Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).
Description

[0001] The present invention relates to a beam for a vehicle, comprising a box-shaped member made of bent sheet metal, having a greater length than both width and height, and having a portion which is oriented in the longitudinal direction of the vehicle when mounted thereto and which has, at a distance from one end, an area which is made so that its stiffness in the longitudinal direction of the beam is suddenly reduced after the beam has been deformed a pre-determined distance beginning from said end. Such beams are known e.g. from DE-A-2459 518.

[0002] Box beams appear in a number of different applications in automobiles, e.g. as front lateral members in passenger car chassis, and are thus components, the design of which crucially affects the collision safety of the automobile. One method of achieving high collision safety through crash control is to force, as much as possible, the elements in the structure to be deformed in the most energy-absorbing manner, which is progressive crushing or fold formation. Less energy-absorbing modes, such as rigid body rotation or bending should thus be avoided.

[0003] From the point of view of crash safety, the ideal situation would be to allow the volume represented by the forward portion of the car, to consist of a large number of cells each having a large energy-absorbing capacity regardless of from which direction the car is struck, but such solutions have not been able to be employed in mass production for a number of reasons.

[0004] Test vehicles have been manufactured in which foam plastic-filled box beams have been used to achieve control deformation. Such vehicles have, however, never been produced in large volumes. The reasons are many, but the most important are the high costs connected with complicated manufacturing processes and the effect on the environment of harmful chemicals in the foam used.

[0005] Normally the beam member system in a vehicle is regarded as a passive security system, where it is primarily the geometric shape of the box beams which, through their energy-absorbing capacity, determine the collision safety. It is, however, known to arrange in a vehicle an "active" beam system, i.e. a system where a collision triggers an activity which makes the beam system act in a certain manner beyond its normal mechanical limitations. Such an active beam system is known, for example, by US-A-4,050,537. Here an explosive charge is used, in the event of a collision, to change a cross section of a box beam in such a manner that its stiffness and thus its energy-absorbing capacity increases.

[0006] The purpose of the present invention is in general to achieve a simple and inexpensive active beam arrangement of the type described by way of introduction, which avoids less energy-absorbing modes such as rigid rotation and bending.

[0007] This is achieved according to the invention by virtue of the fact that the box-shaped member is stiffened in said area by means of stiffeners fixed to the box profile, said stiffeners being arranged to split off when the beam has been deformed said pre-determined distance. The stiffeners can be simple plates which are glued to the beam with an adhesive which provides a hard and brittle glue joint, for example, an epoxy glue. If the areas under the plates are for example stamped, folded, perforated or of smaller thickness than the rest of the beam plate, a substantial reduction in the stiffness of the beam can be obtained in these areas, when the glue joint breaks and the plates are shed.

[0008] The beam according to the invention is thus an active beam. By studying the deformation of a passive beam after a collision, it is possible to determine where the transition occurred between upsetting or fold formation and buckling of the entire beam. By actively softening the beam in this area during deformation, the buckling can be avoided and the area where the fold formation occurs can be extended across the softened area to the area behind it, which can be stiffer.

[0009] The invention will be described in more detail below with reference to examples shown in the accompanying drawings, where Fig. 1 shows a perspective view of a first embodiment of a forward lateral beam according to the invention in a schematically represented passenger car; Figs. 2 a, 2 b and 2 c show views from above of a portion of the beam in Fig. 1 in different stages of deformation. and Fig. 3 shows a lateral beam corresponding to the beam in Fig. 1, in a second embodiment.

[0010] In Fig. 1, 1 designates a car body of the so-called self-supporting type. A box beam, generally designated 2, is one of two lateral beams or members fixed symmetrically relative to the longitudinal centerplane of the vehicle. The beam 2 consists of two U-profiles 3, which are joined to each other to form a rectangular box profile. The beam shown and its general construction and function are well known and need not be described in more detail here. It should suffice to say that in one car model available on the market, the lateral beams serve as supports for an intermediate frame which in turn supports the engine. As can be seen in Figs. 2 a-c, the beam is in the form of a horn. Its broader end 4 (to the left in Figs. 2 a-c) is joined to the front bumper 5 of the vehicle (Fig. 1). From its straight front portion 6, extending in the longitudinal direction of the vehicle, there is a transition to a curved rear portion 7, which is joined to the bottom plate of the vehicle.

[0011] In the embodiment shown in Figs. 1 and 2 a-c, two rectangular metal plates 8 are glued securely to opposite vertical sides 9,10 of the beam 2 at a distance from the end 4. The plates 8 are arranged in a section which must be temporarily prevented from bending or buckling. Their function is in general to support the structure in front of them so that it will be used effectively for energy-absorption by optimizing the crushing process.
Beam for a vehicle, comprising a box-shaped member (2), the box-shaped member (2) being adapted to each other so that the force level when the stiffeners are split off is ca 80-100 kN.

5. Beam according to one of Claims 1 - 4, characterized in that the box-shaped member (2) has a rectangular profile and that the stiffeners in the form of plates (8) are fixed at least on two opposite sides (9,10) of the profile.

6. Beam according to one of Claims 1 - 4, characterized in that the box-shaped member (2) has a rectangular profile and that the stiffeners in the form of angle irons (12) are fixed over the corners of the profile.

7. Beam according to one of Claims 1 - 6, characterized in that the box-shaped member (2) in the areas overlapped by the stiffeners (8;12), has reduced stiffness in relation to the adjacent areas of the box-shaped member.

8. Beam according to one of Claims 1 - 7, characterized in that the box-shaped member (2) is a portion of a front lateral beam in a passenger car chassis.

