TETRA TECH CANADA INC.
V.
GEORGETOWN RAIL EQUIPMENT COMPANY

IPR2019-01581

U.S. PATENT NO. 8,081,320

Patent Owner's Demonstratives

December 3, 2020

IPR2019-01581

U.S. PATENT NO. 8,081,320

CLAIMS 1-17

PETITIONER FAILS IN ITS BURDEN OF PROVING GROUNDS 1-3

- Petition Ground 1: Claims 1-2, 5-7, 10-13, and 16-17 unpatentable based on Villar, Choros, Casagrande, and Szwilski
- Claim 1 is the focus; unpatentability arguments of other claims derivative

- Petition Ground 2: Claims 3, 8, and 14 unpatentable based on Villar, Choros, Casagrande, Szwilski, and Khattak
- Claim 3 is the focus; unpatentability arguments of other claims derivative

- Petition Ground 3: Claims 4, 9, and 15 unpatentable based on Villar, Choros, Casagrande, Szwilski, and Andersson
- Claim 4 is the focus; unpatentability arguments of other claims derivative

Petition at 8, 20-76; Reply at 4-26; POR at 6-43; Sur-reply at 5-26.

A POSITA WOULD NOT HAVE COMBINED CHOROS WITH VILLAR FOR ANY OF PETITIONER'S GROUNDS OR CLAIMS

- Grounds 1-3 all rely on combining Choros with Villar
- A POSITA would not have combined Choros' simple manual method with Villar's complex machine vision system

Petition at 8; POR at 4-6; Sur-reply at 4.

A POSITA WOULD NOT HAVE COMBINED CHOROS WITH VILLAR

Dr. Bovik

- "The content of a prior art reference that utilizes computer vision [like Villar] simply would not have been helpful to a POSITA in implementing [Choros'] tasks or techniques in computer vision."

- "Referring to a prior art reference, like Choros, that performs the task of manually measuring rail seat abrasion, and then referencing prior art that implements computer or machine vision, like Villar, would not have made it obvious to implement the determination of rail seat abrasion in a computer vision system."

Ex-2001, ¶40; POR at 6.

A POSITA WOULD NOT HAVE COMBINED CHOROS WITH VILLAR

Dr. Bovik

- "[I]mplementing even simple tasks in machine vision is generally difficult[and] extremely time-consuming."

- "The process of taking such a [manual] task … and synthesizing it into one that operates in computer vision system is very burdensome."

Ex-2001, ¶¶38, 39; POR at 5.

PETITIONER FAILS TO PROVE GROUND 1

VILLAR, CHOROS, CASAGRANDE, AND SZWILSKI DO NOT DISCLOSE ELEMENTS [E] OR [F] OF CLAIM 1

POR at 6-31; Sur-reply at 5-21.

PETITIONER FAILS TO PROVE THAT VILLAR AND CHOROS DISCLOSE ELEMENT [E] OF CLAIM 1

"DETERMINING WHETHER RAIL SEAT ABRASION IS PRESENT ALONG THE RAIL ROAD TRACK"

POR at 7-16; Sur-reply at 5-13.

PETITIONER FAILS TO PROVE THAT A POSITA WOULD HAVE COMBINED OR MODIFIED VILLAR WITH CHOROS

- Petitioner fails to provide sufficient evidence that a POSITA would have been motivated to combine Villar and Choros to obtain element [e]

- Relies first on contention that Choros discloses "both manual and automatic inspection methods" and the supposed "automatic" method is "collecting data on geometry cars as an alternative to manually identifying RSA locations."

Petition at 31, 28, 37; Reply at 11, citing Ex-1007 at 11; POR at 12-16; POR Sur-reply at 8-12; Ex-2001, ¶¶58-60.

PETITIONER FAILS TO PROVE THAT A POSITA WOULD HAVE COMBINED OR MODIFIED VILLAR WITH CHOROS

- Choros does not suggest automated determination of RSA but instead emphasizes the importance of using visual inspection and manual measurement to determine and measure RSA.

- Choros discloses that geometry cars can only "identify[]" potential RSA locations and that, to determine if RSA exists and to measure RSA, a track inspector must visit those locations and physically measure RSA.

- Petitioner's other evidence demonstrates that geometry cars can only "indicate" "possible" or "potential" track locations where RSA might be present, and that subsequent manual and visual inspection is necessary "to verify whether [RSA] exists."

Ex-1007 at 11; POR at 13-14; POR Sur-reply at 8-9; Ex-1019 at 3, 18; Ex-1015 at 2-3; Ex-1017 at 3-4; Ex-2001, ¶¶59-60.

PETITIONER FAILS TO PROVE THAT A POSITA WOULD HAVE COMBINED OR MODIFIED VILLAR WITH CHOROS

- Petitioner incorrectly argues that Choros contemplates using inspectors only "because of the lack of 'availability of existing geometry cars.'"

- Choros states only that such "availability" "may be" an issue, not that it is the sole reason why Choros' "simpler method" of manual inspection must be employed to determine and measure RSA.

- The import of Choros is visual inspection and manual measurement by use of its "abrasion measurement gauge."

Reply at 11; POR at 13; POR Sur-reply at 8-9; Ex-1007 at 11-13; Ex-2001, ¶59.

PETITIONER FAILS TO PROVE THAT A POSITA WOULD HAVE COMBINED OR MODIFIED VILLAR WITH CHOROS

- Petitioner relies on Choros' comment about "adjusting parameters based on new field data values '[a]s measurement methodologies improve, either from automated inspection vehicles or hand held devices.'"

