

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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**JTEKT CORPORATION**

Petitioner,

v.

**GKN AUTOMOTIVE LTD.**

Patent Owner.

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Case IPR2016-00046

U.S. Patent No. 8,215,440

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**PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 8,215,440  
UNDER 35 U.S.C. § 312 AND 37 § C.F.R. 42.104**

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## **LIST OF EXHIBITS**

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| 1001 | U.S. Patent No. 8,215,440  |
| 1002 | Certified English translation of Japanese Patent Application Publication No. 2002-370557 and original document |
| 1003 | Certified English translation of Japanese Patent Application Publication No. H02-57725 and original document   |
| 1004 | Great Britain Patent No. 2407804   |
| 1005 | Declaration of Steven J. Becker (and CV)   |
| 1006 | Office Action dated September 1, 2011 in prosecution of U.S. Patent No. 8,215,440                              |
| 1007 | Response dated February 27, 2012 in prosecution of U.S. Patent No. 8,215,440                                   |

## **I. INTRODUCTION**

JTEKT Corporation (“JTEKT” or “Petitioner”) requests that the Patent Trial and Appeal Board (“the Board”) institute *inter partes* review of claims 1-7 of U.S. Patent No. 8,215,440 (“the ‘440 patent,” Ex. 1001) in accordance with 35 U.S.C. §§ 311-319 and 37 C.F.R. § 42.100 et seq.

The challenged claims of the ‘440 patent are unpatentable for at least two reasons: (i) drive train systems configured such that a portion of the secondary drive train does not rotate or move when the vehicle is in two-wheel drive mode were well known as of the effective filing date of claims 1-7 of the ‘440 patent, and (ii) it would have been obvious during the pertinent time frame to, among other things, employ a side shaft coupling for each side shaft of a secondary axle such that, 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. As such, for the reasons detailed below, Petitioner requests that the Board cancel the challenged claims of the ‘440 patent.

## **II. STATE OF THE ART**

User selectable four-wheel drive vehicles – *i.e.*, vehicles including drive trains where the driver can choose to switch from two-wheel drive to four-wheel drive in specific operating situations – were well known in the art in the 2008 to 2009 time frame. (*See* Ex. 1005, ¶ 16.)

There were at least two types of selectable four-wheel drive trains in the relevant time frame. Each type included a primary drive train which is generally constantly connected to a power source (*i.e.*, an engine, electric motor or the like); and a second drive train which can be selectively connected to the power source via a transfer gearbox. In the first type, the secondary drive train is switched on and receives torque from the engine when the vehicle is stationary. Here, the driver typically switches the transfer gearbox over manually from two-wheel to four-wheel drive. (*See* Ex. 1001, 1:38-53.) In the second type, the secondary drive train can be connected during travel through the use of frictionally engaged couplings. (*Id.*, 1:54-60.) Both types of drive trains have disadvantages, including needing additional system components and the increased costs in development and manufacture associated therewith. Furthermore, increasing the number of components results in heavier vehicles. (*Id.*, 1:61-2:18.)

Net drive output is also diminished in manually connected four-wheel drive systems because of power losses where the components of the secondary drive train are driven unnecessarily or passively. (*Id.*, 2:19-49.) Heavier vehicles and power losses both contribute to increased fuel consumption. (*Id.*) Because of these known disadvantages, vehicle designers and manufacturers look for ways to minimize power loss and reduce fuel consumption in situations where the secondary drive train is not being used.

For example, the ‘440 patent is generally directed to a drive train system including a shutdown section allowing the secondary drive train to be decoupled from the rest of the system so that the shutdown section does not rotate or move when the vehicle is in two-wheel mode. (*See generally* Ex. 1001.) However, this type of system was well-known years prior to the earliest possible effective filing date of claims 1-7 of the ‘440 patent (May 6, 2008), as demonstrated by various references which were not before the Examiner.<sup>1</sup>

For example, Teraoka (Ex. 1002) discloses a primary drive train along front axles 13 and 15; a secondary drive train along rear axles 27 and 29; a switching mechanism 7 disposed at the primary drive train; and a clutch mechanism 71 disposed at the secondary drive train.

In Teraoka, when switching mechanism 7 is open, power from the engine 1 is not transmitted through propeller shaft 21 to the secondary drive train (*i.e.*, operating in two wheel drive mode). If switching mechanism 7 is open, clutch mechanism 71 is closed, rear wheels 31 and 33 are turning, and the rotation of wheels 31 and 33 (due to the road) spin differential 25 and transmit the rotation to propeller shaft 21. If clutch mechanism 71 is open, then wheels 31 and 33 rotate

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<sup>1</sup> For the purposes of this petition, Petitioner does not take a position whether the ‘440 patent should benefit from the filing date of its two German priority applications.

independently (not connected by differential 25) and their rotation does not affect differential 25 or propeller shaft 21. (*See, e.g.*, 1002 at ¶¶ [0074]-[0080].) “In this way, the rotation of the power transmission system from the two-four switching mechanism 7 to the outer plates 121, 123 of the clutch mechanism 71 stops....” (*Id.* at [0078].)

