



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
28.07.2004 Bulletin 2004/31

(51) Int Cl.7: **E01F 15/04, E01D 19/10**

(21) Application number: **04250233.6**

(22) Date of filing: **17.01.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT RO SE SI SK TR
 Designated Extension States:
AL LT LV MK

(72) Inventor: **Mustard, Trevor Raymond**
Oakham, Rutland, LE15 6HB (GB)

(74) Representative: **Downing, Michael Philip et al**
Fry Heath & Spence LLP,
The Gables,
Masset Road
Horley, Surrey RH6 7DQ (GB)

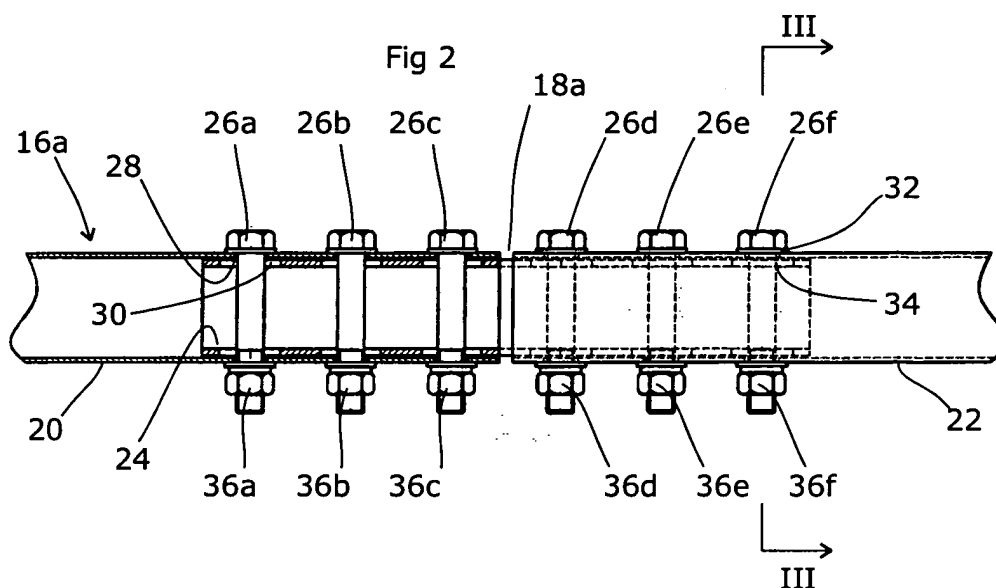
(30) Priority: **25.01.2003 GB 0301759**
25.01.2003 GB 0301758

(71) Applicant: **Corus UK Limited**
London SW1P 4WY (GB)

(54) **Parapet**

(57) A parapet comprises a plurality of uprights affixable to a substrate and a plurality of rails supported by the uprights, each rail being formed from a plurality of lengths of substantially equiaxed box section affixed to the uprights at a point along their length and joined end to end at locations between uprights. A suitable cross-sectional aspect ratio is less than between 1.4 and 1.1. The preferred external dimension of each side of the box section is between 60 and 90 millimetres, and

the application also relates to such a rail per se. In a further aspect, the application describes a parapet comprising a plurality of uprights and at least one rail supported by the uprights, the uprights and rail being formed of steel and connected via bolts of stainless steel. It is preferred that the uprights and rails are galvanised. This avoids the requirement to touch up the bolts and any other fastenings with zinc paint in order to provide continuous galvanic protection to the entire structure.



Description

FIELD OF THE INVENTION

[0001] The present invention relates to a parapet. It has particular (but not exclusive) use alongside roads and other transport infrastructure links, for example at bridges or adjacent steep inclines.

BACKGROUND ART

[0002] Where a road passes over a bridge or adjacent to a steep downward incline, there is a risk that vehicles travelling thereon will fall from the roadway if poorly steered or if deflected from their intended steering line such as following accidental impact, for example with other vehicles. In such cases, the consequences would be serious both for the occupants of the vehicle and any personnel or installations below.

[0003] It is therefore normal to protect against such occurrences through the installation of parapets alongside the roadway. Regulations govern the properties of the parapet, in particular its effect on the deviating vehicle and the severity of impact that it must withstand.

