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F16H 3/097 (2006.01) *B60W 30/19* (2012.01)
F16H 3/72 (2006.01) *F16D 41/04* (2006.01)
F16H 61/04 (2006.01) *F16H 63/30* (2006.01)
B60K 6/44 (2007.10)

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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[Continued on next page]

(54) Title: GEARBOX

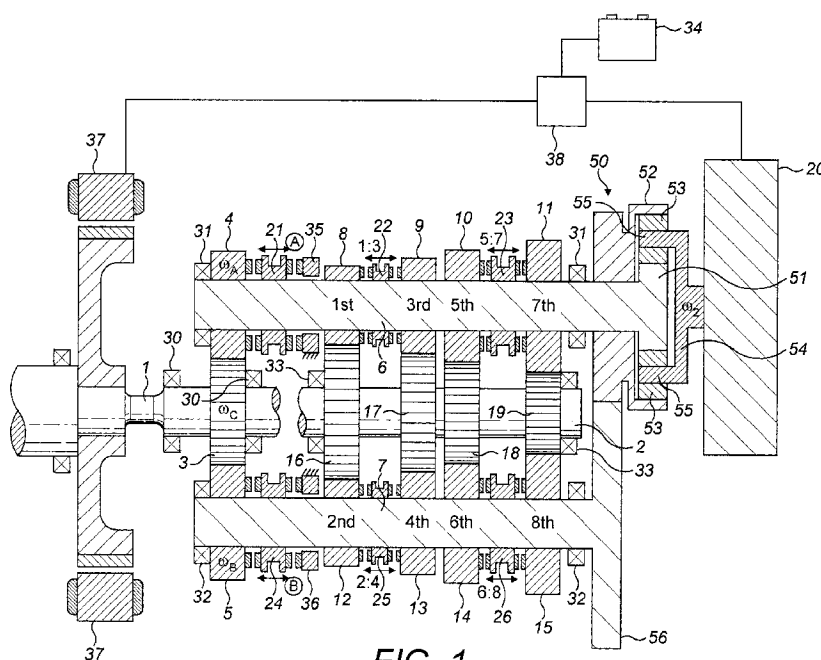


FIG. 1

(57) Abstract: A gearbox comprising: a first shaft (2) and a second shaft (1), one of the first and second shafts being an input shaft (1) for receiving a drive torque and the other being an output shaft (2) for providing a drive torque; two intermediate shafts (6, 7) by means of which the first and second shafts (2, 1) can be coupled together, each intermediate shaft being arranged so that: (a) it can be coupled to the first shaft (2) via a respective first torque path at any of a plurality of gear ratios (1st - 8th), or the respective first torque path can be disengaged; and (b) it can be coupled to the second shaft (1) via a respective second torque path, or the respective second torque path can be disengaged; and a differential torque device (50) coupled between the intermediate shafts (6, 7), the differential torque device (50) being capable of transmitting a differential torque between the intermediate shafts (6, 7).



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) Date of publication of the international search report:
13 March 2014

