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(54) **Crash barrier bracket**

(57) A bracket (28) for supporting a rail (20) of a road-side crash barrier or parapet (10) from a support post (12) is disclosed. The bracket is formed from a single sheet of metal bent into a shape, which, when mounted to a post and supporting a rail, has a uniform horizontal cross-section including parallel front and rear panels for

mounting to the rail and post respectively, and interconnecting sides. The shape of the cross-section provides a first deformation mode of the bracket in the event of an impact to the rail exceeding a first impact level, and a second mode of deformation of the bracket in the event of an impact exceeding a second, higher impact level.

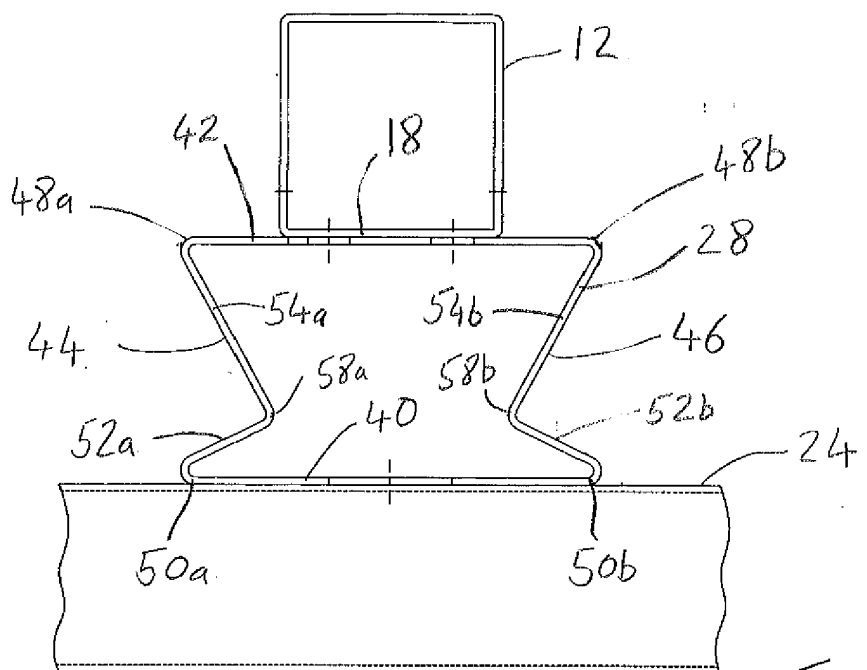


Figure 2.

Description

Field of the Invention

[0001] The present invention relates to a bracket for supporting a rail of a roadside crash barrier or parapet.

Background

[0002] Roadside crash barriers and parapets are designed to prevent vehicles from leaving the road along which they are travelling, in accordance with certain design standards. In recent years, particularly in the European Union, the standards have been revised requiring the barrier design to be proven in crash tests (as specified, for example, in EN.1317). In the case of parapet designs for use on bridges or steep hillside roads, the crash tests require that both small vehicles (cars) and larger vehicles, such as trucks are prevented from leaving the road. In the case of a small vehicle, or relatively low impact crash, it is preferable for the parapet to have some flexibility to avoid bringing a vehicle to too sudden a stop. However, for higher impacts, particularly with larger vehicles, the barrier needs to be stiffer to absorb more of the impact and prevent the vehicle passing too far over the edge of the road.

[0003] With this in mind various designs have been proposed, based on a series of posts or uprights, anchored to the ground, usually in a concrete footing, at the roadside. A number of rails at varying heights are supported off the posts by brackets. When a vehicle impacts a rail, the impact is transmitted through the brackets to the posts. To provide the required flexibility at low impact, and stiffness at higher impacts, brackets have been designed having two or more parts, in which a first bracket part collapses relatively easily under an impact. When the first part has collapsed by a certain amount, the impact is then transmitted into the second, stiffer part which will only collapse under a significantly higher impact. However, a problem with these designs is in their relative cost and complexity, especially in the installation of the multi-part support brackets.

