



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

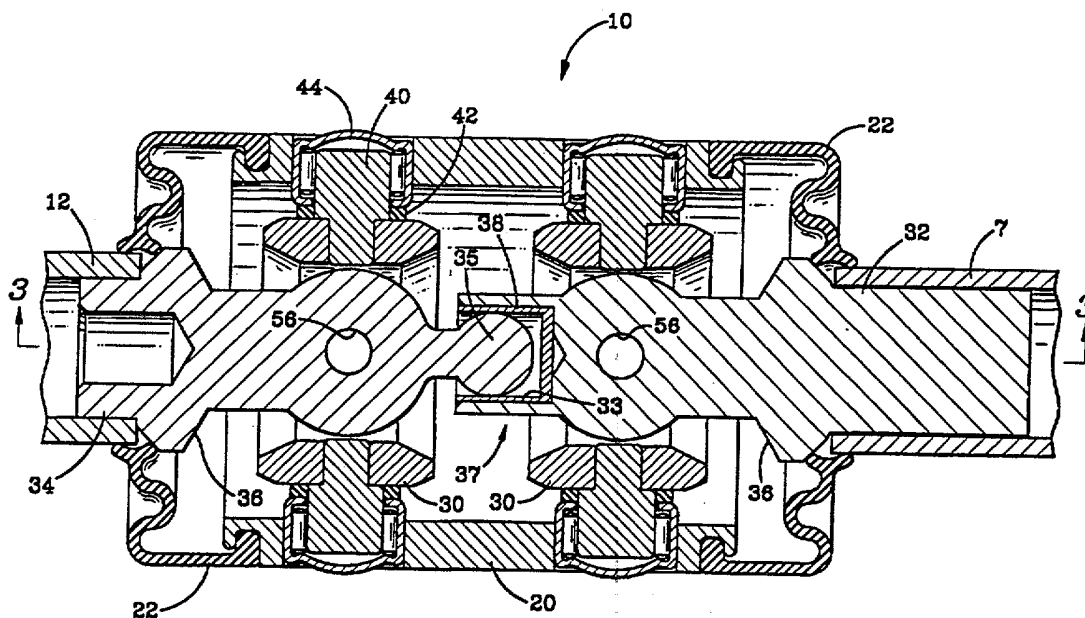
(51) International Patent Classification ⁶ : F16D 3/33, B62D 1/16	A3	(11) International Publication Number: WO 95/12073
		(43) International Publication Date: 4 May 1995 (04.05.95)

(21) International Application Number: PCT/US94/11551

(22) International Filing Date: 11 October 1994 (11.10.94)

(30) Priority Data:
08/146,379 29 October 1993 (29.10.93) US(71) Applicant: THE TORRINGTON COMPANY [US/US]; 59
Field Street, Torrington, CT 06790 (US).(72) Inventors: RICCITELLI, Martin, G.; 48 Big Wood Drive,
Westfield, ME 01085 (US). MITCHELL, Frederick, W., III;
242 Westside Road, Torrington, CT 06790 (US). KORZAN,
William, E.; 597 Main Street South, Bethlehem, CT 06751
(US). BOYDEN, David, E.; 17 North Church Road,
Granby, CT 06035 (US).(74) Agents: WATKINS, Mark, A. et al.; Oldham, Oldham &
Wilson Co., L.P.A., 1225 West Market Street, Akron, OH
44313-7188 (US).(81) Designated States: AU, BR, CA, CN, JP, European patent
(AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC,
NL, PT, SE).**Published***With international search report.
Before the expiration of the time limit for amending the
claims and to be republished in the event of the receipt of
amendments.*(88) Date of publication of the international search report:
20 July 1995 (20.07.95)

(54) Title: UNIVERSAL JOINT



(57) Abstract

A double cardan universal joint (10) having a pair of annular ring yokes (30) pivotally connected by a tubular coupling yoke (20). Specific examples are provided of using the double cardan universal joint as a non-constant velocity joint in a three universal joint steering system whereby the three universal joint system operates at constant velocity.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgystan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 94/11551

