



(11) **EP 2 276 887 B9**

(12) **CORRECTED EUROPEAN PATENT SPECIFICATION**

(15) Correction information:  
**Corrected version no 1 (W1 B1)**  
**Corrections, see**  
**Description Paragraph(s) 32, 39, 41**

(51) Int Cl.:  
**D21H 17/67** (2006.01) **D21H 17/69** (2006.01)  
**D21H 19/38** (2006.01) **C09C 1/42** (2006.01)  
**D21H 19/40** (2006.01) **C09D 1/00** (2006.01)

(48) Corrigendum issued on:  
**06.03.2013 Bulletin 2013/10**

(86) International application number:  
**PCT/US2009/000467**

(45) Date of publication and mention  
of the grant of the patent:  
**24.10.2012 Bulletin 2012/43**

(87) International publication number:  
**WO 2009/117040 (24.09.2009 Gazette 2009/39)**

(21) Application number: **09723362.1**

(22) Date of filing: **23.01.2009**

(54) **BASECOAT AND ASSOCIATED PAPERBOARD STRUCTURE**

GRUNDLACK UND KARTONSTRUKTUR DAFÜR

COUCHE DE FOND ET STRUCTURE EN CARTON ASSOCIÉE

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR**  
**HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL**  
**PT RO SE SI SK TR**

(30) Priority: **21.03.2008 US 38579 P**  
**02.12.2008 US 326430**

(43) Date of publication of application:  
**26.01.2011 Bulletin 2011/04**

(60) Divisional application:  
**12182180.5 / 2 537 980**

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**EP 2 276 887 B9**

## Description

### FIELD

**[0001]** The present patent application is directed to coatings for paperboard and, more particularly, to basecoats as well as smooth paperboard structures formed with the disclosed basecoats.

### BACKGROUND

**[0002]** Paperboard is used in various packaging applications. For example, aseptic liquid packaging paperboard is used for packaging beverage cartons, boxes and the like. Therefore, customers often prefer paperboard having a generally smooth surface with few imperfections to facilitate the printing of high quality text and graphics, thereby increasing the visual appeal of products packaged in paperboard.

**[0003]** Conventionally, paperboard smoothness is achieved by a wet stack calendering process in which the paperboard is rewetted and passed through a calendering device having two or more hard rolls. The wet stack calendering process smoothes the paperboard by compressing the fiber network to reduce the pits and crevices in raw stock paperboard (see Fig. 1).

**[0004]** The result is a smooth paperboard with reduced board thickness and bulk and, therefore, reduced stiffness. However, stiffness is an important requirement for many paperboard applications, such as aseptic liquid packaging paperboard. Therefore, preparing a smooth yet stiff paperboard using the conventional wet stack calendering process requires increasing the basis weight of the paperboard, thereby substantially increasing the raw material cost.

**[0005]** Alternatively, manufacturers have attempted to smooth the surface of paperboard by coating the entire surface of the paperboard with a basecoat comprised of various pigments, such as clay, calcium carbonate, TiO<sub>2</sub> and the like, then overcoating this base with a second and sometimes even a third coating, which is generally referred to as a topcoat. It was discovered that high quantities of relatively fine pigment particles applied to the surface of Paperboard provided a more smooth surface without the need for wet stack calendering, thereby maintaining bulk. For example, as shown in Fig. 2, it was discovered that relatively high quantities (e.g., 17.2 g/m<sup>2</sup> (10.6 pounds per 3000 ft<sup>2</sup>) or more) of relatively fine ground calcium carbonate, such as CARBITAL® 95 (Imerys Pigments, Inc. of Roswell, Georgia), applied to the rough surface of paperboard provided the greatest smoothness. Indeed, it has been understood that the more pigment applied to the surface of the paperboard the better the resulting smoothness. However, the use of relatively high quantities of pigments substantially increases the cost of preparing smooth and highly printable paperboard.

**[0006]** Accordingly, there is a need for a basecoat and

associated paperboard structure that maintains paperboard bulk and provides the desired smoothness for high quality printing, while reducing manufacturing cost.

**[0007]** US 2003085012A discloses a basecoat for paper comprising a pigment blend including eg a ground calcium carbonate component and a hyperplaty kaolin (clay) component, the hyperplaty kaolin having an aspect ratio of at least about 70:1 (an aspect ratio of at least 100:1 also being disclosed). Paperboard structures are also disclosed. The particle size of the calcium carbonate and the calcium carbonate content of the pigment blend are not disclosed.

### SUMMARY

**[0008]** In one aspect, the invention provides a basecoat comprising a pigment blend including a ground calcium carbonate component and a hyperplaty clay component, wherein said ground calcium carbonate component is at least 10 percent by weight of said pigment blend and at most 60 percent of said ground calcium carbonate component has a particle size smaller than 2 micrometres, and wherein said hyperplaty clay component has an average aspect ratio of at least 40:1.

**[0009]** Preferably said average aspect ratio of said hyperplaty clay component is at least 70:1, more preferably at least 90:1.

**[0010]** Preferably, at most 35 percent of said ground calcium carbonate component has a particle size smaller than 2 micrometres.

**[0011]** Preferably, said pigment blend consists essentially of said hyperplaty clay component and said ground calcium carbonate component.

**[0012]** Preferably said basecoat further comprises a carrier, wherein said pigment blend is dispersed in said carrier to form a slurry.

**[0013]** The invention also provides a paperboard structure comprising a paperboard substrate coated with a basecoat as defined above, said paperboard substrate having a basis weight of at least 0.138kg/m<sup>2</sup> (85 pound/3,000 ft<sup>2</sup>) and the coat weight, per side, of said basecoat being at most 14.6 g/m<sup>2</sup> (9 pounds/3,000 ft<sup>2</sup>) wherein said average aspect ratio of said hyperplaty clay component is at least 70:1.

**[0014]** In one embodiment said basecoat forms a discontinuous film on a surface of said paperboard substrate.

**[0015]** Preferably said paperboard substrate is formed as a web of fibers defining a plurality of pits in a surface thereof, and wherein said basecoat is substantially received within said plurality of said pits without substantially completely covering said surface.

**[0016]** Preferably said basecoat is applied to said paperboard substrate at a coat weight, per side, of at most 14.6 g/m<sup>2</sup>, more preferably at most 13.0 g/m<sup>2</sup>, most preferably at most 11.4 g/m<sup>2</sup> of said paperboard substrate

**[0017]** In one embodiment the paperboard structure a basis weight of at least 0.138kg/m<sup>2</sup> (85 pounds per 3000

square feet).

## BRIEF DESCRIPTION OF THE DRAWINGS

### [0018]

Fig. 1 is a photograph of an uncoated surface of an exemplary paperboard substrate (i.e., raw stock);

Fig. 2 is a photographic comparison of the surface of a paperboard substrate coated with various quantities (in pounds per 3000 ft<sup>2</sup>) of fine ground calcium carbonate according to the prior art;

Fig. 3 is a photographic comparison of the surface of a paperboard substrate coated with various quantities (in pounds per 3000 ft<sup>2</sup>; 11b/3,000ft<sup>2</sup> = 1.63 g/m<sup>2</sup>) of the disclosed basecoat;

Fig. 4 is a graphical illustration of percent sediment void volume versus percent clays component for various pigment blends formulated with an extra course ground calcium carbonate;

Fig. 5 is a graphical illustration of percent sediment void volume versus percent clay component for various pigment blends formulated with a course ground calcium carbonate;

Fig. 6 is a graphical illustration of percent sediment void volume versus percent clay component for various pigment blends formulated with a fine ground calcium carbonate;

Fig. 7 is a first graphical comparison of Parker Print Surface smoothness versus coat weight (in pounds per 3000 ft<sup>2</sup>; 11b/3,000ft<sup>2</sup> = 1.63 g/m<sup>2</sup>);

Fig. 8 is a second graphical comparison of Parker Print Surface smoothness versus coat weight (in pounds per 3000 ft<sup>2</sup>; 11b/3,000ft<sup>2</sup> = 1.63 g/m<sup>2</sup>);

Fig. 9 is a side cross-sectional view of a paperboard substrate coated with the disclosed basecoat according to the disclosed method; and

Fig. 10 is a side cross-sectional view of the paperboard substrate of Fig. 9 shown at a second, greater magnification.

