COMMONWEALTH OF AUSTRALIA.

Patents Act 1952 **612783**

CONVENTION APPLICATION FOR A STANDARD PATENT

~~I~~/We, FELIX SCHOELLER JR. GMBH & CO. KG. a limited liability company of Burg Gretesch, D-4500 Osnabruck, Federal Republic of Germany

hereby apply for the grant of a Standard Patent for an invention entitled:

BASE PAPER FOR PHOTOGRAPHIC COATINGS CONTAINING MOISTURE REPELLENT SIZING, AMPHOTERIC POLY(METH) ACRYLAMIDE AND CATIONIC RESIN.

which is described in the accompanying complete specification.

This application is made under the provision of Part XVl of the Patents Act 1952 and is based on an application for a patent or similar protection made

in Federal Republic of Germany on 16 February 1988

No. (P38 04 776.4-51)

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Dated this 9th day of February 1989

FELIX SCHOELLER JR. GMBH & CO. KG

By: ________________

Registered Patent Attorney

To: The Commissioner of Patents
COMMONWEALTH OF AUSTRALIA

Commonwealth of Australia
The Patents Act 1952

DECLARATION IN SUPPORT

In support of the (Convention) Application made by:

FELIX SCHOELLER JR. GMBH & CO. KG., Burg Gretesch, D-4500
Osnabruck, Federal Republic of Germany

for a patent for an invention entitled:

BASE PAPER FOR PHOTOGRAPHIC COATINGS

~~I~~ (We) Dr. Harald Siegers and Dr. Gregor Kemme

of and care of the applicant company do solemnly and sincerely declare as follows:

~~a) I am (We are) the applicant(s) for the patent~~

~~or~~

b) ~~I am~~ (We are) authorised by the applicant~~(s)~~ for the patent to make this declaration on its behalf.

Delete the following if not a Convention Application.

The basic application~~(s)~~ as defined by section 141 ~~(142)~~ of the Act was ~~(were)~~ made

on 16 February 1988 in Federal Republic of Germany

~~on~~ ~~in~~

~~on~~ ~~in~~

by the present applicant company

The basic application~~(s)~~ referred to in this paragraph is ~~(are)~~ the first application~~(s)~~ made in a Convention country in respect of the invention the subject of the application.

~~a) I am (We are) the actual inventor(s) of the invention.~~

~~or~~

b) Robert Winiker, Am Plessen 23, D-4507 Hasbergen, Federal Republic of Germany

is ~~(are)~~ the actual inventor~~(s)~~ of the invention and the facts upon which the applicant company is ~~(are)~~ entitled to make the application are as follows:

the applicant is a person who would if a patent were granted upon an application made by the actual inventor, be entitled to have the patent assigned to it.

Declared at Osnabrück this 7th day of December 1988

ppa. i.V. Gregor Kemme

~~Signed~~ ~~XXXXX~~ Vice President Status Head of Patent Department

Declarant's Name FELIX SCHOELLER JR GmbH & Co. KG signed by

Dr. Harald Siegers Dr. Gregor Kemme

F. B. RICE & CO PATENT ATTORNEYS

This form is suitable for any type of Patent Application. No legalisation required.

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(57) Claim

1. A base paper for photographic emulsion carriers, wherein the paper sheet has at least one moisture repellent sizing, at least one amphoteric poly(meth) acrylamide of molecular weight between 100,000 to 2,000,000 and at least one cationic resin giving it wet strength.

2. A base paper according to claim 1, wherein the amphoteric poly(meth)acrylamide is a co-polymer which contains at least 40 mole % acrylamide and/or methacrylamide groups together with another monomer/polymer as hereinbefore defined.

10. A base paper according to claim 9, wherein the cationic resin imparting wet strength is a polyamide-polyamine-epichlorhydrine resin.

