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(54) Title: RECEPTACLE FOR A TOWING MEANS AND METHOD OF MANUFACTURE

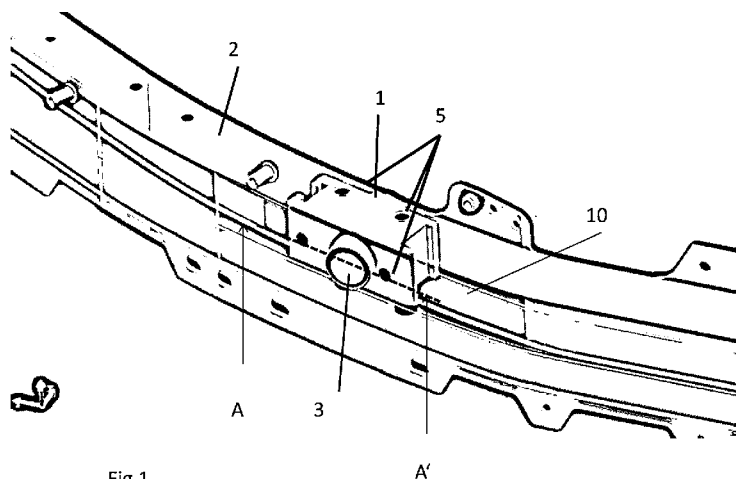


Fig.1

(57) Abstract: An arrangement is proposed of a receptacle consisting of multiple components for a towing means, especially a towing lug, on a support piece (1) attachable to the body of a motor vehicle, wherein the support piece is insertable into a receptacle on a cross member of the vehicle, and the support piece is to be joined with the cross member via friction-stir welds.



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RECEPTACLE FOR A TOWING MEANS AND METHOD OF MANUFACTURE

FIELD OF THE INVENTION

The invention relates to an arrangement of a receptacle for a towing means, especially a towing lug, on a support piece attachable to the body of a motor vehicle, as well as a method for manufacture of the arrangement.

BACKGROUND

Such arrangements of a receptacle for a towing means are generally known from prior art. To direct the forces arising during towing of the vehicle to a longitudinal member of the vehicle body, such receptacles must be arranged in the area where a front cross member connects with the longitudinal member. Otherwise, during the towing, excessively great bending stresses of the cross member would arise. As a rule, so-called crash boxes are implemented for the connection between the front cross member and the particular designated longitudinal members of the front-end structures of vehicle bodies. These serve for bracing the cross member to the particular longitudinal member. In the event of an accident, the crash box functions as a deformation element which partially absorbs the energies that arise, and protects the longitudinal member from damage at low speeds. However, as is known from prior art, the deformation behavior of the bending element is altered in disadvantageous fashion by application of a multi-component receptacle for a towing means directly to such a crash box (receptacle covered by bending member). The result is a so-called block formation, so that the bending carrier no longer is able to absorb the energies arising to the desired degree and transmit them on to the crash box.

From DE 102008057379 an arrangement is known for a receptacle for towing means, which discloses a supporting piece screw-connected with a cross member.

Screwed connections have a drawback in that they always display settling behavior, and that the screws to be used, as additional components, complicate assembly, and also contribute to additional weight.

SUMMARY OF EMBODIMENTS OF THE INVENTION

Thus it is the task of the present invention to further develop an arrangement of a multi-component receptacle for a towing means according to the preamble of Patent Claim 1, so that improved crash behavior is achieved.

This problem is solved by an arrangement of a multi-component receptacle for a towing means according to the preamble of Patent Claim 1.

The problem is solved specifically by a receptacle for a towing means, having multiple components, on a supporting piece attachable on the body of a motor vehicle, wherein the supporting piece is to be inserted into a receptacle on the cross member of a vehicle, and the support piece is to be attached to the cross member by friction stir welding. This special type of welding makes it possible to provide a very rigid connection of the carrying piece with the cross member of the vehicle, without negative screw attachments present. Omitting the screwed attachments makes the assembly simpler and more reliable.

In advantageous fashion the support piece has a borehole for a towing lug.

By configuring the support piece with catches and hooklike projections, the support piece exhibits a shape which makes it simple to slide the support piece into the cross member and position it at the right place.

