UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/031,097	04/21/2016	AJAY ANAND	2013P01181WOUS	8090

24737 7590 08/19/2020

PHILIPS INTELLECTUAL PROPERTY & STANDARDS
465 Columbus Avenue
Suite 340
Valhalla, NY 10595

EXAMINER
VIERRA, RACHEL A

ART UNIT	PAPER NUMBER
3794	

NOTIFICATION DATE	DELIVERY MODE
08/19/2020	ELECTRONIC

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

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

katelyn.mulroy@philips.com
marianne.fox@philips.com
patti.demichele@Philips.com

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte AJAY ANAND, SHRIRAM SETHURAMAN, SHIWEI ZHOU, HUA XIE, JUNBO LI, and JEAN-LUC ROBERT

Appeal 2019-006490
Application 15/031,097
Technology Center 3700

Before MICHAEL L. HOELTER, MICHELLE R. OSINSKI, and WILLIAM A. CAPP, *Administrative Patent Judges*.

OSINSKI, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellant[1] appeals under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 1–19. We have jurisdiction over the appeal under 35 U.S.C. § 6(b).

We AFFIRM.

---

[1] We use the term "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as Koninklijke Philips N.V. Appeal Br. 3.

THE CLAIMED SUBJECT MATTER

Claims 1 and 15 are independent. Claim 1 is reproduced below.

1. A temperature monitoring apparatus comprising:

a temperature application unit configured to introduce heating power into a tissue for heating the tissue during a thermal ablation process;

an ultrasound unit configured to emit and receive ultrasound waves and to determine a temperature in a measurement region of the tissue using ultrasound shear wave detection during the ablation process; and

a temperature estimation unit comprising a heat transfer model, the heat transfer model comprising parameters which have initial values based on medical images of the tissue, wherein the temperature estimation unit is configured, during the thermal ablation process, to:

generate a temperature distribution based on the parameters of the heat transfer model, the temperature distribution comprising estimated temperatures for locations in the tissue corresponding to a region of interest and the measurement region,

compare the estimated temperatures in locations of the temperature distribution corresponding to the measurement region to the determined temperature in the measurement region, and

update the values of the parameters of the heat transfer model based on the comparison.

EVIDENCE

The Examiner relied on the following evidence in rejecting the claims on appeal:

Garabedian	US 2005/013765 A1	June 23, 2005
Birchard	US 2009/0018497 A1	Jan. 15, 2009
Kuhn	US 2013/0060243 A1	Mar. 7, 2013

Bastien Arnal et al., "Monitoring of Thermal Therapy Based on Shear Modulus Changes: I. Shear Wave Thermometry," IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, Vol. 58, No. 2, 369–78 (Feb. 2011) (hereinafter "Arnal")

REJECTIONS

I. Claims 1–5, 7–11, and 14–19[2] stand rejected under 35 U.S.C. § 103 as being unpatentable over Kuhn and Arnal. Final Act. 3–11.

II. Claims 12 and 13 stand rejected under 35 U.S.C. § 103 as being unpatentable over Kuhn, Arnal, and Garabedian. *Id.* at 11–12.

III. Claim 6 stands rejected under 35 U.S.C. § 103 as being unpatentable over Kuhn, Arnal, and Birchard. *Id.* at 12–13.

OPINION

Rejection I

Appellant argues claims 1–5, 7–11, and 14–19 as a group. Appeal Br. 5–8. We select claim 1 as representative of the issues that Appellant presents in the appeal, and claims 2–5, 7–11, and 14–19 stand or fall therewith. *See* 37 C.F.R. § 41.37(c)(1)(iv).

