

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MOMENTUM DYNAMICS CORPORATION,
Petitioner,

v.

WITRICITY CORPORATION,
Patent Owner.

IPR2021-01165
Patent 7,741,734 B2

Before JAMESON LEE, SALLY C. MEDLEY, and SCOTT E. RAEVSKY,
Administrative Patent Judges.

LEE, *Administrative Patent Judge.*

DECISION

Granting Petitioner's Request on Rehearing

37 C.F.R. § 42.71(d)

Granting Institution of *Inter Partes* Review

35 U.S.C. § 314

I. INTRODUCTION

On January 10, 2022, Petitioner filed a Request for Rehearing (Paper 8, “Reh’g Req.”) under 37 C.F.R. § 42.71(d) to seek modification of the Decision Denying Institution of *Inter Partes* Review (Paper 7, “Decision” or “Dec.”) of claims 1–7, 13, 19–22, 25, 26, 29, 30, 33, 34, 37, 38, 41, 42, 45, 46, 49, 50, 53, 54, 57–62, 64, 65, and 67–70 (“challenged claims”) of U.S. Patent No. 7,741,734 B2 (“the ’734 patent”). The Request is *granted*.

Our concerns regarding the Petition, as discussed in the Decision, have been alleviated by Petitioner’s referring, in the Rehearing Request, to parts of Dr. Young’s testimony (Ex. 1003) that Petitioner did not specifically refer to in the Petition and also by Petitioner’s explanation of how it understands Figure 3-11 of Stark. In our view, Petitioner should have expressly discussed these matters in the Petition, particularly the assertion that Stark’s Figure 3-9 belongs in Section 3.1.2, not Section 3.1.3 of Stark as it physically appears. However, we do not regard the explanations as belated because Petitioner reasonably might not have expected the Patent Owner or the Board to question these aspects of Stark.

The changed understanding regarding Figure 3-9 is alone enough to modify the Decision to institute review. Patent Owner is not entitled to further briefing under Rule 42.71(d), and in any event, Patent Owner already had full opportunity to discuss Figure 3-9 of Stark. It was Patent Owner who first raised the assertion that Figure 3-9 pertains to a mistuned circuit. Prelim. Resp. 13. In the Rehearing Request, Petitioner relied only on Stark and the pre-existing testimony of Dr. Young to explain that that is not so.

Petitioner has shown a reasonable likelihood that it would prevail in establishing unpatentability of at least one challenged claim. Accordingly,

we institute an *inter partes* review of all challenged claims of the '734 patent on all grounds set forth in the Petition.

II. STANDARD OF REVIEW

When rehearing a decision on institution, we do not review the merits of the decision *de novo*, but instead review the decision for an abuse of discretion. 37 C.F.R. § 42.71(c). An abuse of discretion occurs when a “decision was based on an erroneous conclusion of law or clearly erroneous factual findings, or . . . a clear error of judgment.” *PPG Indus. Inc. v. Celanese Polymer Specialties Co.*, 840 F.2d 1565, 1567 (Fed. Cir. 1988) (citations omitted). The party requesting rehearing has the burden to show that the decision should be modified. 37 C.F.R. § 42.71(d). Additionally, the request for rehearing “must specifically identify all matters the party believes the Board misapprehended or overlooked, and the place where each matter was previously addressed in a motion, an opposition, or a reply.” *Id.*

Because, as explained above, we do not treat Petitioner’s explanations in the Rehearing Request as belated, based on the explanations offered in the Rehearing Request, it was error to deny the Petition. Petitioner has shown that the Decision should be modified to institute *inter partes* review.

III. ANALYSIS

A. Independent Claim 1

1. Figure 3-9

In the Decision, we explained that Petitioner adequately accounted for elements 1 [Preamble], 1[a], 1[a][i], 1[a][ii], 1[a][iii], 1[a][iv], 1[b], 1[b][i], 1[b][ii], 1[b][iii], and 1[b][iv] on pages 11–33 of the Petition, where Petitioner asserts that Stark discloses each and every one of these elements. Dec. 12. We also explained how Petitioner adequately accounted for claim

element 1[c] as met by Stark. *Id.* at 13–14. The only claim element for which we found Petitioner’s accounting deficient is limitation 1[d]: “wherein the electromagnetic resonator structures are designed to have $Q_1 > 100$ and $Q_2 > 100$.” Dec. 14–24.