[0004] The barriers and brackets disclosed herein have been conceived with the foregoing in mind.

Summary

[0005] According to one aspect, there is provided a bracket for supporting a rail of a roadside crash barrier from a support post. The bracket has the form of a continuous sheet of metal bent into a shape, which, when mounted to a post and supporting a rail, has a uniform horizontal cross-section, including parallel front and rear panels for mounting to the rail and post respectively, and interconnecting sides. The shape of the cross-section provides a first deformation mode of the bracket in the event of an impact to the rail exceeding a first impact level, and a second mode of deformation of the bracket

in the event of an impact exceeding a second, higher impact level.

[0006] The bracket may be formed from two or more sheet metal parts welded together.

[0007] In embodiments the horizontal cross-section is made up of straight web sections joined at bends.

[0008] In embodiments, the rear panel is adapted for attachment centrally to a front face of the support post and has ends separated by a lateral width that is greater than the width of the front face of the post. Preferably, the rear panel has a width of between 1.75 and 2.25 times the width of the front face of the post.

[0009] In embodiments the front panel has ends that are separated by a distance that is greater than the width of the front face of the post, and the interconnecting sides of the bracket each extend from one of the ends of the front panel to a corresponding one of the ends of the rear panel. Each of the interconnecting sides may comprise a pair of web portions, wherein first of the web portions extend inwardly towards each other and away from the rail at an angle to the rail of less than 45 degrees, preferably between 20 degrees and 40 degrees. Second of the web portions extend from the inward ends of the first web portions to the ends of the rear panel, the second web portions being longer than the first web portions and adjoining the ends of the rear panel at acute angles of more than 45 degrees, preferably between 50 degrees and 70 degrees.

[0010] According to another aspect there is provided a roadside parapet comprising a plurality of posts supporting a rail. At least one of the posts supports the rail by way of a bracket having the form of a continuous sheet of metal bent into a shape, which, when mounted to the post and supporting the rail, has a uniform horizontal cross-section that includes parallel front and rear panels for attaching to the rail and post respectively, and interconnecting sides. The shape of the cross-section provides a first deformation mode of the bracket in the event of an impact to the rail exceeding a first impact level, and a second mode of deformation of the bracket in the event of an impact exceeding a second, higher impact level.

[0011] The parapet may further comprise one or more additional rails mounted to the posts above the aforesaid rail. The aforesaid rail, supported on the bracket preferably extends a greater distance from the post towards the road than the additional rails.

Brief Description of the Drawings

[0012]

Figure 1 is an elevational cross-section through a post of parapet supporting three rails.

Figure 2 is a plan view in the direction of arrows A-A of Figure 1 showing a bracket supporting one of the rails.

Figure 3 is a plan view showing the bracket of Figures 1 and 2 in a first mode of deformation.

Figure 4 is a plan view showing the bracket of Figures 1 and 2 in a second mode of deformation.

Detailed Description

[0013] Referring to Figure 1, there is shown part of a parapet 10 having a post 12 with a base 14. The post 12 is secured at base 14 to a plinth 16, which is typically a concrete plinth forming the edge of a bridge or raised roadway. The post 12 is one of a series of posts spaced at intervals of typically a few meters from each other along the edge of the road. As shown in Figure 1 the road is to the right of the parapet, which is designed to prevent stray vehicles from leaving the roadway and dropping over the edge to the left of the parapet. The illustrated parapet has three rails, 20, 22, 24 supported by the post 12. The upper two rails 20, 22 are secured directly to a front face 18 of the post by bolts 26. The upper rails 20, 22 are formed of lengths a rectangular box-section (typically steel) oriented with their longer sides horizontal and shorter sides vertical. The lowest rail 24 is supported away from the post by a bracket 28. The bracket 28 is secured by bolts 30 to the front face 18 of the post 12 and the lowest rail 24 is secured to the bracket 28 by bolts 32.

[0014] Also shown in Figure 1 are connecting sleeves 34 surrounding each of the rails 20, 22, 24. These sleeves are only positioned at locations at the ends of each length of a rail where it is connected to another length of rail at the same height. Vertical bolts, 36, 38, secure the ends of the length of rail to the sleeves 34.

