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1551002-7 10 July 2015 (10.07.2015) SE(71) Applicant: **SAFESEAT IP AB** [SE/SE]; c/o Ingvar Eriksson, Kungsbros Strand 17, 112 26 Stockholm (SE).(72) Inventors: **ERIKSSON, Ingvar**; Kungsbros Strand 17, 2tr, 112 26 Stockholm (SE). **LINDERHOLM, Dag**; Rönninge skolväg 42, 144 62 Rönninge Rönninge (SE). **SVENSSON, Stefan**; Odlingsvägen 3, 1003, 170 77 Bergshamra (SE). **ENESTRÖM, Magnus**; Enebybergsvägen 35, 18248 Enebyberg (SE). **AXELSSON, Daniel**; Videgatan 7a, 582 49 Linköping (SE).(74) Agent: **KRANSELL & WENNBORG KB**; P.O. Box 27834, 115 93 Stockholm (SE).

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[Continued on next page]

(54) Title: ENERGY ABSORBER

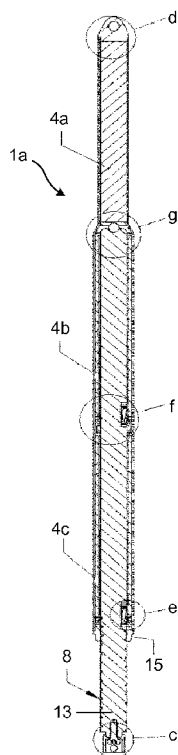


Fig. 1b

(57) Abstract: An energy absorber comprises a bar extending along a longitudinal axis and arranged to be moved along the longitudinal axis upon a tensile force acting on the bar along the longitudinal axis. The energy absorber comprises a first energy absorbing means and a second energy absorbing means extending along the longitudinal axis. The energy absorber comprises a coupling mechanism for coupling the second energy absorbing means to the bar. The bar is arranged to activate energy absorption of the first energy absorbing means upon movement of the bar along the longitudinal axis. The coupling mechanism comprises at least one force transferring element arranged to transfer force from the bar to the second energy absorbing means upon activation by at least one trigger element. The trigger element is arranged to be subjected to a trigger load as the bar is moved along the longitudinal axis, wherein the trigger load is proportional to velocity of the bar such that a higher velocity results in a higher trigger load. The trigger element is displaceably arranged relatively its unloaded position upon loading and, simultaneously, constrained from displacing by a constraining force acting in opposite direction of the trigger load. The trigger element is arranged to be displaced for activating the force transferring element for coupling and activation of the second energy absorbing means to the bar when the velocity of the bar is higher than a first pre-determined non-zero amount.



DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT,
LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE,
SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA,
GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2016/064523

A. CLASSIFICATION OF SUBJECT MATTER
INV. F16F15/02
ADD.

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)
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 practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 10 2010 013935 A1 (SCHAEFFLER TECHNOLOGIES GMBH [DE]) 6 October 2011 (2011-10-06)	1,2,5-7, 26-28, 31,35, 49-51
A	paragraphs [0001], [0026] - [0034]; figures 1,2	3,4,47, 48,53
X,P	----- WO 2015/107134 A2 (SAFESEAT IP AB [SE]) 23 July 2015 (2015-07-23)	1-7, 26-28, 31,35, 47-51,53
A	the whole document ----- EP 2 872 360 A2 (SAFESEAT IP AB [SE]) 20 May 2015 (2015-05-20) the whole document -----	53



Further documents are listed in the continuation of Box C.



See patent family 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 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

10 November 2016

Date of mailing of the international search report

13/01/2017

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2016/064523

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.:
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 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.:

1-7, 26-28, 31, 35, 47-51, 53

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-7, 26-28, 31, 35, 47-51, 53

An energy absorber whereby a trigger load is created by a hydraulic or pneumatic pressure.

2. claims: 8, 9, 30, 32-34, 38-46

An energy absorber whereby a trigger element is arranged on a separate axis.

3. claims: 10, 36

An energy absorber with a third energy absorbing means and trigger element.

4. claims: 11, 37

An energy absorber whereby the energy absorbing elements are piston elements.

5. claims: 12-25

An energy absorber whereby the energy absorbing elements are piston elements.

6. claims: 29, 52

An energy absorber whereby energy absorbing means have a tapered cross sectional area.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2016/064523

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102010013935 A1	06-10-2011	DE 102010013935 A1	06-10-2011
		WO 2011124559 A1	13-10-2011

WO 2015107134 A2	23-07-2015	CN 105916728 A	31-08-2016
		EP 3094883 A2	23-11-2016
		KR 20160125368 A	31-10-2016
		US 2016327117 A1	10-11-2016
		WO 2015107134 A2	23-07-2015

EP 2872360 A2	20-05-2015	EP 2872360 A2	20-05-2015
		SE 1250813 A1	12-01-2014
		WO 2014011109 A2	16-01-2014
