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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte NIKOLAOS V. TSEKOS and AHMET E. SONMEZ

Appeal 2018-005957
Application 13/199,741
Technology Center 3700

Before BRETT C. MARTIN, MICHELLE R. OSINSKI, and
PAUL J. KORNICZKY, *Administrative Patent Judges*.

KORNICZKY, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE¹

Pursuant to 35 U.S.C. § 134(a), Appellant² appeals from the Examiner's decision, as set forth in the Final Office Action, rejecting claims 1, 2, 4, 5, 7, 12–16, 18–25, and 31–34 under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over Vesely (US 6,246,898 B1, issued June 12, 2001), Strommer (US 2002/0049375 A1, published April 25, 2002), and Hauck (US 2007/0181139 A1, published August 9, 2007). Final Act. 2. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

THE CLAIMED SUBJECT MATTER

The claims are directed to devices, systems and methods for multimodal biosensing and imaging of a tissue in a subject. Claims 1, 18, and 31 are the independent claims on appeal. Claim 1, reproduced below, is illustrative of the claimed subject matter:

1. An automated system for multimodality biosensing and imaging of a tissue in a subject, comprising:
 - an actuated manipulator with two degrees of freedom of linear and rotational movement configured for mechanically scanning an area of interest inside the tissue;
 - a computational core comprising a plurality of software modules having instructions executed by a processor on a computer and electronically and tangibly interlinked with the actuated manipulator and the computer;

¹ In this Decision, we refer to (1) the Examiner's Final Office Action dated October 12, 2016 ("Final Act."), Advisory Action dated January 30, 2017 ("Adv. Act."), and Answer dated January 30, 2018 ("Ans."), and (2) Appellant's Appeal Brief dated September 27, 2017 ("Appeal Br.").

² We use the Appellant to refer to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies University of Houston System as the real party in interest. Appeal Br. 3.

one or more interfaces between one or both of the computational core and the actuated manipulator and an operator thereof;

at least one limited field of view sensor modality consisting of one or more of optical coherence tomography, light induced fluorescence, confocal microscopy, MR imaging with miniature radiofrequency coils tuned to appropriate nuclei, or MR spectroscopy, and mechanically linked to or carried on the actuated manipulator and electronically linked to the computational core configured to acquire multilevel information of tissues comprising morphological information, biomorphologic information, molecular information, cellular information, organ information or a combination thereof;

at least one limited field of view sensor modality data acquisition unit with one or more interfaces with the at least one limited field of view sensor and at least one data processing module; and

at least one wide field of view imaging modality consisting of MR imaging, non-digital or digital X-ray, computer tomography, or 20 or 30 ultrasound, and electronically linked to the computational core, said limited field of view sensor modality co-registered with the wide field of view imaging modality at a same spatial coordinate system, wherein an end point of the limited field of view is calculated by a registered initial point and measurements of kinematics.

DISCUSSION

The Examiner finds that claims 1, 2, 4, 5, 7, 12–16, 18–25, and 31–34 are unpatentable over Vesely, Strommer, and Hauck. Final Act. 2–4.

Appellant argues claims 1, 2, 4, 5, 7, 12–16, 18–25, and 31–34 as a group. Appeal Br. 7–16. We select independent claim 1 as the representative claim, and claims 2, 4, 5, 7, 12–16, 18–25, and 31–34 stand or fall with claim 1. 37 C.F.R. § 41.37(c)(1)(iv).

The Examiner finds that Vesely teaches most of the limitations of claim 1 but does not specifically teach the degrees of freedom of the actuated manipulator. Final Act. 2–4. For this limitation, the Examiner finds that Hauck teaches, in the same field of endeavor, robotically navigating a catheter by actuating one or more of translation and rotation movement. *Id.* at 3 (citing Hauck ¶ 65). The Examiner reasons that it would have been obvious to one of ordinary skill in the art to have provided Vesely “with the robotic surgical system of Hauck as actuating in a translation and rotation movement is well known.” *Id.*

The Examiner also finds that Vesely does not specifically teach the that the “limited field of view sensor modality consists of one or more of optical coherence tomography, light induced fluorescence, confocal microscopy, MR imaging with miniature radiofrequency coils, or MR spectroscopy configured to acquire multilevel information of tissues comprising morphological information, biomorphologic information, molecular information, cellular information, organ information or a combination thereof.” Final Act. 3–4. For this missing limitation, the Examiner finds that Strommer teaches that, in medical imaging and navigation systems, the catheter comprises the limited field of view sensor modality which includes an OCT imaging element or ultrasound transducer, MRI element, thermography device, or the like. *Id.* at 4. The Examiner reasons it would have been obvious to one of ordinary skill in the art “to have substituted the instrument of [Vesely] with the instrument as taught by [Strommer] as a substitution of one instrument for another is well within the skill level of one of ordinary skill in the art and providing an imaging system in an instrument is well known.” *Id.*