That is, Teraoka discloses a drive train system including a portion that allows the secondary drive train to be decoupled from the rest of the system so that a portion of the secondary drive train does not rotate or move when the vehicle is in two-wheel mode—precisely the allegedly novel feature of the ‘440 patent.

### **III. MANDATORY NOTICES**

Pursuant to 37 C.F.R. § 42.8(a)(1), Petitioner provides the following mandatory disclosures.

#### **A. Real Party-In-Interest**

Pursuant to 37 C.F.R. § 42.8(b)(1), Petitioner certifies that JTEKT Corporation is the real party-in-interest.

#### **B. Related Matters**

Pursuant to 37 C.F.R. § 42.8(b)(2), Petitioner states that there are no matters in the U.S. related to the ‘440 patent.

#### **C. Lead and Back-Up Counsel**

Pursuant to 37 C.F.R. § 42.8(b)(3), Petitioner provides the following designation of counsel: Lead counsel is W. Todd Baker (Reg. No. 45,265) and



back-up counsel are Ryan Smith (Reg. No. 62,257) and Lisa Mandrusiak (Reg. No. 72,653).

**D. Service Information**

Pursuant to 37 C.F.R. § 42.8(b)(4), papers concerning this matter should be served in accordance with the following.

Address: W. Todd Baker  
Oblon, McClelland, Maier & Neustadt, LLP  
1940 Duke Street  
Alexandria, VA 22314  
Email: cpdocketBaker@oblon.com and  
Telephone: (703) 412-6383  
Fax: (703) 413-2220

**IV. PAYMENT OF FEES**

The undersigned authorizes the Office to charge the fee required by 37 C.F.R. § 42.15(a) for this Petition for *inter partes* review to Deposit Account No. 15-0030. Any additional fees that might be due are also authorized.

**V. REQUIREMENTS FOR *INTER PARTES* REVIEW**

**A. Grounds for Standing 37 – C.F.R. § 42.104(a)**

Pursuant to 37 C.F.R. § 42.104(a), Petitioner hereby certifies that the ‘440 patent is available for *inter partes* review and that the Petitioner is not barred or estopped from requesting *inter partes* review challenging the claims of the ‘440 patent on the grounds identified herein. The ‘440 patent has not been subject to a completed estoppel-based proceeding of the AIA, nor the subject of litigation.

**B. Identification of Claims for Which Review is Requested and Relief is Requested – 37 C.F.R. §§ 42.104(b)(1) and 42.22(a)(1)**

Pursuant to 37 C.F.R. §§ 42.104(b) and (b)(1), Petitioner requests *inter partes* review of claims 1-7 of the ‘440 patent, and that the Board cancel the same as unpatentable.

**C. Prior Art Patents and Printed Publications**

Petitioner relies upon the following patents and printed publications:

Exhibit 1002 (“Teraoka”) – Japanese Patent Application Publication No. 2002-370557 was published on Dec. 24, 2002. Teraoka qualifies as prior art under 35 U.S.C. § 102(b). Exhibit 1002 includes a certified English translation of Teraoka.

Exhibit 1003 (“Watanabe”) – Japanese Patent Application Publication No. H02-57725 was published on Feb. 27, 1990. Watanabe qualifies as prior art under 35 U.S.C. § 102(b). Exhibit 1003 includes a certified English translation of Watanabe.

Exhibit 1004 (“Burrows”) – Great Britain Patent Application Publication No. 2407804 was published on May 11, 2005. Burrows qualifies as prior art under 35 U.S.C. § 102(b).

**D. Statutory Grounds of Challenge – 37 C.F.R. § 42.104(b)(2)**

Petitioner requests cancellation of the challenged claims under the following statutory grounds:

**Ground 1** – Claims 1, 4 and 5 of the ‘440 patent are anticipated by Teraoka (Ex. 1002) under 35 U.S.C. § 102(b).

**Ground 2** – Claims 2 and 3 of the ‘440 patent are unpatentable over Teraoka (Ex. 1002) in view of Watanabe (Ex. 1003) under 35 U.S.C. § 103(a).

**Ground 3** – Claims 6 and 7 of the ‘440 patent are unpatentable over Teraoka (Ex. 1002) in view of Burrows (Ex. 1004) under 35 U.S.C. § 103(a).