[0015] The bracket 28, which supports the lowest rail 24 is designed to have a progressive, or plural-mode deformation in the event of an impact from a vehicle on the lowest rail 24. The lowest rail 24 extends further towards the road than the upper two rails 20, 22. This means that it will be the lowest rail 24 that will be struck first by an impacting vehicle. In the case of a car or other small vehicle it may only be the lowest rail 24 that will be struck, especially if the vehicle impact is only a glancing blow. To limit the chances of injuring the occupants of the impacting vehicle, it is important that the lowest rail does not present too stiff an object so that it does not bring the vehicle to too sudden a stop and does not cause excessive damage to the vehicle. Therefore, in the first mode of deformation the bracket is relatively flexible, allowing the rail 24 to move a significant distance under the impact.

[0016] However, if the lowest rail 24 is struck by a larger vehicle, or is struck with a high impact by a smaller vehicle, then the deformation of the bracket in the first mode will not be sufficient to arrest or deflect the vehicle, or to absorb all of the impact. Therefore, after the bracket has been deformed by a certain amount in its first deformation mode, it is designed to undergo a second, stiffer mode of deformation. In this stiffer mode, the rail 24 does not move far and most of the impact is transferred to the post 12. In addition a larger vehicle impacting the parapet 10 will contact the upper rails 20, 22 after the lowest rail 24 has deformed to its limit (i.e. collapsed) under the first

mode of deformation.

[0017] A preferred embodiment of the bracket 28 is shown in Figure 2. Equivalent components have the same reference numerals as used in Figure 1. The bracket 28 is shown mounted to post 12, and rail 24 is shown mounted to the bracket 28. For clarity the fasteners (bolts) securing the bracket 28 to the post 12 and rail 24 have been omitted. The bracket 28 has a shape that provides the two modes of deformation as described above, and as will be discussed further below with reference to Figures 3 and 4. The bracket 28 is preferably has the form of a continuous sheet of metal bent into the shape shown. Although the bracket may be formed from a single sheet of metal, it may also conveniently be formed by welding two or more sheet metal parts together to provide the continuous sheet metal form shown. As shown in plan view, mounted to the post 12 and supporting the rail 24, the bracket has a uniform horizontal cross-section that includes parallel front 40 and rear 42 panels. Front panel 40 is mounted to the rail 24 and rear panel 42 to the post 12. The front and rear panels 40, 42 are interconnected by side panels, 44, 46 to be discussed further below.

[0018] The rear panel 42 includes means, such as fixing holes for receiving bolts, for attaching it centrally to the front face 18 of the post 12. The rear panel 42 extends either side of the post 12 to ends 48a, 48b. The rear panel 42 has a lateral width that is significantly greater than the width of the front face 18 of the post 12. Typically, the width of the rear panel 42 may be about twice, and is preferably between 1.75 and 2.25 times, the width of the front face 18 of the post 12.

[0019] The front panel 40 may extend as a continuous panel (as shown in Figure 2) along the side of the rail 24 mounted to it. However, it is also possible for the front panel 40 not be continuous, but to have separate portions extending inwardly from its outer ends with a gap between the portions. The front panel 40, or the separate portions, include means, such as fixing holes for receiving bolts, for attachment to the rail 24. The front panel has outer ends 50a, 50b that are separated by a distance similar to the width of the rear panel 42 and more than the width of the front face 18 of the post 12.