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/065915

A. CLASSIFICATION OF SUBJECT MATTER INV. F16H3/12 F16H3/097 F16H3/72 F16H61/04 B60K6/44 B60K6/365 B60W30/19 F16D41/04 ADD. F16H63/30																	
According to International Patent Classification (IPC) or to both national classification and IPC																	
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) F16H B60K B60W F16D Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data																	
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>EP 1 826 462 A2 (HITACHI LTD [JP]) 29 August 2007 (2007-08-29)</td> <td>53,56-58</td> </tr> <tr> <td>Y</td> <td>paragraphs [0009] - [0052]; figures 1-4,7,8</td> <td>1-34, 37-40,52</td> </tr> <tr> <td>Y</td> <td>----- EP 1 541 900 A2 (HITACHI LTD [JP]) 15 June 2005 (2005-06-15) paragraphs [0088] - [0090]; figure 12</td> <td>1-34,37, 52</td> </tr> <tr> <td>A</td> <td>----- DE 10 2010 063582 A1 (ZAHNRADFABRIK FRIEDRICHSHAFEN [DE]) 21 June 2012 (2012-06-21) the whole document ----- -/-</td> <td>1-3,6</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	EP 1 826 462 A2 (HITACHI LTD [JP]) 29 August 2007 (2007-08-29)	53,56-58	Y	paragraphs [0009] - [0052]; figures 1-4,7,8	1-34, 37-40,52	Y	----- EP 1 541 900 A2 (HITACHI LTD [JP]) 15 June 2005 (2005-06-15) paragraphs [0088] - [0090]; figure 12	1-34,37, 52	A	----- DE 10 2010 063582 A1 (ZAHNRADFABRIK FRIEDRICHSHAFEN [DE]) 21 June 2012 (2012-06-21) the whole document ----- -/-	1-3,6
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X	EP 1 826 462 A2 (HITACHI LTD [JP]) 29 August 2007 (2007-08-29)	53,56-58															
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A	----- DE 10 2010 063582 A1 (ZAHNRADFABRIK FRIEDRICHSHAFEN [DE]) 21 June 2012 (2012-06-21) the whole document ----- -/-	1-3,6															
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.																	
* Special categories of cited documents : <table border="0"> <tr> <td> "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed </td> <td> "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family </td> </tr> </table>			"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family													
"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family																
Date of the actual completion of the international search		Date of mailing of the international search report															
10 January 2014		20/01/2014															
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Wurzer, Oliver															

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/065915

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2011/152374 A1 (HITACHI NICO TRANSMISSION CO LTD [JP]; IBAMOTO MASAHIKO [JP]; NAKAMURA) 8 December 2011 (2011-12-08)	41-46, 51-53, 55-58
Y	abstract; figures 1-10	1,9,13, 14,35, 36, 38-40, 47-50
	-& EP 2 578 901 A1 (HITACHI NICO TRANSMISSION CO LTD [JP]) 10 April 2013 (2013-04-10) paragraphs [0010] - [0014], [0025] - [0083]; figures 1-10	
X	GB 2 110 324 A (BROWN GEAR IND) 15 June 1983 (1983-06-15)	41-46, 51-53, 55-58
Y	the whole document	1,9,13, 14,35, 36, 38-40, 47-50
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Y	EP 1 995 494 A1 (PEUGEOT CITROEN AUTOMOBILES SA [FR]) 26 November 2008 (2008-11-26) paragraphs [0053] - [0080]; figures 1,2	38-40, 47-50
Y	EP 2 325 511 A1 (PEUGEOT CITROEN AUTOMOBILES SA [FR]) 25 May 2011 (2011-05-25) the whole document	38-40, 47-50
Y	US 4 096 932 A (LIBERTY JR JOSEPH C) 27 June 1978 (1978-06-27) the whole document	38,48
X	DE 102 49 829 A1 (SELLE HANS-DIETER [DE]) 29 April 2004 (2004-04-29) abstract; figure 2	53,54, 56-58

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2013/065915

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 59
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2013/065915

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1826462	A2	29-08-2007	EP 1826462 A2 29-08-2007
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US 4096932	A	27-06-1978	NONE
DE 10249829	A1	29-04-2004	NONE

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-34, 53(completely); 37, 52, 56-58(partially)

Transmission comprising a differential gear and a torque provider/absorber

2. claims: 35, 36, 41-51, 55(completely); 37, 52, 56-58(partially)

Transmission comprising a synchronization clutch

3. claims: 38-40

Transmission comprising a one-way clutch

4. claim: 54

Transmission comprising a continuously variable transmission

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 59

Present claim 59 relates to subject matter vaguely defined by reference to the description and/or drawings. It is, however, impossible to establish the features encompassed by this claim (Article 6 PCT).

This makes it impossible to compare the subject-matter of this claim to the prior art. As a result, no meaningful search could be carried out for the subject-matter of this claim.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.