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(51) INT CL[5]
E01B 9/30

(52) UK CL (Edition K)
E1G GBH

(56) Documents cited
GB 2218445 A **GB 2214545 A** **GB 1510224 A**

(58) Field of search
UK CL (Edition K) **E1G**
INT CL[5] **E01B**

(54) Railway rail-fastening clip

(57) A clip for fastening a railway rail to a rail foundation is proposed, which clip is made of a rod of resilient material such that it has at least one bent portion of which the axial cross-sectional area is greater than that of the remainder of the clip. In one embodiment of the clip, the clip comprises, proceeding along the rod from one end thereof to the other, a first portion (1) which is substantially straight, the said one end of the rod constituting a free end (1b) of the said first portion (1), a second portion (2) which is a reverse bend, a third portion (3), a fourth portion (4) which is another reverse bend, and a fifth portion (5), the construction of the clip being such that it can be placed in a position in which a longitudinal axis of the first portion (1) extends horizontally and the third and fifth portions (3, 5), when viewed from above, appear to lie on opposite sides of the said first portion (1), wherein the axial cross-section of more than a tenth of the length of the said first portion (1) of the clip is smaller in area than the axial cross-section of at least a region of the said second portion (2) of the clip. Such clips may be made of less material as compared with some prior art clips intended for the same purpose, thereby being cheaper to make.

