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# D E C I S I O N
# of 4 April 2006

**Case Number:** W 0027/05 - 3.4.02

**Application Number:** PCT/US 2005/001914

**Publication Number:** WO 2005/073787

**IPC:** G02F 1/167

**Language of the proceedings:** EN

**Title of invention:**
Structured fluid compositions for electrophoretically frustrated total internal reflection displays

**Applicant:**
The Lubrizol Corporation

**Opponent:**
-

**Headword:**
-

**Relevant legal provisions:**
PCT Art. 17
PCT R. 40

**Keyword:**
"Non-unity a posteriori: confirmed"

**Decisions cited:**
-

**Catchword:**
-

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**Case Number:** W 0027/05 - 3.4.02

**International Application No. PCT/**US 2005/001914

# D E C I S I O N
**of the Technical Board of Appeal 3.4.02**
**of 4 April 2006**

**Applicant:** The Lubrizol Corporation
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**Decision under appeal:** **Protest according to Rule 40.2(c) of the Patent Cooperation Treaty made by the applicants against the invitation (payment of additional fees) of the European Patent Office (International Searching Authority) dated 5 July 2005.**

**Composition of the Board:**

**Chairman:** A. G. Klein
**Members:** M. P. Stock
C. Holtz

## Summary of Facts and Submissions

I. The search in the present international application PCT/US2005/001914 was based on the following claims 1 to 10:

1. A structured fluid composition comprising:
(a) a low refractive index liquid;
(b) at least one particle selected from the group consisting of a light absorbing particles such as pigments, non light absorbing particles such as teflon, silica, alumina and mixtures there of, and combinations thereof; and
(c) at least one additive selected from the group consisting of
(i) a dispersant,
(ii) a charging agent,
(iii) a surfactant,
(iv) a flocculating agent,
(v) a polymer, and
(vi) combination thereof;
resulting in a stable suspension that is not agglomerated or clustered, having ionically charged light absorbing particles, and forming an interactive structure which inhibits motion, and for use in a TIR electronic display, wherein wherein the particles occupy from about 1 to about 75% by weight of the electrophoretic suspension, and wherein the particles comprise a blue pigment, red pigment, brown pigment, black pigment and combinations thereof.

2. An electronically addressable display, comprising:

(a) a transparent upper front sheet;

(b) a lower sheet that is essentially parallel to and spaced from the upper front sheet;

(c) a structured electrophoretic suspension substantially filling the space between the sheets which structure is controlled by the composition of the suspension, wherein the composition comprises a low refractive index liquid; a light absorbing particles such as pigments; particles which are not light absorbing such as teflon, silica, alumina and combinations thereof; and at least one additive selected from the group consisting of a dispersant, a charging agent, a surfactant, a flocculating agent, a polymer, and combination thereof; and

(d) a means for applying a voltage across the suspension for controllably compressing the colloidal suspension away from the inward surface of the front sheet to either form a thin particle free liquid layer to allow total internal reflection or a layer with a higher concentration of particles to frustrate total internal reflection at the inward surface of light rays passing through the front sheet.

3. The composition of claim 1 comprising a mixture of two or more pigment particles to enhance the optical properties, wherein the frustration of’ total internal reflection is improved by the collective absorption of different wavelengths of light and wherein the liquid electrophoretic medium is comprised of substantially fluorinated oils.

4. The composition of claim 3 wherein the fluorinated oil is perfluorinated.

5. The composition of claim 1 where the blue pigment is selected from a group consisting of chromophthal blue, metal containing phthalo blue, metal free phthalo blue indigo blue and combinations thereof wherein the red pigment is selected from a group consisting of monastral red and combinations thereof, and wherein the black pigment is selected from a group consisting of carbon black, modified carbon black, iron, oxide, aniline black and combinations thereof.

6. The composition of claim 1 wherein the composition results in a colloidal structure selected from the group consisting of a non-Newtonian rheology, a yield stress or combinations thereof.

7. The composition of claim 1:

(a) wherein the particle has a surface treatment selected from the group consisting of reaction with an oxidizing or reducing chemical, reaction with a chemical that covalently bonds to the surface, grafting onto the surface with a plasma containing small molecules such as oxygen or monomers with various functional groups or mixtures thereof resulting in improved response time and as herein the dispersant forms a tightly packed monolayer adsorbed on the particle surface resulting in less particle agglomeration,

(b) wherein the particle has a sufficient number of functional groups 10 of either acid or base, to allow a dispersant to form a tightly packed mono-layer,

(c) wherein the dispersant has the complementary acid or basic functional group to interact with the particle surface and a molecular structure resulting in a strong interaction between the particle surface and the dispersant to inhibit agglomeration, and

(d) wherein the suspended particles have at least two distinct particle size distributions one in the range of about 200 nm to about 500 nm and the other in the range of about 10 nm to about 100 nm.

8. The composition of claim 1 wherein the particles are coupled via reaction with a coupling agent and wherein the coupling agent is bi-functional wherein the dispersant has only either an acidic functional group or a basic functional group.

9. The composition of claim 1 wherein the ratio of dispersant to pigment ranges from about 0.1 to about 3.

10. The composition in claim 1 where the concentration of pigment particles is adjusted to maintain small particle separation distance in a homogeneous dispersion so the distance that particles must move to produce a color change in TIR is small, and this results in fast response time in producing an image wherein the charging agent, dispersant or surfactant forms inverse micelles which increase the particle charge thereby improving the structure and response time of the mixture.

