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| 332                  | 332 | Subclass |
| ISSUE CLASSIFICATION |     |          |

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| 1<br>O.I.P.E. RM<br>SCANNED <i>gf</i> Q.A. <i>A.G.</i> | PATENT DATE<br>APR 30 2002 |
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| CLASS<br>379 | SUBCLASS | ART UNIT<br>2370 | EXAMINER |
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Certificate  
JUN 03 2003  
of Correction

| ISSUING CLASSIFICATION       |  |          |  |                    |                                   |     |     |  |  |  |  |
|------------------------------|--|----------|--|--------------------|-----------------------------------|-----|-----|--|--|--|--|
| ORIGINAL                     |  |          |  | CROSS REFERENCE(S) |                                   |     |     |  |  |  |  |
| CLASS                        |  | SUBCLASS |  | CLASS              | SUBCLASS (ONE SUBCLASS PER BLOCK) |     |     |  |  |  |  |
| 37B                          |  | 39       |  | 37B                | 38                                | 170 | 205 |  |  |  |  |
| INTERNATIONAL CLASSIFICATION |  |          |  |                    |                                   |     |     |  |  |  |  |
| A61B                         |  | 6/4      |  |                    |                                   |     |     |  |  |  |  |
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Form **PTO-436A**  
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Formal Drawings ( sheets) set

1 of 86

(FACE)

Dentsply Sirona Inc. – Exhibit 1005

# PATENT APPLICATION



09452348

JC542 U.S. BTO

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INITIALS

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## CONTENTS

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1. Application 2 papers.

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3. Change of Address

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4. Ext. of Time (3)

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6. Pro 413

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7. Pro 37 / Reasons for

Amendment / Answer

8. Drawings (2 sets) set 1

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PATENT APPLICATION SERIAL NO. 09/452348

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PATENT AND TRADEMARK OFFICE  
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## UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS  
UNITED STATES PATENT AND TRADEMARK OFFICE  
WASHINGTON, D.C. 20231  
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Bib Data Sheet

|                                                                                                                                                                                                                                                                                                                  |                                                                                                                   |                               |                                                                                                                                                                                                                                                                                 |                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| <b>SERIAL NUMBER</b><br>09/452,348                                                                                                                                                                                                                                                                               | <b>FILING DATE</b><br>12/01/1999<br><b>RULE</b> -                                                                 | <b>CLASS</b><br>378           | <b>GROUP ART UNIT</b><br>2742                                                                                                                                                                                                                                                   | <b>ATTORNEY DOCKET NO.</b><br>99.378 |
| <b>APPLICANTS</b><br>RONALD E. MASSIE, LAKE OZARK, MO ;                                                                                                                                                                                                                                                          |                                                                                                                   |                               |                                                                                                                                                                                                                                                                                 |                                      |
| <b>** CONTINUING DATA *****</b><br>None due 3/2001                                                                                                                                                                                                                                                               |                                                                                                                   |                               |                                                                                                                                                                                                                                                                                 |                                      |
| <b>** FOREIGN APPLICATIONS *****</b>                                                                                                                                                                                                                                                                             |                                                                                                                   |                               |                                                                                                                                                                                                                                                                                 |                                      |
| <b>IF REQUIRED, FOREIGN FILING LICENSE</b><br><b>GRANTED ** 01/07/2000</b> <b>** SMALL ENTITY **</b>                                                                                                                                                                                                             |                                                                                                                   |                               |                                                                                                                                                                                                                                                                                 |                                      |
| Foreign Priority claimed <input type="checkbox"/> yes <input checked="" type="checkbox"/> no<br>35 USC 119 (a-d) conditions <input type="checkbox"/> yes <input checked="" type="checkbox"/> no <input type="checkbox"/> Met after<br>met <input type="checkbox"/> Allowance <input checked="" type="checkbox"/> |                                                                                                                   | <b>STATE OR COUNTRY</b><br>MO | <b>SHEETS DRAWING</b><br>2                                                                                                                                                                                                                                                      | <b>TOTAL CLAIMS</b><br>20            |
| Verified and Acknowledged<br>Examiner's Signature <u>                    </u> Initials <u>          </u>                                                                                                                                                                                                         |                                                                                                                   |                               |                                                                                                                                                                                                                                                                                 | <b>INDEPENDENT CLAIMS</b><br>3       |
| <b>ADDRESS</b><br>SHUGHART THOMSON & KILROY, PC<br>TWELVE WYANDOTTE PLAZA<br>120 WEST 12TH STREET<br>KANSAS CITY, MO 64105                                                                                                                                                                                       |                                                                                                                   |                               |                                                                                                                                                                                                                                                                                 |                                      |
| <b>TITLE</b><br>DENTAL AND ORTHOPEDIC DENSITOMETRY MODELING SYSTEM AND METHOD                                                                                                                                                                                                                                    |                                                                                                                   |                               |                                                                                                                                                                                                                                                                                 |                                      |
| <b>FILING FEE RECEIVED</b><br>380                                                                                                                                                                                                                                                                                | FEES: Authority has been given in Paper<br>No. _____ to charge/credit DEPOSIT ACCOUNT<br>No. _____ for following: |                               | <input type="checkbox"/> All Fees<br><input type="checkbox"/> 1.16 Fees ( Filing )<br><input type="checkbox"/> 1.17 Fees ( Processing Ext. of time )<br><input type="checkbox"/> 1.18 Fees ( Issue )<br><input type="checkbox"/> Other _____<br><input type="checkbox"/> Credit |                                      |

Express Mail EL300244301US

PATENT

Case Docket No.: 99,378

ASSISTANT COMMISSIONER FOR PATENTS

Box: Patent Application  
Washington, D. C. 20231

Sir:

Transmitted herewith for filing is the patent application of:

Inventor: Ronald E. Massie

For: DENTAL AND ORTHOPEDIC DENSITOMETRY MODELING SYSTEM AND METHOD

Enclosed are:

- ☒ Abstract of the Disclosure (1 page) and
- 17 Pages of Specification and Claims
- 2 Sheets of drawings
- Information Disclosure Statement
- ☒ Verified statement(s) to establish small entity status under  
37 C.F.R. 1.9 and 37 C.F.R. 1.27
- ☒ The filing fee has been calculated as shown below:

|                                    |                           |           | SMALL ENTITY |                       | OTHER THAN A<br>SMALL ENTITY |                  |
|------------------------------------|---------------------------|-----------|--------------|-----------------------|------------------------------|------------------|
| FOR                                | NO. FILED                 | NO. EXTRA | RATE         | FEE                   | RATE                         | FEE              |
| BASIC FEE                          | *****                     | *****     | ****         | \$ 380 or             | ****                         | \$ 760           |
| TOTAL CLAIMS                       | <u>20</u> - 20 = <u>0</u> | x         | 9            | = \$ <u>    </u> or x | 18                           | = \$ <u>    </u> |
| INDEP. CLAIMS                      | <u>3</u> - 3 = <u>0</u>   | x         | 39           | = \$ <u>    </u> or x | 78                           | = \$ <u>    </u> |
| MULTIPLE DEPENDENT CLAIM PRESENTED | <u>    </u>               | + 130     |              | \$ <u>    </u> or +   | 260                          | = \$ <u>    </u> |
|                                    |                           |           | TOTAL        | \$ <u>380</u> or      | TOTAL                        | \$ <u>    </u>   |

☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment, to Account No. 12-1660. A duplicate copy of this sheet is attached.

☒ Our check No. 12354 is also enclosed to cover, among other items, the above filing fee.

Respectfully submitted,

LITMAN, KRAAI & BROWN, L.L.C.

BY

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Express Mail No. EL300244301US

1           **DENTAL AND ORTHOPEDIC DENSITOMETRY MODELING**  
2                           **SYSTEM AND METHOD**

3  
4                           **Background of the Invention**

5  
6       1.     **Field of the Invention**

7           The present invention relates generally to dental and orthopedic diagnosis and  
8       treatment, and in particular to a densitometry modeling system and method.

9  
10      2.     **Description of the Related Art**

11           The field of dental diagnostics is generally concerned with locating pathologies in  
12       the dental structure, i.e. the teeth and surrounding tissue and bone. Three of the most  
13       common pathologies are: 1) caries associated with decay; 2) fractures; and 3) apical  
14       abscesses. The system and method of the present invention are primarily, but not  
15       exclusively, concerned with detecting these pathologies and with orthopedics.

16           Early detection of dental pathologies is very important in minimizing damage.  
17       Conventional diagnosis procedures are generally performed using dental X-rays (both  
18       fixed beam and scanning beam), explorers, and other conventional equipment.

19           Incipient caries, particularly those located beneath the enamel surface, often go  
20       undetected with conventional equipment. When such caries are finally found,  
21       considerable damage to tooth structure may have already occurred. Subsurface, incipient  
22       caries are located almost entirely within the enamel layer of the teeth. They are

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1 sometimes referred to as "smooth surface" caries and are particularly difficult to locate  
2 using conventional diagnostic equipment and procedures. By the time such incipient  
3 caries are located, the extent of the damage is often 17% to 23% greater than it would  
4 appear to be on a conventional X-ray negative.

5 Dental fractures can result from bruxism (teeth grinding), trauma, etc. Dental  
6 structure which is weakened by various causes, such as decalcification, is particularly  
7 susceptible to fractures. Fractures can assume various configurations, including craze  
8 line patterns. Fracture patterns and configurations can be particularly difficult to locate  
9 using conventional X-ray equipment and procedures. For example, fractures which are  
10 generally parallel to the X-ray beam are often undetectable on an X-ray negative.  
11 Undetected, and hence untreated, fractures can provide direct paths through the enamel  
12 layer of the teeth whereby bacteria can invade the dentin and pulp layers. Pathologies in  
13 the dentin and pulp layers are often associated with considerable pain and tooth loss.

14 Apical abscesses comprise yet another dental condition which can be difficult to  
15 diagnose with conventional equipment, particularly in the early stages. Advanced apical  
16 abscesses can cause considerable pain because they involve the neurovascular bundles  
17 located in the root canals. Early detection of apical abscesses can lead to appropriate,  
18 early-stage treatment, thus avoiding advanced disease processes with resultant pain,  
19 swelling, and/or space involvement which left untreated could ultimately result in death.

20 Tomography or sectional radiography techniques using scanning X-ray beams  
21 have previously been employed for dental applications. For example, U.S. Patents No.

1 4,188,537; No. 4,259,583; No. 4,823,369; No. 4,856,038; and No. 5,214,686 all relate to  
2 dental X-ray diagnosis utilizing scanning techniques and are incorporated herein by  
3 reference.

4 In the medical field, densitometry procedures are used for measuring bone  
5 morphology density (BMD) by utilizing scanning X-ray beam techniques. Examples are  
6 shown in U.S. Patents No. 5,533,080; No. 5,838,765; and Re. 36,162, which are  
7 incorporated herein by reference. Medical applications of densitometry include the  
8 diagnosis and treatment of such bone diseases as osteoporosis.

9 The availability of relatively fast computers with large memories at reasonable  
10 costs has led to the digitalization of X-ray images for mapping BMD models in various  
11 formats. For example, BMD images use color to identify varying densities. Digital BMD  
12 patient models are also used for comparison purposes with standard models and with  
13 patients' own prior BMD histories. Age correction factors can be applied to patients'  
14 models for diagnosing and monitoring the onset and progress of such medical conditions  
15 as osteoporosis and the like. The present invention utilizes such densitometry modeling  
16 and mapping techniques for dental applications.

17 In addition to pathology detection and diagnosis, the present invention has  
18 applications in monitoring osseointegration. Osseointegration occurs at the interface  
19 between bone structures and prostheses, such as implants and replacement joints. For  
20 example, dental implants osseointegrate with patients' dental structure. The application  
21 of tomographical densitometry techniques to osseointegration monitoring can provide the

1 dental or medical practitioner with important information in evaluating the effectiveness  
2 of implant procedures.

3 Heretofore there has not been available a system or method for applying the  
4 technology of densitometry to dental and medical applications such as the detection of  
5 caries and decalcification and the monitoring of osseointegration in connection with  
6 dental and medical prostheses.

7  
8 **Summary of the Invention**

9 In the practice of the present invention, a dental and orthopedic densitometry  
10 modeling system utilizes a controller with a microprocessor and memory. An input  
11 device inputs data to the microprocessor for controlling the operation of the modeling  
12 system and for providing a database including densitometry parameters for comparison  
13 with a patient's densitometry model. The controller controls the operation of X-ray  
14 equipment, which is adapted for scanning patients' dental and orthopedic structures along  
15 preprogrammed scan paths. The X-ray output is processed by the microprocessor for  
16 creating a densitometry model, which can be output in various formats. In the practice of  
17 the method of the present invention, a patient and the X-ray equipment are positioned  
18 relative to each other. A controller is preprogrammed with a scan path and with data  
19 corresponding to the patient. The X-ray equipment emits and detects X-ray beams at first  
20 and second energy levels to provide densitometry output. The densitometry output is  
21 digitized and merged to provide a tomographic model, which can be compared to

1 predetermined parameters unique to the patient. The model can be output in various  
2 formats, including a visual image color-coded to depict varying dental and orthopedic  
3 structure densities.  
4

5 **Principle Objects and Advantages of the Invention**

6 The principle objects and advantages of the present invention include: providing a  
7 dental and orthopedic diagnostic application for densitometry; providing such an  
8 application which includes a method for modeling dental and orthopedic structure using  
9 densitometry; providing such a method which includes dual-energy, X-ray emission and  
10 detection; providing such a method which includes providing a color-coded output model  
11 showing dental density; providing such a method which detects incipient caries;  
12 providing such a method which is adapted for detecting decalcification beneath the  
13 surface of the dental enamel layer; providing such a method which employs scanning X-  
14 ray techniques; providing such a method which utilizes commercially available  
15 tomography equipment; providing such a method which detects dental fractures;  
16 providing such a method which detects dental apical abscesses; providing such a method  
17 which detects dental pathologies at the micron level; providing such a method which  
18 facilitates the monitoring of decalcification in dental structures for determining  
19 appropriate treatment; providing such a method which is adaptable for monitoring  
20 osseointegration; providing such a method which can be practiced with relatively minor

changes to existing densitometry equipment; and providing such a method which is economical in operation and particularly well adapted for the proposed usage thereof.

Other objects and advantages of this invention will become apparent from the following description taken in conjunction with the accompanying drawings wherein are set forth, by way of illustration and example, certain embodiments of this invention.

The drawings constitute a part of this specification and include exemplary embodiments of the present invention and illustrate various objects and features thereof.

#### **Brief Description of the Drawings**

Fig. 1 is a schematic, block diagram of a dental and orthopedic densitometry modeling system embodying the present invention.

Fig. 2 is a flowchart of a dental and orthopedic densitometry modeling method embodying the present invention.

#### **Detailed Description of the Preferred Embodiments**

##### **I. Introduction and Environment**

As required, detailed embodiments of the present invention are disclosed herein; however, it is to be understood that the disclosed embodiments are merely exemplary of the invention, which may be embodied in various forms. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as

1 a basis for the claims and as a representative basis for teaching one skilled in the art to  
2 variously employ the present invention in virtually any appropriately detailed structure.

