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[Continued on next page]

- (54) Title: SPRAY EJECTOR MECHANISMS AND DEVICES PROVIDING CHARGE ISOLATION AND CONTROLLABLE DROPLET CHARGE, AND LOW DOSAGE VOLUME OPHTHALMIC ADMINISTRATION

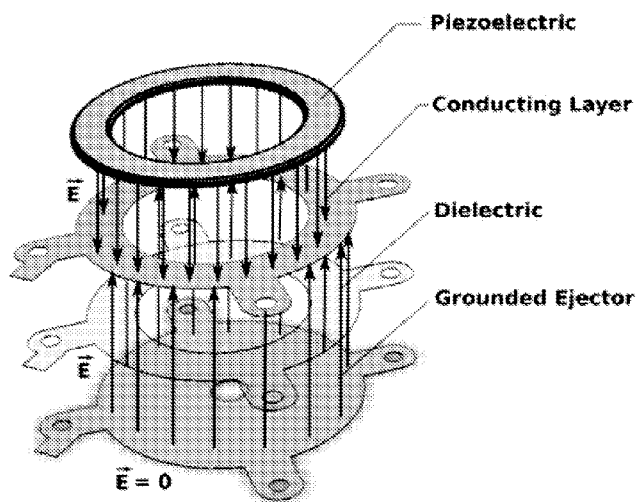


FIG. 6

(57) Abstract: The present disclosure relates to ejector mechanisms and devices for generating a directed stream of droplets, as well as improved methods for delivering an ejected stream of droplets to a target. The device and methods may be useful for the delivery of fluid for ophthalmic, topical, oral, nasal, or pulmonary use, more particularly, for use in the delivery of ophthalmic fluid to the eye. Certain aspects of the disclosure relate to devices and methods for the delivery of a therapeutically effective low dosage volume medicament composition to a target, e.g., by controlling charge, droplet size and/or droplet deposit parameters of the medicament composition.

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- with international search report (Art. 21(3))
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2013/036002

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B05B 1/02 (2013.01)

USPC - 239/102.2

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)
 IPC(8) - A61F 9/00; A61M 35/00; B05B 1/00, 1/02, 1/08, 17/00, 17/04, 17/06; B41J 2/045 (2013.01)
 USPC - 128/200.14, 200.16; 239/4, 102.2, 338; 347/68, 71; 604/295, 298

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
 CPC - A61M 35/003; B05B 1/02, 17/0607, 17/0638, 17/0646 (2013.01)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Orbit, Google Patents, Google Scholar

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2011/0175971 A1 (NEWTON et al) 21 July 2011 (21.07.2011) entire document	1-8
Y	WO 2012/009706 A1 (HUNTER et al) 19 January 2012 (19.01.2012) entire document	1-8
Y	US 2002/0085067 A1 (PALIFKA et al) 04 July 2002 (04.07.2002) entire document	6
A	US 2012/0062840 A1 (BALLOU JR et al) 15 March 2012 (15.03.2012) entire document	1-8
A	US 2011/0233302 A1 (LIN et al) 29 September 2011 (29.09.2011) entire document	1-8

Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"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
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2013/036002

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.: 21, 33, 34
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 Extra 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 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.:
1-8

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/US2013/036002

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-8, is drawn to a charge isolated ejector system.

Group II, claims 9-20 and 22-32, is drawn to a method of delivering a therapeutics to an eye of a subject.

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical features of the Group I, a charge isolated ejector system including a generator plate, piezoelectric actuator, two conducting layers, and a dielectric layer, are not present in Group II; and the special technical features of the Group II, a method of delivering a therapeutics to an eye of a subject including generating a directed stream of droplets including a low dosage volume medicament composition to the eye of said subject, wherein the delivered stream of droplets including the low dosage volume medicament composition is deposited on the eye of said subject in less than 3/4 of the volume of that of a standard eyedropper, are not present in Group I.

Groups I and II share the technical features of ejecting droplets of medicament to a eye of a patient. However, these technical features do not represent a contribution over the prior art. Specifically, US 2012/0062840 A1 to Ballou et al. discloses ejecting droplets of medicament (Abstract, method generally includes administering a stream of droplets to the eye of a subject from an ejector device; Paras. [0008] through [0011] regarding ejecting dosages) to a eye of a patient (Abstract and Paras. [0008] through [0011]).

Since none of the special technical features of the Groups I and II inventions are found in more than one of the inventions, unity of invention is lacking.