Pursuant to 37 C.F.R. § 42.104(b)(4), an explanation of how claims 1-7 of the ‘440 patent are unpatentable under the statutory grounds identified above and that the Petitioner has at least a reasonable likelihood of prevailing on these grounds, including the identification of where each element of the claim is found in the prior art, is provided in Section IX below. Pursuant to 37 C.F.R. § 42.104(b)(5), the exhibit numbers of the supporting evidence relied upon to support the challenges and the relevance of the evidence to the challenges raised, including identifying specific portions of the evidence that support the challenges, are provided in Section IX below.

## **VI. OVERVIEW OF THE ‘440 PATENT**

### **A. Disclosure of the ‘440 Patent**

The ‘440 patent is directed to manually connected four-wheel drive transmissions in vehicles. The system in the ‘440 patent is configured so that a majority of the secondary drive train can be shut down when only the primary

drive train is engaged such that it does not rotate or move when the vehicle is in two-wheel drive mode. (*See, e.g.*, Ex. 1001 at abstract; *id.* at 3:20-24.)

Specifically, the ‘440 patent discloses a drive train for a vehicle comprising a permanently driven primary axle and a secondary axle that is connectable to the primary axle by a switch-on device that can be engaged during travel without requiring a differential. (*Id.*, 1:19-22.) The ‘440 patent purports that with this configuration, power loss is minimized, as is the weight and overall cost of the vehicle, as fewer components are required. (*Id.* at 2:53-65.)

In particular, the drive train of the ‘440 patent has a switch-on mechanism and side shaft couplings that have at least one frictionally engaged coupling. (*Id.* at 2:66-3:1.) When the secondary drive train is disconnected, the section of the secondary drive train between the connection unit and the side shaft couplings (*i.e.*, the “shutdown section”) is uncoupled from the primary axle and the secondary drive wheels when power is provided from only the primary axle. (*Id.* at 3:1-19.) On the other hand, when the secondary drive train is connected, both the side shaft couplings and the switch-on device are coupled, enabling the secondary drive output flow from the primary axle to the secondary axle. (*Id.*) Frictionally engaged couplings are used in order to match the speed of the components of the secondary drive train with the speed of the drive wheels of the secondary axle prior to coupling. (*Id.* at 3:20-30.)

In a “preferred embodiment” of the ‘440 patent, the side shaft couplings used to connect the secondary axle are used to guarantee both transverse and longitudinal equalization and are able to form drive output distribution without a differential, *i.e.*, with fewer components than other systems. (*Id.* at 3:31-65.)

In another “preferred embodiment” of the ‘440 patent, the switch-on device has a positively working power transmission gearbox, namely, an angular gear working via cogged wheels. (*Id.* at 3:66-4:16.) This positive power transmission gearbox must be synchronized for the coupling or uncoupling of the secondary drive train to function using known techniques. (*Id.* at 4:17-41.)

In other configurations, the side shaft couplings are formed using a frictionally engaged multiple disc clutch where the friction plates connect to the secondary drive wheels and cooperate with an inner plate carrier, whereas the drive-side discs cooperate with an outer plate carrier. (*Id.* at 4:42-57.) This configuration enables lubrication without an additional, external oil supply. (*Id.*)

When compared to drive trains known in the prior art, the drive train of the ‘440 patent is alleged to be less complex and thus lighter. (*Id.* at 6:46-49.) Furthermore, the system purportedly has significantly less power loss than some prior art drive trains. (*Id.* at 6:57-7:5.)

## **B. Prosecution History of the ‘440 Patent**

On April 30, 2009, the Patent Owner filed a preliminary amendment to address formality issues in the specification and amend claims 1-12 to reflect language more in keeping with U.S. Patent Law.

On September 1, 2011, the Examiner issued an Office Action (rejecting claims 1-12 under 35 U.S.C. § 112 as indefinite, noting that “there are several instances of indefinite claim language throughout the claims, which (like the entire present application) appears to be a crudely translated foreign document.” (Ex. 1006 at 5-6.<sup>2</sup>) The Examiner rejected claims 1-12 as anticipated by U.S. Patent Application Publication No. 2002/0144851 to Porter (“Porter”). The Examiner also made several objections to the specification, claims, and drawings.

In explaining the rejection over Porter, the Examiner noted that Porter teaches a drive train for a vehicle comprising at least a primary axle that is permanently driven by a primary drive train and a secondary axle that is operably connectable to the primary drive train and axle via a switch-on device. (Ex. 1006 at 9-10.) As such, the secondary drive train can be integrated with the primary drive train, and when connected, drive output to the secondary drive train is conveyed to side shaft couplings and transmitted to the drive wheels. The

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<sup>2</sup> All page numbers from the prosecution history refer to the exhibit page numbering rather than any original numbering.

