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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte KJELL KRISTOFFERSON and SEVALD BERG

Appeal 2014-006418
Application 11/412,614
Technology Center 3700

Before LINDA E. HORNER, LISA M. GUIJT, and PAUL J. KORNICZKY,
Administrative Patent Judges.

KORNICZKY, *Administrative Patent Judge.*

DECISION ON APPEAL

STATEMENT OF CASE

Appellants, Kjell Kristofferson et al.,¹ appeal under 35 U.S.C. § 134 from the Examiner's decision rejecting claims 1–44.² We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM-IN-PART.

¹ Appellants identify General Electric Company as the real party in interest. Br. 3.

² The Office Action Summary states that claims 1–43 are pending, but the Final Action (Final Act. 14, 17), Appellants' Brief (Br. 26–27), and Examiner's Answer (Ans. 18, 28) address claim 44. We treat the statement in the Office Action Summary as a typographical error.

THE CLAIMED SUBJECT MATTER

The claims are directed to “diagnostic ultrasound systems, and more particularly, to [a] method and system for measuring flow through a heart valve.” Spec. ¶ 1. Claims 1, 7, and 15 are independent. Claim 1, reproduced below, is illustrative of the claimed subject matter:

1. A system for presenting multiple parallel slices, comprising:

a display for displaying ultrasound data over time, the ultrasound data formed from a plurality of scan planes acquired by an array of transducers defining a face, the plurality of scan planes intersecting the face of the array;

a user interface for defining a proximal plane and a distal plane within the ultrasound data that are parallel to one another, the proximal and distal planes intersecting multiple scan planes and not intersecting the face of the array, the proximal and distal planes defining a region of interest (ROI), the user interface receiving a user input to adjust an orientation of one of the proximal plane or distal plane to change the ROI, wherein a positional relationship between the proximal plane and distal plane is maintained, including at least one of an angular orientation or a distance therebetween; and

a signal processor for automatically extracting a plurality of intermediate slices from the ultrasound data within the ROI and between the proximal and distal planes, the plurality of intermediate slices being parallel with respect to each other, the plurality of intermediate slices intersecting multiple scan planes and not intersecting the face of the array, the plurality of intermediate slices being displayed on the display.

REFERENCES

In rejecting the claims on appeal, the Examiner relied upon the following prior art:

Yanof	US 5,371,778	Dec. 6, 1994
Roundhill '194 ³	US 6,602,194 B2	Aug. 5, 2003
Taylor	US 2002/0198452 A1	Dec. 26, 2002
Abuhamad	US 2005/0251036 A1	Nov. 10, 2005
Roundhill '853	US 2006/0098853 A1	May 11, 2006

REJECTIONS

The Examiner made the following rejections:

1. Claims 1–6, 23–32, and 34–36 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Roundhill '194, Taylor, Yanof, and Abuhamed.^{4, 5}
2. Claims 7, 12, 21, and 22 stand rejected under 35 U.S.C § 103(a) as being unpatentable over Roundhill '853, Taylor, and Yanof.

³ The Examiner also references U.S. 5,720,291 (pub. Feb. 24, 1998) (hereinafter “Schwartz”) which is cited in Roundhill '194.

⁴ Although the Examiner’s summary statement of the rejection does not refer to claims 27–32, 35, and 36, the Examiner’s substantive explanation of the rejection (Final Act. 2–8) and Appellants’ brief (Br. 24–25) address these claims. Thus, we understand the summary statement’s failure to explicitly recite claim 27–32, 35, and 36 is a typographical error.

⁵ On page 8 of the Final Action, the rejections of claims 32, 34, and 35 reference, without explanation, Roundhill '853. Because the Examiner’s summary statement of the rejections (Final Act. 2), the Appellants’ Brief (Br. 24–25), and the Examiner’s Answer (Ans. 24–26) do not refer to or address Roundhill '853, we understand that the references to Roundhill '853 in the rejections of claims 32, 34, and 35 are typographical errors.

3. Claims 8–11, 13, 14, 33, and 37–40 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Roundhill '853, Taylor, Yanof, and Roundhill '194.⁶

4. Claims 15–20 and 41–44 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Roundhill '853, Roundhill '194, Yanof, and Abuhamed.

Appellants seek our review of these rejections.

ANALYSIS

The Rejection of Claims 1–6, 23–32, and 34–36 as Unpatentable Over Roundhill '194, Taylor, Yanof, and Abuhamed

Claims 1–3, 26–30, 32, and 34

Appellants argue claims 1–3, 26–30, 32, and 34 as a group. Br. 14–25. We select claim 1 as the representative claim, and claims 2–3, 26–30, 32, and 34 stand or fall with claim 1. 37 C.F.R. § 41.37(c)(1)(iv). The remaining claims 4–6, 23–25, 31, 35, and 36 are addressed below.

