Atty. Dkt. No. 128729-0132

BEFORE THE INTERNATIONAL SEARCHING AUTHORITY
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	Tesla, Inc.
Title:	UNDERACTUATED HAND WITH CABLE-DRIVEN FINGERS
Int'l Appl. No.:	PCT/US2023/034306
Int'l Filing Date:	10/2/2023

ARTICLE 34 AMENDMENT AND CHAPTER II DEMAND AND RESPONSE TO WRITTEN OPINION FROM THE INTERNATIONAL SEARCHING AUTHORITY UNDER PCT RULE 43*BIS*

Mail Stop PCT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Authorized Officer: Shane Thomas

Dear Officer Thomas:

Applicant provides these comments in response to the Written Opinion issued on February 16, 2024, from the United States Patent and Trademark Office as the International Searching Authority (ISA).

Article 34 Amendments to the Claims

Accompanying this communication is a Listing of Claims on pages containing a complete set of the claims in replacement of the claims as originally filed. The claims are amended as follows:

1. (Currently Amended) A robotic hand system comprising:

a palm region; and

one or more fingers, each finger comprising:

an actuator device;

a respective proximal member having a first end mechanically coupled to the palm region [[robot]] and configured to rotate around a respective first pivot relative to the palm region;

a respective distal member having a first end mechanically coupled to a second end of the proximal member and configured to rotate around a respective second pivot relative to the proximal member; and

a respective cable having a first portion coupled to the actuator and a second portion extending along the proximal member and the distal member, the second portion separated away from the first pivot and the second pivot and having an end with a higher dimension than a diameter of the cable, the end with higher dimension floating within a region of the distal member and structured to engage the distal member when the cable is pulled by the actuator.

2. (Cancelled)

3. (Original) The robotic hand system of claim 1, wherein the end with higher dimension includes at least one of:

a potted end; or

an end with a potted insert.

4. (Original) The robotic hand system of claim 1, wherein each finger comprises a respective channel structure extending at least partially along the respective proximal member and the respective distal member, the respective channel structure hosting at least partially the second portion of the respective cable.

5. (Original) The robotic hand system of claim 4, wherein the end with higher dimension of the second portion of the respective cable is structured to engage a ledge structure of the respective channel structure when the respective cable is pulled by the respective actuator.

6. (Original) The robotic hand system of claim 1, wherein each finger comprises:
a respective first torsion spring placed around the respective first pivot; and
a respective second torsion spring placed around the respective second pivot.

7. (Original) The robotic hand system of claim 1, wherein each finger comprises:
a respective magnet coupled to the respective first pivot; and
a respective hall effect sensor placed proximate to the respective magnet.

8. (Original) The robotic hand system of claim 7, wherein the respective magnet includes a ring magnet placed around the respective first pivot.

9. (Original) The robotic hand system of claim 1, wherein each finger comprises:
a respective magnet coupled to the respective second pivot; and
a respective hall effect sensor placed proximate to the respective magnet.

10. (Currently Amended) The robotic hand system of claim 1, wherein a distance between the respective cable and the respective first pivot varies and/or a distance between the respective cable and the respective second pivot varies.

11. (Currently Amended) A finger device, comprising:
an actuator device;
a proximal member having a first end mechanically coupled to a base member and configured to rotate around a first pivot relative to the base member;
a distal member having a first end mechanically coupled to a second end of the proximal member and configured to rotate around a second pivot relative to the proximal member; and
a cable having a first portion coupled to the actuator and a second portion extending along the proximal member and the distal member, the second portion separated away from the first pivot and the second pivot and having an end with a higher dimension than a diameter of the cable, the end with higher dimension floating within a region of the distal member and structured to engage the distal member when the cable is pulled by the actuator.

12. (Cancelled)

13. (Original) The finger device of claim 11, wherein the end with higher dimension includes at least one of:

a potted end; or

an end with a potted insert.

14. (Original) The finger device of claim 11, further comprises a channel structure extending at least partially along the proximal member and the distal member, the channel structure hosting at least partially the second portion of the cable.

15. (Currently Amended) The finger device system of claim 14, wherein the end with higher dimension of the second portion of the cable is structured to engage a ledge structure of the channel structure when the ~~respective~~ cable is pulled by the ~~respective~~ actuator.

16. (Currently Amended) The finger device of claim [[q1]] 11, further comprises:

a first torsion spring placed around the first pivot; and

a second torsion spring placed around the second pivot.

17. (Original) The finger device of claim 11, further comprises:

a magnet coupled to the first pivot; and

a hall effect sensor placed proximate to the magnet.

18. (Original) The finger device of claim 17, wherein the magnet includes a ring magnet placed around the first pivot.

19. (Original) The finger device system of claim 11, further comprises:

a magnet coupled to the second pivot; and

a hall effect sensor placed proximate to the magnet.

