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(54) Title: HIGH RESISTIVITY COMPOSITIONS

(57) Abstract: The present invention relates to a black matrix formed by applying a curable coating composition onto a substrate to form a curable coating, curing the curable coating imagewise to form a coating, and developing and drying the coating. The curable coating composition comprises a vehicle, a curable resin, and at least one modified pigment comprising a pigment having attached at least one organic group having the formula -X-I or -X-NI, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, an alkylene group, an aralkylene group, or an alkarylene group, I represents a non-polymeric group comprising at least one ionic group or at least one ionizable group, and NI represents a non-polymeric group comprising at least one nonionic group. The curable coating composition, curable coating, and cured coating are also described. Also disclosed is a method of controlling the resistivity of a coating.



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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
 INV. G03F7/00 C09D5/02 C09D7/00 C09D7/12
 According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
 Minimum documentation searched (classification system followed by classification symbols)
 G03F C09D
 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
 EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT.

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2003/129529 A1 (STEP EUGENE N [US] ET AL) 10 July 2003 (2003-07-10) cited in the application claim 60	1-25
X	US 5 885 335 A (ADAMS CURTIS E [US] ET AL) 23 March 1999 (1999-03-23) cited in the application column 6, lines 51-57 column 7, lines 3-6 claims	46-53
A	US 2002/011185 A1 (BELMONT JAMES A [US]) 31 January 2002 (2002-01-31) cited in the application page 2, paragraph 22 claim 1	1-25, 46-53
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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
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- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention.
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
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INTERNATIONAL SEARCH REPORT

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2002/020318 A1 (GALLOWAY COLLIN P [US] ET AL) 21 February 2002 (2002-02-21) cited in the application pages 12-13; example 21 -----	1-25, 46-53

INTERNATIONAL SEARCH REPORT

International application No.
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Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

see annex

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-24,46-53

A black matrix formed by applying a curable coating composition onto a substrate to form a curable coating, curing the curable coating imagewise to form a coating, and developing and drying the coating, wherein the curable coating composition comprises a vehicle and at least one modified pigment comprising a pigment having attached at least one organic group having the formula $-X-I$, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, or an alkylene group, and I represents a non-polymeric group comprising at least one ionic group or at least one ionizable group.

1.1. claim:

A coating comprising a resin and at least one modified pigment, wherein the modified pigment comprises a pigment having attached at least one organic group having the formula $-X-I$, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, or an alkylene group, and I represents a non-polymeric group comprising at least one ionic group or at least one ionizable group, and wherein the coating comprises greater than or equal to about 30 wt% of the modified pigment based on the total weight of the coating.

2. claim: 25

A black matrix formed by applying a curable coating composition onto a substrate to form a curable coating, curing the curable coating imagewise to form a coating, and developing and drying the coating, wherein the curable coating composition comprises a vehicle and at least one modified pigment comprising a pigment having attached at least one organic group having the formula $-X-NI$, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, or an alkylene group, and NI represents a non-polymeric group comprising at least one nonionic group.

3. claims: 26-37

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

A curable coating composition comprising a vehicle, a curable resin, and at least one modified pigment, wherein the modified pigment comprises a pigment having attached at least one organic group having the formula $-X-I$, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, or an alkylene group, and I represents a non-polymeric group comprising at least one ionic group or at least one ionizable group, and wherein the modified pigment is present in an amount such that, when the curable coating composition is applied to a substrate to form a curable coating and cured to form a coating, the coating comprises greater than or equal to about 30 wt% of the modified pigment based on the total weight of the coating.

4. claim: 38

A curable coating composition comprising a vehicle, a curable resin, and at least one modified pigment, wherein the modified pigment comprises a pigment having attached at least one organic group having the formula $-X-NI$, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, or an alkylene group, and NI represents a non-polymeric group comprising at least one nonionic group, and wherein the modified pigment is present in an amount such that, when the curable coating composition is applied to a substrate to form a curable coating and cured to form a coating, the coating comprises greater than or equal to about 30 wt% of the modified pigment based on the total weight of the coating.

5. claims: 39-44

A curable coating comprising a curable resin and at least one modified pigment, wherein the modified pigment comprises a pigment having attached at least one organic group having the formula $-X-I$, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, or an alkylene group, and I represents a non-polymeric group comprising at least one ionic group or at least one ionizable group, and wherein the modified pigment is present in an amount such that, when the curable coating is cured to form a coating, the coating comprises greater than or equal to about 30 wt% of the modified pigment based on the total weight of the coating.

6. claim: 45

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

A curable coating comprising a curable resin and at least one modified pigment, wherein the modified pigment comprises a pigment having attached at least one organic group having the formula -X-NI, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, or an alkylene group, and NI represents a non-polymeric group comprising at least one nonionic group, and wherein the modified pigment is present in an amount such that, when the curable coating is cured to form a coating, the coating comprises greater than or equal to about 30 wt% of the modified pigment based on the total weight of the coating.

