

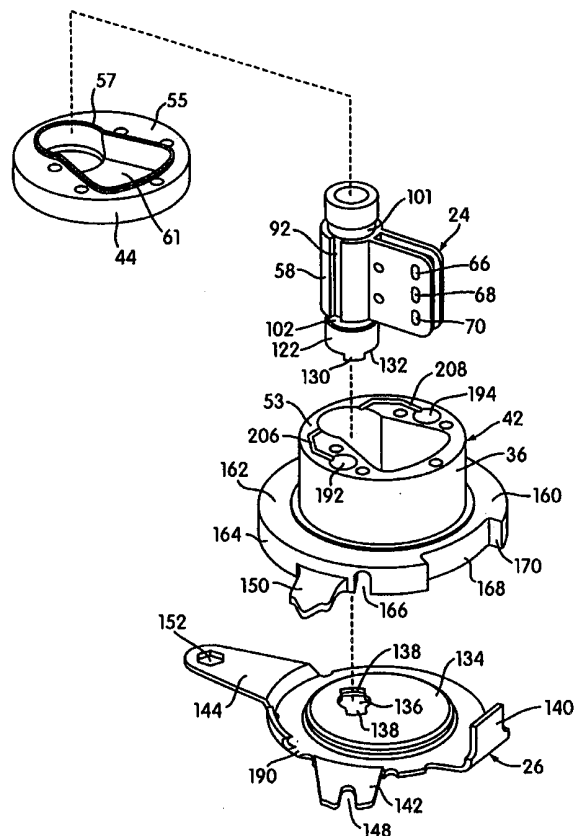


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/CA98/01068 (22) International Filing Date: 20 November 1998 (20.11.98) (30) Priority Data: 60/066,473 26 November 1997 (26.11.97) US (71) Applicant: LITENS AUTOMOTIVE PARTNERSHIP [CA/CA]; 730 Rowntree Dairy Road, Woodbridge, Ontario L4L 5T9 (CA). (72) Inventors: DINCA, Flaviu, V.; 55 Bridlepath Street, Richmond Hill, Ontario L4S 1V6 (CA). MUSSELMAN, Daryl, D.; 2307 Beecroft Road, Toronto, Ontario M2N 6G9 (CA). FERRIMAN, Larry, J.; 485 Bell Street, Milton, Ontario L9T 4R6 (CA). BYTZEK, Klaus, K.; R.R. #3, Schomberg, Ontario L0G 1T0 (CA). (74) Agent: IMAI, Jeffrey, T.; Magna International Inc., 337 Magna Drive, Aurora, Ontario L4G 7K1 (CA).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> (88) Date of publication of the international search report: 7 October 1999 (07.10.99)

(54) Title: ROTARY BELT TENSIONER WITH HYDRAULIC DAMPING**(57) Abstract**

A belt tensioner for use in an engine comprises a fixed structure attached to the engine and a moveable structure biased in a belt tensioning direction. One of the fixed and movable structures defines a fluid chamber containing an incompressible fluid, while the other of the two structures defines a chamber dividing structure within said fluid chamber. The fluid dividing structure defines two chamber portions and is constructed such that relative movement of the moveable structure displaces fluid from one chamber portion to the other. The chamber dividing structure is also configured so as to allow the fluid to flow between chamber portions in a restricted manner so as to yieldingly resist the relative movement of the moveable structure, whereby the fluid flow restriction is greater when the moveable structure moves in the opposite direction than when the moveable structure moves in the belt tensioning direction.



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INTERNATIONAL SEARCH REPORT

International Application No

PCT/CA 98/01068

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 F16H7/12 F16F9/14 F16F9/52

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 F16H F16F

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 5 630 767 A (HIRABAYASHI KATSUMI ET AL) 20 May 1997 (1997-05-20) column 6, line 29 - line 64 column 7, line 26 - line 37 figure 3 ---	1-4,20, 25-27
X	US 5 052 982 A (OUCHI HIDEO) 1 October 1991 (1991-10-01) abstract ---	1-3,19
Y	column 1, line 46 - column 2, line 14 column 3, line 1 - line 44 figures 1-13 --- -/--	36,37

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

16 July 1999

Date of mailing of the international search report

03.08.99

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

Wilson, M

INTERNATIONAL SEARCH REPORT

International Application No
PCT/CA 98/01068

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 38 29 479 A (VOLKSWAGENWERK AG) 30 March 1989 (1989-03-30) column 4, line 68 - column 5, line 64 figures 1,2	20,25, 26,29-31
Y		36,37
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X	PATENT ABSTRACTS OF JAPAN vol. 014, no. 256 (M-0980), 4 June 1990 (1990-06-04) -& JP 02 072252 A (TSUBAKIMOTO CHAIN CO), 12 March 1990 (1990-03-12) abstract figures 6,7	20,25, 26,30-34
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA 98/01068

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 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 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/SA/ 210

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

1. Claims: 1-19

Claims 1-19 (searched) relate to the problem of providing a belt tensioner having damping characteristics which are different in one direction than they are in the other, such that the dampening be greater in the belt tensioned direction than in the decreased belt tension direction, thus helping prevent belt slippage which can be caused by the belt becoming slack during decreased belt tension and the tensioner arm not moving quickly enough to apply the appropriate tension. This problem is solved via the special technical feature of providing a belt tensioner comprising a fixed structure and a movable structure, one of which defines a fluid chamber containing a substantially incompressible fluid and the other of which includes a chamber dividing structure defining first and second chamber portions, this chamber dividing structure being configured to allow the fluid to flow between the chamber portions in a restricted manner so as to yieldingly resist and dampen the relative motion of the movable structure, said chamber dividing structure being constructed and arranged such that the fluid flow restriction is greater when the movable structure moves in the opposite direction than when the movable structure moves in the tensioning direction, thereby providing greater resistance to movement in the opposite direction than in the tensioning direction.

2. Claims: 20-48

Claims 20-48 (not searched) relate to the problem of compensating for increased damping fluid pressure within a belt tensioner, which is caused by an increase in the operating temperature and which can adversely effect tensioner performance. This problem is solved via the special technical feature of providing a belt tensioner comprising a fixed structure and a movable structure, one of which defines a fluid chamber containing a substantially incompressible fluid and the other of which includes a chamber dividing structure defining first and second chamber portions, this chamber dividing structure being configured to allow the fluid to flow between the chamber portions in a restricted manner so as to yieldingly resist and dampen the relative motion of the movable structure, with a surface defining a volume compensation chamber communicating with the said fluid chamber, with a resiliently compressible structure being disposed in side the compensation chamber, the compressible structure and the compensation chamber being positioned and configured such that the substantially incompressible fluid can flow from the fluid chamber to the compensation chamber then the fluid pressure in the chamber increases as a result of increased temperature, such that

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

the fluid compresses the resiliently compressible structure so as to volumetrically expand the compensation chamber and compensate for the increased fluid pressure.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/CA 98/01068

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