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DYKEMA GOSSETT PLLC (STJ)
4000 Wells Fargo Center
90 South Seventh Street
Minneapolis, MN 55402

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* YELENA NABUTOVSKY and HODA RAZAVI

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Appeal 2020-001110
Application 15/303,714
Technology Center 3700

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Before JENNIFER D. BAHR, MICHAEL J. FITZPATRICK, and BRANDON J. WARNER, *Administrative Patent Judges*.

BAHR, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant appeals from the Examiner's decision to reject claims 1–23.[1] We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42(a). Appellant identifies St. Jude Medical International Holding S.à r.l. as the real party in interest. Appeal Br. 4.

## CLAIMED SUBJECT MATTER

Appellant's invention is directed to "an electrophysiology apparatus used to measure electrical and mechanical activity occurring in a heart of a patient and to visualize the activity and/or information related to the activity in a three-dimensional (3D) model." Spec. ¶ 2. Claim 1, reproduced below, is illustrative of the claimed subject matter:

> 1. A system capable of displaying mechanical activation patterns for a heart, the system comprising the following:
>
> a data input adapted to receive data from an electrophysiology apparatus;
>
> a processor electrically connected to the data input, the processor configured to execute the following steps:
>
> calculate mechanical activation parameters from the data;
>
> generate an anatomical representation of the heart from the data;
>
> divide the anatomical representation into segments; and
>
> generate a depiction that displays magnitudes of the mechanical activation parameter relative to the segments such that performance of a plurality of segments can be simultaneously evaluated; and
>
> an output adapted to transmit the depiction that displays magnitudes of the mechanical activation parameter relative to the segments to a display; and
>
> wherein the display is configured and arranged to facilitate clinician diagnosis based on the visualized magnitudes of the mechanical activation parameter relative to the segments, and the mechanical activation parameter comprises a time or displacement parameter.

REFERENCES

The prior art relied upon by the Examiner is:

| Name | Reference | Date |
|---|---|---|
| Rosenberg | US 2009/0254140 A1 | Oct. 8, 2009 |
| Ramanathan | US 2014/0005563 A1 | Jan. 2, 2014 |
| Boeck | *Three-dimensional mapping of mechanical activation patterns, contractile dyssynchrony and dyscoordination by two-dimensional strain echocardiography: Rationale and design of a novel software toolbox*, Cardiovascular Ultrasound 2008, BioMed Central Ltd., 6:22, (2008)[2] | May 30, 2008 |

REJECTIONS

Claims 1–7, 10–12, and 14–20 stand rejected under 35 U.S.C. §§ 102(a)(1) and 102(a)(2) as anticipated by Boeck.

Claims 1, 7–9, 14, and 21–23 stand rejected under 35 U.S.C. §§ 102(a)(1) and 102(a)(2) as anticipated by Ramanathan.

Claims 1 and 12–14 stand rejected under 35 U.S.C. §§ 102(a)(1) and 102(a)(2) as anticipated by Rosenberg.

OPINION

*Anticipation—Boeck*

Appellant argues independent claims 1 and 14 together, and does not present any separate arguments for dependent claims 2–7, 10–12, and 15–20

[2] Available at https://cardiovascularultrasound.biomedcentral.com/articles/10.1186/1476-7120-6-22, last visited Sept. 16, 2020.

apart from their dependence from claim 1 or claim 14.[3] Appeal Br. 9–16. We decide the appeal of this rejection on the basis of claim 1, and claims 2–7, 10–12, and 14–20 stand or fall with claim 1. *See* 37 C.F.R. § 41.37(c)(1)(iv) (permitting the Board to select a single claim to decide the appeal as to a single ground of rejection of a group of claims argued together).

The Examiner finds that Boeck discloses a system as recited in claim 1. Final Act. 9. Appellant argues that Boeck fails to teach aspects of claim 1, including "the mechanical activation parameter comprises a time or displacement parameter" and "generat[ing] a depiction that displays magnitudes of the mechanical activation parameter relative to the segments such that performance of a plurality of segments can be simultaneously evaluated." Appeal Br. 9, 14.