20. (Currently Amended) The finger device of claim 11, wherein a distance between the cable and the first pivot varies and/or a distance between the cable and the second pivot varies.

Response to the Written Opinion

Claims 1-20 are pending. Claims 1, 10, 11, 15, 16 and 20 have been amended. Claims 2 and 12 has been canceled. Independent claims 1 and 11 have been amended to incorporate

the subject matter of dependent claims 2 and 12, respectively, and to correct clerical errors. Claims 10, 15, 16 and 20 have been amended to correct clerical errors. No new matter has been added by way of these amendments.

The Written Opinion rejects claims 1-6, 10-16 and 20 as lacking novelty over WO2019/0287024A1 to KUKA Deutschland GmbH, (hereinafter "KUKA'), and rejects claims 7-9 and 17-19 as allegedly lacking inventive step over KUKA in view of US 2013/0193704 A1 to GM GLOBAL TECHNOLOGY OPERATIONS, INC. et al., (hereinafter "GM"). Applicant traverses these rejections in view of amended independent claims 1 and 11 and the comments below.

KUKA fails to teach or suggest the feature of "*the end with higher dimension floating within a region of the distal member*" recited in amended independent claims 1 and 11 and incorporated from claims 2 and 12. In rejecting claims 2 and 12, the Written Opinion cites to FIGS. 2, 3, 6, 7 and paragraphs [0077] and [0078] of KUKA and alleges that the tips of the traction means 8.1 and 8.2 of KUKA float. Applicant disagrees. KUKA describes the traction means 8.1, 8.2 **as being connected** to the respective fingertip 7.7, 7c. See at least paragraphs [0001], [0004], [0020] and [0065] of KUKA. The traction means 8.1, 8.2 have potted ends that are located **outside** the fingertip 7.7, 7c and are fixed/connected to the fingertip 7.7, 7c, not floating within a region to the fingertip. See FIG. 2 of KUKA, a copy of which is provided below, as well as FIGS. 3-11. Nowhere does KUKA teach or suggest that the potted ends of the traction means 8.1, 8.2 are floating within the fingertip 7.7, 7c.

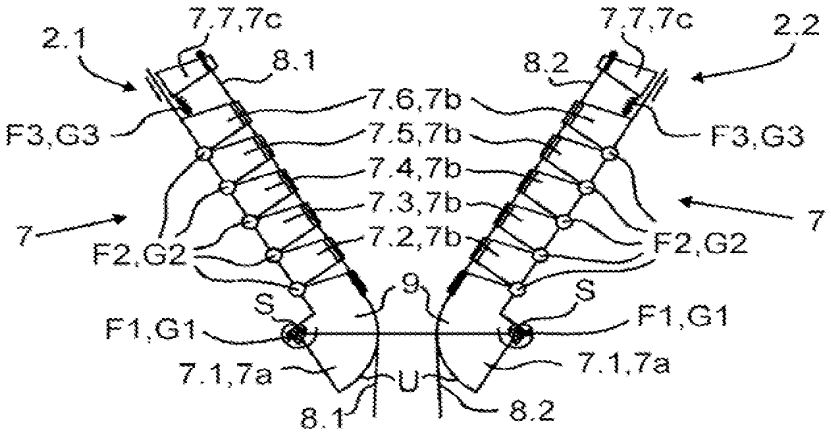

Fig. 2

In contrast, an example implementation of the claim feature of "*the end with higher dimension floating within a region of the distal member*" recited in amended independent

claims 1 and 11 are illustrated in FIG. 4D the of the current application, where the end **420** of the cable **418** is floating in in a pocket or space located within the distal member **408** (not be connected of fixed to the distal member **408**). (See paragraph [0062] of the current application.) Another example implementation is illustrated in FIG. 5B of the current application, where the second end (having a potted insert potted insert **520**) of the cable **512** can be floating (not connected, fastened, or fixed) in a region (or pocket region) **518** of the distal member **504**. (See paragraph [0071] of the current application. Nowhere does or KUKA teach or suggest "*[an] end [of a cable] with higher dimension floating within a region of the distal member*" as recited in amended independent claims 1 and 11. Therefore, the subject matter of amended independent claims 1 and 11 is novel over KUKA. GM is not cited against this claim feature.

As discussed at least in paragraph [0075] of the current application, maintaining the end of the cable to be floating in the distal member prevents the cable from breaking or being damaged. Specifically, when the finger gets in contact or pushes other objects, the fact that the cable is floating provides some flexibility and avoids breaking or denting the cable. Neither KUKA nor GM recognize the technical problem of potential breaking or denting of the cable in the case where a finger gets in contact with or pushes other objects, nor do they provide any solution for this technical problem. Therefore, the subject matter of amended independent claims 1 and 11 includes an inventive step over the cited references.

In view of the above, the rejections of the claims under PCT Article 33(2) and PCT Article 33(3) is respectfully requested.

