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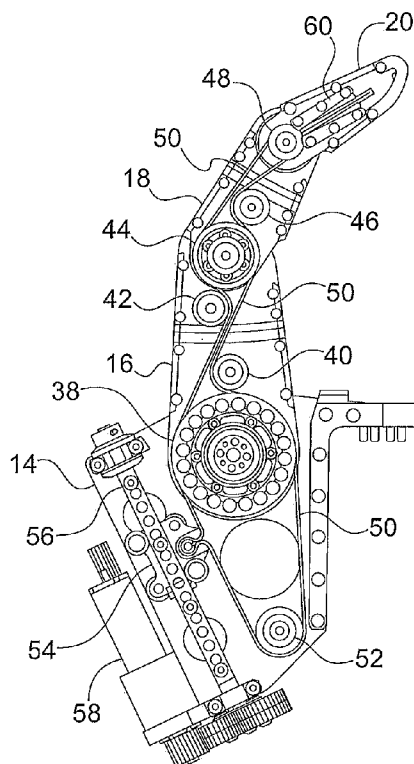
(54) **Title:** ROBOTIC HAND WITH CONFORMAL FINGER

Fig. 4B

(57) **Abstract:** A robotic finger assembly can include a base for mounting the finger to a robotic hand, with the base having a motor, and at least three links. The links of the robotic hand are connected to each other and to the base by a series of joints. A joint shaft and a pivot shaft, where the pivot shaft can freely move within its respective joint shaft, is connected to a preceding link. The motor is activated for opening or closing the finger. The finger closes on an object with a distributed force across the links. Grasping also can mean engaging an object like a human hand, by closing the first finger link until it engages the object, then closing the second finger link until it engages the object, then closing the third link until it engages the object. A robotic hand assembly is also disclosed.



SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:**Declarations under Rule 4.17:**

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

— *with international search report (Art. 21(3))*

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/029919**A. CLASSIFICATION OF SUBJECT MATTER****B25J 15/08(2006.01)i, B25J 17/00(2006.01)i**

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)

B25J 15/08; F16D 43/21; B66C 1/10; B25J 15/02; B25J 15/10

Documentation 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 models

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

eKOMPASS(KIPO internal) & Keywords: finger, link, pivot, motor, gear, reduction

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 04957320 A (ULRICH; NATHAN T.) 18 September 1990 See abstract, column 5 line 59-column 12 line 59, claims 1-7 and figures 1-7.	1-25
Y	US 2010-0259057 A1 (MADHANI AKHIL J.) 14 October 2010 See abstract, paragraphs 13-39, claims 1-25 and figures 1-14.	1-25
A	US 05062673 A (MIMURA; NOBUHARU) 05 November 1991 See abstract, column 6 line 27-column 12 line 9, claims 1-9 and figures 1-8.	1-25
A	JP 6104310 B2 (AGENCY OF IND SCIENCE & TECHNOL) 21 December 1994 See abstract, column 3 line 31-column 6 line 10, claim 1 and figures 1-6.	1-25

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

* Special categories of cited documents:

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"E" earlier application or patent but published on or after the international filing date

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"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

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 04957320 A	18.09.1990	EP 0358966 A2 JP 03-179464 B2 JP 11-245187 A WO 90-02030 A1	21.03.1990 13.04.2001 14.09.1999 08.03.1990
US 2010-0259057 A1	14.10.2010	EP 2239106 A1 JP 2010-240834 A US 8052185 B2	13.10.2010 28.10.2010 08.11.2011
US 05062673 A	05.11.1991	JP 02-256489 A	17.10.1990
JP 6104310 B2	21.12.1994	None	