[0020] The interconnecting side panels 44, 46 are each formed as a pair of web sections 52a, 54a and 52b, 54b, interconnecting the front and rear panels 40, 42. The side panel 44 extends from the end 50a of the front panel 40 to a corresponding end 48a of the rear panel 42. The side panel 46 extends from the end 50b of the front panel 40 to a corresponding end 48b of the rear panel 42. Each of the side panels 44, 46 includes a first, shorter web portion 52a, 52b, and a second, longer web portion 54a, 54b. The first, shorter web portions 52a, 52b extend inwardly from the ends 50a, 50b of the front panel 42 towards each other and away from the rail at an angle to the rail of less than 45 degrees, preferably in the range 20 to 40 degrees. The second, longer web portions 54a, 54b extend from the inward ends 58a, 58b of the first, shorter web portions 52a, 52b to the ends 48a, 48b of

the rear panel 42. The second web portions 54a, 54b join the respective ends 48a, 48b of the rear panel at acute internal angles of more than 45 degrees, preferably in the range 50 to 70 degrees. The angle of the bends between the first and second webs at the locations 58a, 58b are preferably in the range 80 to 100 degrees.

[0021] As shown in Figure 2, the term "end" is used to describe the locations of the bends between the connecting panels or webs. Thus the "ends" 48a, 48b, 50a, 50b, 58a, 58b, are in fact the locations of bends between one straight section (panel or web) and another. In the embodiment shown, because the bracket 28 is formed by bending from a sheet of metal of a certain thickness, these bends each have a radius of curvature.

[0022] Figure 3 shows a first mode of deformation of the bracket 28 in the event of an impact to the rail 24. Equivalent components have the same reference numerals as used in Figures 1 and 2. Because the rear panel 42 is wider than the front face 18 of the post 12, the impact is transmitted through the bracket 28 to the post 12. The impact force applied to the rail 24 is transmitted into the front panel 40, along the side panels 44, 46 to the ends 48a, 48b of the rear panel 42. The reaction to the impact force by the post 12 occurs in the central portion of the rear panel 42. the rear panel 42 is therefore subjected to bending moments, which are highest at the positions 60a, 60b adjacent the edges of the front face 18 of the post 12.

[0023] As shown in Figure 3, the bracket 28 starts to deform at the positions 60a, 60b where the bending moments are largest such that the ends 48a, 48b of the rear panel 42 are pushed backwards relative to the front face 18 of the post 12. The effect of this deformation of the bracket 28 is for the angle between the second, longer web portions 54a, 54b of the side panels 44, 46 and the deformed rear panel 42 to reduce, eventually to a point where it resists further deformation (i.e. becomes stiffer). In this first mode of deformation there is relative large degree of movement in the bracket 28, meaning that the rail 24 can be pushed a significant distance towards the post 12.

[0024] If the impact forces are high enough (e.g. because the impact is from a larger vehicle), then further deformation of the rear panel 42 may continue, but at a slower rate as the stiffness increases. At a certain point, the stiffness of the deforming rear panel 42 will equal, or exceed, that of other parts of the bracket 28. In these circumstances, as shown in Figure 4, a second mode of deformation occurs. Equivalent components have the same reference numerals as used in Figures 1 to 3. The second mode of deformation involves a closing of the angles of the bends at the locations 50a, 50b, 58a, 58b between the front panel 40, the first, shorter web portions 52a, 52b, and the second, longer web portions 54a, 54b. In addition, in this second mode, there is a continued reduction of the angle of the bends at the locations 48a, 48b between the rear panel 42 and the longer web portions 54a, 54b. The second mode of deformation results in a flattening of the bracket towards the front panel 40,

as shown. The second mode of deformation results in a relatively small movement of the rail towards the post (compared with the first mode) meaning that there is a greater resistance to the impact of the vehicle and larger forces are transmitted to the post 12. It will be appreciated that the transition between the first and second modes of deformation need not be a sudden or instantaneous, but that there may be a progressive transition.

[0025] Once the bracket 28 has been deformed to its full extent, as shown in Figure 4, any additional load is transferred directly to the post 12. The rail 24 will then start to bend and deflect the post 12 with forces being transferred into the anchorage in the plinth 16 at the post base 14.