Appellant argues that the bulls-eyes of Boeck's Figure 1 "do not illustrate displacement of the segment from a nominal position, but instead shortening/stretching/stagnation of the segment in response to an electrical

[3] Appellant mentions dependent claim 3 in arguing that Boeck does not anticipate the subject matter of claims 1 and 14. *See* Appeal Br. 12–13 (stating that "[c]laim 3 further emphasizes this distinction — 'the mechanical activation parameter is the time parameter which is indicative of the relative activation times of the segments.'"). Appellant, however, does not present a separate substantive argument as to why claim 3 would be patentable if claim 1 were not patentable. *See* 37 C.F.R. § 41.37(c)(1)(vii) (stating that "[a] statement which merely points out what a claim recites will not be considered an argument for separate patentability of the claim"). Rather, Appellant merely concludes that, in light of the recitation of dependent claim 3, "Boeck does not teach [or] otherwise suggest visualizing time or displacement parameters" as called for in claims 1 and 14. Appeal Br. 13.

stimulus (or lack thereof)." Appeal Br. 10. Thus, according to Appellant, "instead of teaching displacement or position of the various segments, Boeck appears to teach the equivalent of acceleration of the cardiac segments." *Id.* Further, Appellant contends that "the alleged 'time periods' in Boeck are used as a constant for each of the visualizations, as opposed to presenting a 'time parameter' in the visualization itself." *Id.*

The Examiner points out, correctly, that claim 1 does "not require the limitation 'displacement of the segment from a nominal position' as argued" by Appellant. Ans. 7. In response, Appellant submits that "Appellant's claim 4 does indeed recite the disputed language — 'the displacement parameter which is indicative of the relative distance of each of the segments between a nominal position and a maximum displacement location.'" Reply Br. 3. This argument is unavailing with respect to independent claim 1. Under the doctrine of claim differentiation, "the presence of a dependent claim that adds a particular limitation raises a presumption that the limitation in question is not found in the independent claim." *Bancorp Servs., L.L.C. v. Sun Life Assurance Co. of Can. (U.S.)*, 687 F.3d 1266, 1275 (Fed. Cir. 2012). To the extent that Appellant now wishes to argue dependent claim 4 separately from claim 1, such an argument, made for the first time in the Reply Brief, is untimely and will not be considered. *See* 37 C.F.R. § 41.41(b)(2) ("Any argument raised in the reply brief which was not raised in the appeal brief, or is not responsive to an argument raised in the examiner's answer . . . will not be considered by the Board for purposes of the present appeal, unless good cause is shown.").

We do not find any evidentiary basis to support Appellant's contention that the bulls-eyes in Boeck's Figure 1 display acceleration of the

cardiac segments. The caption below Boeck's Figure 1 describes "[s]hortening and stretching patterns . . . represented by a series of colour-coded bulls-eyes representing deformation-rate at 25 time points throughout the entire cardiac cycle for each of the 36 segments," with yellow denoting shortening, blue denoting stretching, and green denoting no deformation. Boeck 3. Further, Boeck's Figure 1 shows darker and lighter shades of blue, as well as darker and lighter shades of yellow/orange in several of the bulls-eyes, thereby signifying not only the direction of deformation (stretching or shortening), but also a quantitative indication of the deformation (or rate of deformation). The use of various shades or colors to display the *magnitudes* of the mechanical activation parameter, as Boeck does in Figure 1, is consistent with Appellant's disclosure of displaying the magnitudes of the mechanical activation parameter "as various shades, colors, or cross-hatching patterns." *See* Spec. ¶ 65, claim 3. Whether the colors in the bulls-eyes represent the quantitative degree of deformation or the quantitative rate of deformation, Appellant does not persuasively explain why the quantitative degree of deformation or the quantitative rate of deformation would not be a magnitude of a "displacement parameter" as claimed. Moreover, Boeck displays numerical indications of the strains in each of the 36 segments in the strain plot of Figure 3, which includes "36 separate tracings." Boeck 4.

