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Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

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(54) Title: AUTOMOTIVE COATING SURFACE ENHANCEMENT USING A PLASMA TREATMENT TECHNIQUE

(57) Abstract: A technique of treating an automotive coating to modify surface-specific physical properties thereof while retaining bulk physical properties of the automotive coating includes the step of generating a plasma discharge in a plasma generating assembly. The automotive coating is treated with the plasma discharge. The automotive coating is completely cured prior to treatment with the plasma discharge. To treat the automotive coating, either 1) a precursor material is introduced into the plasma discharge to form a thin film on the automotive coating, or 2) the plasma discharge is free of a precursor material and weak bonds are destroyed on or near the surface of the automotive coating.



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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER

INV. B05D7/14 B05D3/14 B05D7/24

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)
B05D

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.
X	US 4 898 775 A (OKA JOJI [JP] ET AL) 6 February 1990 (1990-02-06) claim 1; example 1	1
X	WO 2008/057702 A (PPG IND OHIO INC [US]) 15 May 2008 (2008-05-15) claims; figures; example 2	1,2
A	WO 03/080258 A (UNIV DURHAM [GB]; BADYAL JAS PAL SINGH [GB]; WOODWARD IAIN STUART [GB]) 2 October 2003 (2003-10-02) claims; examples	1

☐ 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)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *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.
- * & * document member of the same patent family

Date of the actual completion of the international search

22 January 2010

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28/07/2010

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/061608

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.:

1(partially), 2

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(partially), 2

A technique of treating an automotive coating to modify surface-specific physical properties thereof while retaining bulk physical properties of the automotive coating, said method comprising the step of:

- generating a plasma discharge in a plasma generating assembly; and
- treating the automotive coating with the plasma discharge; wherein the automotive coating is completely cured prior to treatment with the plasma discharge; and wherein a precursor material is introduced into the plasma discharge to form a thin film on the automotive coating, and wherein the plasma discharge is generated under conditions of atmospheric pressure

2. claims: 1(partially), 3

A technique of treating an automotive coating to modify surface-specific physical properties thereof while retaining bulk physical properties of the automotive coating, said method comprising the step of:

- generating a plasma discharge in a plasma generating assembly; and
- treating the automotive coating with the plasma discharge; wherein the automotive coating is completely cured prior to treatment with the plasma discharge; and wherein the plasma discharge is directed out of the assembly and onto the automotive coating to be treated.

3. claims: 1(partially), 4-9

A technique of treating an automotive coating to modify surface-specific physical properties thereof while retaining bulk physical properties of the automotive coating, said method comprising the step of:

- generating a plasma discharge in a plasma generating assembly; and
- treating the automotive coating with the plasma discharge; wherein the automotive coating is completely cured prior to treatment with the plasma discharge; and wherein the plasma generating assembly includes at least one pair of parallel electrodes spaced from each other.

4. claims: 1(partially), 14

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

A technique of treating an automotive coating to modify surface-specific physical properties thereof while retaining bulk physical properties of the automotive coating, said method comprising the step of:

- generating a plasma discharge in a plasma generating assembly; and
- treating the automotive coating with the plasma discharge; wherein the automotive coating is completely cured prior to treatment with the plasma discharge; and wherein the automotive coating comprises the reaction product of at least a resin component and a crosslinking agent that is reactive with the resin component.

5. claims: 1(partially), 15-21

A technique of treating an automotive coating to modify surface-specific physical properties thereof while retaining bulk physical properties of the automotive coating, said method comprising the step of:

- generating a plasma discharge in a plasma generating assembly; and
- treating the automotive coating with the plasma discharge; wherein the automotive coating is completely cured prior to treatment with the plasma discharge; and wherein the automotive coating comprises the reaction product of a dual cure composition comprising at least four elements.

6. claims: 1(partially), 2, 3, 4, 10-13, 14, 15-21, 22-25

A technique of treating an automotive coating to modify surface-specific physical properties thereof while retaining bulk physical properties of the automotive coating, said method comprising the step of:

- generating a plasma discharge in a plasma generating assembly; and
- treating the automotive coating with the plasma discharge; wherein the automotive coating is completely cured prior to treatment with the plasma discharge; and wherein the plasma discharge is free of a precursor material.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2009/061608

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4898775	A	06-02-1990	NONE	
WO 2008057702	A	15-05-2008	US 2008113103 A1	15-05-2008
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