[0026] Figure 5 illustrates the modes of deformation of the bracket 28 mounted to the post 12 (the rail and fixing bolts have been removed for clarity), with the shapes of the bracket after deformation in each mode superimposed. Equivalent components have the same reference numerals as used in Figures 1 to 4. The initial bracket shape 28a is shown in solid outline; the shape 28b follows deformation in the first mode; and the shape 28c follows deformation in the second mode. The front panel 40 is shown as 40a in the undeformed bracket, 40b after the first mode deformation and 40c after the second mode deformation. As can be seen, the front panel 40 moves further towards the post 12 during deformation in the first mode, and does not move as far during deformation in the second mode. Also, it can be seen in Figure 5 that the width of the front panel 40 is reduced as the bracket is deformed. This is a consequence of the deformation of the side panels 44, 46 of the bracket and absorbs some of the energy of the impact.

[0027] It is a particular advantage of the bracket arrangement described above, that a single bracket component can be used to achieve plural modes of deformation and a progressive transition in the stiffness in the event of an impact. The use of a single component bracket not only reduces material and product costs compared with known multi-component bracket systems, but also simplifies the installation of a barrier or parapet. In addition, the use of a single bracket simplifies maintenance and replacement after an impact.

Claims

1. A bracket for supporting a rail of a roadside crash barrier from a support post, the bracket having the form of a continuous sheet of metal bent into a shape, which, when mounted to a post and supporting a rail, has a uniform horizontal cross-section including parallel front and rear panels for mounting to the rail and post respectively, and interconnecting sides, wherein the shape of the cross-section provides a first deformation mode of the bracket in the event of an impact to the rail exceeding a first impact level, and a second mode of deformation of the bracket in

- the event of an impact exceeding a second, higher impact level.
2. The bracket of claim 1 wherein the horizontal cross-section is made up of straight web sections joined at bends. 5
 3. The bracket of claim 1 or claim 2 wherein the rear panel is adapted for attachment centrally to a front face of the support post and has ends separated by a lateral width that is greater than the width of the front face of the post. 10
 4. The bracket of claim 3 wherein the rear panel has a width of between 1.75 and 2.25 times the width of the front face of the post. 15
 5. The bracket of any preceding claim wherein each of the interconnecting sides comprises a plurality of straight web sections. 20
 6. The bracket of any of claims 3 to 5, wherein the front panel has ends that are separated by a distance that is greater than the width of the front face of the post, and wherein the interconnecting sides of the bracket each extends from one of the ends of the front panel to a corresponding one of the ends of the rear panel. 25
 7. The bracket of claim 6 wherein each of the interconnecting sides comprises a pair of web portions, wherein the first web portions extend inwardly towards each other and away from the rail at an angle to the rail of less than 45 degrees, and wherein the second web portions extend from the inward ends of the first web portions to the ends of the rear panel, the second webs being longer than the first webs and adjoining the ends of the rear panel at acute angles of more than 45 degrees. 30 35
 8. The bracket of claim 7 wherein the first web portions extend inwardly towards each other and away from the rail at an angle to the rail of between 20 degrees and 40 degrees. 40
 9. The bracket of claim 7 or claim 8 wherein the second 45
adjoin the ends of the rear panel at an angle of between 50 degrees and 70 degrees.
 10. The bracket of claim 3 or claim 4 wherein the front panel is spaced from, and extends substantially parallel to, the rear panel and has ends that are separated by a distance that is greater than the width of the front face of the post; and the bracket further comprises 50
a pair of web sections interconnecting the front panel and the rear panel, one of the pair extending from each of the ends of the front panel to a corresponding one of the ends of the rear panel, each web section 55
- including a first web and a second web,
wherein the first webs extend inwardly towards each other and away from the rail at an angle to the rail of less than 45 degrees,
wherein the second webs extend from the inward ends of the first webs to the ends of the rear panel, the second webs being longer than the first webs and adjoining the ends of the rear panel at acute angles of more than 45 degrees.
11. The bracket of any preceding claim wherein the bracket has a depth between the post and the rail that is between 50% and 75% of the lateral width of the rear panel of the bracket.
 12. The bracket of any preceding claim further comprising means for attaching the rear panel centrally to a post, and means for attaching the front panel to a rail.
 13. A roadside parapet comprising a plurality of posts supporting a rail, wherein at least one of the posts supports the rail by way of a bracket as recited in any of the preceding claims.
 14. The parapet of claim 12 further comprising one or more additional rails mounted to the posts above said rail.
 15. The parapet of claim 13 wherein said rail, supported on said bracket extends a greater distance from the post towards the road than the additional rails.