Examiner further asserted that the system in Porter also uses frictionally engaged couplings. (*Id.*)

On February 27, 2012, the Patent Owner filed a response that amended the claims to address the objections and indefiniteness rejections. (*See* Ex. 1007.) In addition, claim 1 was amended “to make clear that a shutdown section of the secondary drive train is decoupled from the primary drive train and from the wheels of the secondary axle when the primary drive train does not provide power to the wheels of the secondary axle.” In conjunction with this amendment, the Patent Owner argued that the novel feature of the application was the fact that, when the vehicle is in two-wheel drive mode, *the shutdown section does not rotate or move*. (*Id.* at .) In contrast, the Patent Owner argued that, in Porter, all components of the drive train are in motion at all times whenever the vehicle is moving, regardless of whether the vehicle is in two-wheel mode or four-wheel mode. (*Id.* at 12.) Based on this amendment and argument, the Examiner issued a Notice of Allowance without providing any commentary.

The allowance of the claims based on this feature is inconsistent with prior art patents and publications as detailed in the references applied below.

**C. Claim Construction – 37 C.F.R. § 42.104(b)(3)**

1. A “**shutdown section**” should be construed as any portion of a secondary drive train which can be decoupled from both the primary axle and the wheels of the secondary axle. (*See* Ex. 1005, ¶ 33-35.)
2. A “**switch-on device**” should be construed as a structure designed to couple/decouple the shutdown section. (*See* Ex. 1005, ¶ 36-37.)
3. A “**switch-on mechanism**” should be construed as a point (*e.g.*, a clutch) of the switch-on device between the primary drive train and the secondary drive train which can couple/decouple the shutdown section. (*See* Ex. 1005, ¶ 38-39.)

**VII. LEVEL OF ORDINARY SKILL IN THE ART**

The level of ordinary skill in the art is evidenced by the prior art. *See In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (determining that the Board did not err in adopting the approach that the level of skill in the art was best determined by references of record). The prior art discussed herein and in the declaration of Steven Becker (Ex. 1005) demonstrates that a person of ordinary skill in the art, at the time the ‘440 patent was filed, was an engineer with several years of drive train experience.



**VIII. IDENTIFICATION OF HOW THE CHALLENGED CLAIMS ARE UNPATENTABLE – 37 C.F.R. §§ 42.104(b)(4)-(5) AND 42.22(a)(2)**

**1. The Specific Art and Statutory Ground(s) on Which the Challenge is Based**

Claims 1, 4, and 5 of the ‘440 patent are anticipated by Teraoka (Ex. 1002) under 35 U.S.C. § 102(b).

Claims 2 and 3 of the ‘440 patent are rendered obvious by Teraoka (Ex. 1002) in view of Watanabe (Ex. 1003) under 35 U.S.C. § 103.

Claims 6 and 7 of the ‘440 patent are rendered obvious by Teraoka (Ex. 1002) in view of Burrows (Ex. 1004) under 35 U.S.C. § 103.

**2. How the Construed Claims are Unpatentable under the Statutory Grounds Identified in 37 C.F.R. § 42.204(b)(2) and Supporting Evidence Relied upon to Support the Challenge**

Pursuant to 37 C.F.R. § 42.204(b)(4), an explanation of how claims 1-7 of the ‘440 patent are unpatentable under the statutory grounds identified above, and that the Petitioner has at least a reasonable likelihood of prevailing on these grounds, including the identification of where each element of the claim is found in the prior art, is provided below in the form of claim charts. Pursuant to 37 C.F.R. § 42.204(b)(5), the exhibit numbers of the supporting evidence relied upon to support the challenges and the relevance of the evidence to the challenges raised, including identifying specific portions of the evidence that support the challenges, are provided in the claim charts.

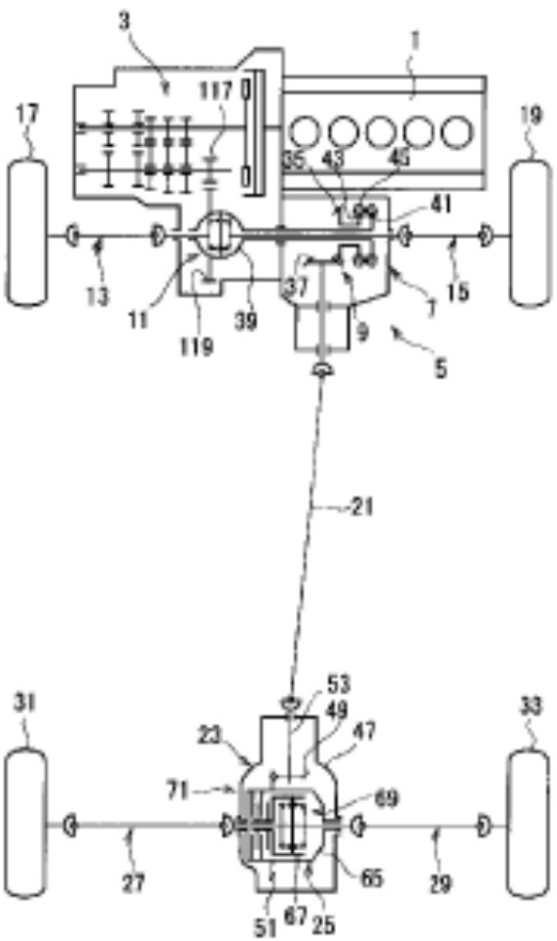
## IX. GROUNDS OF UNPATENTABILITY

The references addressed below each anticipate and render obvious the claimed subject matter.