- The quote is inadequate to support combining Choros with Villar; it only generally states that future developments might lead to improved technology.

Reply at 11 (emphasis original); Ex-1007 at 13; POR Sur-reply at 9.

PETITIONER FAILS TO PROVE THAT A POSITA WOULD HAVE COMBINED OR MODIFIED VILLAR WITH CHOROS

- Petitioner also argues that it would have been "obvious to implement" automated RSA determinations "in response to the" FRA's "initiatives to automate RSA detection following two high profile derailments in 2005 and 2006."

- The FRA's final rules cannot provide motivation because they came into effect on 11/8/2011, after the '320 patent's 6/23/2009 effective filing date.

Reply at 7-9; Petition at 25-27; POR at 14-15; POR Sur-reply at 9-10; Ex-2001, ¶¶61-62.

PETITIONER FAILS TO PROVE THAT A POSITA WOULD HAVE COMBINED OR MODIFIED VILLAR WITH CHOROS

- The FRA's proposed rules also could not have motivated a POSITA to implement an automated system for RSA.
- The proposed rules state that "automated inspection technology shall be used … as a supplement to visual inspection," and that each potential issue "must be located and field verified" (*i.e.*, by manual inspection).
- The rules provide no motivation for change; the FRA recognized that existing automated and manual technologies were sufficient to satisfy their proposed rules because they required only that automated equipment "indicate" areas of "possible rail seat deterioration," and "on-the-ground visual verification" "done by inspectors" to locate, determine, and measure actual RSA.

POR Sur-reply at 10; POR at 15; Ex-2001, ¶¶62-63; Ex-1021 at 17-18; Ex-1041 at 3-4; Ex-1017 at 3-4; Reply at 7-9; Petition at 19-20.

PETITIONER FAILS TO PROVE THAT A POSITA WOULD HAVE COMBINED OR MODIFIED VILLAR WITH CHOROS

- The evidence relating to FRA committee formation because of the 2005 and 2006 derailments at most supports a better effort to detect RSA, not the development of any particular method.

- The committee's "objective" was "develop[ing] manual and automated methods to detect rail seat failure on concrete ties."

- The objective's wording, as well as the content of the subsequent rules, demonstrate that this objective meant using both methods combined, not an automated method alone.

POR Sur-reply at 11; Ex-1020 at 83; Petition at 19; Reply at 9; *see id.* at 8.

PETITIONER FAILS TO PROVE THAT A POSITA WOULD HAVE COMBINED OR MODIFIED VILLAR WITH CHOROS

- Petitioner raised a new argument in its Reply that combining Villar and Choros would "predictably result" in element [e] because GREX's employees testified that Villar's automated detection of misaligned or sunken tie plates involves the "same, similar type of analysis."

- Testimony is inapplicable: taken from other IPRs, involving different patents and claim language; no context for testimony of what might be the "same" or "similar" between different patent claims' requirements.

Reply at 7; Ex-1043 at 1, 85:4-86:15; Ex-1044 at 1, 29:11-12, 23:17-19; POR Sur-reply at 11-12.

PETITIONER FAILS TO PROVE THAT A POSITA WOULD HAVE COMBINED OR MODIFIED VILLAR WITH CHOROS

- In context, GREX's Mr. Grissom's testimony is that all loading from the train that causes wear is transferred to tie plates (on wooden ties) or rail seats (on concrete ties), and thus the distinct measurements take on the "same" or "similar" importance.

- Mr. Grissom testified that the algorithms for RSA and "tie plate cutting" are "separate" and "not identical," and that the "steps would not be the same."

POR Sur-reply at 11-12; Ex-1043 at 85:4-86:15.

A POSITA WOULD NOT HAVE COMBINED CHOROS WITH VILLAR

Dr. Bovik:

- Combining Choros and Villar "to create a machine vision system that measures rails seat abrasion would not have been obvious."

- "Villar is at best a starting point for the creation of another invention, not an obvious endeavor"

Ex-2001, ¶¶ 52-53, 64; POR at 9-10; PO Sur-reply at 5-6.

A POSITA WOULD NOT HAVE COMBINED CHOROS WITH VILLAR

Dr. Bovik:

- "Even if a POSITA were motivated to add the feature of determining rail seat abrasion to Villar, a POSITA would need to create a model, create code for the model, and then experiment and test the resulting code and system to make certain that they work properly."

- "The disclosure in Choros is not helpful to that endeavor because Choros does not contain a model, an algorithm, or code for determining rail seat abrasion."

Ex-2001, ¶¶ 52-53, 64; POR at 9-10; PO Sur-reply at 5-6.

A POSITA WOULD NOT HAVE COMBINED OR MODIFIED VILLAR WITH CHOROS

- **Dr. Bovik:**

- "[A] POSITA would not have modified Villar with Choros because there is a vast chasm between Choros' manual method and an automated method that uses machine vision, like Villar."

- "A special amount of invention and creativity is necessary" "to write an algorithm to implement a manual method because" "implementing even the simplest concept into machine vision is very difficult and time consuming."

POR at 9; Ex-2001, ¶52.