COMMONWEALTH OF AUSTRALIA

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Complete Specification for the invention entitled:
BASE PAPER FOR PHOTOGRAPHIC COATINGS CONTAINING MOISTURE REPELLENT SIZING, AMPHOTERIC POLY(METH) ACRYLAMIDE AND CATIONIC RESIN

The following statement is a full description of this invention including the best method of performing it known to us/~~me~~:-

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The invention concerns a base paper for paper carriers which have a water repellent photographic layer applied to it as well as a process for the production of such a base paper for the production of emulsion carriers.

The use of a paper, coated on both sides with water repellent resin layers (laminate), as carrier material for photographic layers which are to developed wet, is well known. Such a carrier material in a widely used form consists of a base paper coated on both sides with poly-olefine resin of which the coating situated next to the photographic layers usually contains at least one light reflecting pigment (for example titanium dioxide).

A paper provided on both surfaces with water impermeable resin layers is protected over its surface against the penetration of water or aqueous photographic developer solutions but not on its open edges. Here the paper nucleus of the laminate is exposed. Therefore aqueous developer solutions can penetrate into the paper nucleus from the edges of the laminate and cannot be removed without residue by means of the usual washing processes.

In order to prevent, respectively to reduce the penetration of aqueous solutions at the edges of the laminate, the base paper is usually hard sized. Both reactive materials such as for example dimerised alkylates and non reactive materials such as higher fatty acids are known as sizings for photographic base papers. Reactive sizings are usually processed together with a cationic resin without change in pH (neutral) while non reactive sizings require the addition of aluminium ions for fixing and are processed in an acid environment. Over and above that a combination of these two sizing processes were described in DOS 32 38 865 in order to protect the paper nucleus still better against the penetration of the various constituents of the photographic developing solutions.

The sizings which are water repellent are usually added to the fibre suspension and are deposited on the surface of the fibres by means of the addition of aids. In case of an acid sizing such an aid is for example an aluminium salt, in the case of neutral sizing for example a cationic polyamide-polyamine-epichlorhydrine resin which is preponderantly used together with with C_{16}-C_{18}-alkylketene dimers (J.Appl. Photographic Engineering 7. (1981), pp. 67 - 722). However, other cationic substances such as polyacrylamides, cationic starches or polyethylene imines are suitable in certain cases for the improvement of retention and for the fixation of reactive sizings in the paper sheet.

As the sizings are deposited on the surface of the cellulose fibres, it is natural that fibre-fibre cohesion is weaker in a sized paper than in a non sized paper. Therefore water soluble resins are widely used to improve the strength of the paper. Such resins are among others polyvinyl alcohol, anionic polyacrylamide, guarana resin and various starch derivatives. DE-OS 32 10 621 describes for example the use of anionic polyacrylamide together with cationic starch. According to DE-OS 32 16 840 anionic polyacrylamide is used together with cationic polyacrylamide, and in DE-OS 33 28 463 a combination is described of cationic resin with anionic polysaccharide derivatives. The addition of these strengthening resins has the simultanecus purpose of reducing the discoloration of the edges by the developer.

It is not only the loss in strength which is a disadvantage of a hard sizing of the base paper whereby the loss of structural strength in the case of laminates is especially deleterious. Above all it is also a disadvantage that the addition of flocculating additives exerts a disadvantageous influence on sheet formation. This is caused by the fact that the addition of cationic substances does not only cause retention of the sizing on the fibre surface, but unavoidably and in spite of counteracting machine technical measures, flocculation of fibres takes place to an increased extent because the repelling negative charges of the fibres are to a large extent neutralised and the formation of bridges between fibres is enhanced by the cationic substances. The flocculated fibres have different sizes and distribution in the paper sheet depending on the materials used in each case and types of machines used and they determine the homogeneity and surface quality of the base paper. The structure of the paper sheet once created can no longer be changed even by strong calendering.