The primary reason we regarded the Petition as deficient is that although Stark discloses in Figure 3-9 sets of parameters including $Q_1 = Q_2 = 1000$, Figure 3–9 is in a separate section of Stark for developing an intuition where $\omega_1 \neq \omega_2$, and Stark’s prototype, described in Chapter 7, was designed for systems with a common resonant frequency ω_n among all coils. Dec. 15–16. Petitioner relied on Clark’s prototype parameters to account for the distance D requirement in limitation [1c]. Pet. 33–37. We determined that Petitioner did not show that limitations [1c] and [1d] were met together, as required by claim 1. Dec. 15–16.

Petitioner asserts, however, that we erred in treating Figure 3-9 as belonging to “Section 3.1.3 Physical Interpretation of $\omega_1 \neq \omega_2$ ” even though Figure 3-9 does appear on page 53 and Section 3.1.3 begins on page 52 of Stark. Reh’g Req. 3–5. According to Petitioner, Figure 3-9 belongs to “Section 3.1.2 Solution with primary and secondary tuned together.” *Id.* at 4–5. Petitioner cites to the following testimony of Dr. Young, which appears in a footnote of Declaration ¶ 162:

I note that while Figure 3-9 appears immediately under the heading “3.1.3 Physical interpretation of $\omega_1 \neq \omega_2$ ”, this appears to be the result of a spacing issue with Stark’s figures. Stark’s pole-zero plots are part of its Section 3.1.2 (“Solution with primary and secondary tuned together”). Stark at 52; 93. This is confirmed by the MATLAB code included in Stark and used to generate these plots, which uses only a single value ω_n , rather than a distinct ω_1 and ω_2 . Stark at 237–38.

Ex. 1003 ¶ 162 n.2 (cited at Reh’g Req. 4). Patent Owner in its Preliminary Response did not address this testimony. We credit this testimony of Dr. Young. This changed understanding alone is sufficient to justify a modification of the Decision to institute *inter partes* review, because on this record Petitioner has shown that Stark expressly discloses, in a tuned circuit environment where all frequencies are set to the same frequency, $Q_1 = Q_2 = 1000$. Because Stark’s prototype described in Chapter 7 is for tuned circuits, Stark reasonably would have suggested to one with ordinary skill in the art an implementation of its disclosed prototype, which has distance D satisfying limitation $1[c]$, with each of Q_1 and Q_2 set to 1000.

With the changed understanding of Figure 3-9, and the fact that Figure 3-9 shows setting $Q_1 = Q_2 = 1000$, we agree with Petitioner, on the record presented, that “it would have been obvious, to implement the same system [breadboard prototype] with Q values in the hundreds or thousands, as described with respect to limitation $1/6[d]$.” Pet. 36 n.8. Thus, limitations $1[c]$ and $1[d]$ would have been met together.

With the changed understanding of Figure 3-9, our many other noted concerns are also alleviated. For example, we noted Stark’s statement that $Q \approx 87$ is most likely the upper bound for the secondary coil. Dec. 21 (citing Ex. 1006, 129). We also noted Stark’s statement that “[t]he individual values of the quality factors are unimportant here so long as their product is constrained to $Q_1 Q_2 = 1 / k_{\text{crit}}^2 = 400$ and they are within the same order of magnitude.” *Id.* at 20 (citing Ex. 1006, 129). Given the changed understanding of Figure 3-9, these restrictions on Q are not absolutely limiting but appear to be exemplary circumstances.

2. *Figure 3-11*

In the Decision, we also stated a concern regarding how Figure 3-11 of Stark appears to indicate that high values of Q are undesirable. Dec. 18. This issue no longer matters because, as discussed above, Stark expressly describes the case of $Q_1 = Q_2 = 1000$ in a tuned circuit environment. However, we appreciate Petitioner offering a different reading of Figure 3-11 which is consistent with higher Q values being desirable with decreasing coupling coefficient k . Reh’g Req. 11–12.