## 3 **II. Dental Densitometry Modeling System 2**

4 Referring to the drawings in more detail, the reference numeral 2 generally  
5 designates a dental and orthopedic densitometry modeling system embodying the present  
6 invention. The system 2 includes a controller 4 with a microprocessor 6 connected to a  
7 digital memory device 7. The hardware components of the controller 4, i.e. the  
8 microprocessor 6 and the memory device 7, can comprise any of a number of suitable  
9 hardware devices which are commercially available and are suitable for this application.

10 In addition to various programmable logic devices (PLDs) and special-purpose  
11 microprocessors, general purpose, commercially available personal computers can be  
12 utilized in the controller 4. The controller 4 can be programmed in any suitable manner  
13 utilizing any of a variety of commercially available programming languages and software  
14 development systems.

15 The microprocessor 6 is adapted to receive input from one or more input devices  
16 8, such as a keyboard, a pointing device (e.g., a mouse), a communications link, or  
17 another computer. Without limitation on the generality of useful data which can be input  
18 via the input device(s) 8, such data can include: 1) a patient's dental and orthopedic  
19 records, including previous tomographical densitometry models; 2) baseline  
20 tomographical densitometry models, which can be adjusted to accommodate for such

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factors as age, gender, size, weight, etc.; and 3) a preprogrammed scan path for the X-ray equipment.

The microprocessor 6 controls a positioning motor 10 which is operably connected to X-ray equipment 12 and is adapted for moving same through three axes of movement. Examples of X-ray equipment adaptable for use with the present invention are disclosed in U.S. Patents No. 5,533,080; No. 5,838,765; and No. Re. 36,162, which are incorporated herein by reference. The X-ray equipment 12 includes an X-ray beam source 14 and a detector array 16. The X-ray beam can suitably be collimated to assume any suitable configuration, such as fan, pencil, cone, etc. With the scanning technique disclosed, a restricted (i.e. collimated) beam is preferred. The source and the detector array 14, 16 are adapted for positioning on either side of a patient's dental/orthopedic structure 18.

Analog signals from the detector array 16 are output to an analog-to-digital (A/D) converter 20, from which digitized signals are transmitted to a merger device 22 for merging into formats suitable for processing and analyzing by the microprocessor 6. The microprocessor 6, using data from the merger device 22, creates a tomographical densitometry model 24 which is transmitted to an output device or devices 26. Without limitation on the generality of useful output devices 26, it can comprise a monitor, a display, a printer, a communications link, and/or another computer. For example, a color printer can be utilized to provide a color-coded graphical representation of the tomographical densitometry model 24. The color coding can correspond to densities,

thus identifying potential problem areas where decalcification has occurred and resulted in lower density. The tomographical densitometry model 24 can also be useful for monitoring osseointegration, since the density of the dental/orthopedic structure 18 (tissue and bone) in the vicinity of an implant 28 or other prostheses can provide an important diagnostic tool for the use of the dental or medical practitioner in assessing the effectiveness of an implant or prosthetic procedure. The tomographical densitometry model 24 is also entered into the computer's memory device 7.

### III. Dental and Orthopedic Densitometry Modeling Method

Fig. 2 is a flow chart of a dental and orthopedic densitometry method embodying the present invention. The method steps include positioning a patient and positioning the X-ray equipment relative to the patient, i.e. with the patient's dental/orthopedic structure to be examined located between the X-ray source 14 and the detector array 16.

Diagnostic parameters are input to the system and can comprise, for example, the patient's prior tomographical densitometry models and standardized models. The tomographical densitometry models can be corrected and/or adjusted to account for patients' age, gender, physical characteristics, etc. The input diagnostic parameters can be stored in the computer's memory device. A scan path for the X-ray equipment is preprogrammed in the computer.

The scanning procedure is commenced by collimating a first energy band beam, detecting emissions from same with a detector array, and converting the analog output of the detector array to a digital signal. The digital signal is output for storage in the

1 computer. The steps of collimating the energy band beam and detecting, digitizing and  
2 storing same are repeated for a second energy band beam. The Bisek et al. U.S. Patent  
3 No. Re. 36,362 discloses the use of dual-energy X-ray beams in medical densitometry  
4 applications. As discussed therein, dual-energy densitometry can result in a more  
5 accurate patient model.

6 The X-ray equipment then traverses the preprogrammed scan path and the  
7 first/second energy band steps are repeated until the scanning procedure is complete. The  
8 digitized detector array output is merged and compared to the diagnostic parameters  
9 which are stored in the computer's memory. The dental/orthopedic densitometry is  
10 tomographically modeled and output, for example to a monitor or printer for converting  
11 the model to a visual image. The visual image is output in a visible form for use by  
12 dental and medical practitioners.

## CLAIMS

What is claimed and desired to be secured by Letters Patent is as follows:

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1. A system for tomographically modeling dental and orthopedic structure densitometry, which includes:
- a) a controller with a microprocessor and a memory device connected to the microprocessor;
  - b) an input device connected to the microprocessor;
  - c) a positioning motor connected to the microprocessor and movable in response to signals from said microprocessor;
  - d) X-ray equipment including an X-ray source and a detector array;
  - e) conversion means for converting a signal from said detector array, said conversion means being connected to said detector array and to said microprocessor; and
  - f) an output device connected to said microprocessor and adapted for receiving a tomographical densitometry model from said microprocessor.

2. The system according to Claim 1 wherein said positioning motor is adapted for positioning said X-ray equipment with respect to three axes of movement.
3. The system according to Claim 1 wherein said conversion means comprises an analog-to-digital convertor connected to said detector array.

4. The system according to Claim 3 wherein said conversion means includes a merger device connected to said analog-to-digital converter and to said microprocessor.
5. The system according to Claim 1 wherein said X-ray equipment comprises a dual energy level, restricted beam device.
6. The system according to Claim 1 which includes:
  - a) a preprogrammed scan path for said X-ray equipment, said scan path being programmed into said microprocessor.
7. The system according to Claim 1 wherein said output device includes a color monitor adapted to receive said tomographical densitometry model output color-coded to represent densitometry.
8. The system according to Claim 1 wherein said output device includes a color printer adapted to print images color-coded to correspond to the densitometry of said model.

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9. The system according to Claim 1 wherein said controller includes:
- a) means for storing a pre-existing tomographical dental/orthopedic densitometry model; and
  - b) means for comparing pre-existing and current tomographical densitometry models.

10. A method of tomographically modeling dental and orthopedic densitometry, which includes the steps of:
- a) providing a controller with a microprocessor and a memory device connected to said microprocessor;
  - b) providing an input device connected to said microprocessor;
  - c) inputting patient diagnostic parameters, <sup>including a pre-existing densitometry model,</sup> with said input device;
  - d) storing said diagnostic parameters in memory;
  - e) providing X-ray equipment with an X-ray source and an X-ray detector array;
  - f) positioning said X-ray equipment and a patient's dental/orthopedic structure relative to each other with said patient's dental/orthopedic structure between said source and said detector array;
  - g) emitting an X-ray beam from said source through said dental structure and to said detector array;
  - h) outputting a signal from said detector array to said microprocessor;

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- i) forming with said microprocessor a tomographical densitometry model of said dental/orthopedic structure;
- j) providing an output device connected to said microprocessor; and
- k) outputting said densitometry model to said output device.

11. The method according to Claim 10 which includes the additional steps of emitting, detecting, digitizing, and storing signals corresponding to first and second energy levels from said X-ray source.

12. The method according to Claim 10 which includes the additional steps of:

- a) inputting to said controller a predetermined scan path for said X-ray equipment; and
- b) traversing said X-ray equipment along said scan path.

13. The method according to Claim 12 which includes the additional steps of:

- a) providing a positioning motor connected to said microprocessor and to said X-ray equipment for moving same through three axes of movement along said scan path.

14. The method according to Claim 10 which includes the additional step of detecting incipient caries with said tomographical densitometry model.
15. The method according to Claim 10 which includes the additional step of detecting dental fractures with said tomographical densitometry model.
16. The method according to Claim 10 which includes the additional step of detecting apical abscesses with said tomographical densitometry model.
17. The method according to Claim 10 which includes the additional step of analyzing the extent of osseointegration of a dental or orthopedic prostheses with respect to a patient's dental or orthopedic structure with said tomographical densitometry model.
18. The method according to Claim 10 which includes the additional steps of:
- a) inputting to said microprocessor a pre-existing tomographical densitometry model; and
  - b) comparing said patient's current densitometry model to said pre-existing densitometry model.

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19. The method according to Claim 10 which includes the additional steps of:
  - a) providing a color output device connected to said microprocessor; and
  - b) color coding said densitometry model in colors corresponding to the patient's dental or orthopedic structure density and outputting said densitometry model to said output device.
  
20. A method of tomographically modeling dental and orthopedic densitometry, which includes the steps of:
  - a) providing a controller with a microprocessor and a memory device connected to said microprocessor;
  - b) providing an input device connected to said microprocessor;
  - c) inputting with said input device dental or orthopedic patient diagnostic parameters, including a pre-existing densitometry model;
  - d) storing said diagnostic parameters in said memory device;
  - e) providing X-ray equipment connected to said microprocessor, said equipment including an X-ray source and an X-ray detector array;
  - f) positioning said X-ray equipment and a patient's dental or orthopedic structure relative to each other with said patient's dental or orthopedic structure located between said X-ray source and said detector array;

- g) emitting an X-ray beam from said source at a first X-ray beam energy level, passing same through said dental or orthopedic structure, and detecting same with said detector array;
- h) outputting a signal corresponding to said detected X-ray beam from said detector array;
- i) digitizing said detector array output signal;
- j) storing said digitized output signal in said memory device;
- k) repeating steps f) - j) at a second X-ray beam energy level;
- l) merging said stored output signals to form a present tomographical densitometry model of said dental or orthopedic structure;
- m) comparing said present densitometry model with said pre-existing densitometry model;
- n) adjusting said present densitometry model to account for patient parameters including age and gender;
- o) providing an output device connected to said microprocessor;
- p) color coding said present tomographical densitometry model with colors corresponding to dental or orthopedic structure density; and
- q) outputting said color-coded model to said output device.

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Abstract of the Disclosure

1  
2 A dental and orthopedic densitometry modeling system includes a controller with  
3 a microprocessor and a memory device connected to the microprocessor. An input device  
4 is also connected to the microprocessor for inputting diagnostic procedure parameters and  
5 patient information. X-ray equipment including an X-ray source and an X-ray detector  
6 array are connected to a positioning motor for movement relative to a patient's dental or  
7 orthopedic structure in response to signals from the microprocessor. The output consists  
8 of a tomographical densitometry model. A dental/orthopedic densitometry modeling  
9 method involves moving the X-ray equipment across a predetermined scan path, emitting  
10 dual-energy X-ray beams, and outputting an image color-coded to correspond to a  
11 patient's dental or orthopedic density.

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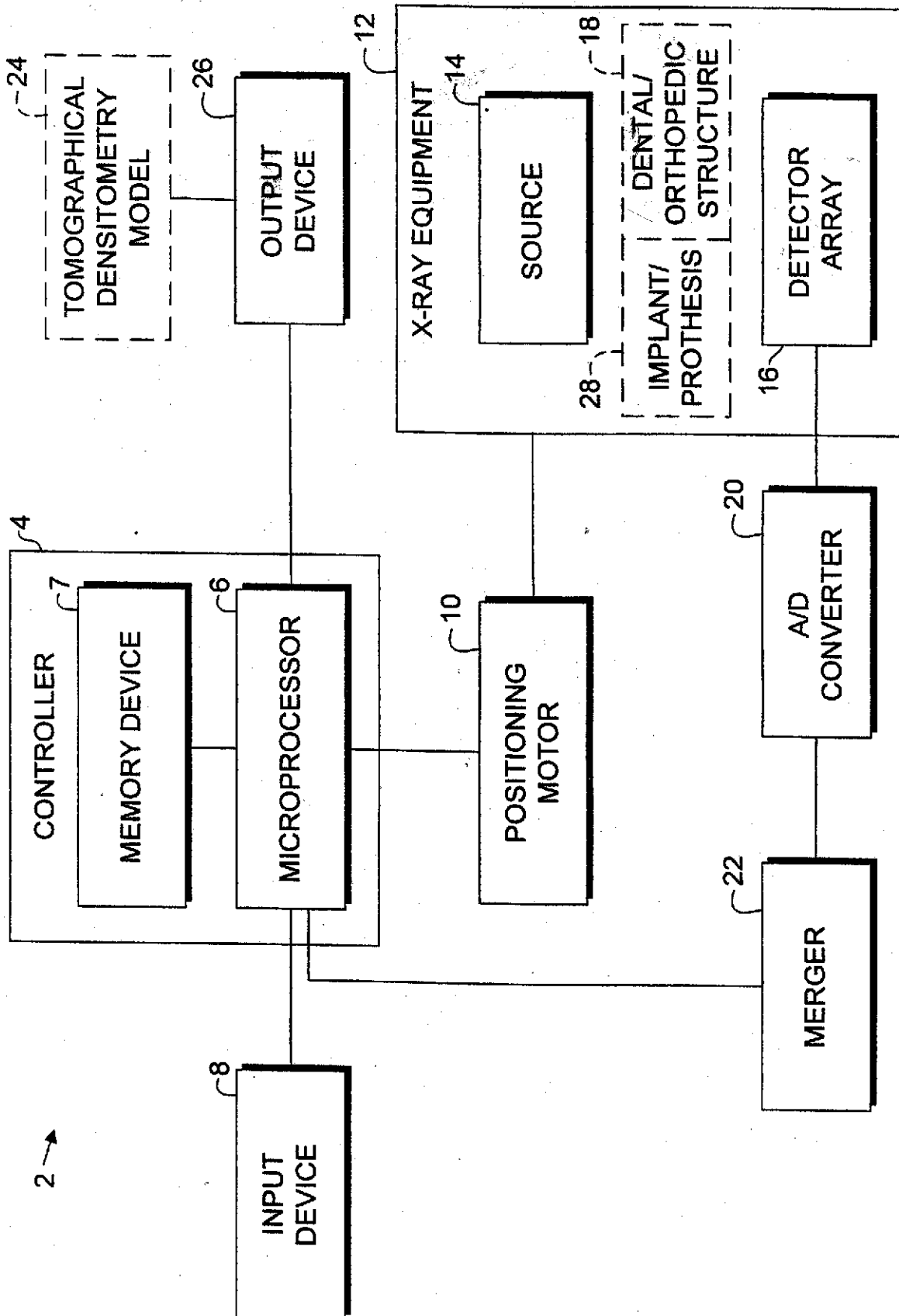