While a reduction of the developer penetration at the cut edges was achieved through the combined use of cationic and anionic resins as described in DE-OS 32 10 621, DE-OS 32 16 840, DE-OS 33 28 463 and finally in DE-Patent 36 06 806, the problem of the formation, the surface quality and the structural strength were given little consideration. These two points have only been considered in DEPatent 36 06 806 in combination with an acid sizing.

In neutrally sized papers the combined use of anionic and cationic resins regularly causes a deterioration of the formation.

Besides the structural strength of the paper sheet frequently decreases because, with untidy process operation, isolated flocculations occur formed from anionic and cationic resin which are held in the paper lattice without adding to the structural strength.

So as to get around the flocculation problem, the attempt was made to add non ionic polymers, for example starch, polyvinyl alcohol or guarana resin to the cellulose suspension. While this achieved a certain improvement of the sheet formation and of the surface quality, the retention of these materials was, however, clearly worse, the production rate had to be decreased and on exposure to photographic processing solutions, the internal strength proved to be clearly reduced. The edges of the coated carrier split open under the influence of the photographic processing solutions.

Only with acid sizing can a good sheet formation and an adequate surface quality be obtained with some assurance up to the present according to DE-PS 36 06 806. An acid sizing is, however, not desirable in many cases because the sensitivity of the photagraphic layers are thereby reduced.

But even papers according to DE-PS 36 06 806 still require improvement. It is a disadvantage that with the use of two differently charged polyacrylamides two solution stations and two dosage stations are necessarily required. It is also a disadvantage that the dosages of the two components cannot be precisely adjusted to each other because on the one hand the electrochemical character of the two polyacrylamides is not stable in solution and on the other hand the electrochemical behaviour of the fibres is subject to continuous fluctuations. It is a consequence of this that the internal strength (structural strength) and the sheet structure are subject to fluctuations, which up to now could neither be reliably explained nor controlled.

In the described state of the technology it is finally a disadvantage that none of the processes described up to now is suitable for both "neutral" sized papers with reactive sizings as well as for "acid" sized papers with non reactive sizings. But rather in an experiment with the transfer of, for example, DE-PS 36 06 806 to neutrally sized paper all the weaknesses of th DE-PS 32 06 806 are again experienced, and the fluctuations of structural strength, sheet structure and edge penetration are complemented by bad formation and surface quality.

It is therefore the task of the present invention to provide a base paper as carrier for photographic layers which does not have the disadvantages described and which is improved particularly with respect to formation, surface quality and internal strength (structural strength), without deterioration of edge penetration and other important properties.

It is a further task of the invention to propose a process for the production of a base paper for carriers of photographic layers after the parameters quoted are improved both in the application of the so-called acid sizing and the soc-called neutral sizing, and undesirable fluctuations of these properties and of the edge penetration are avoided. In this connection, undesirable fluctuations are considered to be fluctuations around the average of the surface number and of the edge penetration of more than ±5 % as well as of more than ±6 % in the case of the internal strength.

The problem is solved by using a base paper for laminate production which contains, beside the water repellent sizing, at least one cationic resin and at least one amphotheric polyacrylamide.

The invention, therefore concerns a base paper for resin coated photographic layer carriers as well as a process for the production of a base paper which contains at least one water repellent sizing, at least one cationic resin and at least one amphotheric polyacrylamide.

Water repellent sizings in the sense of the invention are both reactive sizings such as dimerised alkyl ketenes, epoxy-fatty acid amides or fatty acid anhydrides, and also non reactive sizings such as higher fatty acids (for example stearic acid) and salts of higher fatty acids. When using a non reactive sizing, polyvalent metal ions in the form of a salt such as aluminium sulfate or sodium aluminate are added besides to the paper material, and the pH value is adjusted to a usual value between pH = 4 and pH = 6. In the individual case polyvalent metal ions can also be used together with reactive sizings.

A particularly preferred dimerised alkyl ketene consists to at least 50 % of behenyl ketene or another alkyl ketene with more than 18 carbon atoms in the alkyl residue. The hydrocarbon residue of the ketene can, however, also contain ring structures or C=C double bonds.