A POSITA WOULD NOT HAVE COMBINED OR MODIFIED VILLAR WITH CHOROS

- **Dr. Bovik:**
- "[A] POSITA would not have modified Villar with Choros because their techniques are diametrically opposed."
- "Choros employs a simple technique using human visual inspection to locate the rail seat followed by manual placement of a gauge, ruler, or similar measurement tool in or near the rail seat to physically measure the distance between the rail seat and the abraded top surface of the crosstie."
- "Villar employs a vastly more complicated technique that involves automated imaging of virtually every object inspected and all surrounding areas, recording an image of the height of each object's entire visible surface and of the surrounding areas, to create multiple images, and analyzing those images to locate certain objects and measure various aspects of the railroad track and its components."

POR at 10; Ex-2001, ¶54.

A POSITA WOULD NOT HAVE COMBINED CHOROS WITH VILLAR

Petitioner:

Dr. Bovik's opinion "contradicted by" evidence of "extensive research efforts" into "automating manual inspection tasks" "before 2009" to "obviate time, accuracy, and safety issues associated with manual inspection."

Patent Owner:

- Petitioner suggests that automating any task in machine vision was obvious in 2009.
- The evidence represents only general machine vision improvements, not anything significant to the claimed features.
- Dr. Bovik's opinions based on view of POSITA as of critical date—takes into consideration the state of the art.

Reply at 6-7; PO Sur-reply at 6; Ex-2001, ¶¶ 52-53, 64, 25-26, 3, 36.

VILLAR TEACHES AWAY FROM THE COMBINATION OF CHOROS WITH VILLAR

Dr. Bovik:

- Another reason why a POSITA would not have combined Villar with Choros:

- Villar expressly teaches away from Choros' type of measurement system.

POR at 10-12; Ex-2001, ¶¶55-57; Sur-reply at 7.

VILLAR TEACHES AWAY FROM THE COMBINATION OF CHOROS WITH VILLAR

"Villar discloses a laser/camera line optical scanning and analysis system that can automatically determine certain measurable aspects of a railroad track."

Its purpose is directed to "overcoming" the problems of manual and "visual inspection" by "railroad inspectors" grading crossties and fastener system.

POR at 10-12; Ex-2001, ¶¶55-57; POR Sur-reply at 7; Ex-1005 at ¶¶[0004], [0007].

[0004] To manage the logistics of crosstie replacement and to quantify the need for new crossties, railroad inspectors attempt to grade the condition of crossties and the fastener system on a regular basis. This grading is most often done with a visual inspection to identify crossties and fasteners that are rotten, broken, split, or worn to an extent that their serviceable life is at its end. The process of visual inspection is quite time consuming. In practice, inspection of the track is performed by an inspector walking along the track to inspect and record the conditions of the crosstie and/or fasteners, which are spaced approximately every 20-inches along the track. One particular North American railroad reports that a crew of 3 or 4 men can grade only about 5 to 7 miles of track per day.

[0007] The present invention is directed to overcoming, or at least reducing the effects of, one or more of the problems set forth above.

VILLAR TEACHES AWAY FROM THE COMBINATION OF CHOROS WITH VILLAR

Dr. Bovik:

In contrast, Choros discloses a manual measurement and visual inspection method.

Choros uses a tool called "an abrasion measurement gauge" physically placed "between the abraded tie and the rail base" to "measure the void between the rail and tie" and "measure concrete tie abrasion" as compared to the unabraded crosstie surface.

Choros discloses that "similar feeler gages or a ruler" can also be used.

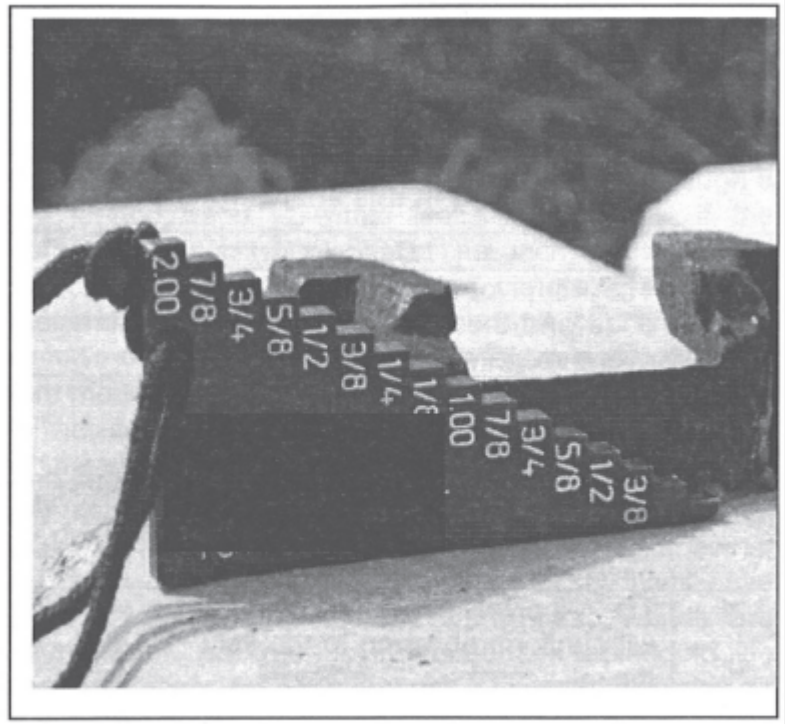


Figure 7. A Typical rail abrasion measurement device

POR at 11; Ex-2001, ¶56; Sur-reply at 7; Ex-1007 at 11-13.