Fig. 1

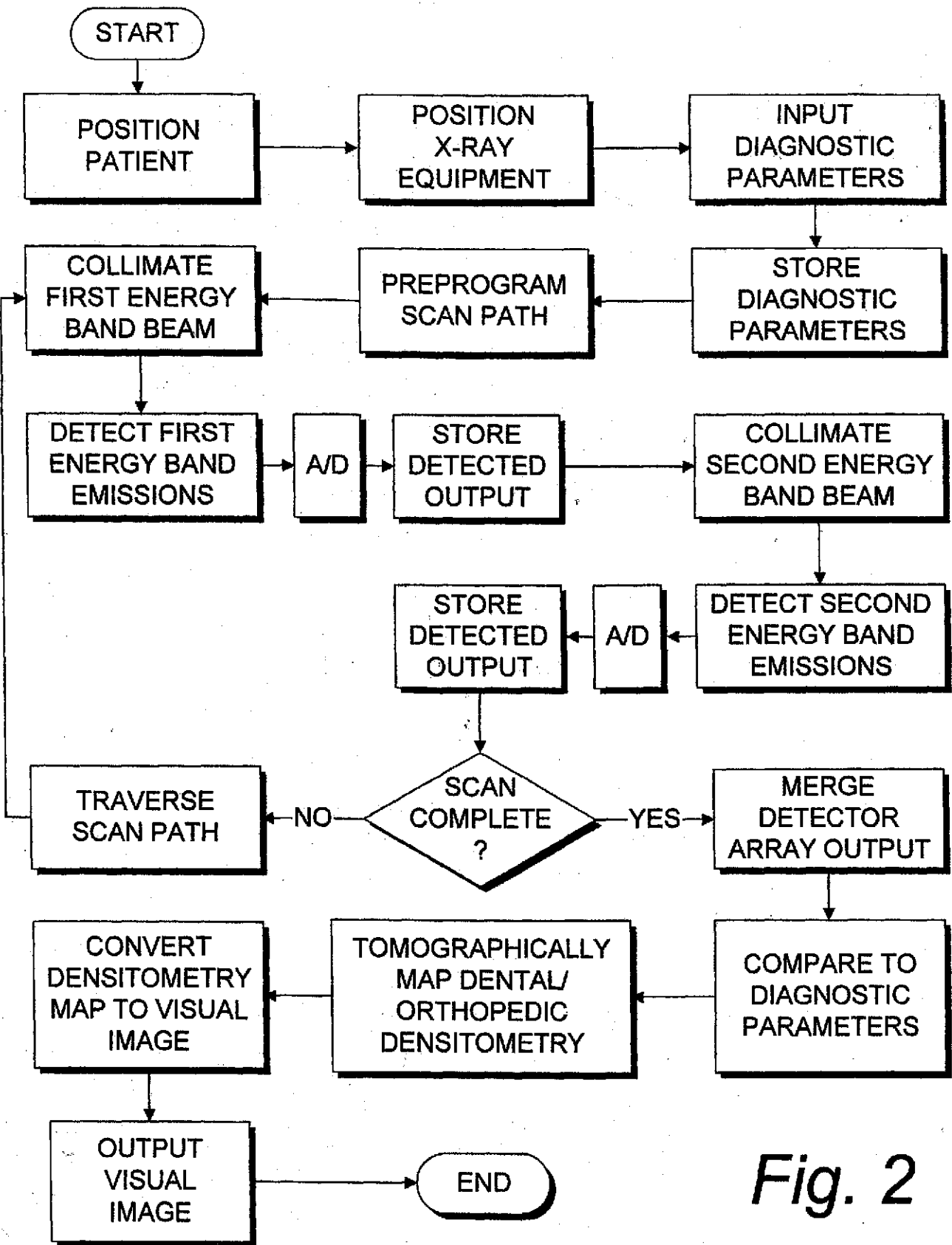


Fig. 2

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205

PRINT OF DRAWING  
AS ORIGINALLY FILED

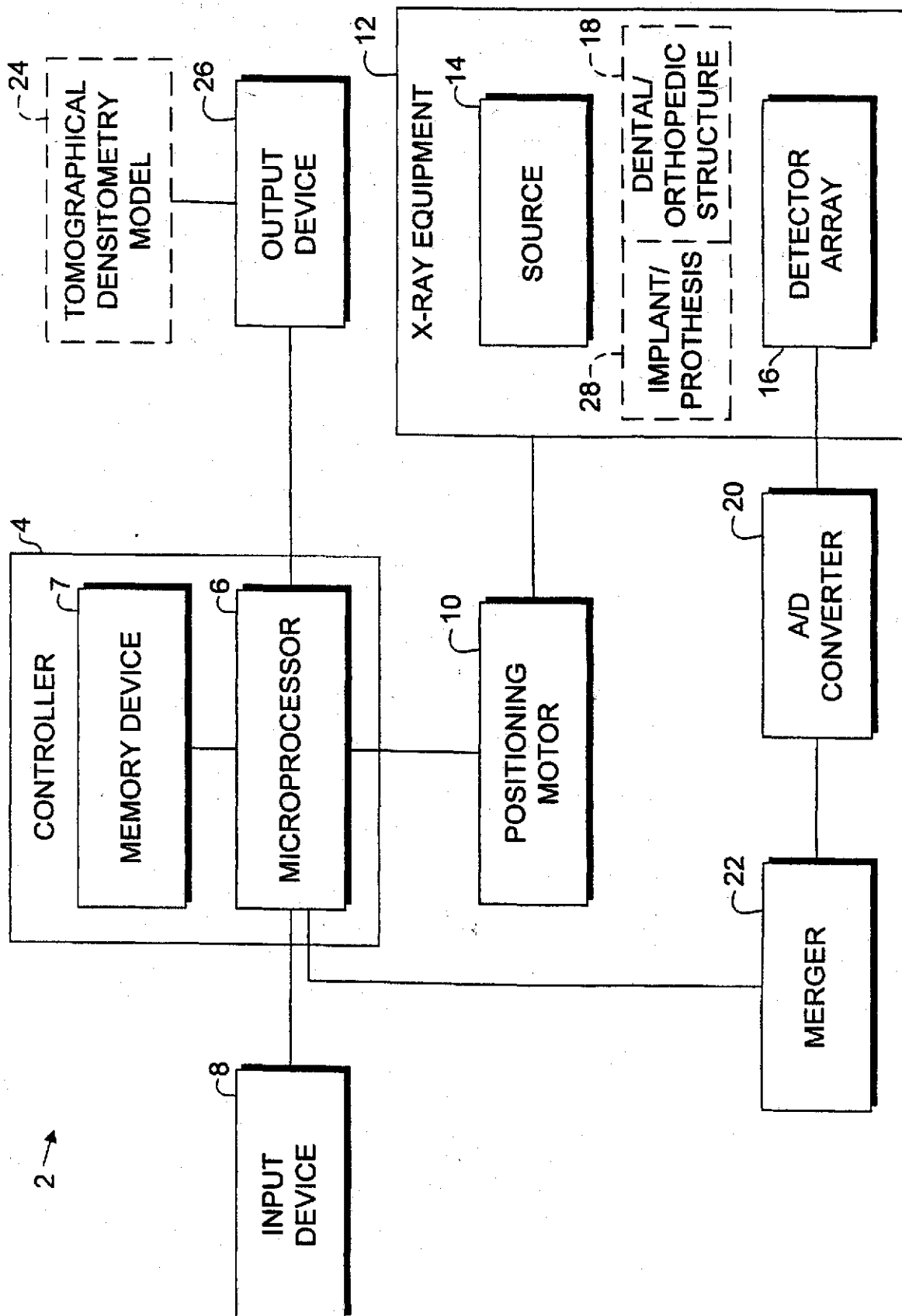


Fig. 1

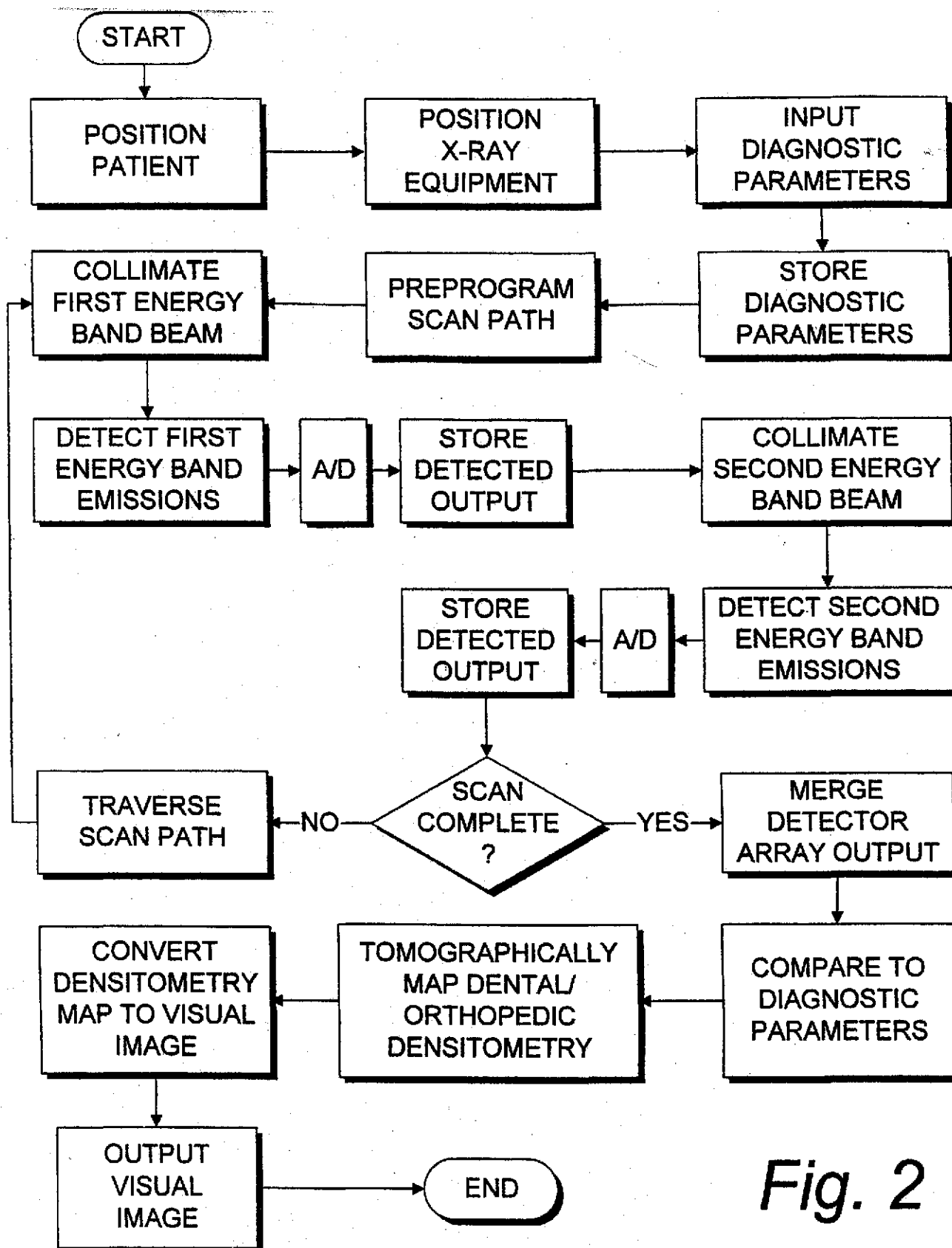


Fig. 2

Express Mail No. EL300244301US

DECLARATION AND POWER OF ATTORNEY  
FOR A PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled DENTAL AND ORTHOPEDIC DENSITOMETRY MODELING SYSTEM AND METHOD, the specification of which is attached hereto.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, Sec. 1.56. (Under Sec. 1.56 information is material to patentability when it is not cumulative to information already of record before the Patent and Trademark Office with respect to the present application and it establishes either by itself or in combination with other information a prima facie case of unpatentability of a claim or it refutes or is inconsistent with a position taken in opposing an argument of unpatentability relied upon by the Patent and Trademark Office or in asserting an argument of patentability. Under this section a prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.)

00452348 120195

I hereby state that I do not know and do not believe that the invention was ever known or used in the United States of America before my invention thereof; that to the best of my knowledge and belief the invention has not been in public use or on sale in the United States of America more than one year prior to this application, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, or patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months prior to this application; and that no application for patent or inventor's certificate on this invention has been filed in any country foreign to the United States of America prior to this application by me or my legal representatives or assigns.

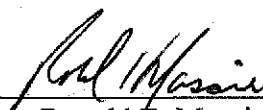
I hereby appoint Malcolm A. Litman, Reg. No. 19,579; Gerald M. Kraai, Reg. No. 34,854; Mark E. Brown, Reg. No. 30,361; Kent R. Erickson, Reg. No. 36,793 and Michael Elbein all members of the bar of the State of Missouri, whose postal address is Litman, Kraai & Brown, L.L.C., 4700 Belleview, Suite 200, Kansas City, Missouri 64112, telephone (816) 931-1800 as my attorneys, with full power of substitution, to prosecute this application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent Office connected therewith in my behalf.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are

punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date:

11/30/99



Ronald E. Massie

Residence: Lake Ozark, Missouri 65049

Post Office

Address: P.O. Box 873, Lake Ozark, Missouri 65049

Citizenship: United States of America

00453419 120499

Express Mail No. EL300244301US

VERIFIED STATEMENT CLAIMING SMALL ENTITY STATUS  
BY INVENTOR

Applicant: Ronald E. Massie

For: DENTAL AND ORTHOPEDIC DENSITOMETRY MODELING SYSTEM AND  
METHOD

As a below-named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 C.F.R. 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the above-entitled invention described in:

(X) the specification filed herewith.

( ) application Serial No. \_\_\_\_\_, filed \_\_\_\_\_.

I have not assigned, granted, conveyed or licensed, and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who, upon knowledge and belief, could not be classified as an independent inventor under 37 C.F.R. 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 C.F.R. 1.9(d) or a nonprofit organization under 37 C.F.R. 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

Name of Concern: NONE

Address of Concern:

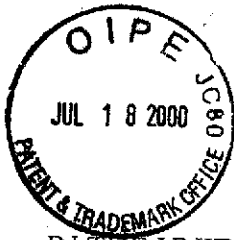
I acknowledge my duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States

Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

11/30/99  
Date

  
Ronald E. Massie



#2/IDS  
T. Feaster  
7/27/00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

INFORMATION DISCLOSURE STATEMENT

Applicant: Ronald E. Massie ✓

Serial No. 09/452,348 ✓

For: DENTAL DENSITOMETRY MODELING SYSTEM AND METHOD ✓

\*\*\*\*\*

Kansas City, Missouri

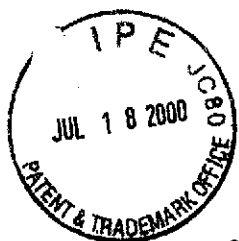
Assistant Commissioner for Patents  
Washington, D. C. 20231

Sir:

Applicant is aware of the following references listed on the attached PTO-1449, copies of which are enclosed:

U. S. Patents

| <u>Patent No.</u> | <u>Inventor</u> | <u>Issue Date</u> |
|-------------------|-----------------|-------------------|
| 3,949,229         | Albert          | Apr. 6, 1976      |
| 4,188,537         | Franke          | Feb. 12, 1980     |
| 4,239,971         | Cushman         | Dec. 16, 1980     |
| 4,259,853         | Albert          | Mar. 31, 1981     |
| 4,628,356         | Spillman et al. | Dec. 9, 1986      |
| 4,823,369         | Guenther et al. | Apr. 18, 1989     |



| <u>Patent No.</u> | <u>Inventor</u>        | <u>Issue Date</u> |
|-------------------|------------------------|-------------------|
| 4,856,038         | Guenther et al.        | Aug. 8, 1989      |
| 5,214,686         | Webber                 | May 25, 1993      |
| 5,503,559         | Vari                   | Apr. 2, 1996      |
| 5,533,080         | Pelc                   | Jul. 2, 1996      |
| 5,579,361         | Augais et al.          | Nov. 26, 1999     |
| 5,828,721         | Schulze-Ganzlin et al. | Oct. 27, 1999     |
| 5,838,765         | Gershman               | Nov. 17, 1998     |
| 5,917,882         | Khutoryansky et al.    | Jun. 29, 1999     |
| 5,917,883         | Khutoryansky et al.    | Jun. 29, 1999     |
| 5,930,327         | Lin                    | Jul. 27, 1999     |
| Re. 35,423        | Adams et al.           | Jan. 14, 1997     |
| Re. 36,162        | Bisek et al.           | Mar. 23, 1999     |

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Other Documents

A Textbook of Oral Pathology, Fourth Edition/Illustrated by W.B. Saunders Company, pages 437-446, 1983

Tissue-Integrated Prostheses, Osseointegration in clinical Dentistry, Edited by Per-Ingvar Branemark, M.D., Ph.D., George A. Zarb, B.Ch.D., D.D.S., M.S., Tomas Albrektsson, M.D., Ph.D., Quintessence Publishing Co., Inc., 1985

The above-listed references are, in the belief and opinion of the undersigned, the closest art, that is required to be disclosed under the duty of disclosure, of which the applicant is aware as of the date of execution of the Declaration in the above-captioned application.