## DETAILED DESCRIPTION

[0019] As noted above, the basecoat may of the invention comprises a specific pigment blend of high aspect ratio clay (average aspect ratio at least 40:1) and calcium carbonate. The pigment blend may be dispersed in a carrier, such as water, to facilitate application of the basecoat to an appropriate substrate, such as a paperboard

substrate. Additional components, such as binders, stabilizers, dispersing agents and additional pigments, may be combined with the pigment blend to form the final basecoat without departing from the scope of the present disclosure.

[0020] As used herein, "paperboard substrate" broadly refers to any paperboard material that is capable of being coated with the disclosed basecoat. Those skilled in the art will appreciate that the paperboard substrate may be bleached or unbleached, and typically is thicker and more rigid than paper. Generally, a paperboard substrate has an uncoated basis weight of about 0.138kg/m<sup>2</sup> (85 pounds per 3000 ft<sup>2</sup>) or more. Examples of appropriate paperboard substrates include corrugating medium, linerboard and solid bleached sulfate (SBS).

[0021] As used herein, the terms "aspect ratio" and "shape factor" refer to the geometry of the individual clay particles, specifically to a comparison of a first dimension of a clay particle (e.g., the diameter or length of the clay particle) to a second dimension of the clay particle (e.g., the thickness or width of the clay particle). The terms "hyperplaty," "high aspect ratio" and "relatively high aspect ratio" refer to aspect ratios generally in excess of 40:1, such as 50:1 or more, particularly 70:1 or more, and preferably 90:1 or more.

[0022] In a preferred embodiment, the clay component may include a platy clay wherein, on average, the clay particles have an aspect ratio of about 50:1 or more. An example of such a clay is CONTOUR® 1180 available from Imerys Pigments, Inc. of Roswell, Georgia. In another preferred embodiment, the clay component may include a platy clay wherein, on average, the clay particles have an aspect ratio of about 90:1 or more. An example of such a clay is XP-6100 also available from Imerys Pigments, Inc. Additional examples of appropriate platy clays are disclosed in U.S. Patent No. 7,208,039 to Jones et al..

[0023] Optionally, the clay component of the pigment blend may include platy clay having a relatively high average particle size. In one embodiment, the clay component may have an average particle size of about 4 micrometres or more. In a second embodiment, the clay component may have an average particle size of about 10 micrometres or more. In a third particular embodiment, the clay component may have an average particle size of about 13 micrometres or more.

[0024] The calcium carbonate component in one embodiment may include a coarse ground calcium carbonate. An example of such a coarse ground calcium carbonate is CARBITAL® 60, also available from Imerys Pigments, Inc., wherein about 60 percent of the calcium carbonate particles are less than about 2 micrometres in diameter. In another embodiment, the calcium carbonate component may include an extra coarse ground calcium carbonate. An example of such an extra coarse ground calcium carbonate is CARBITAL® 35, also available from Imerys Pigments, Inc., wherein only about 35 percent of the calcium carbonate particles are less than about 2

micrometres in diameter.

**[0025]** In another embodiment, the calcium carbonate component of the pigment blend may have an average particle size of about 1 micrometre or more, such as about 1.5 micrometres and, more particularly, 3 micrometres or more.

**[0026]** Without being limited to any particular theory, it is believed that pigment blends that are formulated to provide relatively high percent sediment void volumes (i.e., bulkier particle packing) provide high smoothness at relatively low coat weights, thereby reducing raw material costs. Furthermore, it is believed that using a clay component having a relatively high aspect ratio and/or a relatively high average particle size and a calcium carbonate component having a relatively high average particle size yields relatively high and, therefore, desirable percent sediment void volumes. For example, sediment void volumes in excess of 45 percent may be desired, while sediment void volumes in excess of 47.5 percent may be more desired and sediment void volumes in excess of 50 percent may be even more desired.

**[0027]** One appropriate technique for measuring percent sediment void volume includes preparing a pigment blend sample having the desired weight percentage of the clay component to the calcium carbonate component. The pigment blend sample is then diluted with water to 50 percent by weight solids to provide a slurry. A 70 gram sample of the slurry is placed into a centrifuge tube and spun at about 8000g for about 90 minutes. The sample is then removed from the centrifuge and the clear supernatant liquid is separated and weighed. The sediment is typically packed densely enough that the supernatant liquid is easy to pour off. Based upon the weight of the water removed, the weight of water still contained in the voids of the sediment may be calculated. Then, using particle densities, the weight of water in the voids may be converted into percent sediment void volume.

**[0028]** Referring to Figs. 4-6, the percent sediment void volume for various pigment blends versus the percent by weight of the clay component in the pigment blend is provided. Specifically, Figs. 4-6 compare the use of CARBITAL® 35 (extra coarse), CARBITAL® 60 (coarse) and CARBITAL® 95 (fine) as the calcium carbonate component and XP-6100 (aspect ratio over 90:1), CONTOUR® 1180 (aspect ratio about 50:1), CONTOUR® Xtrm (aspect ratio about 45:1) and KCS (aspect ratio about 10:1 (not a high aspect ratio clay)) as the clay component.

**[0029]** Figs. 4-6 indicate that coarse ground calcium carbonate (Figs. 4 and 5), particularly extra coarse ground calcium carbonate (Fig. 4), and high aspect ratio clays, particularly, clays having an aspect ratio over 70:1, more particularly over 90:1 (XP-6100 clay), provide the highest percent sediment void volume.

**[0030]** Furthermore, the concave shape of the curves in Figs. 4-6, particularly the curves associated with XP-6100 clay, indicates that maximum percent sediment void volume is achieved when the clay component is blended with the calcium carbonate component. For ex-

ample, referring to Fig. 4, when extra coarse ground calcium carbonate and XP-6100 are used, maximum percent sediment void volume occurs between about 60 and about 90 percent by weight of the clay component.

**[0031]** Still furthermore, the concave shape of the curves indicates that certain blends of the clay component and the calcium carbonate component provide a percent sediment void volume that is similar, if not higher, than using 100 percent high aspect ratio clay. Therefore, the curves indicate that blending less expensive calcium carbonate with more expensive high aspect ratio clay may yield an equal, if not superior, coating material in terms of percent sediment void volume. Indeed, comparing Fig. 4 to Fig. 6 for example, the curves indicate that the coarser the calcium carbonate, the less high aspect ratio clay must be used to achieve higher percent sediment void volume. For example, referring to Fig. 4, when extra coarse ground calcium carbonate is blended with XP-6100 clay, a 45:55 blend of the clay component to the calcium carbonate component provides the same percent sediment void volume as 100 percent of the high aspect ratio clay.