The Examiner finds that Kuhn teaches most of the limitations of independent claim 1, including, among other things, a temperature estimation unit comprising a heat transfer model. Final Act. 4; Ans. 4. Although in the Final Action, the Examiner refers only to "the display which

[2] Even though the Examiner includes claim 6, rather than claim 7, in the heading for this rejection (*see* Final Act. 3), the Examiner makes reference to claim 7, rather than claim 6, in the body of the rejection (*id.* at 6, 12–13). We consider the Examiner's oversight in the heading to be a typographical error, and therefore, we list claim 7, rather than claim 6, as being subject to this ground of rejection. The Examiner rejects claim 6 in connection with Rejection III.

shows the images of the predetermined influence region (22) and the estimated influence region (24)" as the heat transfer model (Final Act. 4), the Examiner further explains in the Answer that:

> Kuhn discloses that the temperature distribution estimating unit, which estimates the second temperature distribution, is adapted to use heat-diffusion equations and known parameters of the object like heat-diffusion algorithms ([0049-0050]). The equations that are specifically used are displayed in paragraphs ([0056]-[0060]) and this mathematical framework is used to estimate the second temperature distribution evolution in space over time ([0074]), showing that an algorithm is used in this estimation and overall to determine the estimated influence region (24). This information is used to recommend parameter settings to the user in order to have the estimated temperature distribution in the planned/targeted region ([0074]).

Ans. 4. The Examiner also finds that Kuhn teaches, among other things, that "the temperature estimation unit is configured . . . to . . . compare the estimated temperatures in locations of the temperature distribution corresponding to the measurement region to the determined temperature in the measurement region." Final Act. 4; *see also* Ans. 5–6. In particular, the Examiner explains that, in Kuhn:

> [t]he system delivers heat to a tissue and continuously measures a first temperature distribution in a first temperature range until the object is heated to a determined threshold temperature in the predefined influence region ([0045]). The system estimates the second temperature distribution based on the measured first temperature distribution ([0048]) by extrapolating parameters from the first temperature range defined by the determined first temperature distribution ([0049]). Depending on the estimated second temperature distribution, the estimated influence region of the cited heat transfer model is determined ([0050]). Thus[,] the system provides estimated temperatures within the estimated second temperature distribution in order to determine the estimated influence region, where these temperatures are within

> the measurement region. The estimated influence region is predicted based on a measured three dimensional temperature distribution evolution over time based on the second temperature distribution, which is preferentially determined by extrapolation by using heat-diffusion algorithms ([0051]). Further, the . . . second temperature distribution, and thus the estimated influence region, is adapted and changed based on a calculated deviation between the predefined influence region and estimated influence region ([0076]).
>
> Therefore, since the estimated influence region is dependent on the second temperature distribution, Kuhn teaches a comparison between estimated temperatures (i.e.[,] the second temperature distribution) in the measurement region to the determined temperature (i.e.[,] the predetermined temperature to heat the target . . . in the predefined influence region to . . . the first temperature distribution).

Ans. 5–6.

Appellant first argues that "a user- or automatically-defined region where energy should be applied cannot reasonably be interpreted as corresponding to 'a heat transfer model.'" Appeal Br. 6. More specifically, Appellant argues that, when interpreting the term "heat transfer model" in light of the Specification, one having ordinary skill in the art would view a heat transfer model as an algorithm, which may include equations, and "would not interpret 'a heat transfer model' of Appellant's claims to correspond to a region where energy should be applied or a region where energy may be applied shown on a display." *Id.* at 6–7.

We have considered Appellant's first argument, but Appellant does not respond with sufficient particularity to the Examiner's additional findings in the Answer explaining that equations and a mathematical framework are used to estimate a second temperature distribution evolution in space over time so as to persuade us of error in the Examiner's finding

that Kuhn teaches "a temperature estimation unit comprising a heat transfer model," as claimed.

Appellant secondly argues that "Kuhn does not teach or suggest a temperature estimation unit configured to 'compare the estimated temperatures . . . to the determined temperatures . . . ' as recited in the independent claims." Appeal Br. 7 (boldface omitted). With respect to this second argument, Appellant asserts that "both [an] initial first temperature distribution and [a] modified first temperature distribution are based on measured temperatures in the predefined influence region 22 of Kuhn, not on a comparison between estimated temperatures and measured temperatures within the predefined influence region 22 of Kuhn." *Id.* at 7–8. We have considered this argument, but do not find it persuasive in that the rejection does not rely on a finding that the first temperature distribution is based on a comparison between estimated temperatures and measured temperatures. *See* Final Act. 3–4 (referring to Kuhn's "first temperature distribution" as the determined "temperature in a measurement region of the tissue" recited in the claims and referring to Kuhn's "second temperature distribution" as the "temperature distribution" generated by the temperature estimation unit recited in the claims).

