



European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

— *with international search report*

Ball joint

The present invention relates to a ball joint for use in connection with joining a V-stay and an axle suspension for wheels, an internal element for a ball element and a universal joint.

In some cases a vehicle has a V-stay mounted between the frame of the vehicle and the axle for wheel suspension. In order to achieve the desired functional capability, a ball joint is employed in the mounting between the stay and the axle. Where the mounting points for the V-stay are at the same distance from a base, thereby forming a perpendicular force resultant against the ball joint's centre axis, there is no problem with using a ball joint in such a mounting.

However in some cases the mounting of the V-stay is such that the mounting point on the frame is at a different distance from a base for the wheels than the mounting point in the ball joint – in a normal position. Normal position means in this connection a position for the connection of V-stay to axle for a vehicle ready for driving, but at a standstill. It should be understood here that from such a normal position the axle normally has a freedom of movement relative to the frame of around 90 mm upwards from the base and 180 mm downwards towards the base. The result is that the joint needs a greater working area in one direction compared to the other direction and therefore one cannot have a bearing house for the ball joint that is oriented at right angles to the flange surface, the solution being to angle the bearing house. Thus in normal position the force resultant from the V-stay forms an angle with the base. For previously known ball joints used in the connection between V-stay and axle, the force resultant from the V-stay also forms an angle other than 90 degrees with a centre axis for the housing and the abutment surface in the housing. In such a case the ball bearing will not absorb all the forces radially in the ball bearing assembly, resulting in extra loading on the ball joint. This can cause the ball joint to be pulled apart, thus losing the connection between the frame and the wheel axle. In addition, due to this angling the ball joint will be subjected to greater wear and thereby have a shorter operational life than a perpendicularly oriented ball joint. As already mentioned, in order to achieve the necessary working area for the ball bearing, the bearing house of the ball joint will normally be angled.

The object of the present invention is to provide a connecting joint between the V-stay connected to the vehicle's frame and the wheel axle for the wheels, which is reliable and has a long operational life. It is also an object to achieve a ball joint for this connection that has a force distribution in the joint that is as ideal as possible. It is also an object to provide a method for easy manufacture of an internal element in a ball joint.

The above objects are achieved with devices and a method as indicated in the attached claims.

The present invention relates to a ball joint for joining a vehicle's axle suspension and V-stay that extends between the vehicle's frame and the axle for wheel suspension.

In some cases the V-stay in a normal position as defined above, will be mounted in such a manner that the centre for mounting the V-stays to the frame is arranged at a different distance from a base for the wheels than the centre for the ball joint. During driving with the vehicle, the axle with the ball joint will be moved in a working area, in some cases as indicated above with an area of movement of 90mm – 180mm. In some other cases it is conceivable that the centre axis for the ball joint in a normal position is perpendicular to the force resultant, but the working area is of such a size and possibly asymmetrical arrangement that it will be appropriate to employ a ball joint according to the present invention.

In the present case the centre for mounting the V-stays to the frame is in a normal position for the V-stay, arranged at a greater distance from a base for the wheels than the centre for the ball joint.

According to the invention the ball joint comprises an internal element with an external partly spherical surface arranged in relation to a flange surface. The purpose of the flange surface is for mounting the ball joint to the wheel axle. The flange surface normally has an orientation in a plane substantially parallel to a base for the wheels. The partly spherical surface also has a centre axis. The ball joint further comprises an external holding element with an internal, partly spherical abutment surface with a centre axis. The external holding element is fixed relative to the V-stay. In the ball joint the internal element's partly spherical surface abuts against the external holding element's partly spherical abutment surface.

According to the invention the centre axis for the spherical surface is coincident with the centre axis for the abutment surface in a normal position. The housing and the V-stay are thereby securely joined so that the centre axis for the abutment surface is perpendicular relative to the force resultant axis for the V-stay, thus providing a very good force transition in the ball joint. The desired working area for the ball joint, as indicated above, is achieved by the centre axis for the internal element's spherical surface forming an angle other than 90 degrees with the flange surface's main orientation.