With respect to claim 1, the Examiner finds that Roundhill '194

suggests a user interface (28) capable of allowing an operator to define a proximal plane and a distal plane within the ultrasound data that are parallel to one another, the proximal and distal planes intersecting multiple scan planes and not intersecting the face of the array (the proximal and distal planes defining a region of interest (ROI)).

Final Act. 2. The Examiner also finds that:

⁶ The Examiner made a finding that Roundhill '194 discloses the subject matter of claim 33, but failed to explicitly list claim 33. Final Act. 14 (findings as to claim 37). Thus, we understand that claim 33 was inadvertently omitted from the Final Action. Adv. Act. mailed August 15, 2013.

Via incorporation of *Schwartz* . . . as stated in column 7, line 52, Roundhill ['194] describes elaborate features of the (c) a signal processor (*image processor*, 22). Based on this description, Roundhill ['194] explains being able to automatically extract[] a plurality of intermediate slices from the ultrasound data within the ROI and between the proximal and distal planes, the plurality of intermediate slices being parallel with respect to each other, the plurality of intermediate slices being displayed on the display.

Final Act. 3. The Examiner further finds that:

as Abuhamed explains (*paragraph [0104]*), it would be obvious to one skilled in the art, having the teachings of Roundhill ('194) via incorporation of Schwartz and Yanof et al. . . . to modify the 3D Doppler multiple slice extraction teachings of Roundhill ('194) via incorporation of Schwartz with the teachings of Yanof et al. so that one could extract from these 3D projections multiple slices to pinpoint specific portions of an anatomy not available through the volumetric-regions of interest of Yanof et al.

Final Act. 5.

Appellants present several arguments asserting that “the combination of Roundhill '194, Taylor, Yanof, and Abuhamad does not describe, teach, or suggest all of the limitations in claim 1.” Br. 14. First, in response to the Examiner’s findings that Roundhill '194 discloses extracting and displaying intermediate slices, Appellants initially assert that:

Roundhill '194 [does not] describe, teach, or suggest extracting any planes between image slices that result from using/adjusting planes 82 and 84 As can be seen . . . in Fig. 9 of Roundhill '194, the **only planes that are extracted** for display correspond to the two horizontal planes 82 and 84. Thus, a user is able to move these two planes 82 and 84 up or down as viewed in Fig. 9 to select image planes for display. Accordingly, Roundhill '194 only teaches using two planes that may be moved to select images for display.

Br. 15; *see also* Br. 16 (“Roundhill ’194 does not describe, teach, or suggest that any intermediate slices can be extracted.”); Br. 22 (“There is no description, teaching or suggestion within the Roundhill ’194 to extract intermediate slices.”).

However, in responding to the Examiner’s determination “that one of ordinary skill in the art would want to extract or obtain singular slices in cases where pin-pointed data of a region of interest is needed and only singular slices would provide this information,” Appellants subsequently admit that “Roundhill ’194 already provides this ability by allowing a user to move the horizontal planes 82 and 84 to positions within the volume to where pin-pointed data of a region of interest is needed and only singular slices would provide this information.” Br. 21. Thus, Appellants concede that Roundhill ’194 extracts or selects intermediate slices between the proximal and distal planes of the region of interest.

Further, as the Examiner correctly finds, Figure 9 of Roundhill ’194 discloses (1) a wedge-shaped region of interest in the left diagram and (2) intermediate slices extracted and displayed in the two middle diagrams. Ans. 22–24 (citing to Roundhill ’194, 7:58 – 8:16). Roundhill ’194, for example, explains that “horizontal planes 82 and 84 can be moved up and down through the volumetric region (as indicated by the arrows) . . . until they intersect horizontal planes of the volume which are to be selectively displayed in images 92 and 94” (col. 8, ll. 1–6), and “images 92, 94 and 96 can be processed by the 2D beamformer to produce highly diagnostic 2D images of planar regions where accurate, detailed and precise diagnoses are being performed” (col. 8, ll. 12–16).

For these reasons, Appellants do not identify error in the Examiner's findings that Roundhill '194 extracts or selects intermediate slices between the proximal and distal planes of the region of interest. Additionally, Appellants do not address the Examiner's finding (Final Act. 5) that Abuhamed discloses extracting and displaying intermediate slices, as recited in claim 1.