Respectfully submitted,

7/13

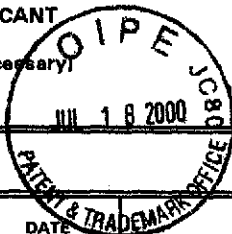
Date

Mark Brown

Mark E. Brown

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|                                                                                                                                                                                                              |                              |                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------|
| Form PTO-1449 U.S. DEPARTMENT OF COMMERCE<br>(Modified) PATENT AND TRADEMARK OFFICE<br><br>INFORMATION DISCLOSURE<br>STATEMENT BY APPLICANT<br><br>(Use several sheets if necessary)<br><br>(37 CFR 1.98(b)) | ATTY. DOCKET NO. 99,378      | SERIAL NO. 09/452,348 |
|                                                                                                                                                                                                              | APPLICANT Ron Massie, D.D.S. |                       |
|                                                                                                                                                                                                              | FILING DATE December 1, 1999 | GROUP 2882            |



## U.S. PATENT DOCUMENTS

| EXAMINER INITIAL | DOCUMENT NUMBER | DATE                | PATENTEE               | CLASS | SUBCLASS | FILING DATE IF APPROPRIATE |
|------------------|-----------------|---------------------|------------------------|-------|----------|----------------------------|
| DAD              | 3,949,229       | 04/06/76            | Albert                 |       |          |                            |
| DAD              | 4,188,537       | 02/12/80            | Franko                 |       |          |                            |
| DAD              | 4,239,971       | 12/16/80            | Cushman                |       |          |                            |
| DAD              | 4,259,853       | 4/19/81<br>03/01/81 | Albert FLEISSNER       |       |          |                            |
| DAD              | 4,628,356       | 12/09/86            | Spillman et al.        |       |          |                            |
| DAD              | 4,823,369       | 04/18/89            | Guenther et al.        |       |          |                            |
| DAD              | 4,856,038       | 08/08/89            | Guenther et al.        |       |          |                            |
| DAD              | 5,214,686       | 05/25/93            | Webber                 |       |          |                            |
| DAD              | 5,503,559       | 04/02/96            | Vari                   |       |          |                            |
| DAD              | 5,533,080       | 07/02/96            | Pelc                   |       |          |                            |
| DAD              | 5,579,361       | 12/26/96            | Augais et al.          |       |          |                            |
| DAD              | 5,828,721       | 10/27/98            | Schulze-Ganzlin et al. | 378   |          |                            |
| DAD              | 5,838,765       | 11/17/98            | Gershman               |       |          |                            |
| DAD              | 5,917,882       | 06/29/99            | Khutoryansky et al.    |       |          |                            |
| DAD              | 5,917,883       | 06/29/99            | Khutoryansky et al.    |       |          |                            |
| DAD              | 5,930,327       | 07/27/99            | Lin                    |       |          |                            |
| DAD              | Re. 35,423      | 01/14/97            | Adams et al            |       |          |                            |
| DAD              | Re. 36,162      | 03/23/99            | Bisek et al.           |       |          |                            |

## OTHER DOCUMENTS (including Author, Title, Date, Relevant Pages, Place of Publication)

|                                                                                                                                                                             |                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                             | A textbook of Oral Pathology, Fourth Edition/Illustrated by W.B. Saunders Company, pages 437-446, 1983.                                                                                                                                    |
| DAD                                                                                                                                                                         | Tissue- Integrated Prostheses, Osseointegration in clinical dentistry, Edited by per-Ingvar Branemark, M.D., Ph.D., George A. Zarb, B.Ch.D.D.S., M.S., Thomas Albrektsson, M.D., Ph.D., Quintessence publishing Co., Inc., 1985, pp 11-30. |
| Examiner                                                                                                                                                                    | Date Considered                                                                                                                                                                                                                            |
| DAD                                                                                                                                                                         | 3-12-2001                                                                                                                                                                                                                                  |
| EXAMINER: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. |                                                                                                                                                                                                                                            |

GAU 2742  
# 2  
a: July 12, 2000

In re application of: Ron Massie, D.D.S.

Serial No.: 09/452,348

Group Art Unit: 2742

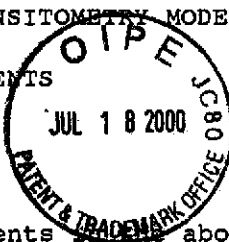
Filed: December 1, 1999

Examiner:

For: DENTAL AND ORTHOPEDIC DENSITOMETRY MODELING SYSTEM AND METHOD

ASSISTANT COMMISSIONER FOR PATENTS  
Washington, D. C. 20231

Sir:

Transmitted herewith are documents  above-identified application:

☐ Small Entity Status of this application under 37 C.F.R. 1.9 and 1.7 has been established by a Verified Statement previously submitted.

☐ Request for Extension of Time and fee are enclosed.

☐ The fee has been calculated as shown below:

☒ Information Disclosure Statement

☒ Form PTO-1449

☒ References cited in IDS

☒ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 12-1660. A duplicate copy of this sheet is attached.

☒ Any patent application processing fees under 37 C.F.R. 1.17.

Respectfully submitted,

*Mark Brown*

BY Mark E. Brown

Reg. No. 30,361

120 West 12th Street  
Kansas City, Missouri 64105  
Telephone: (816) 421-3355

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CERTIFICATE OF MAILING

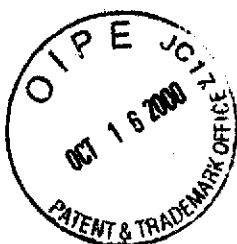
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I hereby certify that this correspondence Serial No. 09/452,348 is being deposited with the United States Postal Service as first class mail in an envelope addressed to BOX POST REG FEE, Assistant Commissioner for Trademarks, 2900 Crystal Drive, Arlington, VA 22202-3513 on July 13, 2000.

By: Mark Brown

Date of Signature: 7/13/00

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2742  
2642

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Ronald E. Massie

Serial No.: 09/452,348

Group Art Unit: 2742

Filed: December 1, 1999

Exam:

For: DENTAL AND ORTHOPEDIC DENSITOMETRY MODELING SYSTEM AND METHOD

3/ Change  
of  
Address  
G. Stanley  
10-27-00

Assistant Commissioner for Patents  
Washington, D.C. 20231

CHANGE OF ATTORNEY'S ADDRESS IN PATENT APPLICATION

Please send all correspondence for this patent application as follows:

SHUGHART THOMSON & KILROY, P.C.  
Twelve Wyandotte Plaza  
120 West 12th Street  
Kansas City, Missouri 64105

TC 2742 MAIL ROOM

OCT 19 2000

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Respectfully submitted,

By

*Mark Brown*

Mark E. Brown  
Reg. No. 30,361

MEB:ml

Twelve Wyandotte Plaza  
120 West 12th Street  
Kansas City, Missouri 64105  
816-421-3355

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Ronald E. Massie

Serial No.09/452,348



CERTIFICATE OF MAILING

I hereby certify that this Change of Attorney's Address for application Serial No.09/452,348 filed December 1, 1999, is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231, on October 9, 2000.

Ronald E. Massie

By Mark Brown  
Mark E. Brown

October 9, 2000

\_\_\_\_\_  
(Date of Signature)

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**UNITED STATES DEPARTMENT OF COMMERCE  
Patent and Trademark Office**

Address: COMMISSIONER OF PATENTS AND TRADEMARKS  
Washington, D.C. 20231

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. |
|-----------------|-------------|----------------------|---------------------|
|-----------------|-------------|----------------------|---------------------|

09/452,348    12/01/99    MASSIE    R    99.378

SHUGHART THOMSON & KILROY, PC  
TWELVE WYANDOTTE PLAZA  
120 WEST 12TH STREET  
KANSAS CITY MO 64105

MM92/0409

EXAMINER

DLINN, D

ART UNIT

PAPER NUMBER

2882

DATE MAILED:

04/09/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

# Office Action Summary

Application No.  
09/452,348

Applicant(s)  
Massie

Examiner  
Drew A. Dunn

Group Art Unit  
2882



- ☐ Responsive to communication(s) filed on \_\_\_\_\_
- ☐ This action is **FINAL**.
- ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire three month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

## Disposition of Claims

- ☒ Claim(s) 1-20 is/are pending in the application.
- Of the above, claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- ☒ Claim(s) 1-20 is/are rejected.
- ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- ☐ Claims \_\_\_\_\_ are subject to restriction or election requirement.

## Application Papers

- ☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.
- ☒ The drawing(s) filed on 12/1/99 is/are objected to by the Examiner.
- ☐ The proposed drawing correction, filed on \_\_\_\_\_ is ☐ approved ☐ disapproved.
- ☒ The specification is objected to by the Examiner.
- ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

- ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- ☐ All ☐ Some\* ☐ None of the CERTIFIED copies of the priority documents have been
- ☐ received.
- ☐ received in Application No. (Series Code/Serial Number) \_\_\_\_\_.
- ☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\*Certified copies not received: \_\_\_\_\_

- ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

## Attachment(s)

- ☒ Notice of References Cited, PTO-892
- ☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). \_\_\_\_\_
- ☐ Interview Summary, PTO-413
- ☐ Notice of Draftsperson's Patent Drawing Review, PTO-948
- ☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---



UNITED STATES DEPARTMENT OF COMMERCE  
Patent and Trademark Office  
ASSISTANT SECRETARY AND COMMISSIONER  
OF PATENTS AND TRADEMARKS  
Washington, D.C. 20231

Paper No. 4

Application Number: 09/452,348

Filing Date: 12/01/99

Applicant(s): Massie

### DETAILED ACTION

#### *Drawings*

The drawings are objected to under 37 C.F.R. 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, as pertains to claims 2 and 13 the "positioning motor being adapted for positioning said X-ray equipment with respect to three axes of movement" must be shown or the feature(s) cancelled from the claim(s). No new matter should be entered.

#### *Specification*

The abstract of the disclosure is objected to because it should include phraseology with regards to line 5, after "information" such as, --, which may include a pre-existing densitometry model--. Correction is required. See MPEP § 608.01(b).

#### *Claim Rejections - 35 U.S.C. § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 2882

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admission of the state of the art in view of any one of Suhulze-Ganzlin et al. (U.S. Pat. No. 5,828,721), Arai (U.S. Pat. No. 5,784,429) or Suzuki et al. (U.S. Pat. No. 5,677,940).

It is noted that applicant discloses that the state of the art in the medical field (see page 3 of disclosure) in densitometry procedures, measuring bone morphology density (BMD) is well known. Further, with the aid of faster computers with large memories, mapping BMD models including colorization and comparison with a patients own history is known. What applicant appears to believe is lacking is the use of such a system for dental tomographic imaging.

In a first instance, the desire to have pathology detection and diagnosis, which may include the monitoring of osseointegration between bone and prostheses is known in standard medical practice wherein past and present X-ray films are compared by a dentist to see a patients dental history and changes. Official notice is taken. As such, it appears that though the general concept of tomographic modeling is known, applicant's claims are drawn towards the structure of tomographically imaging and modeling dental and orthopedic structure densitometry.

With regards to claims 1-20, these claims are deemed obvious in light of applicant's disclosure of the state of the art of tomographic modeling in view of these references teaching generally accepted techniques and systems for dental tomographic imaging.

Specifically, each of these references illustrates a system includes a controller processing systems with a memory, an input device or means, a positioning motor connected to the

Art Unit: 2882

processor, an X-ray source and associated detector with means to convert the detected X-rays to signals that can and are to be processed by said processor and output for outputting the desired data from the processor. It is well known in the art and it would have been obvious to one of ordinary skill to recognize that the detectors could be arrays. Official notice is taken.

Further, it would have been obvious to one of ordinary skill to apply the systems taught by these three references to include the appropriate algorithms known in the art for modeling (BMD) as suggested by applicant to form the appropriate tomographic densitometry dental model to be outputted by the processor.

With regards to claims 2 and 13, Official Notice is taken that moving X-ray equipment with respect to three axes in tomographic imaging is known and to enable a motor and alignment means to image from any position would have been obvious to one of ordinary skill depending upon the detail of the information desired.

With regards to claims 3-9, these claims would have been obvious variances on the electronic and detector systems taught by any of the three references supra. Further, as disclosed as being conventional by applicant, the dual energy levels, preprogramming tomographic imaging and the concept of colorizing and analyzing the data are well known in other tomographic systems and modeling and as such would have been obvious to be modified by one of ordinary skill in light of the well known tomographic imaging systems disclosed in any of the three references supra.

Lastly, with specific regards to claims 10-20, the method of modeling would have been obvious to one of ordinary skill since this is just an programmable automated arrangement to run

Art Unit: 2882

the system claimed in claims 1-9 (addressed supra) as well as automating a dentist's functions of comparing old images to new images to determine changes in a patient's bone or dental densitometry.

### *Conclusion*

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure has been cited as of interest.

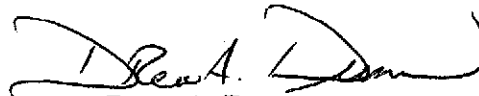
Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Drew A. Dunn** whose telephone number is (703) 305-0024. The examiner can normally be reached between the hours of 8:00 AM to 3:00 PM Monday thru Thursday and every other Friday (second Friday of the bi-week).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert H. Kim, can be reached on (703) 305-3492. The fax phone number for this Group is (703) 308-7722 or (703)308-7724.

Communications via Internet e-mail regarding this application, other than those under 35 U.S.C. 132 or which otherwise require a signature, may be used by the applicant and should be addressed to [**drew.dunn@uspto.gov**].

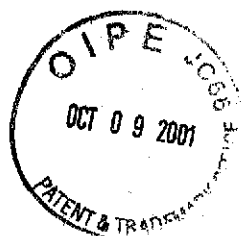
All Internet e-mail communications will be made of record in the application file. PTO employees do not engage in Internet communications where there exists a possibility that sensitive information could be identified or exchanged unless the record includes a properly signed express waiver of the confidentiality requirements of 35 U.S.C. 122. This is more clearly set forth in the Interim Internet Usage Policy published in the Official Gazette of the Patent and Trademark on February 25, 1997 at 1195 OG 89.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.