Appellant argues that the Examiner's rejection is erroneous for several reasons. First, Appellant argues that Vesely, Strommer, and Hauck do not teach "at least one limited field of view modality and at least one wide field of view modality . . . for the sole purpose of biosensing and localized imaging of pathophysiologic properties of tissue with at least a limited field of view modality." Appeal Br. 10. Appellant's argument is not persuasive because claim 1 does not recite "biosensing and localized imaging of pathophysiologic properties of tissue with at least a limited field of view modality."

Second, Appellant argues that Vesely does not teach "a limited field of view sensor modality is optical coherence tomography, light induced fluorescence, confocal microscopy, MR imaging with miniature radiofrequency coils, or MR spectroscopy or a combination thereof," as recited in claim 1, and Vesely "merely disclose transducers and reference transducers surrounding a body to track positional signals." Appeal Br. 10. Appellant's argument is not persuasive because Appellant is attacking the teachings of Vesely individually. Nonobviousness cannot be established by attacking the references individually when the rejection is predicated upon a combination of prior art disclosures. *In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986). Here, the Examiner finds that Strommer, not Vesely, discloses the disputed limitation. Final Act. 3-4; *see also* Ans. 6-7. The Examiner finds that Strommer "teaches in medical imaging and navigation systems comprising a limited field of view sensor modality (120; catheter) comprises an OCT imaging element or ultrasound transducer, MRI element, thermography device, or the like." Ans. 6-7 (citing Strommer ¶ 37). The Examiner also finds that Strommer teaches "imaging an organ" (citing

Strommer ¶ 33), “imaging plaque” (*id.* at ¶¶ 255–256), and imaging plaque type/density and tissue layers: media, adventitia, and intima (*id.* at ¶¶ 273, 277). Ans. 7. The Examiner further finds that Strommer “discloses acquiring information on organs, plaque, and tissue layers which are interpreted to be morphological information, molecular information, cellular information, organ information or a combination thereof.” *Id.* Finally, the Examiner reasons that it would have been obvious to one of ordinary skill in the art “to have substituted the instrument of [Vesely] with the instrument as taught by [Strommer] as a substitution of one instrument for another is well within the skill level of one of ordinary skill in the art and providing an imaging system in an instrument is well known.” *Id.* Appellant does not address the rejection as articulated by the Examiner, and, thus, does not identify error by the Examiner.

Third, Appellant argues that Vesely does not teach the same coordinate system, that is, “the limited field of view modality and wide field of view modality are in the same coordinate system and the position of the limited field of view modality is calculated by measurement of a registered initial points and the kinematics.” Appeal Br. 12. Appellant’s argument is not persuasive. We agree with the Examiner that Vesely discloses co-registering the position of the instrument with the spatial coordinates of the imaging modality system. Ans. 7 (citing Vesely, 14:1–12); *see* Adv. Act. 2. Appellant does not address the Examiner’s position that the features upon which Appellant “relies (i.e., the position of the limited field of view modality is calculated by measurement of a registered initial points and the kinematics) are not recited in the rejected claim(s).” Ans. 7–8; *see* Adv. Act. 2. Similarly, Appellant does not address the Examiner’s findings that claims

1 and 31 recite the limitation wherein “an endpoint of the limited field of view is calculated by a registered initial point and measurements of kinematics but does not associate it with the coordinate system and the position of the limited field of view modality,” and an “endpoint of the limited field of view” is not equivalent to “the position of the limited field of view modality.” Ans. 8. In this regard, Appellant does not address the Examiner’s findings that Vesely discloses

image registration and tracking (col. 14, lines 1–12), measurements of kinematics (referencing position, shape, and motion of the instrument; col. 14, lines 39–43, col. 14, line 50–col. 15, line 24), tracking the position of the tip (col. 22, line 58–col. 23, line 13); position of the transducer is placed close to the tip such that its motion can be referenced; imaging transducers are not located at the imaging tip). The position of the transducer is interpreted as initial position and the endpoint (tip of the instrument) is referenced through the motion of the instrument (kinematics).

Id.