Claims

1. Beam for a vehicle, comprising a box-shaped member (2) made of bent sheet metal, having a greater length than both width and height, and having a portion (6) which is oriented in the longitudinal direction of the vehicle when mounted thereto and which has, at a distance from one end (4), an area which is made so that its stiffness in the longitudinal direction of the beam is suddenly reduced after the beam has been deformed a predetermined distance beginning from said end, characterized in that the box-shaped member (2) is stiffened in said area by means of stiffeners (8;12) fixed to the box profile, said stiffeners being arranged to split off when the beam has been deformed said predetermined distance.

2. Beam according to Claim 1, characterized in that the stiffeners (8;12) are glued to the outer surface of the box profile by means of an adhesive which provides a hard and brittle glue joint (11).

3. Beam according to Claim 2, characterized in that the adhesive is an epoxy adhesive.

4. Beam according to one of Claims 1 - 3, characterized in that the box-shaped member (2), the stiffeners (8;12) and the means for fixing the same are adapted to each other so that the force level when the stiffeners are split off is ca 80-100 kN.

5. Beam according to one of Claims 1 - 4, characterized in that the box-shaped member (2) has a rectangular profile and that the stiffeners in the form of plates (8) are fixed at least on two opposite sides (9,10) of the profile.

6. Beam according to one of Claims 1 - 4, characterized in that the box-shaped member (2) has a rectangular profile and that the stiffeners in the form of angle irons (12) are fixed over the corners of the profile.

7. Beam according to one of Claims 1 - 6, characterized in that the box-shaped member (2) in the areas overlapped by the stiffeners (8;12), has reduced stiffness in relation to the adjacent areas of the box-shaped member.

8. Beam according to one of Claims 1 - 7, characterized in that the box-shaped member (2) is a portion of a front lateral beam in a passenger car chassis.

Patentansprüche

1. Träger für ein Fahrzeug, umfassend ein aus gebogenem Blech hergestelltes, kastenförmiges Element (2), das eine größere Länge als sowohl Breite als auch Höhe besitzt und einen Abschnitt (6) besitzt, der in der Längsrichtung des Fahrzeuges ausgerichtet ist, wenn er in diesem montiert ist, und der in einem Abstand von einem Ende (4) eine Fläche besitzt, die derart ausgeführt ist, dass dessen Steifigkeit in der Längsrichtung des Trägers schlagartig vermindert ist, nachdem der Balken um einen vorbestimmten Abstand, beginnend von dem Ende, verformt worden ist, dadurch gekennzeichnet, dass das kastenförmige Element (2) in dem Bereich mittels Aussteifern (8;12) ausgesteift ist, die an dem Kastenprofil befestigt sind, wobei die Aussteifer derart angeordnet sind, um sich abzuspalten, wenn der Träger um den vorbestimmten Abstand verformt worden ist.

2. Träger nach Anspruch 1, dadurch gekennzeichnet, dass die Aussteifer (8;12) an die Außenfläche des Kastenprofils mittels eines Klebstoffs angeklebt sind, der eine harte und spröde Klebverbindung (11) bereitstellt.

3. Träger nach Anspruch 2, dadurch gekennzeichnet, dass der Klebstoff ein Epoxy-Klebstoff ist.

4. Träger nach einem der Ansprüche 1 - 3, dadurch gekennzeichnet, dass das kastenförmige Element...
(2), die Aussteifer (8; 12) und die Einrichtung zum Befestigen derselben aneinander derart angepasst sind, dass das Kraftniveau, wenn die Aussteifer abgespalten werden, ca. 80 - 100 kN beträgt.

5. Träger nach einem der Ansprüche 1 - 4, dadurch gekennzeichnet, dass das kastenförmige Element (2) ein Rechteckprofil besitzt, und dass die Aussteifer in der Form von Platten (8) auf zumindest zwei gegenüberliegenden Seiten (9, 10) des Profils befestigt sind.

6. Träger nach einem der Ansprüche 1- 4, dadurch gekennzeichnet, dass das kastenförmige Element (2) ein Rechteckprofil besitzt und dass die Aussteifer in der Form von Winkeleisen (12) über die Ecken des Profils befestigt sind.

7. Träger nach einem der Ansprüche 1 - 6, dadurch gekennzeichnet, dass das kastenförmige Element (2) ein Abschnitt eines vorderen Seiten trägers in einem Personenfahrzeugchassis ist.

Revendications

1. Poutre pour véhicule, comprenant un élément (2) en forme de caisson constitué en feuille métallique incurvée, ayant une longueur plus grande qu'à la fois sa largeur et sa hauteur et ayant une partie (6) qui est orientée dans la direction longitudinale du véhicule quand elle est montée sur celui-ci et qui présente, à une distance d'une extrémité (4), une zone qui est faite de façon que sa rigidité dans la direction longitudinale de la poutre soit brusquement réduite après que la poutre ait été déformée sur une distance prédéterminée à partir de ladite extrémité, caractérisée en ce que l'élément (2) en forme de caisson est rigiflé dans ladite zone par des raidisseurs (8 ; 12) fixés au profilé en caisson, lesdits raidisseurs étant disposés pour se séparer et s'écarter lorsque la poutre a été déformée sur ladite distance prédéterminée.

2. Poutre selon la revendication 1 caractérisée en ce que les raidisseurs (8 ; 12) sont collés à la surface extérieure du profilé en caisson au moyen d'un adhésif qui fournit un joint de colle (11) dur et cassant.

3. Poutre selon la revendication 2 caractérisée en ce que l'adhésif est un adhésif époxy.