VILLAR TEACHES AWAY FROM THE COMBINATION OF CHOROS WITH VILLAR

Dr. Bovik:

- "Villar thus explicitly criticizes, discredits, and discourages use of Choros' type of system."
- "[A] POSITA would not have been motivated to combine Choros with Villar for this additional reason."

POR at 10-12; Ex-2001, ¶¶55-57; Sur-reply at 7.

VILLAR TEACHES AWAY FROM THE COMBINATION OF CHOROS WITH VILLAR

Petitioner:

- "Villar does not discourage automating RSA—but rather encourages it"

- Villar's and Choros' "combined teachings" "would have suggested" element [e] because:
  - Villar states that its methods are not "intended to be limited to the measurable aspects and particular techniques described herein," and
  - Villar "[r]ecogniz[ed] that manual inspection" "is time-consuming" and thus "concedes that automating manual inspection tasks, including identifying crosstie defects, were well-known."

Reply at 9-10 (emphasis original), citing Ex-1005, ¶43.

VILLAR TEACHES AWAY FROM THE COMBINATION OF CHOROS WITH VILLAR

- "Villar's general statement that it is not "limited" to the "particular techniques described" is "boilerplate language"; it cannot enlarge Villar beyond what its specification describes.

- Such "boilerplate language" "is not sufficient to show adequate disclosure of" an invention. *See* D Three Enterprises, LLC v. SunModo Corp., 890 F.3d 1042, 1051 (Fed. Cir. 2018).

- It cannot suggest any specific application undisclosed in Villar, like element [e].

POR Sur-reply at 8.

PETITIONER FAILS TO PROVE THAT VILLAR AND CHOROS DISCLOSE ELEMENT [E] OF CLAIM 1

- Even presuming a motivation to combine Villar and Choros, the combination does not disclose or suggest element [e].

- Petitioner relies on Choros to prove unpatentability of element [e] because Villar does not disclose or suggest determining or measuring RSA.

- Choros does not disclose or suggest element [e]: Choros does not disclose or suggest a processor or image processor, or a processor that analyzes track images to measure vertical distances or that determines or measures rail seat abrasion.

Petition at 37-45; PO Response at 8; Ex-2001 at ¶50; PO Sur-reply at 12.

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, CASAGRANDE, AND/OR SZWILSKI DISCLOSE ELEMENT [F] OF CLAIM 1

"WHEREIN, WHEN DETERMINING WHETHER RAIL SEAT ABRASION IS PRESENT, THE AT LEAST ONE PROCESSOR COMPENSATES FOR A TILT OF THE RAIL ROAD TRACK"

POR at 17-31; Sur-reply at 13-21.

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, CASAGRANDE, AND/OR SZWILSKI DISCLOSE ELEMENT [F] OF CLAIM 1

Petitioner Posits Three Separate Combinations

- Villar, Choros, and Casagrande
- Villar, Choros, and Szwilski
- Villar, Choros, Casagrande, and Szwilski

Petition at 46-54; Reply at 11-18.

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, AND CASAGRANDE DISCLOSE ELEMENT [F]

- Casagrande does not disclose or suggest element [f]: "determining whether rail seat abrasion is present"

- Casagrande discloses its system making certain rail related measurements, but not determining RSA.

POR at 18; POR Sur-reply at 17; Ex-2001 at ¶69; Ex-1008 at ¶¶[0007]-[0043].

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, AND CASAGRANDE DISCLOSE ELEMENT [F]

- Casagrande's system is also incapable of determining if RSA is present.
- It measures points on, and obtains profiles of, the "two rails," "each rail," and "the top of the rail head," not any other components.
- Because it does not measure points on crossties, it cannot determine or measure the height difference between rail seats and unabraded crosstie surfaces, and thus cannot determine or measure RSA.
- It also cannot "compensate[] for a tilt of the rail road track" when making an RSA a determination, as element [f] further requires.

POR at 18-19; POR Sur-reply at 17; Ex-2001 at ¶69; Ex-1008 at ¶¶[0008], [0022]-[0030] & Figs. 1-5; *see* Petition at 49.

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, AND CASAGRANDE DISCLOSE ELEMENT [F]

- Casagrande further does not "compensate[] for a tilt of the railroad track" as element [f] requires.

- Casagrande discloses using up to three measurement units on a vehicle that can capture rail profile images.

