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(71) Applicant : **GRUNDY PARAPETS LIMITED**
Unit 28, Balfour Business Centre, Balfour Road
Southall, Middlesex UB2 5BD (GB)

(71) Applicant : **COTTERGRADE LIMITED**
44-46 Deeside Industrial Estate, Welsh Road
Deeside, Clwyd (GB)

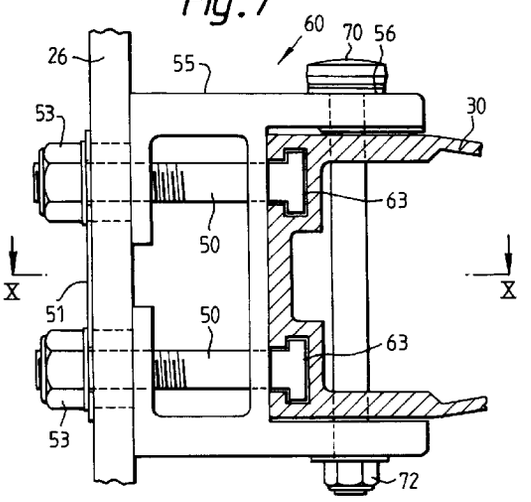
(72) Inventor : **Yardley, Ralph**
44-46 Deeside Industrial Estate, Welsh Road
Deeside, Clwyd CH5 2LR (GB)
Inventor : **Tyson, Ronnie**
5 Carlton Avenue
Feltham, Middlesex (GB)

(74) Representative : **Harland, Linda Jane**
c/o Reddie & Grose 16 Theobalds Road
London WC1X 8PL (GB)

(54) Safety parapet.

(57) A safety parapet of the kind used on road bridges and at road edges to prevent vehicles leaving the road comprises at least two posts (20) and a rail (30). The rail (30) is secured to at least one of the posts (20) by means of an elongate fastener (50) having an enlarged head and a body of smaller transverse dimension. The head of the fastener (50) is received in a recess (32) formed in the rail (30), the recess (32) having a relatively large part in which the head is located with the body of the fastener (50) projecting to a relatively narrow opening towards the post (20). The free end of the fastener (50) engages the post (20) to secure the rail to it. Disposed between the post and the rail is a spacer (60) through which the fastener (50) passes. The spacer (60) has an abuttment surface which abutts the rail (30) so as to oppose deformation of the rail (30) in the region of the recess (32). The spacer (60) abutts the rail (30) across its entire transverse dimension and has at least one flange (56) extending to an angle to the abuttment surface. The flange (56) fits closely, in use, against a longitudinal surface of the rail (30). Preferably, the spacer (60) has two flanges (56) so arranged as to fit closely against two opposite longitudinal surfaces of the rail (30). The spacer (60) may also include tie means (70) which extend through an opening formed in the rail (30) the tie means engaging at each of its ends one of the flanges (56) on the spacer (60) so as to secure the rail (30) to the spacer (60). The construction described can produce a parapet capable of meeting safety standards imposed by government authorities.

Fig. 7



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The present invention relates to safety parapets of the kind used on road bridges and at road edges to prevent vehicles leaving the road should their drivers, for any reason, lose control of them and in particular to a parapet comprising at least two posts and a rail extending between them, the rail being secured to at least one post by means of an elongate fastener having an enlarged head and a body of smaller transverse dimension, the head of the fastener being received in a recess formed in the rail, the recess having a relatively large part in which the head is located with the body of the fastener projecting through a relatively narrow opening towards the post, the free end of the fastener engaging the post to secure the rail to it.

In this country, such parapets must meet standards laid down by the Department of Transport to ensure that, in use, there is a minimal risk of the safety parapet collapsing or breaking under the loads likely to be imposed on them by a crashing vehicle.

Safety parapets currently in use mostly consist of a relatively simple arrangement of posts and rails secured together and to the ground so as to form a net-like construction which will retain an out-of-control vehicle without breaking. It will be apparent that, for such a construction, it is important that the joints between the components from which the parapet is formed are sufficiently strong and reliable that there is little risk of the parapet construction coming apart when struck by a vehicle. It is not sufficient that the posts and rails be strong, although this is also, of course, of importance.

At least one existing parapet system in use at present uses posts and rails of hollow cross-section, the rails being bolted to flanges formed on the posts. With this arrangement, the heads of the bolts used to fasten the posts and rails together are retained in T-shaped or keyhole-type slots formed in the rear of the rails where they abut the posts. The other ends of the bolts pass through the posts and are secured with suitable nuts.

It has recently been found that there is a danger that when subjected to loads of the magnitude likely to occur when a vehicle crashes into the parapet, the metal edges which form the T-section slots may deform, bending outwards, to allow the bolts to pop out of the slots and the rail to separate from the post.