In a second argument addressing Schwartz, Appellants contend that Schwartz does not remedy the purported deficiencies of Roundhill '194. Br. 17. Appellants argue that "it is clear that Schwartz is only describing an image processing technique and not any type of extraction of intermediate slices as required by claim 1," and "there is nothing to suggest that any individual slices should be automatically extracted and displayed." Br. 17; *see also* Br. 17–21. In response to the Examiner's determination that "by reverse engineering, one may rely on (or extract) the image planes of Schwartz individually," Appellants submit that "reverse engineering is not the proper standard to support an obviousness rejection." Br. 21. Appellants also argue that the "planes of Schwartz intersect the face of the array" so that Schwartz "cannot [disclose] intermediate slices intersecting multiple scan planes that do not intersect the face of the array," as recited in claim 1. Br. 22. However, as discussed above, the Examiner finds that Roundhill '194, not Schwartz, discloses these allegedly missing limitations.

With regard to the "automatically" extracting limitation, the Examiner relies on Roundhill's incorporation of Schwartz. Final Act. 3 (finding that based on the description in Roundhill '194 of Schwartz's method, "Roundhill ('194) explains being able to automatically extract[] a plurality of intermediate slices . . ."). Appellants' argument fails to address the

rejection as articulated by the Examiner, which modifies the extraction of slices as disclosed in Roundhill '194 in view of Schwartz' automatic processing technique.

Next, Appellants argue that the Examiner used "impermissible hindsight reconstruction to reverse engineer Applicants' application." Br. 22. However, as discussed above, the Examiner's findings regarding extracting and displaying intermediate slices are supported by explicit teachings in Roundhill '194 and Abuhamed. Appellants do not identify any knowledge relied upon by the Examiner that was gleaned only from Appellants' disclosure and that was not otherwise within the level of ordinary skill at the time of the invention, thereby obviating Appellants' assertion of hindsight. *See In re McLaughlin*, 443 F.2d 1392, 1395 (CCPA 1971). Thus, Appellants do not apprise us of error.

Finally, Appellants argue that "while the horizontal planes 82 and 84 of Roundhill '194 may define image planes for display, these planes do not define any [region of interest] ROI as required by claim 1." Br. 23. The Examiner correctly finds that Figure 9, for example, illustrates a "volumetric region of the body" which is studied and imaged by a clinician. Roundhill '194, 7:58–8:17; *see* Ans. 22–24. Appellants' contention that Roundhill '194 does not define a "region of interest" is wrongly premised on the fact that Roundhill '194 does not use the same terminology as claim 1. *In re Bond*, 910 F.2d 831, 832 (Fed. Cir. 1990) (There is no *ipsissimis verbis* test for determining whether a reference discloses a claim element, i.e., identity of terminology is not required.). Appellants' arguments do not show error by the Examiner.

For these reasons, we sustain the rejection of claim 1, and claims 2–3, 26–30, 32, and 34 fall with claim 1.

Claims 4 and 6

With respect to claim 4, Appellants argue:

There is nothing that would suggest that any of the processes described in Roundhill '194 necessarily use interpolation. In fact, the specific algorithms and equations are not described in Roundhill '194. It is just a[s] likely that other types of mathematical operations are used instead of interpolation. Thus, it is submitted that the required interpolation limitation is not inherently taught by Roundhill '194.

Br. 24. However, the Examiner finds that Schwartz, the processor of which Roundhill '194 teaches can be used in the system of Roundhill '194, discloses the interpolation limitation. *See* Final Act. 5–6 (citing Schwartz, 4:37–65, 5:45–7:4); Ans. 24–25 (citing Schwartz, 5:9–67, 6:1–17). Thus, Appellants do not address the rejection as articulated by the Examiner, and do not apprise us of Examiner error. We sustain the rejection of claim 4.

With respect to claim 6, Appellants argue that claim 6 is patentable for the same reasons presented for claim 4. Br. 25. For the same reasons that the rejection of claim 4 is sustained, the rejection of claim 6 is sustained.

Claim 5

With respect to claim 5, Appellants merely argue that “neither Roundhill '194 [nor] Schwartz describe[] any tracking of like anatomical structures as required by claim 5.” Br. 24–25. 37 C.F.R. § 41.37 requires “more substantive arguments in an appeal brief than a mere recitation of the claim elements and a naked assertion that the corresponding elements were

not found in the prior art.” *In re Lovin*, 652 F.3d 1349, 1357 (Fed. Cir. 2011); *see generally Ex parte Belinne*, No. 2009-004693, 2009 WL 2477843 (BPAI 2009) (informative) (“[W]e find that the Examiner has made extensive specific fact finding . . . with respect to each of the argued claims. Appellants’ argument . . . repeatedly restates elements of the claim language and simply argues the elements are missing from the reference. However, Appellants do not present any arguments to explain why the Examiner’s explicit fact finding is in error.”). Appellants fail to apprise us of error in the Examiner’s findings. We sustain the rejection of claim 5.