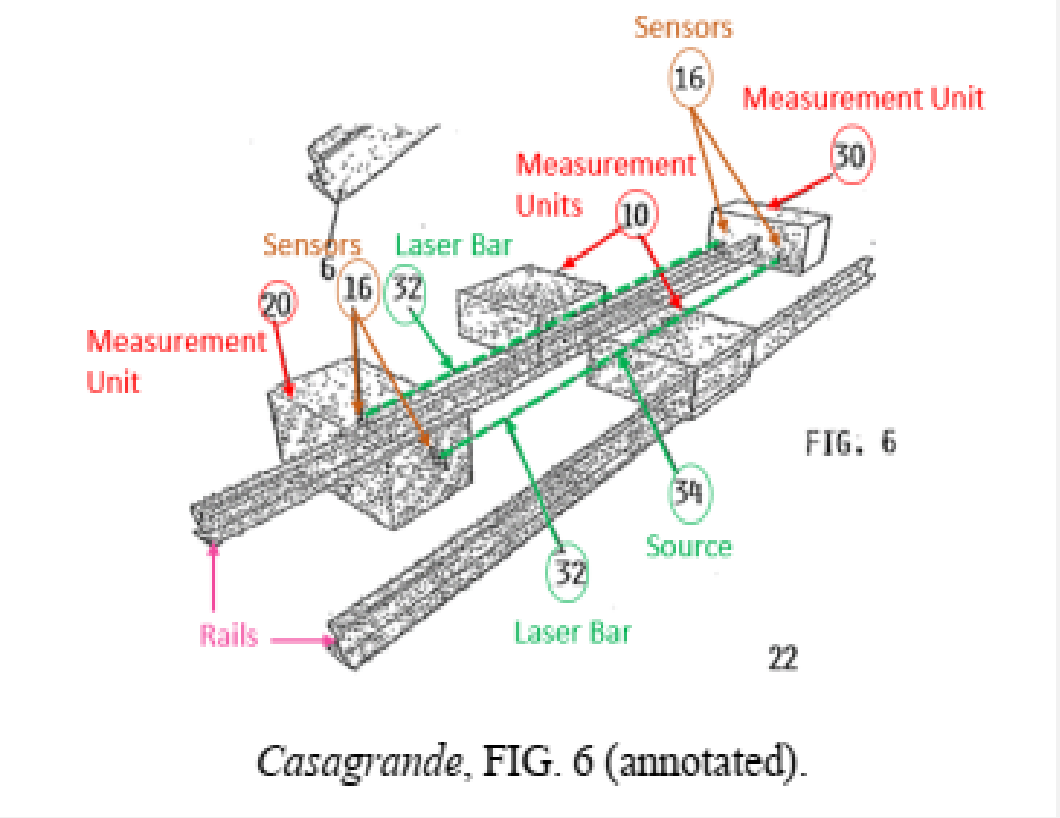
POR at 20-22; POR Sur-reply at 13-16; Ex-2001 at ¶¶71-73; Ex-1008 at ¶¶[0001], [0004]-[0007], [0009], [0011]-[0012], [0020]-[0025], [0029]-[0030], [0036], [0043] & Fig. 6.

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, AND CASAGRANDE DISCLOSE ELEMENT [F]

In one embodiment (Figure 6), the "position in height of" the "two end measurement units 20 and 30 is monitored by a laser bar 32" emitted from the center unit and "received by a sensor 16" in the end units that provides "a precise alignment of the points of measurement."

If sensors are not aligned with laser, the software uses the resulting signal "to automatically compensate the resultant measurement errors."

POR at 19-20; POR Sur-reply at 15; Ex-2001 at ¶70; Ex-1008 at ¶[0036] & Fig. 6.



Casagrande, FIG. 6 (annotated).

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, AND CASAGRANDE DISCLOSE ELEMENT [F]

- Casagrande's embodiment illustrated by Figure 6 will not register tilt in the railroad track, and thus it cannot "compensate[] for a tilt of the railroad track" as element [f] requires.

- Contrary to Petitioner's argument, Casagrande cannot detect vertical deviation or tilt caused by elastic deformation, curves, or wear of the "railway."

- Casagrande's express objective, including for Figure 6, is to make "rail measurements with the ***measurement apparatus insensitive to oscillation and deformation of the vehicle on which it is mounted.***"

POR at 20-22; POR Sur-reply at 13-16; Ex-2001 at ¶¶71-73; Ex-1008 at ¶[0012].

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, AND CASAGRANDE DISCLOSE ELEMENT [F]

- Casagrande's measurement units are "***mounted on board a railway carriage***" or "***are installed***" "***on board the railway or tramway carriage***"

- Its system provides "compensation for the errors due to elastic deformation ***of the railway or tramway carriage***"

- Its apparatus operates so measurements are "insensitive to elastic deformation and oscillation ***of the railway carriage on which [the device] is mounted***."

Ex-1008 at ¶¶[0023], [0029], [0036], [0043]; POR at 20-21; POR Sur-reply at 14-15; Ex-2001 at ¶¶71-72.

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, AND CASAGRANDE DISCLOSE ELEMENT [F]

- Casagrande thus expressly states that it adjusts only for measurement errors caused by "oscillations" or "elastic deformation" of the "vehicle," "railway carriage," or tramway carriage" on which the measurement units are mounted.

- It does not detect, measure, or adjust for rail "tilt" or vertical displacement of one rail compared to another.

- Its specification does not disclose, as Petitioner argues, that it detects vertical deviation or tilt caused by elastic deformation, curves, or wear of the "railway."

Ex-1008 at ¶¶[0012], [0023], [0029], [0036], [0043]; POR at 19-21; POR Sur-reply at 13-16; Ex-2001 at ¶¶71-73; Reply at 14-15.

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, AND CASAGRANDE DISCLOSE ELEMENT [F]

- Casagrande is incapable of measuring or compensating for track "tilt."
- When traveling on tilted or vertically displaced tracks (caused by deviation of one or both rails), the entire vehicle tilts because it rides on the tracks.
- Because a vehicle is rigid, when one side of the vehicle tilts, the entire vehicle tilts, and each measurement unit mounted on the vehicle—including the alignment laser and laser sensors—will tilt in the same way.
- Any track tilt will not disturb the alignment between the measurement units; Casagrande's system will not register the tilt and cannot "compensate for" that "tilt" as element [f] requires.

POR at 21-22; POR Sur-reply at 15-16; Ex-2001 at ¶73.

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, AND CASAGRANDE DISCLOSE ELEMENT [F]

- Even if a POSITA were motivated to combine Casagrande with Villar and Choros, the only predictable result is a system that compensates for the errors disclosed in Casagrande, not RSA.

