

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

JTEKT CORPORATION,
Petitioner,

v.

GKN AUTOMOTIVE LTD.,
Patent Owner.

Case IPR2016-00046
Patent 8,215,440 B2

Before JOSIAH C. COCKS, MITCHELL G. WEATHERLY, and
JAMES J. MAYBERRY, *Administrative Patent Judges*.

MAYBERRY, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

Petitioner, JTEKT Corporation (“JTEKT”), filed a Petition (Paper 1, “Pet.”) requesting *inter partes* review of claims 1–7 of U.S. Patent No. 8,215,440 B2 (“the ’440 patent”). Patent Owner, GKN Automotive Ltd. (“GKN”), filed a Preliminary Response (Paper 6, “Prelim. Resp.”) to the

Petition. We instituted trial on all challenged claims. Paper 7, 32 (“Dec. on Inst.”).

After institution of trial, GKN filed a Patent Owner’s Response (“PO Resp.”) to the Petition. Paper 12. JTEKT filed a Petitioner’s Reply (“Pet. Reply”) to the Patent Owner’s Response. Paper 14. JTEKT relies on the declaration testimony of Mr. Steven J. Becker (“Mr. Becker”) in support of its Petition (Exs. 1005, 1008). GKN relies on the declaration testimony of Dr. Jeffrey L. Stein (“Dr. Stein”) in support of its Patent Owner’s Response (Ex. 2017). Oral hearing was conducted on December 6, 2016. The record contains a transcript of the hearing. Paper 26 (“Tr.”).

GKN filed a Disclaimer in Patent under 37 C.F.R. § 1.321(a) with the Patent Office on June 15, 2016, disclaiming claims 1, 4, and 5 of the ’440 patent. *See* Ex. 2016. Accordingly, claims 1, 4, and 5 are no longer subject to this *inter partes* review proceeding.

The Board has jurisdiction under 35 U.S.C. § 6. This final written decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. JTEKT has shown by a preponderance of the evidence that claims 6 and 7 are unpatentable under 35 U.S.C. § 103(a) over Japanese Unexamined Patent Application Publication JP 2002-370557 A (Ex. 1002, “Teraoka”) and U.K. Patent Application GB 2,407,804 A (Ex. 1004, “Burrows”). JTEKT has not shown by a preponderance of the evidence that claims 2 and 3 are unpatentable under 35 U.S.C. § 103(a) over Teraoka and Japanese Unexamined Patent Application Publication JP H2-57725 A (Ex. 1003, “Watanabe”).

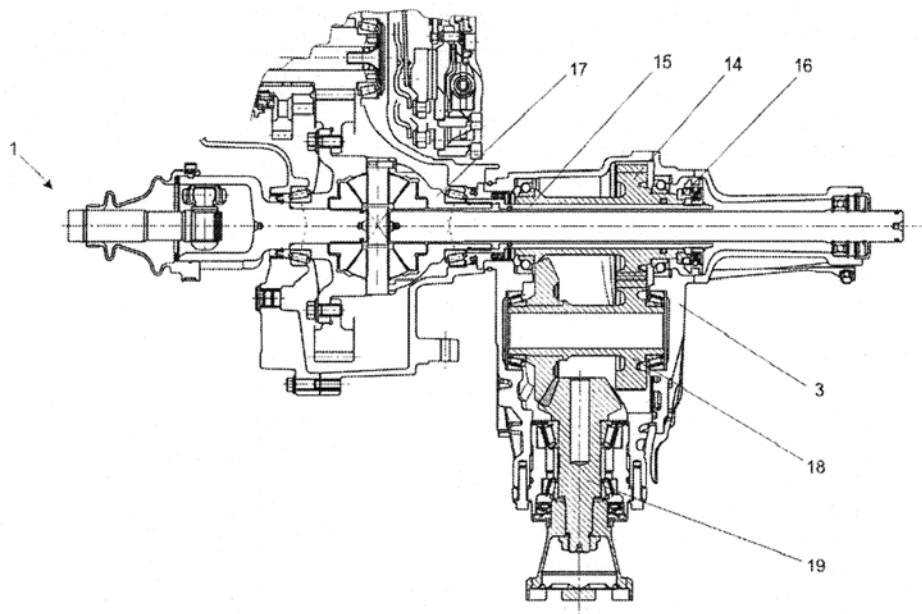
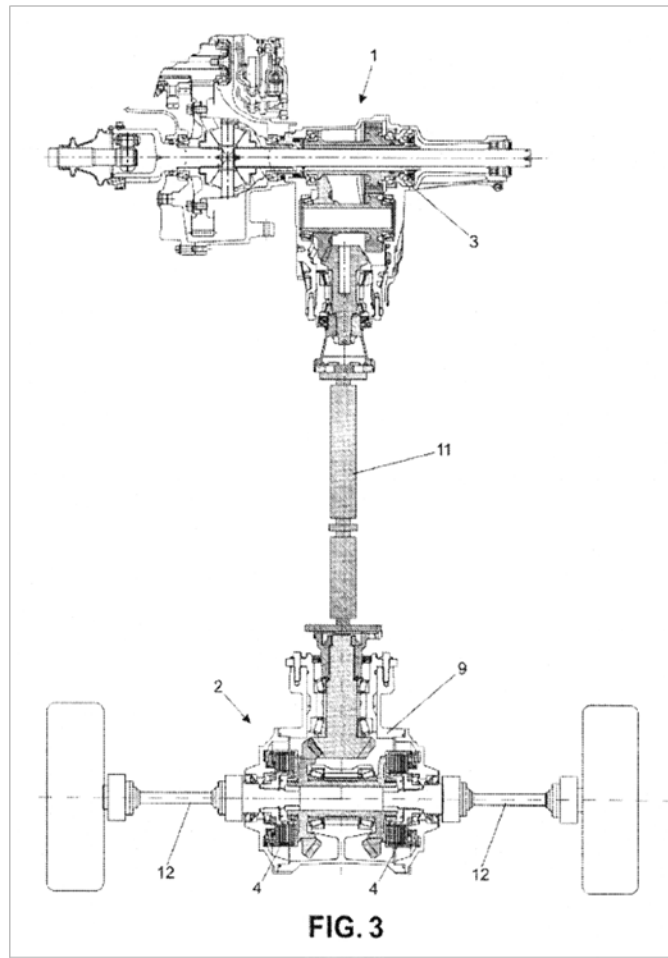
A. Related Matters

According to the Petition and Patent Owner's Mandatory Notices, the '440 patent is not the subject of a court or administrative proceeding other than this one. Pet. 4; PO Man. Not. 1 (Paper 5).

B. The '440 Patent

The '440 patent, titled "Drive Train for a Vehicle with Connectable Secondary Axle," issued July 10, 2012 with twelve claims. Claims 1–7 of the '440 patent, the claims challenged in the Petition, are directed to a vehicle drive train with primary and secondary drive trains. Ex. 1001, 12:10–67. Specifically, the claims are directed to a vehicle drive train with a switch-on mechanism and side shaft coupling, where a shutdown section of a secondary drive train is decoupled from the primary drive train when the vehicle is driven by the primary drive train only. *Id.*, Abstract.

Figures 3–5, reproduced below, depict an embodiment of the vehicle drive train of the '440 patent.



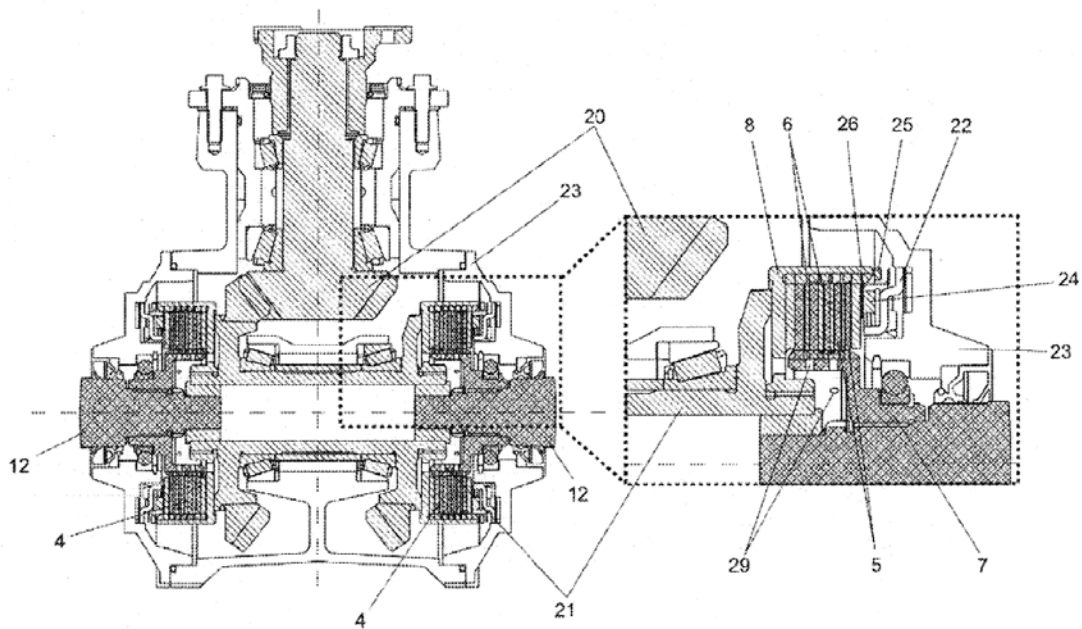


FIG. 5

“[Figure] 3 illustrates a drive train with permanently driven primary axle and connectable secondary axle, the section of the secondary drive train of which located between side shaft couplings and switch-on device is shut down.” Ex. 1001, 5:5–8. The image in Figure 4 depicts the switch-on device of the drive train of Figure 3 in detail and the image in Figure 5 depicts a secondary axle drive with loosened side shaft couplings and no rear differential. *Id.* at 5:9–11. Details of the invention are best understood by way of an explanation of how the drive train and associated components work.