In advantageous fashion the support piece serves as a spacer for the attachment device of additional crash boxes situated behind the cross member. Additionally, it is advantageous that the support piece is caulked into a T-shaped groove of the cross member. The groove facilitates assembly and positioning of the support piece.

For manufacture of the arrangement, it is advantageous for the support piece to be welded in the cross member before or after the bending process of the overall cross member.

Welding is done preferably via at least 2 friction-stir welding points.

In the further course of the procedure it is advantageous if the support piece, after being connected with the cross member, is further processed, and in particular, a borehole is made for a

towing lug. Possibly it could be advantageous to insert boreholes for the attachment of the crashbox perpendicular to the borehole for the towing lug.

In accordance with an aspect of at least one embodiment, there is provided a system for securing a towing lug to a vehicle that is to be towed, the system comprising: a cross member connected to a longitudinal member of the vehicle, the cross member having an interior cavity; and a support piece inserted into the interior cavity of the cross member, characterized in that: the support piece is fixedly attached to the cross member by friction-stir welding.

In accordance with an aspect of the at least one embodiment, the support piece exhibits a receptacle in the form of a borehole for a towing lug.

In accordance with an aspect of the at least one embodiment, the support piece on its end exhibits catches and hook-shaped projections.

In accordance with an aspect of the at least one embodiment the support piece serves as a spacer piece for an attachment device of a crash box.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described in what follows in exemplary fashion, with reference to the appended drawing.

Figure 1 is a schematic depiction of the exemplary embodiment form at the installation location.

Figure 2 shows a cross section along the axis A – A'.

Figure 3 shows a cross section along the axis B – B'.

DETAILED DESCRIPTION OF THE DRAWINGS

Figure 1 shows a cutout from a cross member 2, which is already bent in bowed fashion in this depiction.

As is shown in figure 1 the cross member exhibits at least one interior cavity 10. A support piece 1 is inserted into this cavity 10. The support piece is designed as an extruded profile. In this process, at no expense, details may be integrated such as a T-groove or projecting flanks for

reducing rigidity discontinuities. In the chosen embodiment example, a catch 6 and hooklike arrangements 7 are perceptible on the support piece, especially in figure 2.

Also shown in figure 1 is a towing sleeve 3 in the already completely assembled support piece 1. The reference symbols 5 designate friction-stir weld points, which are to be placed to the left and right of the towing sleeve 3 to produce a connection with the cross member 2.

Friction-stir welding is a known process for the joining of materials. The rotating pin and sleeve tools are placed at the point of connection. The heat thereby produced converts the material into a plastifiable, non-fusible state. The rotating sleeve penetrates into the “doughy” material. Simultaneously the “inner” pin is withdrawn from the tool; a cavity is produced. This resulting cavity admits the displaced volume. The stamp lies flat on the material surface; material is prevented from escaping in uncontrolled fashion. The sleeve penetrates through the upper sheet and reaches the lower layer.

During the retrograde movement, the sleeve is withdrawn from the joint zone.

At the same time the pin compresses the plastic material back into the joining area; the cavity is again filled. By a brief resetting of the tools, the material becomes fixed. A material-locking, point-shaped and flat-configured connection is achieved.

Figure 2 shows a cross section along the section line A – A'. The support piece 1 sits flush in a receptacle in a cavity 10 of cross member 2. Via the friction-stir weld points 5, the two components are connected to each other. A borehole 8 generates a through-running opening through both of the components, to admit a towing sleeve 3.

Figure 3 shows a cross section through the line B – B'. As shown in figure 3 a borehole 9 is provided for admitting a crash box. The crash box is not depicted in this drawing and would be located beneath the cross member 2. That the support piece is not screw-connected with the cross member, but rather via weld locations to be positioned as desired, poses no problem for placement of the boreholes 9 for a crash box potentially to be attached. The material of support piece 1 offers a spacer 4 for the through-running borehole.

The optimized manufacturing process for the cross member with the arrangement for a towing lug derives from extruded profiles. The cross member, and also the support piece itself, is manufactured from such an extruded profile.

The support pieces are produced from aluminum or magnesium extruded profiles. Alternatively, the support piece can also be made using a casting process.

In the manufacturing process, the two components are fitted together, and the support piece is caulked into the cross member. The next manufacturing step then is either joining of the components by welding and connection of the component combination into the desired form. The two final manufacturing steps can also be done in reverse: the component combination is then first bent, and only then is the support piece welded to the cross member.