In a preferred embodiment the internal element in the ball joint comprises a pin arranged extending out from the flange surface, with a ball element with an external

partly spherical surface, securely connected to the pin at a distance from the flange surface. In a preferred embodiment the ball element is designed with an internal recess complementary to the pin's external shape, and arranged round the pin and secured thereto by an abutment element secured to the pin above the ball element, where in the transition between pin, ball element and abutment element there is mounted a clamping ring for positioning the spherical element relative to the pin. Other variants may be envisaged here where the ball element does not have a through-going recess, but only a groove for partial insertion of the pin or where ball element and pin are in the form of a common element.

In the preferred embodiment the external holding element of the ball joint has a surrounding housing securely fixed relative to the V-stay. Inside the housing and secured thereto there is mounted an abutment element with an internal partly spherical abutment surface.

In the preferred embodiment the ball joint includes a protective bellows in order to prevent dirt etc. from penetrating the ball bearing and destroying the abutment surfaces in the ball joint. The bellows surrounds the ball joint so that a ring termination of the bellows is secured to the external holding element and a second ring termination is secured to the flange. According to the invention the bellows for use in the ball joint is formed with an angle between the planes for the first and second ring terminations of the bellows. In the preferred embodiment this angling constitutes an angling substantially corresponding to the angling of the pin relative to a perpendicular axis from the flange surface.

The present invention also comprises an internal element for use in a ball joint, for example used in the connection between a V-stay and an axle wheel suspension. The internal element according to the invention comprises a flange surface with an orientation in a first plane and a pin extending up from the flange surface. The pin comprises a partly spherical portion where the spherical portion has a common centre axis with the pin. According to the invention the centre axis for the pin forms an angle other than 90 degrees with the flange surface's orientation. In a preferred embodiment the spherical portion is composed of a ball element with an external partly spherical surface and an internal recess complementary to the shape of the pin and fixed to the pin at a distance from the flange surface.

In a preferred embodiment of the internal element the pin has an external shape from the outer point of the pin inwards towards the flange surface corresponding to a cylindrical portion with transition to a conical portion with increasing diameter towards the flange surface. The conical portion is terminated in a run-out at one side of the pin and has a termination in the material at the opposite side of the pin. The

termination of the conical portion in the run-out is at a greater distance from the flange surface than the termination in the material.

In a method for manufacturing an internal element according to the invention, the flange surface is formed by means of a blank that projects from the flange surface with a thickness that enables a pin with a centre axis forming an angle other than 90 degrees to be manufactured from the blank by removing material in order to form a pin with a cylindrical portion with an inner conical portion from the basic blank. On account of the slanting position of the pin, when machining the conical surface, the machining tool will run out at one side of the pin and continue machining at the opposite side of the pin. One obtains thereby a termination in the run-out at one side of the pin and a termination in the material at the opposite side of the pin.

The invention will now be explained by means of an embodiment, with reference to the embodiment and the attached drawings, in which:

Fig. 1 illustrates an assembly where a V-stay connects the frame of a vehicle and a wheel axle,

Fig. 2 illustrates a previously known ball joint for connection of a V-stay and a wheel axle,

Fig. 3 illustrates a ball joint according to the invention for connection of a V-stay and a wheel axle,

Fig. 1 illustrates a mounting between a frame of a vehicle and a wheel axle of the vehicle by means of a V-stay.

In fig. 1 the use is illustrated of a ball joint according to the invention where a V-stay 3 is mounted between a frame 1 and a wheel axle 2. The wheel axle 2 has wheel-mounting 6 at both of its ends. The V-stay 3 is mounted on to the frame 1 at a mounting point 4 and to the wheel axle 2 at a mounting point 5 in the bearing 10. For the sake of clarity, further features of the frame 1 and the wheel axle 2 are not shown. The wheel axle 2 will normally be moved slightly in the direction towards and away from the frame 1, and from a normal position a wheel axle will typically move 90 mm upwards from the base and 180 mm downwards towards the base, but normally and in most cases the mounting point 4 to the frame will be at a greater distance from a base on which the wheels, which are mounted on the wheel mounting on the axle 2 roll, than the mounting point 5 for mounting V-stay to the ball bearing 10.