- Petitioner refers to nothing that provides a sufficient reason why a POSITA would have further modified them to include element [f]'s requirements.

- Also, a POSITA would not have sufficient reason to combine the three references because a POSITA would not have looked to Choros' manual measurement to modify Villar machine vision system.

Petition 46-50; Reply at 15, 18; POR at 22-23, 4-6, 8-12; POR Sur-reply at 16-17, 4-7; Ex-2001 at ¶¶74-75, 37-40, 51-57.

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, AND SZWILSKI DISCLOSE ELEMENT [F]

- Szwilski does not disclose or suggest the features of element [f]
- Szwilski discloses tilt correction only to correct vertical and horizontal errors in measuring "rail displacement."
- Petitioner effectively admits that this is Szwilski's only express disclosure.

POR at 23-29; POR Sur-reply at 17-19; Ex-1009 at 5-7, 9-12, 16, 20, Fig. 3; Ex-2001 at ¶¶77-85; *see* Petition at 51.

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, AND SZWILSKI DISCLOSE ELEMENT [F]

- Petitioner relies on Szwilski's terse statement that its error corrections could apply to "other … rail defects," and its expert's testimony that, based on that statement, "it would have been obvious" to apply that correction mechanism to "RSA" because "[t]he combination would have yielded the claimed subject matter."

- Expert's testimony is unsubstantiated; no technical analysis or explanation, and thus provides insufficient grounds to prove unpatentability. *In re Mangum Oil Tools Int'l Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016); *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

Petition at 51-52; Ex-1004 at ¶¶86-87; Reply at 16-17; POR at 24-25; POR Sur-reply at 17; Ex-1009 at 20; Ex-2001 at ¶78.

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, AND SZWILSKI DISCLOSE ELEMENT [F]

Dr. Bovik

- A POSITA would not have looked to implement Szwilski with Villar and Choros to obtain element [f] because "Szwilski's measurements are unrelated to the position of the rail seats, and thus cannot be used to obtain element [f]."

- Because Szwilski's mobile platform rides on top of the rails, its GPS measurements are based on the location of the rail tops.

- Element [f] concerns determining abrasion at the "rail seat" (rail bottom), which abrades and changes position in a distinct manner from the rail tops.

Ex-2001 at ¶80; POR at 26-27, 29; POR Sur-reply at 18; Ex-1009 at 1, 5-6, 10-12, 16-17, Figs. 1, 3.

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, AND SZWILSKI DISCLOSE ELEMENT [F]

Dr. Bovik

- A POSITA would not have looked to implement Szwilski with Villar and Choros because Szwilski's system is far too inaccurate for RSA determinations.

- Average accuracy is "2.2 cm (0.87 ins) vertical," far higher than the FRA's maximum allowed RSA of 0.5 inches and Choros' maximum abrasion of between 0.125 to 0.6875 inches.

- Its "coordinates" can only be "generated every 14.6 feet," a span that covers 16-18 rail seats, and thus cannot determine RSA for each rail seat.

Ex-2001 at ¶¶81-84; Ex-1009 at 6-7, 12; POR at 27-29; POR Sur-reply at 19; Ex-1041 at 1-2; Ex-1021 at 17; Ex-1007 at 14 (Table 2).

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, AND SZWILSKI DISCLOSE ELEMENT [F]

- Even if Szwilski's general disclosure somehow suggests the combination, Szwilski does not disclose element [f].

- Szwilski's track inclination determination is based on positions of GPS receivers and subsequent calculations, rather than any "image," or "profile" in an image, of a railroad track as element [f] requires.

POR at 25-26; POR Sur-reply at 18; Ex-1009 at 5-6, 10-12, 16, 20, Fig. 3; Ex-2001 at ¶79; *see* Petition at 52.

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, AND SZWILSKI DISCLOSE ELEMENT [F]

- Petitioner tries to evade Szwilski's shortfalls by claiming that Petitioner does not rely on Szwilski "to determine" RSA but only for its "tilt compensation teachings."

- A POSITA would have viewed those "teachings" as useless for RSA and element [f]'s requirements because Szwilski is admittedly hopeless for compensating for track tilt associated with RSA.

- Petitioner's position is illogical: it does not rely on Szwilski for any reason relating to element [f], but maintains that Szwilski is somehow useful for proving unpatentability of that element.

Reply at 17-18; POR Sur-reply at 19; POR Response at 26-29.

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, CASAGRANDE, AND SZWILSKI DISCLOSE ELEMENT [F]

- Casagrande and Szwilski combined (and added to Villar and Choros) also do not disclose or suggest the features of element [f]

- Petitioner's theory essentially repeats its flawed individual arguments for Casagrande and Szwilski.

POR at 30-31; POR Sur-reply at 19-21; *see* Petition at 52-54; Reply at 18.

PETITIONER FAILS TO PROVE THAT VILLAR, CHOROS, CASAGRANDE, AND SZWILSKI DISCLOSE ELEMENT [F]

- Petitioner does not deny shortcomings; asserts that "Petition relies upon Casagrande and Szwilski's teachings compensating imaged rail defect measurements for railway vehicle tilt—not the RSA determination."

- Petitioner's argument fails because element [f] requires compensating for "tilt" "when determining whether rail seat abrasion is present."