In further development of the invention two or more water repellent sizings are contained in the paper. In this reactive sizings can be combined with non reactive sizings. A preferred combination is for example a combination of alkyl ketene dimer and fatty acids, but also a combination of epoxy fatty acid amide and fatty acid is possible within the framework of the invention.

A cationic resin is every resin with cationic groups usual in the paper industry for use as wet strength additive. Such resins usually serve for the creation of wet strength and for the retention of reactive sizings. According to the invention they are, however, used both in combination with reactive and also with non reactive sizings. In a preferred form of execution the cationic resin is a polyamine- or polyamide resin modified with epichlorhydrine. Other suitable resins are urea/formaldehyde resins, melamine/formaldehyde resins, polyethyl imine and polyethyl imine derivatives.

The third component which is decisive for the success of the invention, the amphotheric polyacrylamide is a polyacrylamide which contains both anionic groups and also cationic groups in the macromolecule. The anionic groups are carboxylic, respectively alkali carboxylate groups. The cationic groups can be any cationic groups. Preferred cationic groups are, however, quaternary or protonic alkali amino alkylene (meth)acrylate or alkyl amino alkylene (methacrylamide groups whereby quaternary transformation is carried out for preference with dimethyl sulfate or methyl chloride and where the salts of the protonic form are preferably sulfate or chlorides.

The introduction of cationic groups into a poly(meth)acrylamide usually takes place by way of a co-polymerisation in the presence of corresponding cationic monomers, for example dialkyl amino alkylene (meth)acrylate or dialkyl amino alkylene (meth)acrylate amide in the form of acid salts or in quaternary form. Dimethyl diallyl ammonium chloride is also a suitable cationic co-monomer. However, cationic groups can also be formed by reaction of polyacrylamide according to Mannich or Hoffmann, or by trans-aminisation with polyamine.

In a similar way the anionic groups in the amphotheric polyacrylamide are either the result of a co-polymerisation in the presence of for example (meth)acrylic acid, respectively its salts, or the result of a hydrolysis of acrylamide groups or co-polymerised (meth)acrylic acid esters.

The molecular weight of the amphotheric polyacrylamide is within the limits of 100,000 to 2,000,000, preferably 500,000 to 1,500,000.

The polyacrylamide(PAA) is a modified polyacrylamide or polymethacrylamide in which the molar ratio of the amide component to the sum of the anionic and cationic groups is preferably within the limits of 60 : 40 to 95 : 5. The ratio of the number of cationic groups to the number of anionic groups lies between 10 : 1 and 1 : 2. The poly(meth)acrylamide used may contain up to 10 mole % of a fourth co-monomer (for example acrylic acid ester, vinyl ester or others). The quantity used according to the invention is 0.3 to 3 % by weight based on the fibre material.

Surprisingly it was found that with addition of the amphoteric polyacrylamide to the cellulose suspension according to the invention, the flocculation caused by the cationic resin is clearly reduced or even totally absent. This effect shows up even when in addition smaller quantities of anionic strengtheners are added to the paper pulp.

Contrary to fear, the edge penetration of the photographic processing solutions does not increase either when operating according to the invention and the splitting open of of the edges in photographic processing solutions, observed in case of non ionic additives, did not occur.

Against expectation, the speed of dehyration does no deteriorate and the decisive strength value is surprisingly better than in the case of using a combination of anionic and cationic polyacrylamides. It is finally of special advantage that the described good results are obtained with small differences both with neutrally sized and acid sized papers.

Papers sized and strengthened according to the invention can contain all otherwise usual paper additives such as pigments, dyes, fillers, optical whiteness correctors, antioxidants or components of synthetic fibre material without loss of the advantages according to the invention.

In the framework of the process according to the invention the different components can be added in different sequences and at different points of the cellulose suspension which are known to the paper manufacturer. Usually fatty acids, fatty acids anhydrides and aluminium compounds are added immediately after milling of the cellulose fibres while reactive sizings are added to the cellulose suspension a relatively short time before the entry into the paper machines.