Fig. 2 illustrates a previously normally used ball joint in connection with joining a V-stay 3 and a wheel axle. The flange surface 13 is secured to the wheel axle and has an orientation substantially parallel to a base for the wheels. A pin 14 projects upwards from the flange surface 13. The pin 14 extends perpendicularly from the flange surface's 13 orientation plane. The pin 14 has an inner conical portion 19 and an outer cylindrical portion 18. On the outside of the pin is mounted a ball element 15 with an external partly spherical surface 11. The ball element 15 is secured to the pin by a securing element 16 and a tensioning element 17, which is screwed to the pin 14. Pin 14 and ball element 15 have a common centre axis 12. On the outside of the internal element of the ball joint there is provided a housing 30, which is securely fixed to the V-stay 3. The housing 30 has an abutment element 32 on the inside with an internal partly spherical abutment surface 31. The abutment surface 31 abuts against the ball element's 15 external spherical surface 11. The purpose of the housing 30 with the abutment surface 31 is to achieve the desired working area for the joint angled relative to the resultant force F in the V-stay, so that the angle between the centre axis for the housing 33 and the force resultant F forms an angle other than 90 degrees. This gives a residual axial force in the ball joint. A bellows 34, which covers the connection of the ball joint, thus preventing dirt etc. from reaching the abutment surfaces 11, 31 in the ball joint, is attached to the housing 30 in a ring termination 35 and to the flange in a second ring termination 36.

Fig. 3 illustrates a ball joint in the mounting between a V-stay and a wheel axle, which is designed according to the invention with the advantages this entails as indicated above. The same figure references have been employed for the same parts as indicated above. The ball joint comprises an internal element comprising a flange surface 13 with an orientation in a plane substantially corresponding to a base for the wheels. From the flange surface 13 extends a pin 14 with a surrounding ball element 15, which has an external partly spherical termination 11. The ball element is secured to the pin by a securing element 16 screwed to the pin 14 and a tensioning element 17 located at the connection of the pin 14, the ball element 15 and the securing element 16. A similar tensioning element for securing a ball element to a pin is explained in Norwegian patent application 19975563. The pin 14 and the ball element 15 have a centre axis 12 that forms an angle other than 90 degrees with the orientation plane for the flange surface 13.

The ball joint comprises a surrounding housing 30, which is fixed relative to the V-stay 3. Inside the housing is an abutment element 32 with an internal partly spherical abutment surface 31 abutting against the ball element's 15 external spherical surface 11. The centre axis 33 for the abutment element 32 is arranged substantially perpendicularly to the force resultant F.

In this embodiment of the ball joint according to the invention the pin 14 with the surrounding ball element 15 has a centre axis 12 that is angled relative to the flange surface 13. The pin 14 therefore has an oblique angle in its projection from the flange surface 13 in order to achieve the desired working area for the ball joint. The angling of the pin 14 or in other words the centre axis 12 has an orientation facing away from the V-stay. The centre axis 33 for the abutment element 32 and the internal abutment surface 31 is substantially perpendicular relative to the force resultant F in the V-stay. This provides a ball joint with a good force transfer without residual axial forces in the joint since the centre axis 33 for the abutment surfaces is arranged substantially perpendicularly to the force resultant F, while on account of the angle of the pin a ball joint is obtained with a desired working area.

The flange surface 13 and the pin 14 in the preferred embodiment of the ball joint's internal element are provided in one piece. The flange surface 13 is provided with an outwardly projecting machining pin, which is machined down to a pin 14 according to the invention. The machining pin has a thickness that permits a slanting pin 14 to be formed. First of all a cylindrical portion 18 with a centre axis 12 and a conical portion 19 with the same centre axis are machined. The conical portion is terminated in a run-out at a point 29 at one side of the pin 14 and terminated in a termination 21 in the material at the opposite side of the pin 14. On the pin 14 illustrated in the figure one can also see a casting termination of the machining pin at 22 as an extra curved form under the run-out termination 20. Such a pin 14 according to the invention will normally have an angling of the centre axis of around 5-15 degrees, usually in the region of 10 degrees, in relation to an axis that is perpendicular relative to the flange surface, but other angles may well be envisaged for the pin depending on the application.