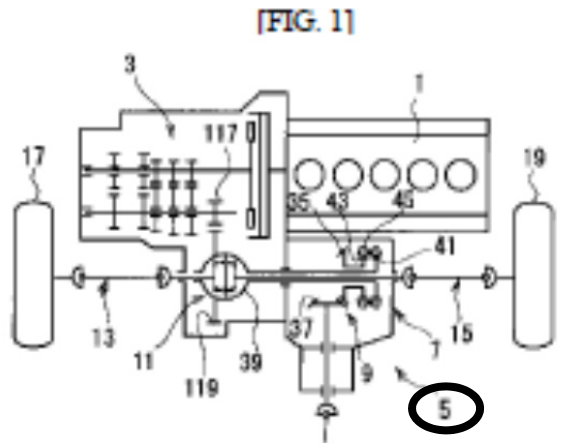
### A. Claims 1, 4, and 5 are Unpatentable under 35 U.S.C. § 102(b) As Anticipated by Teraoka

Each and every element of claims 1, 4, and 5 is found in the disclosure of Teraoka, including the allegedly novel feature of having a shutdown section (*i.e.*, any portion of a secondary drive train which can be decoupled from both the primary axle and the wheels of the secondary axle) that does not rotate or move when the vehicle is in two-wheel drive mode. (*See, e.g.*, 1002 at ¶¶ [0074]-[0080].) Teraoka specifically states that the rotation “due to drag rotation of the rear wheels 31, 33 is disconnected” and “[i]n this way, the rotation of the power transmission system from the two-four switching mechanism 7 to the outer plates 121, 123 of the clutch mechanism 71 stops ...” (*Id.* at [0077] and [0078].) In other words, Teraoka discloses a drive train system including a portion that allows the secondary drive train to be decoupled from the rest of the system so that a portion of the secondary drive train (at least from the front axle switching mechanism 7 to the rear axle clutch mechanism 71) does not rotate or move when the vehicle is in two-wheel mode—precisely the allegedly novel feature of the ‘440 patent. (Ex. 1005, ¶ 43.) The following claim chart and the claim chart in Ex. 1005 demonstrate how Teraoka anticipates the subject matter of claims 1, 4, and 5:

The ‘440 Patent	Teraoka (Ex. 1002)
<p><b>1.a.</b> A drive train of a vehicle, comprising a primary drive train and a secondary drive train, further comprising:</p>	<p>Teraoka discloses at Fig. 1 a four wheel drive (“4WD”) vehicle including a primary front drive train including: engine 1, transmission 3, differential 11, axles 13 and 15 and a secondary rear drive train including: final gear set 23, differential 25, and axles 27 and 29. (Ex. 1002, [0040].)</p>
<p><b>1.b.</b> a primary axle which is permanently driven via the primary drive train; and</p>	<p>Teraoka discloses a primary axle 13 (and 15) from which driving force of engine 1 is non-selectively transmitted through the transmission 3 and front differential 11. (Ex. 1002, [0073] and [0075].)</p>
<p><b>1.c.</b> a secondary axle as part of the secondary drive train;</p>	<p>Teraoka discloses a secondary axle 27 (and 29) which are part of the secondary rear drive train. (Ex. 1002, [0040], [0074], and [0075], Fig. 1.)</p>
<p><b>1.d.</b> 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</p>	<p>Teraoka discloses a transfer case 5 (<i>i.e.</i>, a switch-on device) which includes a dog clutch (or 2-4 switching mechanism) 7 (<i>i.e.</i>, a switch-on mechanism). (Ex. 1002, [0071] and Fig. 1.)</p> <p>When the 2-4 switching mechanism 7 is engaged, “and the driving force of the engine 1 is transmitted through differential case 39, transfer case 5 (two-four switching mechanism 7 and direction changing gear set 9) and propeller shaft 21 to final speed reduction gear set 23 and is subjected to speed reduction, after which it 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.” (Ex. 1002,</p>