In accordance with a first aspect of the invention the safety parapet is characterized in that there is disposed between the post and the rail a spacer through which the fastener passes and which has an abutment surface which abuts the rail so as to oppose deformation of the rail in the region of the recess, the spacer abutting the rail across the entire transverse dimension thereof and having a flange extending at an angle to the abutment surface, the flange fitting closely, in use, against a longitudinal surface of the rail.

The spacer may have two such flanges arranged to fit closely against opposite longitudinal surfaces of the rail.

In a second aspect, the parapet of the invention is characterized in that there is disposed between the post and the rail a spacer through which the fastener passes; the spacer being provided with at least one projecting lug shaped to be received and retained in the recess formed in the rail so as to secure the spacer to the rail. Preferably the spacer has two sets of projecting lugs spaced along a line and parallel to one another; the lugs of one set being aligned with the lugs of the other set.

An embodiment of the invention will now be described in detail, by way of example, with reference to the drawings, in which:

Figure 1 is a diagrammatic sketch of a safety parapet;

Figure 2 is a sectional plan view through a post of a safety parapet in accordance with the present invention;

Figure 3 is a side elevation of the post of Figure 2;

Figure 4 is a detailed sectional view of an intermediate spacer member by means of which a rail is secured to the post of Figure 3.

Figure 5 is a detailed sectional view of a modified spacer member in accordance with the invention;

Figure 6 is an elevational view from the rear of the spacer member of Figure 5 secured to a post and a rail;

Figure 7 is an elevational sectional view of the spacer of Figure 5, in use;

Figure 8 is a plan sectional view through the spacer of Figure 5 along the line x-x therein;

Figure 9 is a detailed sectional view of a third form of spacer in accordance with the invention; and

Figure 10 is a fragmentary side view of the spacer of Figure 9.

As mentioned above and as illustrated in Figure 1, a safety parapet 10 in accordance with the invention comprises a plurality of generally vertical, spaced posts 20, between which extend a number, in this case, three, continuous rails 30.

The posts 20, as can be seen from Figures 2 and 3, are generally rectangular in cross-section and are hollow. Each hollow section is formed from two U-shape sections 22 and 24 welded together at points 23 part way along the longer sides of the rectangular cross-section. The section 24, which, in use, is adjacent the rails 30, is so shaped that the shorter side of the rectangular cross-section is extended on each side to form an outwardly directed flange 26.

At its bottom end, each post 20 has a generally flat aluminium base plate 25 with bolt holes by means of which the post 20 can be secured to a suitably firm foundation. For strength, the vertical rectangular hol-

low section is welded, as indicated at 28, to the base plate 25 around its entire periphery. To facilitate the positioning of the post 20 onto the base plate for welding, the base plate 25 is formed with a transverse step 21 against which the post 20 can be positioned. At its top, the post 20 is closed by means of a cap 29.

The rail 30 is formed as a hollow extruded aluminium section. At the side of the rail 30, which in use faces the posts 20, the extrusion is shaped to define two parallel longitudinally-extending T-section slots 32. The slots 32 are dimensioned so that the broad part 33 of the slot will accept the head 52 of a fixing bolt 50 with the shaft of the bolt protruding through the narrow opening 34 of the slot towards the posts 20. The other ends of the bolts 50 pass through holes formed in the outwardly-directed flanges 26 on the posts 20 to secure the rails 30 to the posts 20. An elongate aluminium two-hole flat washer 51 is interposed between the securing nuts 53 and the flange 26 to give greater security.

The lips 35 which define the narrow opening 34 of the slots 32 serve to retain the bolts 50 in engagement with the rails 30. However, as outlined above, it has been found that the existing parapets which use this arrangement of T-shaped slots 32 to capture the bolt heads 52 in the rail 30, may fail in exactly the circumstances in which it is most important that they should not do so. When subject to a load, for example, due to a vehicle crashing into the parapet, the lips 35 deform sufficiently to allow the bolt heads 52 to escape from the slots 32 and, hence, to permit the rail 30 to separate from the post 20. The main area of deformation is at the points marked A on Figure 4, the lips 35 tending to bend outwards in the direction of arrows B.

With a view to preventing this, the safety parapet includes a spacer bracket 40 which is interposed between the rail 30 and the post 20.

The spacer bracket 40 is generally of rectangular C-shaped cross-section with inwardly directed flanges 42 at its open side. The flanges 42 abut, in use, against the post 20 and are provided with through holes 43 aligned with the holes in the flanges 26 on the post 20 through which the bolt 50 passes. The spacer bracket 40 is provided with a further set of holes 44 opposite the holes 43 so that the bolts can pass right through the spacer 40.

The wall 45 of the spacer bracket 40 opposite the flanges 42, in which the holes 43 are formed butts up against the lips 35 which define the T-shaped slots 32 in the rail 30. However, the wall 45 of the spacer 40 is also extended transversely of the rail 30 so that it extends the full width of the rail 30 and then is turned to form a pair of parallel flanges 46 which extend away from the post 20 to lie close to the upper and lower surfaces of the rail 30. The close fit of the flanges 46 around the rail 30 helps to keep the lips 35 undistorted at the point A where they are most likely to bend under a load.

The spacer 40 is held firmly by the bolts 50 so that it 'embraces' the edge of the rail 30. This engagement substantially reduces the likelihood of the lips 35 defining the T-shaped slots 32, bending out of shape and, hence, allowing the bolt heads 52 to escape from the slots and the rail 30 to separate from the posts 20.

Figures 5, 6 and 7 show a modified spacer bracker 60 similar to that of Figure 4 but capable of providing even greater security.

Again, the spacer bracket 60 is generally C-shaped construction with inwardly directed flanges 62 at its open side which, in use, abut, and are secured to, the post 20. The spacer bracket 60 is secured to the post 20 by means of bolts 50 as described above.

The flanges 56 which embrace the rail 30 are, however, of more substantial construction than the flanges 46 of the spacer bracket 40. Preferably, the flanges 56 are formed as extensions of the side walls 55 of the C-shaped structure which abuts the post 20. Furthermore, the flanges 56 are provided with through holes 58 opposite one another.

A tie in the form of a bolt 70 passes through the holes 58 in the flanges 56 and through suitable openings in the rail 30 and is secured by means of a locking nut 72. The bolt 70 serves to secure the rail 30 even more securely to the spacer bracket 60 and, hence, to the post 20.

In addition, the spacer bracket 60 is provided with a plurality of T-section lugs 63 which are shaped to fit into and be retained by the T-section slots 32 in the rail 30. The lugs 63 are spaced longitudinally so that the heads of the bolts 50 can be located between them as shown in Figure 8.

In practice, to assemble the parapet, the bolts 50 are passed through the holes in the spacer bracket 60 and then the lugs 63 and bolt heads are slid into the T-section slots 32 in the rail 30 from the end of the rail 30. The bolts 50 can then be secured to flanges 26 of the posts 20.

The two sets of lugs 63 which fit into the two T-section slots 32 are arranged so that the lugs 63 of one set are aligned with the lugs of the other and thus the gaps between them in which the heads of the bolts 50 locate are also aligned.

The spacer shown in Figures 5 to 7 is particularly secure. It is not always necessary, however, to reach such a high standard. In other jurisdictions and in other circumstances, lower standards of safety may be acceptable. Figure 9 shows a spacer 90 which is less secure than that of Figure 5 but which is still capable of performing adequately where lower standards are acceptable.

The spacer 90 can be viewed as a hybrid of those shown in Figures 4 and 5. The spacer 90 comprises a flat plate 91 which is interposed, in use, between the post 20 and the rail 30. At opposite edges, the

plate 91 is provided with flanges 96 which extend generally perpendicularly to the plate 91. The flanges 96 fit closely along opposite parallel faces of the rail 30 in a similar manner to the flanges 46 of the spacer 40 and flanges 56 of spacer bracket 60, described above.

The plate 91 is also provided with T-section lugs 93 which locate in the T-shaped cross-section slots 32 in the rail 30 in a similar manner to the lugs 63 shown in Figure 5. The interengagement of the lugs 93 in the slots 32 helps to secure the spacer 90 to the rail 30.

The plate 91 is then secured to the flanges 26 of the post 20 by means of bolts 100. As can be seen from Figure 10, the bolts 100, whose heads are also received in the T-section slots 32 in the rail 30, are spaced longitudinally from the lugs 93.

It will be appreciated that the spacer 90, which is of simpler construction than spacer 60 shown in Figure 5 (not having a C-section body or bolts passing through the flanges 96 to secure them to the rail), is considerably cheaper to manufacture.

Claims

1. A parapet comprising at least two posts (20) and a rail (30) extending between them, the rail (30) being secured to at least one post (20) by means of an elongate fastener (50; 100) having an enlarged head and a body of smaller transverse dimension, the head of the fastener (50; 100) being received in a recess (32) formed in the rail, the recess having a relatively large part in which the head is located with the body of the fastener (50; 100) projecting through a relatively narrow opening towards the post (20) the free end of the fastener (50; 100) engaging the post (20) to secure the rail (30) to it; the parapet being characterized in that there is disposed between the post (20) and the rail (30) a spacer (40; 60; 90) through which the fastener (50; 100) passes and which has an abutment surface which abuts the rail (30) so as to oppose deformation of the rail (30) in the region of the recess (32), the spacer (40; 60; 90) abutting the rail (30) across the entire transverse dimension thereof and having a flange (46; 56; 96) extending at an angle to the abutment surface, the flange (46; 56; 96) fitting closely, in use, against a longitudinal surface of the rail (30).

2. A parapet according to claim 1 in which the spacer (40; 60; 90) has two flanges (46; 56; 96) so arranged to fit closely against two opposite longitudinal surfaces of the rail (30).

3. A parapet according to claim 2 in which tie means (70) extend though an opening formed in the rail (30), the tie means (70) engaging at each of its ends one of the said flanges (56) so as to secure the rail(30) to the spacer (60).

4. A parapet according to claim 3 in which the tie means comprises a bolt (70) secured by means of a locking nut (72).

5. A parapet according to any preceding claim in which the spacer (60; 90) is provided with at least one projecting lug (63; 93) shaped to be received and retained in the recess (32) formed in the rail (30) so as to secure the spacer (60; 90) to the rail (30).

6. A parapet comprising at least two posts (20) and a rail (30) extending between them, the rail (30) being secured to at least one post (20) by means of an elongate fastener (50; 100) having an enlarged head and a body of smaller transverse dimension, the head of the fastener (50; 100) being received in a recess (32) formed in the rail (30) the recess (32) having a relatively large part in which the head is located with the body of the fastener (50; 100) projecting through a relatively narrow opening towards the post (20), the free end of the fastener (50; 100) engaging the post (20) to secure the rail (30) to it; the parapet being characterized in that there is disposed between the post (20) and the rail (30) a spacer (60; 90) through which the fastener (50, 100) passes; the spacer (60; 90) being provided with at least one projecting lug (63; 93) shaped to be received and retained in the recess (32) formed in the rail (30) so as to secure the spacer (60; 90) to the rail (30).

7. A parapet according to claim 6 or 7, in which the spacer (60; 90) is provided with at least two projecting lugs (63; 93) which engage recesses (32) formed in the rail (30) at locations spaced both longitudinally and vertically of the rail (30).

8. A parapet according to claim 7, in which the spacer (60; 90) has two sets of projecting lugs (63; 93) spaced along a line and parallel to one another; the lugs of one set being aligned with the lugs of the other set.

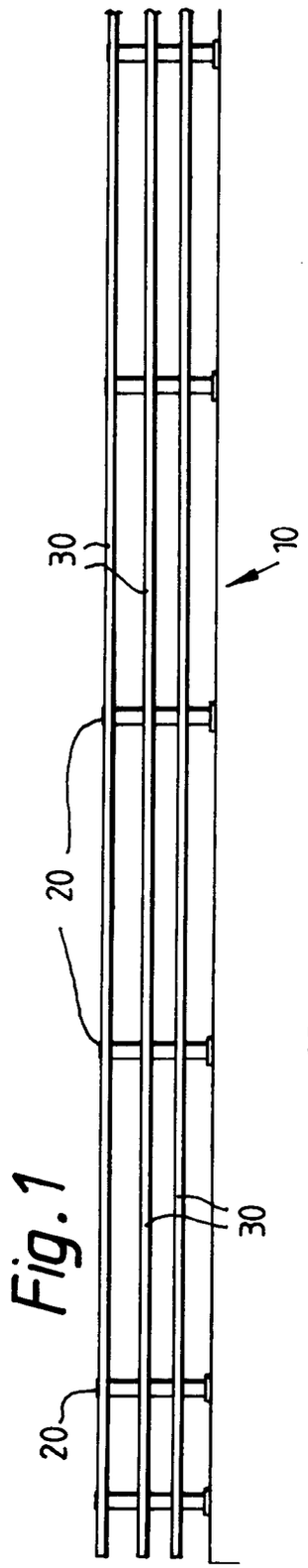


Fig. 1

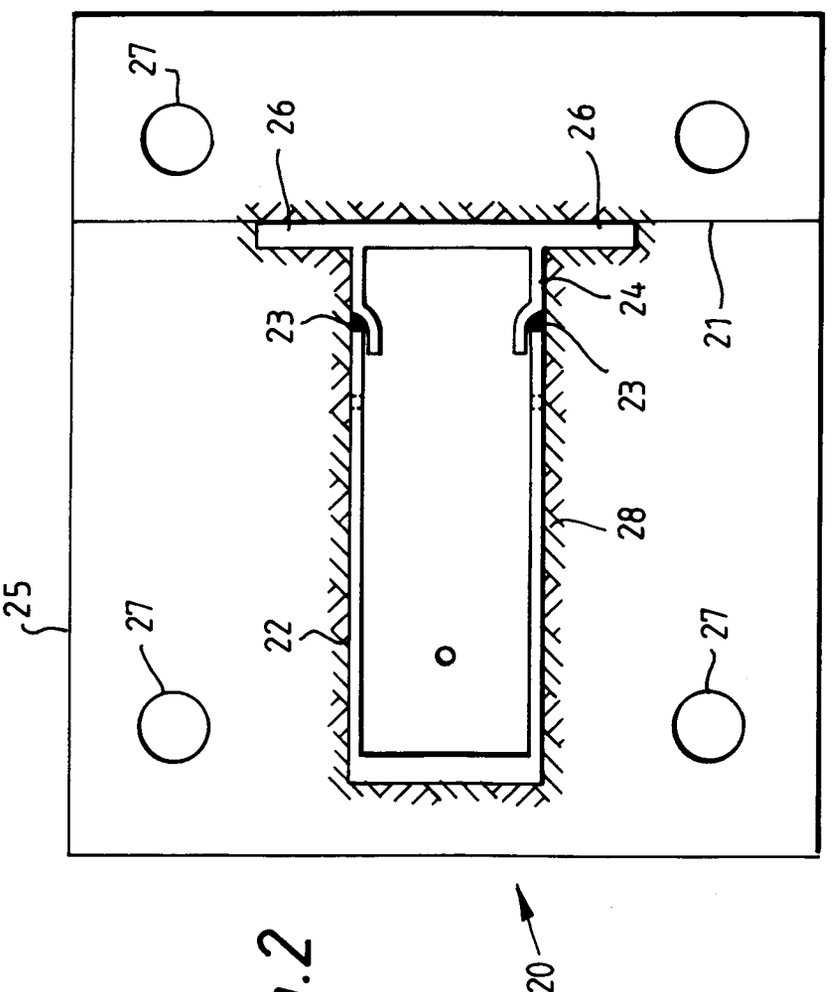


Fig.2

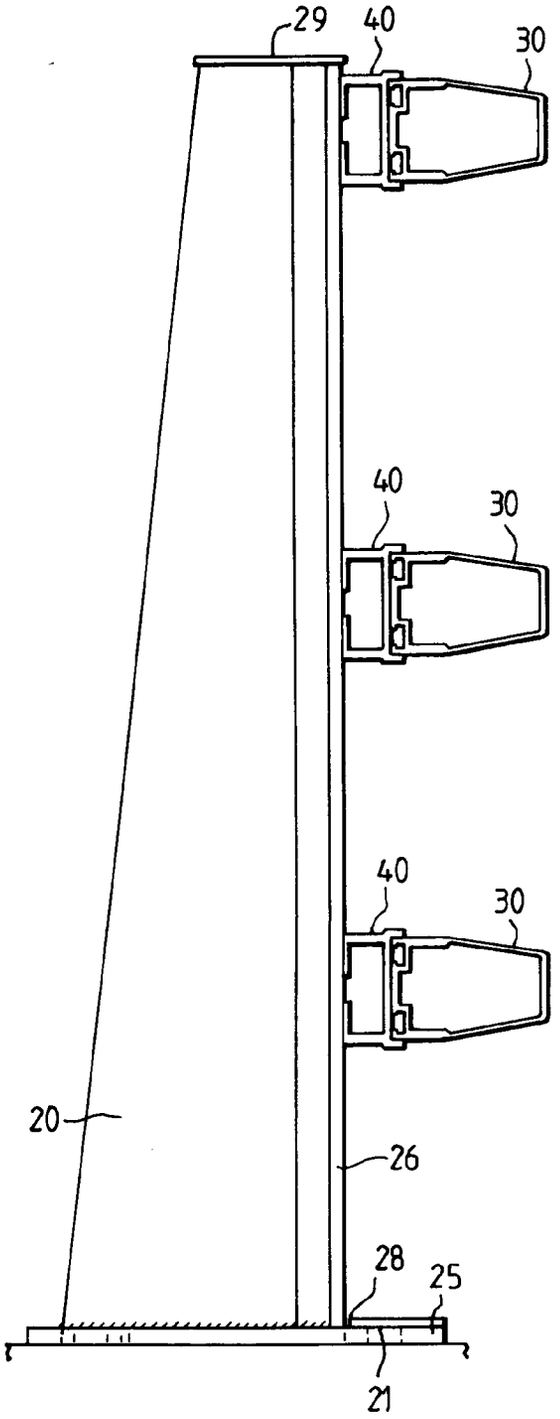
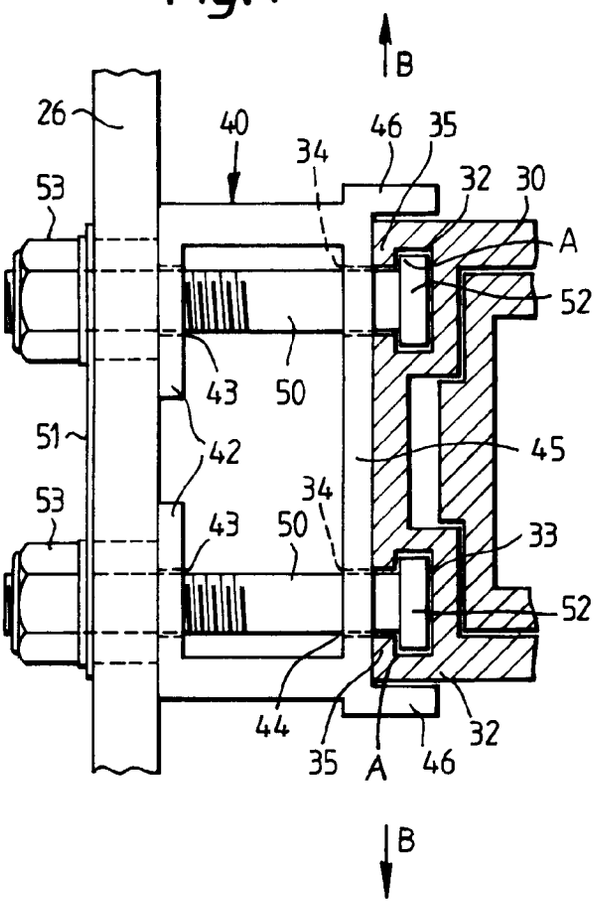

29
40
30
40
30
40
30
20
26
28
25
21

Fig.3

Fig.4


B
26
40
46
35
34
32
30
53
A
52
43
50
51
42
45
53
34
43
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33
52
44
35
A
46
32
B

Fig. 5

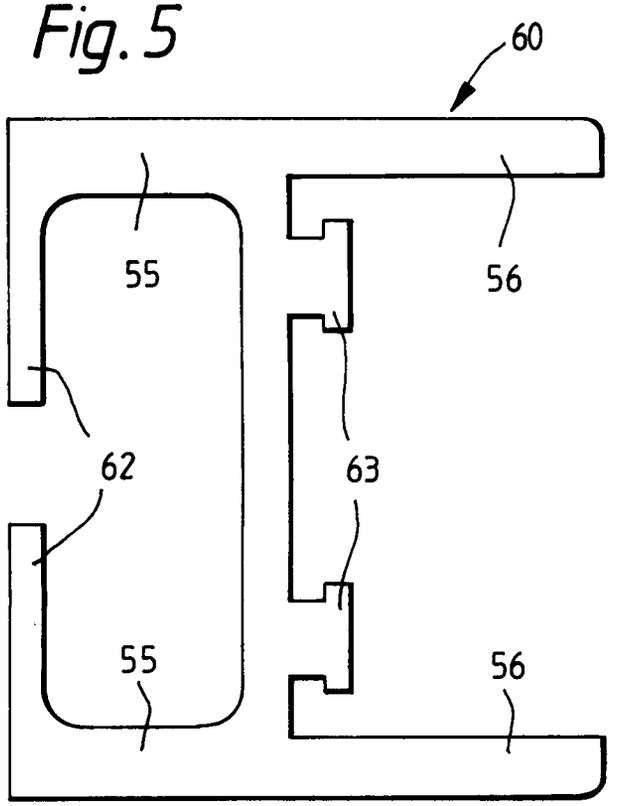


Fig.6

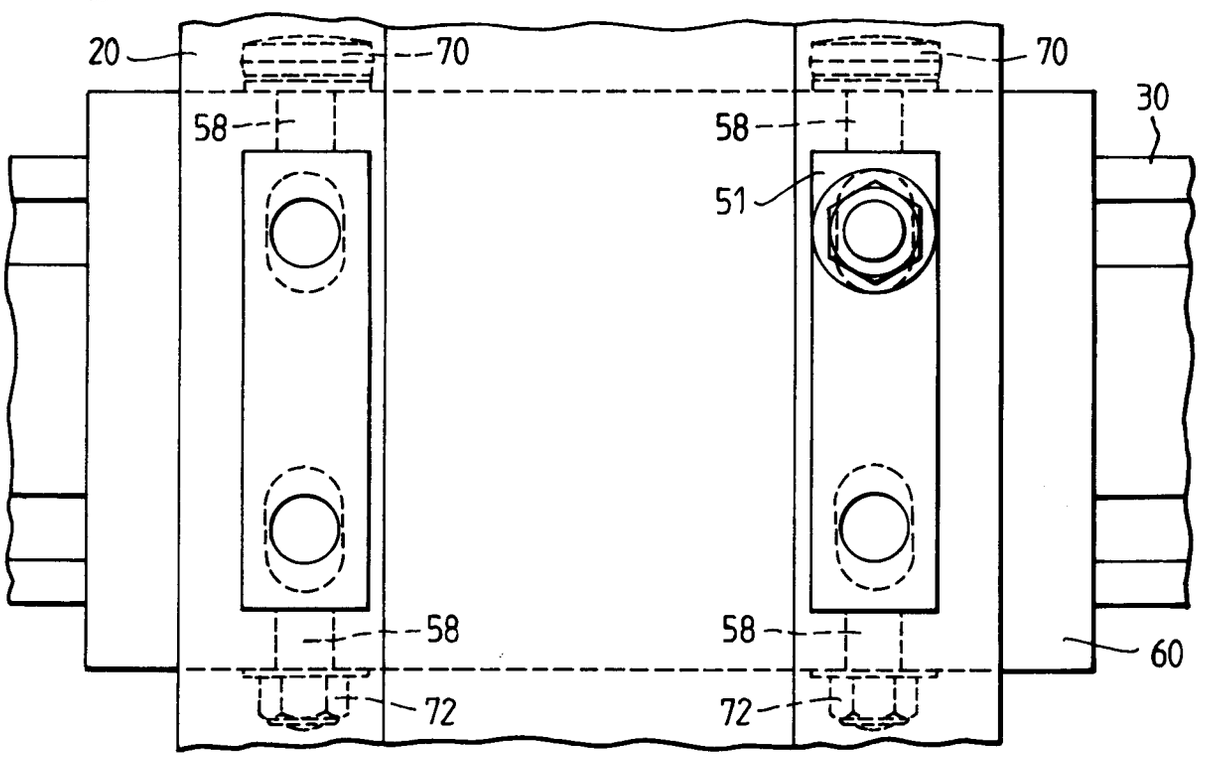
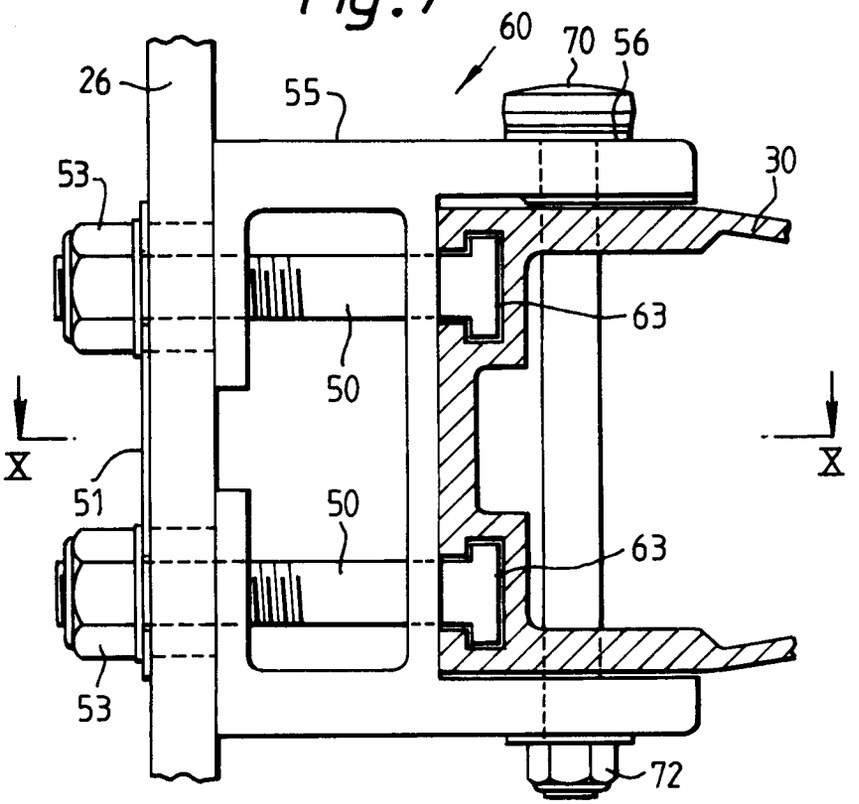


Fig.7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70
56
26
55
30
53
63
50
X
X
51
50
63
53
72