**[0032]** Referring to Figs. 7 and 8, the Parker Print Surface ("PPS") smoothness values of paperboard coated with various basecoats on a pilot coater are presented with respect to the coat weight of the basecoat in pounds per ream (3000 ft<sup>2</sup>). 1lb/ream = 1.63 g/m<sup>2</sup>. Those skilled in the art will appreciate that PPS smoothness values taken from samples prepared with a pilot coater are generally higher than the PPS smoothness values obtained from samples prepared on a full scale mill. Nonetheless, the PPS smoothness values taken using a pilot coater are indicative of the improvement provided by the disclosed basecoats over prior art coatings. For reference, when a pilot coater is used, PPS smoothness values of about 7.0 micrometres or less are generally desired, PPS smoothness values of about 6.5 micrometres or less are preferred and PPS smoothness values of about 6.0 micrometres or less are more preferred.

**[0033]** Of particular interest, as shown in Fig. 7, basecoats including coarse or extra coarse calcium carbonate and high aspect ratio clay, particularly XP-6100 clay, provide relatively high percent sediment void volumes and present PPS smoothness values generally below about 7 micrometres at coat weights of about 14.6 g/m<sup>2</sup> (9 pounds per ream) or less on a paperboard substrate. Indeed, as shown by the positive slope of the curves in Fig. 7, improved smoothness (i.e., lower PPS smoothness value) of the resulting paperboard is directly correlated to lower coat weights. This data is contrary to the expectations of those skilled in the art, which would expect higher smoothness values at high coat weights.

**[0034]** Indeed, when a full scale mill was used, a basecoat including a 50:50 pigment blend of CARBITAL® 35 (ground calcium carbonate) and XP-6100 (high aspect ratio and high average particle size clay) yielded a PPS smoothness value of about 2 micrometres at a relatively low coat weight of 9.8 g/m<sup>2</sup> (6 pounds per ream).

**[0035]** Accordingly, coating substrates such as paperboard with basecoats comprising ground calcium carbonate, particularly coarse or extra coarse ground calcium carbonate, and high aspect ratio clay, particularly clay having an aspect ratio in excess of about 70:1, more particularly high aspect ratio clay having a relatively high average particle size, yields a smooth paperboard structure without sacrificing bulk, and reduces manufacturing cost by combining more expensive platy clay with less expensive ground calcium carbonate, while requiring surprisingly low coat weights to achieve the desired smoothness.

**[0036]** Furthermore, those skilled in the art will appreciate that the type of high aspect ratio clay selected and the type of ground calcium carbonate selected, as well as the ratio of the clay component to the calcium carbonate component, may be dictated by cost considerations in view of the desired smoothness.

**[0037]** The disclosed basecoats may be applied to the surface of a substrate, such as paperboard (e.g., aseptic liquid packaging paperboard), in a quantity sufficient to fill the pits and crevices in the substrate without the need for coating the entire surface of the substrate. Therefore, the disclosed basecoat together with the disclosed method for applying the basecoat may be used to obtain high surface smoothness with a relatively small quantity of basecoat. Indeed, as discussed above, high surface smoothness may be achieved with an unexpectedly small quantity of the disclosed basecoat.

**[0038]** In one embodiment, the basecoat is applied to the substrate using a blade coater such that the blade coater urges the basecoat into the pits and crevices in the substrate while removing the basecoat from the surface of the substrate. Specifically, as shown in Figs. 9 and 10, the basecoat may be applied in a manner that is more akin to spackling, wherein substantially all of the basecoat resides in the pits and crevices in the surface of the substrate rather than on the surface of the substrate.

**[0039]** At this point, those skilled in the art will appreciate that when the disclosed basecoat is used in a blade coater the spacing between the moving substrate and the blade of the coater may be minimized to facilitate filling the pits and crevices in the surface without substantially depositing the basecoat on the surface of the substrate (i.e., forming a discontinuous film on the surface of the substrate). In other words, the blade of the coater may be positioned sufficiently close to the surface of the moving substrate such that the blade of the coater urges the basecoat into the pits and crevices in the surface of the substrate, while removing excess basecoat from the surface of the substrate.

#### EXAMPLE 1

**[0040]** A first pigment blend prepared according to an aspect of the present disclosure includes 50 percent by weight CARBITAL® 35 (coarse ground calcium carbon-

ate) and 50 percent by weight XP-6100 (hyperplaty clay). In a stationary mixer, a coating formulation is prepared by combining the 50:50 pigment blend with water, latex binders and a thickening agent. The water is added in a quantity sufficient to form a slurry. Using a blade coater in the manner described above, the coating formulation is applied to raw paperboard stock having a basis weight of about 205 g/m<sup>2</sup> (126 pounds per 3000 ft<sup>2</sup>) at the following coat weights: 10.9, 12.9, 14.5 and 18.4 g/m<sup>2</sup> (6.7, 7.9, 8.9 and 11.3 pounds per 3000 ft<sup>2</sup>). Photographic results are shown in Fig. 3 and the PPS smoothness values are provided in Fig. 7 (data points marked with a circle).

**[0041]** Thus, as shown in Fig. 3, the disclosed basecoat and associated method provide optimum smoothness at relatively low coat weights. (Compare Fig. 2 to Fig. 3.) Specifically, the greatest smoothness is achieved at a coat weight of 10.9 g/m<sup>2</sup> (6.7 pounds per 3000 ft<sup>2</sup>), with good smoothness achieved at 12.9 g/m<sup>2</sup> (7.9 pounds per 3000 ft<sup>2</sup>), with less smoothness at 14.5 g/m<sup>2</sup> (8.9 pounds per 3000 ft<sup>2</sup>), and even less smoothness at 18.4 g/m<sup>2</sup> (11.3 pounds per 3000 ft<sup>2</sup>).

#### EXAMPLE 2

**[0042]** A second pigment blend prepared according to an aspect of the present disclosure includes 50 percent by weight OMYA HYDROCARB® 60 (coarse ground calcium carbonate available from Omya AG of Oftringen, Switzerland) and 50 percent by weight XP-6170 (hyperplaty clay available from Imerys Pigments, Inc.). In a stationary mixer, a coating formulation is prepared by combining the 50:50 pigment blend with water, latex and starch binders and a thickening agent. The water is added in a quantity sufficient to form a slurry. Using a blade coater in the manner described above, the coating formulation is applied to raw paperboard stock having a basis weight of about 173 g/m<sup>2</sup> (106 pounds per 3000 ft<sup>2</sup>) at coat weights of 9.5 and 11.1 g/m<sup>2</sup> (5.8 and 6.8 pounds per 3000 ft<sup>2</sup>), thereby providing paperboard structures with improved smoothness at relatively low coat weights.

**[0043]** Accordingly, at this point those skilled in the art will appreciate that basecoats formulated according to the present disclosure to include coarse ground calcium carbonate, particularly extra coarse ground calcium carbonate, and hyperplaty clay, particularly hyperplaty clays having aspect ratios in excess of about 70:1, and more particularly high aspect ratio clays having a relatively high average particle size (e.g., about 10 micrometres or more), provide increased surface smoothness at relatively low coat weights, particularly when applied to the substrate using the disclosed method.

**[0044]** While the pigment blends discussed above include platy clay and ground calcium carbonate, particularly coarse ground calcium carbonate, those skilled in the art will appreciate that alternative pigment blends may be used without departing from the scope of the present

disclosure. For example, the pigment blend of the disclosed basecoat may include a platy clay and one or more additional inorganic pigments other than ground calcium carbonate, such as precipitated calcium carbonate, talc or kaolin clay.