Drew A. Dunn  
T.C.A.U. 2882  
12 March 2001

|                                   |  |                                                                 |                               |                               |             |          |
|-----------------------------------|--|-----------------------------------------------------------------|-------------------------------|-------------------------------|-------------|----------|
| <b>Notice of References Cited</b> |  | Application No.<br><b>09/452,348</b>                            | Applicant(s)<br><b>Massie</b> |                               |             |          |
|                                   |  | Examiner<br><b>Drew A. Dunn</b>                                 |                               | Group Art Unit<br><b>2882</b> | Page 1 of 1 |          |
| <b>U.S. PATENT DOCUMENTS</b>      |  |                                                                 |                               |                               |             |          |
|                                   |  | DOCUMENT NO.                                                    | DATE                          | NAME                          | CLASS       | SUBCLASS |
| A                                 |  | 4,783,793                                                       | 11/1988                       | Virta et al.                  | 378         | 39       |
| B                                 |  | 5,093,852                                                       | 3/1992                        | Nishikawa et al.              | 378         | 39       |
| C                                 |  | 5,784,429                                                       | 7/1998                        | Arai                          | 378         | 39       |
| D                                 |  | 5,677,940                                                       | 10/1997                       | Suzuki et al.                 | 378         | 38       |
| E                                 |  | 5,195,114                                                       | 3/1993                        | Sairenji et al.               | 378         | 170      |
| F                                 |  | 5,528,645                                                       | 6/1996                        | Koivisto                      | 378         | 38       |
| G                                 |  | 5,793,837                                                       | 8/1998                        | Mezhinsky et al.              | 378         | 38       |
| H                                 |  | 5,828,720                                                       | 10/1998                       | Syrjanen                      | 378         | 38       |
| I                                 |  | 5,828,722                                                       | 10/1998                       | Ploetz et al.                 | 378         | 38       |
| J                                 |  |                                                                 |                               |                               |             |          |
| K                                 |  |                                                                 |                               |                               |             |          |
| L                                 |  |                                                                 |                               |                               |             |          |
| M                                 |  |                                                                 |                               |                               |             |          |
| <b>FOREIGN PATENT DOCUMENTS</b>   |  |                                                                 |                               |                               |             |          |
|                                   |  | DOCUMENT NO.                                                    | DATE                          | COUNTRY                       | NAME        | CLASS    |
| N                                 |  |                                                                 |                               |                               |             |          |
| O                                 |  |                                                                 |                               |                               |             |          |
| P                                 |  |                                                                 |                               |                               |             |          |
| Q                                 |  |                                                                 |                               |                               |             |          |
| R                                 |  |                                                                 |                               |                               |             |          |
| S                                 |  |                                                                 |                               |                               |             |          |
| T                                 |  |                                                                 |                               |                               |             |          |
| <b>NON-PATENT DOCUMENTS</b>       |  |                                                                 |                               |                               |             |          |
|                                   |  | DOCUMENT (Including Author, Title, Source, and Pertinent Pages) |                               |                               |             | DATE     |
| U                                 |  |                                                                 |                               |                               |             |          |
| V                                 |  |                                                                 |                               |                               |             |          |
| W                                 |  |                                                                 |                               |                               |             |          |
| X                                 |  |                                                                 |                               |                               |             |          |



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

AMENDMENT

6/a  
10/24/01  
D. Bell

Applicant: Ronald E. Massie

Serial No.: 09/452,348

Date: October 9, 2001

Filed: December 1, 1999

Group Art Unit: 2882

Exam: Drew A. Dunn

For: DENTAL AND ORTHOPEDIC DENSITOMETRY MODELING  
SYSTEM AND METHOD

Kansas City, Missouri

Box: FEE - AMENDMENT  
Assistant Commissioner for Patents  
Washington, D. C. 20231

Sir:

In response to the Office Action dated April 9, 2001, Applicant hereby amends the above-identified application as follows:

IN THE DRAWINGS:

The following change should be noted on FIG. 1: the wording on the box labeled Part No. 10 has been changed to read "Three-Axes Positioning Motor".

1124796 V1

RECEIVED  
OCT 12 2001  
TECHNICAL CENTER  
1000 N. 17TH ST.  
KANSAS CITY, MO 64108

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**IN THE SPECIFICATION:**

Please change the Abstract of Applicant's disclosure beginning at line 5 to read as follows:

a<sup>1</sup> A dental and orthopedic densitometry modeling system includes a controller with a microprocessor and a memory device connected to the microprocessor. An input device is also connected to the microprocessor for inputting diagnostic procedure parameters and patient information, which may include a pre-existing densitometry model. X-ray equipment including an X-ray source and an X-ray detector array are connected to a positioning motor for movement relative to a patient's dental or orthopedic structure in response to signals from the microprocessor. The output consists of a tomographical densitometry model. A dental/orthopedic densitometry modeling method involves moving the X-ray equipment across a predetermined scan path, emitting dual-energy X-ray beams, and outputting an image color-coded to correspond to a patient's dental or orthopedic density.

**IN THE CLAIMS:**

Please amend Claim 1 to read as follows:

- a<sup>2</sup>
1. (Amended) A system for tomographically modeling dental and orthopedic structure densitometry, which includes:
    - a) a controller with a microprocessor and a memory device connected to the microprocessor, said controller including means for storing a pre-existing tomographical dental/orthopedic densitometry model;
    - b) an input device connected to the microprocessor;
    - c) a positioning motor connected to the microprocessor and movable in response to

a2  
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signals from said microprocessor;

- d) X-ray equipment including an X-ray source and a detector array;
- e) conversion means for converting a signal from said detector array, said conversion means being connected to said detector array and to said microprocessor; and
- f) an output device connected to said microprocessor and adapted for receiving a tomographical densitometry model from said microprocessor.

Please amend Claim 9 to read as follows:

- a3
9. (Amended) The system according to Claim 1 wherein said controller includes means for comparing said pre-existing tomographical densitometry model to a current tomographical densitometry model.

**REMARKS:**

Reconsideration of the subject application as amended above is requested in view of the remarks that follow.

**In the Drawings**

Applicant has incorporated a change to FIG. 1 by rewording the box labeled Part No. 10 to read "Three-Axes Positioning Motor".

A positioning motor operably connected to X-ray equipment and adapted for moving same through three axes of movement is disclosed in lines 3 through 5 on page 8 of Applicant's specification. Consequently, the changed lettering of the box labeled Part No. 10 of FIG. 1 does not constitute new matter.

1124796 V1

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### **In the Specification**

Applicant has amended the Abstract, beginning on line 5 to add the following wording "which may include a pre-existing densitometry model." This change is made in accordance with the Examiner's suggestion. Applicant respectfully submits that this change does not constitute new matter.

### **Section 103 Rejection**

In paragraph 3 of the Office Action, the Examiner rejected Claims 1 through 20 under 35 U.S.C. §103(a) as being unpatentable over Applicant's admission of the state of the art in view of the Schulze-Ganzlin et al. (U.S. Patent No. 5,828,721), Arai (U.S. Patent No. 5,784,429), or Suzuki et al. (U.S. Patent No. 5,677,940). This rejection is respectfully traversed as applied to the claims as amended above.

Applicant has carefully reviewed the cited references and has herein amended Claim 1 to even more clearly and patentably distinguish such claim over the cited prior art. All claims, as now amended, are believed to patentably distinguish over the prior art and are in compliance with 35 U.S.C. §103(a). Favorable action and allowance is hereby respectfully requested.

The features that Applicant respectfully submits patentably distinguish Applicant's invention over the prior art include the teaching of a dental and orthopedic densitometry modeling system utilizing a microprocessor having a database that includes a patient's unique and predetermined densitometry modeling parameters for comparison to the patient's present densitometry model. This feature is generally discussed in lines 10 through 13 and lines 20 through 21 on page 4, and line 1 on page 5 of Applicant's application. This feature is further discussed in greater detail in lines 17 through 20 of page 7, and lines 1 and 2 of page 8 of

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Applicant's application. Furthermore, methods employing this feature are detailed in lines 13 through 16 on page 9 of Applicant's application.

The Schulze-Ganzlin reference cited by the Examiner teaches comparing the tomogram of a first slice position with the tomogram of a second slice position, as disclosed in lines 48 through 56 of page 3. However, nowhere in the Schulze-Ganzlin patent does it teach comparing a patient's prior tomographical densitometry model with a patient's current tomographical densitometry model, nor does such comparison relate to the heart of the purpose of the Schulze-Ganzlin invention, which is to disclose an apparatus and method for more quickly producing tomograms of a desired slice position.

The Arai patent cited by the Examiner is directed to an apparatus for removing the blur from a specific tomographic image. Nowhere in the Arai patent does it disclose the concept of comparing a patient's prior tomographical densitometry model to a patient's present tomographical densitometry model, nor does such comparison relate to the point of novelty of the Arai patent.

The Suzuki patent cited by the Examiner discloses an invention to provide a digital X-ray imaging apparatus capable of taking tomographic images along a given tomographic plane by a single X-ray imaging operation. Nowhere in the Suzuki patent is it taught to compare a patient's prior tomographical densitometry model with a patient's current tomographical densitometry model, nor does such comparison relate to the point of novelty of the Suzuki patent.

In conclusion, Applicant respectfully asserts that none of the cited references considered individually, or in combination, either teaches or suggests Applicant's invention as recited in the claims as now amended. For the reasons set forth above, it is believed that the claims now before

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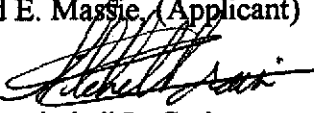
the Examiner patentably distinguish over the prior art and are not obvious. Therefore, Applicant respectfully requests that this application be passed to allowance.

The Examiner is invited to contact the undersigned by telephone if prosecution of this application can be expedited thereby.

Respectfully submitted,

Ronald E. Massie, (Applicant)

By



Mitchell L. Crain

Reg. No. 37,299

Attorney for Applicant

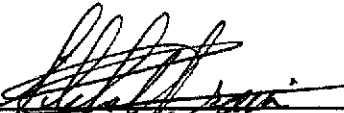
MEB:pab  
120 West 12th Street  
Kansas City, Missouri 64105  
Phone: (816) 421-3355

#### CERTIFICATE OF MAILING

I hereby certify that this Amendment for application Serial No. 09/452,348 filed December 1, 1999, is being deposited with the United States Postal Service as *Express Mail* #EL880048562US in an envelope addressed to BOX: FEE - AMENDMENT, Assistant Commissioner for Patents, Washington, D.C. 20231 on October 9, 2001.

Ronald E. Massie, (Applicant)

By



Mitchell L. Crain

(October 9, 2001)

\_\_\_\_\_  
(Date of Signature)

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**MARKED UP VERSION SHOWING CHANGES MADE IN  
THE SPECIFICATION / ABSTRACT**

(Additions shown in bold and underlining; there are no deletions)

**IN THE SPECIFICATION / ABSTRACT:**

Please change the Abstract of Applicant's disclosure beginning at line 5 to read as follows:

- - A dental and orthopedic densitometry modeling system includes a controller with a microprocessor and a memory device connected to the microprocessor. An input device is also connected to the microprocessor for inputting diagnostic procedure parameters and patient information, **which may include a pre-existing densitometry model.** X-ray equipment including an X-ray source and an X-ray detector array are connected to a positioning motor for movement relative to a patient's dental or orthopedic structure in response to signals from the microprocessor. The output consists of a tomographical densitometry model. A dental/orthopedic densitometry modeling method involves moving the X-ray equipment across a predetermined scan path, emitting dual-energy X-ray beams, and outputting an image color-coded to correspond to a patient's dental or orthopedic density. - -

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### **CLEAN COPY OF CHANGE MADE IN SPECIFICATION / ABSTRACT**

Please change the Abstract of Applicant's disclosure beginning at line 5 to read as follows:

- - A dental and orthopedic densitometry modeling system includes a controller with a microprocessor and a memory device connected to the microprocessor. An input device is also connected to the microprocessor for inputting diagnostic procedure parameters and patient information, which may include a pre-existing densitometry model. X-ray equipment including an X-ray source and an X-ray detector array are connected to a positioning motor for movement relative to a patient's dental or orthopedic structure in response to signals from the microprocessor. The output consists of a tomographical densitometry model. A dental/orthopedic densitometry modeling method involves moving the X-ray equipment across a predetermined scan path, emitting dual-energy X-ray beams, and outputting an image color-coded to correspond to a patient's dental or orthopedic density. - -

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**MARKED UP VERSION SHOWING CHANGES MADE TO CLAIM NO. 1**

(Additions shown in bold and underlining; deletions in brackets)

1. (Amended) A system for tomographically modeling dental and orthopedic structure densitometry, which includes:
  - a) a controller with a microprocessor and a memory device connected to the microprocessor, **said controller including means for storing a pre-existing tomographical dental/orthopedic densitometry model;**
  - b) an input device connected to the microprocessor;
  - c) a positioning motor connected to the microprocessor and movable in response to signals from said microprocessor;
  - d) X-ray equipment including an X-ray source and a detector array;
  - e) conversion means for converting a signal from said detector array, said conversion means being connected to said detector array and to said microprocessor; and
  - f) an output device connected to said microprocessor and adapted for receiving a tomographical densitometry model from said microprocessor.

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**CLEAN COPY OF AMENDED CLAIM NO. 1**

1.     *(Amended)* A system for tomographically modeling dental and orthopedic structure densitometry, which includes:

- a)     a controller with a microprocessor and a memory device connected to the microprocessor, said controller including means for storing a pre-existing tomographical dental/orthopedic densitometry model;
- b)     an input device connected to the microprocessor;
- c)     a positioning motor connected to the microprocessor and movable in response to signals from said microprocessor;
- d)     X-ray equipment including an X-ray source and a detector array;
- e)     conversion means for converting a signal from said detector array, said conversion means being connected to said detector array and to said microprocessor; and
- f)     an output device connected to said microprocessor and adapted for receiving a tomographical densitometry model from said microprocessor.

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**MARKED-UP VERSION SHOWING CHANGES MADE TO CLAIM 9**

(Additions shown in bold and underlining; deletions in brackets)

9. The system according to Claim 1 wherein said controller includes [:
- a) means for storing a pre-existing tomographical dental/orthopedic densitometry model; and
  - b) means for comparing pre-existing and current tomographical densitometry models.] **means for comparing said pre-existing tomographical densitometry model to a current tomographical densitometry model.**

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**CLEAN COPY OF AMENDED CLAIM NO. 9**

Please amend Claim 9 to read as follows:

9.     *(Amended)* The system according to Claim 1 wherein said controller includes means for comparing said pre-existing tomographical densitometry model to a current tomographical densitometry model.

