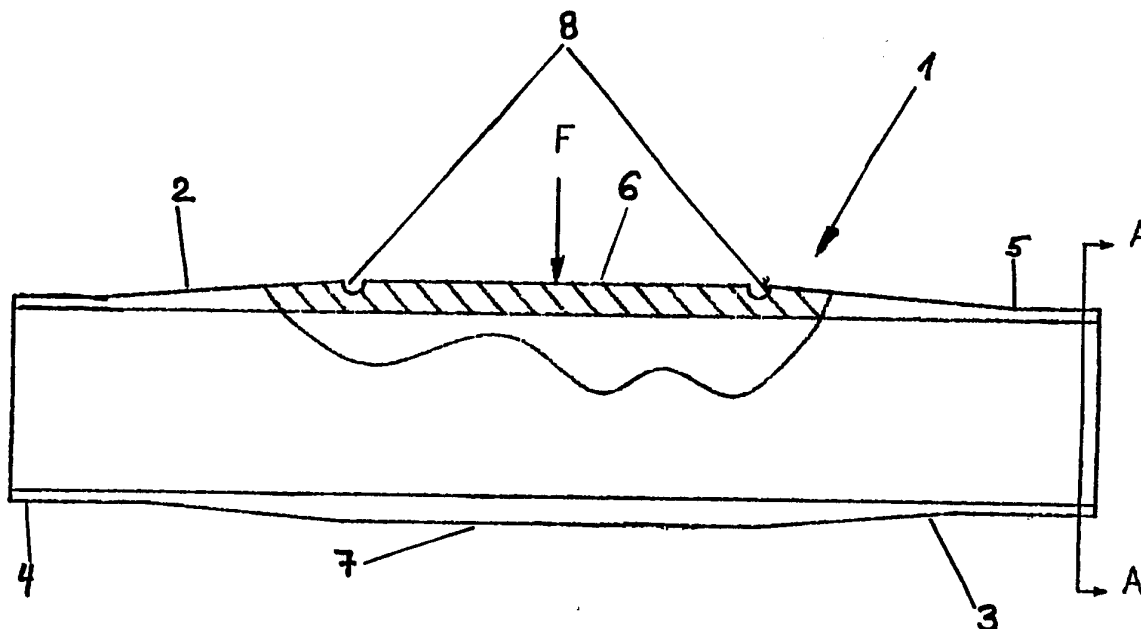




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁵ : B60R 19/02, B60J 5/04 B62D 25/02</p>	<p>A1</p>	<p>(11) International Publication Number: WO 91/10582 (43) International Publication Date: 25 July 1991 (25.07.91)</p>
<p>(21) International Application Number: PCT/NO91/00002 (22) International Filing Date: 7 January 1991 (07.01.91) (30) Priority data: 900109 9 January 1990 (09.01.90) NO (71) Applicant (for all designated States except US): NORSK HYDRO A.S [NO/NO]; N-0240 Oslo 2 (NO). (72) Inventor; and (75) Inventor/Applicant (for US only) : CLAUSEN, Edvin, List [DK/DK]; Kogsvn. 10, DK-6270 Tønder (DK). (74) Agent: RICANEK, Ivan; Norsk Hydro a.s, N-0240 Oslo 2 (NO).</p>		<p>(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), SE (European patent), US. Published With international search report.</p>

(54) Title: STRUCTURAL BEAM



(57) Abstract

Beam for reinforcement of vehicle bodies is extruded as a hollow shape (1) having plane parallel deformation planes (2, 3) of variable wall thickness along its length. Two laterally extending grooves (8) define a deformation zone (6) having a maximal wall thickness allowing for a controlled folding of the shape.

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Structural beam

The present invention relates to a beam applied as reinforcement of a vehicle body, in impact structures or the like, and more particularly to structural beams comprising a hollow shape having parallel deformation planes orientated perpendicularly to the load exposure.

Such beams are applied e.g. in car doors as protection for vehicle occupants against side collision. Apart from the request to absorb the applied impact energy the beam should also be as light as possible in order to avoid an unnecessary increase in the vehicle body weight. German laid open application number DE 3606024 describes a beam of this type being dimensioned over its whole length to absorb the actual maximal load. Consequently, the provided beams do not comply with the request regarding an optimal strength/weight relation.

