

Application No.: 12/433,672
Response to Office Action of September 1, 2011
Attorney Docket: BUNGA-017US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	Werner Hoffman)	Confirmation No.	9564
)		
Serial No.:	12/433,672)	Art Unit:	3611
)		
Filed:	April 30, 2009)	Examiner:	Scharich,
)		Marc A.
For:	DRIVE TRAIN FOR A VEHICLE)		
	WITH CONNECTABLE)		
	SECONDARY AXLE)		

RESPONSE TO OFFICE ACTION

Mail Stop Non-Fee Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action of September 1, 2011, Applicant respectfully requests entry of the following amendments:

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Amendment to the Specification:

Applicant respectfully requests entry of the following amendments to the specification.

[0005] On the one hand drive trains are known which enable the secondary axle to be switched on mostly exclusively when the vehicle is idling. These include in particular positively working, mechanical wheel hub circuits which can be coupled either expensively by hand or via switch and control units to be provided additionally in the vehicle. Also, the driver must switch the transfer gearbox over manually from single-axle drive to four-wheel drive. Switching during driving is mostly not an option due to unavailable speed synchronization of the positively engaged ~~engages~~ power transmission elements or if so is possible only at minimal speeds. It can also be necessary when switching over from all-wheel drive to single-axle drive to first reverse a few meters to disengage the freewheeling mechanism. Such systems are used especially in off-road vehicles and are provided either factory-set or as a retrofit kit.

[0028] Figure 9b illustrates a drive train concept corresponding as far as possible to the drive train concept according to Figure 9a 9b with a blockable center differential;

[0045] Such a multi-level configuration of the forwarding of the secondary drive output flow is not mandatory. Other simplification steps can also be undertaken, for example by the connecting shaft 15 ~~[[14]]~~ providing no spur gear, but a crown wheel for directly forwarding the secondary drive output to the pinion shaft.

[0046] To support the synchronizing of spur gear step 14 and connecting shaft 15 it is provided that the side shaft couplings are switched prior to synchronizing of the shafts to bring the intermediate shaft 11 and thus also the spur gear ~~step shaft~~ 14 up to speed. The switch-on mechanism is actuated preferably hydraulically, but naturally can also be actuated another way, for example pneumatically, by electric motor or electromagnetically.

[0053] With the side shaft couplings 4 power loss can also be saved by the friction plates of the side shaft couplings 4 being configured differently, depending on whether they are outer plates 6 ~~[[8]]~~ or inner plates 5 ~~[[7.]]~~ The inner plates 7, therefore the friction plates, which, as previously described, are preferably connected torque-proof to the side shafts 12 of the secondary axle 2 and accordingly revolve permanently, can be configured as blank steel discs

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with a relatively low-friction surface. ~~If~~ If these rotate during travel with constant contact with cooling and lubricating oil, they cause only minor friction losses. But the outer plates 6 [[8]], which are preferably idle anyway when the secondary axle drive train is disconnected, can present the actual friction lining and channeling delivering lubricating and cooling oil arranged herein or separately.

[0061] The hydraulic actuation schematically illustrated in Figure 11 can understandably also executed be in other ways. Synergies result for example from using double coupling gears. The hydraulic actuator 30 of the switch-on device and/or the side shaft couplings can be operated directly by the hydraulics of the double coupling gear in spatial proximity to the double coupling gear. In the event where both the switch-on device and the side shaft couplings are arranged near the gearbox, the hydraulic unit 31 can even be dispensed with completely. The pressure-reduction valves can then be integrated in the double coupling gear.

Please amend the abstract as shown below:

~~The invention relates to a~~ A drive train of a vehicle is disclosed which comprises , comprising a permanently driven primary axle and a secondary axle connectable to the primary axle via a switch-on device with a switch-on mechanism, whereby the secondary drive train output via side shaft couplings is transferred to the drive wheels of the secondary axle. Because the switch-on mechanism and/or the side shaft couplings have frictionally engaged couplings, it can be that when the secondary axle is uncoupled, the shutdown section of the secondary drive train located between the switch-on device and the side shaft couplings is uncoupled both from the primary axle and from the secondary drive wheels, such that there is no more power loss in this shutdown section, whereby connecting the secondary drive train during travel is possible all the same and losses in comfort and practicability do not have to be tolerated.

~~A disadvantage to these drive trains is that also when the secondary axles are not connected their components are dragged along by the vehicle drive or by the drive wheels rolling away on the roadway, causing power losses. Complete shutdown of the secondary drive train to date is executed only by manually switchable wheel hub couplings which are however a disadvantage with respect to ease of use and practicability.~~

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~~Because the switch on mechanism and/or the side shaft couplings have frictionally engaged couplings, it can be that when the secondary axle is uncoupled the section of the secondary drive train located between the switch on device and the side shaft couplings is uncoupled both from the primary axle and from the secondary drive wheels, such that there is no more power loss in this secondary drive train section, whereby connecting the secondary drive train during travel is possible all the same and losses in comfort and practicability do not have to be tolerated.~~

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Amendments to the Claims:

1. (Currently Amended) 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 a 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, whereby the switch-on device has a switch-on mechanism, via which in order to allow the integration of the secondary drive train can be integrated into the drive train so that transferring the overall drive output, and whereby 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 output is conveyed via at least one side shaft couplings into side shafts of the secondary axle and is transmitted to drive wheels of the secondary axle, comprising: the secondary drive train having a shutdown section located between the switch-on device and the at least one side shaft coupling, whereby:

[[a]]the switch-on mechanism and/or the side shaft couplings comprise having 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 located between the switch-on device and the side shaft couplings is uncoupled both from both the primary axle of the primary drive train, in particular from the primary axle, and from the secondary drive wheels of the secondary axle.

2. (Currently Amended) 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 from drive output distribution without a differential gearing between the drive wheels of the secondary axle to ensure guaranteeing transverse compensation. equalization similar to transverse differential.

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3. (Currently Amended) The drive train as claimed in Claim 1~~Claim 2~~, 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 secondary axle is connected the side shaft couplings allow a drive power forms a drive output distribution without differential gearing between the primary axle and the secondary axle, guaranteeing to ensure longitudinal compensation, equalization similar to longitudinal differential.

4. (Currently Amended) The drive train as claimed in claim 1~~Claim 3~~, wherein the switch-on device comprises ~~has~~ a positively working power transmission gearing~~gearbox~~, in particular having an angular gear working via cogged wheels.

5. (Currently Amended) 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 ~~felt by the switch-on mechanism, when the secondary drive train is connected directly by a primary axle shaft.~~

6. (Currently Amended) The drive train as claimed in Claim 5, wherein a the speed synchronization in the switch-on mechanism of the power transmission gearbox for the establishment of a positive lock is undertaken or at least supported to produce the tight fit by the at least one side shaft couplings.

7. (Currently Amended) The drive train as claimed in Claim 6, wherein the at least one side shaft couplings is ~~are~~ formed by a frictionally engaged multiple disc clutch, whereby the friction plates connected in a torque-proof way to the secondary drive wheels cooperate ~~torque-proof~~ as inner plates with an inner plate carrier and whereby the friction plates located on the vehicle drive train-side of the vehicle ~~friction plates~~ cooperate with an outer plate carrier as outer plates.

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8. (Currently Amended) The drive train as claimed in Claim 7, wherein the outer plate carrier supplies oil for cooling and/or lubrication of the friction plates when the secondary axle is connected to the primary axle, ~~switched on~~.

9. (Previously Presented) The drive train as claimed in Claim 8, wherein the side shaft couplings comprise a first, frictionally engaged acting side shaft coupling for a first side shaft and a second, positively acting side shaft coupling for a second side shaft.

10. (Previously Presented) The drive train as claimed in Claim 9, wherein a secondary axle synchronizing is provided for switching the positively acting side shaft coupling.

11. (Currently Amended) The drive train as claimed in Claim 10, wherein a positively acting differential gearing gearbox is provided for transmitting the drive train power of the secondary drive train to the side shafts of the secondary axle.

12. (Currently Amended) The drive train as claimed in Claim 11, wherein an ~~the~~ axle drive unit of the secondary axle is constructed modular such that a frictionally engaged working coupling or a positively acting coupling can be used selectively as a second coupling.

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Amendments to the drawings:

Applicant respectfully request entry of new Figure 16 which deletes reference numeral 39.

REMARKS

This is in response to the Office Action dated September 1, 2011.

I. SUMMARY OF OFFICE ACTION

In the Office Action, the Examiner requested Applicant to file a certified copy of the foreign German application. The abstract, disclosure, drawings and claims were objected to for various informalities. Claims 1-12 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Claims 1-12 were rejected under 35 U.S.C. 102(b) as being anticipated by Porter (U.S. Patent Publication No. 2002/0144851).

II. APPLICANT'S RESPONSE

A. Priority Data

Applicant submits concurrently herewith a certified copy of the foreign German applications as Exhibit A.

B. Specification

Applicant has amended the abstract by deleting the second paragraph and by merging paragraphs one and two together. Applicant has also added verbiage regarding a shutdown section discussed below. The new amended abstract contains no more than 150 words and is a single paragraph.

Applicant has also incorporated all of the suggested amendments to the specification proposed by the Examiner in the Office Action.

For these reasons, Applicant respectfully submits that all of the objections to the specification have been overcome.

C. Drawings

Applicant has amended paragraph 61 of the instant specification to include reference to reference numeral 30. Moreover, Applicant submits concurrently herewith as Exhibit B a Replacement Sheet for Figures 15 and 16 which delete reference to numeral 39. Hence, the objections to the drawings have been overcome.

D. Claim Objections

In relation to Claim 1, extensive amendments to the claims have been made to address the issues identified by the Examiner in relation to the objection and the 35 U.S.C. 112 rejections. Moreover, Applicant has incorporated the Examiner's proposed amendments to line 12 of Claim 1. Moreover, Applicant has incorporated the suggestion of the Examiner in relation to Claim 6. For these reasons, Applicant respectfully submits that the objections to Claims 1 and 6 have been overcome.

E. Claim Rejections – 35 U.S.C. 112, second paragraph

In the Office Action, the examiner identified numerous indefinite claim language in relation to Claim 1. Applicant has made extensive amendments to Claim 1 to address these issues.

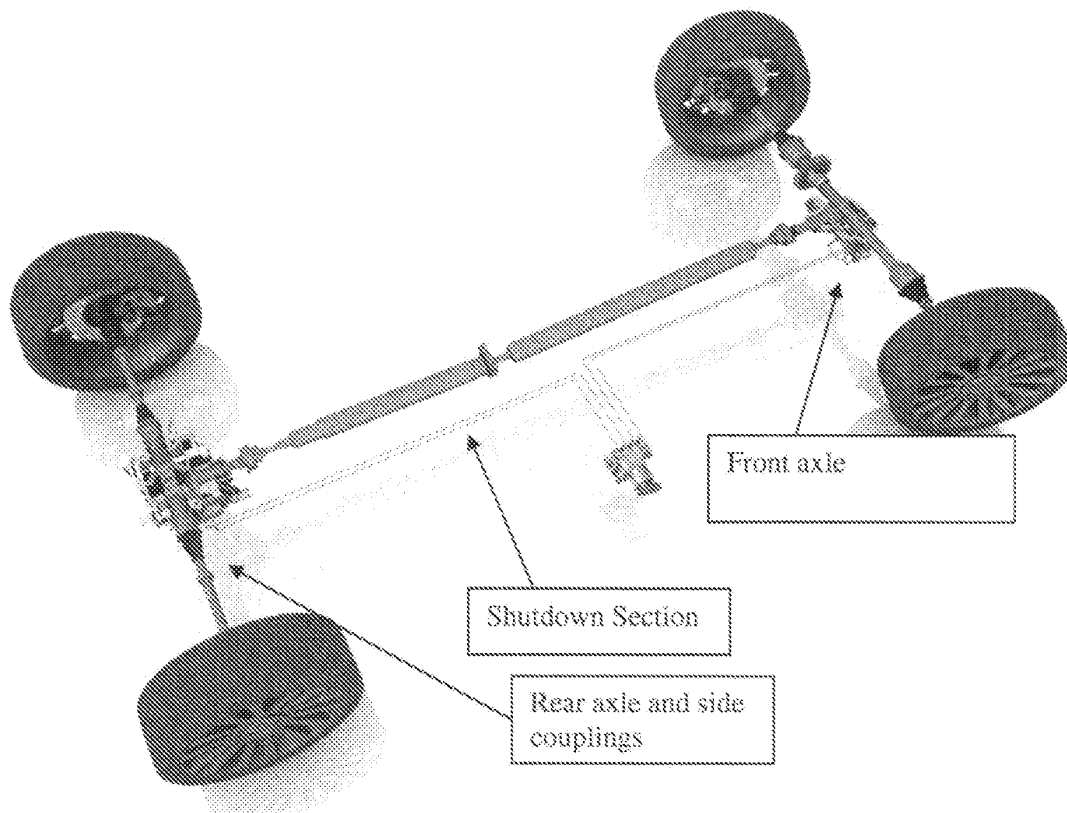
Applicant has also amended the dependent claims to address the issues identified by the Examiner.

For these reasons, Applicant respectfully submits that the rejection of Claims 1-12 under 35 U.S.C. 112, second paragraph has been overcome.

F. Claim Rejections – 35 U.S.C. 102

In the Office Action, Claim 1 was rejected under 35 U.S.C. 102(b) as being anticipated by Porter. In response, Applicant has amended Claim 1 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 other words, when the vehicle is in two-wheel drive mode, the shutdown section does not rotate or move. Accordingly, when the vehicle is in two wheel drive mode, the shutdown section does not add to the friction lost and requires no power or braking force for rotational acceleration or deceleration when the vehicle is accelerating or decelerating. This benefit of the claimed invention is further explained in paragraphs 8 and 37-43 of the originally filed application.