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APPLICANT: Ronald E. Massie  
 Serial No.: 09/452,348  
 Filed: Dec: 1, 1999  
 For: DENTAL AND ORTHOPEDIC

DENSITOMETRY SYSTEM AND METHOD  
 Substitute Drawing for FIG. 1

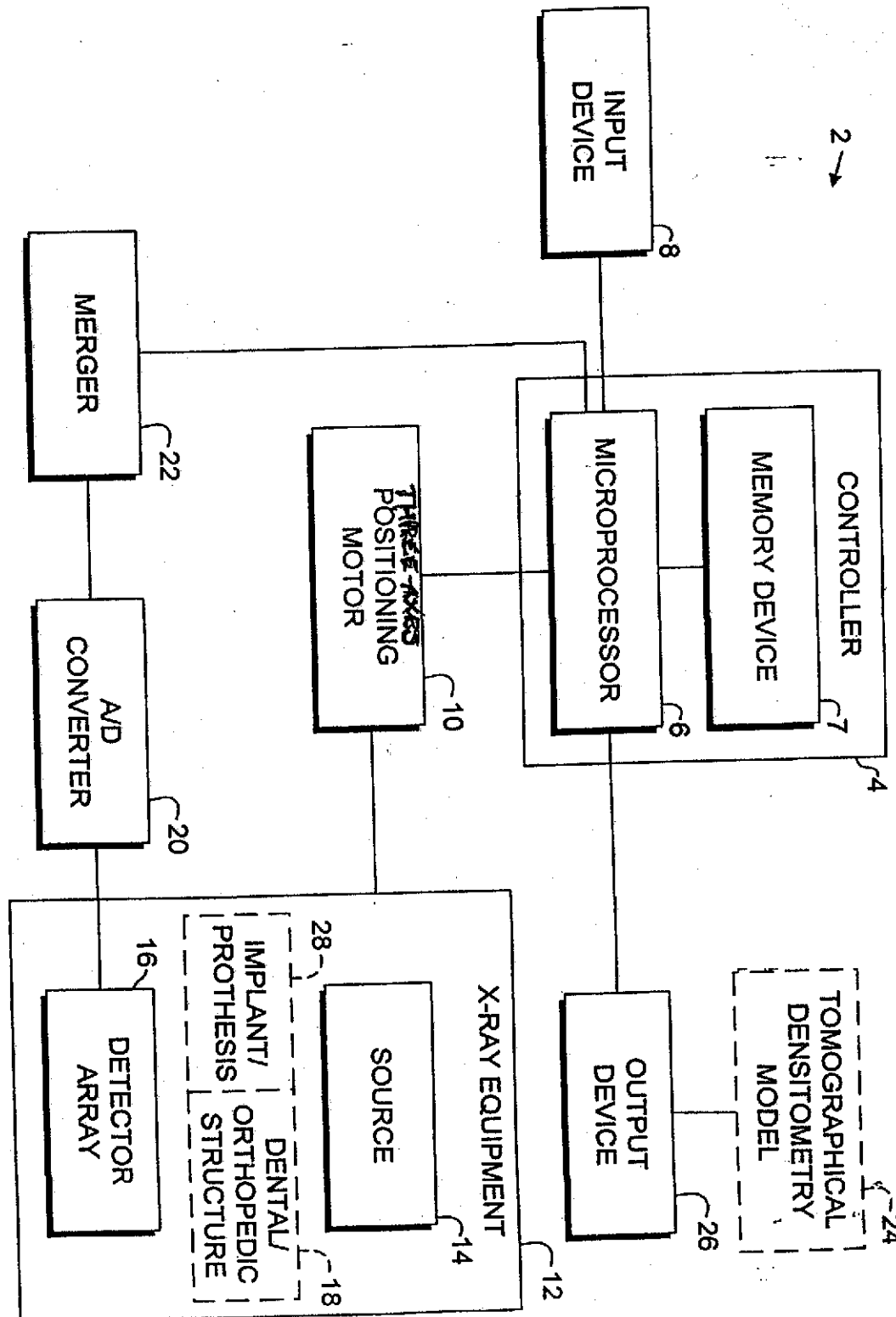
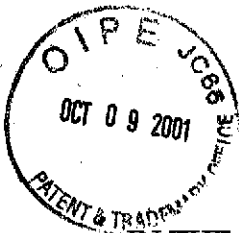


Fig. 1

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 [Signature]



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

REQUEST FOR EXTENSION OF TIME

(THREE -MONTH)

Applicant: Ronald E. Massie

Serial No.: 09/452,348

Date: October 9, 2001

Filed: December 1, 1999

Group Art Unit: 2882

Exam: Drew A. Dunn

For: DENTAL AND ORTHOPEDIC DENSITOMETRY MODELING  
SYSTEM AND METHOD

Kansas City, Missouri

Assistant Commissioner for Patents  
Box: FEE - AMENDMENT  
Washington, D. C. 20231

Sir:

Applicants petition the Commissioner of Patents and Trademarks to extend the time for response to the Office Action dated April 9, 2001, from its responsive due date of July 9, 2001, for an additional three (3) months from July 9, 2001 through and including October 9, 2001.

Attorney for Applicant encloses herewith its check in the amount of \$460.00 as the filing fee associated with this filing. The Commissioner is hereby authorized to charge from attorney's Deposit Account No. 12-1660 any additional processing and/or handling fees associated with this filing. *A duplicate copy of this sheet is enclosed.*

10/12/2001 HUNDMG1 00000043 09452348

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5/EX. OF  
Time  
(3)  
10/24/01  
D. Bell

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OCT 16 2001  
TECHNICAL STAFF

Ronald E. Massie, Applicant

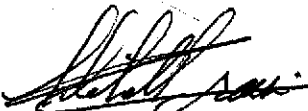
Serial No. 09/452,348

Respectfully submitted,

Ronald E. Massie, Applicant

By SHUGHART, THOMSON & KILROY, P.C.

By

  
Mitchell L. Crain

Reg. No. 37,299

Attorney for Applicant

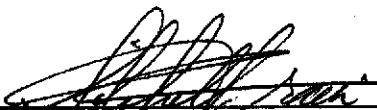
MEB:pab  
120 West 12th Street  
Kansas City, Missouri 64105  
Phone: (816) 421-3355

**Certificate of Mailing**

I hereby certify that the Amendment for Serial No. 09/452,348, filed December 1, 1999, has been submitted via *Express Mail* #EL880048562US, addressed to: Assistant Commissioner of Patents, BOX: FEE - AMENDMENT, Washington, D.C. 20231, on October 9, 2001.

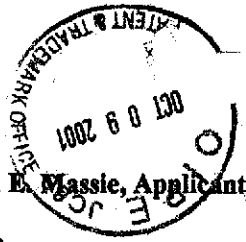
Ronald E. Massie, (Applicant)

By

  
Mitchell L. Crain

(October 9, 2001)

\_\_\_\_\_  
(Date of Signature)



10-10-01

2882  
#6

Date: October 9, 2001

In re application of: Ronald E. Classic, Applicant

Serial No.: 09/452,348  
Filed: December 1, 1999

Group Art Unit: 2882  
Examiner: Drew A. Dunn

For: DENTAL AND ORTHOPEDIC DENSITOMETRY MODELING SYSTEM AND METHOD

ASSISTANT COMMISSIONER FOR PATENTS  
BOX - (FEE) - AMENDMENT  
Washington, D. C. 20231

Sir:

Transmitted herewith is an Amendment in the above-identified application with the following documents:

- ☒ Request for Extension of Time (Three - Months) Under 37 C.F.R.
- ☒ Substitute Drawings
- ☒ Filing fees have been calculated as shown below:

|           |             |         |  | SMALL ENTITY |        | OTHER THAN<br>SMALL ENTITY |       |
|-----------|-------------|---------|--|--------------|--------|----------------------------|-------|
| CLAIMS    | HIGHEST NO. |         |  |              |        |                            |       |
| REMAINING | PREVIOUSLY  | PRESENT |  | RATE         | ADDL.  | RATE                       | ADDL. |
| AFTER     | PAID FOR    | EXTRA   |  | 355.00       | FEE    | 710.00                     | FEE   |
| AMENDMENT |             |         |  |              |        |                            |       |
| TOTAL     | Minus 20    | =       |  | x            | = \$ 0 | x 18                       | = \$  |
| INDEP     | Minus 3     | = 0     |  | x            | = \$ 0 | x 84                       | = \$  |

TOTAL  
ADDITIONAL FEE \$460.00

\*\* Filing fee is for Request for Extension of Time (3-Months) to File Amendment (\$460.00)

— The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 12-1660.  
A duplicate copy of this sheet is attached.

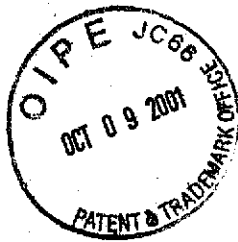
- ☒ Any filing fees under 37 C.F.R. 1.16 for presentation of extra claims.
- ☒ Any patent application processing fees under 37 C.F.R. 1.17.

120 West 12th Street  
Kansas City, Missouri 64105  
Telephone: (816) 421-3355

Respectfully submitted  
BY   
Mitchell L. Crain  
Reg. No. 37,299  
Attorney for Applicant

TECHNICAL CENTER 2001  
OCT 13 2001  
RECEIVED

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**CERTIFICATE OF MAILING**

I hereby certify that an AMENDMENT, Substitute Drawings, Request for Extension of Time to File (3-Months), Transmittal and appropriate filing fees for U.S. Patent Application No. 09/452,348, filed December 1, 1999, have been deposited with the United States Postal Service as *Express Mail #EL880048562US* in an envelope addressed to Assistant Commissioner of Patents; BOX: (FEE) AMENDMENT, Washington, D.C. 20231 on this 9<sup>th</sup> day of October, 2001.

Ronald E. Massie, Applicant

SHUGHART THOMSON & KILROY, P.C.

By:   
Mitchell L. Crain  
Reg. No. 37,299  
Attorney for Applicant

Date of Signature: 10/9/01

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TECHNICAL CENTER 2800

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# Interview Summary

Application No.

09/452,348

Applicant(s)

Massie

Examiner

Drew A. Dunn

Group Art Unit

2882



All participants (applicant, applicant's representative, PTO personnel):

(1) Drew A. Dunn

(3) \_\_\_\_\_

(2) Mitchell L. Crain (37,299)

(4) \_\_\_\_\_

Date of Interview 30 Nov 2001

Type: a) ☒ Telephonic b) ☐ Video Conference

c) ☐ Personal (copy is given to 1) ☐ applicant 2) ☐ applicant's representative]

Exhibit shown or demonstration conducted: d) ☐ Yes e) ☒ No. If yes, brief description:

Claim(s) discussed: 1, 10, 18, and 20

Identification of prior art discussed:

n/a

Agreement with respect to the claims f) ☒ was reached. g) ☐ was not reached. h) ☐ N/A.

Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments:

Authorization for the examiner's amendment was granted.

(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims allowable, if available, must be attached. Also, where no copy of the amendments that would render the claims allowable is available, a summary thereof must be attached.)

i) ☒ It is not necessary for applicant to provide a separate record of the substance of the interview (if box is checked).

Unless the paragraph above has been checked, THE FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN ONE MONTH FROM THIS INTERVIEW DATE TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. See Summary of Record of Interview requirements on reverse side or on attached

Examiner Note: You must sign this form unless it is an Attachment to a signed Office action.

# Notice of Allowability

Application No.

09/452,348

Applicant(s)

Massie

Examiner

Drew A. Dunn

Art Unit

2882



--The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance and Issue Fee Due or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the response and amendment filed 10/9/01.
2. ☒ The allowed claim(s) is/are 1-20.
3. ☐ The drawings filed on \_\_\_\_\_ are acceptable as formal drawings.
4. ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
- \*Certified copies not received: \_\_\_\_\_

5. ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application. **THIS THREE-MONTH PERIOD IS NOT EXTENDABLE FOR SUBMITTING NEW FORMAL DRAWINGS, OR A SUBSTITUTE OATH OR DECLARATION.** This three-month period for complying with the REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL is extendable under 37 CFR 1.136(a).

6. ☐ Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.
7. ☒ Applicant MUST submit NEW FORMAL DRAWINGS
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto    or    2) ☐ to Paper No. \_\_\_\_\_.
- (b) ☒ including changes required by the proposed drawing correction filed 9 Oct 2001, which has been approved by the examiner.
- (c) ☐ including changes required by the attached Examiner's Amendment/Comment or in the Office action of Paper No. \_\_\_\_\_.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings. The drawings should be filed as a separate paper with a transmittal letter addressed to the Official Draftsperson.

8. ☐ Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Any reply to this letter should include, in the upper right hand corner, the APPLICATION NUMBER (SERIES CODE/SERIAL NUMBER). If applicant has received a Notice of Allowance and Issue Fee Due, the ISSUE BATCH NUMBER and DATE of the NOTICE OF ALLOWANCE should also be included.

## Attachment(s)

- 1 ☐ Notice of References Cited (PTO-892)
- 2 ☐ Notice of Informal Patent Application (PTO-152)
- 3 ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 4 ☒ Interview Summary (PTO-413), Paper No. 7
- 5 ☐ Information Disclosure Statement(s) (PTO-1449), Paper No(s). \_\_\_\_\_
- 6 ☒ Examiner's Amendment/Comment
- 7 ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
- 8 ☒ Examiner's Statement of Reasons for Allowance
- 9 ☐ Other



UNITED STATES DEPARTMENT OF COMMERCE  
Patent and Trademark Office  
ASSISTANT SECRETARY AND COMMISSIONER  
OF PATENTS AND TRADEMARKS  
Washington, D.C. 20231

Paper No. 8B  
TAP  
(11/30/01)

Application Number: 09/452,348

Filing Date: 12/01/99

Applicant(s): Massie

### DETAILED ACTION

#### *Examiner's Amendment*

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mitchell L. Crain (37,299) on 30 November 2001.

1) The **Claims** in the application have been amended as follows:

Claim 10 line 6, after "parameters" the following has been inserted, --, including a pre-existing densitometry model,--;

Replace original Claim 18 with:

Claim 18 (amended) The method according to Claim 10 which includes the additional step[s] of [: a) inputting to said microprocessor a pre-existing tomographical densitometry model; and b)] comparing said patient's current densitometry model to pre-existing densitometry model.

21

B

Art Unit: 2882

2) In the **Drawings**, the amendment filed has been approved and the required corrected subject matter which was add has been marked over in red ink as required in drawing changes.

*Allowable Subject Matter*

Claims 1-20 are allowed.

The following is an examiner's statement of reasons for allowance: though the prior art discloses tomographic modeling for dentistry, it fails to teach or suggest the further steps and system for inputting or containing patient diagnostic parameters, including a pre-existing densitometry model.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

*Conclusion*

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure has been cited as of interest.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Drew A. Dunn** whose telephone number is (703) 305-0024. The examiner can normally be reached between the hours of 8:00 AM to 3:00 PM Monday thru Thursday and every other Friday (second Friday of the bi-week).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert H. Kim, can be reached on (703) 305-3492. The fax phone number for this Group is (703) 308-7722 or (703)308-7724.

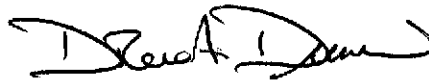
B

Art Unit: 2882

Communications via Internet e-mail regarding this application, other than those under 35 U.S.C. 132 or which otherwise require a signature, may be used by the applicant and should be addressed to [**drew.dunn@uspto.gov**].

All Internet e-mail communications will be made of record in the application file. PTO employees do not engage in Internet communications where there exists a possibility that sensitive information could be identified or exchanged unless the record includes a properly signed express waiver of the confidentiality requirements of 35 U.S.C. 122. This is more clearly set forth in the Interim Internet Usage Policy published in the Official Gazette of the Patent and Trademark on February 25, 1997 at 1195 OG 89.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.