FIG. 3

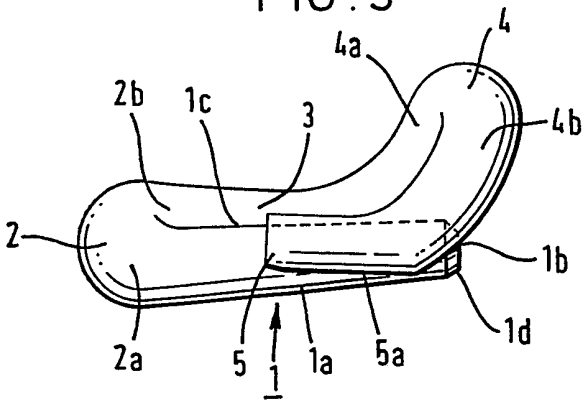

FIG. 4

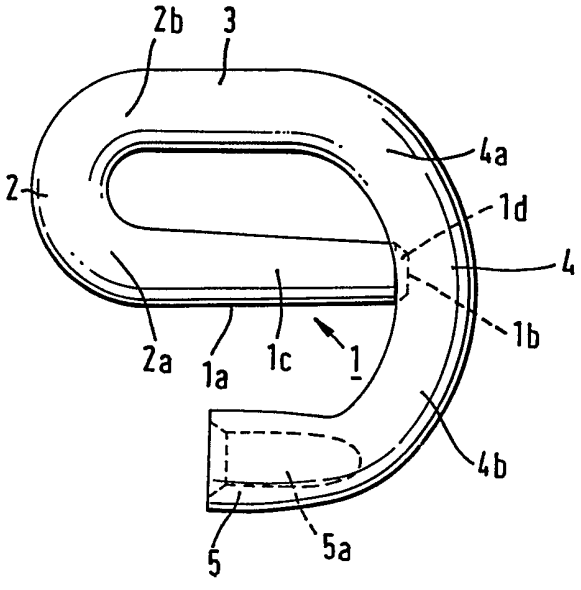

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FIG . 1

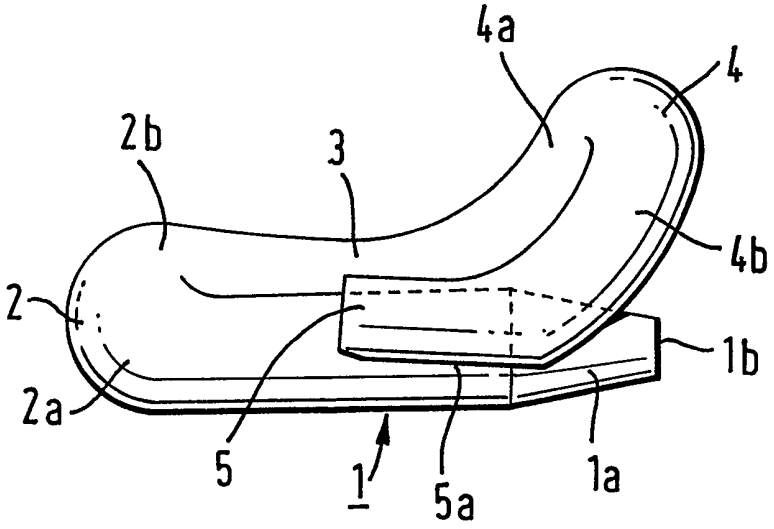


FIG . 2

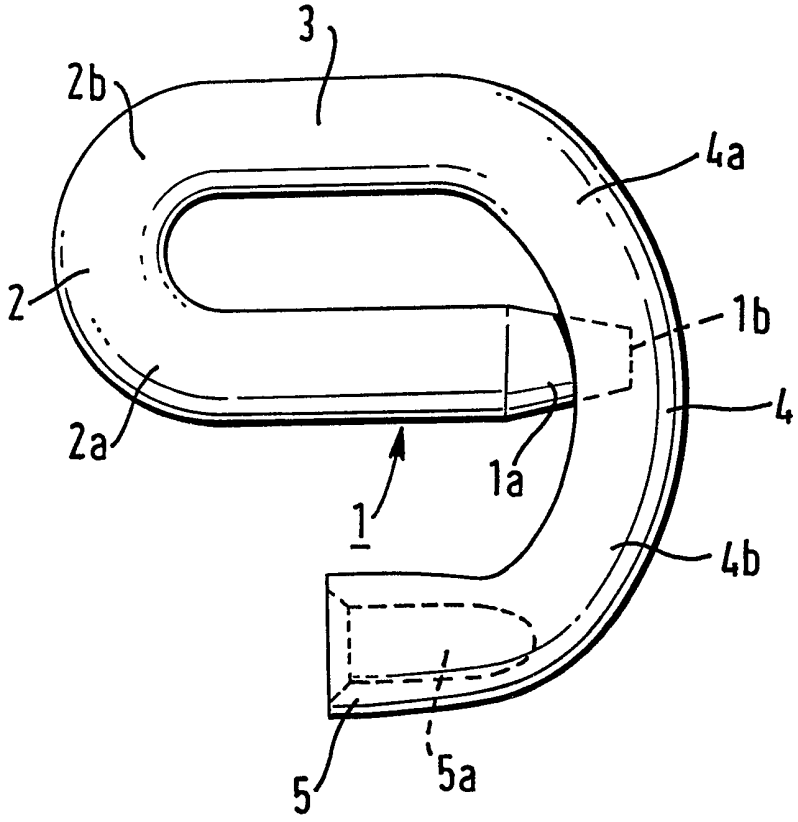


FIG. 3

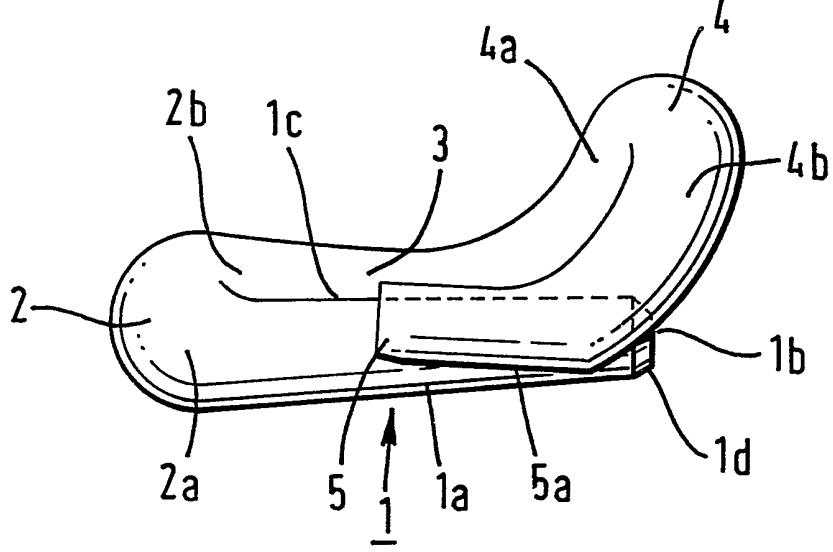


FIG. 4

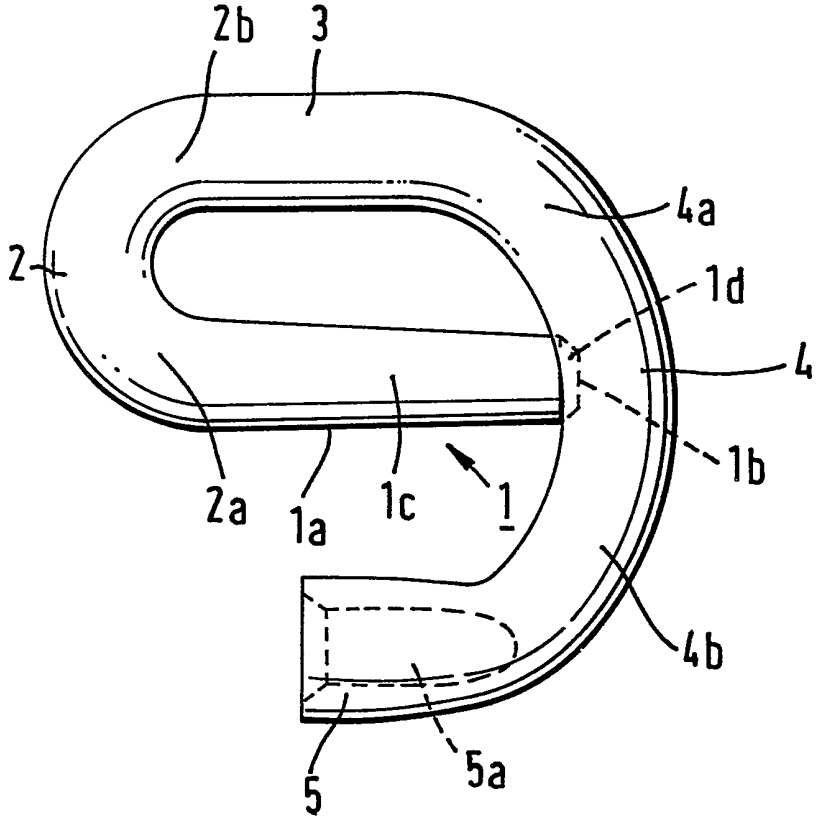


FIG.5

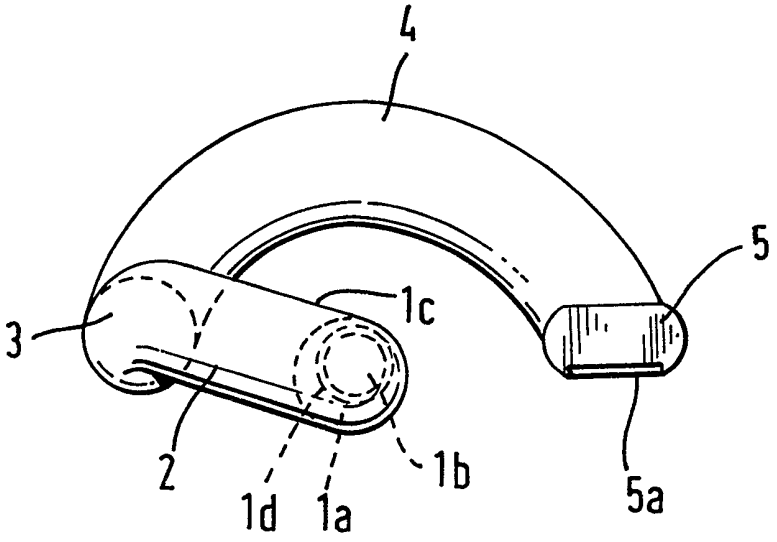


FIG.8