Applicant respectfully directs the Examiner's attention to Exhibit C which is a publication of some of the inventors of the instant application. Although the publication is in the German language, the various figures therein are instructive. The following illustration is a cut out from the publication.



In this publication, the front and rear axles rotate. The shutdown section is the central shaft that connects the front and rear axles between the switch-on device and the side shaft couplings. In two wheel drive mode, only the wheels on the primary axle is provided with power to propel the vehicle forward. The shutdown section does not rotate or move. It does not impose a load on the system. No extra power or braking force is required to accelerate or decelerate the shutdown section during driving. The rear wheels are rolling on the ground and any components attached to the rear wheels are also still rotating up to the side shaft coupling. In four wheel drive mode, the shutdown section is not shut down but is rotating. Power is delivered to all four wheels through the central shaft.

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 or four wheel drive mode. Figure 2 of Porter illustrates a drive axle assembly 34 of the secondary drive line shown in Figure 1. The drive axle assembly 34 is a standard differential gearing with

standard differential lock (i.e., coupling 62 operable only to limit intra-axle slip). In support thereof, Applicant respectfully directs the Examiner's attention to paragraph 19 of Porter's published application 2002/0144851. As understood, the coupling 62 (see Figure 2) is always engaged but allows for limited slip. In the event that the secondary drive line does not transmit any power to the wheels mounted to the axle side shafts 58 and 60 (see Figure 2; 58 and 60 are same as side shaft 30 in Figure 1), all components of the secondary drive line are, nonetheless, rotating. The reason is that the wheels that are connected to the side shaft 58 and 60 are rotating when the car is moving due to having contact with the road. The rotation of the wheels is therefore transferred to the drive axle assembly via the axle shafts 58, 60 via gears 244, 242, 256, 222, 220 into shaft 54, from there into outer drum 110 and outer clutch plates of clutch pad 114 (see Figure 3). When the vehicle is in two wheel drive mode, the secondary drive line is not in use to transmit any driving power. Nonetheless, all of its components up to the outer clutch plates of clutch pad 114 are still in motion when the wheels are in motion due to its permanent inter connection.

The same principle applies for the chain of components starting from the power take-off unit (PTU) 26 which drives prop shaft 28, which drives input shaft 42, which again drives the further components down the line up to the inner clutch plate and transfer clutch 76. In Porter, when the vehicle is in two-wheel drive mode and the secondary drive line is not transmitting any driving power to the wheels, the components of the secondary drive line are still rotating either by the wheels or via the PTU which connects the secondary drive line to the primary drive line. These rotating components cause lost of friction during rotational acceleration and deceleration during dynamic driving even when the vehicle is in two wheel drive mode.

For these reasons, Applicant respectfully submits that Porter does not disclose all of the limitations recited in Claim 1.

Moreover, there is no motivation to modify the Porter device to have a shutdown section. In Porter, the drive train system has a secondary drive line which is only connected to the primary drive line if the rotational speed occurs between shafts 42 and 54. Only when there is a rotational speed difference does toothed pump members 90, 92 generate oil pressure needed to close the clutch pack 114. This design requires that all components must rotate even if no driving power is being transmitted via the secondary drive line for proper

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functioning of the case pump member. As such, one of ordinary skill in the art would not modify the Porter reference or device to shut down parts of the secondary drive line since doing so would make the Porter reference inoperable for its intended purpose.

For the foregoing reasons, Applicant respectfully submits that the Porter reference does not disclose, suggest or make obvious the invention recited in Claim 1. Claim 1 is believed to be in condition for allowance.

The dependent claims of Claim 1 are also believed to be in condition for allowance for containing additional patentable subject matter and for being dependent upon Claim 1 which is also believed to be in condition for allowance.

III. CONCLUSION

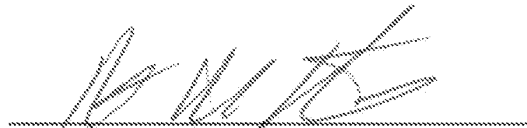
For the foregoing reasons, Applicant respectfully submits that all pending claims are believed to be in condition for allowance. An early notice of allowance is therefore respectfully requested. Should the Examiner have any suggestions for expediting allowance of the application, the Examiner is invited to contact Applicant's representative at the telephone number listed below.

If any additional fee is required, please charge Deposit Account Number 19-4330.

Respectfully submitted,

Date: 2/24/12

By:



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