[0004] Parapets generally consist of a plurality of uprights affixed to the bridge or roadside and to which are attached a plurality of rails running alongside the road. Some parapets are in the form of an upright wall of concrete or other suitable material. Rails can also be attached to such parapets to cushion an impact. A deviating vehicle that impacts the rails is then 'shepherded' along the road and prevented from leaving same. This will typically involve some deformation of the parapet structure, and the maximum permissible outward deflection is referred to as the working width.

[0005] Similar considerations apply to rail and other transport infrastructure. Accordingly, where this application refers to roads or the like, the skilled reader should understand that reference to other forms of transport infrastructure is to be inferred.

SUMMARY OF THE INVENTION

[0006] The present invention seeks to provide an improved form of parapet. It addresses that part of the parapet that acts on the deviating vehicle, i.e. the rail.

[0007] The present invention therefore provides a parapet comprising a plurality of uprights affixable to a substrate and a plurality of rails supported by the uprights, each rail being formed from a plurality of lengths of substantially equiaxed box section affixed to the uprights at a point along their length and joined end to end at locations between uprights.

[0008] In some known designs, the rails are in the form of elongate lengths that are joined at their ends to the uprights. Thus, each length traverses the distance between a pair of uprights. This is extremely inflexible and means that the location of uprights is dictated by

the parapet design and cannot be adjusted to local conditions. It also means that any error in the location of the uprights will result in a local weakening of the parapet. By providing rails that are affixed to the uprights along their length rather than at their ends, the invention avoids these difficulties.

[0009] A substantially equiaxed box section can be achieved by providing a box section with a cross-sectional aspect ratio less than 1.4. Particularly preferred aspect ratios are less than 1.2 and less than 1.1.

[0010] The preferred external dimension of each side of the box section is between 60 and 90 millimetres. Particular preferred sections are between 60 and 80mm, more preferably 65 to 75 millimetres.

[0011] In another aspect, the present invention provides a parapet comprising a plurality of uprights affixable to a substrate and at least one rail supported by the uprights, the rail being a substantially equiaxed box section, in which the external dimension of each side of the box section is between 60 and 90 millimetres. We have found that this dimensional range is particularly preferable in terms of the performance of the parapet. It will be preferred that there are a plurality of rails, typically at least two or three, but this aspect of the invention is applicable to parapets containing any number of rails.

[0012] In both of the above aspects, the substrate to which the uprights are affixable can be the edge of a bridge, or the edge of a roadway adjacent to a steep drop, or any suitable substrate adjacent a road.

[0013] In a further aspect, the present invention provides a parapet comprising a plurality of uprights and at least one rail supported by the uprights, the uprights and rail being formed of steel and connected via bolts of stainless steel. It is preferred that the uprights and rails are galvanised.

[0014] Hitherto, when installing steel parapets it has been necessary to touch up the bolts and any other fastenings with zinc paint, in order to provide continuous galvanic protection to the entire structure. We propose to use stainless steel bolts to fasten the part together, thereby avoiding this step.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] An embodiment of the present invention will now be described by way of example, with reference to the accompanying figures in which;

Figure 1 schematically illustrates the parapet of the present invention,

Figure 2 is a partially sectioned view from the side of a rail used in the present invention;

Figure 3 is a section on III-III of figure 2;

Figure 4 is a view of the rail from above;

Figure 5 is a view of the connection insert of figures 2 to 4, from above;

Figure 6 is a view of the connection insert from one end;

Figure 7 is a partially sectioned view from the side of an alternative form of rail used in a second embodiment of the present invention;

Figure 8 is a section on VIII-VIII of figure 7;

Figure 9 is a view of the rail from above;

Figure 10 is a view of the connection insert of figures 7 to 9, from above; and

Figure 11 is a view of the connection insert from one end.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0016] Referring to Figure 1, a parapet generally designated as 10 comprises an array of uprights 12 of which two are shown. These are secured on mountings 14 to a substrate (not shown). The substrate may be (for example) the edge of a bridge or a roadside verge adjacent a steep drop, or any location where it is important that cars do not leave the roadway.

[0017] Three rails 16a, 16b, 16c are attached to the uprights 12 in a generally parallel arrangement. It is comparatively normal for there to be between one and three rails although the invention is applicable to parapets having any number. As can be seen in Figure 1, all three rails have a join at 18a, 18b, 18c.

