



- (51) International Patent Classification:  
*G06T 7/00* (2006.01) *G01N 33/483* (2006.01)  
*G06K 9/00* (2006.01)
- (21) International Application Number:  
PCT/US2016/028913
- (22) International Filing Date:  
22 April 2016 (22.04.2016)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
62/151,681 23 April 2015 (23.04.2015) US  
62/318,483 5 April 2016 (05.04.2016) US
- (71) Applicant: **BD Kiestra B.V.** [NL/NL]; Marconilaan 6,  
9207 JC Drachten (NL).
- (72) Inventor; and  
(71) Applicant: **WILES, Timothy M.** [US/US]; 4205 Hermitage Court, Manchester, MD 21102 (US).
- (72) Inventor: **MARCELPOIL, Raphael Rodolphe**; 86 Avenue du Grésivaudan, 38700 Corenc (FR).
- (74) Agents: **BOTOS, Richard J.** et al.; Lerner, David, Littenberg, Krumholz & Mentlik, LLP, 600 South Avenue West, Westfield, NJ 07090 (US).
- (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, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG,

[Continued on next page]

(54) Title: COLONY CONTRAST GATHERING

(57) Abstract: An imaging system and method for microbial growth detection using differences appearing over time to assess whether microbial growth has occurred for a given sample.

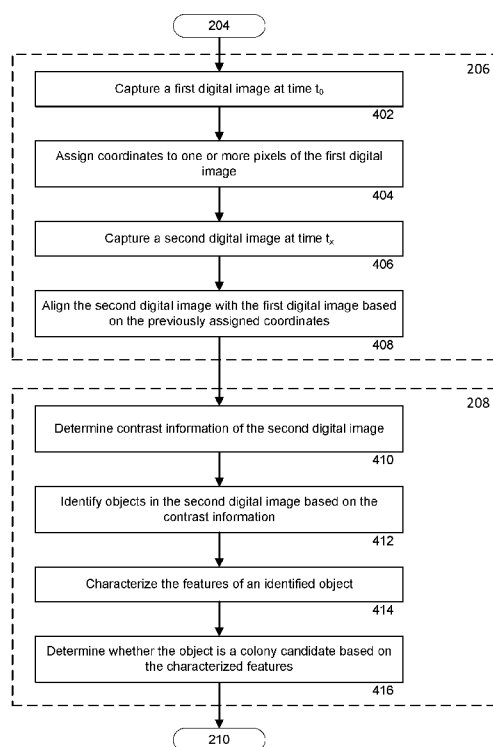


FIGURE 4

400



WO 2016/172527 A3



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).

**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))*

**Published:**

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

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

19 January 2017

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2016/028913

## 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:

see additional 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 an 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/US2016/028913

A. CLASSIFICATION OF SUBJECT MATTER  
INV. G06T7/00 G06K9/00 G01N33/483  
ADD.

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)  
G06T G06K G01N

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

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

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 03/022999 A2 (GENOMIC PROFILING SYSTEMS INC [US]) 20 March 2003 (2003-03-20)	1-13, 15-23, 40-44, 46,48, 49,51
A	page 12, line 21 - page 13, line 2 page 28, line 23 - line 26 figure 17 page 54, line 3 - line 10 page 52, line 18 - line 19 page 12, line 4 - line 5 figure 7 page 53, line 18 - line 19 page 53, line 27 - line 29 page 32, line 30 - page 33, line 1 page 50, line 7 - line 12 ----- -/--	14,45



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

30 November 2016

Date of mailing of the international search report

09/12/2016

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040,  
Fax: (+31-70) 340-3016

Authorized officer

Winkler, Gregor

## INTERNATIONAL SEARCH REPORT

International application No

PCT/US2016/028913

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 96/18720 A1 (MINNESOTA MINING & MFG [US]) 20 June 1996 (1996-06-20)	24-36,
A	page 6, line 1 - page 12, line 22	39,47,50
	page 1, line 5 - line 9	1,37,38,
	claim 1	46,49
	-----	
A	SOUSA ANA MARGARIDA ET AL: "Improvements on colony morphology identification towards bacterial profiling", JOURNAL OF MICROBIOLOGICAL METHODS, vol. 95, no. 3, 1 January 2013 (2013-01-01), pages 327-335, XP028791358, ISSN: 0167-7012, DOI: 10.1016/J.MIMET.2013.09.020	6,10
	page 328, right-hand column, lines 28-32	
	page 330, right column, Section 3.3	
	Effects of culture medium composition on colony morphogenesis	
	-----	
A	Anonymous: "Microbiology Online   Society for General Microbiology   Teachers - Observing microbes - Observing bacteria in a Petri dish", 10 March 2015 (2015-03-10), XP55319208, Retrieved from the Internet: URL:http://web.archive.org/web/20150310031310/http://www.microbiologyonline.org.uk/teachers/observing-microbes/observing-bacteria-in-a-petri-dish [retrieved on 2016-11-14]	6,43
	page 2, line 1 - line 6	
	figure 1	
	-----	
A	US 2004/253660 A1 (GIBBS DAVID [US] ET AL) 16 December 2004 (2004-12-16)	6,40,41,
	paragraphs [0031], [0041], [0076]	48,51
	paragraphs [0048], [0049]	
	-----	
A	WO 2013/049440 A1 (LIFE TECHNOLOGIES CORP [US]) 4 April 2013 (2013-04-04)	13,15
	paragraphs [0093], [0095]	
	-----	
A	US 2014/278136 A1 (SHAMSHYEVA ALENA [US] ET AL) 18 September 2014 (2014-09-18)	22,23
	paragraph [0063]	
	-----	
A	US 2005/213845 A1 (AVINASH GOPAL B [US] ET AL) 29 September 2005 (2005-09-29)	24,47,50
	claim 6	
	-----	
	-/--	

