table which follows:

	Percent Volume Change After 24 Hours at 23° C.				
	1	2	7	Natural Rubber	Synthetic Rubber
Acetone.....	1.89	7.51	0	-----	119.00
Cyclohexane.....	4.61	67.50	22.36	239.00	-----
Xylene.....	5.69	72.60	17.80	253.00	303.00
Toluene.....	6.19	70.10	18.00	248.50	143.50
Methylethyl Ketone.....	0.43	16.97	0	-----	327.50
Isophorone.....	0	6.73	0	87.50	187.50

As shown by the above noted table, printing plates formed in accordance with the present invention have a significantly greater resistance to the swelling action of commonly used ink solvents than do printing plates formed from natural or synthetic rubber.

Example III

This example also illustrates that excellent printing plates can be produced in accordance with the present invention.

Compositions, whose formulations are shown in the

Printing plates formed from these compositions were employed in a flat-bed, letter-press. Printed paper sheets of excellent quality were obtained.

Example V

Compositions, whose formulations are shown in the table below, were compounded and formed into printing plates in a manner identical to that described in Example I.

	Parts by Weight			
	13	14	15	16
Polyethylene 0.914 density, 1.2 Melt Index.....	50	50	50	50
Electrically non-conductive carbon black.....	12.5	25	37.5	50
Bis-(α,α -dimethylbenzyl) peroxide.....	1.5	1.5	1.5	1.5
4,4'-Thio-bis-(3-methyl-6-t-butylphenol).....	0.05	0.05	0.05	0.05

Printing plates formed from these compositions were employed in a flexographic printing press. Printed paper sheets of excellent quality were obtained.

Example VI

Compositions, whose formulations are shown in the table below, were compounded and formed into flexographic printing plates in a manner identical to that described in Example I.

	Parts by Weight					
	17	18	19	20	21	22
Ethylene-Ethyl Acrylate Copolymer, 10 Melt Index, 14 Weight Percent Combined Ethyl Acrylate.....	56.84	56.84	-----	-----	-----	-----
Ethylene-Ethyl Acrylate Copolymer, 15.7 Melt Index, 19 Weight Percent Combined Ethyl Acrylate.....	-----	-----	56.84	-----	-----	-----
Ethylene-Ethyl Acrylate Copolymer, 18.8 Melt Index, 26.1 Weight Percent Combined Ethyl Acrylate.....	-----	-----	-----	56.84	-----	-----
Ethylene-Ethyl Acrylate Copolymer, 26.4 Melt Index, 16 Weight Percent Combined Ethyl Acrylate.....	-----	-----	-----	-----	49.14	-----
Ethylene-Ethyl Acrylate Copolymer, 0.1 Melt Index, 5 Weight Percent Combined Ethyl Acrylate.....	-----	-----	-----	-----	-----	49.14
Electrically Conductive Carbon Black.....	41.16	-----	-----	-----	-----	-----
Electrically Non-Conductive Carbon Black.....	41.16	41.16	41.16	41.16	49.14	49.14
Bis-(α,α -dimethylbenzyl)peroxide.....	1.72	1.72	1.72	1.72	1.47	1.47
4,4'-Thio bis-(3-methyl-6-t-butylphenol) (Antioxidant).....	0.28	0.28	0.28	0.28	0.25	0.25

table below, were compounded and formed into printing plates in a manner identical to that described in Example I.

	Parts by Weight	
	8	9
Polyethylene, 0.95 density, 6 Melt Index.....	50	-----
Polyethylene, 0.95 density, 4 Melt Index.....	-----	50
Electrically non-conductive carbon black.....	50	50
2,5-Bis-(t-butylperoxy)-2,5-dimethyl hexane.....	-----	1.5
Bis-(α,α -dimethylbenzyl) peroxide.....	1.5	-----
Polymerized trimethyl dihydroquinoline.....	-----	0.05
4,4'-Thio bis-(3-methyl-6-t-butylphenol).....	0.05	-----

Printing plates formed from both compositions were employed in a flat-bed, letter-press. Printed paper sheets of excellent quality were obtained.

Example IV

Compositions, whose formulations are shown in the table below, were compounded and formed into printing plates in a manner identical to that described in Example I.

	Parts by Weight		
	10	11	12
Polyethylene, 0.914 density, 1.2 Melt Index.....	50	50	50
Electrically non-conductive carbon black.....	50	100	150
Bis-(α,α -dimethylbenzyl) peroxide.....	1.5	1.5	1.5
4,4'-Thio bis-(3-methyl-6-t-butylphenol).....	0.05	0.05	0.05

All of the printing plates so produced had imprinted on their surfaces a perfect mirror image of the lettering of the matrix board. The imprinted surface of each printing plate was free from any surface defects.

Example VII

A composition whose formulation is shown below, was compounded and formed into printing plates in a manner identical to that described in Example I.