[0018] Figures 2 - 6 show the join in more detail. Each rail, for example rail 16a, is not typically formed of a continuous length but is formed of a plurality of sub-lengths 20, 22. These sub-lengths 20, 22 are each in the form of 80mm square 3.2mm thick steel first box sections, joined end-to-end at the join 18a. At the join, a smaller size 70mm square 5mm thick second box section 24 is located inside the first box sections 20, 22. Thus, the first sections 20, 22 almost abut and at their ends the second box section 24 extends into both otherwise free ends of the first box sections 20, 22.

[0019] The second box section 24 is then secured in place by six stainless steel M20x120mm bolts 26a-26f. Three bolts, 26a, 26b and 26c pass through 25mm diameter apertures 28 in the first box section 20 and aligned 25mm apertures 30 in the second box section 24, whilst the remaining three bolts 26d, 26e and 26f pass through like apertures 32 in the remaining first box section 22 and aligned apertures 34 in the second box section 24. The bolts are spaced at 75mm in each rail, the bolt closest the join being 60mm therefrom. All six bolts are secured using corresponding stainless steel nuts 36a - 36f and stainless steel washers as required.

[0020] The use of stainless steel bolts provides corrosion protection. All other parts are hot dip galvanised, and stainless steel bolts do not then need to be touched up with a zinc coating.

[0021] Figures 7-11 show a second embodiment. This generally corresponds to the first and therefore like reference numerals are used where possible. The second embodiment differs in that the apertures 30, 34 in the second box section 24 are elongate, their long axis being aligned with the length of the second box section 24. A suitable oval is a 25mm diameter circle extended by 20mm, i.e. by about 80% of a diameter. This means that prior to tightening of the bolts 26a - f, there is a degree of latitude in the exact relative longitudinal position of the first box sections 20, 22.

[0022] Once the bolts are tightened, provided the second box section is a snug fit within the first, the first will deform slightly so as to clamp the second box section in place and provide the necessary rigidity, whilst still allowing for expansion and contraction due to movement of the substrate.

[0023] Meanwhile, the longitudinal adjustability allowed by this embodiment allows for minor tolerances in the precise length of the rail sections 20, 22 and the location of the uprights 12 to be corrected for. As the parapet will typically be several tens of meters long, it is not generally possible to predict in advance the precise length needed, at least to millimetre accuracy.

[0024] The dimensions set out above are of course by way of example only and could be varied within normal engineering limits as required by the particular circumstance. Furthermore, substantially the same design could be obtained by adopting dimensions within about 20% and/or 10mm of the above figures.

[0025] It will be appreciated that the features of the third embodiment could be combined with the features of the first or the second embodiment as necessary, as can the features of the first and second embodiments.

[0026] This invention shows distinct benefits as compared to existing designs, and solves problems inherent therein. It provides a standardised rail end detail, simplified fabrication, and tolerance provision. The stainless steel bolts solve corrosion issue, and the entire structure is suited to manufacture in steel of J2 impact quality.

[0027] The use of an equiaxed box section for the rail (e. a box section whose two thickness dimensions are generally the same) offers advantages in use. In practice, the rail must exhibit a certain bulk strength in order to restrain a vehicle that would otherwise depart the roadway. This translates into a certain amount of material in the cross-section of the rail. It was apparent to us that the use of rails with a small vertical dimension and a large horizontal dimension, as has hitherto been the case, in effect gives the rail a cutting edge along which the vehicle slides. By making this edge more blunt, the rail can have less effect on the vehicle.

[0028] It is not desirable to make the rail depth signif-

icantly lesser than its height, since its rigidity perpendicular to its length will then be reduced. This could adversely affect its restraining ability. In existing designs, this consideration has been paramount. However, we have discovered that there is room to adopt a wider front face without sacrificing the necessary rigidity, and that the best compromise between these competing factors is therefore to adopt an equiaxed section.