Figure 3 depicts primary axle 1 and secondary axle 2, where primary axle 1 is permanently driven and secondary axle 2 is connectable, such that the vehicle may be switched between two-wheel drive (driving primary axle 1 only) and four-wheel drive (driving both primary axle 1 and secondary axle 2) modes. Ex. 1001, 6:34–35. Secondary axle 2 is

uncoupled from primary axle 1 by opening side shaft couplings 4 and switch-on device 3. *Id.* at 6:49–52. Side shaft couplings 4, which are frictionally engaged, transmit the secondary drive output to side shafts 12 of secondary axle 2. *Id.* at 6:40–42. As depicted in the embodiment of Figure 3, when side shaft couplings 4 and switch-on device 3 are open, the secondary drive train between these components is inoperative. *Id.* at 6:35–37; *see also id.*, Fig. 3 (depicting shutdown section as shaded region).

Primary axle 1 drives drive basket 17, which in turn drives connecting shaft 15. Ex. 1001, 7:6–11; *see also id.*, Fig. 4 (depicting primary axle 1 and switch-on device 3). When synchronizing 16 engages spur gear step 14 (when switch-on device 3 is closed), power is transmitted through transverse shaft 18 to pinion shaft 19 and intermediate shaft 11, which directs power to secondary axle 2. *Id.* at 7:7–21. To synchronize spur gear step 14 and connecting shaft 15 when switching to four-wheel drive mode from two-wheel drive mode, side shaft couplings 4 are closed to bring intermediate shaft 11 and spur gear step 14 to speed (that is, by being driven by the wheels of secondary axle 2) prior to engaging spur gear step 14 with connecting shaft 15. *Id.* at 7:28–32.

Intermediate shaft 11 drives drive sprocket 20 which drives a crown wheel with crown wheel carrier shaft 21. Ex. 1001, 7:50–53. Outer plate carrier 8 of each side shaft coupling 4 connects to crown wheel carrier shaft 21. *Id.* at 7:55–57. A clutch pack including outer plates 6 and inner plates 5 is positioned between outer plate carrier 8 and inner plate carrier 7. *Id.* at 7:57–59. When side shaft couplings 4 are closed (compressing the clutch pack), each inner plate carrier 7 connects inner plates 5 to each side shaft 12 to deliver drive power to the wheels. *Id.* at 7:59–61.

The secondary drive train detailed in the embodiment of Figure 5 has no differential—instead, two side shaft couplings provide the functionality that a differential would provide. Ex. 1001, 6:42–47. Figure 5 depicts the secondary drive train in two-wheel-drive mode. *Id.* at 7:47–48. The singly-hatched components depicted in Figure 5 are inoperative and the cross-hatched components rotate in this mode. *Id.* at 8:15–21.

C. Illustrative Claims

Claim 1 of the challenged claims of the '440 patent, which has been disclaimed, is the sole independent claim and is reproduced below.

1. A drive train of a vehicle, comprising a primary drive train and a secondary drive train, further comprising:
 - a primary axle which is permanently driven via the primary drive train; and
 - a secondary axle as part of the secondary drive train;wherein the secondary axle is connectable to the primary axle via a switch-on mechanism of a switch-on device in order to allow the integration of the secondary drive train into the drive train so that the overall drive train power is transferred over both the primary axle and the secondary axle, and
 - wherein when the secondary axle is connected to the primary axle, the secondary drive train power is conveyed via at least one side shaft couplings into side shafts of the secondary axle and is transmitted to wheels of the secondary axle the secondary drive train having a shutdown section located between the switch-on device and the at least one side shaft coupling,
 - whereby: the switch-on mechanism and/or the side shaft couplings comprise at least one frictionally engaged coupling and when the secondary axle is disconnected from the primary axle in order to transfer the overall drive train power via the primary axle only, the shutdown section of the secondary drive train is decoupled from both the primary axle of the primary drive train and the wheels of the secondary axle.

Ex. 1001, 12:11–36.

D. The Prior Art

We instituted *inter partes* review on grounds of unpatentability for claims 2, 3, 6, and 7 of the '440 patent that rely on the following references:

Teraoka	JP 2002–370557 A	Dec. 24, 2002	Ex. 1002 ¹
Watanabe	JP H2–57725 A	Feb. 27, 1990	Ex. 1003 ²
Burrows	GB 2 407 804 A	May 11, 2005	Ex. 1004

E. Grounds of Unpatentability

We instituted *inter partes* review on the following grounds of unpatentability for claims 2, 3, 6, and 7 of the '440 patent.³

References	Basis	Claims Challenged
Teraoka and Watanabe	35 U.S.C. § 103(a)	2 and 3
Teraoka and Burrows	35 U.S.C. § 103(a)	6 and 7

II. ANALYSIS

A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are given their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *see also Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142–46 (2016) (concluding that 37 C.F.R. § 42.100(b) “represents a reasonable exercise of the rulemaking

¹ Exhibit 1002 provides a certified English translation of Teraoka.

² Exhibit 1003 provides a certified English translation of Watanabe.

³ We also instituted trial on the ground that disclaimed claims 1, 4, and 5 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Teraoka and on the ground that, in addition to claims 2 and 3, disclaimed claim 1 is unpatentable under 35 U.S.C. § 103(a) over Teraoka and Watanabe.

authority that Congress delegated to the Patent Office”). Under the broadest reasonable construction standard, claim terms generally are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Also, we are 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 In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993) (“[L]imitations are not to be read into the claims from the specification.” (internal citation omitted)).

1. Level of Ordinary Skill in the Art

JTEKT contends that a person having ordinary skill in the art would be an engineer with several years of drive train experience. Pet. 12. GKN contends that an artisan of ordinary skill would be a person with an engineering degree and some experience in driveline mechanics or design, although GKN expresses agreement with JTEKT’s characterization of the level of ordinary skill in the art. PO Resp. 19; *see also* Tr. 51:21–23 (“[I]t’s true that both parties have agreed as to what the standard is for a person of skill in the art.”).

We agree with JTEKT that the level of ordinary skill in the art is an engineer with several years (5 or more years) of drive train experience. Factual indicators of the level of ordinary skill in the art include “the various prior art approaches employed, the types of problems encountered in the art, the rapidity with which innovations are made, the sophistication of the technology involved, and the educational background of those actively working in the field.” *Jacobson Bros. v. United States*, 512 F.2d 1065, 1071 (Ct. Cl. 1975); *see also Orthopedic Equip. Co. v. United States*, 702 F.2d

1005, 1011 (Fed. Cir. 1983) (quoting with approval *Jacobson Bros.*). We find that the prior art is directed to vehicle drive train design, as would be encountered by a mechanical or automotive engineer. *See, e.g.*, Exs. 1002–04.

2. “*shutdown section*”

Independent claim 1 recites “the secondary drive train having a shutdown section located between the switch-on device and the at least one side shaft coupling.” Ex. 1001, 12:26–28. The claim further recites “when the secondary axle is disconnected from the primary axle . . . , the shutdown section of the secondary drive train is decoupled from both the primary axle of the primary drive train and the wheels of the secondary axle.” *Id.* at 12:31–36. In our Decision on Institution, we determined that the term “shutdown section” means the portion of a secondary drive train that is decoupled from both the primary axle and the wheels of the secondary axle located between the switch-on device and side shaft coupling. Dec. on Inst.11. Neither party contested this construction during trial.

After considering anew the underlying bases for the above construction as explained in our Decision on Institution, we discern no reason to alter the construction of the term “shutdown section” applied in our Decision on Institution.

3. “*side shaft couplings*”

Independent claim 1 recites a “drive train of a vehicle[] comprising a primary drive train and a secondary drive train, . . . wherein . . . the secondary drive train power is conveyed via at least one side shaft couplings into side shafts of the secondary axle.” Ex. 1001, 12:11–26. In our Decision

on Institution, we determined that the term “side shaft couplings” should be afforded its ordinary and customary meaning: “the connecting device that conveys power from the secondary drive train into side shafts of the secondary axle.” Dec. on Inst. 11–12. Neither party contested this construction during trial.