The '440 Patent	Teraoka (Ex. 1002)
	[0074].)
<p><b>1.e.1</b> 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 and is transmitted to wheels of the secondary axle</p>	<p>Teraoka discloses a clutch mechanism 71 (<i>i.e.</i>, at least one side shaft coupling) integral with the rear gear set 23. (Ex. 1002, Figs. 1 (reproduced below) and 2.)</p> <p style="text-align: center;"><b>[FIG. 1]</b></p>  <p>Teraoka states “[w]hen the clutch mechanism 71 is coupled in this manner, the driving force of the engine 1 is transmitted from outer case 65 to inner case 67 (differential mechanism 69) and is distributed through pinion shaft 77, pinion gear 79 and side gears 81, 83 to left and right rear wheels 31, 33.” (Ex. 1002, [0066].)</p>

The ‘440 Patent	Teraoka (Ex. 1002)
<p><b>1.e.2</b> the secondary drive train having a shutdown section located between the switch-on device and the at least one side shaft coupling, whereby:</p>	<p>Fig. 1 of Teraoka (Ex. 1002) illustrates that intermediary propeller shaft 21 and final gear 23 (<i>i.e.</i>, a shutdown section) are between clutch mechanism 71 (<i>i.e.</i>, the at least one side shaft coupling) and the transfer case 5 (<i>i.e.</i>, the switch-on device). (<i>See also</i> Ex. 1002 [0076]-[0078].)</p> <p>Teraoka states: “due to uncoupling of the two-four switching mechanism 7, rotation of the power transmission system (especially the large mass propeller shaft 21) stops from the two-four switching mechanism 7 to outer case 65, which is the input side member of the clutch mechanism 71, and to the outer plates 121, 123 of the main clutch 89 and pilot clutch 97.” (Ex. 1002 at [0076].)</p>
<p><b>1.f.</b> the switch-on mechanism and/or the side shaft couplings comprise at least one frictionally engaged coupling and</p>	<p>Teraoka illustrates in Fig. 2 that the clutch mechanism 71 (<i>i.e.</i>, the at least one side shaft coupling) includes frictionally engaged wet multiple disc main clutch 89. (<i>See also</i> Ex. 1002, [0055].)</p>
<p><b>1.g.</b> 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.</p>	<p>Teraoka discloses that the clutch mechanism 71 and the two-four switching mechanism 7 of transfer case 5 (<i>i.e.</i>, the switch-on device) are each disengaged for the two wheel drive (“2WD”) mode where only front axles 13/15 are driven. (Ex. 1002, [0075].)</p> <p>In this 2WD mode, the intermediary propeller shaft 21 and the final gear 23 (<i>i.e.</i>, the shutdown section) are stopped (<i>i.e.</i> shut down). (Ex. 1002, [0076].)</p>

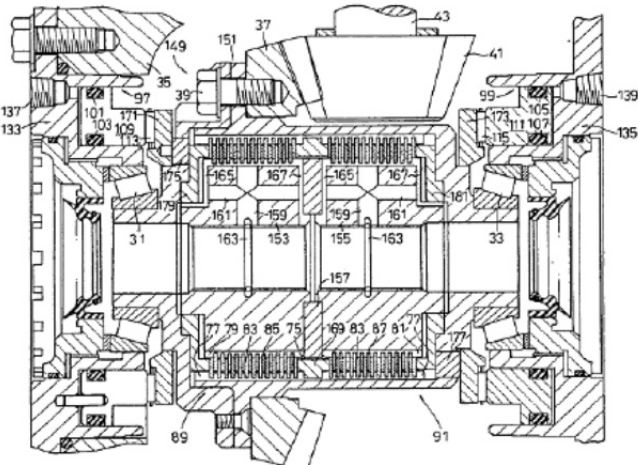
The '440 Patent	Teraoka (Ex. 1002)
<p>4. The drive train as claimed in claim 1, wherein the switch-on device comprises a positively working power transmission gearing having an angular gear working via cogged wheels.</p>	<p>Teraoka discloses that the transfer case 5 (<i>i.e.</i>, the switch-on device) includes two-four switching mechanism 7 in the form of a dog clutch and direction changing (<i>i.e.</i>, angled) gear set 9. (Ex. 1002, [0040].)</p> <p>The dog clutch 7 is positively engaging and the changing gear 9 is angled to change the direction to the rear axles. (Ex. 1002, Fig. 1.)</p> <p>Teraoka states “[t]he transmitted driving force of the engine is converted in direction by the direction changing gear set 9 and transmitted toward the rear wheels.” (Ex. 1002, [0041].)</p>
<p>5. The drive train as claimed in claim 4, 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.</p>	<p>Figure 1 of Teraoka illustrates the transfer case 5 (<i>i.e.</i>, the switch-on device) being arranged on the primary front axles 13/15:</p>  <p>The transfer case 5 connects the rear axles 27/29 to the front axles 13/15 when the switching mechanism 7 of transfer case 5 is engaged.</p>

**B. Claims 2 and 3 are Unpatentable Under 35 U.S.C. § 103 As Rendered Obvious by Teraoka in View of Watanabe**

Teraoka does not disclose side shaft couplings for each side shaft of the secondary axle. However, 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 relatively heavy bevel gear differential, therefore reducing the weight and fuel consumption of the vehicle. (Ex. 1005, ¶ 45.) As described above, independent Claim 1 of the '440 patent merely requires a four wheel drive system that includes at least one side shaft coupling. Claims 2 and 3 merely recite a combination of well-known alternative components that are joined in a conventional manner. (*See* Ex. 1005, ¶ 46.)