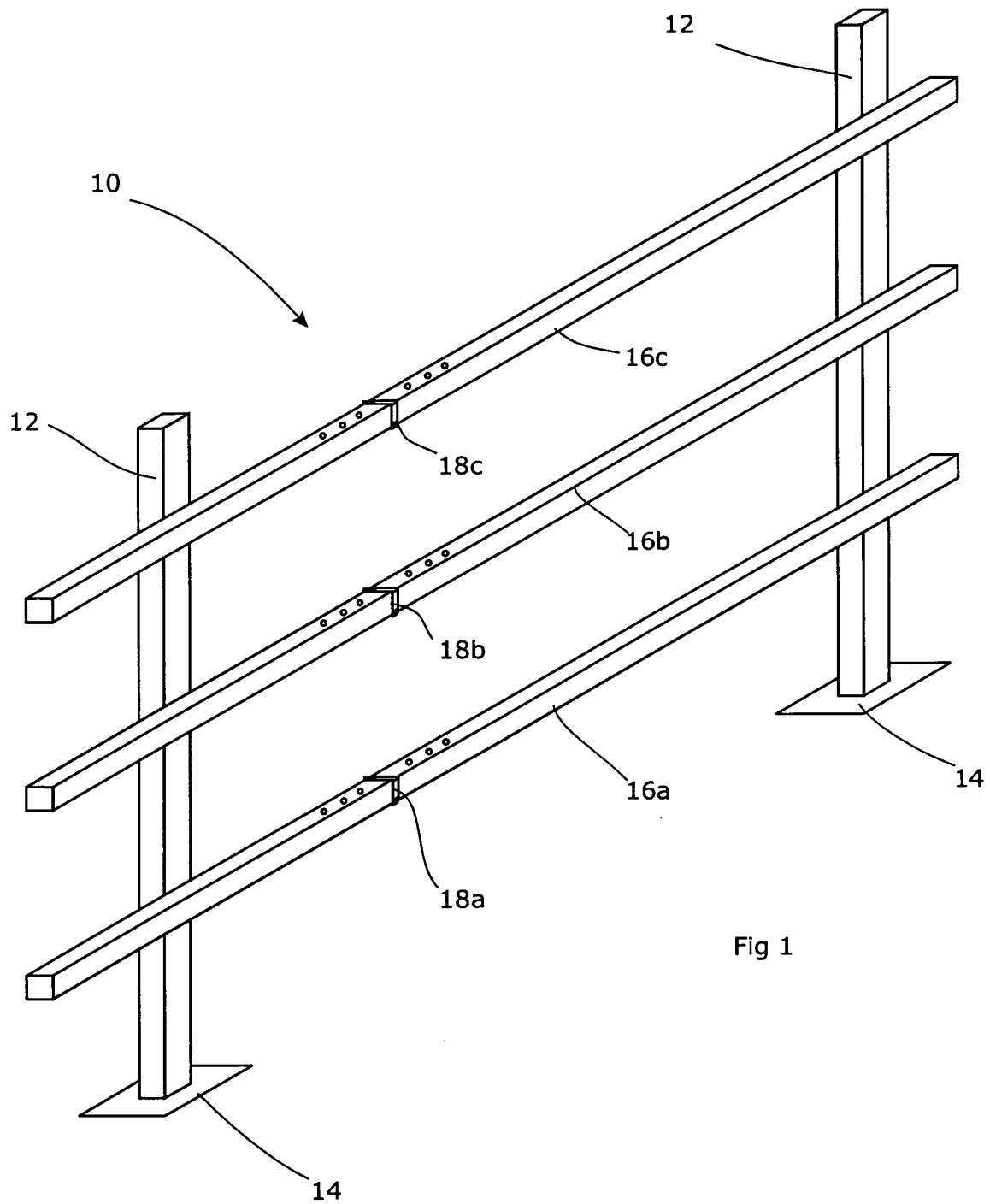
[0029] It will of course be understood that many variations may be made to the above-described embodiment without departing from the scope of the present invention.