After considering anew the underlying bases for the above construction as explained in our Decision on Institution, we discern no reason to alter the construction of the term “side shaft coupling” applied in our Decision on Institution.

B. Overview of the Prior Art

We provide a brief overview of the prior art references at issue in this proceeding—Teraoka, Watanabe, and Burrows—below.

1. Teraoka

Teraoka, titled “Four-wheel drive system,” “relates to a four-wheel drive system in which either the front or the rear wheels are disengaged when in two-wheel drive.” Ex. 1002 ¶ 1.

Figures 1 and 2 of Teraoka, reproduced below, illustrate an embodiment of its invention.

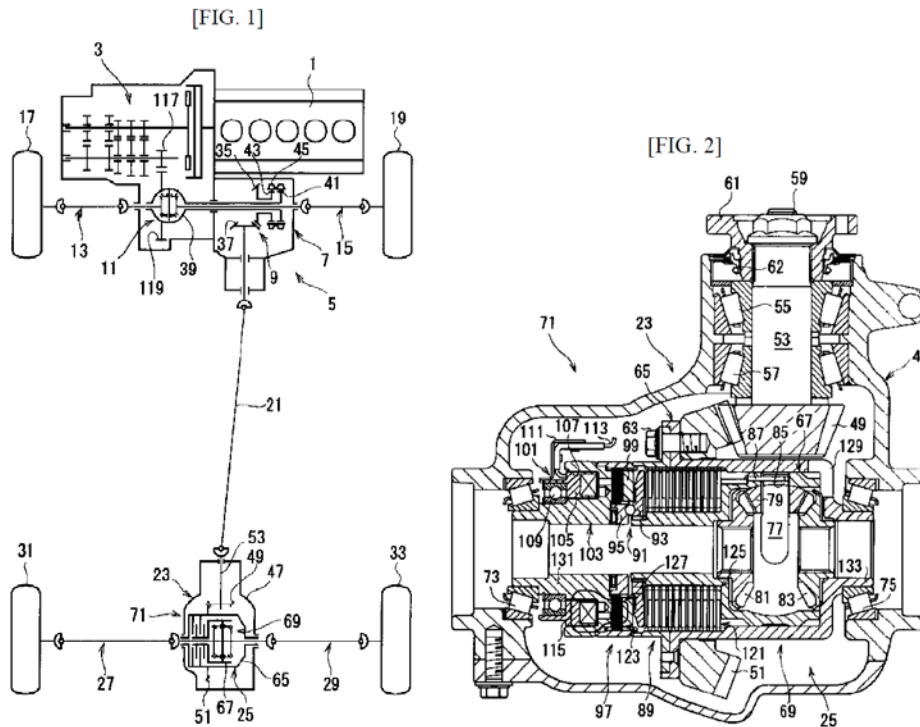


Figure 1 provides a schematic of the drive train of the embodiment, and Figure 2 provides a cross section of a portion of the drive train for that embodiment. Ex. 1002, Brief Description of Drawings. Referring to Figure 1, engine 1 drives the primary drive train, which includes front axles 13, 15 and front wheels 17, 19. *Id.* ¶ 40. Transfer case 5, which includes two-four switching mechanism 7 (a dog clutch) and direction changing gear set 9, engages with the primary drive train to drive the secondary drive train in four-wheel drive mode. *Id.* ¶¶ 40–43. The secondary drive train includes rear wheel side propeller shaft 21, final speed reduction gear set 23, rear differential 25, rear axles 27, 29, and rear wheels 31, 33. *Id.* ¶ 40.

Figure 2 provides details of a portion of the secondary drive train. Final speed reduction gear set 23 includes drive pinion shaft 53, which is driven by propeller shaft 21 and is integrally formed with drive pinion gear 49, which meshes with ring gear 51. Ex. 1002 ¶¶ 45–47. Engine

driving force is transmitted to outer case 65 of rear differential 25 through final speed reduction gear set 23. *Id.* ¶ 49.

Rear differential 25 includes “outer case 65, inner case 67, bevel gear type differential mechanism 69, [and] clutch mechanism 71,” which is a wet, multi-plate clutch. Ex. 1002 ¶ 50. Differential mechanism 69 includes pinion gear 79, pinion shaft 77, and output-side side gears 81, 83, which mesh with pinion gear 79. *Id.* ¶ 52. Left and right rear axles 27, 29 are coupled to side gears 81, 83. *Id.* ¶ 66.

Clutch mechanism 71 engages to transmit driving force from outer case 65 to inner case 67 in four-wheel-drive mode and disengages to decouple outer case 65 from inner case 67. Ex. 1002 ¶ 66. A controller simultaneously couples two-four switching mechanism 7 and clutch mechanism 71 for four-wheel-drive operation and simultaneously decouples two-four switching mechanism 7 and clutch mechanism 71 for two-wheel drive operation. *Id.* ¶ 72.

2. *Watanabe*

Watanabe discloses a vehicle power transmission device. Ex. 1003, 2, lower left col. (providing “Industrial Field of Use”).⁴ Watanabe’s Figure 3 is reproduced below.

⁴ Pagination for Exhibit 1003 is to the exhibit page number supplied by JTEKT, rather than the numbers appearing at the bottom center of Exhibit 1003’s pages. Exhibit 1003 is structured such that the two columns (left and right) at the upper half of each page corresponds to a continuous disclosure and the two columns at the lower half of each page corresponds to a second continuous disclosure, continuing from the upper right column of that page. Accordingly, we identify columns in Exhibit 1003 as “left” or “right” and “upper” or “lower.”

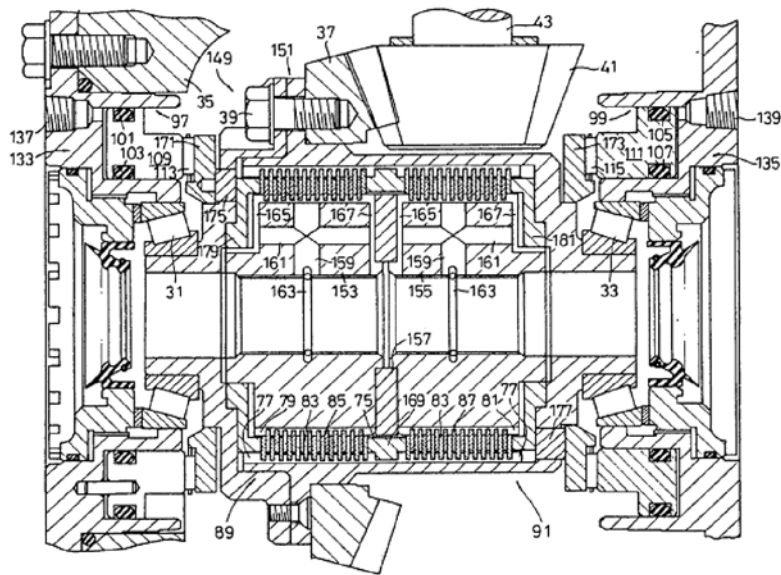


FIG. 3

Figure 3, reproduced above, “is a cross-sectional view of a second embodiment” of the disclosed transmission device. Ex. 1003, 6, lower left col. Figure 3 depicts rear differential 149, which includes multi-plate clutches 89, 91. “When the multiple plate clutches 89 and 91 are tightened, the rear wheels 25 and 27 are driven and the vehicle enters 4WD mode.” *Id.* at 4, lower left col. Also, “[b]ecause the drive power is dispersed to all four wheels, the drive power distribution per wheel falls, reducing the likelihood of slipping as the gripping force is spread out. Accordingly, straight-line motion of the vehicle and driving stability are improved.” *Id.*

Watanabe further discloses that, “by increasing or decreasing the tightening force individually for the multiple plate clutches 89 and 91, the distribution ratio of the drive power between the right and left rear wheels 25 and 27 can be adjusted and the differential rotation can be controlled.” Ex. 1003, 4, right col. That is, the two multi-plate clutches replace the function of a traditional differential. Also, Watanabe discloses adjusting the

drive power distribution ratio between wheels to improve steering characteristics. *See* Ex. 1003, 4, right col.–5, left. col.