Figure 3-11 of Stark is reproduced below:

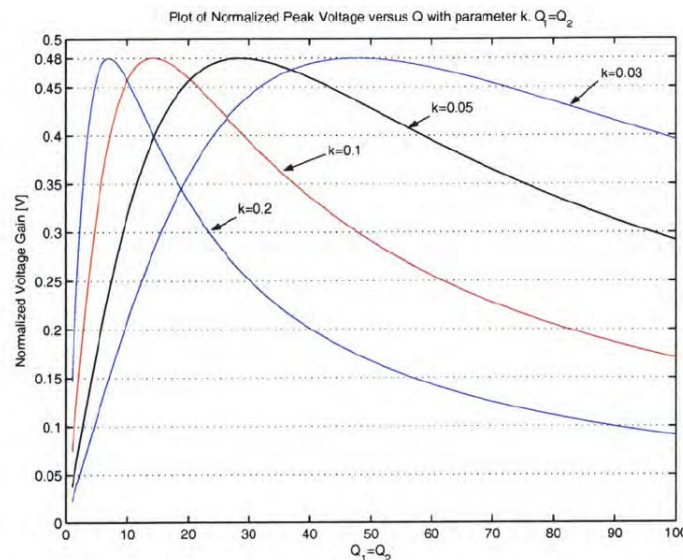


Figure 3-31: Plot of the normalized peak voltage versus Q with parameter k . Note that $\omega_n = 1$, $Q_1 = Q_2$, and $R_1 = R_2 = 1$.

Figure 3-31 illustrates normalized voltage gain based on variations in Q . Ex. 1006, 84. In the Decision, we stated that Figure 3-11 “shows that except for small values of Q , the voltage gain gets smaller as Q gets higher, the opposite of what Petitioner contends.” Dec. 18.

Petitioner explains, however, that it “did **not** contend that k is held constant as Q increases.” Reh’g Req. 12. Petitioner further explains that “a POSA would seek to maximize efficiency, and minimize losses, by

increasing Q in order to maximize the ‘kQ product.’ Young Decl. ¶¶ 209, 213.” *Id.* Petitioner argues that “as k decreases, increasing Q improves *efficiency*” because “POSAs understood at least as early as 1961 that high Q values compensated for losses associated with lower coupling (represented by k, the coefficient of coupling).” *Id.* (citing Pet. 6; Young Decl. ¶¶ 209, 211, 213, 215, 217, 218–220). In Petitioner’s view,

This is exactly what Figure 3-31 shows. With larger k (k=0.2), gain drops off quickly as Q increases, as shown by the leftmost line in the figure. But as k gets smaller, as shown by the later lines in the figure, that effect no longer holds true. Instead, as k decreases (i) a higher Q is needed to achieve peak gain, and (ii) the gain drop-off for higher Q becomes more and more gradual until it is nearly non-existent. Figure 3-31 thus supports and is perfectly consistent with Petitioner’s explanation of using high Q to maximize the kQ product: higher efficiency is obtained “by increasing the quality factor” and compensates for lower k values. Young Decl. ¶¶82–92, 209.

Id. The explanation is supported by the cited evidence. Given this explanation, Figure 3-11 from that perspective is consistent with Petitioner’s contentions.

3. *The Formula: $k_{crit} = 1 / \sqrt{Q_1 Q_2}$*

In the Decision, we had a concern based on this formula in Stark:

$$k_{crit} = \frac{1}{\sqrt{Q_1 Q_2}}$$

Dec. 18–19. We stated: “According to this formula, higher Qs would lead to a lower coupling coefficient, meaning less efficiency in energy transfer.” *Id.* at 19 (footnote omitted). We made that observation based in part on Stark’s statement that when the quality factors are roughly equal, $k = k_{crit}$ “is the coupling that yields a maximum gain when the system is driven at the

frequency w_n .” Ex. 1006, 80. It appeared that one would want to make coupling coefficient k equal to k_{crit} , and thus the smaller k_{crit} becomes, the smaller would be k , the coupling coefficient.

Petitioner explains, citing the testimony of Dr. Young:

But the “coupling coefficient,” k , is not present in this formula. Young Decl. ¶ 57. Contrary to Patent Owner’s unsupported attorney argument, k_{crit} is a *separate* value from k —which Stark discloses can be at least 40 times larger than k_{crit} . Young Decl. ¶¶250–259; Pet. 58–59, 61 n.2 (citing same). As Dr. Young testified:

Stark expressly states that k_{crit} “is only a number, *not* a method to find k or adjust it to equal k_{crit} .” Stark at 127. Accordingly, a POSA would understand that Stark discloses its system to operate at the full range of k/k_{crit} values mentioned in its plots, and not merely at $k/k_{crit} = 1$.