With respect to the second argument, Appellant also asserts that "estimated temperatures are only generated for the region outside the measurement region, that is, the estimated influence region 24 of Kuhn." Appeal Br. 8. Appellant continues that "[a]ccordingly, Kuhn fails to teach or suggest, 'compare the estimated temperatures in locations of the temperature distribution corresponding to the measurement region to the determined temperature in the measurement region, and update the values of

the parameters of the heat transfer model based on the comparison,' as recited in claim 1." *Id.*

As to there being a comparison between estimated temperatures and determined temperatures in Kuhn, the Examiner states that "[t]he estimated influence region is based on the calculated second temperature distribution, which itself is based on a measured first temperature region . . . [,] implying that a comparison between a measured temperature and an estimated temperature does occur when the second temperature distribution is recalculated." Adv. Act. 2. The Examiner adds that the second temperature distribution is continuously recalculated until a deviation between the predetermined influence region and the estimated influence region (which is determined by the second temperature distribution) is within a desired threshold. *Id.*

As to whether Kuhn's estimated temperatures are generated for the measurement region, the Examiner disagrees with Appellant's suggestion that Kuhn's estimated temperatures are only generated for the region outside the measurement region. Ans. 5. The Examiner states that Kuhn's system "provides estimated temperatures within the estimated second temperature distribution in order to determine the estimated influence region, *where these temperatures are within the measurement region*." *Id.* (citing Kuhn ¶¶ 19, 45, 48–50) (emphasis added); *see also, e.g.*, Kuhn ¶ 19 ("While the energy is applied to the object in accordance with the provided energy application characteristics and while the temperature of the object increases within the first temperature range, the temperature distribution measuring unit measures a spatially and temporally dependent first temperature distribution in the object. Based on the temporal and spatial evolution of the first

temperature distribution, i.e. based on the spatial and temporal dependence of the measured first temperature distribution, a spatially and temporally dependent second temperature distribution within the second temperature range is estimated, preferentially without heating the object to a temperature within the second temperature range. Then, the estimated influence region determining unit determines an estimated influence region of the object depending on the estimated second temperature distribution.").

Appellant does not respond with sufficient particularity to the positions set forth by the Examiner in the Advisory Action and the Answer so as to persuade us of error in the Examiner's finding that Kuhn teaches a "temperature estimation unit [that] is configured . . . to . . . compare the estimated temperatures in locations of the temperature distribution corresponding to the measurement region to the determined temperature in the measurement region," as claimed.

For the foregoing reasons, Appellant does not apprise us of error in the Examiner's determination that Kuhn and Arnal render obvious the subject matter of independent claim 1. We sustain the rejection of claim 1, and claims 2–5, 7–11, and 14–19 falling therewith, under 35 U.S.C. § 103 as obvious over Kuhn and Arnal.

Rejections II and III

In contesting the rejections of dependent claims 6, 12, and 13, Appellant relies on the same arguments and reasoning we found unpersuasive in connection with independent claim 1 as the basis for seeking reversal of the rejections of these claims. Appeal Br. 5–9. Accordingly, for the same reasons discussed above in connection with the rejection of claim 1, we also sustain the rejections, under 35 U.S.C. § 103, of claims 12

and 13 as unpatentable over Kuhn, Arnal, and Garabedian and claim 6 as unpatentable over Kuhn, Arnal, and Birchard.

CONCLUSION

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–5, 7–11, 14–19	103	Kuhn, Arnal	1–5, 7–11, 14–19	
12, 13	103	Kuhn, Arnal, Garabedian	12, 13	
6	103	Kuhn, Arnal, Birchard	6	
Overall Outcome			1–19	

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