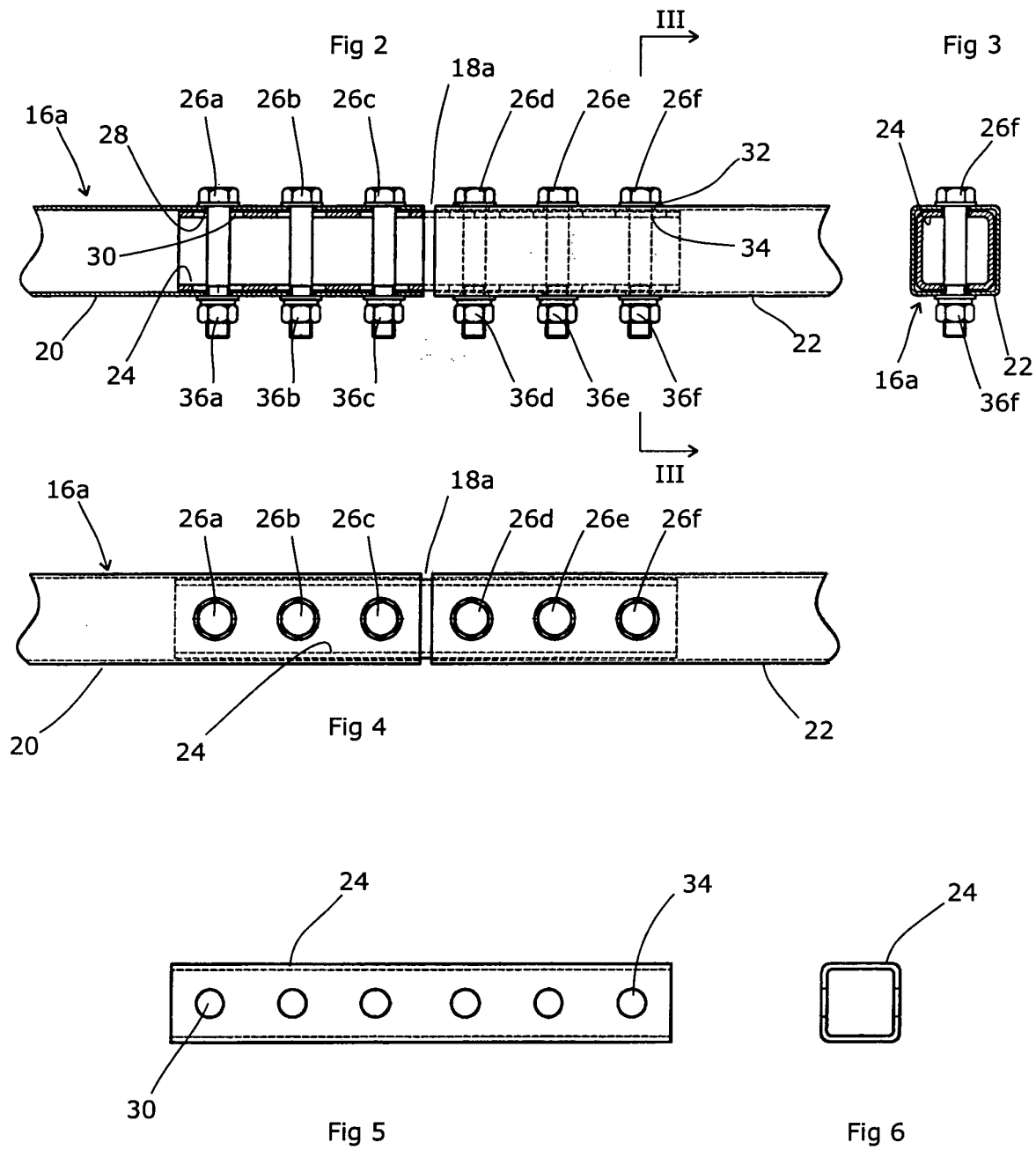
Claims

1. A parapet comprising a plurality of uprights affixable to a substrate and a plurality of rails supported by the uprights, each rail being formed from a plurality of lengths of substantially equiaxed box section affixed to the uprights at a point along their length and joined end to end at locations between uprights. 20
2. A parapet according to claim 1 in which the box section has a cross-sectional aspect ratio less than 1.4. 25
3. A parapet according to claim 1 in which the box section has a cross-sectional aspect ratio less than 1.2.
4. A parapet according to claim 1 in which the box section has a cross-sectional aspect ratio less than 1.1. 30
5. A parapet according to claim 1 in which the external dimension of each side of the box section is between 60 and 90 millimetres. 35
6. A parapet according to claim 1 in which the external dimension of each side of the box section is between 65 and 75 millimetres. 40
7. A parapet comprising a plurality of uprights affixable to a substrate and at least one rail supported by the uprights, the rail being a substantially equiaxed box section, in which the external dimension of each side of the box section is between 60 and 90 millimetres. 45
8. A parapet according to claim 7 in which the external dimension of each side of the box section is between 65 and 75 millimetres. 50
9. A parapet according to claim 7 or claim 8 in which there are a plurality of rails.
10. A parapet according to any one of the preceding claims in which the substrate to which the uprights are affixable is one of the edge of a bridge, the edge of a roadway adjacent to a steep drop, or a verge 55

adjacent a road.