II. An invitation to pay additional fees was issued by the European Patent Office as International Searching Authority (ISA) under Article 17(3)(a) and Rule 40.1

PCT. The ISA considered that there were three different inventions claimed not complying with the requirement of unity, and issued a partial search report for the first invention. The following inventions were identified by the ISA:

(i) claims: 1, 3-5

The subject-matter of the set of claims is directed to an electrophoretic mixture composition (fluid) designed for the purpose of providing a broader absorption spectrum (better contrast for a wide range of wavelength, in particular for white light) of the whole fluid in the case the total internal reflection is frustrated.

(ii) claims: 1,6-10

The subject-matter of the set of claims is directed to an electrophoretic mixture composition (fluid) designed to improve the rheological behaviour of the fluid (resulting in reduced switching times of the corresponding electrophoretic device) and to reduce agglomeration of the particles contained in it.

(iii) claim: 2

The subject-matter of the claim is directed to an electrophoretic display device based on the frustrated TIR operation principle and a corresponding electrophoretic suspension (fluid), the composition of the latter designed to provide/improve the colloidal structure of the whole fluid.

III. The ISA found that the subject-matter of independent claim 1 did not involve an inventive step in the sense of Article 33(3) PCT with respect to the prior art as disclosed in document D1: MOSSMAN, M.A. El AL. (XP009048336). As a consequence, a common inventive concept underlying the remaining claims (or group of claims) was lacking. The requisite unity of invention (Rule 13.1 PCT) therefore no longer existed between the subject-matter of the (groups of) claims as defined above:

The subject-matter of dependent claims 3-5 (group (i)) was directed to a mixture composition (fluid) for an electrophoretic device, the fluid designed for the purpose of providing a broader absorption spectrum during the state of frustration of total reflection in the device. The underlying (possibly) inventive concept, namely the introduction of selected plural pigment particles of complementing absorptive properties, was characterising this first group of invention (group (i)).

For Claims 6-10 (group (ii)), the (possibly) inventive concept was the special selection and concentration of chemical additives and particles as well as the distribution of particle size in the fluid leading to the technical effects of improved rheological behaviour of that fluid (resulting, in turn, in reduced switching times of the corresponding electrophoretic device) and to reduced agglomeration of the particles.

For Claim 2 (further independent claim; group (iii)), the (possibly) inventive concept was the incorporation of non-light absorbing particles into the fluid

composition. This leaded to the technical effect of enabling/improving the colloidal structure of the whole fluid.

Therefore, the identified inventive concepts belonging to the three groups of inventions stated above were neither identical nor did they correspond to each other. Also, examining the possible correspondence by technical effect, it was found that all three technical effects were different and not corresponding, either. Moreover, the associated technical problems underlying the subjects of the claimed inventions were not related. Neither were their solutions, defined by those concepts.

IV. With letter dated 1 August 2005 the applicant paid two additional search fees under protest for the second and third invention. The following argumentation was presented:

"Applicants assert that there is unity of invention between Group 1 (claims 1, 3-5), Group 2 (claims 1, 6-10) and Group 3 (claim 2) in that Group 1 and Group 2 relate to the structured fluid composition which is used in the Group 3 electronically addressable display.

Further, the Group 1 dependent claims 3-5 and the Group 2 dependent claims 6-10 all depend on the structured fluid of claim 1. Thus there is unity of invention between Group 1 and Group 2."

V. In a notification regarding review of justification for invitation to pay additional search fees the ISA stated that the invitation to pay additional fees was

justified. The applicant was invited to pay the protest fee. Applicant's arguments were dealt with.

VI. By letter dated 23 November 2005 the applicant informed the ISA that payment of the protest fee was authorised for further examination of the protest.

## Reasons for the Decision

1. *Admissibility*

The applicant based his protest on the assertion that there is a relation between groups 1, 2 and 3. Although not discussed by the applicant, this was accepted by the Board as a reasoned statement in the meaning of Rule 40.2(c) PCT, from which the Board can understand the grounds for which the applicant believes that the application does not lack unity. The protest is therefore admissible.

2. *Unity*

2.1 Concerning the applicant's arguments in his letter of 01/08/2005 it is noted, that the applicant has not disputed the finding of the ISA - considered convincing by the Board - that claim 1 as filed does not involve an inventive step over the prior art cited. The remaining arguments in that letter are not found convincing by the Board for the following reasons:

2.2 The applicant asserts firstly that there is unity between the three groups of claims because group (i) and group (ii) relate to the structured fluid

composition which is used in the electronically addressable display of group (iii). The Board agrees with the ISA that this argument is not convincing because the structured electrophoretic suspension defined in claim 2 (group (iii)) does not include any technical features corresponding to the inventive concept of groups (i) and (ii) as can be seen from the discussion by the ISA, see section III above.

2.3 The applicant asserts further that there is unity between groups (i) and (ii) because claims 3-5 of group (i) and 6-10 of group (ii) are all dependent on claim 1. The Board agrees with the ISA that this argument is not convincing because the subject-matter of claim 1 does not involve an inventive step, so cannot contribute to the presence of a common inventive concept between the claims which are dependent on it.

3. *Conclusion*

Therefore taking into due account the arguments of the applicant, the Board reaches the conclusion that the invitation to pay additional search fees was entirely justified. Hence refund of the additional search fees and the protest fee cannot be made, see Rule 40(e) PCT.

## Order

**For these reasons it is decided that:**

The protest is refused.

The Registrar: The Chairman:

C. Eickhoff A. G. Klein