From DE 380724 it is known to resolve the above problem by provision of a composed beam where one or more additional complementary shapes are connected to the hollow shape along the actual area being exposed to the load. DE 3826958 shows a composed beam consisting of two spot welded shapes being locally reinforced by means of outwardly or inwardly positioned and fastened additional shapes. Rather complicated solutions are presented in both the above cases, where the application of additional shapes results in extra working and increased manufacturing costs.

The object of the present invention is therefore to provide a weight optimized beam exhibiting a variable deformation resistance along its length without requirement for supplemental reinforcing elements or need of extensive working/machining of the beam.

This object is achieved according to the invention by provision of a beam comprising an integral, unitary extruded hollow shape having parallel deformation surfaces exhibiting a variable wall thickness along their longitudinal extension. According to its preferred embodiment the hollow shape is extruded having a rectangular cross-section configuration with two parallel extending planes arranged perpendicularly to the load with a wall thickness gradually increasing from both sides of the shape towards a central deformation zone characterized by a maximal wall thickness. The central zone of the deformation plane on the predicted load side may be delimited against its end portions (rand zones) by laterally extending grooves to ensure a controlled folding of the shape.

The invention will in the following be described in more details referring to the accompanying drawings, Figs. 1-2, where

Fig. 1 shows schematically the hollow shape in a longitudinal cross-section, and

Fig. 2 illustrates a cross-section of the hollow shape taken along line A-A in Fig. 1.

The hollow shape 1 shown in the Figures has a substantially rectangular cross-section extruded with two plane parallel extending planes or walls 2,3. These planes exhibit a gradually

increasing wall thickness from the respective shape ends 4,5 towards central deformation zones 6,7 characterized by maximal wall thickness being dimensioned according to the expected load. The hollow shape having the desired longitudinal contour and wall thickness is provided ready to use in one simple extrusion operation without any need for following machining, removal of the excess material or similar operations. This can be done e.g. by means of a radially movable tool attached to the orifice of conventional extrusion dies, the tool being periodically lowered at predetermined intervals and amplitudes to restrict the material flow and thus variate the wall thickness of the provided shape.

The deformation plane (surface) facing the load impact marked by F on Figure 1, is furthermore provided with two laterally and parallelly extending grooves or rills 8 which limit the deformation zone against the rand zones of the plane surface. This weakening of the wall thickness by means of grooves ensures that a controlled folding of the hollow shape will be achieved in a defined area on the deformation plane during energy absorption e.g. at a vehicle collision.

The hollow shape is preferentially provided as an extruded aluminium shape of a high strength Al-alloy.

The shown rectangular configuration of the beam shape is only one of possible embodiments. A hollow shape having e.g. flat oval or polygonal cross-section extruded in accordance with the invention having a variable wall thickness increasing from the shape ends towards a central deformation zone of the deformation planes can also be an actual shape configuration.

The obvious advantages of the beam according to the invention is the possibility to achieve an optimal strength/weight ratio within a given space, a minimal working/machining and controlled development of shape folding with predicted localization of deformation zones. The beam offers also a gliding, smooth surface, something which is advantageous for its adapting to other parts of the vehicle body.

Claims

1. A beam for reinforcement of vehicle bodies, impact structures or the like comprising a hollow shape (1) having substantially parallel deformation planes,
c h a r a c t e r i z e d i n t h a t
the hollow shape (1) is an integral, unitary extruded shape exhibiting a variable wall thickness over its length at least along one of the deformation planes (2,3) orientated perpendicularly to the expected load exposure.
2. The beam according to claim 1,
c h a r a c t e r i z e d i n t h a t
the hollow shape (1) has substantially rectangular cross-section having two parallel longitudinally extending deformation planes (2,3) exhibiting maximal thickness at their middle zones (6,7).
3. The beam according to claim 1 or 2,
c h a r a c t e r i z e d i n t h a t
one of the deformation planes (2,3) is provided with one or more laterally extending grooves (8) locally weakening the wall thickness and defining a limited deformation zone for a controlled folding of the shape.
4. The beam according to claim 1, 2 or 3,
c h a r a c t e r i z e d i n t h a t
the hollow shape is extruded of aluminium or aluminium alloy.