It would have been a matter of simple substitution to replace the rear, secondary drive train with the rear, secondary drive train of Watanabe to yield the predictable result of reducing mass and rotating losses. (*See* Ex. 1005, ¶ 46.)

The following claim chart and the claim chart in Ex. 1005 illustrate how the combined teachings of Teraoka and Watanabe meet all of the elements of claims 2 and 3 of the '440 patent.

The '440 Patent	Teraoka (Ex. 1002) and Watanabe (Ex. 1003)
<p>2. The drive train as claimed in claim 1, 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.</p>	<p>Figure 2 of Watanabe illustrates a rear differential 11 that distributes drive force differentially to a right rear wheel 27 and a left rear wheel 25 via rear axles 23 and 21, respectively. (Ex. 1003 at Fig. 2.)</p> <p>Figure 3 of Watanabe illustrates the differential 11 includes multiple plate clutches 89 and 91, as side shaft couplings, on each side of the differential 11, each connected to axle 23 and 21, respectively. (Ex. 1003 at Fig. 3.)</p> <p>As seen in Figure 3 below, the multiple plate clutches 89 and 91 allow power distribution without differential gearing between the drive wheels.</p>  <p>FIG 3</p> <p>(Ex. 1003 at Fig. 3.)</p> <p>Further, Watanabe states, “And by increasing or decreasing the tightening force individually for the multiple plate</p>



The '440 Patent	Teraoka (Ex. 1002) and Watanabe (Ex. 1003)
	<p>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 at 147, lines 37-40.)</p>
<p><b>3.</b> The drive train as claimed in claim 1, 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.</p>	<p>Figure 2 of Watanabe illustrates a rear differential 11 that distributes drive force differentially to a right rear wheel 27 and a left rear wheel 25 via rear axles 23 and 21, respectively. (Ex. 1003, Fig. 2.)</p> <p>Figure 3 of Watanabe illustrates the differential 11 includes multiple disc clutches 89 and 91, as side shaft couplings, on each side of the differential 11, each connected to axle 23 and 21, respectively. As seen in Figure 3 above, the clutches 89 and 91 allow power distribution without differential gearing between the drive wheels. (Ex. 1003, Fig. 3.)</p> <p>Further, Watanabe states “... during cornering there is a stronger cornering force effect from the rear wheels 25 and 27, creating a tendency to under-steer. If the drive power distribution to the rear wheels 25 and 27 is increased to reduce the cornering force thereof, the under-steering typical of such vehicles can be corrected.” (Ex. 1003 at 148.)</p>

**C. Claims 6 and 7 are Unpatentable Under 35 U.S.C. § 103 As Rendered Obvious by Teraoka in View of Burrows**

Claim 6 depends from claim 5, claim 5 depends from claim 4, and claim 4 depends from claim 1. Claim 4 provides that “the switch-on device comprises a positively working power transmission gearing having an angular gear working via cogged wheels” and claim 5 further provides that “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.” (Ex. 1001 at 12:49-56.) Both claims 4 and 5 are anticipated by Teraoka as shown above.

Claim 6 provides that “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.” (*Id.* at 12:57-60.) Teraoka discloses a switch-on mechanism including a claw clutch 7 which provides a mechanical engagement and a clutch 71 (a wet multiple disc clutch) which provides friction engagement and possibly provides speed synchronization. (*See, e.g.,* Ex. 1002 at [0034].) However, Teraoka does not expressly state that speed synchronization is provided. (Ex. 1005, ¶ 48.)

It 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

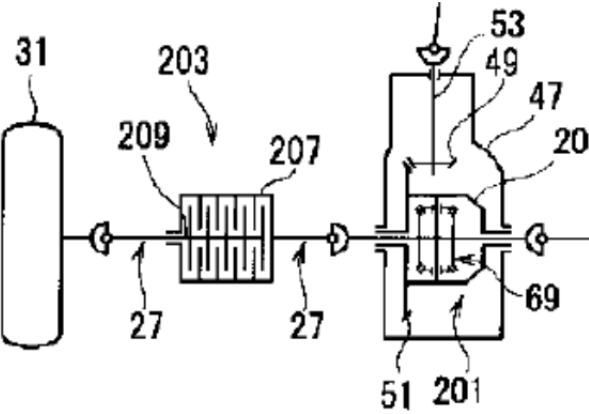
the input and output sides to reduce wear and prevent failure. One such way to provide speed synchronization is by use of a friction clutch which allows a speed transition by slipping the clutch. (Ex. 1005, ¶ 49.)

