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(54) Title: CELL-TYPE SPECIFIC TARGETING CONTRACTILE INJECTION SYSTEM

(57) Abstract: The present disclosure relates generally to the field of delivery systems using contractile injection systems (CIS). Specifically disclosed are engineered extracellular CISs (eCISs) that can deliver non-natural protein payloads to non-natural target cells such as human cells. In addition, methods of using the engineered eCISs are also disclosed.



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A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - INV. - A61K 38/46; A61K 47/42; A61K 47/68; C07K 14/195; C07K 16/46 (2023.01)
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ADD. - C07K 2319/01; C12N 2320/32; A61K 2039/64 (2023.05)
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)
See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
See Search History document

Electronic database consulted during the international search (name of database and, where practicable, search terms used)
See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2020/102746 A1 (SAN DIEGO STATE UNIVERSITY (SDSU) FOUNDATION DBA SAN DIEGO STATE UNIVERSITY RESEARCH FOUNDATION et al.) 22 May 2020 (22.05.2020) entire document	1, 9, 10, 19-21, 29, 30, 39, 40
Y		2, 11, 12, 15-18, 22, 31, 32, 35-38
Y	JIANG et al. " Cryo-EM Structure and Assembly of an Extracellular Contractile Injection System," Cell, 04 April 2019 (04.04.2019), Vol. 177, Pgs. 370-383. entire document	2, 22
Y	CN 103585105 A (CHILDRENS HOSPITAL MEDICAL CENTER) 19 February 2014 (19.02.2014) entire document	11, 31
Y	WO 2020/245611 A1 (THE UNIVERSITY OF WARWICK) 10 December 2020 (10.12.2020) entire document	12, 32
Y	WO 2022/032154 A2 (MODERNATX INC.) 10 February 2022 (10.02.2022) entire document	15-18, 35-38
A	ROCCHI et al. " A Bacterial Phage Tail-like Structure Kills Eukaryotic Cells by Injecting a Nuclease Effector," Cell Reports, 09 July 2019 (09.07.2019), Vol. 28, Pgs. 295-301. entire document	1-3, 9-12, 15-23, 29-32, 35-40
A	CHEN et al. "Genome-wide Identification and Characterization of a Superfamily of Bacterial Extracellular Contractile Injection Systems," Cell Reports, 8 October 2019 (08.10.2019), Vol. 29, Pgs. 511-521. entire document	1-3, 9-12, 15-23, 29-32, 35-40

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"D" document cited by the applicant in the international application	"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
"E" earlier application or patent but published on or after the international filing date	"&" document member of the same patent family
"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	

Date of the actual completion of the international search 27 May 2023	Date of mailing of the international search report AUG 15 2023
Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	Authorized officer Taina Matos Telephone No. PCT Helpdesk: 571-272-4300

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Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item 1.c of the first sheet)

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of a sequence listing:
 - a. forming part of the international application as filed.
 - b. furnished subsequent to the international filing date for the purposes of international search (Rule 13ter.1(a)),
 accompanied by a statement to the effect that the sequence listing does not go beyond the disclosure in the international application as filed.
2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this report has been established to the extent that a meaningful search could be carried out without a WIPO Standard ST.26 compliant sequence listing.
3. Additional comments:

On 04 April 2023, the ISA/US issued Form PCT/ISA/225 requiring the applicant to furnish a nucleotide and/or amino acid sequence listing in the form of an Annex C/ST.26 XML file, accompanied by a statement to the effect that the sequence listing does not go beyond the disclosure in the international application as filed.

A timely response to the form was not received by the ISA/US. Consequently, the international search was not established taking into account a sequence listing.

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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.: 4-8, 13, 14, 24-28, 33, 34
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:
Claims 4-8, 13, 14, 24-28, 33, and 34 are held unsearchable as a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit, furnish a sequence listing in the form of an Annex C/ST.26 XML file, and such listing was not available to the International Searching Authority in the form and manner acceptable to it; or the sequence listing was not available to the International Searching Authority in the form and manner acceptable to it; or the sequence listing was not available to the International Searching Authority in the form and manner acceptable to it; or the sequence listing was not available to the International Searching Authority in the form and manner acceptable to it;
See Extra Sheet(s)
3. Claims Nos.: 41-44
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:

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.:

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/US2022/052867

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E, X	KREITZ et al. " Programmable protein delivery with a bacterial contractile injection system," Nature, 29 March 2023 (29.03.2023), Vol. 616, Pgs. 357-364. entire document	1-3, 9-12, 15-23, 29-32, 35-40
A	US 2015/0297579 A1 (CELGENE CORPORATION) 22 October 2015 (22.10.2015) entire document	1-3, 9-12, 15-23, 29-32, 35-40

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Continued from Box No. II Observations where certain claims were found unsearchable

listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.