Claim 23

Claim 23 (emphasis added) recites “the signal processor is configured to maintain a *relative distance* between each of the plurality of intermediate planes when a location of one of the proximal and distal planes is changed.” Appellants argue that:

While Schwartz describes that the image planes retain a spatial orientation to each other by being stored in the time or spatial sequence in which the planes were obtained, this is not the same as maintaining a relative distance. Schwartz is merely describing that the arrangement of the slices is maintained in order in time or sequence, but does not describe maintaining [sic] a relative distance between planes.

Br. 25. Appellants are correct — spatial orientation between planes is not the same as relative distance between planes. Because the Examiner does not identify where Roundhill ’194 or Schwartz discloses that the signal processor maintains the “relative distance” between the planes when the proximal or distal planes are changed, we cannot sustain the rejection of claim 23.

Claims 24, 25, and 31

With respect to claims 24, 25, and 31, Appellants argue that “because no intermediate planes are described, taught, or suggested as discussed above [with respect to claim 1], the limitations of claims 24, 25 and 31 with respect to the intermediate planes likewise are not described, taught, or suggested.” Br. 25. For the same reasons that the rejection of claim 1 is sustained, the rejection of claims 24, 25, and 31 is sustained.

Claims 35 and 36

Claim 35 (emphasis added) recites that “a *positional relationship* between the plurality of intermediate slices and the proximal and distal planes is maintained when the orientation of the proximal or distal plane is adjusted.” Claim 36 (emphasis added) recites “the plurality of intermediate slices are *parallel* and have an *equidistant* relationship between the proximal and distal planes.”⁷

With respect to claims 35 and 36, the Examiner finds that Roundhill ’194, via incorporation of Schwartz, and Yanof, disclose a plurality of intermediate slices (e.g., planes 82 and 84) which are parallel and have an equidistant relationship between proximal and distal planes. Final Act. 8 (citing Roundhill ’194, Fig. 9, 7:58–8:16); Ans. 25–26. Appellants merely argue that “maintaining a temporal or sequence order arrangement is not the same, nor suggests any specific positioned orientation,” and do not explain why the Examiner’s finding is incorrect. Br. 25.

⁷ We find that wording of claim 36 a bit confusing, and query how a “plurality” of intermediate planes can have an “equidistant relationship” between “proximal and distal planes,” and whether claim 36 contains a typographical error.

With respect to claim 35, maintaining a parallel relationship between planes 82 and 84, as disclosed in Schwartz, is maintaining a “positional relationship,” as broadly recited in claim 35. Thus, we sustain the rejection of claim 35.

With respect to claim 36, parallel planes do not necessarily maintain an “equidistant relationship” with each other, as broadly recited in claim 36. Because the Examiner does not identify where Roundhill ’194, Schwartz, or Yanof disclose that the parallel planes maintain an equidistant relationship with other, we cannot sustain the rejection of claim 36.

*The Rejection of Claims 7, 12, 21, and 22 as
Unpatentable Over Roundhill ’853, Taylor, and Yanof*

Independent claim 7 recites, in part, “user selected planes intersecting multiple scan planes and not intersecting the face of the array.” Appellants argue that the Examiner’s rejection of claim 7 based on Roundhill ’853 is incorrect because “all of the planes in . . . Fig. 3 of Roundhill ’853 intersect the source point at the face of the array.” Br. 26. In response, the Examiner agrees that the image planes through the apex in Fig. 3 in Roundhill ’853 and the image plane (e.g., d_1) in Taylor intersect the face of the probe. Ans. 26. The Examiner correctly finds that the deficiencies of Roundhill ’853 and Taylor are remedied by Roundhill ’194 which discloses image planes 82 and 84 in Figure 9 which do not intersect the face of the probe. Ans. 26. However, Roundhill ’194 is not cited in the rejection of claim 7. Thus, the Examiner’s rejection of claim 7 based upon Roundhill ’853, Taylor and

Yanof does not state a prima facie case of unpatentability, and we cannot sustain the rejection of independent claim 7, and claims 12, 21, and 22 which depend from claim 7.