Appellant does not dispute that strain may be considered a mechanical activation parameter, but contends "it is not clear how the displayed stretching and shortening strain rates of Boeck could be interpreted as the claimed 'magnitude of the mechanical activation parameter.'" Appeal Br. 10. Appellant submits that, "to the extent that the Examiner is alleging

the strain rate of Boeck is the same as a magnitude, such an interpretation is completely non-sensical — a unit of change over time is not a magnitude." *Id.* at 11. Appellant's argument is not convincing.

Consistent with a dictionary definition of "magnitude," the Examiner construes the magnitude of a quantity such as strain or strain rate to be "simply the numerical value it represents." Ans. 8. Appellant does not specifically dispute the Examiner's claim construction or persuasively explain why it is flawed. Further, Appellant does not offer any evidence or persuasive technical reasoning to explain why the quantitative value of strain, or even a change of strain per unit time, as displayed in Figures 1 and 3 of Boeck, is not a "magnitude" of strain or deformation rate. To the extent that Appellant may be arguing that strain rate or deformation rate may not be considered a mechanical activation parameter, Appellant does not persuasively explain why such a construction would be unreasonable, especially in light of Appellant's acknowledgement that strain is a mechanical activation parameter. Moreover, as discussed above, Boeck's Figure 3 appears to plot quantitative numerical values of strain over time for each of the 36 segments.

Appellant argues that "Boeck teaches that the bulls-eyes indicate the extent of shortening/stretching (a change in dimension), and the term strain refers to a force measurement. It is not clear how the mechanical activation parameter of Appellant's specification could visually indicate both a dimension and a force simultaneously." Reply Br. 5. This argument is logically unsound and appears to be grounded on a layperson's definition of "strain" that is inapposite in the context of Boeck's disclosure, which discusses "myocardial deformation" (Boeck 2), "shortening and

lengthening/thickening strain slopes" (*id.* at 3), deformation-rates indicative of shortening or stretching (*id.*, Fig. 1), and equates strain plots with deformation curves (*id.* at 4, Fig. 3). It is clear to a person having ordinary skill in the art that Boeck uses the term "strain" in the conventional physics/mechanics sense of strain (a measure of deformation representing the relative displacement between particles in a material body or a measure of how much an object is stretched or deformed when force is applied to the object), as distinguished from stress (a measure of force per unit area). Boeck does not use the term "strain" as a measure of force as Appellant contends.

Further, the Examiner also points out that Boeck displays time values on bulls-eye plots in Figure 6. *See* Final Act. 4; Ans. 11. With particular reference to Appellant's claim 3, which recites that "the mechanical activation parameter is the time parameter which is indicative of the relative activation times of the segments," the Examiner points out that "the varying shades on the bulls eye plots correspond to time values . . . i.e., the magnitudes of the mechanical activation parameter (time) are visualized as various shades, colors, or cross-hatching patterns." Final Act. 4. The Examiner also explains that Boeck's Figure 6 "is representative of mechanical activation timing (wherein the numerical time is a magnitude) over various segments as represented by the different sextants of the plot." Ans. 11. Appellant does not persuasively explain why the Examiner's finding is incorrect or why the display, using color-coding, of the magnitudes of mechanical activation times for each segment in Boeck's Figure 6 would not satisfy the limitation of generating "a depiction that

displays magnitudes of the mechanical activation parameter relative to the segments" in claim 1.[4]

Appellant appears to argue that Boeck's depiction of deformation rates is not a depiction of a mechanical activation parameter that "is indicative of 'displacement of heart wall muscle [that] may be used in conjunction with electrical mapping data to optimize the placement of leads for cardiac resynchronization therapy (CRT) procedures,' for example." Appeal Br. 14–15 (quoting Spec. ¶ 32); *see id.* at 15 (contending that "the Examiner is making a conclusory leap between the measured shortening and stretching of tissue in Boeck and the strain measurement as taught by Appellant"). This argument is unavailing because it is not commensurate with the scope of claim 1, which does not specify that the mechanical activation parameter necessarily is indicative of displacement of the heart wall muscle. *See* Ans. 13 (observing that "the mechanical activation parameter as displacement of heart wall [muscle] is not recited in [claim 1]" and that "Appellant is impermissibly reading limitations from [paragraph 32 of the Specification]").

