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(71) Applicant: **E INK CORPORATION** [US/US]; Attn: IP Department, 1000 Technology Park Drive, Billerica, Massachusetts 01821-4165 (US).

(72) Inventors: **WIDGER, Peter Carsten Bailey**; c/o E Ink Corporation, 1000 Technology Park Drive, Billerica, Massachusetts 01821-4165 (US). **ANSETH, Jay William**; c/o E Ink Corporation, 1000 Technology Park Drive, Billerica, Massachusetts 01821-4165 (US). **PAOLINI, Richard J., Jr.**; c/o E Ink Corporation, 1000 Technology Park Drive, Billerica, Massachusetts 01821-4165 (US). **ROMANOWSKY, Mark Benjamin**; c/o E Ink Corporation, 1000 Technology Park Drive, Billerica, Massachusetts 01821-4165 (US). **SMITH, Jillian**; c/o E Ink Corporation, 1000 Technology Park Drive, Billerica, Massachusetts 01821-4165 (US). **TELFER, Stephen J.**; c/o E Ink Corporation, 1000 Technology Park Drive, Billerica, Massachusetts 01821-4165 (US).

Corporation, 1000 Technology Park Drive, Billerica, Massachusetts 01821-4165 (US). **BREEN, Craig Alan**; c/o E Ink Corporation, 1000 Technology Park Drive, Billerica, Massachusetts 01821-4165 (US). **BULL, Stephen**; c/o E Ink Corporation, 1000 Technology Park Drive, Billerica, Massachusetts 01821-4165 (US).

(74) Agent: **BARONIAN, Antranig**; E Ink Corporation, 1000 Technology Park Drive, Billerica, Massachusetts 01821-4165 (US).

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(54) Title: VARIABLE TRANSMISSION ELECTROPHORETIC DEVICES

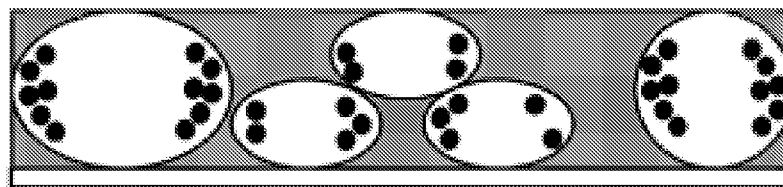


Fig. 1F

(57) Abstract: A variable transmission film may include an electrophoretic medium having a plurality of capsules and a binder, each capsule containing a plurality of electrically charged particles and a fluid, the charged particles being movable by application of an electric field and being capable of being switched between an open state and a closed state. The film may include at least one of a binder containing fish gelatin and a polyanion; a binder containing one or more tinting agents; capsules containing charge control agents, such as an oligoamine-terminated polyolefin and a branched chain fatty acid comprising at least 8 carbon atoms; a selection of capsules in which at least 60% have a diameter between 50 μm and 90 μm and at least 15% have a diameter between 20 μm and 49 μm ; a tinted adhesive layer; and a fluid selected from one or more nonconjugated olefinic hydrocarbons.



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- *with international search report (Art. 21(3))*
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A. CLASSIFICATION OF SUBJECT MATTER**G02F 1/167(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHEDMinimum documentation searched (classification system followed by classification symbols)
G02F 1/167; C09D 5/44; E06B 9/24; G02B 26/00Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility modelsElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: electrophoretic, electro-optic, charge control agent, capsule, fluid, binder, olefine, amine, hydrocarbon**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2005-0213191 A1 (THOMAS WHITESIDES et al.) 29 September 2005 See claims 1, 4, 13 and paragraphs [0055], [0056].	18-21
Y		16, 17, 26-28
A		1-15, 22-25
Y	US 2005-0237599 A1 (SHINYA TAKAGI) 27 October 2005 See paragraph [0074].	16, 17
Y	US 2017-0097556 A1 (E INK CORPORATION) 06 April 2017 See paragraphs [0006], [0017], [0045], [0056], [0063].	10-15
Y	US 2015-0277205 A1 (FUJI XEROX CO., LTD.) 01 October 2015 See paragraphs [0032], [0033], [0115], [0121].	10-15, 26-28
A	US 2007-0002427 A1 (YASUAKI OGIWARA et al.) 04 January 2007 See claims 25-65 and fig. 11.	1-28
A	US 2015-0248045 A1 (E INK CALIFORNIA, LLC) 03 September 2015 See claims 1-16 and fig. 1.	1-28
A	US 2014-0376081 A1 (SEIKO EPSON CORPORATION) 25 December 2014 See claims 1-17 and fig. 1.	1-28

 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 application or patent 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

11 January 2019 (11.01.2019)

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Name and mailing address of the ISA/KR

International Application Division
Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea

Facsimile No. +82-42-481-8578

Authorized officer

LEE, Seoung Young

Telephone No. +82-42-481-3535



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:

Group 1 (claims 1-9 and 22-25) directed to a variable transmission electro-optic medium and film consisting of capsules and a binder wherein the binder comprises a tinting agent.

Group 2 (claims 10-15) directed to a variable transmission electro-optic medium consisting of capsules and a binder wherein charge control agent comprises a polyolefin and fatty acid.

Group 3 (claims 16-21) directed to an electro-optic medium and method of forming an electro-optic medium consisting of capsules and a binder wherein the capsules have several size ranges.

Group 4 (claims 26-28) directed to a variable transmission electro-optic medium consisting of capsules and a binder wherein a fluid comprises olefinic hydrocarbons.

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 any 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.:

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.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2018/037479

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 2016-0246154 A1 (VLYTE INNOVATIONS LIMITED) 25 August 2016 See claim 1 and fig. 1A.	1-28

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