The Rejection of Claims 8–11, 13, 14, 33, and 37–40 as Unpatentable Over Roundhill ’853, Taylor, Yanof, and Roundhill ’194

Appellants merely argue that “[c]laims 8–11, 13, 14, and 37–40 depend from claim 7 and are patentable over the combination of Roundhill ’853, Taylor, Yanof and Roundhill ’194 at least for the reasons set forth above [with respect to claim 7].” Br. 26. However, although claim 7 may be patentable over Roundhill ’853, Taylor, and Yanof, the dependent claims also stand rejected over Roundhill ’194 which remedies the deficiencies of Roundhill ’853, Taylor, and Yanof. Appellants do not address the rejection as articulated by the Examiner, and, thus, do not identify Examiner error. We sustain the rejection of claims 8–11, 13, 14, and 37–40, as well as the like rejection of claim 7 encompassed therein. Although the Examiner did not expressly include independent claim 7 in this ground of rejection under 35 U.S.C. § 103(a), the Examiner’s rejection of claim 8, which depends from and thus incorporates all the limitations of claim 7, inherently includes a rejection of claim 7. *See Ormco Corp. v. Align Tech.*, 498 F.3d 1307, 1319 (Fed. Cir. 2007) (when a dependent claim is “found to have been obvious, the broader claims . . . must also have been obvious”).

Claim 33

Appellants argue “that claim 33 is patentable over the cited references for at least the reasons discussed above with respect to claim 1.” Br. 27. Because the rejection of claim 1 is sustained, the rejection of claim 33 is sustained.

*The Rejection of Claims 15–20 and 41–44 as Unpatentable
Over Roundhill ’853, Roundhill ’194, Yanof, and Abuhamed*

Claim 15 recites, in part, “measuring a flow jet area based on a first slice at a first time position and measuring a flow jet area based on a second slice at a second time position; and interpolating the flow jet area on the ultrasound data between the first and second time positions.”

Appellants first argue that “claims 15–20 and 41–44 are patentable over Roundhill ’853, Roundhill ’194, Yanof, and Abuhamad [sic] at least for the reasons set forth above [with respect to claims 1–14 and 21–40].” Br. 26. Appellants’ argument is unpersuasive because claims 1–14 and 21–40 have different limitations than claims 15–20 and 41–44, and are rejected over different combinations of prior art.

Appellants also argue that the Examiner’s finding that “paragraph [0036] of Roundhill ’853 teaches the required ‘interpolating the flow jet area on the ultrasound data between the first and second time positions’” is incorrect. Br. 26–27. According to Appellants,

Paragraph [0036] of Roundhill ’853 only describes a tracking system that re-surveys an image to account for movement to make adjustments. However, compensation for movement is not the same as interpolating data between two time positions. For example, in Roundhill ’853 the data is known and used to correct for motion instead of interpolating to determine additional data.

Br. 27.

Although Rejection 1 identified other art (e.g., Schwartz) that may disclose interpolation of certain types of data, the basis of the Examiner's rejection of the disputed limitation in claim 15 is limited to paragraph 36 of Roundhill '853. We agree with Appellants that Roundhill '853 merely discloses "automatically re-survey[ing] the image every so often in a continuous mode to account for movement of the thing being imaged, movement of the transducer, etc." Roundhill '853 ¶ 36. It does not disclose data interpolation. Thus, on the present record, we cannot sustain the rejection of claim 15, and claims 16–20 and 41–44 which depend from claim 15.

DECISION

For the above reasons, the Examiner's rejection of claims 1–6, 24–32, 34, and 35 under 35 U.S.C. § 103(a) as being unpatentable over Roundhill '194, Taylor, Yanof, and Abuhamed is AFFIRMED.

The Examiner's rejection of claims 23 and 36 under 35 U.S.C. § 103(a) as being unpatentable over Roundhill '194, Taylor, Yanof, and Abuhamed is REVERSED.

The Examiner's rejection of claims 7, 12, 21, and 22 under 35 U.S.C. § 103(a) as being unpatentable over Roundhill '853, Taylor, and Yanof is REVERSED.

The Examiner's rejection of claims 7–11, 13, 14, 33, and 37–40 under 35 U.S.C. § 103(a) as being unpatentable over Roundhill '853, Taylor, Yanof, and Roundhill '194 is AFFIRMED.

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The Examiner's rejection of claims 15–20 and 41–44 under 35 U.S.C. § 103(a) as being unpatentable over Roundhill '853, Roundhill '194, Yanof, and Abuhamed is REVERSED.

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

AFFIRMED-IN-PART