The amphoteric polyacrylamide can be added during the course of the paper production both to the so-called thick material or to the so-called thin material. In this, the sequence of addition of the three components which are important in the framework of the invention, can be different. In principle, each sequence is possible. With regard to achieving optimum results, the amphoteric polyacrylamide is added to the fibre suspension in the sequence prior to the cationic resin, according to a preferred mode of operation of the invention. Apart from that, the rules for making paper which are known to the expert are valid.

The ideas of the invention are explained by means of the subsequent examples.

Example 1

A mixture of 90 % by weight of deciduous timber sulfate cellulose and 10 % by weight of pine wood sulfate cellulose were milled at a material density of 4 % to a milling degree of 35 °SR. Sizings, amphotheric polyacrylamide (PAA), cationic resin and additives according to Table 1 were then added to the cellulose suspension and heavy base papers were then produced in the known manner from the suspensions which had been diluted to to about 1.2 %. The papers were then surface sized in the known manner with a solution which contained 52g/L oxidised starch, 20g/L NaCl and 1g/L of white corrector, and were then smoothed in-line.

Table 1

Additives and quantities* according to example 1

	Sample				
	1.1	1.2	1.3	1.4	1.5
Stearic acid	1.0	1.0	1.0	1.0	1.0
Al. sulfate	1.0	1.0	1.0	1.0	1.0
amph. PAA Ia	1.0	-	-	-	-
amph. PAA Ib	-	1.0	-	-	-
amph. PAA Ic	-	-	1.0	-	-
amph. PAA Id	-	-	-	1.0	-
amph. PAA IId	-	-	-	-	1.0
polyamide-polyamine epichlorhydrine resin	0.5	0.5	0.5	0.5	0.5
H_2SO_4	to pH = 4.5				

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* All quantities quoted in this as well as in subsequent tables are % by weight based on the fibre material.

Comparison Example 1

Corresponding to example 1 the samples 1.6 to 1.8 were produced for comparison without amphotheric PAA with the deviations

1.6 - no polyacrylamide
1.7 - with 1 % cationic PAA
1.8 - with 1 % anionic PAA

Example 2

Analogous to example 1 base papers with a weight of about 175 g/m^2 were produced with the additives listed in Table 2.

Table 2

Additives and quantities according to example 2

	Sample					
	2.1	2.2	2.3	2.4	2.5	2.6
Na stearate	0.5	0.5	0.5	0.5	0.5	0.5
Na aluminate	0.5	0.5	0.5	0.5	0.5	0.5
amph. PAA IIa	1.0	-	-	-	-	-
amph. PAA IIb	-	1.0	-	-	-	-
amph. PAA IIc	-	-	1.0	-	-	0.5
amph. PAA IId	-	-	-	1.0	-	-
amph. PAA IV	-	-	-	-	1.0	-
anionic PAA (10mole% anion. groups)	-	-	-	-	-	0.5
alkyl ketene dimer	0.4	0.4	0.4	0.4	0.4	0.4
polyamide-polyamine-epichlorhydrine resin	0.5	0.5	0.5	0.5	0.5	0.5
H_2SO_4	up to pH = 5.5					

Comparison Example 2

The samples 2.7 and 2.9 were produced corresponding to example 2 without amphoteric PAA.

2.7 - with 1 % cationic PAA
2.8 - with 0.5 % anionic PAA

Example 3

Base Papers of about 175 g/m^2 weight were produced in an analogous manner to example 1 using the additives given in Table 3.