Appellant contends that "it is reasonable to conclude (in reference to claim 1) that because a heart primarily consists of muscle tissue that the claimed displacement parameter would inherently be indicative of

[4] Appellant asserts that "the Examiner alleges that the visualizations of FIGs. 1 and 6 are the same." Appeal Br. 13. This is not the case. As the Examiner explains, different figures of Boeck "can individually be considered the claimed display as they each individually display a mechanical activation parameter that includes either displacement (stretching or shortening, see Fig. 1, 2) or time (mechanical activation time, see Fig. 6), or both (strain over time, see Fig. 4)." Ans. 12.

displacement of a heart wall muscle." Reply Br. 6. To the extent that this would be the case, the same could be said of the deformation and strain of the heart tissue that Boeck plots. Appellant appears to attempt to support its position as to the asserted claim construction by referencing claim 2, "which recites 'wherein the mechanical activation parameter is selected from the group consisting of heart wall displacement distance.'" *Id.* Appellant's reliance on dependent claim 2 actually undermines Appellant's claim construction, rather than supporting it. The recitation of heart wall displacement as a mechanical activation parameter in claim 2 merely highlights the absence of such a limitation from claim 1, from which claim 2 depends, and indicates the broader scope of claim 1. As we point out above, "the presence of a dependent claim that adds a particular limitation raises a presumption that the limitation in question is not found in the independent claim." *Bancorp*, 687 F.3d at 1275. To the extent that Appellant may be attempting, in the Reply Brief, to present a new argument for the separate patentability of claim 2, this argument is untimely and will not be considered. *See* 37 C.F.R. § 41.41(b)(2).

For the above reasons, Appellant does not apprise us of error in the Examiner's rejection of claim 1 as anticipated by Boeck. Accordingly, we sustain the rejection of claim 1, and of claims 2–7, 10–12, and 14–20, which fall with claim 1, as anticipated by Boeck.

*Anticipation—Ramanathan*

Appellant argues claims 1 and 14 together, and does not present any separate arguments for dependent claims 7–9 and 21–23, apart from their dependence from claim 1 or claim 14. Appeal Br. 16–17. We decide the

appeal of this rejection on the basis of claim 1, and claims 7–9, 14, and 21–23 stand or fall with claim 1. *See* 37 C.F.R. § 41.37(c)(1)(iv).

The Examiner finds that Ramanathan discloses a system comprising all of the features recited in claim 1. Final Act. 10. More specifically, the Examiner finds, in relevant part, that Ramanathan discloses a

> processor configured to calculate[] mechanical activation parameters from the data, i.e. activation times (par. [0135]); generate a 3D anatomical representation (par. [0034, 0039]; Fig. 14) of the heart from the data; divide the heart into segments (par. [0131]); and overlay magnitudes of activation times over the heart image (par. [0135]; Fig. 14). Lastly, Ramanathan discloses an output 24 adapted to transmit the images to a display (Fig. 1) wherein the display aids clinical diagnosis.

*Id.*

The Examiner explains that because Appellant's claims and Specification do not "specifically define the term 'relative[,'] the term is given its plain meaning[,] which is that there exists some relation between the displayed magnitudes and displayed segments." Final Act. 7. According to the Examiner, Ramanathan's Figure 14 "indicates that displayed magnitudes can be displayed in relation to the anatomical segments, i.e.[,] adjacent to." *Id.*

Appellant argues that "Ramanathan fails to teach, as claimed, displaying the magnitudes of the mechanical activation parameter relative to the segments on the anatomical representation." Appeal Br. 17. In particular, Appellant contends that, in Ramanathan's Figure 14, "the electroanatomical map is depicted on a second screen adjacent the anatomical representation of the heart (which shows the segmentation)." *Id.*

Appellant asserts that, by considering a display of magnitudes adjacent the segments to be displayed relative to the segments, "the Examiner is substituting the plain meaning of 'adjacent' in place of the actual claim language — 'relative.'" *Id.*