7. claim: 54

A coating comprising a resin and at least one modified pigment, wherein the modified pigment comprises a pigment having attached at least one organic group having the formula -X-NI, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, or an alkylene group, and NI represents a non-polymeric group comprising at least one nonionic group, and wherein the coating comprises greater than or equal to about 30 wt% of the modified pigment based on the total weight of the coating.

8. claims: 55-57

A coating comprising a resin and at least one modified pigment, wherein the coating has a volume resistivity of greater than or equal to 10^{12} ohm-cm and an optical density of greater than or equal to 3 at a 1 micron thickness, and wherein the coating comprises greater than or equal to about 30 wt% of the modified pigment based on the total weight of the coating.

9. claims: 58-60

A coating comprising at least one modified pigment, wherein the coating has a volume resistivity of between 10^6 and 10^8 ohm-cm and an optical density of greater than or equal to 4 at a 1 micron thickness, and wherein the coating comprises greater than or equal to about 30 wt% of the modified pigment based on the total weight of the coating.

10. claims: 61-65

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

A method of improving the resistivity of a coating comprising a resin and a pigment, wherein the method comprises the step of preparing a curable coating composition comprising a vehicle, a curable resin, and at least one modified pigment, wherein the modified pigment comprises the pigment having attached at least one organic group having the formula -X-I, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, or an alkylene group, and I represents a non-polymeric group comprising at least one ionic group or at least one ionizable group.

11. claims: 66-70

A method of controlling the resistivity of a coating comprising a resin and a pigment, wherein the method comprises the step of preparing a curable coating composition comprising a vehicle, a curable resin, and at least one modified pigment, wherein the modified pigment comprises the pigment having attached at least one organic group having the formula -X-NI, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, or an alkylene group, and NI represents a non-polymeric group comprising at least one nonionic group.

12. claims: 71-74

A coating having a preselected resistivity at a preselected pigment loading level comprising a resin and a modified pigment, wherein the modified pigment comprises a pigment having attached at least one organic group having the formula -X-I, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, or an alkylene group, and I represents a non-polymeric group comprising at least one ionic group or at least one ionizable group, and wherein a coating comprising the resin and said pigment has a resistivity at the preselected pigment loading level that is lower than the preselected resistivity of the coating comprising the resin and the modified pigment at said preselected pigment loading level.

13. claim: 75

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

A coating having a preselected resistivity at a preselected pigment loading level comprising a resin and a modified pigment, wherein the modified pigment comprises a pigment having attached at least one organic group having the formula $-X-NI$, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, or an alkylene group; and NI represents a non-polymeric group comprising at least one nonionic group, and wherein a coating comprising the resin and said pigment has a resistivity at the preselected pigment loading level that is lower than the preselected resistivity of the coating comprising the resin and the modified pigment at said pigment loading level.

14. claims: 76-79

A coating comprising a resin and a modified pigment wherein the modified pigment comprises a pigment having attached at least one organic group having the formula $-X-I$, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, or an alkylene group, and I represents a non-polymeric group comprising at least one ionic group or at least one ionizable group wherein the modified pigment has a volatile content of less than 3%, and wherein the coating has a resistivity of between 10^{6} and 10^{13} ohm.

15. claim: 80

A coating comprising a resin and a modified pigment wherein the modified pigment comprises a pigment having attached at least one organic group having the formula $-X-NI$, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, or an alkylene group, and NI represents a non-polymeric group comprising at least one nonionic group, wherein the modified pigment has a volatile content of less than 3%, and wherein the coating has a resistivity of between 10^{6} and 10^{13} ohm.

16. claims: 81,82

A black matrix comprising at least one modified pigment, wherein the modified pigment comprises a pigment having attached at least one organic group having the formula $-X-I$, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, or an alkylene group, and I represents a non-polymeric group comprising at least one ionic group or at least one ionizable group.

17. claim: 83

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

A black matrix comprising at least one modified pigment, wherein the modified pigment comprises a pigment having attached at least one organic group having the formula -X-NI, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, or an alkylene group, and NI represents a non-polymeric group comprising at least one nonionic group.

18. claims: 84,85

A black matrix comprising at least one modified pigment, wherein the modified pigment comprises a pigment having attached at least one organic group having the formula -X-I, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, an alkylene group, an aralkylene group, or an alkarylene group, and I represents a non-polymeric group comprising at least one ionic group or at least one ionizable group.

19. claim: 86

A black matrix comprising at least one modified pigment, wherein the modified pigment comprises a pigment having attached at least one organic group having the formula -X-NI, wherein X, which is directly attached to the pigment, represents an arylene or heteroarylene group, an alkylene group, an aralkylene group, or an alkarylene group, and NI represents a non-polymeric group comprising at least one nonionic group.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2005/037041

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