Drew A. Dunn  
Primary Examiner Art Unit 2882  
30 November 2001

B



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UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER OF PATENTS AND TRADEMARKS  
Washington, D.C. 20231  
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

7590 12/04/2001

SHUGHART THOMSON & KILROY, PC  
TWELVE WYANDOTTE PLAZA  
120 WEST 12TH STREET  
KANSAS CITY, MO 64105

EXAMINER

DUNN, DREW A

ART UNIT CLASS-SUBCLASS

2882

378-039000

DATE MAILED: 12/04/2001

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 09/452,348      | 12/01/1999  | RONALD E. MASSIE     | 99.378              | 1203             |

TITLE OF INVENTION: DENTAL AND ORTHOPEDIC DENSITOMETRY MODELING SYSTEM AND METHOD

| TOTAL CLAIMS | APPLN. TYPE    | SMALL ENTITY | ISSUE FEE | PUBLICATION FEE | TOTAL FEE(S) DUE | DATE DUE   |
|--------------|----------------|--------------|-----------|-----------------|------------------|------------|
| 20           | nonprovisional | YES          | \$640     | \$0             | \$640            | 03/04/2002 |

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT.

**PROSECUTION ON THE MERITS IS CLOSED.** THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN **THREE MONTHS** FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. **THIS STATUTORY PERIOD CANNOT BE EXTENDED.** SEE 35 U.S.C. 151.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above. If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:  
A. If the status is changed, pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above and notify the United States Patent and Trademark Office of the change in status, or  
B. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check the box below and enclose the PUBLICATION FEE and 1/2 the ISSUE FEE shown above.

☐ Applicant claims SMALL ENTITY status.  
See 37 CFR 1.27.

II. PART B - FEE(S) TRANSMITTAL should be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). Even if the fee(s) have already been paid, Part B - Fee(s) Transmittal should be completed and returned. If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Box ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER:** Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

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7590 12/04/2001

SHUGHART THOMSON & KILROY, PC  
TWELVE WYANDOTTE PLAZA  
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KANSAS CITY, MO 64105

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|                    |
|--------------------|
| (Depositor's name) |
| (Signature)        |
| (Date)             |

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 09/452,348      | 12/01/1999  | RONALD E. MASSIE     | 99.378              | 1203             |

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|--------------|----------------|--------------|-----------|-----------------|------------------|------------|
| 20           | nonprovisional | YES          | \$640     | \$0             | \$640            | 03/04/2002 |

| EXAMINER     | ART UNIT | CLASS-SUBCLASS |
|--------------|----------|----------------|
| DUNN, DREW A | 2882     | 378-039000     |

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363). Use of PTO form(s) and Customer Number are recommended, but not required.

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.  
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47) attached.

2. For printing on the patent front page, list (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 \_\_\_\_\_  
2 \_\_\_\_\_  
3 \_\_\_\_\_

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. Inclusion of assignee data is only appropriate when an assignment has been previously submitted to the USPTO or is being submitted under separate cover. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) ☐ individual ☐ corporation or other private group entity ☐ government

4a. The following fee(s) are enclosed:

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☐ The Commissioner is hereby authorized by charge the required fee(s), or credit any overpayment, to Deposit Account Number \_\_\_\_\_ (enclose an extra copy of this form).

The COMMISSIONER OF PATENTS AND TRADEMARKS is requested to apply the Issue Fee and Publication Fee (if any) to the application identified above.

(Authorized Signature)

(Date)

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| APPLICATION NO.                                                                                                           | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---------------------------------------------------------------------------------------------------------------------------|-------------|----------------------|---------------------|------------------|
| 09/452,348                                                                                                                | 12/01/1999  | RONALD E. MASSIE     | 99.378              | 1203             |
| 7590                                                                                                                      | 12/04/2001  |                      | EXAMINER            |                  |
| SHUGHART THOMSON & KILROY, PC<br>TWELVE WYANDOTTE PLAZA<br>120 WEST 12TH STREET<br>KANSAS CITY, MO 64105<br>UNITED STATES |             |                      | DUNN, DREW A        |                  |
|                                                                                                                           |             |                      | ART UNIT            | PAPER NUMBER     |
|                                                                                                                           |             |                      | 2882                |                  |
| DATE MAILED: 12/04/2001                                                                                                   |             |                      |                     |                  |

**Determination of Patent Term Extension under 35 U.S.C. 154 (b)**  
(application filed after June 8, 1995 but prior to May 29, 2000)

The patent term extension is days. Any patent to issue from the above identified application will include an indication of the day extension on the front page.

If a continued prosecution application (CPA) was filed in the above-identified application, the filing date that determines patent term extension is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) system. (<http://pair.uspto.gov>)

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CURRENT CORRESPONDENCE ADDRESS (Note: Legibly mark-up with any correction or use Block 1)

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12/04/2001

SHUGHART THOMSON & KILROY, P.C.  
TWELVE WYANDOTT PLAZA  
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KANSAS CITY, MO 64105



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Kent P. Erickson (Depositor's name)  
[Signature] (Signature)  
3/1/02 (Date)

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
|-----------------|-------------|----------------------|---------------------|------------------|

09/452,348

2/01/1999

RONALD E. MASSIE

99.378

1203

TITLE OF INVENTION: DENTAL AND ORTHOPEDIC DENSITOMETRY MODELING SYSTEM AND METHOD

| TOTAL CLAIMS | APPL. TYPE | SMALL ENTITY | ISSUE FEE | PUBLICATION FEE | TOTAL FEE(S) DUE | DATE DUE |
|--------------|------------|--------------|-----------|-----------------|------------------|----------|
|--------------|------------|--------------|-----------|-----------------|------------------|----------|

20

nonprovisional

YES

\$640

\$0

\$640

03/04/2002

| EXAMINER | ART UNIT | CLASS-SUBCLASS |
|----------|----------|----------------|
|----------|----------|----------------|

DUNN, DREW A

2862

378-039000

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2. For printing on the patent front page, list (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Shughart Thomson & Kilroy  
P.C.  
2  
3

## 3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. Inclusion of assignee data is only appropriate when an assignment has been previously submitted to the PTO or is being submitted under separate cover. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) ☐ individual ☐ corporation or other private group entity ☐ government

## 4a. The following fee(s) are enclosed:

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- ☒ A check in the amount of the fee(s) is enclosed.  
☐ Payment by credit card. Form PTO-2038 is attached.  
☐ The Commissioner is hereby authorized by charge the required fee(s), or credit any overpayment, to Deposit Account Number 12-11660 (enclose an extra copy of this form).

The COMMISSIONER OF PATENTS AND TRADEMARKS is requested to apply the Issue Fee and Publication Fee (if any) to the application identified above.

(Authorized Signature) (Date)

[Signature] 3/1/02

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PTOL-85 (REV. 07-01) Approved for use through 01/31/2004. OMB 0651-0033

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Allow December 4, 2001  
Serial No. 09/452,348

91  
#9  
J.L.G.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER

Applicant: Ronald E. Massie

Serial No. 09/452,348

Group Art Unit: 2882

Filed: December 1, 1999

Exam: Drew A. Dunn

For: DENTAL AND ORTHOPEDIC DENSITOMETRY MODELING SYSTEM AND METHOD

-----  
ATTN: OFFICIAL DRAFTSPERSON  
Assistant Commissioner of Patents  
2231 Crystal Park III, Suite 915  
Arlington, Virginia 22202

Kansas City, Missouri

RECEIVED  
MAR 13 2002  
Office of Patent Publication  
Director's Office

Sir:

Enclosed is one set of copies of the formal drawings in the above-noted application as required in the Examiner's Notice of Allowability dated December 4, 2001.

The formal drawings have been studied with regard to the informal drawings filed with the application and it is believed that no new matter is presented by the filing of the formal drawings.

Respectfully submitted,

SHUGHART THOMSON & KILROY



Kent R. Erickson  
Reg. No. 36,793

KRE:vbf  
Enclosure

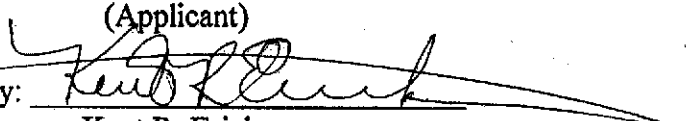
120 West 12th Street  
Kansas City, Missouri 64105

12.01

Allow December 4, 2001  
Serial No. 09/452,348

I hereby certify that this letter  
addressed to the Official Draftsman  
along with 2 sheet of formal drawings  
is being deposited  
with the United States Postal  
Service as first class mail in an  
envelope addressed to:  
ATTN: OFFICIAL DRAFTSPERSON,  
Assistant Commissioner for Patents,  
2231 Crystal Park III, Suite 915,  
Arlington, Virginia 22202,  
on March 1, 2002.

Ronald E. Massie  
(Applicant)

By: 

Kent R. Erickson

March 1, 2002  
(Date of Signature)

6381301

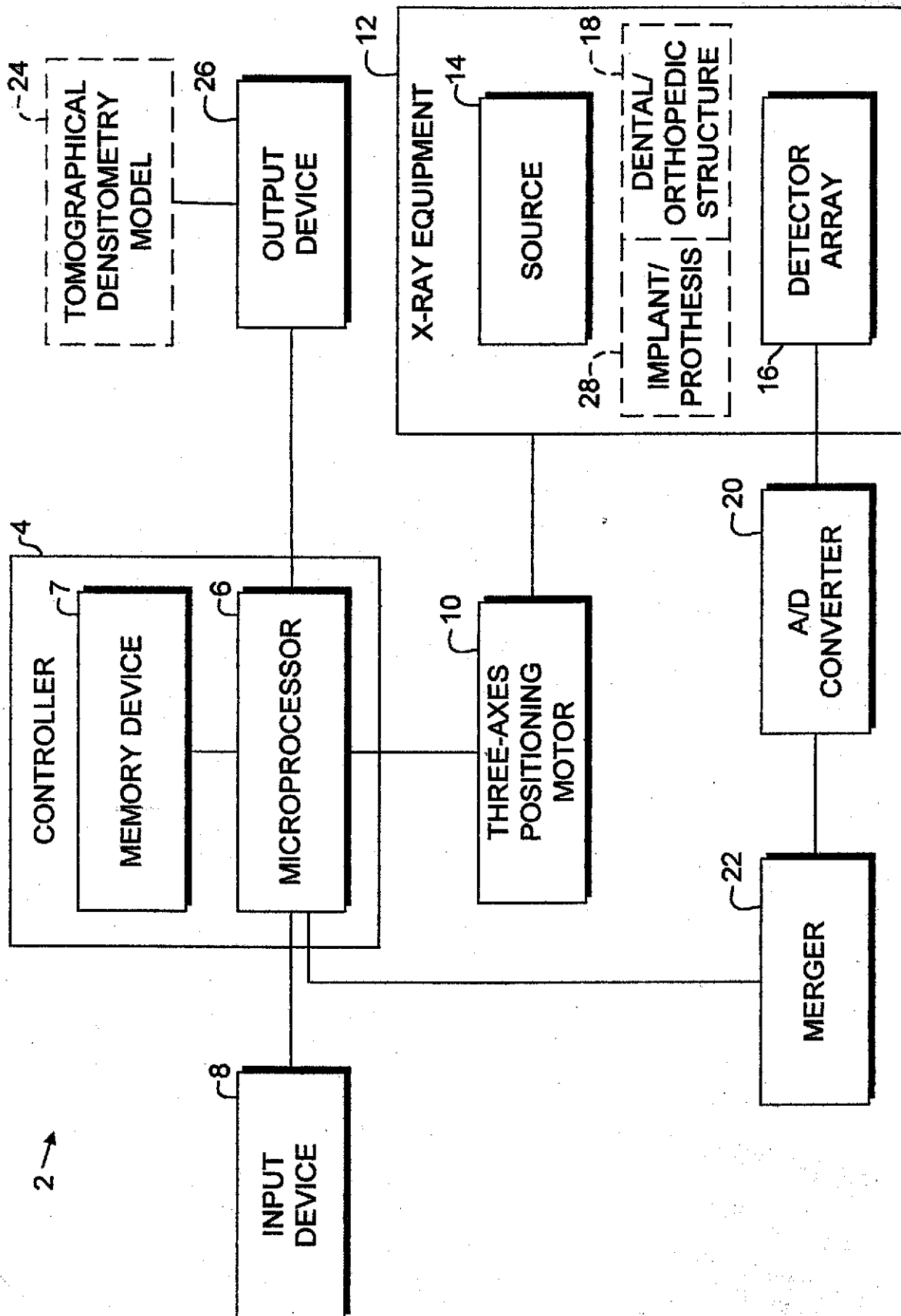


Fig. 1

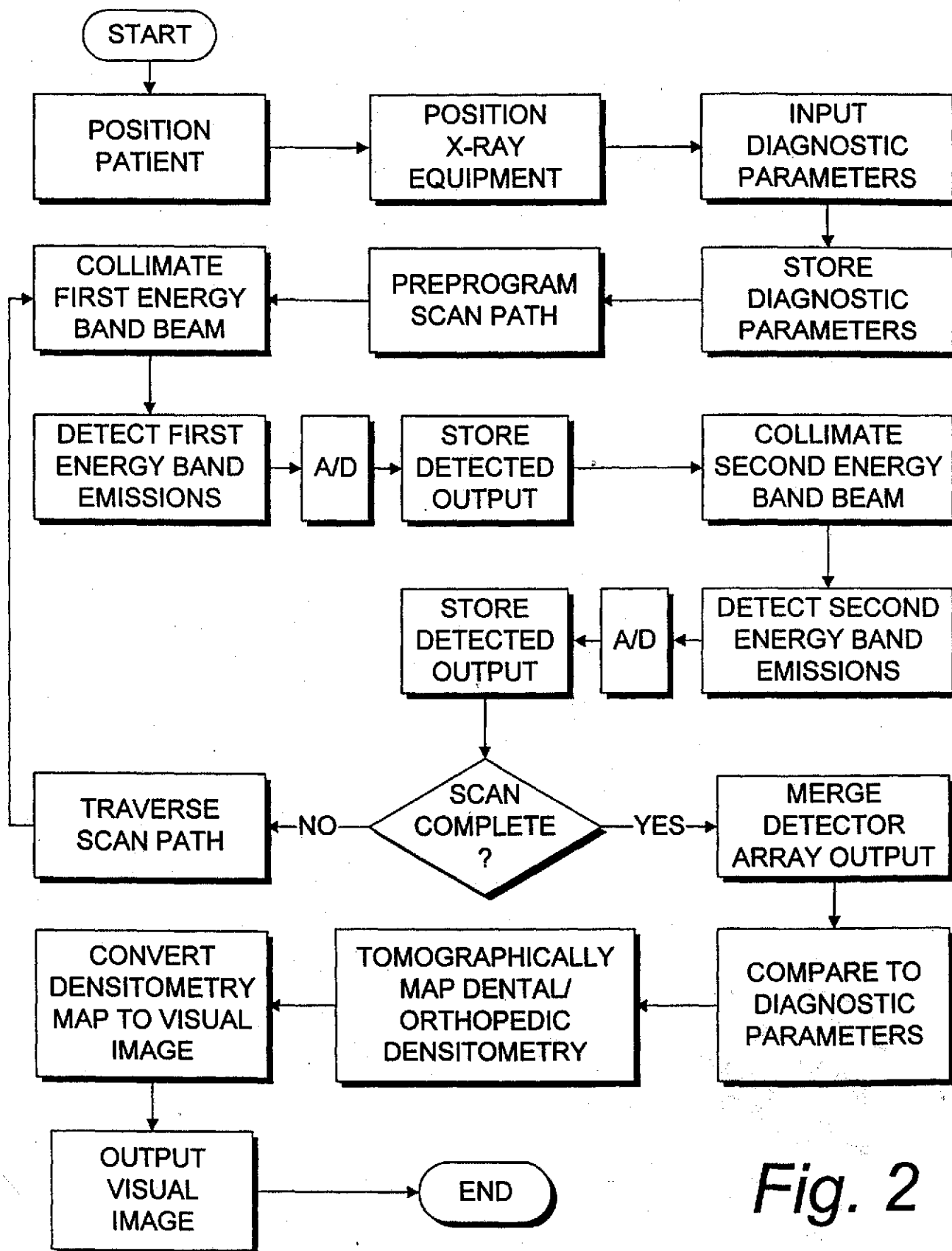


*Fig. 2*



04-24-02

2882

Please type a plus sign (+) inside this box → ☐

PTO/SB/82 (10-00)

Approved for use through 10/31/2002. OMB 0651-0035

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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# REVOCATION OF POWER OF ATTORNEY OR AUTHORIZATION OF AGENT

|                        |                  |
|------------------------|------------------|
| Application Number     | 09/452,348       |
| Filing Date            | December 1, 1999 |
| First Named Inventor   | Ronald E. Massie |
| Group Art Unit         | 2882             |
| Examiner Name          | Drew A. Dunn     |
| Attorney Docket Number | 2932             |

I hereby revoke all previous powers of attorney or authorizations of agent given in the above-identified application:

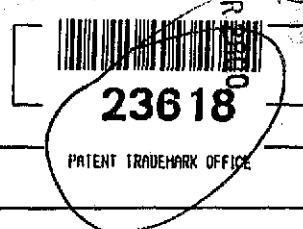
☒ A Power of Attorney or Authorization of Agent is submitted herewith.