- Also, Casagrande is incapable of detecting or compensating for tilt in any measurement, while Szwilski's tilt measurement cannot apply to RSA and is far too inaccurate to compensate for tilt in an RSA measurement.

Reply at 18; POR Sur-reply at 20-21, 13-19; POR at 30-31, 18-29.

PETITIONER FAILS TO PROVED THAT CLAIMS 2, 5-7, 10-13, AND 16-17 ARE PATENTABLE

- Petitioner's unpatentability arguments of claims 2, 5-7, 10-13, and 16-17 are derivative of claim 1

- Other claims are patentable because:
  - (1) They depend on patentable claims; or
  - (2) Petitioner's arguments rely on the same faulty reasoning applied in claim 1 or other claims.

POR at 32-35; PO Sur-reply at 21-22.

PETITIONER FAILS TO PROVE GROUND 2

VILLAR, CHOROS, CASAGRANDE, SZWILSKI, AND KHATTAK DO NOT DISCLOSE CLAIMS 3, 8, AND 14

POR at 35-38; Sur-reply at 22-23.

PETITIONER FAILS TO PROVE THAT CLAIMS 3, 8 AND 14 ARE PATENTABLE

- Regardless of Petitioner's arguments in ground 2, claims 3, 8, and 14 are patentable because:
  - (1) They depend on patentable claims; or
  - (2) Petitioner's arguments rely on the same faulty reasoning applied in claim 1 or other claims.

POR at 35, 38; PO Sur-reply at 22.

PETITIONER ALSO FAILS TO PROVE THAT VILLAR, CHOROS, CASAGRANDE, SZWILSKI, AND KHATTAK DISCLOSE CLAIM 3

"WHEREIN THE STEP OF DETERMINING THE HEIGHTS FURTHER COMPRISES THE STEPS OF: DETERMINING VERTICAL PIXEL COUNTS FOR EACH OF THE HEIGHTS OF THE LEFT RAIL BASE, RIGHT RAIL BASE, LEFT CROSSTIE AND RIGHT CROSSTIE; AND NORMALIZING THE VERTICAL PIXEL COUNTS BASED UPON A MEASUREMENT INDEX"

POR at 35-38; Sur-reply at 22-23.

PETITIONER FAILS TO PROVE THAT VILLAR DISCLOSES USING THE VERTICAL PIXEL COUNTS REQUIRED BY CLAIM 3

- Petitioner fails to prove that Villar discloses "determining vertical pixel counts" for "height[]" measurements, as claim 3 requires.

- **Dr. Bovik:** "Villar does not disclose determining the vertical pixel counts for determining any height measurement."

- "The only use of pixel summing disclosed in Villar is averaging or summing the value of pixels in an entire region of interest to determine the presence of a crosstie."

POR at 35-38; PO Sur-reply at 22-23; Ex-2001, ¶110; *see* Ex-1005 at ¶[0046].

PETITIONER FAILS TO PROVE THAT VILLAR DISCLOSES USING THE VERTICAL PIXEL COUNTS REQUIRED BY CLAIM 3

- **Dr. Bovik:**
- The portions of Villar on which Petitioner relies "discuss using best fit or curve fitting techniques, edge detecting techniques, and line fitting techniques to determine the distances or heights involved."
- Such techniques "do not necessarily include determining vertical pixel counts."
- Petitioner's expert statement that "a POSITA would have understood that these disclosures of Villar … would have included the step of determining vertical pixel counts" is unsupported because he cites nothing but Villar.

Petition at 64-67; Reply at 21-22; Ex-1004 at ¶¶69-74, 119-123; POR at 36-38; PO Sur-reply at 22; Ex-2001, ¶¶111-112; *see* Ex-1005 at ¶¶[0047], [0050], [0052], [0055].

PETITIONER FAILS TO PROVE GROUND 3

VILLAR, CHOROS, CASAGRANDE, SZWILSKI, AND ANDERSSON DO NOT DISCLOSE CLAIMS 4, 9, AND 15

POR at 38-43; Sur-reply at 23-26.

PETITIONER FAILS TO PROVE THAT CLAIMS 4, 9 AND 15 ARE PATENTABLE

- Regardless of Petitioner's argument in Ground 3, claims 4, 9, and 15 are patentable because:
  - (1) They depend on patentable claims; or
  - (2) Petitioner's arguments rely on the same faulty reasoning applied in claim 1 or other claims.

POR at 38, 43; PO Sur-reply at 23.

PETITIONER ALSO FAILS TO PROVE THAT VILLAR, CHOROS, CASAGRANDE, SZWILSKI, AND ANDERSSON DISCLOSE CLAIM 4

"WHEREIN THE STEP OF DETERMINING THE TILT CORRECTION FACTOR IS ACCOMPLISHED BASED UPON THE LEFT AND RIGHT RAIL BASE HEIGHTS AND A STANDARD TILT CORRECTION FACTOR"

POR at 38-43; Sur-reply at 23-26.

PETITIONER FAILS TO PROVE THAT ANDERSSON DISCLOSES USING A "STANDARD TILT CORRECTION FACTOR"

- Petitioner relies on a misconstruction of the claim language to argue that Andersson discloses a "standard tilt correction factor" by "preemptively compensat[ing]" "for known vertical alignment tilt errors associated with upcoming track geometry."

- A "standard tilt correction factor" does not mean or include applying a pre-determined factor that corrects vertical alignment (height) errors for each segment of the track.

Reply at 26; Petition at 74-75; POR at 39-42; PO Sur-reply at 23-25.