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2016/028913

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2014/099643 A1 (3M INNOVATIVE PROPERTIES CO [US]) 26 June 2014 (2014-06-26) paragraph [0063] -----	24,47,50
A	CHATBURN L.T., KIRKUP B.C., POLZ M.F.: "VAPI: low cost, rapid automated visual inspection system for Petri plate analysis", PROC OF SPIE, vol. 6755, 2007, pages 1-11, XP040247777, page 10, Section 5.3 -----	42
A	OTERO ET AL: "Rapid microbiological methods in meat and meat products", MEAT SCIENCE, ELSEVIER SCIENCE, GB, vol. 49, 1 January 1998 (1998-01-01), pages S179-S189, XP005092939, ISSN: 0309-1740, DOI: 10.1016/S0309-1740(98)90047-X page S182, line 4, last paragraph - line 6 -----	41
Y	SOUVENIR R ET AL: "Cell motion analysis without explicit tracking", COMPUTER VISION AND PATTERN RECOGNITION, 2008. CVPR 2008. IEEE CONFERENCE ON, IEEE, PISCATAWAY, NJ, USA, 23 June 2008 (2008-06-23), pages 1-7, XP031296956, ISBN: 978-1-4244-2242-5 page 5, left column, Section 3.1 page 4, equation 12 page 5, equation 13 -----	24-36, 39,47,50
A	WEI-BANG CHEN ET AL: "An automated bacterial colony counting and classification system", INFORMATION SYSTEMS FRONTIERS ; A JOURNAL OF RESEARCH AND INNOVATION, KLUWER ACADEMIC PUBLISHERS, BO, vol. 11, no. 4, 18 February 2009 (2009-02-18), pages 349-368, XP019730180, ISSN: 1572-9419, DOI: 10.1007/S10796-009-9149-0 abstract ----- -/--	31-35

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2016/028913

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>M. L. Chayadevi ET AL: "Data mining, Classification and Clustering with Morphological features of Microbes", International Journal of Computer Applications, 1 August 2012 (2012-08-01), pages 1-5, XP55322901, Retrieved from the Internet: URL:<a href="http://research.ijcaonline.org/volume52/number4/pxc3881547.pdf">http://research.ijcaonline.org/volume52/number4/pxc3881547.pdf</a> [retrieved on 2016-11-24] abstract</p> <p>-----</p>	31-35

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2016/028913

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 03022999	A2	20-03-2003	AT 437216 T 15-08-2009
		AT 470859 T 15-06-2010	
		AU 2002323649 A1 24-03-2003	
		AU 2002365913 A1 16-09-2003	
		CA 2458802 A1 01-05-2003	
		CA 2459320 A1 20-03-2003	
		CA 2460212 A1 12-09-2003	
		CN 1582327 A 16-02-2005	
		CN 1582394 A 16-02-2005	
		CN 1606691 A 13-04-2005	
		DK 1432786 T3 26-10-2009	
		DK 2311934 T3 08-09-2013	
		EP 1428018 A1 16-06-2004	
		EP 1432786 A2 30-06-2004	
		EP 1502101 A2 02-02-2005	
		EP 2184346 A2 12-05-2010	
		EP 2311934 A2 20-04-2011	
		ES 2329986 T3 03-12-2009	
		ES 2430854 T3 22-11-2013	
		HK 1070424 A1 19-07-2013	
		JP 4363980 B2 11-11-2009	
		JP 2005502354 A 27-01-2005	
		JP 2005508495 A 31-03-2005	
		JP 2005518553 A 23-06-2005	
		US 2003082516 A1 01-05-2003	
		US 2003143580 A1 31-07-2003	
		US 2003170613 A1 11-09-2003	
		US 2009315987 A1 24-12-2009	
		US 2010248281 A1 30-09-2010	
		WO 03022999 A2 20-03-2003	
		WO 03036290 A1 01-05-2003	
		WO 03073817 A2 12-09-2003	
WO 9618720	A1	20-06-1996	DE 69520004 D1 01-03-2001
			DE 69520004 T2 06-09-2001
			EP 0796319 A1 24-09-1997
			JP H10510706 A 20-10-1998
			US 5694478 A 02-12-1997
			WO 9618720 A1 20-06-1996
US 2004253660	A1	16-12-2004	US 2004253660 A1 16-12-2004
			WO 2004111606 A2 23-12-2004
WO 2013049440	A1	04-04-2013	CN 104115190 A 22-10-2014
			EP 2761593 A1 06-08-2014
			US 2014233816 A1 21-08-2014
			WO 2013049440 A1 04-04-2013
US 2014278136	A1	18-09-2014	CA 2942815 A1 18-09-2014
			EP 2971055 A1 20-01-2016
			US 2014278136 A1 18-09-2014
			US 2016010138 A1 14-01-2016
			WO 2014145899 A1 18-09-2014
US 2005213845	A1	29-09-2005	NONE
WO 2014099643	A1	26-06-2014	CN 104870650 A 26-08-2015
			EP 2935612 A1 28-10-2015



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2016/028913

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		JP 2016508034 A	17-03-2016
		KR 20150096718 A	25-08-2015
		US 2015339513 A1	26-11-2015
		WO 2014099643 A1	26-06-2014
-----			

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-5, 11, 12, 18-20(completely); 21, 46, 49(partially)

First invention

---

2. claims: 6-10(completely); 21, 46, 49(partially)

Second invention

---

3. claims: 13-17(completely); 46, 49(partially)

Third invention

---

4. claims: 22, 23, 40-45, 48, 51(completely); 46, 49(partially)

Fourth invention

---

5. claims: 24-39, 47, 50

Fifth invention

---