## Claims

1. A basecoat comprising a pigment blend including a ground calcium carbonate component and a hyperplaty clay component, wherein said ground calcium carbonate component is at least 10 percent by weight of said pigment blend and at most 60 percent of said ground calcium carbonate component has a particle size smaller than 2 micrometres, and wherein said hyperplaty clay component has an average aspect ratio of at least 40:1.
2. The basecoat of claim 1 wherein said average aspect ratio of said hyperplaty clay component is at least 70:1.
3. The basecoat of claim 1 wherein said average aspect ratio of said hyperplaty clay component is at least 90:1.
4. The basecoat of claim 1 wherein at most 35 percent of said ground calcium carbonate component has a particle size smaller than 2 micrometres.
5. The basecoat of claim 1 wherein said pigment blend consists essentially of said hyperplaty clay component and said ground calcium carbonate component.
6. The basecoat of claim 1 further comprising a carrier, wherein said pigment blend is dispersed in said carrier to form a slurry.
7. The basecoat of claim 1 wherein said pigment blend has a sediment void volume of at least 50 percent when measured by a technique involving diluting the pigment blend with water to 50% by weight solids, centrifuging a 70g sample of the resulting slurry at 8000g for 90 minutes and calculating the volume of water remaining in the voids of the sediment remaining after pouring off and weighing the supernatant liquid.
8. A paperboard structure comprising a paperboard substrate coated with said basecoat of any preceding claim, said paperboard substrate having a basis weight of at least 0.138kg/m<sup>2</sup> (85 pounds/3,000 ft<sup>2</sup>) and the coat weight, per side, of said basecoat being at most 14.6 g/m<sup>2</sup> (9 pounds/3,000 ft<sup>2</sup>) wherein said average aspect ratio of said hyperplaty clay component is at least 70:1.

9. The paperboard structure of claim 8 wherein said basecoat forms a discontinuous film on a surface of said paperboard substrate.

10. The paperboard structure of claim 8 wherein said paperboard substrate is formed as a web of fibers defining a plurality of pits in a surface thereof, and wherein said basecoat is substantially received within said plurality of said pits without substantially completely covering said surface.

11. The paperboard structure of claim 8 wherein said basecoat is applied to said paperboard substrate at a coat weight, per side, of at most 13.0 g/m<sup>2</sup> (8 pounds per 3000 square feet) of said paperboard substrate.

12. The paperboard structure of claim 8 wherein said basecoat is applied to said paperboard substrate at a coat weight, per side, of at most 11.4, g/m<sup>2</sup> (7 pounds per 3000 square feet) of said paperboard substrate.

## Patentansprüche

1. Basisbeschichtung, die eine Pigmentmischung umfasst, wobei die Pigmentmischung eine gemahlene Kalziumkarbonatkomponente und eine plättchenförmige Tonerdekomponente beinhaltet, wobei die gemahlene Kalziumkarbonatkomponente wenigstens 10 Gewichtsprozent der Pigmentmischung ausmacht und höchstens 60 Prozent der gemahlene Kalziumkarbonatkomponente eine Partikelgröße aufweist, die kleiner als 2 Mikrometer ist, und wobei die plättchenförmige Tonerdekomponente ein mittleres Seitenverhältnis von 40:1 aufweist.
2. Basisbeschichtung gemäß Anspruch 1, wobei das mittlere Seitenverhältnis der plättchenförmigen Tonerdekomponente wenigstens 70:1 ist.
3. Basisbeschichtung gemäß Anspruch 1, wobei das mittlere Seitenverhältnis der plättchenförmigen Tonerdekomponente wenigstens 90:1 ist.
4. Basisbeschichtung gemäß Anspruch 1, wobei höchstens 35 Prozent der gemahlene Kalziumkarbonatkomponente eine Partikelgröße aufweist, die kleiner als 2 Mikrometer ist.
5. Basisbeschichtung gemäß Anspruch 1, wobei die Pigmentmischung im Wesentlichen aus der plättchenförmigen Tonerdekomponente und der gemahlene Kalziumkarbonatkomponente besteht.
6. Basisbeschichtung gemäß Anspruch 1, die weiterhin einen Träger umfasst, wobei die Pigmentmischung

in diesem Träger dispergiert ist, um eine Schlämme auszubilden.

7. Basisbeschichtung gemäß Anspruch 1, wobei die Pigmentmischung ein Feststoffhohlraumvolumen von wenigstens 50 Prozent aufweist, wenn dies mit einer Technik gemessen wird, die das Verdünnen der Pigmentmischung mit Wasser auf 50% Feststoff beinhaltet, Zentrifugieren einer 70-g-Probe der resultierenden Schlämme bei 8000 g für 90 Minuten und Berechnen des Wasservolumens, das in den Hohlräumen des Feststoffs nach dem Abgießen und Wiegen der überstehenden Flüssigkeit verbleibt. 5
8. Pappmaterialstruktur, die ein Pappmaterialsubstrat umfasst, das mit der Basisbeschichtung gemäß einem der vorherigen Ansprüche beschichtet ist, wobei das Pappmaterialsubstrat ein Basisgewicht von wenigstens 0,138 kg/m<sup>2</sup> (85 Pounds/3000 ft<sup>2</sup>) und das Beschichtungsgewicht, pro Seite, der Basisbeschichtung höchstens 14,6 g/m<sup>2</sup> (9 Pounds/3000 ft<sup>2</sup>) aufweist, wobei das mittlere Seitenverhältnis der plättchenförmigen Tonerdekomponente wenigsten 70:1 ist. 10
9. Pappmaterialstruktur gemäß Anspruch 8, wobei die Basisbeschichtung einen diskontinuierlichen Film auf einer Fläche des Pappmaterialsubstrats ausbildet. 15
10. Pappmaterialstruktur gemäß Anspruch 8, wobei das Pappmaterialsubstrat als ein Gewebe von Fasern ausgebildet ist, das eine Vielzahl von Vertiefungen in ihrer Fläche definiert, und wobei die Basisbeschichtung im Wesentlichen in der Vielzahl der Vertiefungen aufgenommen wird, ohne im Wesentlichen die Fläche komplett zu bedecken. 20
11. Pappmaterialstruktur gemäß Anspruch 8, wobei die Basisbeschichtung auf das Pappmaterialsubstrat aufgebracht wird mit einem Beschichtungsgewicht, pro Seite, von höchstens 13,0 g/m<sup>2</sup> (8 Pounds per square feet) des Pappmaterialsubstrats. 25
12. Pappmaterialstruktur gemäß Anspruch 8, wobei die Basisbeschichtung auf das Pappmaterialsubstrat aufgebracht wird mit einem Beschichtungsgewicht, pro Seite, von höchstens 11,4 g/m<sup>2</sup> (7 Pounds per square feet) des Pappmaterialsubstrats. 30

## Revendications

1. Couche de fond comprenant un mélange de pigments, lequel comporte un composant de type carbonate de calcium moulu et un composant de type argile en plaquettes hyperplates, lequel composant de type carbonate de calcium moulu représente au 35

moins 10 % du poids dudit mélange de pigments et duquel composant de type carbonate de calcium moulu une fraction d'au plus 60 % présente une taille de particules inférieure à 2 micromètres, et lequel composant de type argile en plaquettes hyperplates présente un rapport de forme moyen d'au moins 40/1.