3. *Burrows*

Burrows discloses a four-wheel-drive system that switches between two-wheel-drive mode and four-wheel-drive mode while the vehicle is moving and also seeks to minimize acceleration forces during the switching. Ex. 1004, 1:23–2:2.⁵

Burrows’s Figure 2 is reproduced at right and is “a schematic drawing of the driveline of a second example.” Ex. 1004, 4:12. Power Take-off clutch 22 is connected to main drive shaft 23 and couples the driving force of engine 11 to auxiliary driveline 21. *Id.* at 4:14–5:2. Auxiliary driveline 21

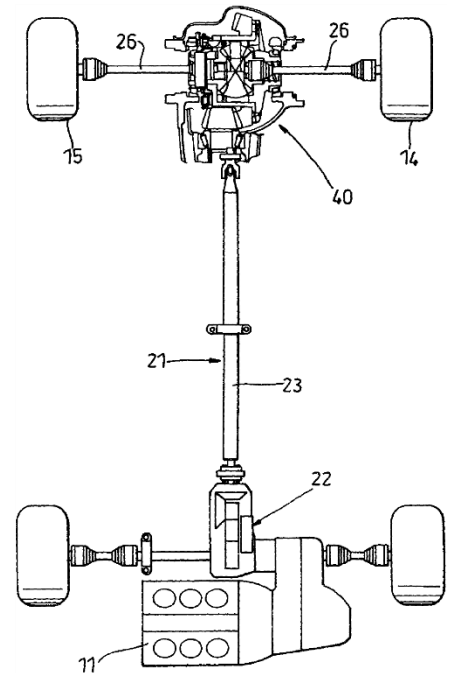


Fig. 2

transmits power to rear wheels 14, 15 through main drive shaft 23 and free running differential 40. *Id.* at 7:23–25. “[D]ifferential 40 may include a dog clutch or a one-way (e.g.,) roller sprag type) clutch.” *Id.* at 8:2–3.

Burrows discloses three methods for transitioning between two-wheel-drive mode and four-wheel-drive mode. *See, e.g.*, Ex. 1004, Figs. 1–3 (depicting three examples of a motor vehicle in accordance with Burrows’s invention). In the method associated with Figure 2, Burrows discloses “caus[ing] the clutch 22 to spin-up the auxiliary driveline 21 to the best

⁵ References to Exhibit 1004 are made to the page numbers of the published patent application, rather than the pagination for the exhibit supplied by JTEKT.

estimated [synchronization] speed for connection to the rear wheels 14, 15. The clutch 22 would then disengage quickly whilst simultaneously the [synchronizer] device would smoothly engage the dog clutch. The clutch 22 then re-engages quickly.” *Id.* at 8:7–11.

C. Instituted Grounds of Unpatentability

We instituted trial on three alleged grounds of unpatentability for claims 1–7 of the ’440 patent: 1) claims 1, 4, and 5 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Teraoka; 2) claims 1–3 are unpatentable under 35 U.S.C. § 103(a) over Teraoka and Watanabe; and 3) claims 6 and 7 are unpatentable under 35 U.S.C. § 103(a) over Teraoka and Burrows. As discussed above, GKN disclaimed claims 1, 4, and 5, so we need not consider the first ground. We address each of the remaining two grounds below.

1. Claims 1–3: Obviousness over Teraoka and Watanabe

We instituted trial on the ground that claims 1–3 are obvious over Teraoka and Watanabe.

Section 103(a) [of 35 U.S.C.] forbids issuance of a patent when “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.”

KSR Int’l Co. v. Teleflex Inc., 550 U.S. 398, 406 (2007).

The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when available, secondary

considerations, such as commercial success, long felt but unsolved needs, and failure of others. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We analyze these factual determinations, along with the reasons for combining Teraoka and Watanabe, below.⁶

a. Claim 1⁷

JTEKT contends that Teraoka discloses each and every claim limitation of claim 1 of the '440 patent. JTEKT asserts that Teraoka discloses a primary drive train that includes engine 1, transmission 3, differential 11, and front axles 13, 15 (the recited primary axle) and a secondary rear drive train that includes final gear set 23, rear differential 25, and rear axles 27, 29 (the recited secondary axle). Pet. 15. JTEKT further identifies transfer case 5 as the recited switch-on device and two-four switching mechanism 7 as the recited switch-on mechanism. *Id.* Based on our review of the complete trial record, we agree with JTEKT that Teraoka discloses the recited primary and secondary drive trains, primary and secondary axles, switch-on mechanism and switch-on device recited in claim 1 and we adopt JTEKT's findings with respect to these claim limitations as our own.

JTEKT further contends that clutch mechanism 71 corresponds to the recited side shaft coupling. Pet. 16. In our Decision on Institution, we found that differential 25, which includes clutch mechanism 71, corresponds

⁶ We analyze the level of ordinary skill in the art in Section II.A.1, *supra*.

⁷ Although GKN disclaims claim 1, we evaluate how the combination of Teraoka and Watanabe discloses or renders obvious the subject matter of claim 1, as claims 2 and 3 depend from claim 1.

to the recited side shaft coupling. Dec. on Inst. 15–16; *see, e.g.*, Ex. 1002 ¶ 50 (defining rear differential 25 as including “outer case 65, inner case 67, bevel gear type differential mechanism 69, [and] clutch mechanism 71”); ¶ 52 (defining differential mechanism 69 as including pinion gear 79, pinion shaft 77, and output-side side gears 81, 83).⁸ Differential 25 is a connecting device (connecting final speed reduction gear set 23 with rear axle side shafts 27, 29 at side gears 81, 83) that conveys power from the secondary drive train into rear axles 27, 29, as claim 1 requires. *See* Pet. 15–16; *see also id.* at 15 (noting that power is “transmitted via clutch mechanism 71 to rear differential 25 and is further distributed through pinion shaft 77 and pinion gear 79 to side gears 81, 83 and is transmitted via rear axles 27, 29 to left and right rear wheels 31, 33”) (quoting Ex. 1002 ¶ 74). Further, differential 25 comprises at least one frictionally engaged coupling—clutch mechanism 71—which decouples the secondary drive train wheels from a portion of the secondary drive train.⁹ *See id.* at 17. After considering anew the underlying bases for our finding, we discern no reason to reach a different finding from our Decision on Institution and, therefore, we make

⁸ GKN also recognizes that the rear differential is a side shaft coupling. *See* Prelim. Resp. 27.

⁹ The language of claim 1 requiring “the [at least one] side shaft couplings [to] *comprise* at least one frictionally engaged coupling” (emphasis added) encompasses a side shaft coupling that includes components in addition to a frictionally engaged coupling. *Promega Corp. v. Life Techs. Corp.*, 773 F.3d 1338, 1350 (Fed. Cir. 2014) (determining that the use of “comprising” in a claim element expands the scope of the claim limitation beyond what is recited).

the same finding that Teraoka discloses the recited side shaft coupling of claim 1.

Claim 1 further requires the secondary drive train to “hav[e] a shutdown section located between the switch-on device and the at least one side shaft coupling” and further requires that “when the secondary axle is disconnected from the primary axle . . . , the shutdown section of the secondary drive train is decoupled from both the primary axle of the primary drive train and the wheels of the secondary axle.” Ex. 1001, 12:26–36.

JTEKT contends that Teraoka discloses the recited shutdown section. Pet. 14, 17. JTEKT explains that Teraoka’s secondary drive train spanning from two-four switching mechanism 7 to outer case 65 stops rotating when switching mechanism 7 and clutch mechanism 71 are decoupled. *Id.* at 17; *see also* Ex. 1002 ¶ 76 (“[D]ue to uncoupling of the two-four switching mechanism 7, rotation of the power transmission system . . . stops from the two-four switching mechanism 7 to outer case 65 . . . and to the outer plates 121, 123 of the main clutch 89 and pilot clutch 97 [of clutch mechanism 71].”). We are persuaded, based on our review of the trial record, that Teraoka discloses the recited shutdown section, and we adopt JTEKT’s positions with respect to the shutdown section limitation, *see* Pet. 14, 17, as our own.

Accordingly, we are persuaded, by a preponderance of the evidence, that the Petition demonstrates that Teraoka discloses each and every claim limitation of claim 1.

b. Claims 2 and 3

Claim 2 depends from claim 1 and further requires

having a side shaft coupling for each side shaft of the secondary axle and wherein when the secondary axle is connected to the primary axle, the side shaft couplings allow a driving power distribution without a differential gearing between the drive wheels of the secondary axle to ensure transverse compensation. Ex. 1001, 12:37–42. Similarly, claim 3, which also depends from claim 1, further requires “having a side shaft coupling for each side shaft of the secondary axle and wherein when the secondary axle is connected to the primary axle, the side shaft couplings allow a drive power distribution without differential gearing between the primary axle and the secondary axle, to ensure longitudinal compensation.” *Id.* at 12:43–48.

i. Disclosure of the subject matter of claims 2 and 3

JTEKT contends that Watanabe discloses the additional subject matter of claims 2 and 3. Pet. 19–21. Additionally, JTEKT contends that modifying Teraoka to replace its differential 25, including clutch mechanism 71, with Watanabe’s clutches 89, 91 arrives at the subject matter of claims 2 and 3. *Id.* That is, JTEKT contends that substituting Watanabe’s clutches 89, 91 for Teraoka’s differential 25 results in “having a side shaft coupling for each side shaft of the secondary axle” as required by claims 2 and 3, driving rear wheels 25, 27. *See id.* at 20 (citing Ex. 1003, 4, lower right col.)