	Parts by weight
Polyethylene, 0.95 density, 6 Melt Index.....	23
Electrically non-conductive carbon black.....	1,225
Bis-(α,α -dimethylbenzyl) peroxide.....	1,225
4,4'-Thio-bis-(3-methyl-6-t-butylphenol).....	73.5
	12

The printing plates formed were heated to a temperature of 175° C. with the result that each printing plate returned to its blank surfaced form that it possessed prior to being imprinted on, without losing its shape. These blanks were then used to prepare new printing plates.

It is to be noted that all patents noted in this application are incorporated herein by reference.

What is claimed is:

1. Process for the production of a printing plate which comprises in sequence the steps of heating a cross-linked shaped article formed from a thermoplastic resin composition having an organic peroxide content of from about 1% to about 6%, to a temperature such that the surface of said article is softened, pressing a matrix board having an imprint on its surface into intimate contact with the softened surface of said cross-linked shaped article whereby the surface of said matrix board is imprinted

on the surface of said cross-linked shaped article, appearing as a mirror image thereon, cooling said cross-linked shaped article to about room temperature while maintaining said cross-linked shaped article in contact with said matrix board and thereafter separating said cross-linked shaped article from said matrix board.

2. Process for the production of a printing plate which comprises in sequence the steps of forming a thermoplastic resin composition having an organic peroxide content of from about 1% to about 6%, into a shaped article, cross-linking said shaped article, heating said cross-linked shaped article to a temperature such that the surface of said article is softened, pressing a matrix board having an imprint on its surface into intimate contact with the softened surface of said cross-linked shaped article whereby the surface of said matrix board is imprinted on the surface of said cross-linked shaped article, appearing as a mirror image thereon, cooling said cross-linked shaped article to about room temperature while maintaining said cross-linked shaped article in contact with said matrix board and thereafter separating said cross-linked shaped article from said matrix board.

3. Process for the production of a printing plate which comprises in sequence the steps of admixing a thermoplastic resin with about 1% to about 6% of an organic peroxide, forming the resultant composition into a shaped article, heating said article to effect a cross-linking thereof, heating the cross-linked shaped article to a temperature such that the surface of said article is softened, pressing a matrix board having an imprint on its surface into intimate contact with the softened surface of said cross-linked shaped article whereby the surface of said matrix board is imprinted on the surface of said cross-linked shaped article, appearing as a mirror image thereon, cooling said cross-linked shaped article to about room temperature while maintaining said cross-linked shaped article in contact with said matrix board and thereafter separating said cross-linked shaped article from said matrix board.

4. Process as defined in claim 3 wherein the thermoplastic resin is polyethylene.

5. Process as defined in claim 3 wherein the thermoplastic resin is a copolymer of ethylene and ethyl acrylate.

6. Process as defined in claim 3 wherein the organic peroxide is bis(α,α -dimethylbenzyl)peroxide.

7. Process as defined in claim 3 wherein the organic peroxide is 2,5-bis-(*t*-butylperoxy)-2,5-dimethyl hexane.

8. Process for the production of a printing plate which comprises in sequence the steps of admixing a thermoplastic resin and from about 1% to about 6% of an organic peroxide and a filler, forming the resultant composition into a shaped article, heating said shaped article at a temperature of about 150° C. to about 200° C.

to effect a cross-linking thereof, heating the cross-linked shaped article at a temperature of at least about 125° C. to effect a softening of the surface thereof, pressing a matrix board having an imprint on its surface into intimate contact with the softened surface of said cross-linked shaped article whereby the surface of said matrix board is imprinted on the surface of said cross-linked shaped article, appearing as a mirror image thereon, cooling said cross-linked shaped article to about room temperature while maintaining said cross-linked shaped article in contact with said matrix board and thereafter separating said cross-linked shaped article from said matrix board.

9. Process as defined in claim 8 wherein said cross-linked shaped article is heated at a temperature of about 125° C. to about 200° C.

10. Process as defined in claim 8 wherein the filler is carbon black.

11. Process for the production of a printing plate which comprises in sequence the steps of admixing a thermoplastic resin, and from about 1% to about 6% of an organic peroxide, and a filler, forming the resultant composition into a shaped article, heating said shaped article at a temperature of about 175° C. to about 190° C. to effect a cross-linking thereof, heating said cross-linked shaped article at a temperature of about 150° C. to about 180° C. to effect a softening of the surface thereof, pressing a matrix board having an imprint on its surface into intimate contact with the softened surface of said cross-linked shaped article whereby the surface of said matrix board is imprinted on the surface of said cross-linked shaped article, appearing as a mirror image thereon, cooling said cross-linked shaped article to about room temperature while maintaining said cross-linked shaped article in contact with said matrix board and thereafter separating said cross-linked shaped article from said matrix board.

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