



- (51) International Patent Classification:
G01N 3/08 (2006.01) G02B 21/36 (2006.01)
G01N 33/483 (2006.01)
- (21) International Application Number:
PCT/US2017/013816
- (22) International Filing Date:
17 January 2017 (17.01.2017)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
62/279,389 15 January 2016 (15.01.2016) US
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- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,

(54) Title: DEVICES AND METHODS FOR TENSION MEASUREMENTS AND APPLICATIONS OF SAME

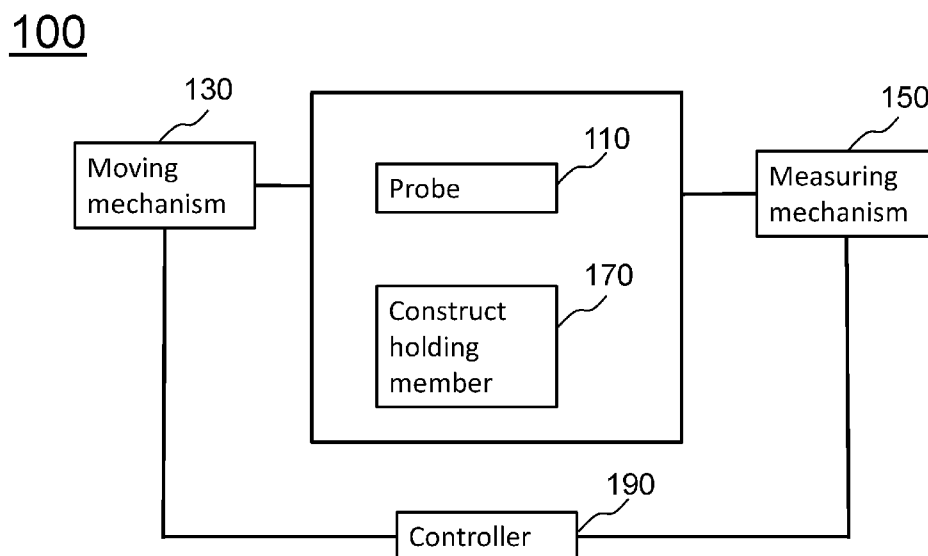


FIG. 1A

(57) Abstract: A device for measuring a tension of a bio-object construct as it is being stretched that includes a microscope, a holding member for accommodating the bio-object, and a probe. The microscope includes a condenser, an objective and a stage positioned therebetween. The stage is movable along a horizontal plane. The holding member is fixable on the stage. The probe has a first end attached to the condenser, and a second end placed in the holding member. The stage operably moves such that the bio-object construct moves toward the second end of the probe and contacts with the second end of the probe, thereby causing a displacement of the second end of the probe and a displacement of the bio-object construct, which are used to measure the tension of the bio-object construct.



HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

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

(88) Date of publication of the international search report:

26 July 2018 (26.07.2018)

INTERNATIONAL SEARCH REPORTInternational application No.
PCT/US2017/013816**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 I. Claims 1-45 directed to a device for measuring tension of a bio-object construct and a method thereof, the device comprising a probe, a stage (a moving mechanism) and a microscope (a measuring mechanism)

Group II. Claims 46-56 directed to a system for measuring tension of at least one bio-object construct, the system comprising a well plate, a mounting base, a movable plate, a probe and a motor

Group III. Claims 57-65 directed to a system for applying and measuring tension of a plurality of bio-object constructs and a method thereof, the system comprising a base and a flexible body

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.: 1-45

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.

A. CLASSIFICATION OF SUBJECT MATTER**G01N 3/08(2006.01)i, G01N 33/483(2006.01)i, G02B 21/36(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)

G01N 3/08; C12M 1/00; G01L 1/00; A61N 1/18; G01L 1/14; A61B 5/11; H01J 37/26; C12M 1/34; G01N 33/483; G02B 21/36

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: bio-object, tension, mechanical, deform, microscope and stage

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012-0186365 A1 (BEYELER et al.) 26 July 2012 See paragraphs [0001]-[0034] and figures 1-3F.	1-12, 18, 20-29, 36 , 38-45
Y		13-17, 19, 30-32, 37
A		33-35
Y	US 2012-0271555 A1 (LEVENTAL et al.) 25 October 2012 See paragraphs [0028]-[0032], [0059] and figures 1, 2.	13, 14, 16, 17, 19, 30 , 31, 37
Y	US 5861624 A (ALEXANDER et al.) 19 January 1999 See column 9, lines 27-65 and figure 1A.	15
Y	WO 2004-011084 A1 (AMERSHAM BIOSCIENCES UK LIMITED) 05 February 2004 See page 3, lines 12-23 and figures 2a-2c.	32
A	WO 2013-090738 A1 (BROWN UNIVERSITY) 20 June 2013 See figure 1A.	1-45

 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

21 July 2017 (21.07.2017)

Date of mailing of the international search report

21 July 2017 (21.07.2017)

Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2017/013816

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2012-0186365 A1	26/07/2012	EP 2480925 A1 US 9046548 B2 WO 2011-032819 A1	01/08/2012 02/06/2015 24/03/2011
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WO 2013-090738 A1	20/06/2013	US 2014-0295538 A1 WO 2013-090738 A9	02/10/2014 31/10/2013