Only after the welding and after the bending, are boreholes and apertures mechanically milled, and the requisite threadings cut. The additional steps in assembly of a cross member then proceed as already described in the prior art.

List of Reference Symbols

- 1 Support piece
- 2 Cross member
- 3 Towing sleeve
- 4 Spacer piece
- 5 Friction stir point
- 6 Catch
- 7 Hooklike arrangement
- 8 Borehole for towing lug
- 9 Borehole for crash box
- 10 Internal cavity

Claims

1. Arrangement of a towing receptacle on a support piece (1) attachable to a vehicle body, wherein the support piece (1) is inserted into an interior cavity (10) on a cross member (2) of the vehicle body, characterized in that the inserted support piece (1) is attached to the cross member (2) by friction-stir welding.
2. Arrangement according to claim 1, characterized in that the support piece (1) exhibits the towing receptacle in the form of a borehole for a towing lug (3).
3. Arrangement according to claim 1, characterized in that the support piece (1) on its end exhibits catches and hook-shaped projections.
4. Arrangement according to claim 1, characterized in that the support piece (1) serves as a spacer piece (4) for the attachment device of crash boxes.
5. Method for manufacture of an arrangement according to claim 1, characterized in that the support piece (1) is caulked into a T-shaped groove in the cross member (2).
6. Method according to claim 5, characterized in that, before or after the bending of the cross member into a bent end form, the support piece (1) is welded in the cross member (2).
7. Method according to claim 5, characterized in that, the support piece (1) is connected with the cross member (2) by at least two friction-stir weld points (5).
8. Method according to claim 5, characterized in that the support piece (1) after attachment to the cross member (2) is further processed.
9. Method according to claim 5, characterized in that the support piece (1) is drilled to admit at least one towing lug (3).
10. Method according to claim 9, characterized in that the support piece (1) is equipped with boreholes (9) perpendicular to the borehole for the towing lug (3).
11. Method for forming an automobile front cross member (2) having a receptacle arrangement for receiving a towing lug (3), the method comprising:

forming the cross member (2) with an interior cavity (10) for receiving a support piece (1);

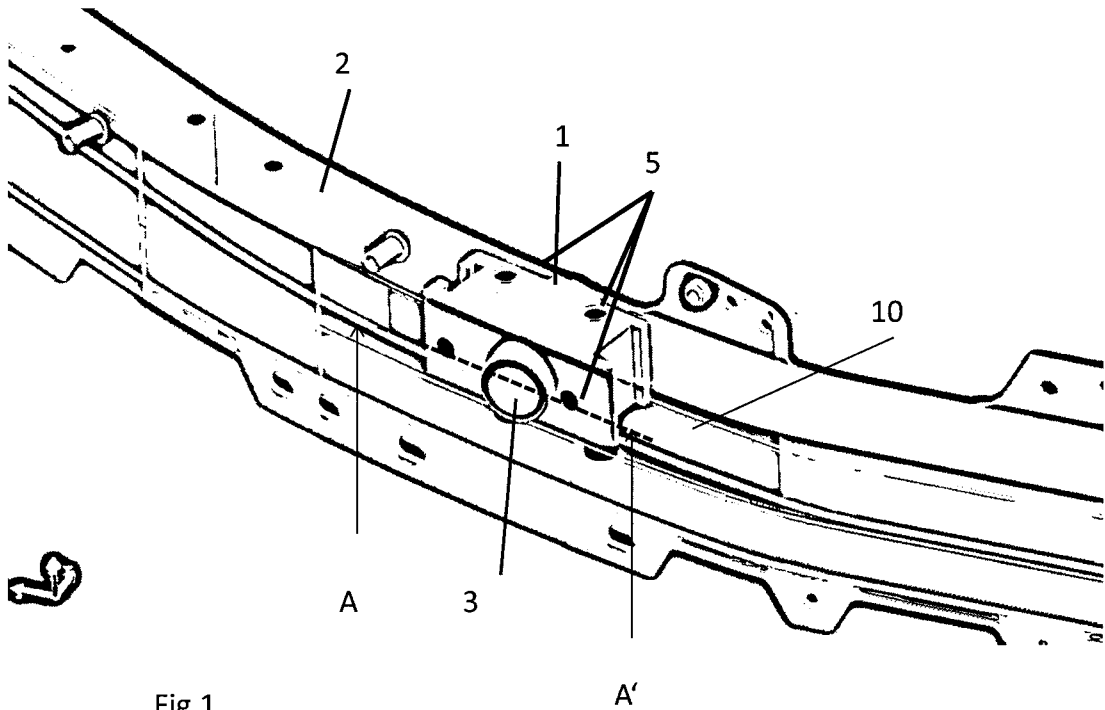
forming the support piece (1);

inserting the support piece (1) into the interior cavity (10) of the cross member (2);