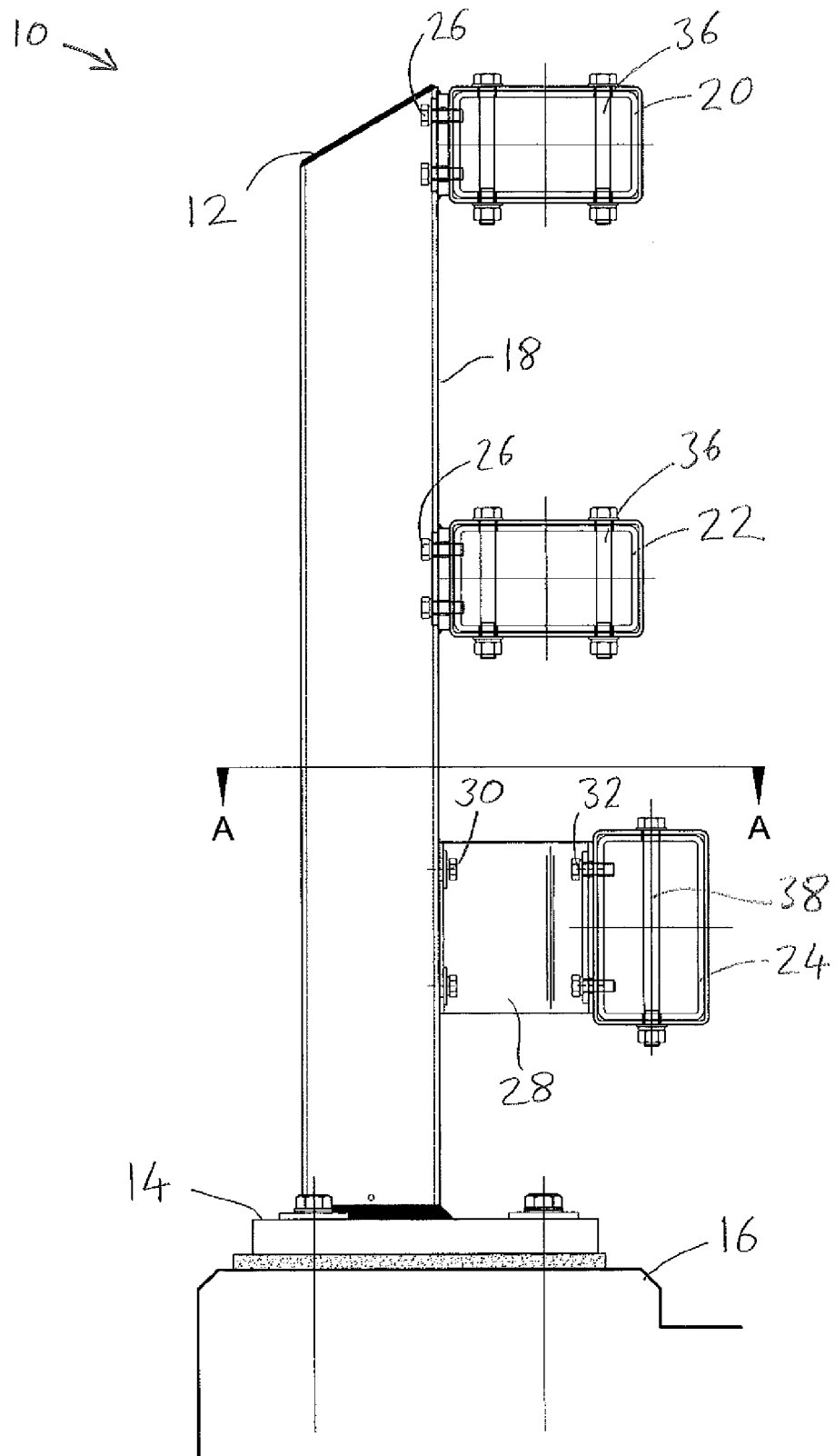


Figure 1

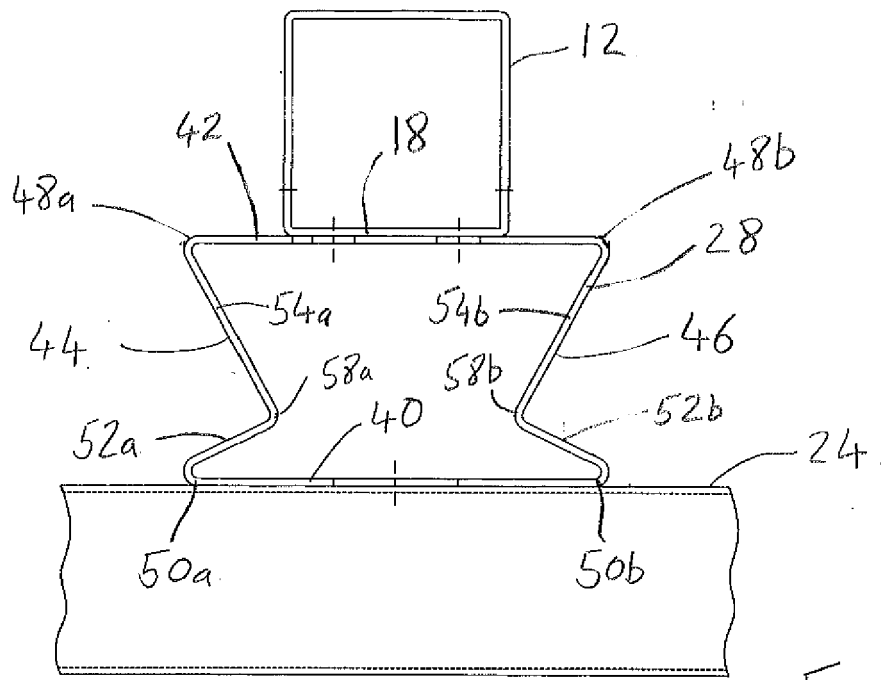


Figure 2

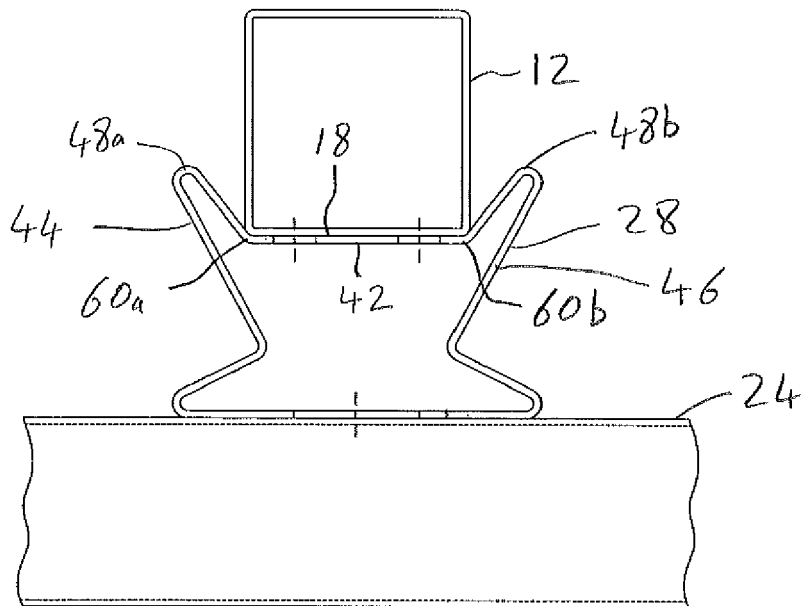


Figure 3

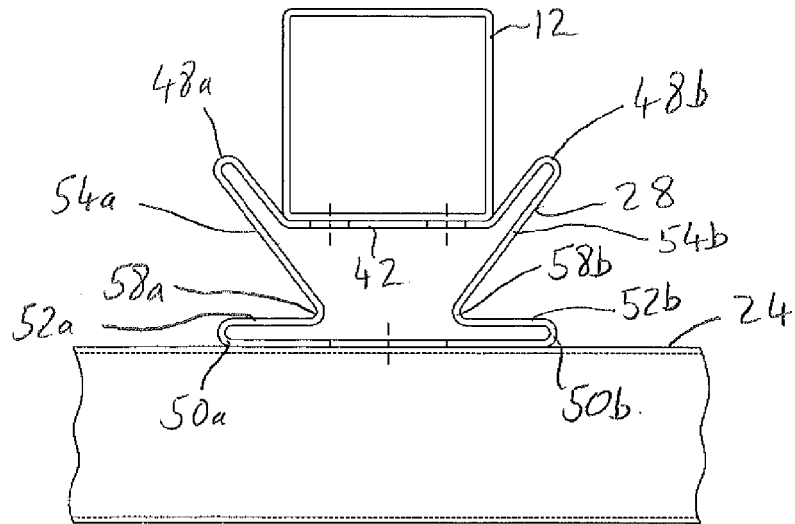


Figure 4

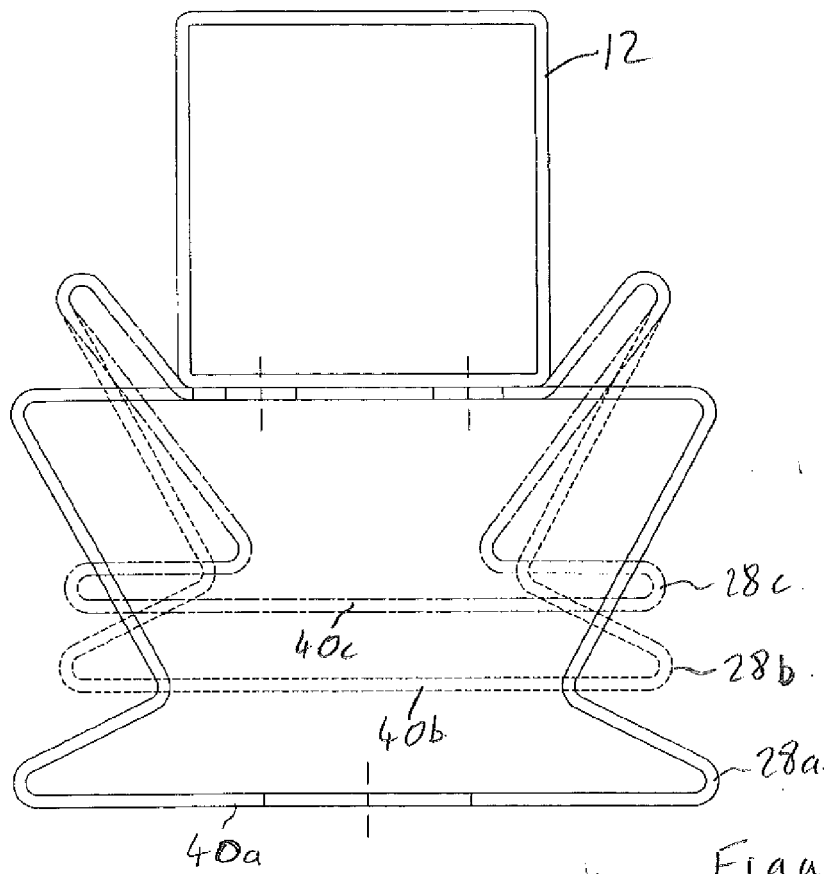


Figure 5



EUROPEAN SEARCH REPORT

Application Number
EP 13 27 5312

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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A	EP 1 496 160 A1 (PROFILES DU CT [FR]) 12 January 2005 (2005-01-12) * paragraphs [0001], [0005] - [0011], [0016] - [0018], [0021] * * figure 7 *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			E01F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 March 2014	Examiner Kremsler, Stefan
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 13 27 5312

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