2. Couche de fond conforme à la revendication 1, dans laquelle le rapport de forme moyen dudit composant de type argile en plaquettes hyperplates vaut au moins 70/1. 40
3. Couche de fond conforme à la revendication 1, dans laquelle le rapport de forme moyen dudit composant de type argile en plaquettes hyperplates vaut au moins 90/1. 45
4. Couche de fond conforme à la revendication 1, dans laquelle une fraction d'au plus 35 % dudit composant de type carbonate de calcium moulu présente une taille de particules inférieure à 2 micromètres. 50
5. Couche de fond conforme à la revendication 1, dans laquelle ledit mélange de pigments est essentiellement constitué dudit composant de type carbonate de calcium moulu et dudit composant de type argile en plaquettes hyperplates. 55
6. Couche de fond conforme à la revendication 1, qui comporte en outre un véhicule et dans laquelle ledit mélange de pigments est dispersé dans ce véhicule, ce qui donne une suspension.
7. Couche de fond conforme à la revendication 1, dans laquelle ledit mélange de pigments présente, à l'état de sédiment, un volume de vides d'au moins 50 %, volume mesuré par une technique impliquant de diluer le mélange de pigments avec de l'eau jusqu'à une teneur en solides de 50 % en poids, de faire subir à un échantillon de 70 g de la suspension ainsi obtenue 90 minutes de centrifugation à 8000 x g, et de calculer le volume de l'eau demeurant dans les vides du sédiment qui reste après qu'on a enlevé et pesé le liquide surnageant.