JTEKT explains that “the multiple plate clutches 89 and 91 allow power distribution without differential gearing between the drive wheels.” Pet. 20; *see* Ex. 1003, 4, upper right col. (“[I]ncreasing or decreasing the tightening force individually for the multiple plate clutches 89 and 91, the distribution ratio of the drive power between the right and left rear wheels 25 and 27 can be adjusted.”). JTEKT further explains that Watanabe discloses

that its clutches 89, 91 ensure transverse and longitudinal compensation, as recited in claims 2 and 3. Pet. 20–21; *see* Ex. 1003, 4, lower right col.–5, upper right col.

GKN does not dispute that the combination of Teraoka and Watanabe discloses the subject matter of claims 2 and 3. *See* PO Resp. 26–45 (addressing JTEKT’s reasons to combine Teraoka and Watanabe but not disputing that the combination discloses the subject matter of claims 2 and 3); *see also* Pet. Reply 2 (“There is no dispute that all features of claims 2 and 3 are present in the combined disclosures of Teraoka and Watanabe.”). We find that JTEKT has demonstrated, by a preponderance of the evidence, that Teraoka, as modified by Watanabe, discloses the subject matter of claims 2 and 3. In addition to findings we make in connection with our analysis of claims 2 and 3 above, we also adopt as our findings JTEKT’s positions as to how the combination of Watanabe and Teraoka discloses the subject matter of each of the claim limitations of claims 2 and 3. *See* Pet. 19–21.

ii. Reasons to Combine Teraoka and Watanabe

JTEKT contends that a person having ordinary skill in the art would have had reason to modify Teraoka with Watanabe’s clutches 89, 91 “as doing so would achieve the well-known goals of eliminating the relatively heavy bevel gear differential, therefore reducing the weight and fuel consumption of the vehicle.” Pet. 19 (supporting this reasoning with Mr. Becker’s Declaration (Ex. 1005 ¶ 45)). JTEKT asserts that the proposed modification represents a simple substitution of well-known alternative components, with the substitution yielding the predictable result of reducing the mass of the secondary drive train and rotational losses when the

secondary drive train is decoupled from the primary drive train. *Id.*; *see also* Ex. 1005 ¶ 46.

GKN argues that JTEKT's rationale to combine Teraoka and Watanabe lacks a rational underpinning. PO Resp. 27. First, GKN argues that JTEKT's rationale to combine Teraoka and Watanabe is conclusory. *Id.* at 27–28. Specifically, GKN argues that JTEKT's assertion that “[i]t would have been a matter of simple substitution to replace the rear, secondary drive train [of Teraoka] with the rear, secondary drive train of Watanabe to yield the predictable result of reducing mass and rotating losses” is nothing more than a statement of a general principle of obviousness and is not a substitute for fact-based analysis. *Id.* at 27. GKN further argues that JTEKT's asserted motivation to combine—that it was a well-known goal to eliminate Teraoka's bevel gear differential to reduce weight and fuel consumption—is not supported by persuasive evidence in the record. *Id.* at 28. As GKN explains, the only support that JTEKT cites to is an almost verbatim statement from its expert, Mr. Becker that is not supported further by evidence. *Id.*

JTEKT replies that the record evidence supports Mr. Becker's assertion that a person having ordinary skill in the art would have been motivated to replace Teraoka's bevel gear differential and single rear clutch with Watanabe's dual rear clutch to reduce weight and improve fuel consumption. Pet. Reply 3–4 (citing Ex. 1005 (Mr. Becker's Declaration), ¶ 45 and Ex. 2020 (Mr. Becker's deposition transcript), 94:4–9, 110–111, 136–137, 140–141, and 175:14–22). We assess each of these citations in turn, below.

In paragraph 45 of Mr. Becker's Declaration, he testifies that:

it would have been obvious to replace the clutch 71 and differential 25 of Teraoka with a side-shaft coupling on each side of the secondary axle without differential gearing in between, as doing so would achieve the well-known goals of eliminating the bevel gear differential, therefore reducing the weight and fuel consumption of the vehicle.

Ex. 1005 ¶ 45. As GKN argues, Mr. Becker fails to provide any additional support for this statement. For example, Mr. Becker fails to substantiate his view that JTEKT's proposed substitution of Watanabe's dual clutch system for Teraoka's single clutch and bevel gear differential would predictably result in a decrease in vehicle weight. Instead, Mr. Becker's testimony merely mimics the language in the Petition. Accordingly, we afford Mr. Becker's statement very little weight. *See In re Am. Acad. of Sci. Tech Ctr.*, 367 F.3d 1359, 1368 (Fed. Cir. 2004) (“[T]he Board is entitled to weigh the declarations and conclude that the lack of factual corroboration warrants discounting the opinions expressed in the declarations.”); *see also* 37 C.F.R. § 42.65(a) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.”).

We further find that JTEKT's citations to Mr. Becker's deposition testimony fails to support JTEKT's rationale for modifying Teraoka with the teachings of Watanabe. Mr. Becker's testimony at page 94, lines 4–9, provides that general considerations in driveline design are weight and cost. *See* Ex. 2020, 94:4–9. Similarly, Mr. Becker's testimony at pages 110 and 111 and 140 and 141 provides that weight is one problem to be solved in driveline design and that “cost, weight, performance, etc.” are reasons for eliminating Teraoka's bevel gear differential, without indicating that there would be a weight savings. *See id.* at 110:13–111:16, 140:13–141:19. Mr. Becker's testimony at pages 136 to 137 and 175 is equivocal and of little

probative value, as he testifies that there *may* be a weight savings switching from a bevel gear differential to a clutch pack. *See id.* at 136:11–137:10, 175:14–22. That is, we find that Mr. Becker’s testimony merely emphasizes that weight is a consideration in designing vehicle components and fails to support the position that a person having ordinary skill in the art would have been motivated to implement JTEKT’s proposed modification of Teraoka with Watanabe to predictably save weight.

Similarly, JTEKT’s reliance on GKN’s proffered evidence is misplaced. JTEKT argues that Dr. Stein testified in his deposition that, in the automotive industry, reducing the number of parts, weight, and costs are common goals. Pet. Reply 5 (citing Ex. 1012, 77:14–18). Again, this testimony supports the general contention that reducing weight is a design goal in the automotive industry, not that a person having ordinary skill in the art would have recognized that JTEKT’s proposed modification of Teraoka with Watanabe teachings would result in a weight savings. JTEKT also cites to statements in Exhibits 2007 and 2019 to support its position. *See id.* JTEKT fails to explain adequately, however, how a light weight axle (Ex. 2007, 2) or the complexity and weight of the differential discussed at pages 635 and 636 of Exhibit 2019 supports its rationale.

JTEKT’s position appears to be that reducing weight is a consideration in vehicle modification and, because the proposed modification *may* reduce the vehicle weight, that an artisan of ordinary skill would have been motivated to make that modification. Indeed, JTEKT asserts that “reducing weight and cost are recognized and implicit goals in virtually all manufacturing.” Pet. Reply 4. Following JTEKT’s reasoning to its logical conclusion, a person having ordinary skill in the relevant art

would be motivated to make *any* modification to a manufactured item if there were a *possibility* that such a modification would result in a reduction of weight or cost, regardless of the probability of realizing such a reduction.

JTEKT further contends, in its Petitioner’s Reply, that express disclosures in Teraoka and Watanabe support JTEKT’s rationale for combining the two references. Pet. Reply 4–5. GKN asserts that JTEKT’s contention exceeds the proper scope of a Petitioner’s Reply. *See* Paper 18, 1.¹⁰ We address GKN’s assertion before addressing the substance of JTEKT’s contention.

“A patent owner in [GKN’s] position is undoubtedly entitled to notice of and a fair opportunity to meet the grounds of rejection. ‘The indispensable ingredients of due process are notice and an opportunity to be heard by a disinterested decision-maker.’” *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1080 (Fed. Cir. 2015) (quoting *Abbott Labs. v. Cordis Corp.*, 710 F.3d 1318, 1328 (Fed. Cir. 2013)). For *inter partes* reviews, the Administrative Procedure Act (“APA”) requires us (1) to “timely [inform]” a patent owner of “the matters of fact and law asserted” (5 U.S.C. § 554(b)(3)); (2) to give “all interested parties opportunity for . . . the submission and consideration of facts [and] arguments . . . [and] hearing and decision on notice” (*id.* § 554(c)); and (3) to permit a party “to submit rebuttal evidence, and to conduct such cross-examination as may be required

¹⁰ We authorized GKN to file a paper (Paper 18) to list those sections of JTEKT’s Petitioner’s Reply that GKN contends exceed the scope of a proper Petitioner’s Reply. *See* Paper 17. We also authorized JTEKT to file a paper (Paper 19) that identifies the portions of GKN’s Patent Owner’s Response to which the listed citations address. *See id.*

for a full and true disclosure of the facts” (*id.* § 556(d)). *See Belden*, 805 F.3d at 1080.

We determine that JTEKT’s argument citing Teraoka’s and Watanabe’s disclosures regarding weight reduction does not exceed the scope of a proper reply brief and that GKN was afforded notice of and a fair opportunity to meet JTEKT’s argument and evidence. GKN expressly argued that JTEKT’s rationale regarding weight reduction in the Petition was deficient and JTEKT’s argument responds to that assertion. *See* PO Resp. 29–32. Further, the Petition identifies Teraoka and Watanabe as the prior art references that JTEKT contends render claims 2 and 3 obvious. As such, GKN was on notice as to what these references disclose and, in particular, should have been aware of any disclosure regarding weight reduction.

Turning now to JTEKT’s specific contentions, it asserts that Teraoka discloses that using clutch 71 results in a simpler configuration that reduces the number of parts, weight, and cost over the prior art. Pet. Reply 4 (citing Ex. 1002 ¶ 89). JTEKT further asserts that Watanabe discloses that its system simplifies the mechanism and results in a lighter weight, lower cost mechanism. *Id.* (citing Ex. 1003, 4, lower right col.; Ex. 1008 ¶ 8). JTEKT also references Watanabe’s disclosure that using its dual clutch system eliminates the need for a center differential, which reduces cost and weight. *Id.* at 4–5 (citing Ex. 1003, 5, lower right col.; Ex. 1008 ¶ 9). JTEKT argues that these disclosures support its rationale that a person having ordinary skill in the art would have been motivated to modify Teraoka with Watanabe to reduce weight by replacing Teraoka’s bevel gear differential. *Id.* at 5.

We determine that JTEKT's reliance upon statements of weight savings expressed in Teraoka and Watanabe is unpersuasive. As to Teraoka's disclosure, the cited language is directed to clutch 71, which is replaced in JTEKT's proposed modification. Indeed, this language cuts against JTEKT, as it suggests that Teraoka's unmodified system has certain weight advantages. As to Watanabe's disclosures, the first cited disclosure is directed to weight and cost savings because a 2-4 switching mechanism is not needed. However, JTEKT's modification does not eliminate Teraoka's 2-4 switching mechanism, as claims 2 and 3 require this structure. As such, this weight advantage would not be realized by JTEKT's modification. As to the second cited disclosure in Watanabe, this disclosed weight and cost savings is attributed to the lack of a center differential. Teraoka's system does not include a center differential—it only has front (item 39) and rear (item 25) differentials. *See, e.g.*, Ex. 1002, Fig. 1 (depicting the drive lines with front and rear differentials, but no center differential). Again, this weight savings would not be realized in JTEKT's proposed modification.

JTEKT further reasons that its proposed modification of Teraoka with the teaching of Watanabe represents substituting one known secondary drive train configuration with another known configuration, a substitution that would yield predictable results. Pet. 19 (citing Ex. 1005 ¶ 46). Although “[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results” (*see KSR Int'l Co.*, 550 U.S. at 416), Mr. Becker testifies that the predictable result that the proposed substitution would yield is “reducing mass and rotating losses.” *See* Ex. 1005 ¶ 46. As we discussed above, Mr. Becker's deposition testimony belies this statement—the proposed substitution would

not predictably result in a weight reduction, but instead *may* result in a weight reduction. *See* Ex. 2020, 136:11–137:10, 175:14–22. Further, record evidence at least suggests that, for a commercial embodiment for a vehicle employing dual clutches to replace a rear differential, the overall vehicle weight increases by a small amount. *See* PO Resp. 30–31 (providing testimony from Dr. Stein regarding the Ford Focus RS, which incurs a small weight penalty by replacing a rear bevel gear differential with a dual clutch system). Although this evidence is not directly related to replacing Teraoka’s rear clutch and rear differential by dual rear clutches, the evidence at least calls into question whether an artisan of ordinary skill would have expected that JTEKT’s proposed modifications to Teraoka would reduce weight.

We recognize that “obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR Int’l Co.*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). ““The presence or absence of a motivation to combine references in an obviousness determination is a pure question of fact.”” *PAR Pharm., Inc. v. TWI Pharm., Inc.*, 773 F.3d 1186, 1196 (Fed. Cir. 2014) (quoting *Alza Corp. v. Mylan Labs., Inc.*, 464 F.3d 1286, 1289 (Fed. Cir. 2006)). We find that JTEKT fails to provide a persuasive rational underpinning to support its argument that an artisan of ordinary skill would have been motivated to replace Teraoka’s clutch and differential with Watanabe’s dual clutch system. JTEKT’s rationale that an artisan of ordinary skill would have been motivated to reduce weight, without further persuasive evidence why such a weight loss would have been predictably

realized, or at least expected, amounts to an unsupported conclusory assertion. Accordingly, we assign very little weight to this rationale.

JTEKT also asserts that other rationales support its modification of Teraoka with the teachings of Watanabe. Pet. Reply 6–14. These rationales include: (1) that providing a larger shutdown section would have motivated the combination of Teraoka and Watanabe (Pet. Reply 6–9); (2) that improving control and providing torque vectoring would have motivated the combination of Teraoka and Watanabe (Pet. Reply 10–11); and (3) that the combination of Teraoka and Watanabe would have been obvious to try (Pet. Reply 12–14). GKN argues that these additional rationales were provided, for the first time, in the Petitioner’s Reply and, as such, exceed the scope of a proper reply brief. We take each rationale in turn.

Providing a larger shutdown section. JTEKT contends that its Petitioner’s Reply argument providing the additional rationale that a person having ordinary skill in the art would have been motivated to combine Teraoka and Watanabe to arrive at a larger shutdown section responds to GKN’s arguments that a person having ordinary skill in the art would not have looked to Watanabe, as “it is not directed to the resulting problems of complex configuration, power loss, drag reduction or fuel efficiency.” *See* Paper 19, 1; PO Resp. 42. JTEKT’s argument in reply highlights that Watanabe does contemplate reducing rotational drag, as does Teraoka.

We appreciate that GKN’s Patent Owner’s Response appears to open the door to JTEKT’s argument. A closer look, however, reveals that JTEKT’s argument is improper in a Petitioner’s Reply. JTEKT’s sole rationale asserted in the Petition is that an artisan of ordinary skill would have been motivated to combine Teraoka and Watanabe to eliminate

Teraoka's bevel gear differential to reduce weight and, thereby, reduce fuel consumption. Accordingly, any arguments in GKN's Patent Owner's Response must be viewed through a lens of that rationale alone. JTEKT cannot properly latch onto language in the Patent Owner's Response and leverage that language into a new rationale for combining Teraoka and Watanabe—a new rationale to which GKN cannot respond. Here, JTEKT's new rationale is not related to reducing weight at all, but instead, further argues that Teraoka and Watanabe both address shutdown sections, strengthening the link between the references.

“It is of the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify ‘with particularity’ the ‘evidence that supports the grounds for the challenge to each claim.’” *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016) (quoting 35 U.S.C. § 312(a)(3)). “Unlike district court litigation—where parties have greater freedom to revise and develop their arguments over time and in response to newly discovered material—the expedited nature of IPRs bring with it an obligation for petitioners to make their case in their petition to institute.” *Id.*

GKN did not have the opportunity to address JTEKT's new rationale nor did it have the opportunity to submit new evidence to counter JTEKT's position. The new rationale does not address any specific deficiency identified by GKN to JTEKT's rationale relied on *in the Petition*. Instead, it provides a new rationale in reply to GKN's arguments highlighting deficiencies in the rationale provided in the Petition, in an attempt to strengthen its obviousness position. As such, we agree with GKN that this new rationale exceeds the scope of a proper Petitioner's Reply, and we do

not consider it, as doing so would be unfair to GKN, as GKN was not given the proper notice and opportunity to respond to this argument.

Improving control and providing torque vectoring. As to its added rationale that a person having ordinary skill in the art would have been motivated to combine Teraoka and Watanabe to improve vehicle control and provide torque vectoring, JTEKT asserts that this rationale addresses GKN's position that Mr. Becker's reasoning to combine Teraoka and Watanabe is unsupported and GKN's further position that an artisan of ordinary skill would not have combined the references. *See* Paper 19, 1; PO Resp. 31, 32.

We agree again with GKN that this new rationale exceeds the proper scope of a Petitioner's Reply and we do not consider it further. JTEKT attempts to leverage language in the Patent Owner's Response about how its rationale proffered in the Petition is deficient to provide a new rationale to which GKN has not had the proper notice and opportunity to respond. The Petition does not discuss improving control and torque vectoring as reasons to combine Teraoka and Watanabe.

Obvious to try. JTEKT asserts that its argument in the Petitioner's Reply that the combination of Teraoka and Watanabe would have been obvious to try responds to GKN's assertion that there are many types of power dividing units and that an engineer would need to make a number of choices and, as such, a more detailed reasoning (that is, more detailed than reducing weight) would be required. *See* Paper 19, 1; PO Resp. 31–32. At oral hearing, JTEKT argued that “[t]he *KSR* rationale is, in fact, included in the institution decision itself,” to further support its assertion that this argument is properly in the Petitioner's Reply. Tr. 61:5–6.