Fourth, Appellant argues that “[c]ombining Hauck et al. and Strommer et al. with Vesely et al. does not remedy the deficiencies in the primary reference.” Appeal Br. 12–13 (boldface omitted). Appellant’s argument is not persuasive because Appellant is attacking the teachings of Vesely, Hauck, and Strommer individually. *In re Merck*, 800 F.2d at 1097 (stating that nonobviousness cannot be established by attacking the references individually when the rejection is predicated upon a combination of prior art disclosures). Appellant’s argument that Hauck does not teach or suggest “a limited view field modality and merely discloses a surgical system with a contact sensing feature” (Appeal Br. 12) is not persuasive because the Examiner relies upon Hauck “to teach navigating a catheter by

actuating one or more of translation and rotation movement.” Ans. 9. Similarly, Appellant’s argument that Strommer teaches “an optical coherence tomography imaging element or ultrasound transducer, MRI element, thermography device or the like, but these sensor modalities in [Strommer] are for wide field of view imaging, which only provides a single level information at a time, e.g., organ monitoring” is not persuasive. Appeal Br. 12. Appellant does not address the Examiner’s finding that Strommer discloses “an imaging catheter comprising optical coherence tomography, ultrasound, MRI, thermography, and the like” (Ans. 9 (citing Strommer ¶ 37)), and the Examiner’s interpretation that Strommer’s imaging catheter has “a limited field of view sensor modality as it is attached to the imaging catheter.” *Id.* Finally, Appellant does not address the Examiner’s reasoning for substituting Vesely’s catheter with that of Strommer. *Id.* Appellant does not address the rejection as articulated by the Examiner, and, thus, does not identify error by the Examiner.

Fifth, Appellant argues that,

In viewing the combination of Vesely et al., Hauck et al. and Strommer et al., a person of ordinary skill in the art would find no suggestion or teaching that the sensor for contact sensing in Hauck et al. is equivalent to the limited view field modality of the claimed invention.

Appeal Br. 13 (boldface omitted). Appellant’s argument is not persuasive because Appellant is attacking the teachings of Hauck individually. *In re Merck*, 800 F.2d at 1097. Here, the Examiner relies on Hauck “to teach navigating a catheter by actuating one or more of translation and rotation movement.” Ans. 10.

Sixth, Appellant argues that the Examiner’s proposed modification teaches away from Vesely’s “intended purpose (i.e., single level, organ monitoring compared to multilevel information)” because a person of ordinary skill in the art would have to modify Vesely’s “optical coherence tomography imaging element or ultrasound transducer, MRI element, thermography device or the like.” Appeal Br. 14. Appellant’s argument is not persuasive because neither Vesely nor Strommer criticize, discredit, or otherwise discourage the Examiner’s proposed combination of Vesely, Strommer, and Hauck. *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009) (A “reference does not teach away, however, if it merely expresses a general preference for an alternative invention but does not ‘criticize, discredit, or otherwise discourage’ investigation into the invention claimed.”) (quoting *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004)). In addition, Appellant does not address the Examiner’s reasoning that, because (1) Vesely “discloses a 3-dimensional tracking and imaging system comprising an imaging modality system, an instrument, a tracking system, and a robotic actuator for the instrument,” and “intravascular ultrasound imaging catheters (col. 21, line 53–col. 23, line 30),” and (2) Strommer “discloses, in the same field of endeavor, a 3-dimensional tracking and imaging system comprising an imaging catheter comprises an OCT imaging element or ultrasound transducer, MRI element, thermography device, or the like ([0037]),” “ a substitution for one imaging catheter for another imaging catheter is within the skill level of one of ordinary skill in the art and does not teach away from its intended purpose.” Ans. 10–11.

Finally, Appellant argues that “the combination of Vesely et al., Strommer et al. and Hauck et al. does not teach or suggest co-registering different modalities at all.” Appeal Br. 14 (boldface omitted). Appellant’s argument is not persuasive because it does not address the Examiner’s finding that Vesely “discloses co-registering the position of the instrument with the spatial coordinates of imaging modality system.” Ans. 11 (citing Vesely, 14:1–12); *see* Adv. Act. 1.

For the reasons above, the rejection of claim 1 is sustained, and claims 2, 4, 5, 7, 12–16, 18–25, and 31–34 fall with claim 1.

CONCLUSION

The Examiner’s rejection of claims 1, 2, 4, 5, 7, 12–16, 18–25, and 31–34 is AFFIRMED.

DECISION SUMMARY

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1, 2, 4, 5, 7, 12–16, 18–25, 31–34	103(a)	Vesely, Strommer, Hauck	1, 2, 4, 5, 7, 12–16, 18–25, 31–34	

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED