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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE
THE PATENT TRIAL AND APPEAL BOARD

Ex parte WILLIAM KEITH FISHER,[1]
Michael John Moore, Steven S. Rosenblum,
Zhiqiang Shi, and John Christopher Thomas

Appeal 2018-009144
Application 13/247,215
Technology Center 1700

Before MARK NAGUMO, MICHAEL P. COLAIANNI, and CHRISTOPHER C. KENNEDY, *Administrative Patent Judges*.

NAGUMO, *Administrative Patent Judge*.

DECISION ON APPEAL

William Keith Fisher, Michael John Moore, Steven S. Rosenblum, Zhiqiang Shi, and John Christopher Thomas ("Fisher") timely appeal under 35 U.S.C. § 134(a) from the Final Rejection[2] of all pending claims 1–6, 8–15, 18–21, and 23–25. We have jurisdiction. 35 U.S.C. § 6.

We AFFIRM, but, in order to provide Fisher with a full and fair opportunity

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[1] The real party in interest is identified as Corning Incorporated. (Appeal Brief, filed 13 April 2018 ("Br."), 2.)

[2] Office Action mailed 13 November 2017 ("Final Rejection"; cited as "FR").

to respond to certain issues raised belatedly, we denominate the affirmance a new ground of rejection.

OPINION

A. Introduction[3]

The subject matter on appeal relates to “chemically-strengthened glass laminates having low weight, high impact resistance, and sound-damping properties.” (Spec. 1 [0002].) Such products are said to be of special interest in architectural and transportation applications because they increase efficiency, safety, and comfort. (*Id.* at [0003].)

The ′215 Specification teaches that glass sheets are chemically strengthened, typically by immersing the sheet into a molten salt bath containing larger ions (e.g., potassium) than are in the glass (e.g., sodium). The larger potassium ions displace smaller sodium ions (to a certain extent and to a certain depth of exchange), creating compressive stress (CS) on the surface and central tension (CT) in the interior. (*Id.* at 5 [0027].) The Specification reveals preferred values of a compressive stress on the surface of at least 300 MPa (more preferably at least 600 MPa), a layer depth of ion

[3] Application 13/247,215, *Chemically-strengthened glass laminates*, filed 28 September 2011, claiming the benefit of a provisional application filed 15 October 2010. We refer to the “′215 Specification,” which we cite as “Spec.”

exchange of at least 20 μm (preferably at least 50 μm)[4], and a central tension greater than 40 MPa and less than 100 MPa. (*Id.* at [0029].)

The Specification teaches that "[i]n order for flaws to propagate and failure to occur, the tensile stress from an impact must exceed the surface compressive stress at the tip of the flaw." (*Id.* at 12 [0061].) Thus, the Specification continues, the "high compressive stress and high depth of layer of chemically-strengthened glass sheets enable the use of thinner glass than in the case of nonchemically-strengthened glass." (*Id.*) Moreover, the chemically strengthened glass laminates can deflect much further without breaking in response to a mechanical impact than ordinary glass laminates, which "enables more energy transfer to the laminate interlayer, which can reduce the energy that reaches the opposite side of the glass." (*Id.* at [0064].) This effect is said to increase the impact energy that can be withstood.

It is also thought that converting energy from the glazing flexural modes into shear strains within the polymer interlayer affects the transmission of sound through the laminate. (*Id.* at 14 [0067].) In the words of the Specification, "[i]n glass laminates employing thinner glass sheets, the greater compliance of the thinner glass permits a greater vibrational amplitude, which in turn can impart greater shear strain on the interlayer." (*Id.*) As a result, the Specification continues, "[t]he low shear resistance of most viscoelastic polymer interlayer materials means that the interlayer will

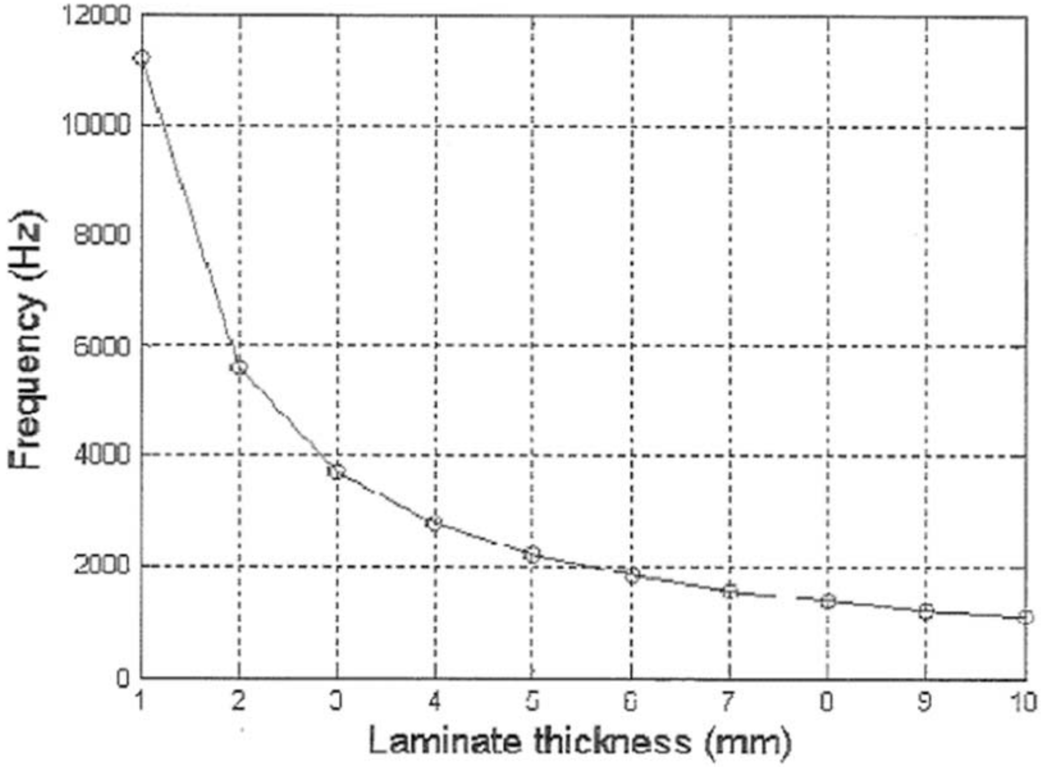
[4] The layer depth is also expressed, in microns, as 65 − 0.6(CS) (Spec. 6 [0032]); more generally as B − M(CS), with specified ranges for parameters B, M, and CS (*id.* at [0033]) .

promote damping via the high shear strain that will be converted into heat under the influence of molecular chain sliding and relaxation." (*Id.*)

The influence of these variables on the propagation of sound through a glass laminate can be characterized by a figure of merit known as the "coincidence frequency." The Specification defines the coincidence frequency as "the frequency at which the flexural oscillation wavelength of the glass sheets equals the wavelength of acoustic waves in air. This wavelength matching condition leads to improved coupling between the ambient and flexural acoustic modes and *less* attenuation at the corresponding frequency." (Spec. 14 [0068]; emphasis added.) In other words, at the coincidence frequency, more sound is transmitted through the glass laminate. As a result, the Specification reveals, it is desirable to design glass laminates having a coincident frequency greater than 5000 Hz (*id.* at 15 [0070]), i.e., "outside of the region of greatest sensitivity [of human hearing] (500 Hz to 5000 Hz)" (*id.* at [0071]). The transmission loss is said to increase essentially linearly from 250 Hz to the coincident frequency "without passing through a local minimum within the specified frequency range." (*Id.* at [0070].) Thus, if the coincidence frequency is set to be greater than 5000 Hz, a person would not perceive an increase in noise at audible frequencies transmitted through such a laminate.

Figure 5, reproduced on the next page, shows that the coincident frequency increases as the glass gets thinner. In particular, when the laminate is less than about 2 mm thick, the coincident frequency is higher than about 5000 Hz. The chemically strengthened glazing allows strong, thinner glass laminates, and thus a wider frequency range of uninterrupted sound dampening.

{Figure 5 is shown below}



{Figure 5 shows the increase in coincident frequency with the decrease in laminate thickness.}

The ′215 Specification reports two models for the acoustic dampening performance of chemically strengthened glass laminates. In the first model, although thinner laminates are said to "have a loss in the mass-controlled regime below 1 kHz, the increased coincidence frequency may increase attenuation in the 2–5 kHz regime, and therefore lead to a net benefit in the STC [sound transmission class] rating." (*Id.* at 16 [0075].) In the second model, "the thinner sheets and lower aspect ratio of the thinner glass laminates makes the laminate structure more compliant, which results in higher shear strain in the polymer interlayer that can lead to higher damping performance." (*Id.*) Moreover, according to the Specification, "as between chemically-strengthened and non-chemically-strengthened glass sheets, there may be [a] small but significant difference at the glass-polymer interlayer interface that contributes to higher shear strain in the polymer layer." (*Id.* at [0076].) Furthermore, the Specification states that different physical and mechanical properties of the glasses and the chemically strengthened glasses, "including modulus, Poisson's ratio, density, etc., . . . may result in a different acoustic response." (*Id.*)

Claim 1 is representative and reads:

> A glass laminate comprising
>
> a polymer interlayer formed over a first major surface of a first chemically-strengthened glass sheet, and
>
> a second glass sheet separated by the polymer interlayer from the first glass sheet,
>
> the first and second glass sheets having:
>
> *a thickness less than 2.0 mm*; and
>
> a near-surface region under a compressive stress, wherein the compressive stress (CS) at a surface of the first glass sheet is greater than 300 MPa, and
>
> the near surface region extends from a surface of the first glass sheet to a depth of layer (in micrometers) having a value of at least 65 − 0.06(CS) where CS is the surface compressive stress in MPa, and
>
> *wherein the glass laminate has a transmission loss that does not decrease by more than 1 dB over any 100 Hz interval over a frequency range from 250 to 5000 Hz.*

(Claims App., Br. 20; some formatting, and emphasis added.)

The Examiner maintains the following grounds of rejection[5, 6]:

A. Claims 1–6, 8–11, 14, 15, 18–20, and 23–25 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Benson,[7] and Glaesemann.[8]

A1. Claims 12 and 13 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Benson, and Glaesemann, and Littell.[9]

A2. Claim 20 stands rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Benson, and Glaesemann, and Tomozane.[10]

B. Discussion

The Board's findings of fact throughout this Opinion are supported by a preponderance of the evidence of record.

Fisher presents arguments for patentability based on limitations recited in claim 1, without raising substantively distinct arguments for any

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[5] Examiner's Answer mailed 27 July 2018 ("Ans.").

[6] Because this application was filed before 16 March 2013, the effective date of the America Invents Act, we refer to the pre-AIA version of the statute.

[7] Vernon C. Benson, Jr., and Glenn E. Freeman, *Sound absorbing article and method of making same*, U.S. Patent No. 6,119,807 (2000).

[8] Gregory Scott Glaesemann et al, *Damage resistant chemically-toughened protective cover glass*, U.S. Patent Application Publication 2009/0202808 A1 (2009).

[9] Harry E. Littell, Jr., *Integral transparent safety glass armor unit*, U.S. Patent No. 3,671,370 (1970).

[10] Shotaro Tomozane et al., *Shaped glass sheet and a process for the preparation thereof*, U.S. Patent No. 5,589,248 (1996).

other claim. (Br. 18–19, §§ B & C.) All claims stand or fall with claim 1. 37 C.F.R. § 41.37(c)(1)(iv) (2017).

The Examiner finds (FR 4) that Benson teaches laminates [for side or rear windows] having glass lamina less than 2.0 mm thick [preferably 1.5–2.5 mm, most preferably 1.9–2.1 mm (Benson col. 4, ll. 34–40)]. The Examiner finds further (FR 5–6, ¶ 4) that Benson also cites prior art teachings to avoid the "coincidence effect," ordinarily at around 2000 Hz, at which frequency the sound transmission increases (i.e., the attenuation of sound at that frequency decreases) (Benson col. 1, l. 61–col. 2, l. 20) by: "increasing the mass of the laminated glass, multi-layered glass, segmentation of the glass area, improvement of the facilities to support the glass plate and improvement in the interlayer film for laminating the glass sheets" (*id*. at col. 2, ll. 26–31, citing EP 0 566 890.) The Examiner finds (FR 4, ¶ 2) that Benson suggests the use of chemically strengthened glass (Benson col. 12, ll. 9–10), but that Benson does not disclose any of the parameters required by the claims.

The Examiner finds that Glaesemann teaches such chemically strengthened glass [for touch-screens]. (FR 4–5, ¶ 3 (citing Glaesemann [0009], [0036], and [0037).)

The Examiner concludes that the subject matter of claim 1 would have been obvious on a theory of inherency (the same structure, a glass laminate with glass layers less than 2.0 mm thick, made of the same materials (chemically strengthened glass meeting the recited CS and layer depth limitations) would have the same acoustic properties). Alternatively, given that the prior art described in Benson taught that "it is necessary to mitigate the coincidence effect described above to prevent the decreases in the minimum transmission loss caused by the coincidence effect ([Benson] column 2, ll. 21–31)" (FR 5, ¶ 4), the Examiner concludes that "not only were these properties well-known in the art before the filing of the instant invention, but the knowledge of varying certain factors to modify the values of these properties was also well-known in the art." (*Id.*)

In response to Fisher's arguments that inherency in the obviousness rejection cannot be maintained because the acoustic properties due to the chemically-strengthened glass sheet were not known at the time of the invention, the Examiner reasons that "Applicants have not shown any proof that the relationship between such acoustic properties with chemical-strengthening of glass sheets were not known at the time of their invention." (FR 8, 2d para.)[11] The Examiner then cites three U.S. Patents and five abstracts of foreign patent publications (one Korean, three Soviet, and one Japanese). The Examiner finds that the Japanese abstract and the last U.S. Patent, No. 5,145,953[12] (hereinafter, "de Moncuit") "especially make mention of the relationship between chemically-strengthened glass sheets and the two claimed sound properties of transmission loss and coincident frequency." (FR 8, last full sentence (citing de Moncuit col. 7, ll. 28–37).)

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[11] We are not aware of any requirement that an applicant need prove that persons skilled in the art did *not* know of some relation or fact in the art. Proving such a negative "fact" is, practically speaking, impossible. The burden was on the Examiner to prove that such a relation was known.

[12] Frédéric de Moncuit et al., *Composite glazing panel*, U.S. Patent No. 5,154,953 (1992).

The Examiner provides no further description or analysis of any of these documents.

Fisher argues that "[a]s compared to non-chemically-strengthened glass sheets, chemically-strengthened glass sheets can have a small but significantly different glass-polymer interlayer interface that can contribute to a higher shear strain on the polymer interlayer and, thus, produce improved acoustic damping properties." (Br. 13, 2d full para. (citing Spec. [0067], [0072], [0073], and [0076]).) "There is no teaching whatsoever in the prior art," Fisher urges, "that a chemically-strengthened glass sheet, when used in a laminate, can provide improved acoustic damping performance as compared to a laminate not comprising a chemically-strengthened glass sheet." (Br. 17, last para.)[13] Because inherency in an obviousness rejection cannot be predicated on what is not known in the art, Fisher concludes, the rejection based on Benson and Glaesemann must be reversed. (*Id.* at 18, 1st full para.)

The Examiner maintains the rejections in the Answer, and elaborates on the teachings of de Moncuit (only), quoting, with added commentary, the cited passage, which reads (without the Examiner's commentary):

> Advantageously, the panel includes at least one vitreous sheet which is of chemically tempered glass and is not more than 2 mm thick. Being tempered, such a sheet will have good resistance to breakage, and it will also have a rather high critical frequency of coincidence (above 6000 Hz) and is useful for masking lower frequency coincidence

[13] In this regard, Fisher provides a brief summary and analysis of each of the additional documents cited by the Examiner in the Final Rejection (copies of the abstracts were not provided, and the abstracts were not listed on the form PTO-892 attached to the Final Rejection). (Br. 14–17, § 5.)

> transmission peaks of other parts of the panel when it is not dynamically coupled to another sheet.

(de Moncuit col. 7, ll. 28–37.)

Regarding this passage, Fisher urges that

> [t]his passage thus merely discloses a coincidence frequency for a single (e.g., uncoupled) chemically tempered glass sheet. This passage does not disclose the coincident frequency of a laminate comprising such a glass sheet, much less teach or suggest that the sound dampening properties of a laminate can be improved by including at least one chemically-strengthened glass sheet in the laminate.

(Br. 17, 1st full para.)

The late citation of de Moncuit (in the "Response to Argument" section of the Final Rejection), without specific analysis by the Examiner until the "Response to Argument" section of the Examiner's Answer, left Appellant Fisher in the unfair position of having to speculate in the Brief as to how the Examiner intended to apply this reference, which was one of eight references cited without analysis in support of the same proposition.

While it is true that Fisher did respond substantively to the eight references cited by the Examiner in the Final Rejection, and hence had some notice of the Examiner's position, it was not until the Response to Argument section of the Examiner's Answer that the Examiner made clear the particular importance of de Moncuit's teachings. While it is true that Fisher did not file a Reply Brief, and hence did not take full advantage of every opportunity to be heard, it should also be noted that it is presumed that new evidence is not relied on without notice in a final rejection. A reason for this is that a full reply to new findings of fact not previously in the record often requires citations of further facts that are not be in the record, but the regulations governing appeals forbid expressly reliance on evidence not of record.[14] Before a case goes on appeal, the record must be complete, because appeals before the Patent Trial and Appeal Board are based on the record. 37 C.F.R. § 41.37(c)(1)(iv) (2017). As the predecessor to our reviewing court stated in a similar situation, "[w]here a reference is relied on to support a rejection, whether or not in a 'minor capacity,' there would appear to be no excuse for not positively including the reference in the statement of the rejection." *In re Hoch*, 428 F.2d 1341, 1342 n.3 (CCPA 1970). In the present case, as discussed below, the teachings of de Moncuit are not present in a mere "minor capacity" in the rejections.

On the basis solely of the combined teachings of Benson and Glaesemann, it can be argued that the Examiner established a prima facie case of obviousness based on Benson's teachings that laminates having glass sheets less than 2 mm thick are useful as side or rear windows, and the suggestion that chemically strengthened sheets are useful, plus Glaesemann's teachings of specific chemically tempered glass sheets meeting the requirements of the claims. The reasons for combining references do not have to be the same as those of applicants. *In re Kahn*, 441 F.3d 977, 990 (Fed. Cir. 2006) ("[T]he skilled artisan need not be motivated to combine [the prior art] for the same reason contemplated by [the inventor].") However, the inquiry into obviousness does not end with the prima facie case, as secondary considerations such as the question of unexpected results, if raised, must be considered. If, based on the applied

[14] "A brief shall not include any new or non-admitted affidavit or other Evidence." 37 C.F.R. § 41.37(c)(2).

prior art of record, the weight of the evidence is that a certain property of an article of manufacture would not have been expected, an unexpected result has been established. *In re Mayne*, 104 F.3d 1339, 1343, 41 USPQ2d 1451, 1455 (Fed. Cir. 1997) ("An examination for unexpected results is a factual, evidentiary inquiry . . . "). That evidence must be weighed against the evidence in favor of obviousness. *In re Rouffet*, 149 F.3d 1350, 1355 (Fed. Cir. 2000) ("Whether the evidence presented suffices to rebut the *prima facie* case is part of the ultimate conclusion of obviousness and is therefore a question of law.").

The Examiner cites no credible evidence that the prior art cited by Benson provides "knowledge of certain factors to modify" that would have led to the reasonable expectation that reducing the thickness would result in avoidance of the "coincidence effect" discussed by Benson. In particular, the Examiner has not explained how any of the "various ways to prevent the decrease in the TL value, such as an increase in the mass of the laminated glass, multi-layered glass, segmentation of the glass area, improvement of the facilities to support the glass plate and improvement in the interlayer film for laminating the glass sheets" (Benson, col. 2, ll. 26–31) would have provided a teaching equivalent to providing thinner glass sheets. Thus, the case for a reasonable expectation of successfully varying known parameters in a known way to achieve an expected result has not been made on the basis of Benson and Glaesemann alone.

The reliance on inherency in an obviousness rejection, which necessarily relies on the combination of separate teachings (else the rejection would be for anticipation) is particularly problematic when, as here, the recited properties arise from the combination of elements, rather from a single element described in one of the references. Many inventions are understandable and "obvious" after the fact, but were not so perceived before the invention was described. Thus, while the Examiner has identified certain combinations of laminates having properties suggested by Benson and by Glaesemann that would have been prima facie obvious, the Examiner has not shown that the routineer would have expected those combinations to have had the acoustic transmission properties asserted to be unexpected by Fisher.

de Moncuit, however, provides evidence that it was known in the art, prior to Fisher's filing date, that providing glass sheets thinner than 2 mm to a laminate would also provide a frequency of coincidence greater than 6000 Hz. Fisher's argument that de Moncuit is concerned only with "a single (e.g. uncoupled) chemically tempered glass sheet" and "does not disclose the coincident frequency of a laminate comprising such a glass sheet" (Br. 17, 1st full para.) are rebutted directly by de Moncuit. de Moncuit acknowledges that the behavior of laminated glazing panels is more complicated than single sheets "because of the different natures of the intervening layers of adhesive material and of the glass." (de Moncuit col. 1, ll. 56–59.) de Moncuit continues,

> However in a typical safety laminate there must be a rather strong bond between the glass and the adhesive so that in the event of breakage fragments of the glass are retained by the panel and do not fly off and possibly cause injury. In fact the acoustic behaviour of typical laminated safety glazings is scarcely distinguishable from the acoustic behaviour of a single monolithic sheet of glass of the same shape and area as the laminate and of the same thickness as the total thickness of the glass in the laminate. Thus for the purposes of this specification and *as regards their acoustic properties, such*

> *conventional laminates are considered as equivalent to a single monolithic sheet*. [(*Id.* at col. 1, l. 59–col. 2, l. 3 (emphasis added).)]

We conclude that, in light of the teachings of de Moncuit, a person having ordinary skill in the art would have expected, reasonably, that using thinner, chemically tempered glass sheets such as those suggested by Glaesemann, for the thin (less than 2-mm thick) glass laminates suggested by Benson for side and rear windows) would have the favorable sound transmission loss characteristics required by claim 1.

We have last to address the allegedly unexpected "acoustic properties of chemically-strengthened glass sheets as incorporated into laminates . . . not previously recognized or appreciated by Benson or Glaesemann." (Br. 14, 3d para.) While such an assertion is made in the Specification, those disclosures are presented as hypotheses. (Spec. 16 [0075]–[0076].) Moreover, there appear to be no comparisons of, e.g., soda-lime glass laminates with glass sheets less than 2.0 mm thick, with chemically strengthened glass sheets of the same thickness. We therefore accord the assertion of unexpected acoustic properties of chemically strengthened glass sheets little, if any, evidentiary weight. *In re Soni*, 54 F.3d 746, 750 (Fed. Cir. 1995) ("[i]t is well settled that unexpected results must be established by factual evidence. Mere argument or conclusory statements in the specification does not suffice.") (quotes and citations omitted).

Had the Examiner presented these arguments, including the discussion of de Moncuit, first made in the Examiner's Answer, in the Final Rejection, we should have had little difficulty affirming the rejection, as Fisher would have been afforded effective notice of the full basis of the Rejection.

We correct the problem by affirming in view of the references actually relied on: Benson, Glaesemann, and de Moncuit.

To cure the disadvantage to Fisher, we denominate the affirmance as a new ground of rejection.

C. Order

It is ORDERED that the rejection of claims 1–6, 8–15, 18–21, and 23–25 is affirmed in view of the combined teachings of Benson, Gleasemann, and de Moncuit.

This decision contains a new ground of rejection. 37 C.F.R. § 41.52(a)(1) provides that "Appellant may file a single request for rehearing within two months of the date of the original decision of the Board." 37 C.F.R. § 41.50(b) provides that "[a] new ground of rejection pursuant to this paragraph shall not be considered final for judicial review." 37 C.F.R. § 41.50(b) also provides that Appellant, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of the appeal as to the rejected claims:

> (1) Reopen prosecution. Submit an appropriate amendment of the claims so rejected or new evidence relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the proceeding will be remanded to the examiner. . . .
>
> (2) Request rehearing. Request that the proceeding be reheard under § 41.52 by the Board upon the same Record.

Should Appellants elect to prosecute further before the Examiner pursuant to 37 C.F.R. § 41.50(b)(1), in order to preserve the right to seek review under 35 U.S.C. §§ 141 or 145 with respect to the affirmed rejection, the effective date of the affirmance is deferred until conclusion of the prosecution before the Examiner unless, as a mere incident to the limited prosecution, the affirmed rejection is overcome.

If Appellant elects prosecution before the Examiner and this does not result in allowance of the application, abandonment or a second appeal, this case should be returned to the Patent Trial and Appeal Board for final action on the affirmed rejection, including any timely request for rehearing thereof.

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

AFFIRMED
37 C.F.R. § 41.50(b)