8. Structure de carton, comprenant un substrat de carton revêtu d'une couche de fond conforme à l'une des revendications précédentes, lequel substrat de carton présente un poids de base qui vaut au moins 0,138 kg/m<sup>2</sup> (85 livres par 3000 pieds carrés), et dans laquelle structure le poids de couche, par face, de ladite couche de fond vaut au plus 14,6 g/m<sup>2</sup> (9 livres par 3000 pieds carrés), et le rapport de forme moyen dudit composant de type argile en plaquettes hyperplates vaut au moins 70/1.
9. Structure de carton conforme à la revendication 8,

dans laquelle ladite couche de fond forme un film discontinu sur une surface dudit substrat de carton.

10. Structure de carton conforme à la revendication 8, dans laquelle ledit substrat de carton se présente sous forme d'un tissu de fibres définissant de multiples cuvettes dans une surface du substrat, et ladite couche de fond se trouve notablement au dedans de ces multiples cuvettes réceptacles, sans couvrir sensiblement complètement ladite surface. 5 10
11. Structure de carton conforme à la revendication 8, dans laquelle ladite couche de fond est appliquée sur ledit substrat de carton en un poids de couche, par face, d'au plus  $13,0 \text{ g/m}^2$  (8 livres par 3000 pieds carrés) dudit substrat de carton. 15
12. Structure de carton conforme à la revendication 8, dans laquelle ladite couche de fond est appliquée sur ledit substrat de carton en un poids de couche, par face, d'au plus  $11,4 \text{ g/m}^2$  (7 livres par 3000 pieds carrés) dudit substrat de carton. 20

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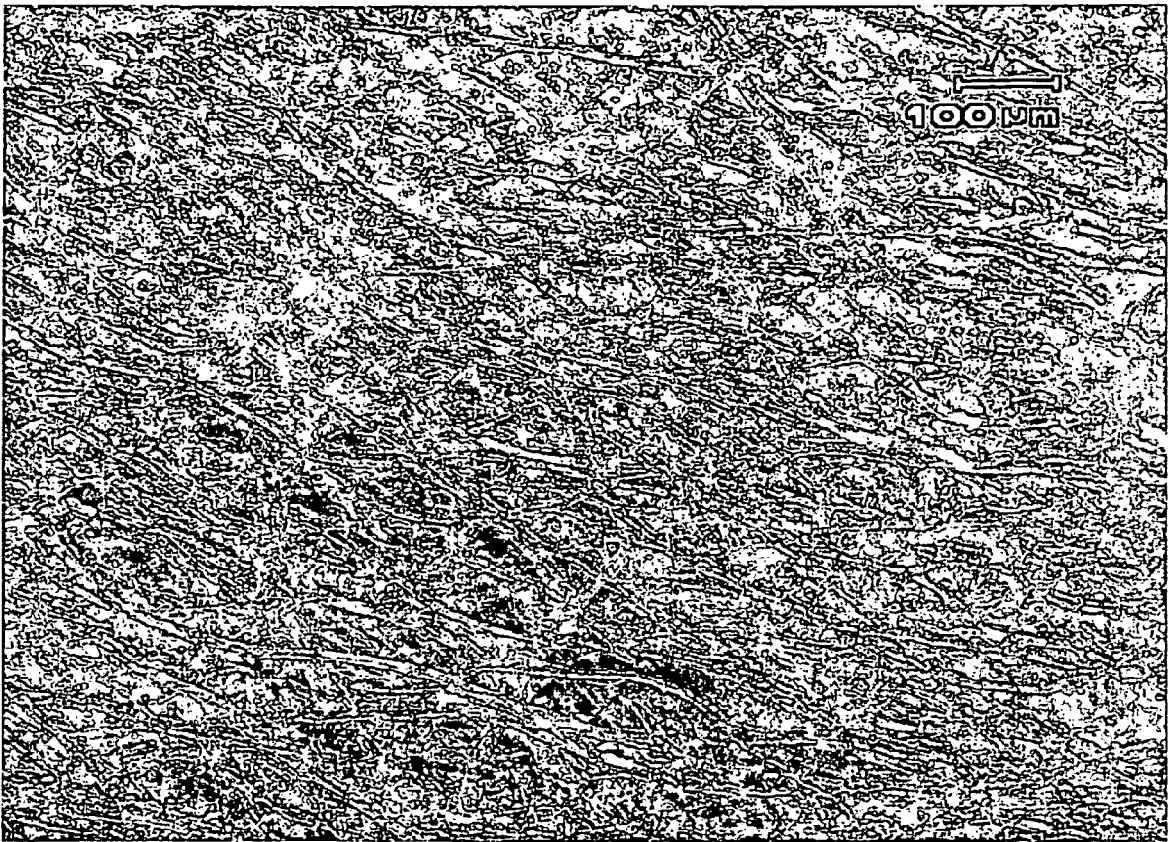
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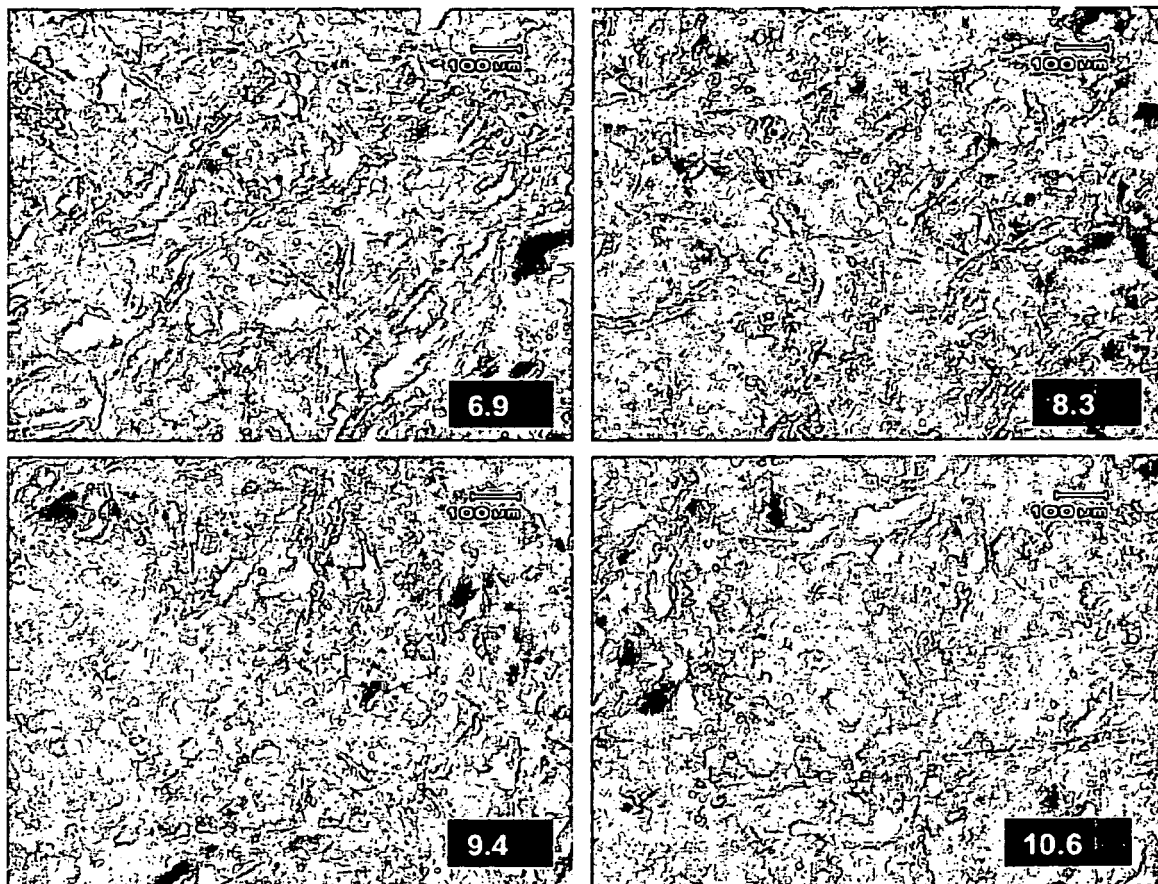
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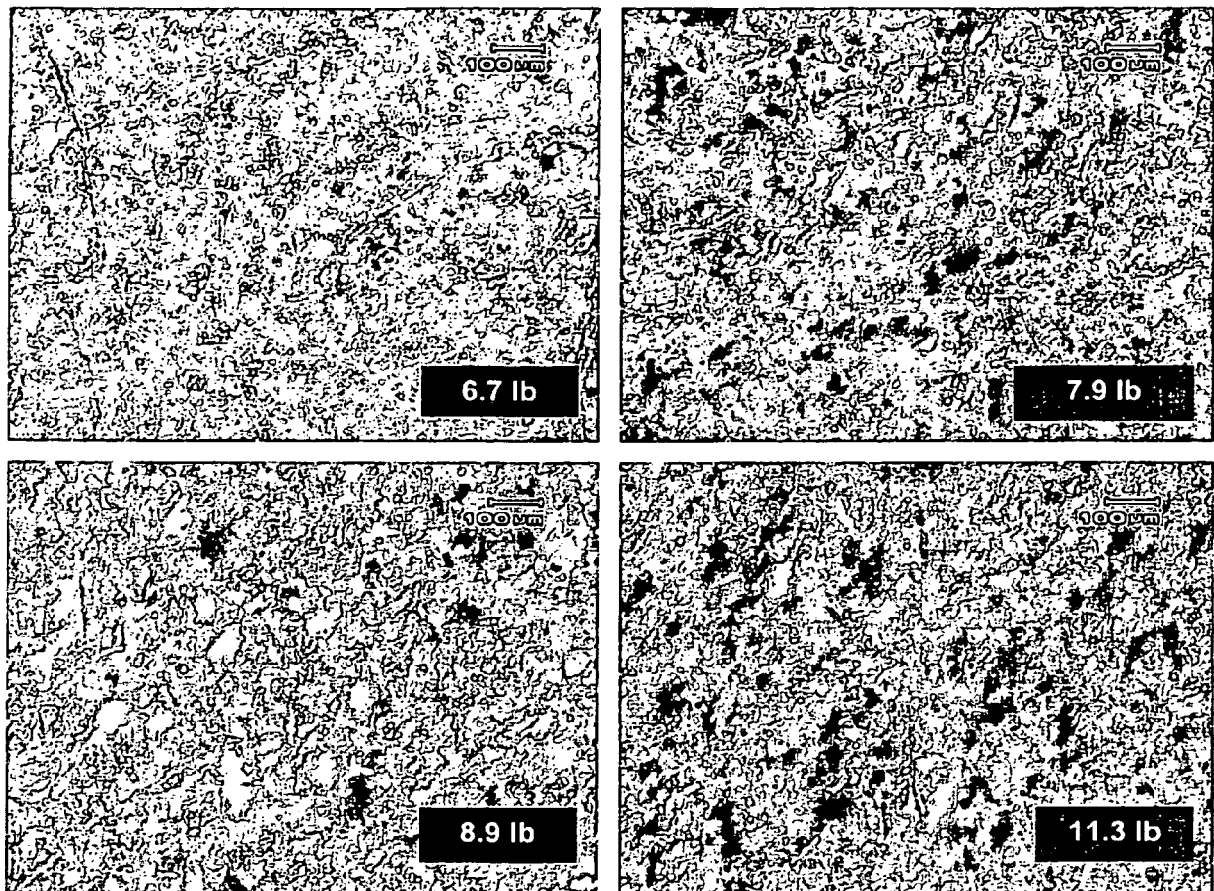
**Fig. 1**  
**(Prior Art)**

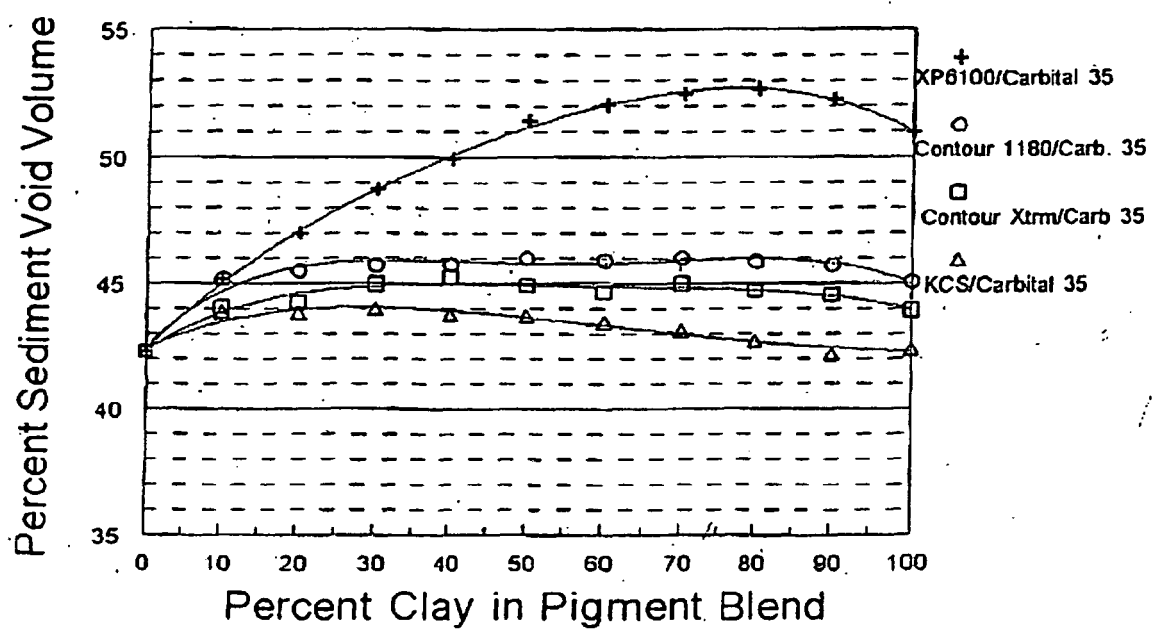


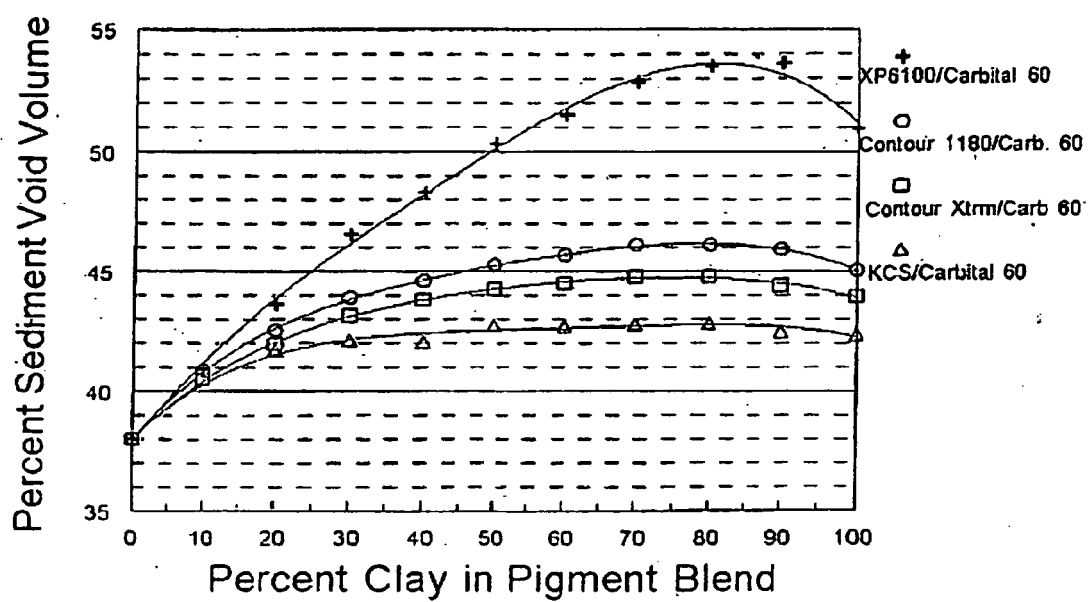
**Fig. 2**  
**(Prior Art)**



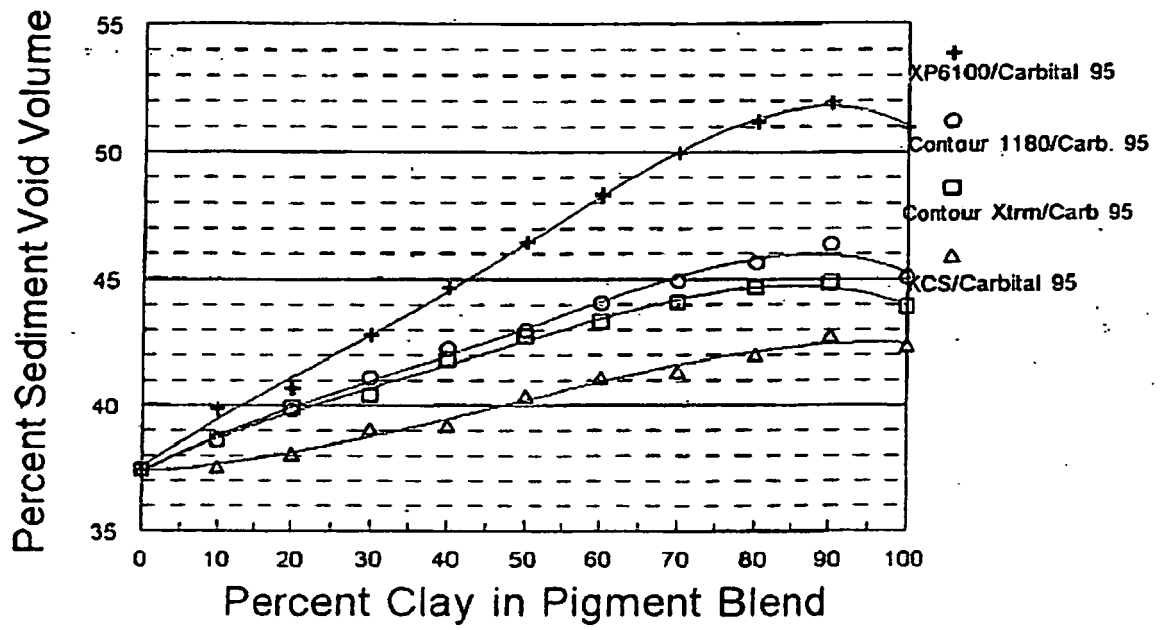
**Fig. 3**



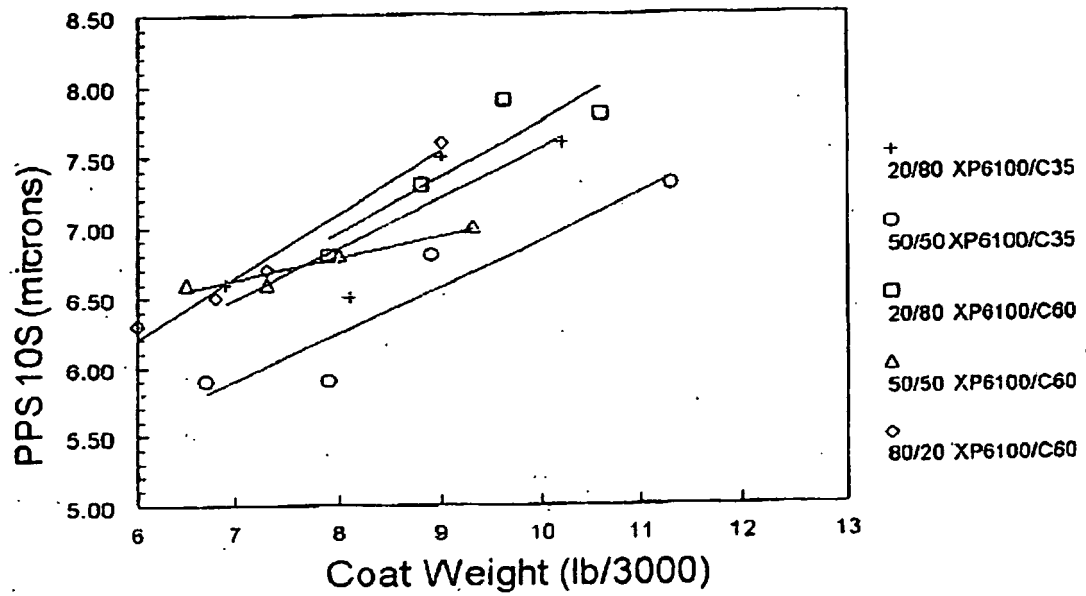
**Fig. 4**

**Fig. 5**

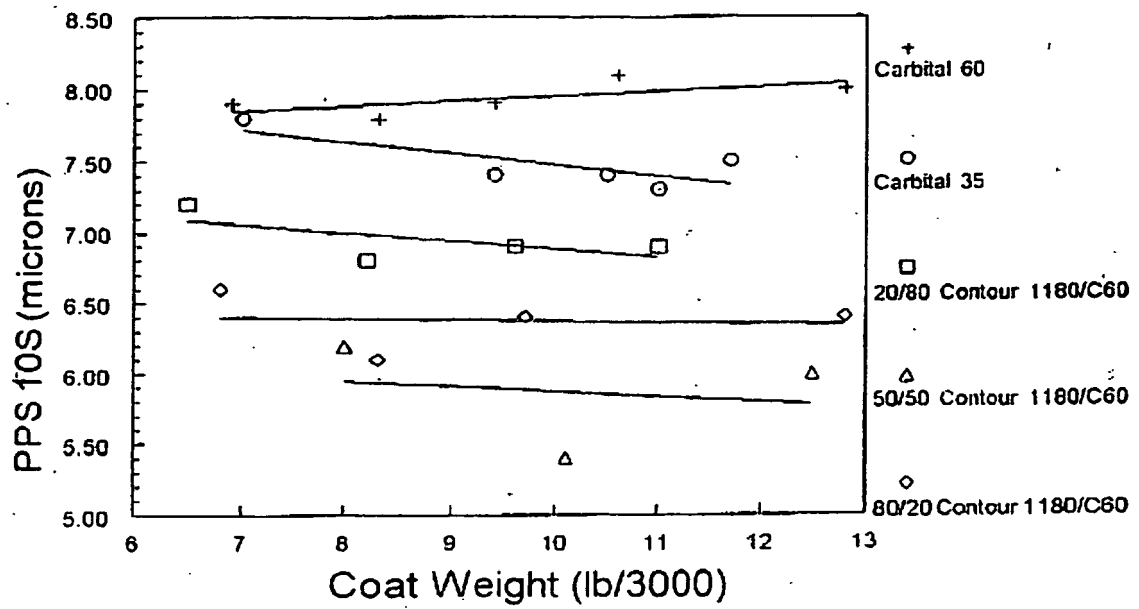