In the preferred embodiment the bellows 34 is mounted on the housing 30 by means of a ring termination 35 of the bellows and to the flange surface 13 by a second ring termination 36. The mounting of the bellows 34 to the housing 30 or the flange surface 13 can be implemented in many ways and it will be up to a skilled person to choose a mounting method. In order to achieve a good movement of the bellows, thus providing easy operation of the ball joint in the desired working area, which approximately corresponds to a 20-25 degree variation of the joint, the bellows is provided with an angling substantially corresponding to the angle between the first ring termination 35 and the second ring termination 36 in normal position and corresponding to the angling of the centre axis 12 for the pin 14 relative to an axis arranged substantially perpendicularly relative to the flange surface's 13 orientation. This provides better operation of the joint and longer operational life for the bellows.

The invention has now been explained by an embodiment, but a number of variations and modifications may be envisaged of the ball joint according to the invention, as defined in the attached claims. It is possible to envisage the ball element attached to the pin in another way or that the pin and the ball element are a unit. The abutment element in the housing may be formed by the housing. The angling of the pin may be different to that stated, depending on the application. The bellows may be mounted to the housing and flange surface in another way. The flange surface may be of a different shape and if so it is important to see what the invention involves in relation to the real planes and force resultants and it is not dependent on having a special shape for the flange surface. For a skilled person other variants and modifications will also be possible within the scope as defined in the following claims.

CLAIMS

1. A ball joint for joining a V-stay from a vehicle's frame and an axle for wheel suspension, comprising an internal element with an external partly spherical surface arranged in relation to a flange surface, which has an orientation in a plane substantially parallel to a base for the wheels, which flange surface is secured to the axle, with a centre axis for the partly spherical surface, an external holding element with an internal, partly spherical abutment surface fixed relative to the V-stay, with a centre axis for the partly spherical abutment surface and a force resultant axis for the V-stay, where the internal element's partly spherical surface abuts against the external holding element's partly spherical abutment surface, characterised in that the centre axis for the aboutment surface is arranged approximately perpendicularly relative to the force resultant axis for the V-stay and that the centre axis for the external partly spherical surface forms an angle other than 90 degrees with the flange surface's orientation.
2. A ball joint according to claim 1, characterised in that the internal element comprises a pin arranged on the flange surface, with a ball element with the partly spherical surface fixed to the pin at a distance from the flange surface.
3. A ball joint according to one of the above-mentioned claims, characterised in that the external holding element comprises a surrounding housing fixed relative to the V-stay and inside the housing an abutment element with the internal partly spherical abutment surface, fixed relative to the housing.
4. A ball joint according to claim 2, characterised in that the ball element is provided with an internal recess complementary to the pin's external shape and mounted round the pin and secured thereto by an abutment element secured to the pin above the ball element, where in the transition between pin, ball element and abutment element there is mounted a tensioning ring for positioning off the spherical element relative to the pin.
5. A ball joint according to one of the above-mentioned claims, characterised in that a bellows surrounds the ball joint where a ring termination of the bellows is secured to the external holding element and a second ring termination is secured to the flange, which bellows is provided with an angling between the planes for the first and second ring terminations.

6. A ball joint according to one of the above-mentioned claims, characterised in that the centre axis for the external partly spherical surface has an angling relative to a perpendicular axis on the flange surface in the range 5-15 degrees.
7. An internal element for use in a ball joint, for example used in the connection between a V-stay and an axle wheel suspension, which internal element comprises a flange surface with an orientation in a first plane and a pin with a partly spherical portion where the spherical portion has a common centre axis with the pin, characterised in that the centre axis forms an angle other than 90 degrees with the flange surface's orientation.
8. An internal element according to claim 7, characterised in that the spherical portion is composed of a ball element with an external partly spherical surface and an internal recess complementary to the shape of the pin and fixed to the pin at a distance from the flange surface.
9. An internal element according to one of the claims 7 or 8, characterised in that the pin has an external shape from the outer point of the pin inwards towards the flange surface corresponding to a cylindrical portion with transition to a conical portion with increasing diameter towards the flange surface, which conical portion is terminated in a run-out at one side of the pin and continues into a termination in the material at the opposite side of the pin where the termination in the run-out is at a greater distance from the flange surface than the termination in the material.
10. A method for manufacturing an internal element according to one of the claims 7-9, characterised in that the flange surface is formed by a blank with a thickness that enables a pin with a centre axis forming an angle other than 90 degrees to be manufactured from the blank, extra material is removed by first machining an external cylindrical portion with an angled centre axis, whereupon the machining is continued towards the flange surface with a conical portion with the same centre axis as the cylindrical portion, which conical portion is terminated when the machining tool runs out at one side of the pin and continues to machine the blank at the opposite side of the pin.