The Written Opinion also objects to claims 1, 10, 11, 15, 16 and 20 for informalities. Applicant submits that the objections are overcome by the claims as amended. Accordingly, withdrawal of the objections to claims 1, 10, 11, 15, 16 and 20 is respectfully requested.

A positive Written Opinion is therefore sincerely requested.

Concluding Comments

For the reasons stated above, Applicant requests favorable reconsideration of this application for preparation of the International Preliminary Examination Report (IPER). The Commissioner is hereby authorized to charge any additional fees which may be due to Deposit Account No. 19-0741.

Respectfully submitted,

Date July 30, 2024

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ePCT - Cover Letter

ePCT Action: Submit Chapter II Demand

Competent IPEA:
US

IA Number:
PCT/US2023/034306

The following documents were submitted as attachments:
- Chapter II Demand : 1 document
- Article 34 Amendments: 1 document

Signature:	/Eric Sophi, Reg. No. 48,499/
Signatory:	SOPHIR, Eric (Agent)
Date:	30 July 2024 15:27:11 EDT
User Name:	Linda TURPIE
Authentication:	Sign-in with strong authentication

International Application Number: US2023034306
Article 34 Amendments
submitted with Demand for IPEA dated 30 Jul 2024

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REPLACEMENT SHEETS

1. A robotic hand system comprising:

a palm region; and

one or more fingers, each finger comprising:

an actuator device;

a respective proximal member having a first end mechanically coupled to the palm region and configured to rotate around a respective first pivot relative to the palm region;

a respective distal member having a first end mechanically coupled to a second end of the proximal member and configured to rotate around a respective second pivot relative to the proximal member; and

a respective cable having a first portion coupled to the actuator and a second portion extending along the proximal member and the distal member, the second portion separated away from the first pivot and the second pivot and having an end with a higher dimension than a diameter of the cable, the end with higher dimension floating within a region of the distal member and structured to engage the distal member when the cable is pulled by the actuator.

2. (Cancelled)

3. The robotic hand system of claim 1, wherein the end with higher dimension includes at least one of:

a potted end; or

an end with a potted insert.

4. The robotic hand system of claim 1, wherein each finger comprises a respective channel structure extending at least partially along the respective proximal member and the respective distal member, the respective channel structure hosting at least partially the second portion of the respective cable.

5. The robotic hand system of claim 4, wherein the end with higher dimension of the second portion of the respective cable is structured to engage a ledge structure of the respective channel structure when the respective cable is pulled by the respective actuator.

6. The robotic hand system of claim 1, wherein each finger comprises:
a respective first torsion spring placed around the respective first pivot; and
a respective second torsion spring placed around the respective second pivot.

7. The robotic hand system of claim 1, wherein each finger comprises:
a respective magnet coupled to the respective first pivot; and
a respective hall effect sensor placed proximate to the respective magnet.

8. The robotic hand system of claim 7, wherein the respective magnet includes a ring magnet placed around the respective first pivot.

9. The robotic hand system of claim 1, wherein each finger comprises:
a respective magnet coupled to the respective second pivot; and
a respective hall effect sensor placed proximate to the respective magnet.

10. The robotic hand system of claim 1, wherein a distance between the respective cable and the respective first pivot varies and/or a distance between the respective cable and the respective second pivot varies.

11. A finger device, comprising:
an actuator device;
a proximal member having a first end mechanically coupled to a base member and configured to rotate around a first pivot relative to the base member;
a distal member having a first end mechanically coupled to a second end of the proximal member and configured to rotate around a second pivot relative to the proximal member; and
a cable having a first portion coupled to the actuator and a second portion extending along the proximal member and the distal member, the second portion separated away from the first pivot and the second pivot and having an end with a higher dimension than a diameter of the cable, the end with higher dimension floating within a region of the distal member and structured to engage the distal member when the cable is pulled by the actuator.

12. (Cancelled)

13. The finger device of claim 11, wherein the end with higher dimension includes at least one of:
a potted end; or

an end with a potted insert.

14. The finger device of claim 11, further comprises a channel structure extending at least partially along the proximal member and the distal member, the channel structure hosting at least partially the second portion of the cable.

15. The finger device system of claim 14, wherein the end with higher dimension of the second portion of the cable is structured to engage a ledge structure of the channel structure when the cable is pulled by the actuator.

16. The finger device of claim 11, further comprises:
a first torsion spring placed around the first pivot; and
a second torsion spring placed around the second pivot.

17. The finger device of claim 11, further comprises:
a magnet coupled to the first pivot; and
a hall effect sensor placed proximate to the magnet.

18. The finger device of claim 17, wherein the magnet includes a ring magnet placed around the first pivot.

19. The finger device system of claim 11, further comprises:
a magnet coupled to the second pivot; and
a hall effect sensor placed proximate to the magnet.

20. The finger device of claim 11, wherein a distance between the cable and the first pivot varies and/or a distance between the cable and the second pivot varies.