Appellant's argument is not persuasive. Claim 1 does not specify any particular spatial relationship between the display of the magnitudes and the segments. *See* Ans. 15 (stating that "Appellant has not provided any specific spatial relation regarding the type of relative placement" and positing that "[a]s long as the parameters are placed in some sort of spatial relationship with the heart segments, the parameters can be considered as being placed relative to the heart segments, which Ramanathan discloses"). Appellant does not point to any definition of "relative" in the record of the present application that would refute the Examiner's construction of the term as conveying merely that there is some relationship between the magnitudes and the segments. We appreciate that Appellant's Figures 7 and 8, for example, illustrate the magnitudes of the mechanical activation parameter (timing or motion/displacement) by color coding overlaid on the segments to which they pertain, but claim 1 does not recite displaying the magnitudes in overlying relationship to the segments. It is well settled that the United States Patent and Trademark Office (PTO) is obligated to give claim terms their broadest reasonable interpretation, taking into account any enlightenment by way of definitions or otherwise found in the specification. *In re ICON Health & Fitness, Inc.*, 496 F.3d 1374, 1379 (Fed. Cir. 2007) ("[T]he PTO must give claims their broadest reasonable construction consistent with the specification. . . . Therefore, we look to the specification to see if it provides a definition for claim terms, but otherwise apply a broad

interpretation."). "[A]s applicants may amend claims to narrow their scope, a broad construction during prosecution creates no unfairness to the applicant or patentee." *Id*. We must be careful not to read a particular embodiment appearing in the written description into the claim if the claim language is broader than the embodiment. *See SuperGuide Corp. v. DirecTV Enterprises, Inc.*, 358 F.3d 870, 875 (Fed. Cir. 2004) ("Though understanding the claim language may be aided by the explanations contained in the written description, it is important not to import into a claim limitations that are not a part of the claim. For example, a particular embodiment appearing in the written description may not be read into a claim when the claim language is broader than the embodiment."). The challenge is to interpret claims in view of the specification without unnecessarily importing limitations from the specification into the claims. *See E-Pass Techs., Inc. v. 3Com Corp.*, 343 F.3d 1364, 1369 (Fed. Cir. 2003).

Moreover, as the Examiner points out on page 15 of the Answer, "Ramanathan also discloses that the magnitudes of activation can be [overlaid] over the heart image." *See* Ramanathan ¶ 135 (disclosing that "[a] corresponding electroanatomical map can also be superimposed on the surface of the heart . . . (e.g., an isochrome map depicted in the example of FIG. 14)"). Thus, even if we were to construe claim 1 as requiring that the magnitudes be displayed overlying the segments, this limitation would not distinguish over Ramanathan. To the extent that the electroanatomical map illustrated in Ramanathan's Figure 14 is not deemed to be displayed in such a manner, Ramanathan discloses doing so in paragraph 135. Thus,

Appellant's assertion with respect to the meaning of "relative to" does not identify error in the rejection.

For the above reasons, Appellant does not apprise us of error in the rejection of claim 1 as anticipated by Ramanathan. Accordingly, we sustain the rejection of claim 1, and of claims 7–9, 14, and 21–23, which fall with claim 1, as anticipated by Ramanathan.

*Anticipation—Rosenberg*

Appellant argues independent claims 1 and 14 together, and does not present any separate arguments for dependent claims 12 and 13 apart from their dependence from claim 1. Appeal Br. 18–19. We decide the appeal of this rejection on the basis of claim 1, and claims 12–14 stand or fall with claim 1. *See* 37 C.F.R. § 41.37(c)(1)(iv).

The Examiner finds that Rosenberg discloses a system as recited in claim 1. Final Act. 11 (citing Rosenberg ¶¶ 92–96, 126–128, 138, 150–153, 188; Figs. 8–14).

Appellant argues that Rosenberg does not teach "'generating a depiction that displays magnitudes of the mechanical activation parameter relative to the segments' of the anatomical representation, as claimed" in claim 1. Appeal Br. 18. According to Appellant, "[w]hile Rosenberg may disclose dividing a heart into segments, the segmented representation does not have an overlay of mechanical activation parameters, but instead displays the position of electrodes relative to anatomical features of the heart." *Id.* (citing Rosenberg ¶ 103; Fig. 9).

