ABSTRACT OF THE DISCLOSURE

A bumper having impact absorbing characteristics, with the bumper including a sheet that is deformed to include spaced parallel ribbons having longitudinally spaced, alternating crests and troughs that are interconnected by webs having a multi-planar torsional deformation. The impact absorbing sheet is preferably sandwiched between inner and outer members, with the impact absorbing sheet being connected to the inner member by means which allow the sheet to expand longitudinally during impact, and with the outer member being connected to the impact absorbing member by means that will readily shear during impact.

BACKGROUND OF THE INVENTION

Bumpers which are in common use today on automotive vehicles are essentially decorative items, and do not satisfactorily protect the vehicle structure adjacent the bumpers. Such bumpers have little or no impact absorbing properties, so that when the bumper strikes another object, the forces are directly transmitted to the vehicle body. Furthermore, known bumpers are easily dented and are difficult and expensive to replace when necessary.

SUMMARY OF THE INVENTION

The bumper of the present invention includes a novel impact absorbing member that is formed from an initial sheet having a plurality of transverse rows of longitudinally aligned openings that divide the sheet into a plurality of spaced parallel ribbons, with webs between the openings interconnecting the ribbons. The openings are relatively wide in comparison to the thickness of the sheet, and the ribbons of the sheet are deformed to provide alternating, longitudinally spaced crests and troughs that extend a substantial distance out of the plane of the sheet, with the webs having a multi-planar torsional deformation. When the initial sheet is deformed to provide the crests and troughs, and the twisted webs, the overall length of the sheet is significantly reduced, on the order of 25%, so that when the deformed sheet is impacted, the sheet will expand to its original length before the sheet material itself is strained. In this manner, the sheet can absorb an impact and dissipate the energy thereof without transmitting the force of the impact to the vehicle structure.

The impact absorbing member is preferably provided in a sandwich structure between inner and outer members, with the inner member having means accommodating elongation of the impact absorbing member, and with the outer member being connected to the impact absorbing member with means that will readily shear during impact.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of a first embodiment of the bumper;
FIG. 2 is an enlarged exploded perspective view of the bumper of FIG. 1;
FIG. 3 is an enlarged perspective view of the impact absorbing sheet material; and
FIG. 4 is a fragmentary top plan view of a modified bumper structure.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail a preferred embodiment of the invention and a modification thereof, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiments illustrated.

Referring now to the drawings in detail, a first embodiment of the bumper is illustrated at 10 in FIG. 1, and includes an impact absorbing sheet 13 sandwiched between an outer member 11 and an inner member 12. The member 13 is formed from a generally planar sheet of material having a plurality of transverse rows of elongate openings therein that separate the member 13 into a plurality of spaced, parallel ribbons 14, three such ribbons being illustrated in the embodiment of FIGS. 1–3. The webs between the openings connect the ribbons 14 on spaced positions therealong, and each of the ribbons 14 is deformed in accordance with the teachings in my concurrently filed application entitled “Article of Manufacture and Method of Making the Same” to provide alternating, longitudinally spaced crests 15 between the webs and troughs 16. As is explained in detail in my above mentioned application, the crests 15 and troughs 16 are defined by converging ribbon portions, and during the ribbon deforming step, the webs W are given a multi-planar torsional deformation so that they are generally uniformly twisted between their oppositely inclined end portions. The apaxes 17 of the crests 15 are flattened and parallel with the plane of the initial sheet, with the apaxes 18 of the troughs 16 also being flattened and parallel with the plane of the initial sheet. As is evident from FIG. 1, crest apaxes 17 are positioned in face abutting engagement with outer member 11, while trough apaxes 18 are positioned in face abutting engagement with inner member 12.

The impact absorbing member 13 is secured to outer member 11 by shear bolt-type fasteners 20, which pass through openings 19 in the member 11, and through openings in the crest apaxes 17. Nuts 22 are threaded on fasteners 20 to positively secure the member 13 to the member 11, and fasteners 20 preferably are weakened, as by a circumferential groove 21, to provide a means allowing the fasteners to readily shear when the member 13 expands during impact.

Means 23 is provided for mounting the bumper 10 upon tubular vehicle chassis supports 24, and mounting means 23 are defined by rectangular tubular mounting brackets 25 having outwardly diverging sides 26 that terminate in mounting feet 27. Mounting feet 27 are positioned in face abutting engagement with the outer surface of inner member 12, and mounting feet 27 include openings 29 that are positionable in alignment with elongate slots 31 in the inner member 12. Fasteners 30 impale openings 29, slots 31, and openings in the trough apaxes 18, with nuts 32 being threaded upon the inner ends of fasteners 30 to secure the brackets 25 and the inner member 12 to the impact resisting member 13. Fasteners 30 are freely slideable along slots 31, so that when the member 13 expands during impact, the members 11 and 13 are free to move relative to inner member 12. The top and bottom of brackets 25 may be bent toward one another, as is shown at 33 in FIG. 2, with flush fasteners 35 extending through openings in the trough apaxes 18 and through openings in the folded over bracket portions.

A modified bumper structure is shown at 10" in FIG. 4, and the bumper 10" is similar to the bumper 10, except that a plurality of impact absorbing members 13' are
provided, with the apexes of the adjacent crests and troughs being secured to one another.

While both of the above-described embodiments have been illustrated in connection with an outer member 10 or 10', the present invention contemplates that in certain instances the outer member may be eliminated to enhance the aesthetic appearance of the bumper.

What is claimed is:

1. A bumper comprising: an impact absorbing sheet having at least two vertically spaced rows of openings, a horizontally extending ribbon portion being provided on each side of the rows of openings and the openings in each row being separated by a web portion, each ribbon including alternating, longitudinally spaced crests and troughs, the crests extending outwardly from a vertical reference plane and the troughs extending inwardly from the reference plane, the transitional portion of each ribbon between the crests and troughs extending at an angle with respect to the reference plane, the crests on each ribbon being aligned with a trough on an adjacent ribbon whereby the aligned transitional portions of adjacent ribbons are disposed at angles that are inclined oppositely with respect to said reference plane, said webs each having a first end portion merging with a transitional portion of one ribbon and a second end portion merging with the aligned transitional portion of an adjacent ribbon, the intermediate portion of each web between its end portions being twisted throughout its length; and means for mounting said sheet upon a vehicle.

2. A bumper as set forth in claim 1 wherein said sheet includes three horizontally extending ribbons.

3. A bumper as set forth in claim 1 wherein a plurality of impact absorbing sheets are secured to one another, with the crests on each sheet being positioned in engagement with a trough on an adjacent sheet.

4. A bumper as set forth in claim 1 wherein said mounting means is defined by an inner member secured to at least two of said troughs, and mounting brackets secured to said inner member and having means connectable with a vehicle.

5. A bumper as set forth in claim 4 wherein said inner member and brackets have cooperating means allowing said sheet to expand longitudinally upon impact.

6. A bumper as set forth in claim 5 wherein said cooperating means are defined by slots in said inner member, and fasteners passing through said slots and openings in said brackets.

7. A bumper as set forth in claim 1 including an outer member, and means securing said outer member to at least some of said crests.

8. A bumper as set forth in claim 7 wherein said securing means includes a plurality of fasteners, said fasteners being weakened so as to shear when said sheet expands upon impact.

9. A bumper as set forth in claim 8 wherein said mounting means is defined by an inner member secured to at least two of said troughs, and mounting brackets secured to said inner member and having means connectable with a vehicle.

10. A bumper as set forth in claim 9 wherein said inner member and brackets have cooperating means allowing said sheet to expand longitudinally upon impact.

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