Young Decl. ¶259 (emphasis in original). Nor is it necessarily preferable that $k = k_{crit}$, as Stark describe[s] scenarios in which “maximum peak output voltage” is obtained with k_{crit} not equal to k . Young Decl. ¶259 (quoting Stark at 84).

Further, the Decision’s statement that “according to this formula, higher Q s would lead to . . . less efficiency in energy transfer” is incorrect and unsupported by the evidence even of $k = k_{crit}$. In that scenario higher Q could lead to lower k , but the efficiency of the energy transfer is a function of k *and* Q . Young Decl. ¶209. As Petitioner explained, it was well known for decades that “a large ***kQ product*** is the secret to low circuit losses.” Young Decl. ¶ 86 (quoting Ex. 1017 at 910). Stark explains the same: “energy transfer *efficiency*” is controlled by both “the quality factor and the coupling coefficient.” Young Decl. ¶209 (quoting Stark at 101). Thus, as Dr. Young testified, where “there may not be any ability to increase k . . . a POSA would understand [that] the energy transfer efficiency can be increased by increasing the quality factor.” Young Decl. ¶209 (citing Stark at 101, Ex. 1010 at 20). The Decision’s suggestion that “efficiency” goes down when Q is increased, merely because

k_{crit} (or even k) may go down, is not correct or supported by evidence.

Reh’g Req. 10–11. The above-quoted explanation alleviates our concern over consistency between the formula and Petitioner’s contentions. There is no inconsistency, when placing the focus on the product kQ .

4. *Additional Patent Owner Argument*

One argument of Patent Owner, not discussed in the Decision because we initially denied the Petition, now needs to be addressed. It relates to prosecution of an alleged European equivalent to the ’734 patent. Patent Owner notes that the European Examiner rejected the European independent claims over Stark, that the Patent Owner appealed that rejection to the Board of Appeal of the European Patent Office (“EPO Appeal Board”), and that the EPO Appeal Board reversed the rejection and found the European claims patentable over Stark. Prelim. Resp. 6–7, 18. Patent Owner notes that the European Appeal Board stated:

[A]ny reasoning intended to demonstrate how a skilled person would have arrived at the claimed subject matter when starting from [Stark] in an obvious way, would have to explain why a skilled person would have been motivated to operate each single Tesla coil in a clearly sub-optimal regime, where the coils are spaced at relatively large distances, when they could simply be operated at the distance corresponding to their global maximum efficiency There is nothing to be gained by operating each individual Tesla coil away from its optimum. . . . **[A]ny suggestion that the Tesla coil could be used individually to wirelessly power a device and that the air gap between the coils was what provided the wireless nature is absent in [Stark].**

Id. at 7 (citing Ex. 2001, 11–12) (emphasis added by Patent Owner).

The contention is unavailing. First, Patent Owner does not describe specifically what limitations were included in the claims rejected by the

European Examiner and appealed to the European Appeal Board. The European Board's reasoning is based on the limitations in the European claims rejected over Stark, not the claims in the '734 patent now before us. Second, Patent Owner does not specifically describe what arguments were made by Patent Owner before the European Appeal Board. The European Appeal Board's reasoning would have been based on the arguments before it, which may not be the same as Petitioner's arguments here. Third, Patent Owner does not explain why any of the specific air gap requirements in the challenged claims, especially independent claims 1 and 6, are "clearly sub-optimal."

Fourth, for claim 1, Petitioner relies on the specific air gap distance expressly described in Stark between the primary coil and secondary coil in Stark's prototype. Fifth, claim 1 does not require the first and second coils to wirelessly power another device and Patent Owner does not specifically identify a claim that does. Sixth, Petitioner explains that higher Q compensates for lower coupling coefficient k : "POSAs understood at least as early as 1961 that high Q values compensated for losses associated with lower coupling (represented by k , the coefficient of coupling), and therefore ***'It is obvious that a large kQ product is the secret to low circuit losses.'***" Schuder 910 (Ex. 1017); Young Decl. ¶¶82–92." Pet. 6. Patent Owner's quoting of what the European Appeal Board stated, without pertinent and specific context, does not undermine Petitioner's assertions.

5. Conclusion

Petitioner has shown a reasonable likelihood that it would prevail in establishing that claim 1 would have been obvious over Stark.

B. Independent Claim 6

Claim 6 is an apparatus claim substantively essentially corresponding to the method of claim 1. Both Petitioner and Patent Owner commonly addressed claims 1 and 6, with no separate arguments for either claim. In our Decision, our analysis was the same for claims 1 and 6. In the Rehearing Request, Petitioner's assertions equally apply to claims 1 and 6. The discussion above regarding Patent Owner's additional argument in the context of claim 1 equally applies to claim 6.

Thus, Petitioner also has shown a reasonable likelihood that it would prevail in establishing that claim 6 would have been obvious over Stark.

C. Claims 2–5, 7, 13, 19–22, 25, 26, 29, 30, 33, 34, 37, 38, 41, 42, 45, 46, 49, 50, 53, 54, 57–61, 64, and 67–70 as Obvious over Stark

Claims 2–5, 7, 13, 19–22, 25, 26, 29, 30, 33, 34, 37, 38, 41, 42, 45, 46, 49, 50, 53, 54, 57–61, 64, and 67–70 each depend, directly or indirectly, from claim 1 or claim 6, and incorporate all the limitations of the independent claim from which it depends. On pages 50–70 of the Petition, Petitioner presents arguments and evidence accounting for the added limitations of each dependent claim. Petitioner's assertions are supported by the cited evidence. We are sufficiently persuaded by Petitioner's arguments pertaining to these dependent claims. Patent Owner does not present contrary arguments with respect to any of these dependent claims, additional to those it has asserted for independent claims 1 and 6.

We specifically address claim 5. Claim 5 depends from claim 1, and additionally recites: “wherein $Q_1 > 1000$, and $Q_2 > 1000$.” Ex. 1001, 11:64. Petitioner explains:

With respect to $Q > 1,000$, Stark teaches that “keeping the Q of the system *exactly* at” a given value “is difficult.” Stark 30 (emphasis original). Accounting for this difficulty, a POSA

would view Stark's disclosure of $Q = 1,000$ as also disclosing Q values slightly above and slightly below those benchmarks, including $Q > 1,000$. Young Decl. ¶234. In addition, a POSA would have understood that there is no meaningful difference between resonators with Q of 1,000 (as disclosed) and Q marginally greater than 1,000 (as claimed). See Element 1/6[d]; *Titanium Metals*, 778 F.2d at 783; *In re Brandt*, 886 F.3d at 1177.

In addition and in the alternative, a POSA would have considered it obvious, in view of Stark and their background knowledge, to design Stark's primary circuit and secondary circuit such that Q_1 and Q_2 are both greater (if only slightly) than the claimed ranges of 200, 500, or 1,000. Young Decl. ¶¶203–05, 235. As described with respect to element 1/6[d], both Stark and decades of background art taught the feasibility and desirability of maximizing Q . A POSA would know how to maximize Q , such as by using different wire and selecting an optimum resonant frequency, or by changing the RLC characteristics of the resonant circuit, and would have been motivated to do so because it would improve the efficiency and further optimize the power transmission from Stark's primary to secondary circuits. Young Decl. ¶¶206–21, 235; see element 1/6[d].

Pet. 52–53. On this record, all of the above-quoted reasoning for extending Q from 1,000, which is disclosed by Stark, to just slightly above 1,000 have a rational underpinning and are supported by the cited testimony of Dr. Young. Patent Owner has not presented contrary arguments additional to those we already have discussed above for claims 1 and 6.

On this record, Petitioner has shown a reasonable likelihood that it would prevail in establishing that each of claims 2–5, 7, 13, 19–22, 25, 26, 29, 30, 33, 34, 37, 38, 41, 42, 45, 46, 49, 50, 53, 54, 57–61, 64, and 67–70 would have been obvious over Stark.

*D. Dependent Claims 61, 62, 64, and 65 as
Obvious over Stark Alone or over Stark and Mecke*

Claim 61 depends from claim 1 and claim 64 depends from claim 6, and each additionally recites: “wherein $D > 1$ cm.” Ex. 1001, 14:32, 14:35. The assertion of obviousness of claims 61 and 64 over Stark alone does not add anything more than the same assertion of obviousness of claims 61 and 64 over Stark noted above in Section C. Specifically, Petitioner asserts:

Stark discloses its primary and secondary coils being separated by a distance of up to 10 inches (approximately 25.4 cm) as measured from the closest points of each coil, which is larger than the claimed distance of 1 cm. Stark 179; Young Decl. ¶¶265–66, 272–74. If measured from the center of each coil, this distance would be increased by the radius of each coil, and therefore Stark discloses distances of up to 11.9 inches (30.226 cm). Young Decl. ¶¶273–74, 280–83.