Fig.1.

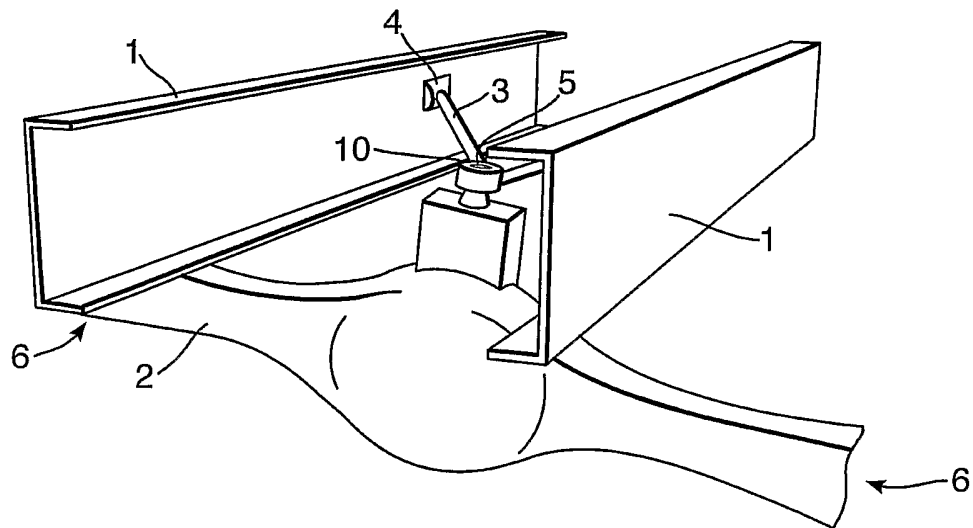


Fig.2.
(Prior Art)

