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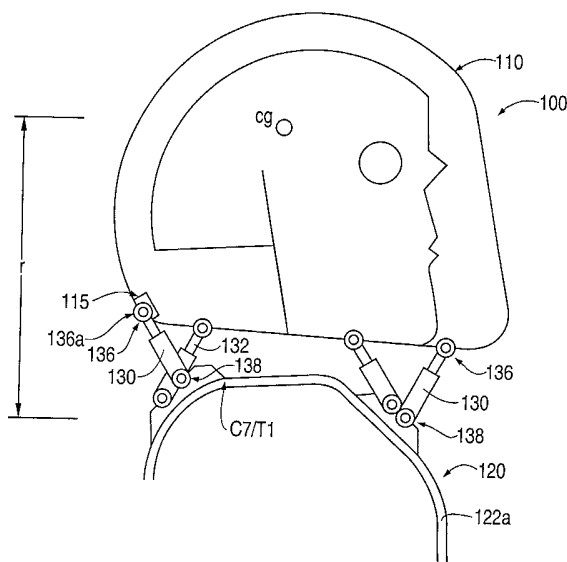
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(54) Title: HEAD STABILIZING DEVICE



(57) Abstract: A head stabilizing system is provided. The head stabilizing system is intended to minimize loads on the head and the neck, some of which may be injurious or even fatal, by generating a reaction force that substantially opposes a force acting on the head and generated by rapid deceleration of a vehicle or a crash impact. The head stabilizing system includes a helmet, a connection structure, and at least one resisting member. The resisting member generates a reaction force that opposes the crash impact force, yielding a reduced net force on the head. This reaction force can be generated as a function of position, velocity or acceleration. The resisting member may include a tether, a dashpot, or a dashpot containing a controllable rheological fluid. The viscosity of the controllable rheological fluid can be automatically adjusted in response to changes in status of a vehicle or it's occupant.



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# INTERNATIONAL SEARCH REPORT

Inter. Application No

PC 705 02/21845

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 A42B3/04

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 A42B

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)

EP0-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 272 770 A (ALLEN RICHARD D ET AL) 28 December 1993 (1993-12-28)	1-7, 10-17, 20-28, 31-34, 56,57,60
Y	column 1, line 28-68 claims; figures	8,9,18, 19,29, 30, 35-45, 50-52, 58,59
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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PC 17 US 02/21845

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 638 510 A (HUBBARD ROBERT P) 27 January 1987 (1987-01-27)	1-7, 10-17, 20-28, 31-34, 56,57,60
Y	column 1, line 7-15 column 2, line 57-66	8,9,18, 19,29, 30, 35-45, 50-52, 58,59
X	--- US 6 009 566 A (HUBBARD ROBERT P) 4 January 2000 (2000-01-04)	1-7, 10-17, 20-28, 31-34, 56,57,60
Y	abstract; figures 1-12	8,9,18, 19,29, 30, 35-45, 50-52, 58,59
X	--- US 5 371 905 A (KEIM HUGO A) 13 December 1994 (1994-12-13)	1-4, 7-10, 24-32, 56-59
Y	column 2, line 20-36 column 2, line 63-68 column 5, line 18-34	18,19, 35-45, 50-52
X	--- FR 2 700 746 A (SCHEGERIN ROBERT) 29 July 1994 (1994-07-29)	1-14, 24-34, 46-49, 53-60
Y	page 1, line 16-32 page 2, line 9-17 page 3, line 10-16 page 4, line 8-13 page 5 figures	8,9,18, 19, 35-45, 50-52, 58,59
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# INTERNATIONAL SEARCH REPORT

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 581 816 A (DAVIS EMSLEY A) 10 December 1996 (1996-12-10) column 1, line 47 -column 2, line 32 abstract; figures 1-6 ---	1-60
A	US 5 758 900 A (KNOLL HEINZ ET AL) 2 June 1998 (1998-06-02) the whole document ---	1-60
A	US 4 094 015 A (HOWARD FRANK N) 13 June 1978 (1978-06-13) column 3, line 3-8 ---	46-49, 53-55
A	US 4 274 161 A (LITTLER BRIAN J) 23 June 1981 (1981-06-23) the whole document ---	46-49, 53-55
A	US 3 497 872 A (MITCHELL RICHARD TRAVIS) 3 March 1970 (1970-03-03) column 1, line 63 -column 2, line 9 column 3, line 33-61 ---	46-49,53
A	FR 2 773 676 A (RUDOLF PIERRE) 23 July 1999 (1999-07-23) page 7, line 15 -page 9, line 9 abstract -----	35,50

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 02/21845

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5272770	A	28-12-1993	NONE	
US 4638510	A	27-01-1987	NONE	
US 6009566	A	04-01-2000	AU 728137 B2 AU 2569899 A CA 2317475 A1 EP 1058508 A1 JP 2002501988 T WO 9938401 A1	04-01-2001 16-08-1999 05-08-1999 13-12-2000 22-01-2002 05-08-1999
US 5371905	A	13-12-1994	NONE	
FR 2700746	A	29-07-1994	FR 2700746 A1	29-07-1994
US 5581816	A	10-12-1996	NONE	
US 5758900	A	02-06-1998	DE 19541779 A1 GB 2306876 A ,B	15-05-1997 14-05-1997
US 4094015	A	13-06-1978	NONE	
US 4274161	A	23-06-1981	DE 2654051 A1 AT 372252 B AT 854977 A AU 514637 B2 AU 3095177 A CH 623462 A5 DK 529577 A ,B, FR 2371894 A1 GB 1587468 A IT 1203123 B JP 1121024 C JP 54000499 A JP 57008202 B NO 774077 A SE 425888 B SE 7713505 A	08-06-1978 26-09-1983 15-02-1983 19-02-1981 31-05-1979 15-06-1981 30-05-1978 23-06-1978 01-04-1981 15-02-1989 28-10-1982 05-01-1979 15-02-1982 30-05-1978 22-11-1982 30-05-1978
US 3497872	A	03-03-1970	NONE	
FR 2773676	A	23-07-1999	FR 2773676 A1	23-07-1999