We agree again with GKN that this new rationale exceeds the proper scope of a Petitioner's Reply and we do not consider it further. JTEKT improperly attempts to leverage language in the Patent Owner's Response that there are a finite number of power dividing units into an obvious-to-try rationale, a rationale not offered in the Petition. Further, JTEKT's assertion that the *KSR* rationale is in our Decision on Institution is inapposite. Our Decision on Institution does not address an obvious-to-try rationale but, instead, cites to *KSR* for the proposition that "[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *See* Dec. on Inst. 25 (quoting *KSR Int'l Co.*, 550 U.S. at 416). *KSR* analyzes the reasoning in a number of Supreme Court precedents directed to obviousness, as well as other potential rationales for finding claimed subject matter obvious or non-obvious. A citation in our Decision on Institution to one sentence in *KSR* does not incorporate every rationale provided in *KSR* into our Decision.

iii. Conclusion

We determine, based on the totality of our findings of the underlining facts and weighing of the record evidence, that JTEKT has not demonstrated, by a preponderance of the evidence, that claims 2 and 3 are unpatentable under 35 U.S.C. § 103(a) over Teraoka and Watanabe. JTEKT's Petition fails to provide a persuasive reason, with rational underpinnings, why a person having ordinary skill in the art would have been motivated to substitute Watanabe's dual clutch system for Teraoka's clutch and differential. The Petition, and its supporting evidence, fails to establish that an artisan of ordinary skill would have had a reasonable expectation of reducing vehicle weight with the proposed modification,

which was the sole reason offered in the Petition for combining the teachings of Teraoka and Watanabe. As we determine that JTEKT fails to meet its burden with respect to claims 2 and 3, we need not address GKN's evidence of secondary considerations with respect to these claims.

2. *Claims 6 and 7: Obviousness over Teraoka and Burrows*

JTEKT asserts that claims 6 and 7, which depend directly or indirectly from disclaimed claims 1, 4, and 5, are unpatentable under 35 U.S.C. § 103(a) as obvious over Teraoka and Burrows. Pet. 22. We address the underlying facts for this obviousness assertion below. First, we address how Teraoka discloses the subject matter of claims 4 and 5.¹¹

a. Claims 4 and 5

Claim 4 depends from claim 1 and further recites “wherein the switch-on device comprises a positively working power transmission gearing having an angular gear working via cogged wheels.” Ex. 1001, 12:49–51. Claim 5 depends from claim 4 and further recites “wherein the switch-on device is arranged on the primary axle and the secondary drive train output is, when the secondary drive train is connected to the primary axle, engaged to the primary drive train by the switch-on mechanism.” *Id.* at 12:52–56. JTEKT contends that Teraoka discloses the subject matter of both claims 4 and 5. Pet. 14.

JTEKT contends that changing gear set 9, which is part of transfer case 5 (the asserted switch-on device), corresponds to the “positively working power transmission gearing” of claim 4. Pet. 18; *see also* Ex. 1002

¹¹ We have already addressed the manner in which Teraoka describes the elements of claim 1. *See* Part II.C.1.a above.

¶ 41 (“The direction changing gear set 9 forms parts of the rear wheel side power transmission system and consists of intermeshing transverse and longitudinal bevel gears 35, 37, whereby the transmitted driving force of the engine is converted in direction . . . and transmitted toward the rear wheels.”). JTEKT contends that Teraoka’s transfer case 5 is arranged on Teraoka’s front axle—the primary axle—and, when two-four switching mechanism 7 (the asserted switch-on mechanism) is engaged, the secondary drive train is engaged to the primary drive train, as required by claim 5. Pet. 18; *see* Ex. 1002, Fig. 1, ¶¶ 24, 40. GKN does not dispute these contentions.

After review of the complete record anew, we are persuaded that JTEKT has shown, by a preponderance of the evidence, that Teraoka discloses the subject matter of claims 4 and 5. In addition to our factual findings presented above, we adopt as our own JTEKT’s positions of how Teraoka discloses the subject matter of claims 4 and 5. *See* Pet. 18.

b. Claims 6 and 7

Claim 6 depends from claim 4 and further recites “wherein a speed synchronization in the switch-on mechanism of the power transmission gearbox for the establishment of a positive lock is supported by the at least one side shaft couplings.” Ex. 1001, 12:57–60. Claim 7 depends from claim 6 and further recites:

wherein the at least one side shaft couplings is formed by a frictionally engaged multiple disc clutch, whereby the friction plates connected in a torque-proof way to the secondary drive wheels cooperate as inner plates with an inner plate carrier and whereby the friction plates located on the drive train-side of the vehicle cooperate with an outer plate carrier as outer plates.

Id. at 12:61–67.

i. Disclosure of the subject matter of claims 6 and 7 and reasons to combine the teachings of Teraoka and Burrows

JTEKT acknowledges that Teraoka does not mention synchronization. Pet. 22. JTEKT contends that “[i]t would have been obvious to provide rear axle speed synchronization in light of the structure disclosed by Teraoka as it was well known in the art that positively connected gearing (*e.g.*[,] a dog clutch) requires speed synchronization of the input and output sides to reduce wear and prevent failure.” *Id.* at 22–23 (referencing Mr. Becker’s declaration, Ex. 1005 ¶ 49). JTEKT asserts that “[o]ne such way to provide speed synchronization is by use of a friction clutch which allows a speed transition by slipping the clutch.” *Id.* at 23.

JTEKT further contends that Burrows discloses a technique for using a multi-plate wet clutch in conjunction with a dog clutch for speed synchronization and specifically the technique associated with Burrows’s Figure 2. *See* Pet. 23; *id.* at 24 (quoting Burrows’s synchronization method for the embodiment of Figure 2). JTEKT explains that Teraoka discloses a secondary drive system with two-four switching mechanism 7 and clutch mechanism 71 including multi-plate wet clutch 89. *Id.*; *see also* Ex. 1002 ¶ 40 (identifying two-four switching mechanism 7 as a dog clutch). JTEKT concludes that “[i]t would have been obvious to one of ordinary skill in the art to synchronize the switching mechanism 7 of Teraoka using the clutch mechanism 71 connected by propeller shaft 21, as taught by Burrows, to perform synchronization without the use of additional equipment.” Pet. 23.

JTEKT further contends that employing Burrows’s technique with Teraoka’s system represents the application of a known technique to improve a similar device in the same way it improves Burrows’s drive train. Pet. 23; *see also* *KSR*, 550 U.S. at 417 (“[I]f a technique has been used to

improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.”). That is, JTEKT’s proposed modification is that it would have been within the level of ordinary skill to apply the technique taught in Burrows to the structure of Teraoka. JTEKT does not contend that Teraoka’s structure needs to be modified by any structure in Burrows. *See* Pet. 23 (“It would have been obvious to one of ordinary skill in the art to synchronize the switching mechanism 7 of Teraoka using the clutch mechanism 71 [of Teraoka] connected by propeller shaft 21 [of Teraoka], as taught by Burrows, to perform synchronization without the use of additional equipment.”); Tr. 22:11–15 (“[S]ynchronization was known in the art to be required when a dog clutch was used, and although Teraoka probably is -- is carrying out . . . synchronization, it was not explicitly discussed in Teraoka, so we relied on Burrows as a clear teaching of synchronizing of a dog clutch scenario.”), 60:12–14 (“[O]ur position is that Burrows is simply explaining what the components are doing in Teraoka when they are synchronizing.”).

GKN contends that JTEKT’s rationale for applying the teachings of Burrows to Teraoka’s structure is insufficient. PO Resp. 48. GKN argues that JTEKT’s rationale is a conclusory statement and fails to establish why a person having skill in the art would look to the Burrows reference. *Id.* GKN further argues that Burrows is directed to all-terrain vehicles and its control strategy is directed to reducing acceleration jerk. *Id.* at 49. GKN contends that the terrain demands of an all-terrain vehicle fundamentally alter the driveline design criteria as compared to a conventional four-wheel drive vehicle.

To the extent that GKN argues that Burrows is not analogous art, we disagree. To qualify as analogous art for § 103 purposes, a reference “must satisfy one of the following conditions: (1) the reference must be from the same field of endeavor; or (2) the reference must be reasonably pertinent to the particular problem with which the inventor is involved.” *K-TEC, Inc. v. Vita-Mix Corp.*, 696 F.3d 1364, 1375 (Fed. Cir. 2012) (citation omitted). Burrows is at least in the same field of endeavor—four-wheel-drive drivelines—as Teraoka and the ’440 patent. *See, e.g.*, Ex. 1004, 1:1–3 (providing that the “invention relates to drivelines for motor vehicles” having “selective two wheel drive or four wheel drive,” with an ATV being an exemplary vehicle). We also find that Burrows is reasonably pertinent to the particular problem addressed by claims 6 and 7—speed synchronization. *See* Ex. 1004, 8 (discussing the second example of Burrows’s invention, the embodiment relied on by JTEKT, including speed synchronization).