1/2

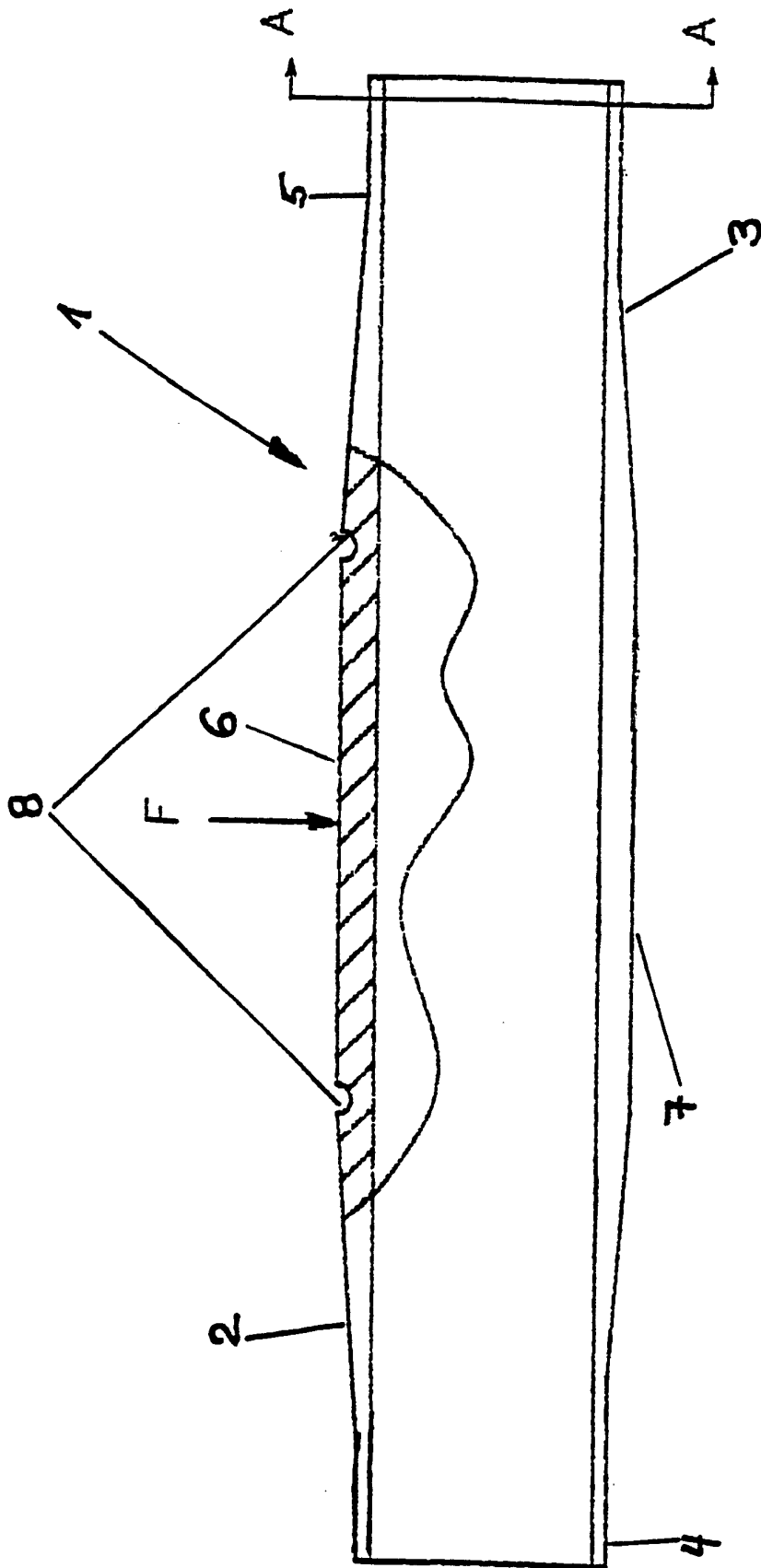


FIG. 1

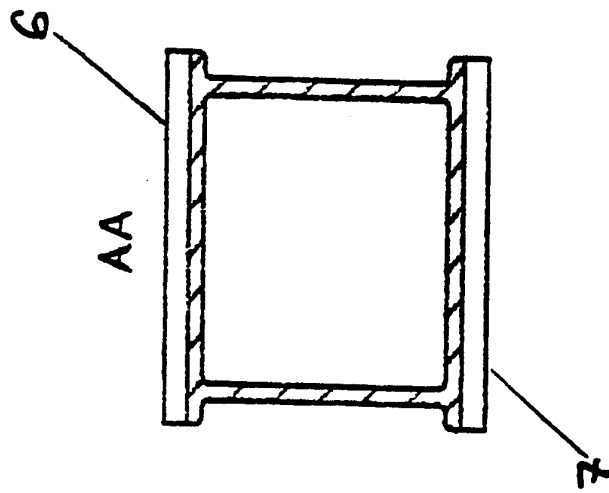





FIG. 2

INTERNATIONAL SEARCH REPORT

International Application No **PCT/NO 91/00002**

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: B 60 R 19/02, B 60 J 5/04, B 62 D 25/02																	
II. FIELDS SEARCHED <div style="text-align: center; border: 1px solid black; padding: 2px;">Minimum Documentation Searched⁷</div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%; padding: 5px;">Classification System</td> <td style="padding: 5px;">Classification Symbols</td> </tr> <tr> <td style="padding: 5px;">IPC5</td> <td style="padding: 5px;">B 60 J; B 60 R; B 62 D</td> </tr> </table> <div style="text-align: center; border: 1px solid black; padding: 2px;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched⁸</div> <p style="padding: 5px;">SE,DK,FI,NO classes as above</p>			Classification System	Classification Symbols	IPC5	B 60 J; B 60 R; B 62 D											
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III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹ <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%; padding: 5px;">Category *</th> <th style="width: 70%; padding: 5px;">Citation of Document,¹¹ with indication, where appropriate, of the relevant passages¹²</th> <th style="width: 20%; padding: 5px;">Relevant to Claim No.¹³</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">EP, A2, 0330759 (VEREINIGTE ALUMINIUM-WERKE AKTIENGESELLSCHAFT) 6 September 1989, see the whole document --</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-4</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">DE, A1, 3826958 (VOLKSWAGEN AG) 