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OR



|                                                             |                                   |       |                |     |       |
|-------------------------------------------------------------|-----------------------------------|-------|----------------|-----|-------|
| <input checked="" type="checkbox"/> Firm or Individual Name | Chase Law Firm, L.C.              |       |                |     |       |
| Address                                                     | 4400 College Boulevard, Suite 130 |       |                |     |       |
| Address                                                     |                                   |       |                |     |       |
| City                                                        | Overland Park                     |       |                |     |       |
| Country                                                     | U. S. A.                          | State | Kansas         | ZIP | 66211 |
| Telephone                                                   | (913) 339-9666                    | Fax   | (913) 339-6061 |     |       |

I am the:

☒ Applicant/Inventor.

☐ Assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)

## SIGNATURE of Applicant or Assignee of Record

|           |                         |
|-----------|-------------------------|
| Name      | Ronald E. Massie        |
| Signature | <i>Ronald E. Massie</i> |
| Date      | 3/27/02                 |

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EXPRESS MAIL LABEL NUMBER EV097208479 US  
DATE OF DEPOSIT 4/23/02  
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*DAN Chase* 20,682  
(PRINTED NAME)  
(SIGNATURE) *D. M. Massie*

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below\*.

☒ \*Total of 2 forms are submitted.

Burden Hour Statement: This form is estimated to take 3 minutes to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.



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PTO/SB/81 (02-01)

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|                        |                                                                  |
|------------------------|------------------------------------------------------------------|
| Application Number     | 09/452,348                                                       |
| Filing Date            | December 1, 1999                                                 |
| First Named Inventor   | Ronald E. Massie                                                 |
| Title                  | DENTAL AND ORTHOPEDIC DENSITOMETRY<br>MODELING SYSTEM AND METHOD |
| Group Art Unit         | 2882                                                             |
| Examiner Name          | Drew A. Dunn                                                     |
| Attorney Docket Number | 2932                                                             |

I hereby appoint:

☒ Practitioners at Customer Number

OR

☐ Practitioner(s) named below:

| Name | Registration Number |
|------|---------------------|
|      |                     |
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I am the:

☒ Applicant/Inventor.

☐ Assignee of record of the entire interest. See 37 CFR 3.71.

Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96).

SIGNATURE of Applicant or Assignee of Record

Name

Ronald E. Massie

Signature

*Ronald E. Massie*

Date

3/27/02

CERTIFICATE OF MAILING BY "EXPRESS MAIL"  
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I CERTIFY THAT THIS PAPER OR FEE IS BEING DEPOSITED  
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2900 CRYSTAL DRIVE, ARLINGTON, VIRGINIA 22202-3513  
D.A.N. Chase 20,682  
(PRINTED NAME)

(SIGNATURE) *D.A.N. Chase*

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below\*.

☒ \*Total of 2 forms are submitted.

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6881301



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| APPLICATION NUMBER | FILING DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|--------------------|-------------|-----------------------|------------------------|
| 09/452,348         | 12/01/1999  | RONALD E. MASSIE      | 99.378                 |

CONFIRMATION NO. 1203

23618  
CHASE & YAKIMO, L.C.  
4400 COLLEGE BOULEVARD, SUITE 130  
OVERLAND PARK, KS 66211



\*OC000000008042969\*

Date Mailed: 05/07/2002

## NOTICE REGARDING POWER OF ATTORNEY

This is in response to the Power of Attorney filed 05/07/2002.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

DAVID O LIPSCOMB  
OPR (703) 308-7127

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**DATE:** March 18, 2003  
**TO:** Certificates of Correction Branch  
**FROM:** Robert Kim (prepared by Drew Dunn)  
SPE, Art Unit 2882  
**SUBJECT:** Request for Certificate of Correction

Please issue a Certificate of Correction in U. S. Letters Patent No. 6,381,301 B1 as specified below:

In column 6, line 11, after "parameters" please insert --, including a pre-existing densitometry model,--.

It is noted that, though the above amendment was made in the application by an approved Examiner's amendment "B" at the time the case was allowed, it was never printed in the issued patent.

  
Robert Kim, SPE

Art Unit 2882

UNITED STATES PATENT AND TRADEMARK OFFICE

**CERTIFICATE OF CORRECTION**

PATENT NO. : 6,381,301 B1  
DATED : APR 30, 2002  
INVENTOR(S) : MASSIE

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 6, line 11, after "parameters"  
insert --, including a pre-existing  
densitometry model, --

0

UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 6,381,301 B1  
DATED : April 30, 2002  
INVENTOR(S) : Massie

Page 1 of 1

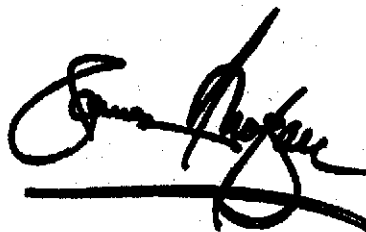
It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 6,

Line 11, after "parameters" insert --, including a pre-existing densitometry model, --

Signed and Sealed this

Third Day of June, 2003

A handwritten signature in black ink, appearing to read "James E. Rogan", written over a horizontal line.

JAMES E. ROGAN  
*Director of the United States Patent and Trademark Office*



**COMPLETED**

PTO/SB/123 (01-06)  
Approved for use through 12/31/2008. OMB 0851-0835  
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE  
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**CHANGE OF  
CORRESPONDENCE ADDRESS  
Patent**

Address to:  
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Alexandria, VA 22313-1450

|                        |                  |
|------------------------|------------------|
| Patent Number          | 6,381,301        |
| Issue Date             | April 30, 2002   |
| Application Number     | 09/452,348       |
| Filing Date            | January 1, 1999  |
| First Named Inventor   | Ronald E. Massie |
| Attorney Docket Number | 2932             |

Please change the Correspondence Address for the above-identified patent to:

☒ The address associated with Customer Number: 63151

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|      |       |     |
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| City | State | ZIP |
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Country

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I am the:

- ☒ Patentee.
- ☐ Assignee of record of the entire interest. See 37 CFR 3.71.  
Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96).
- ☐ Attorney or agent of record. Registration Number \_\_\_\_\_

Signature   
Typed or Printed Name Ronald E. Massie

|                      |                        |
|----------------------|------------------------|
| Date August 15, 2006 | Telephone 573-365-0220 |
|----------------------|------------------------|

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below\*.

☐ \*Total of \_\_\_\_\_ forms are submitted.

This collection of information is required by 37 CFR 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Mail Stop Post Issue, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

| <b>PATENT APPLICATION FEE DETERMINATION RECORD</b><br>Effective November 10, 1998 |                                                |                                  |                         |                                    | Application or Docket Number<br><div style="border: 1px solid black; padding: 2px; display: inline-block;">452348</div> |
|-----------------------------------------------------------------------------------|------------------------------------------------|----------------------------------|-------------------------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>CLAIMS AS FILED - PART I</b>                                                   |                                                |                                  |                         |                                    |                                                                                                                         |
|                                                                                   |                                                | (Column 1)                       | (Column 2)              |                                    |                                                                                                                         |
| FOR                                                                               |                                                | NUMBER FILED                     | NUMBER EXTRA            |                                    |                                                                                                                         |
| BASIC FEE                                                                         |                                                |                                  |                         |                                    |                                                                                                                         |
| TOTAL CLAIMS                                                                      |                                                | 20                               | minus 20 = *            | 1                                  |                                                                                                                         |
| INDEPENDENT CLAIMS                                                                |                                                | 3                                | minus 3 = *             | 1                                  |                                                                                                                         |
| MULTIPLE DEPENDENT CLAIM PRESENT                                                  |                                                |                                  |                         |                                    |                                                                                                                         |
| * If the difference in column 1 is less than zero, enter "0" in column 2          |                                                |                                  |                         |                                    |                                                                                                                         |
| <b>CLAIMS AS AMENDED - PART II</b>                                                |                                                |                                  |                         |                                    |                                                                                                                         |
|                                                                                   |                                                | (Column 1)                       | (Column 2)              | (Column 3)                         |                                                                                                                         |
| AMENDMENT A                                                                       |                                                | CLAIMS REMAINING AFTER AMENDMENT |                         | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA                                                                                                           |
|                                                                                   | Total                                          | * 20                             | Minus                   | ** 20                              | = 0                                                                                                                     |
|                                                                                   | Independent                                    | * 3                              | Minus                   | *** 3                              | = 0                                                                                                                     |
|                                                                                   | FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM |                                  |                         |                                    |                                                                                                                         |
|                                                                                   |                                                |                                  |                         |                                    |                                                                                                                         |
| AMENDMENT B                                                                       |                                                | CLAIMS REMAINING AFTER AMENDMENT |                         | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA                                                                                                           |
|                                                                                   | Total                                          | *                                | Minus                   | **                                 | =                                                                                                                       |
|                                                                                   | Independent                                    | *                                | Minus                   | ***                                | =                                                                                                                       |
|                                                                                   | FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM |                                  |                         |                                    |                                                                                                                         |
|                                                                                   |                                                |                                  |                         |                                    |                                                                                                                         |
| AMENDMENT C                                                                       |                                                | CLAIMS REMAINING AFTER AMENDMENT |                         | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA                                                                                                           |
|                                                                                   | Total                                          | *                                | Minus                   | **                                 | =                                                                                                                       |
|                                                                                   | Independent                                    | *                                | Minus                   | ***                                | =                                                                                                                       |
|                                                                                   | FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM |                                  |                         |                                    |                                                                                                                         |
|                                                                                   |                                                |                                  |                         |                                    |                                                                                                                         |
| SMALL ENTITY TYPE <input type="checkbox"/>                                        |                                                | OR                               | OTHER THAN SMALL ENTITY |                                    |                                                                                                                         |
| RATE                                                                              | FEE                                            |                                  | RATE                    | FEE                                |                                                                                                                         |
|                                                                                   | 380.00                                         | OR                               |                         | 760.00                             |                                                                                                                         |
| X\$ 9=                                                                            |                                                | OR                               | X\$18=                  |                                    |                                                                                                                         |
| X39=                                                                              |                                                | OR                               | X78=                    |                                    |                                                                                                                         |
| +130=                                                                             |                                                | OR                               | +260=                   |                                    |                                                                                                                         |
| TOTAL                                                                             |                                                | OR                               | TOTAL                   |                                    |                                                                                                                         |
| SMALL ENTITY                                                                      |                                                | OR                               | OTHER THAN SMALL ENTITY |                                    |                                                                                                                         |
| RATE                                                                              | ADDITIONAL FEE                                 |                                  | RATE                    | ADDITIONAL FEE                     |                                                                                                                         |
| X\$ 9=                                                                            |                                                | OR                               | X\$18=                  |                                    |                                                                                                                         |
| X39=                                                                              |                                                | OR                               | X78=                    |                                    |                                                                                                                         |
| +130=                                                                             |                                                | OR                               | +260=                   |                                    |                                                                                                                         |
| TOTAL ADDIT. FEE                                                                  |                                                | OR                               | TOTAL ADDIT. FEE        |                                    |                                                                                                                         |

| POSITION                  | INITIALS    | ID NO. | DATE     |
|---------------------------|-------------|--------|----------|
| FEE DETERMINATION         | <i>JK</i>   | 75331  |          |
| O.I.P.E. CLASSIFIER       | <i>M-LW</i> | 5a     | 12-20-99 |
| FORMALITY REVIEW          |             |        |          |
| RESPONSE FORMALITY REVIEW |             | 77471  | 1/7      |

INDEX OF CLAIMS

✓ ..... Rejected  
= ..... Allowed  
- (Through numeral)... Canceled  
÷ ..... Restricted

N ..... Non-elected  
I ..... Interference  
A ..... Appeal  
O ..... Objected

| Claim | Date     |   |   |  |
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| Final | Original |   |   |  |
| 1     | 2        | ✓ | = |  |
| 2     | 3        | ✓ | = |  |
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| 4     | 5        | ✓ | = |  |
| 5     | 6        | ✓ | = |  |
| 6     | 7        | ✓ | = |  |
| 7     | 8        | ✓ | = |  |
| 8     | 9        | ✓ | = |  |
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| Claim | Date     |  |  |  |
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| Claim | Date     |  |  |  |
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If more than 150 claims or 10 actions  
 staple additional sheet here

| SEARCHED      |                                     |         |       |
|---------------|-------------------------------------|---------|-------|
| Class         | Sub.                                | Date    | Exmr. |
| 378           | 205<br>170<br>176<br>38<br>39<br>40 | 2/2001  | DAD   |
| UPDATED ABOVE |                                     | 11/2001 | DAD   |
| 207           |                                     |         |       |

| INTERFERENCE SEARCHED |                        |         |       |
|-----------------------|------------------------|---------|-------|
| Class                 | Sub.                   | Date    | Exmr. |
| 378                   | 205<br>170<br>38<br>39 | 11/2001 | DAD   |

| SEARCH NOTES<br>(INCLUDING SEARCH STRATEGY) |        |       |
|---------------------------------------------|--------|-------|
| DATE SEARCHED                               | Date   | Exmr. |
| DATE SEARCHED                               | 3/2001 | DAD   |