Further, to the extent that GKN’s argument is premised on Burrows being directed to all-terrain vehicles for off-road use with handle bars that a rider may straddle, we find that Burrows is directed to conventional four-wheel drive vehicles and that GKN misinterprets the disclosure of Burrows. *See, e.g.*, Ex. 1004, Figs. 1–3 (depicting conventional four-wheel drive drivetrains with a six-cylinder engine), 1:3–6 (discussing that the vehicle is also used for on-road driving); Pet. Reply 19–21 (explaining that the British disclosure uses the term “all-terrain vehicle” to mean a conventional four-wheel drive vehicle).

GKN also argues that the Petition fails to identify which of Burrows’s three synchronizing approaches JTEKT contends would be used for Teraoka’s structure. PO Resp. 51–53. We disagree. As we stated in our

Decision on Institution, the Petition clearly identifies Burrows's second embodiment as the teaching applied to Teraoka's structure. *See* Dec. on Inst. 30; Pet. 24 (quoting Ex. 1004, 8:7–11); Pet. Reply 21–22 (asserting that GKN's expert recognized that JTEKT asserted Burrows's second embodiment).

GKN next argues that JTEKT fails to provide a rational underpinning for its reasoning that speed synchronization of a dog clutch is a well-known technique. *See* PO Resp. 54. We do not agree. We find that the record evidence provides support for JTEKT's rationale. GKN's expert testified that the speed synchronization of claim 6 was known in the prior art. *See* Ex. 1012, 66:10–19. Further, the '440 patent itself recognizes that it would have been known by a person of ordinary skill in the art that a dog clutch would need speed synchronization. *See* Ex. 1001, 4:16–21 (“The positive power transmission gearbox must . . . be synchronized for the switching procedures to be provided, therefore in particular the coupling or respectively uncoupling of the secondary drive train. Such speed synchronization can be readily guaranteed on the one hand by means of gearbox synchronization familiar to the expert.”). This record evidence supports Mr. Becker's opinion that speed synchronization was well known in the art to reduce wear and prevent failure. *See* Ex. 1005 ¶ 49.

GKN next argues that JTEKT's proposed modification would change the principle of operation of Teraoka, such that the combination cannot render the claims obvious. PO Resp. 54. GKN contends that Teraoka's principle of operation is based on simultaneous coupling of 2-4 switching mechanism 7 and clutch mechanism 71, and, as modified, the system would

not include simultaneous coupling. *Id.* That is, Burrows teaches a technique that employs multi-stage speed synchronization.

We find that applying Burrows’s speed synchronization technique to Teraoka’s structure does not change Teraoka’s principle of operation. GKN’s assertion too narrowly defines Teraoka’s principle of operation as requiring simultaneous coupling. *Id.* Teraoka’s principle of operation is broader—allowing for selective two-wheel-drive and four-wheel-drive operation while reducing drag in two-wheel-drive mode—and, as modified, Teraoka’s drivetrain would still operate under this principle using Burrows’s synchronization technique. *See* Ex. 1002, Abstract.

During oral hearing, GKN argued, *for the first time*, that Teraoka in combination with the teachings of Burrows did not disclose each and every claim element of claims 6 and 7. *See* Tr. 56:12–14 (“I did want to . . . get to this . . . final issue here, which is that there is a missing limitation with respect to claim 6.”), 56:15–19 (“JUDGE MAYBERRY: Counsel, while you’re putting that together, can you point us to where in the Patent Owner response this [argument] is? MS. SHAH: It is not in the Patent Owner response, Your Honor.”). As this argument was not presented in GKN’s Patent Owner’s Response, we do not address it here. *See, e.g., Office Patent Trial Practice Guide*, 77 Fed. Reg. 48,756, 48,768 (Aug. 14, 2012) (At oral argument, “[a] party may rely upon evidence that has been previously submitted in the proceeding *and may only present arguments relied upon in the papers previously submitted*. No new evidence or arguments may be presented at the oral argument.”) (emphasis added). As discussed above, we find that the combination of Teraoka and Burrows discloses each limitation of claims 6 and 7.

ii. Secondary Considerations

GKN asserts that certain objective indicia supports a conclusion that the challenged claims are non-obvious, including unexpected results, commercial success, praise by others, and long-felt need. PO Resp. 54. As an initial matter, “[f]or objective evidence to be accorded substantial weight, its proponent must establish a nexus between the evidence and the merits of the claimed invention.” *In re GPAC Inc.*, 57 F.3d 1573, 1580 (Fed. Cir. 1995). “[T]here is a presumption of nexus for objective considerations when the patentee shows that the asserted objective evidence is tied to a specific product and that product ‘is the invention disclosed and claimed in the patent.’” *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1329 (Fed. Cir. 2016) (internal citation omitted); *see also PPC Broadband, Inc. v. Corning Optical Commc’ns RF, LLC*, 815 F.3d 734, 747 (Fed. Cir. 2016) (“Because the evidence shows that the SignalTight connectors are ‘the invention disclosed and claimed in the patent,’ we presume that any commercial success of these products is due to the patented invention This is true even when the product has additional, unclaimed features.”) (internal citations omitted). “The presumption of nexus is rebuttable: a patent challenger may respond by presenting evidence that shows the proffered objective evidence was ‘due to extraneous factors other than the patented invention.’ Such extraneous factors include additional unclaimed features and external factors, such as improvements in marketing.” *WBIP, LLC*, 829 F.3d at 1329 (internal citation omitted).

We find that GKN is not entitled to this rebuttable presumption. As JTEKT argues, GKN fails to establish that the product identified in its evidence supporting secondary considerations—the GKN Twinstar—is

covered by claims 6 or 7. *See* Pet. Reply 22. Although record evidence supports a finding that the Twinster product includes twin rear clutches (*see, e.g.,* Ex. 2029, 1 (“The system adds two electronically controlled clutches to the rear axle in place of the traditional mechanical differential.”)), GKN fails to identify any evidence that supports a finding that the Twinster product includes other elements of claims 6 or 7, such as a switch-on mechanism or speed synchronization. Further, GKN’s expert did not compare the Twinster to claims 6 or 7. *See* Ex. 1012, 75:14–19.

Even if GKN were to establish that the Twinster is covered by claim 6 or 7, we would afford GKN’s proffered evidence of secondary considerations little weight. As to industry praise, the proffered evidence demonstrates that the praise is directed to the control software developed by GKN, rather than the structural aspects recited in the claims of the ’440 patent. *See, e.g.,* Ex. 2024, 2 (“It’s a whole new way of tuning a car’s handling. ‘We can do a lot with mechanics, but how you computer-control it is really the key. The software gives the vehicle its unique characteristics.’”). Also, an industry award identified by GKN was directed at the collaboration between GKN and Ford, rather than any attribute of the Twinster product. *See* Pet. Reply 24–25; Ex. 2030, 2. As to any commercial success, as JTEKT correctly argues, GKN provides no persuasive evidence of actual success. *See* Pet. Reply 24. Further, as JTEKT argues, GKN fails to explain adequately how the torque vectoring achieved by the Twinster product amounts to an unexpected result, particularly in light of Dr. Stein’s testimony that torque vectoring was known prior to the effective filing date of the ’440 patent. *Id.; see* Ex. 1012, 98:2–99:1. Finally, we find that GKN’s evidence does not support a finding that there was a long-felt, but

unrealized, need for the invention claimed in the '440 patent. GKN merely states that the Twinstar addresses a long-felt need, without substantiating that the addressed need was long-felt. *See* PO Resp. 57.

iii. Conclusion

On the complete trial record, we determine, based on our factual findings and weighing of the trial evidence, that JTEKT has shown, by a preponderance of the evidence, that claims 6 and 7 are unpatentable under 35 U.S.C. § 103(a) over Teraoka and Burrows. In addition to our findings presented above, we adopt as our own JTEKT's findings on how the application of Burrows's teachings to Teraoka discloses the subject matter of claims 6 and 7. *See* Pet. 22–25.

III. CONCLUSION

For the foregoing reasons, JTEKT has demonstrated by a preponderance of the evidence that claims 6 and 7 of the '440 patent are unpatentable. JTEKT has not demonstrated by a preponderance of the evidence that claims 2 and 3 of the '440 patent are unpatentable.

IV. ORDER

After due consideration of the record before us, it is:

ORDERED that claims 2 and 3 of the '440 patent are held *not* unpatentable under 35 U.S.C. § 103(a) over Teraoka and Watanabe;

FURTHER ORDERED that claims 6 and 7 of the '440 patent are held to be *unpatentable* under 35 U.S.C. § 103(a) over Teraoka and Burrows; and

FURTHER ORDERED, that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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