Table 3
Additives and quantities according to example 3

	Sample						
	3.1	3.2	3.3	3.4	3.5	3.6	3.7
anionic starch	1.0	1.0	1.0	1.0	-	-	-
cationic starch	-	-	-	-	0.5	-	-
amph. PAA IIIa	1.0	-	-	-	-	-	-
amph. PAA IIIb	-	1.0	-	-	-	-	-
amph. PAA IIIc	-	-	1.0	-	-	0.5	2.5
amph. PAA IIId	-	-	-	1.0	-	-	-
amph. PAA IId	-	-	-	-	1.0	-	-
cationic PAA	-	-	-	-	-	0.5	-
alkyl ketene dimer	0.6	0.6	0.6	0.6	0.6	0.6	0.6
polyamide-polyamine-epichlorhydrine resin	1.0	1.0	1.0	1.0	1.0	1.0	0.5
epoxy fatty acid amide	0.1	0.1	0.1	0.1	0.1	-	-

parison Example 3

In a manner corresponding to example 3.1 the samples 3.8 and 3.9 as well as corresponding to 3.6 the samples 3.10 and 3.11 were produced without amphotheric polyacrylamide.

3.8 – no polyacrylamide
3.9 – with 1 % cationic PAA
3.10 – with 0.5 % cationic PAA
3.11 – no polyacrylamide

Example 4

Base papers of about 175g/m^2 weight were produced in a manner analogous to example 1 with the additives given in Table 4.

Table 4
Additives and quantities according to example 4

	Sample					
	4.1	4.2	4.3	4.4	4.5	4.6
Sodium stearate	0.5	0.5	0.5	0.5	0.5	–
Al Chloride	0.5	0.5	0.5	0.5	0.5	–
amph. PAA IIIc	1.5	2.0	2.5	–	–	2.5
amph. PAA IId	–	–	–	2.0	–	–
amph. PAA IV	–	–	–	–	2.0	–
alkyl ketene dimer	0.5	0.5	0.5	0.5	0.5	0.5
polyamide-polyamine epichlorhydrine resin	0.5	0.5	0.5	0.5	0.5	0.5
H_2SO_4	up to pH = 5.5					

Comparison Example 4 Corresponding to example 4 the samples 4.7 to 4.9 were produced without amphotheric polyacrylamide.

4.7 - without polyacrylamide
4.8 - with 0.5 % anionic PAA
4.9 - with 0.5 % cationic PAA

Comparison Example 5

Two paper samples were produced in an analogous manner to example 1 using the technological instructions from DOS 32 16 841 and using the additives quoted below

	Sample	
	5.1	5.2
cationic PAA	1.0	2.5
alkyl ketene dimer	0.6	0.6
polyamide-polyamine-epichlorhydrine resin	0.5	0.5

Comparison Example 6

Paper samples were produced in an analogous manner to example 1 using the technological instructions from DOS 32 16 840 and using the additives quoted below.

	Sample	
	6.1	6.2
cationic PAA	0.5	0.7
anionic PAA	0.5	0.3
alkyl ketene dimer	0.6	1.0
polyamide-polyamine-epichlorhydrinre resin	0.5	0.5

Comparison Example 7

Paper samples were produced in a manner analogous to example 1 using the technical instructions from DE-OS 32 10 621 with the additives quoted below.

	Sample	
	7.1	7.2
cationic starch	2.5	2.5
anionic PAA	0.3	0.3
alkyl ketene dimer	0.5	0.5
epoxy fatty acid amide	0.3	-
polyamide-polyamine-epichlorhydrine resin	-	0.5

The alkyl ketene dimer quoted in the examples is a commercial product which is synthesised from a commercial blend of stearic acid and palmitic acid and which therefore carries preponderantly C_{16}-alkyl residues. It was found in further experiments that the results are similar in principle if other ketene dimers are used. Especially good results with regard to edge penetration and structural strength were obtained if a ketene dimer according to DE 36 36 79 was used which contains less than 40 % hydrocarbon residues with less than 20 carbon atoms. A preferred ketene dimer of this type is for example a behenyl ketene dimer.