Fig.8

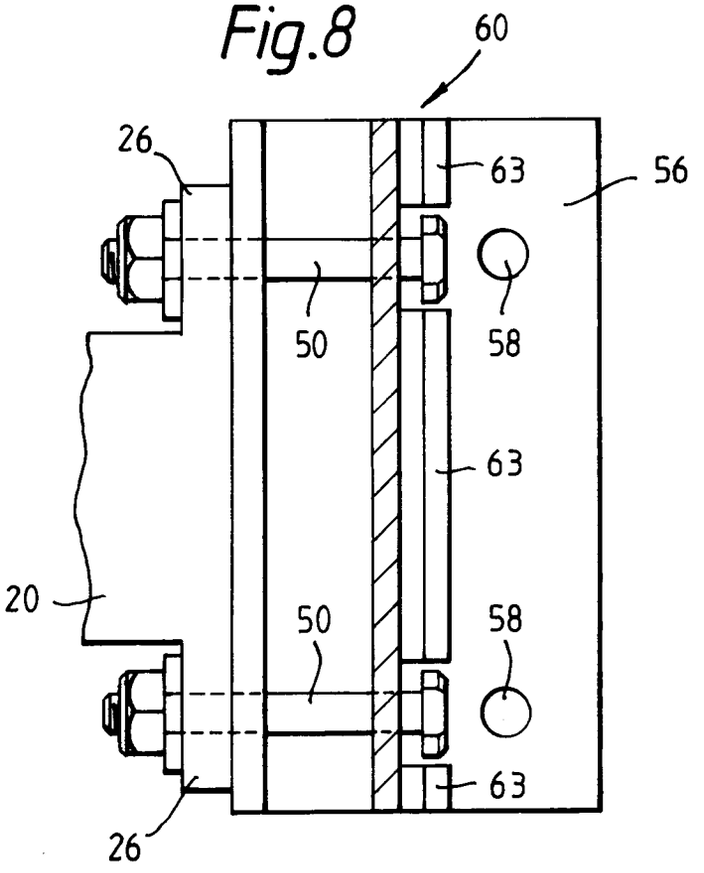

60
26
63
56
50
58
63
20
50
58
63
26

Fig.9

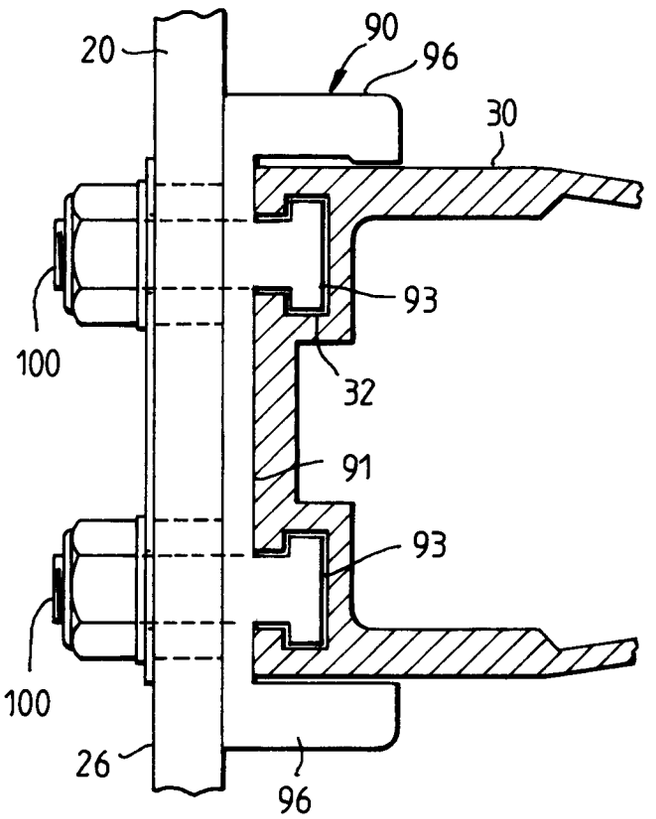
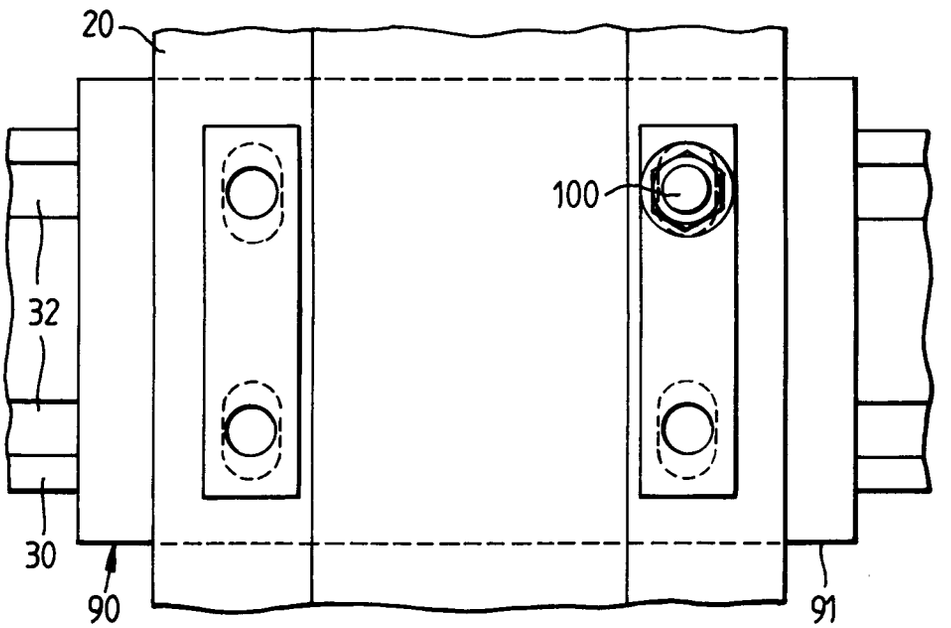


Fig.10



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EUROPEAN SEARCH REPORT

Application Number
EP 93 30 3710

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	GB-A-1 396 301 (BRITISH ALUMINIUM) * figures 1,3 *	1,6	E01D19/10
A	EP-A-0 216 712 (L'EQUIPEMENT ROUTIER) * abstract; figures *	1,6	
A	US-A-3 258 250 (MCMULLIN) * figures *	1,6	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

E01D
E01F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26 AUGUST 1993	DIJKSTRA G.

CATEGORY OF CITED DOCUMENTS

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