Characterized by the step of:

attaching the support piece (1) to the cross member (2) by friction stir welding.

12. Method according to claim 11, characterized in that the support piece (1) is caulked into a T-shaped groove in the cross member (2).
13. Method according to claim 11, characterized in that the cross member (2) is bent into a bent end form before or after the support piece (1) is attached to the cross member (2) by friction stir welding.
14. Method according to claim 13, characterized in that the support piece (1) is drilled to admit at least one towing lug (3).
15. Method according to claim 14, characterized in that the support piece (1) is equipped with boreholes (9) perpendicular to the borehole for the towing lug (3).



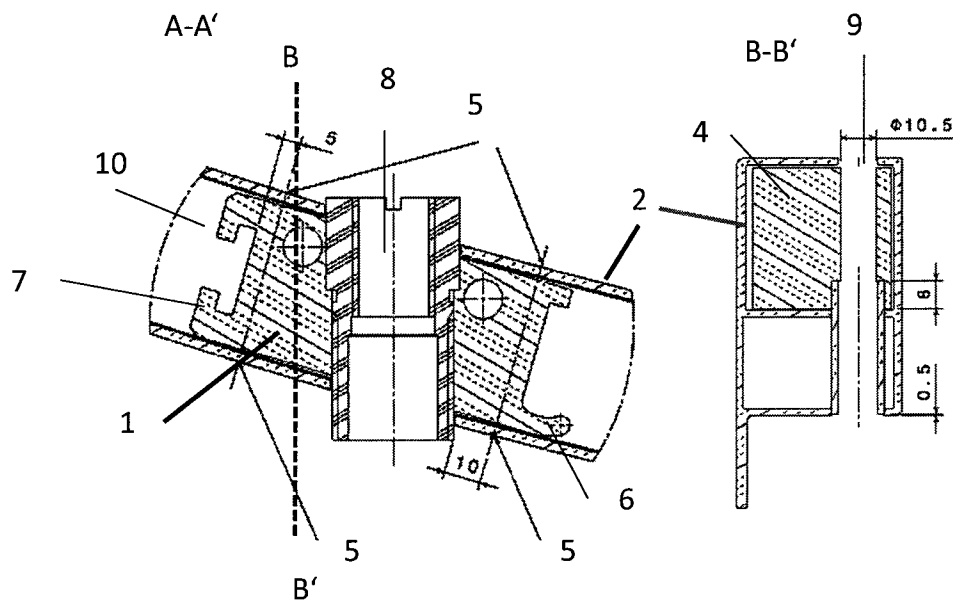


Fig.2

Fig.3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CA2014/000508

A. CLASSIFICATION OF SUBJECT MATTER
IPC: **B60D 1/48** (2006.01) , **B62D 63/04** (2006.01)

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(2006.01): B60D, B62D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
Canadian Patents Database, Questel-Orbit, TotalPatent
Search terms used: friction, welding, towing, lug, support, crash box and similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2006036158 A (FUTAMURA, S. et al.) 9 February 2006 (09-02-2006) *Abstract; Fig. 9*	1-15
P, A	US 8,678,423 B1 (HWANG, C.) 25 March 2014 (25-03-2014) *Abstract; Fig. 3*	1-15
A	DE 102008057379 A1 (STECK, M. et al.) 20 May 2010 (20-05-2010) *Abstract; Fig. 2*	1-15
A	US 2008/0001383 A1 (HODOYA, K. et al.) 3 January 2008 (03-01-2008) *Whole document*	1-15
A	WO 02/04253 A1 (ST JERN, T. A. et al.) 17 January 2002 (17-01-2002) *Page 3, lines 19-21*	1-15

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"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	

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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