Pet. 64. That is a sufficient accounting for claims 61 and 64 over Stark at this stage.

For claims 61 and 64, Petitioner alternatively additionally also relies on the combination of Stark and Mecke as applied to claims 62 and 65. Claim 62 depends from claim 1 and claim 65 depends from claim 6, and claims 62 and 65 each additionally recites: “wherein $D > 30$ cm.” Ex. 1001, 14:33, 14:36. We understand Petitioner’s rationale to be that when $D > 30$ cm, it is also true that $D > 1$ cm, and thus if the combination of Stark and Mecke would have rendered obvious claims 62 and 65, the combination also would have rendered obvious claims 61 and 64. We do not disagree.

Petitioner asserts that Mecke discloses an inductive power transmission system including a primary coil which wirelessly transfers energy to a secondary pickup coil. *Id.* (citing Ex. 1007, 1737). Petitioner further asserts: “A POSA would understand that Stark and Mecke rely on

the same method of operation and could be built with the same circuitry.”

Id. at 71 (citing Ex. 1003 ¶¶ 298, 301). Petitioner explains:

Mecke further states that its system operates through an “air gap of several hundred millimeters[s]” between the primary and secondary coils. Mecke Abstract, 1737, Figs. 1–2; Young Decl. ¶¶298–99. Mecke’s system is disclosed to operate, in particular, at distances including “300 mm,” “400 mm” and “800 mm.” Mecke 1737–38; Young Decl. ¶¶117, 299–304.

A POSA implementing Stark’s system would have been motivated to include an air gap of more than 300 mm (30 cm), as also described in Mecke, in order to transmit power over larger distances and better suit a wider range of wireless charging applications. Young Decl. ¶¶297–301. As Mecke describes, wireless power is useful because it avoids cables (which can trail or break), avoids wear and tear on electrical contacts, and minimizes potential sparking. Mecke 1737; Young Decl. ¶299. As a result, wireless charging is particularly useful for powering “robots” or “electric vehicles.” Mecke 1737; Young Decl. ¶¶298–99. In such cases, as a POSA would understand, larger air gaps are desirable not only because they allow devices to be powered from further away, but because they avoid practical concerns, such as vehicles with a small air gap scraping against uneven asphalt. Mecke 1737; Young Decl. ¶¶298–303.

It would have been with[in] a POSA’s knowledge to modify Stark’s system to include an air gap > 30 cm. As described above, Stark’s system and Mecke’s system operate similarly. While Mecke uses larger coils than those used in Stark’s prototype, a POSA reading Stark have reason to, and have a reasonable expectation of success in, substituting larger coils into Stark’s system, and operating the system at larger distances. Young Decl. ¶¶298–303.

Pet. 72–73. The foregoing is sufficiently persuasive only with respect to the proposed combination of Stark and Mecke, but not with respect to Stark alone, because Petitioner relies heavily on the specific disclosures of Mecke. Petitioner has not made clear what one with ordinary skill in the art would have known or desired to do in the absence of the disclosures of Mecke.

However, as explained elsewhere by Petitioner, Stark already discloses that its primary and secondary coils can be separated by a distance of up to 11.9 inches (30.226 cm), if the separation is measured from the center of each coil. Pet. 64 (citing Ex. 1003 ¶¶ 273–74, 280–83). The distance of 30.226 cm already is greater than 30 cm. For that reason, the requirement of $D > 30$ cm would have been obvious over Stark alone as well.

For the foregoing reasons, Petitioner has shown a reasonable likelihood that it would prevail in establishing that claims 61, 62, 64, and 65 would have been obvious over Stark alone or over the combined teachings of Stark and Mecke.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner's Request for Rehearing is *granted*;

FURTHER ORDERED that *inter partes* review of all challenged claims, i.e., claims 1–7, 13, 19–22, 25, 26, 29, 30, 33, 34, 37, 38, 41, 42, 45, 46, 49, 50, 53, 54, 57–62, 64, 65, and 67–70 of the '734 patent is hereby instituted on all grounds stated in the Petition; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial; the trial will commence on the entry date of this decision.

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