Appellant acknowledges the Examiner's findings that Rosenberg teaches generating a 3D isochrome map and a 3D map of cardiac motion, such as the mechanical activation data, but contends that "the Examiner fails

to provide any evidence that the 3D map would be segmented, as claimed, or that the cardiac motion may be displayed 'relative' to such a segmented map." Appeal Br. 18.

Rosenberg discloses that "[b]y visualizing the global activation pattern seen on color-coded isopotential maps in the system, in conjunction with the reconstructed electrograms, an electrophysiologist can identify the source of an arrhythmia and can navigate to a defined area for therapy." Rosenberg ¶ 92. Rosenberg also discloses that "[i]nformation acquired may be displayed as a 3-D isopotential map and as virtual electrograms. Repositioning of the catheter allows for plotting of cardiac electrograms from other locations." *Id.* ¶ 93. Additionally, Rosenberg discloses that the system "provides for interpolation (mapping a smooth surface) onto which activation voltages and times can be registered." *Id.* ¶ 96. These passages indicate that the mechanical activation data is overlaid onto the mapping of the heart, perhaps by color coding.

Rosenberg discloses dividing the heart into sections AS, A, AL, PL, P, and PS, as shown in Figure 8. Rosenberg ¶ 126. Rosenberg then teaches placing electrodes RV1, RV2, and RV-Tip at various positions in the right ventricle and electrodes LV1–LV5 and LV-Tip at various positions in the left ventricle. *Id.* ¶ 128; Fig. 9. Rosenberg points out that the electrodes are located in five of the six radial sections (AS, A, AL, PL, P, and PS). *Id.* ¶ 128. Rosenberg discloses a local estimator map that "shows the 'volume' of motion of each mapped electrode" in a manner that allows comparison between the volumes of movement at the electrode sites. *Id.* ¶ 138; Fig. 12. As the mapped electrodes for which the local estimator map shows volume of motion are in at least five of the six radial sections, it is not immediately

apparent, and Appellant does not persuasively explain, why this does not constitute "generating a depiction that displays magnitudes of the mechanical activation parameter" (i.e., motion or strain data) "relative to the segments such that performance of a plurality of segments can be simultaneously evaluated," as recited in claim 1.

Rosenberg also discloses introducing "segments" that connect positions of various electrodes, thereby creating a mesh that links the positions. Rosenberg ¶ 150; Fig. 14. According to Rosenberg, a mesh-trajectory approach can analyze change in length of given segments, which may indicate local or regional strain. *Id.* ¶ 151. Such strain data appears to correspond to, or be related to, the segments Rosenberg discusses in paragraph 150. Further, Rosenberg discloses that "[a] map or model of cardiac motion may be displayed . . . based, in part, on 3-D heart information and optionally 3-D torso information that facilitates interpretation of motion information" and that "a heart map and all of the electrical activation data, mechanical activation data, VE data, etc., may be recorded for subsequent review." *Id.* ¶ 188. Appellant does not persuasively explain why this does not constitute "generating a depiction that displays magnitudes of the mechanical activation parameter" (i.e., motion or strain data) "relative to the segments such that performance of a plurality of segments can be simultaneously evaluated," as recited in claim 1.

Thus, Appellant does not apprise us of error in the rejection of claim 1 as anticipated by Rosenberg. Accordingly, we sustain the rejection of claim 1, and of claims 12–14, which fall with claim 1, as anticipated by Rosenberg.

DECISION SUMMARY

In summary:

| Claims Rejected | 35 U.S.C. § | Reference(s)/Basis | Affirmed | Reversed |
|---|---|---|---|---|
| 1–7, 10–12, 14–20 | 102(a)(1)/(a)(2) | Boeck | 1–7, 10–12, 14–20 | |
| 1, 7–9, 14, 21–23 | 102(a)(1)/(a)(2) | Ramanathan | 1, 7–9, 14, 21–23 | |
| 1, 12–14 | 102(a)(1)/(a)(2) | Rosenberg | 1, 12–14 | |
| **Overall Outcome** | | | 1–20 | |

TIME PERIOD FOR RESPONSE

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