



(51) International Patent Classification:

A61B 6/14 (2006.01) A61B 6/00 (2006.01)

(21) International Application Number:

PCT/EP2019/085389

(22) International Filing Date:

16 December 2019 (16.12.2019)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

18248277.8 28 December 2018 (28.12.2018) EP

(71) Applicants: SIRONA DENTAL SYSTEMS GMBH

[DE/DE]; Fabrikstr. 31, 64625 Bensheim (DE). DENTSPLY SIRONA INC. [US/US]; Susquehanna Commerce Center, 221 W. Philadelphia Street, Suite 60W, York, 17401 (US).

(72) Inventors: SCHULZE-GANZLIN, Ulrich; c/o Sirona

Dental Systems GmbH, Fabrikstr. 31, 64625 Bensheim

(DE). LINDENBERG, Kai; c/o Sirona Dental Systems GmbH, Fabrikstr. 31, 64625 Bensheim (DE).

(74) Agent: ÖZER, Alpdemir et al.; Corporate Legal, Fabrikstraße 31, 64625 Bensheim (DE).

(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, HR, HU, ID, IL, IN, IR, IS, JO, 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,

(54) Title: DENTAL X-RAY IMAGING SYSTEM FOR PRODUCING INTRAORAL X-RAY IMAGES

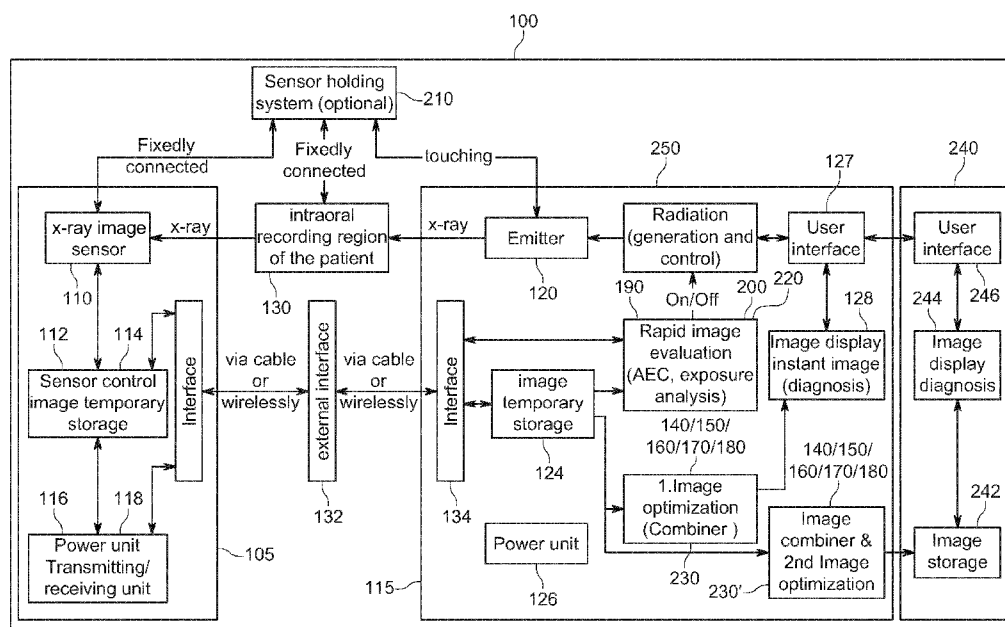


FIG. 1

(57) **Abstract:** The invention relates to a dental x-ray imaging system for producing intraoral x-ray images, in particular of dental patient tissue, with the aid of an intraoral x-ray sensor, which can be placed in the oral cavity in the beam path of an x-ray emitter positioned outside the oral cavity, wherein the x-ray imaging system is configured to record two or more temporally sequential individual x-ray images and to create an overall x-ray image from said individual images in such a way that the results of the exposures of the x-ray images are combined and a motion occurring between and/or during the sequential individual x-ray images is compensated.



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))*
- *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:

13 August 2020 (13.08.2020)

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/085389

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B6/14 A61B6/00
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)
A61B

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2017/281110 A1 (MANDELKERN STAN [US] ET AL) 5 October 2017 (2017-10-05)	1,2, 7-11, 13-15
Y	paragraph [0105] - paragraph [0130] paragraph [0154] - paragraph [0223] paragraph [0303] - paragraph [0362]; figures	2,7
X	US 2012/307965 A1 (BOTHOREL SYLVIE [FR] ET AL) 6 December 2012 (2012-12-06)	1,2,7,8, 11,13-15
Y	paragraph [0050] - paragraph [0065]; figures	2,7
Y	US 2006/193436 A1 (SCHICK DAVID B [US] ET AL) 31 August 2006 (2006-08-31) paragraph [0056]	2,7
	----- -/--	



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

7 February 2020

Date of mailing of the international search report

23/06/2020

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

Strubel, Christine

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2019/085389

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2011/235874 A1 (SIREN JUUSO [FI] ET AL) 29 September 2011 (2011-09-29) paragraph [0044] - paragraph [0064] -----	2,7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2019/085389

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.:

1, 2, 7, 10(completely); 8, 9, 11, 13-15(partially)

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.

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, 2, 7, 10(completely); 8, 9, 11, 13-15(partially)

Dental x-ray imaging system configured to create an overall x-ray image with reduced motion blur

2. claims: 3, 4(completely); 11, 13-15(partially)

Dental x-ray imaging system with a high number exposures in very short time

3. claims: 5, 6(completely); 8, 9, 11, 13-15(partially)

Dental x-ray imaging system with an exposure analyzer

4. claims: 11, 13-15(all partially)

Dental x-ray imaging system comprising a handheld emitter

5. claims: 12(completely); 13-15(partially)

A method for producing an x-ray image with reduced motion blur on an x-ray phantom

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2019/085389

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2017281110 A1	05-10-2017	EP 3209212 A1	30-08-2017
		EP 3662839 A1	10-06-2020
		EP 3662840 A1	10-06-2020
		EP 3664015 A1	10-06-2020
		EP 3673809 A1	01-07-2020
		US 2017281110 A1	05-10-2017
		US 2020107792 A1	09-04-2020
		US 2020107793 A1	09-04-2020
		US 2020107794 A1	09-04-2020
		US 2020121272 A1	23-04-2020
		US 2020155105 A1	21-05-2020
		WO 2016044465 A1	24-03-2016
US 2012307965 A1	06-12-2012	EP 2713886 A2	09-04-2014
		US 2012307965 A1	06-12-2012
		WO 2012166262 A2	06-12-2012
US 2006193436 A1	31-08-2006	AU 2003290522 A1	23-04-2004
		EP 1554869 A2	20-07-2005
		EP 2216980 A1	11-08-2010
		EP 2392260 A2	07-12-2011
		JP 4806432 B2	02-11-2011
		JP 5031986 B2	26-09-2012
		JP 2006505308 A	16-02-2006
		JP 2009056298 A	19-03-2009
		JP 2011120925 A	23-06-2011
		US 2004066898 A1	08-04-2004
		US 2006193436 A1	31-08-2006
		WO 2004032481 A2	15-04-2004
US 2011235874 A1	29-09-2011	NONE	