PETITIONER FAILS TO PROVE THAT ANDERSSON DISCLOSES USING A "STANDARD TILT CORRECTION FACTOR"

- The claim language demonstrates that the "standard tilt correction factor" in claim 4 is distinct from the "tilt correction factor" in claim 2.

- It uses different wording for each "factor."

- The principle of claim differentiation mandates distinct meanings because otherwise claims 2 and 4 would have the same scope.

POR at 39; PO Sur-reply at 24.

PETITIONER FAILS TO PROVE THAT ANDERSSON DISCLOSES USING A "STANDARD TILT CORRECTION FACTOR"

- The specification contains separate disclosures for each factor, further demonstrating that they are distinct.

- Describes claim 2's "tilt correction factor" as compensating for tilt in the railway, *i.e.*, related to differences in rail base heights.

- Describes claim 4's "standard tilt correction factor" as compensating for tilt caused by distinct factors: "variations in vehicle suspension, rail height placement standards, and other factors unrelated to rail seat abrasion."

POR at 39-40; PO Sur-reply at 24; Ex-1001 at 13:45-49, 13-17, Fig. 17; Ex-2001 at ¶¶120-121.

PETITIONER FAILS TO PROVE THAT ANDERSSON DISCLOSES USING A "STANDARD TILT CORRECTION FACTOR"

- The intrinsic evidence indicates that "standard tilt correction factor" is a fixed number
- The term's wording indicates the factor is a "standard," and not variable.
- In the specification's example, that factor is a fixed number ("0.12"), confirming that it is a fixed factor applied to all sections of the railway.
- Petitioner cites no contrary intrinsic evidence.

POR at 40; PO Sur-reply at 25; Ex-1001 at 13:11-17; Ex-2001 at ¶¶121, 124; Petition at 73-75; Reply at 24-26.

PETITIONER FAILS TO PROVE THAT ANDERSSON DISCLOSES USING A "STANDARD TILT CORRECTION FACTOR"

- Petitioner's reliance on Andersson for claim 4's features fails; Andersson discloses a database of individual tilt corrections, one for each curve, along a section of track.

- Andersson does not disclose a "standard tilt correction factor" because:
  - It discloses correction for tilt based on different heights of the rails in track curves
  - It applies a different tilt correction in each curve

Petition at 74-75; Ex-1004 at ¶¶134-136; POR at 40-42; PO Sur-reply at 25-26; Ex-2001 at ¶¶122-124; Ex-1011 at 3:45-6:18, 6:38-41.

PETITIONER FAILS TO PROVE THAT ANDERSSON DISCLOSES USING A "STANDARD TILT CORRECTION FACTOR"

Dr. Bovik:

- "[A] POSITA would not look to Andersson to further modify the combination alleged by Petitioner of Villar, Choros, Casagrande, and Szwilski."
- Claim 4 requires use of both the "tilt correction factor" recited in claim 2 and the separate "standard tilt correction factor" recited in claim 4.
- "Assuming that, as Petitioner asserts, Casagrande and/or Szwilski combined with Villar and Choros would detect the tilt of the railroad track and compensate for that measured tilt to more accurately determine rail seat abrasion, a POSITA would not add the feature disclosed in Andersson to that combination."

POR at 42-43; Ex-2001 at ¶125.

PETITIONER FAILS TO PROVE THAT ANDERSSON DISCLOSES USING A "STANDARD TILT CORRECTION FACTOR"

Dr. Bovik:

- "Because Andersson measures and stores the tilt in each curve, that measured tilt, and any compensation based on that tilt, includes any tilting in the railway caused by uneven heights of the rails, rail seat abrasion, and other physical conditions in the railway that, based on Petitioner's contention, the systems used in Casagrande and/or Szwilski measure and/or use as compensation for tilt as well."
- "The additional use of the compensation employed by Andersson would thus act to overcompensate for all these other overlapping factors that cause any tilting in the railway, such as those caused by uneven heights of the rails, rail seat abrasion, or other physical conditions in the railway."

POR at 42-43; Ex-2001 at ¶125.

PETITIONER FAILS TO PROVE THAT CHOROS WAS PUBLICLY ACCESSIBLE PRIOR ART

POR at 1-4; Sur-reply at 1-3.

PETITIONER FAILED TO SUBMIT EVIDENCE IN THE PETITION OF CHOROS' PUBLIC ACCESSIBILITY

- Petitioner did not submit evidence in the Petition itself of Choros' public accessibility.
- Petitioner cites only to the Watters' declaration, but then explains none of its contents.
- Not the "detailed explanation" of the evidence required in Petition, and it is also improper incorporation by reference. 37 C.F.R. § 42.6(a)(3), §42.22(a)(2).

Petition at 6-7; Reply at 1; POR at 2; PO Sur-reply at 1.

THE WATTERS DECLARATION FAILS TO PROVE CHOROS' PUBLIC ACCESSIBILITY

- The Watters declaration only addresses the cataloging and indexing of the "ASME/IEEE 2007 Joint Rail Conference" publication, not the Choros article.

- The declaration at most shows that a person searching for the Joint Rail Conference publication could locate that publication.

- It provides no evidence that the Choros article was catalogued or indexed such that an interested person would have been able to locate Choros, such as by searching for key words in Choros' title or content.

Reply at 2-4; POR at 2-4; PO Sur-reply at 1-3; Ex-1007 at 1-2 & Exhs. A, B.