UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

EXOCAD GMBH and EXOCAD AMERICA, INC.,
Petitioner,

v.

3SHAPE A/S,
Patent Owner.

Case IPR2018-00788
Patent 9,336,336 B2

PETITIONERS' DEMONSTRATIVES

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Petitioners' Demonstratives

Patent-in-Suit

(12) **United States Patent**
Deichmann et al.

(10) **Patent No.: US 9,336,336 B2**
(45) **Date of Patent: May 10, 2016**

(54) **2D IMAGE ARRANGEMENT**

(75) Inventors: **Nikolaj Deichmann**, Copenhagen Ø (DK); **Tais Clausen**, Klagshamn (SE); **Rune Fisker**, Virum (DK); **Henrik Öjelund**, Lyngby (DK)

(73) Assignee: **3SHAPE A/S**, Kobenhavn K (DK)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 722 days.

(21) Appl. No.: **13/807,443**

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§ 371 (c)(1),
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Related U.S. Application Data

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**
G06F 17/50 (2006.01)
A61C 13/00 (2006.01)
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(52) **U.S. Cl.**
CPC ***G06F 17/50*** (2013.01); ***A61C 9/0046*** (2013.01); ***A61C 13/0004*** (2013.01); *A61B 1/0005* (2013.01)

(58) **Field of Classification Search**
CPC A61B 1/0005
USPC 703/13
See application file for complete search history.

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(57) **ABSTRACT**

Disclosed is a method of designing a dental restoration for a patient, wherein the method includes providing one or more 2D images, where at least one 2D image includes at least one facial feature; providing a 3D virtual model of at least part of the patient's oral cavity; arranging at least one of the one or more 2D images relative to the 3D virtual model in a virtual 3D space such that the 2D image and the 3D virtual model are aligned when viewed from a viewpoint, whereby the 3D virtual model and the 2D image are both visualized in the 3D space; and modeling a restoration on the 3D virtual model, where the restoration is designed to fit the facial feature of the at least one 2D image.

30 Claims, 27 Drawing Sheets

('336 patent, Ex. 1001.)

Patent-in-Suit (cont'd)

The invention claimed is:

1. A computer-implemented method of designing a denta restoration for a patient, wherein the method comprises:

using a hardware processor to:

provide one or more 2D images, where at least one of the one or more 2D images comprises at least one facial feature, wherein the at least one facial feature comprises lips,

either virtually cut at least a part of teeth out of the at least one 2D image or render a part of the at least one 2D image that includes teeth at least partly or wholly transparent;

provide a 3D virtual model of at least part of an oral cavity of the patient;

arrange the at least one 2D image relative to the 3D virtual model in a virtual 3D space such that the at least one 2D image and the 3D virtual model are aligned when viewed from a viewpoint and remain separate representations after being arranged, whereby the 3D virtual model and the at least one 2D image are both visualized in the 3D space; and

design a restoration for the 3D virtual model, where the restoration is designed to fit the at least one facial feature of the at least one 2D image;

wherein the at least one 2D image and the 3D virtual model are aligned by scaling, translating or rotating the at least one 2D image or the 3D virtual model relative to each other.

('336 patent, Ex. 1001, claim 1.)

Overview – Patent Owner's Arguments Related to Sachdeva

- Sachdeva (anticipation)
  - "Morphable Model 102" is 3D, not 2D
  - The morphable face model and 3D tooth model do not "remain separate representations after being arranged"
  - No disclosure of "virtually cut[ting] at least part of teeth out of the at least one 2D image or render[ing] a part of the at least one 2D image that includes teeth partly or wholly transparent
  - Dependent claims 6-8 and 9
- Sachdeva/Kopelman (obviousness)
  - It would not have been obvious to combine
  - Kopelman (also) does not disclose that the 2D image and 3D tooth model "remain separate representations after being arranged"
- Other arguments in sur-reply, but should be stricken

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