Burrows (Ex. 1004) discloses an example of this principle in which a multi-plate wet clutch is connected remotely via a drive shaft, and is used to speed synchronize a dog clutch. Similarly, Teraoka discloses a positively locking switching mechanism 7 including a synchronizer, the switching mechanism 7 is connected through a propeller shaft 21 to a clutch mechanism 71 including a multi-plate wet clutch 89. (Ex. 1005, ¶ 50.)

Use of a known technique to improve similar devices in the same way may support a conclusion of obviousness. (*KSR Int'l Co. v. Teleflex Inc.*, (KSR), 550 U.S. 398, 418 (2007).) 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 connected by propeller shaft 21, as taught by Burrows, to perform synchronization without the use of additional equipment. (Ex. 1005, ¶ 51.)

The following claim chart and the claim chart in Ex. 1005 illustrate how the combined teachings of Teraoka and Burrows meet all of the elements of claims 6 and 7 of the '440 patent.

The '440 Patent	Teraoka (Ex. 1002) and Burrows (Ex. 1004)
<p>6. The drive train as claimed in claim 5, 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.</p>	<p>Burrows discloses a multi-plate wet clutch 22 connected to a longitudinally extending main drive shaft 23 through a transmission assembly 24. (Ex. 1004 at 8, ll. 21-24.)</p> <p>The main drive shaft 23 transmits torque to a free running differential 40 which includes a dog clutch. (Ex. 1004 at 11, l. 7 to 12, l. 5.)</p> <p>Burrows discloses “[a] control strategy for operation of a dog clutch for a dynamic change in two wheel drive mode causes the clutch 22 to spin-up the auxiliary driveline 21 to the best estimated synchronisation [sic] speed for connection to the rear wheels 14, 15. The clutch 22 would then 10 disengage quickly whilst simultaneously the synchroniser [sic] device would smoothly engage the dog clutch.” (Ex. 1004 at 12, ll. 7-11.)</p>
<p>7. The drive train as claimed in claim 6, 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</p>	<p>Teraoka discloses a second embodiment in Fig. 3 which includes the clutch mechanism 203 with wet multiple disc main clutch 89 disposed between the rotating case 207 and the inner shaft 209. (Ex. 1002, [0102].)</p> <p>The main clutch 89 includes inner plates connected in a torque-proof way to the inner shaft 209 which is connected to the wheel 31 by left axle 27. (Ex. 1002,</p>

The '440 Patent	Teraoka (Ex. 1002) and Burrows (Ex. 1004)
<p>of the vehicle cooperate with an outer plate carrier as outer plates.</p>	<p>[0106], portion of Fig. 3, below.)</p>  <p>The clutch 89 also includes outer plates connected in a torque proof way to the case 207 which is connected to differential mechanism 201. (Ex. 1002, [0112].)</p> <p>Although paragraphs [0106] and [0112] do not explicitly describe the relation between the clutch plates and the inner shaft of the case, Teraoka explains that the outer case and the outer plates cooperate with each other, and that the inner case and inner plates cooperate with each other. (Ex. 1002, [0076]-[0077]; <i>see also</i> Fig. 3.)</p>

## **X. CONCLUSION**

Substantial, new and noncumulative technical teachings have been presented for each of claims 1-7 of the '440 patent, which claims are anticipated or rendered obvious for the reasons set forth above. There is a reasonable likelihood that Petitioner will prevail as to each of these claims. *Inter partes* review of claims 1-7 is accordingly requested.

Respectfully submitted,  
Oblon, McClelland, Maier &  
Neustadt, LLP

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/W. Todd Baker/  
W. Todd Baker  
Reg. No. 45,265

Ryan Smith  
Reg. No. 62,257

Lisa Mandrusiak  
Reg. No. 72,653

Customer Number  
22850  
Tel. (703) 413-3000  
Fax. (703) 413-2220

## **CERTIFICATE OF SERVICE**

The undersigned certifies service pursuant to 37 C.F.R. §§ 42.6(e) and 42.105(b) on the Patent Owner by UPS Next Day Air of a copy of this Petition for *Inter Partes* Review and supporting materials at the correspondence address of record for the '440 patent:

STETINA BRUNDA GARRED & BRUCKER  
75 ENTERPRISE, SUITE 250  
ALISO VIEJO, CA 92656

Dated: October 15, 2015

/W. Todd Baker /  
W. Todd Baker  
Reg. No. 45,265