11. A parapet according to any one of the preceding claims, formed of steel.
12. A parapet according to claim 11 in which the steel is galvanised.
13. A parapet comprising a plurality of uprights and at least one rail supported by the uprights, the uprights and rail being formed of steel and connected via bolts of stainless steel.
14. A parapet according to claim 13 in which the uprights and rails are galvanised.





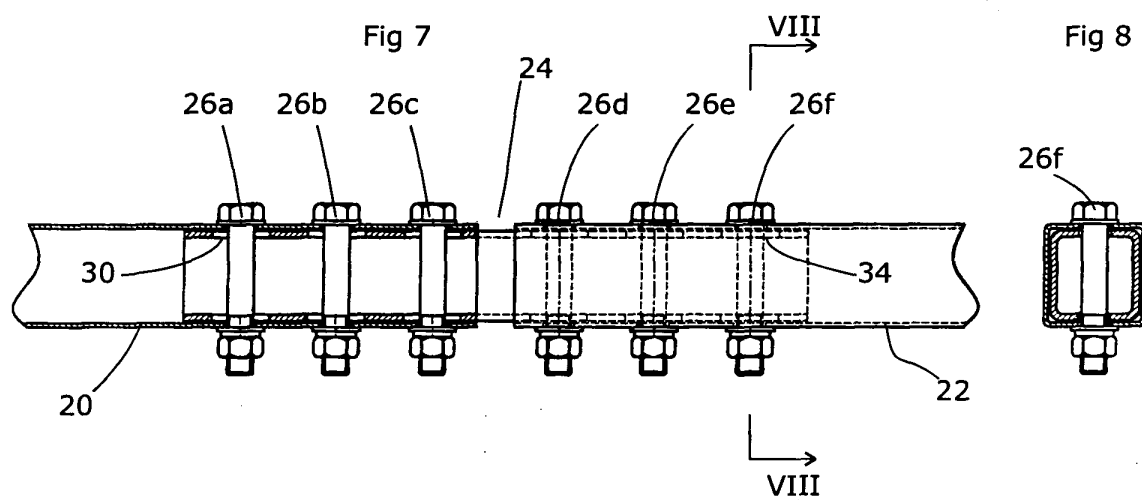


Fig 8

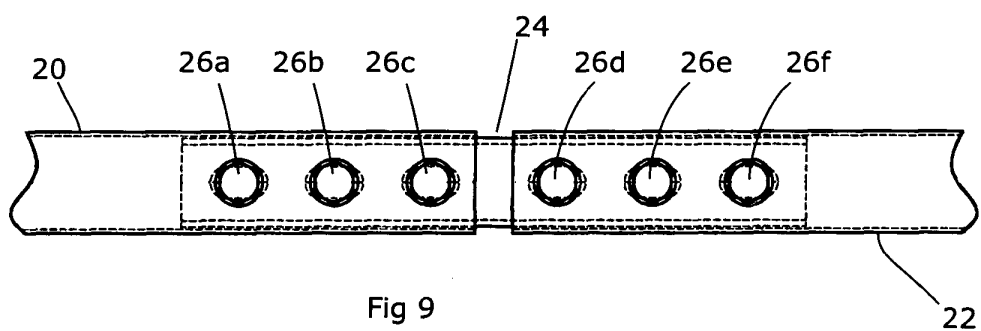
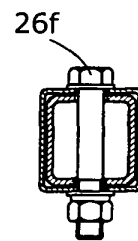


Fig 9

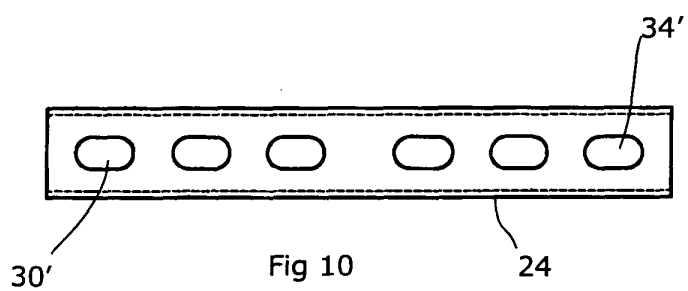


Fig 10

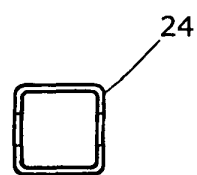


Fig 11