2 March 1989, see the whole document --</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-4</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">DE, C1, 3709489 (ALUMINIUM WALZWERKE SINGEN GMBH) 14 July 1988, see the whole document --</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-4</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">DE, A1, 3606024 (ALUMINIUM WALZWERKE SINGEN GMBH) 27 August 1987, see the whole document --</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-4</td> </tr> </tbody> </table>			Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	A	EP, A2, 0330759 (VEREINIGTE ALUMINIUM-WERKE AKTIENGESELLSCHAFT) 6 September 1989, see the whole document --	1-4	A	DE, A1, 3826958 (VOLKSWAGEN AG) 2 March 1989, see the whole document --	1-4	A	DE, C1, 3709489 (ALUMINIUM WALZWERKE SINGEN GMBH) 14 July 1988, see the whole document --	1-4	A	DE, A1, 3606024 (ALUMINIUM WALZWERKE SINGEN GMBH) 27 August 1987, see the whole document --	1-4
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Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	EP, A2, 0267895 (AUSTRIA METALL AKTIENGESELLSCHAFT) 18 May 1988, see the whole document --	1-4
P	EP, A1, 0390769 (AUSTRIA METALL AKTIENGESELLSCHAFT) 3 October 1990, see the whole document -- -----	1-4

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.PCT/NO 91/00002**

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A2- 0330759	89-09-06	DE-A- 3806724	89-09-14
DE-A1- 3826958	89-03-02	NONE	
DE-C1- 3709489	88-07-14	EP-A- 0284566	88-09-28
DE-A1- 3606024	87-08-27	EP-A- 0235091	87-09-02
EP-A2- 0267895	88-05-18	AT-B- 391453 US-A- 4919473	90-10-10 90-04-24
EP-A1- 0390769	90-10-03	NONE	