It was found in further experiments that the effect according to the invention is not limited to the area weight of the base paper on which the examples were based or to the cellulose types quoted. The effect of an addition of amphotheric PAA is independent of the area weight, of the fibre type and of possible further usual additives, for example fillers.

The amphotheric poly(meth)acrylamides used in the examples have the following composition:

PAA I is a copolymeric polyacrylamide with 15 mole % of dimethylamino ethylacrylate which has been quaternated with dimethyl sulfate which contains different proportions of acrylic acid and sodium acrylate according to the figures given below:

PAA Ia : 2 mole %
PAA Ib : 4 mole %
PAA Ic : 7 mole %
PAA Id : 10 mole %

PAA II is a copolymerised polyacrylamide with 7 mole % of dimethylamino methylmethacrylatye in the form of a sulfuric acid salt which contains different proportions of acrylic acid and sodium acrylate according to the figures given below:

PAA IIa : 2 mole %
PAA IIb : 4 mole %
PAA IIc : 7 mole %
PAA IId : 10 mole %

PAA III is a copolymerised polyacrylamide with 10 mole % of dimethylamino propylacrylamide which has been quaternated with methyl chloride and which contains different proportions of acrylic acid and sodium acrylate according to the figures given below:

PAA IIIa : 2 mole %
PAA IIIb : 4 mole %
PAA IIIc : 7 mole %
PAA IIId : 10 mole %

PAA IV is copolymerised polymethacrylamide with 10 mole % diethyl amino ethylacrylate in the form of a hydrochloric acid salt and with 10 mole % methacrylic acid.

Of the paper samlpes produced according to the examples and comparison examples one part in each case was not coated and reserved for testing while another part was coated on both sides with polyethylene in the known manner and was subjected to an examination in this form. In the framework of the invention the test methods detailed below were used for evaluation.

Surface number (OZ)

Testing was carried out on the paper samples which had not been coated, according to the test method described in DE-OS 34 26 782. According to the existing findings the surface number can be taken as the formation equivalent. The numbers given in the tables below are in each case average values from 5 individual measurements.

Structural strength

The structural strength (internal strength) was determined according to TAPPI RC 308 with a Scott Bond split resistance tester (Internal Bond Impact Tester Model B). The numbers given in the tables below are in each case average values from 5 individual measurements.

Edge penetration of developer (KE)

The paper samples coated with polyethylene were cut and immersed,in the required sample size, into a commercial colour developer bath (T = 30°C) for 14 minutes. After intermediate water wash, treatment with a commercial fixative and final water wash, the samples were dried and the penetration depth (in mm) of the developer solution into the cut edge was measured by means of a scale magnifying glass.

The zone of penetration of the developer can be observed as a more or less discoloured brownish marginal stripe. The figures in the following tables are in each case average values from 6 individual measurements.

Tests were also carried out routinely for rigidity, tear resistance, adhesion of the polyethylene layers and photochemical properties. The results are, however, within the known limits and were not used for the evaluation of the invention.

The results of the tests described are summarised in Tables 5 and 6. Table 5 contains the results of the papers produced according to the invention in the examples 1 to 4, Table 6 those obtained in the comparison examples.

The test results contained in the tables are in each case average values from 5 or 6 individual measurements as said above. In the case of the examples according to the invention, in no case were fluctuations observed which, based on the average value, reached ±5 %, let alone exceeded it. Even in measurements of different rolls of the examples according to the invention, the test values were surprisingly constant. In the comparison examples the fluctuations were partially at ±10 % and in no case below ±5 %.

The decisive factor in the evaluation of the invention is, however, the high surface quality together with a high structural strength. The surface quality expresses itself in the low surface number which reaches a good level even with a naturally poor blend as in example 3. The good structural strength corresponds to the high "Scott-Bond-values of Table 5. In each case comparable systems from Table 6 should be compared with them.