**Fig. 6**



**Fig. 7**

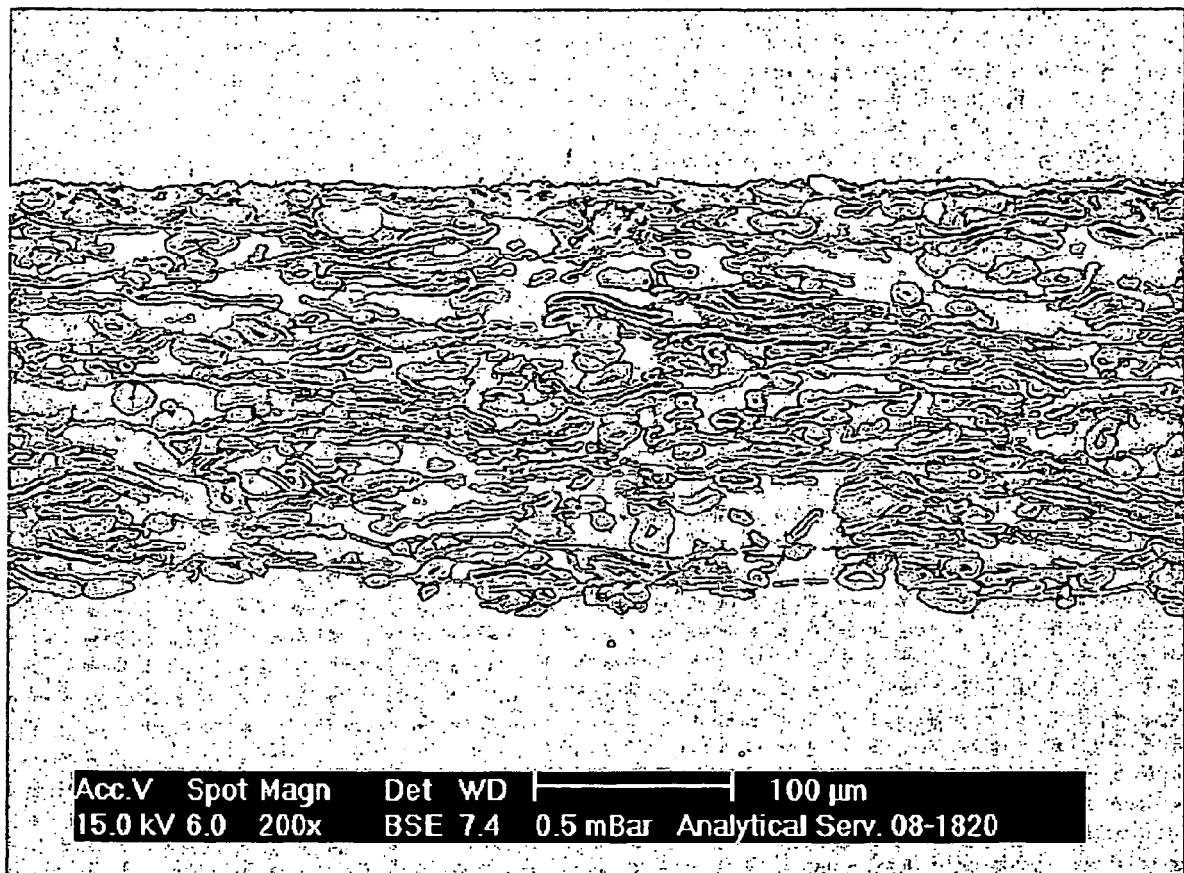


**Fig. 8**

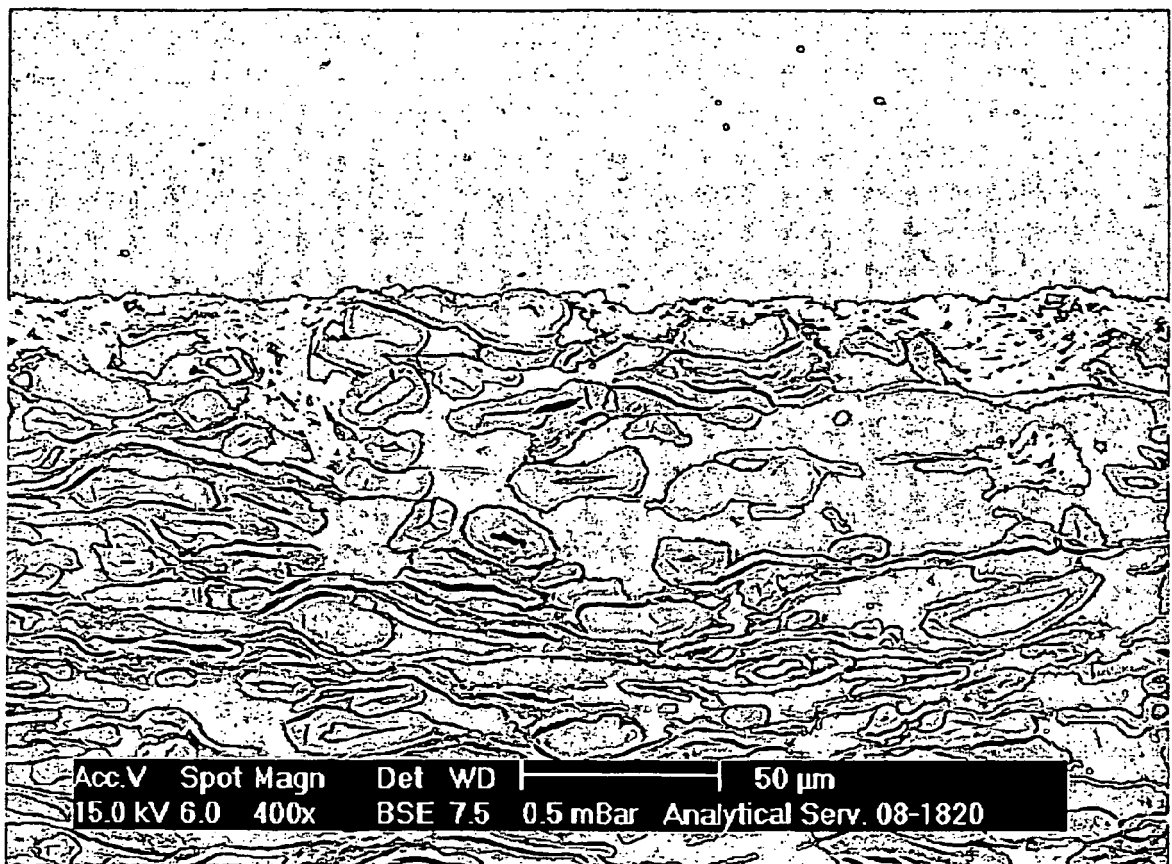




**Fig. 9**



**Fig. 10**



**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

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