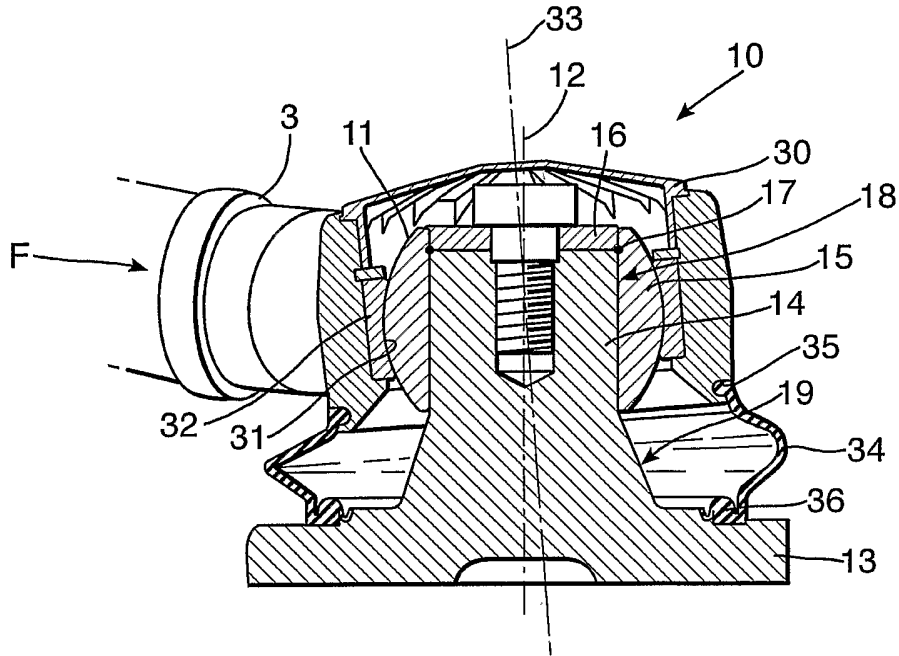
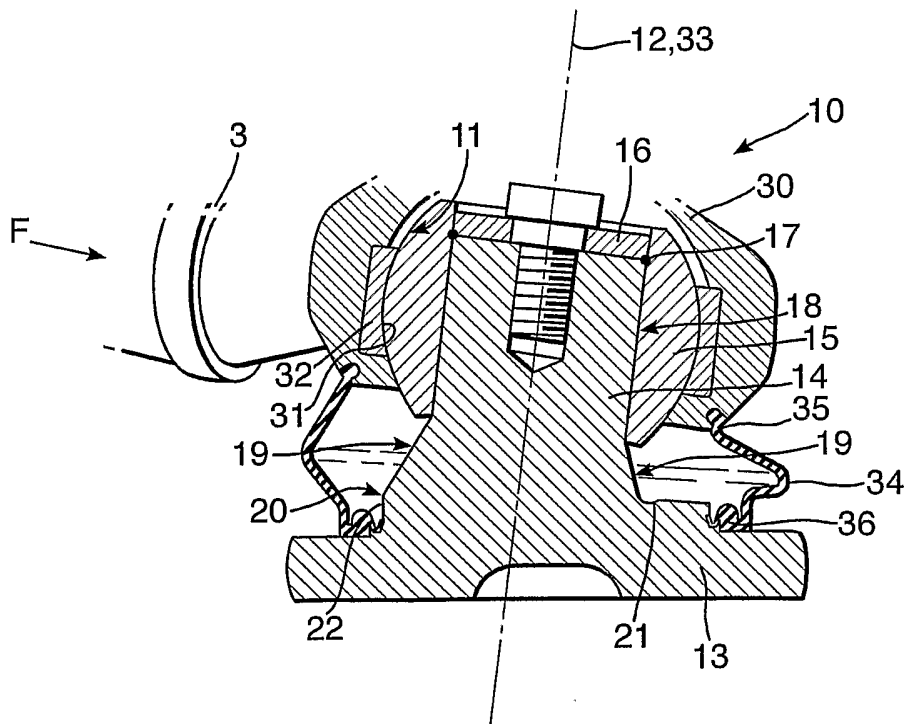


Fig.3.



INTERNATIONAL SEARCH REPORT

International Application No
PCT/NO2005/000069

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B60G7/00 B60G9/00 F16C11/06 B23P15/00

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 7 B60G F16C B23P

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)
EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 789 182 A (ZENGLIN ET AL) 6 December 1988 (1988-12-06)	1,7
Y	claims 1,2,7; figures -----	2-6,8,9
X	EP 0 341 634 A (IVECO FIAT S.P.A) 15 November 1989 (1989-11-15)	1,7
Y	figures 1,2 -----	2-6,8,9
X	US 5 803 200 A (BRANDT ET AL) 8 September 1998 (1998-09-08)	1,7
Y	column 4, line 15 - line 54; figures 2,3A,5,6,4A -----	2-6,8,9
X	FR 879 167 A (GIUSEPPE ALFIERI) 16 February 1943 (1943-02-16)	7
Y	figures 1,3 -----	8
	-/--	

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 18 May 2005	Date of mailing of the international search report 30/05/2005
--	--

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 Tsitsilonis, L
--	--

INTERNATIONAL SEARCH REPORT

 Internat Application No
 PCT/N02005/000069

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 99/28636 A (KONGSBERG AUTOMOTIVE ASA; BJOERKGAARD, SVEN; ANDERSEN, ARNE) 10 June 1999 (1999-06-10)	2-6,8,9
A	figures 4,5	7,10
Y	US 6 113 303 A (BUHL ET AL) 5 September 2000 (2000-09-05)	2,3,5,6, 8,9
A	figure 2	4,7,10
Y	"SUSPENSION PNEUMATIQUE COUPLES DE SERRAGE (DAN.M)" REVUE TECHNIQUE DIESEL, ETAI, BOULOGNE SUR SEINE, FR, vol. 33, no. 204, March 1997 (1997-03), pages 106-108, XP000687291 ISSN: 0037-2579	2,3,5,6, 8,9
A	page 107 - page 108; figures	4,7,10
A	EP 0 945 289 A (LEMFOERDER METALLWAREN AG; ZF LEMFOERDER METALLWAREN AG) 29 September 1999 (1999-09-29)	1,7
A	figures	
A	US 3 792 871 A (CHALMERS W,CA) 19 February 1974 (1974-02-19)	1,7
A	figures 1,8	
A	US 5 649 719 A (WALLACE ET AL) 22 July 1997 (1997-07-22)	1,7
A	figures 5-8	
A	WO 97/47484 A (THE BOLER COMPANY) 18 December 1997 (1997-12-18)	1,7
A	figures 2,3	
A	FR 1 154 082 A (A. EHRENREICH & COMPAGNIE) 2 April 1958 (1958-04-02)	7,9
A	figure 15	