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 6 F16D3/33 B62D1/16

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)
 IPC 6 F16D B62D

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 practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US-A-1 898 265 (RAGAN) 21 February 1933	1, 3, 4, 6-8, 16, 18, 19
Y	see page 1, line 83 - page 2, line 118; figures 1-3	2, 10-15, 17, 20
Y	FR-A-1 486 469 (RENAULT) 30 June 1967 see page 1, right column, paragraph 1; figure 1	2
X	FR-A-1 156 470 (BRUNET) 16 May 1958	9
Y	see page 2, left column, paragraph 8 - right column, paragraph 4; figures 1-3	10-15
Y	US-A-3 319 439 (HOPF) 16 May 1967	15, 20
A	see column 4, line 25 - line 37; figure 1	14, 19
	-/--	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document 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

14 June 1995

Date of mailing of the international search report

27.06.95

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl,
 Fax: (+ 31-70) 340-3016

Authorized officer

Baldwin, D

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 94/11551

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	GB-A-475 455 (PARENT) 19 November 1937 see page 2, line 15 - line 95; figures 1,2 ---	1,4-7 17
X Y	CH-A-303 015 (GELENKWELLENBAU) 17 January 1955 see page 1, right column, paragraph 6 - paragraph 7; figures 1-3 ---	1,3,4,6, 7 2
Y	US-A-4 207 757 (ONUMA) 17 June 1980 see column 3, line 56 - column 4, line 50; figures 2-5 ---	2
X Y	DE-C-664 786 (KUGELFISCHER) 18 August 1938 see page 1, line 57 - page 2, line 49; figures 1-3 ---	1,3,4,6, 16,19 10-12,20
X Y	DE-C-11 90 363 (KRAFT) 2 December 1965 see column 3, line 29 - column 4, line 22; figure 1 ---	9,14,15 10-12,20
X A	GB-A-377 760 (LJUNGSTRÖM) 4 August 1932 see page 1, line 74 - page 2, line 37; figures 1-3 ---	1,4,5,7 8,10, 12-14, 17-19
X A	FR-A-717 790 (BUCCIALI) 14 January 1932 see page 2, line 52 - page 3, line 7; figures 3-6 ---	1,4,6 8,10,12
X A	GB-A-347 315 (DEHN) 30 April 1931 see the whole document ---	1,4,6 10,12, 14,19
X	CH-A-360 551 (GELENKWELLENBAU) 14 April 1962 see the whole document ---	1,4,6
A	EP-A-0 266 255 (CITROEN) 4 May 1988 see column 2, line 42 - column 4, line 54; figures 1-3 -----	21,27,33

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 94/ 11551

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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.:
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:

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 II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

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

SEE ANNEX

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 fee, this Authority did not invite payment of any additional fee.
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.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/210

1. Claims 1-20 : A universal joint comprising a coupling yoke, two ring yokes each pivotally coupled to the coupling yoke, and also pivotally coupled to a shaft section.
2. Claims 21-32 : A steering column assembly with a three shafts and a universal joint and a double universal joint having two pivotal universal joints of unspecified construction, with a defined relation of the angles between the shaft axes and the coupling yoke axis.
3. Claims 33-35 : A steering column assembly with a three shafts and a universal joint and a double universal joint having two pivotal universal joints of unspecified construction, having an acute angle between the pivot axes.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 94/11551

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-1898265	21-02-33	NONE	
FR-A-1486469	06-10-67	NONE	
FR-A-1156470	16-05-58	NONE	
US-A-3319439	16-05-67	NONE	
GB-A-475455		NONE	
CH-A-303015		NONE	
US-A-4207757	17-06-80	JP-A- 54150537	26-11-79
DE-C-664786		NONE	
DE-C-1190363		NONE	
GB-A-377760		NONE	
FR-A-717790	14-01-32	NONE	
GB-A-347315		NONE	
CH-A-360551		BE-A- 566898 FR-A- 1195734 GB-A- 833154 LU-A- 35993 NL-C- 104774	19-11-59
EP-A-266255	04-05-88	FR-A- 2605965	06-05-88