Table 5

Test results obtained from the examples 1 to 4

Sample	Surface number OZ	Scott-Bond Sc. B. (fl.lb/sq.in)	Edge penetration KE (mm)
1.1	112	148	0.61
1.2	101	156	0.57
1.3	90	165	0.50
1.4	97	161	0.52
1.5	102	158	0.55
2.1	118	160	0.53
2.2	102	175	0.51
2.3	96	180	0.45
2.4	97	174	0.50
2.5	95	175	0.49
2.6	100	169	0.54
3.1	160	219	0.54
3.2	143	227	0.51
3.3	130	240	0.48
3.4	139	235	0.49
3.5	141	229	0.52
3.6	151	231	0.53
3.7	136	240	0.51
4.1	101	195	0.43
4.2	113	216	0.42
4.3	117	224	0.40
4.4	115	220	0.45
4.5	115	225	0.47
4.6	156	261	0.48

Table 6

Test Results obtained from the comparison examples 1 to 7

Sample	Surface number OZ	Scott-Bond Sc. B. (fl.lb/sq.in)	Edge penetration KE (mm)
1.6	188	149	0.72
1.7			
1.8			
2.7	141	155	0.57
2.8	147	145	0.60
3.8	140	168	0.59
3.9	179	210	0.55
3.10	181	186	0.60
3.11	132	142	0.62
4.7	145	160	0.53
4.8	167	175	0.50
4.9	185	201	0.45
5.1	170	199	0.55
5.2	240	250	0.52
6.1	191	210	0.50
6.2	183	195	0.47
7.1	260	175	0.80
7.2	279	218	0.50

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A base paper for photographic emulsion carriers, wherein the paper sheet has at least one moisture repellent sizing, at least one amphoteric poly(meth) acrylamide of molecular weight between 100,000 to 2,000,000 and at least one cationic resin giving it wet strength.

2. A base paper according to claim 1, wherein the amphoteric poly(meth)acrylamide is a co-polymer which contains at least 40 mole % acrylamide and/or methacrylamide groups together with another monomer/polymer as hereinbefore defined.

3. A base paper according to claim 1 or 2, wherein the molar ratio of the (meth)acrylamide groups to the sum of the anionic and cationic groups has a value of 60:40 to 95:5.

4. A base paper according to one of the claims 1 to 3, wherein the molar ratio of the sum of the cationic groups in the poly(meth)acrylamide to the sum of anionic groups in the poly(meth)acrylamide to 10:1 to 1:2.

5. A base paper according to claim 4, wherein the cationic groups in the poly(meth)acrylamide are present in quaternary or protonic form.

6. A base paper according to claim 4 or 5, wherein the moisture repellent sizing is at least a reactive sizing.

7. A base paper according to claim 4 or 5, wherein the moisture repellent sizing is at least one non reactive sizing with at least one compound of a polyvalent metal.

8. A base paper according to claim 4 or 5, wherein the moisture repellent sizing is a combination o at least one reactive and at least one non reactive sizing.

9. A base paper according to claim 4 or 5, wherein the cationic compound which imparts wet strength is a resin modified with epichlorhydrine and comes from the group of the polyamide-polyamine, polyamine, polyimide or poly(meth)acrylamide amine resins.

10. A base paper according to claim 9, wherein the cationic resin imparting wet strength is a polyamide-polyamine-epichlorhydrine resin.

11. A process for the production of a base paper for photographic emulsion carriers, wherein a paper pulp suspension consisting of cellulose as well as, in the event, of further additives, has added to it at least one moisture repellent sizing (a), at least one amphoteric poly(meth)acrylamide (b) and at least one cationic resin (c) imparting wet strength and that a paper is produced from this suspension.

12. Process for the production of a base paper according to claim 11, wherein the component (b) is added to the paper pulp suspension prior to the addition of component (c) and that the addition (a) is carried out either before (b) or before (c).

13. A base paper for photographic emulsion carriers substantially as hereinbefore described with reference to any one of the examples.

14. A process for the production of a base paper for photographic emulsion carriers substantially as hereinbefore described with reference to anyone of the examples.

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