INTERNATIONAL SEARCH REPORT

International Application No

Information on patent family members

PCT/N02005/000069

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4789182	A	06-12-1988	DE 3705417 A1	01-09-1988
			FR 2611168 A1	26-08-1988
			GB 2202809 A ,B	05-10-1988
			JP 63247110 A	13-10-1988
			NO 880743 A ,B,	22-08-1988
			SE 8704777 A	21-08-1988
			ZA 8801165 A	16-08-1988
EP 0341634	A	15-11-1989	IT 214322 Z2	03-05-1990
			DE 68902009 D1	13-08-1992
			DE 68902009 T2	25-02-1993
			EP 0341634 A2	15-11-1989
			ES 2033484 T3	16-03-1993
US 5803200	A	08-09-1998	NONE	
FR 879167	A	16-02-1943	CH 222856 A	15-08-1942
			DE 707617 C	27-06-1941
WO 9928636	A	10-06-1999	NO 975563 A	03-06-1999
			AU 1789099 A	16-06-1999
			BR 9814750 A	03-10-2000
			DE 69821974 D1	01-04-2004
			DE 69821974 T2	16-12-2004
			EP 1036280 A1	20-09-2000
			JP 2003517539 T	27-05-2003
			WO 9928636 A1	10-06-1999
US 6113303	A	05-09-2000	DE 4403584 A1	10-08-1995
			BR 9500429 A	17-10-1995
			DE 59504371 D1	14-01-1999
			EP 0667464 A2	16-08-1995
			ES 2126159 T3	16-03-1999
			JP 2783383 B2	06-08-1998
			JP 7259840 A	09-10-1995
EP 0945289	A	29-09-1999	DE 19521875 A1	19-12-1996
			BR 9606445 A	23-12-1997
			CN 1163591 A ,C	29-10-1997
			CZ 9603207 A3	14-05-1997
			DE 59607312 D1	23-08-2001
			DE 59609196 D1	13-06-2002
			WO 9700177 A1	03-01-1997
			EP 0783415 A1	16-07-1997
			EP 0945289 A2	29-09-1999
			ES 2160247 T3	01-11-2001
			ES 2175878 T3	16-11-2002
			HK 1002856 A1	11-05-2001
			JP 10503990 T	14-04-1998
			US 5711544 A	27-01-1998
US 3792871	A	19-02-1974	GB 1373612 A	13-11-1974
			CA 958729 A1	03-12-1974
			CA 963035 A1	18-02-1975
			DE 2227711 A1	21-12-1972
			DE 7221347 U	19-10-1972
			FR 2140498 A2	19-01-1973
			GB 1373613 A	13-11-1974

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/N02005/000069

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3792871	A	ZA 7203889 A	30-05-1973
US 5649719	A	22-07-1997	
		AU 703205 B2	18-03-1999
		AU 1162097 A	10-09-1997
		CA 2247324 A1	28-08-1997
		DE 69626421 D1	03-04-2003
		DE 69626421 T2	27-11-2003
		EP 0880440 A1	02-12-1998
		NZ 331492 A	28-01-2000
		WO 9730860 A1	28-08-1997
		US 6808035 B1	26-10-2004
WO 9747484	A	18-12-1997	
		AU 3148497 A	07-01-1998
		CA 2258107 A1	18-12-1997
		EP 0904209 A1	31-03-1999
		NZ 333228 A	23-06-2000
		WO 9747484 A1	18-12-1997
FR 1154082	A	02-04-1958	NONE