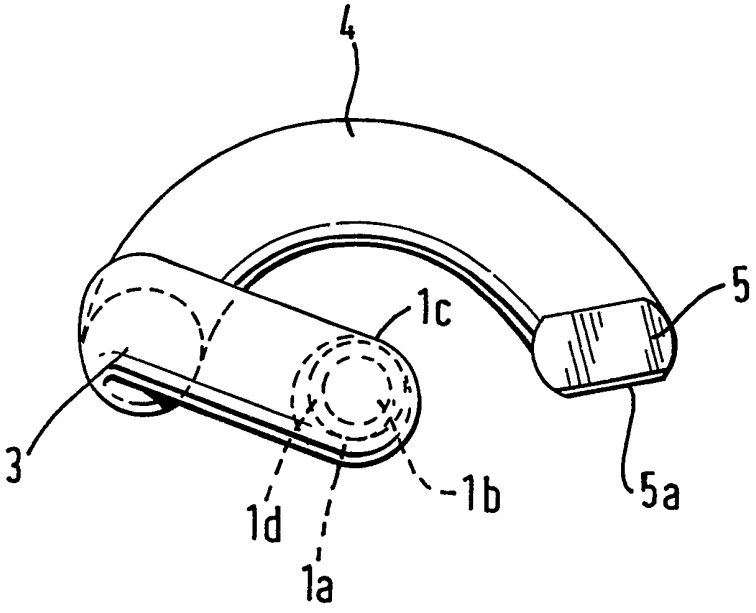


FIG. 6

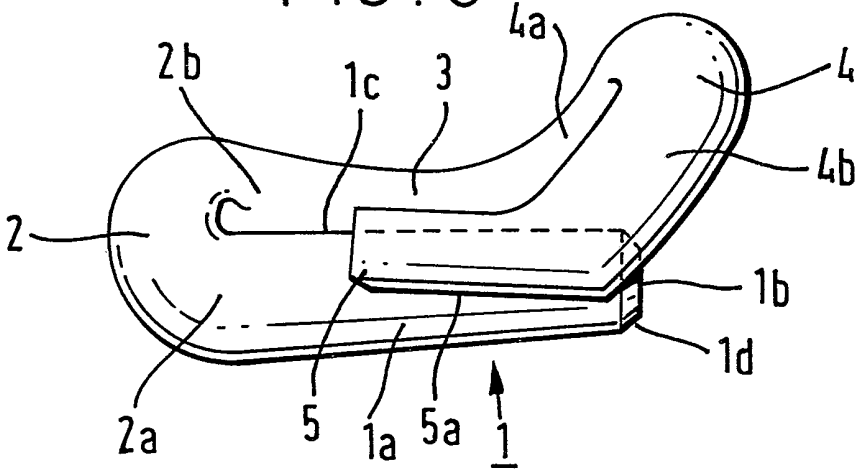


FIG. 7

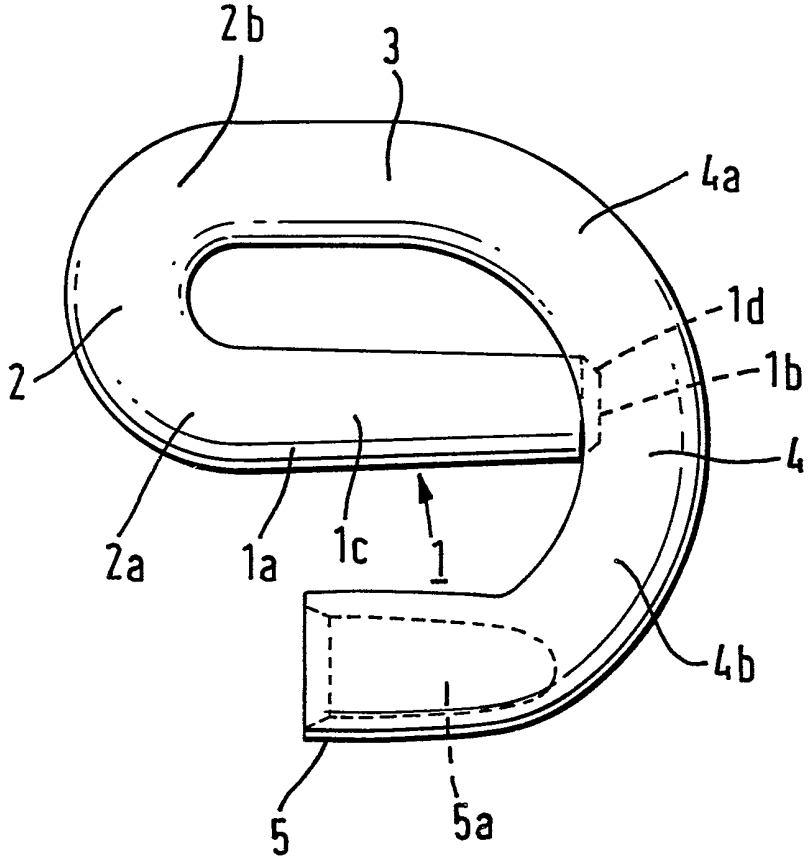


FIG .9a

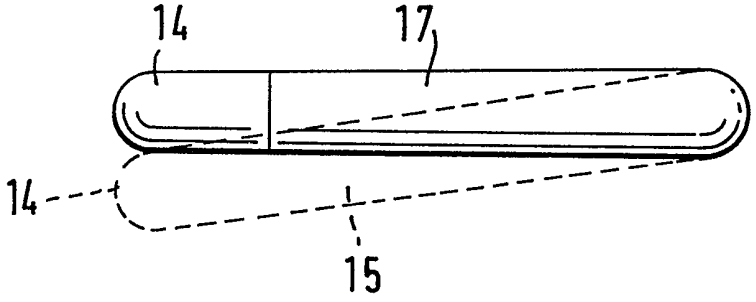


FIG .9b

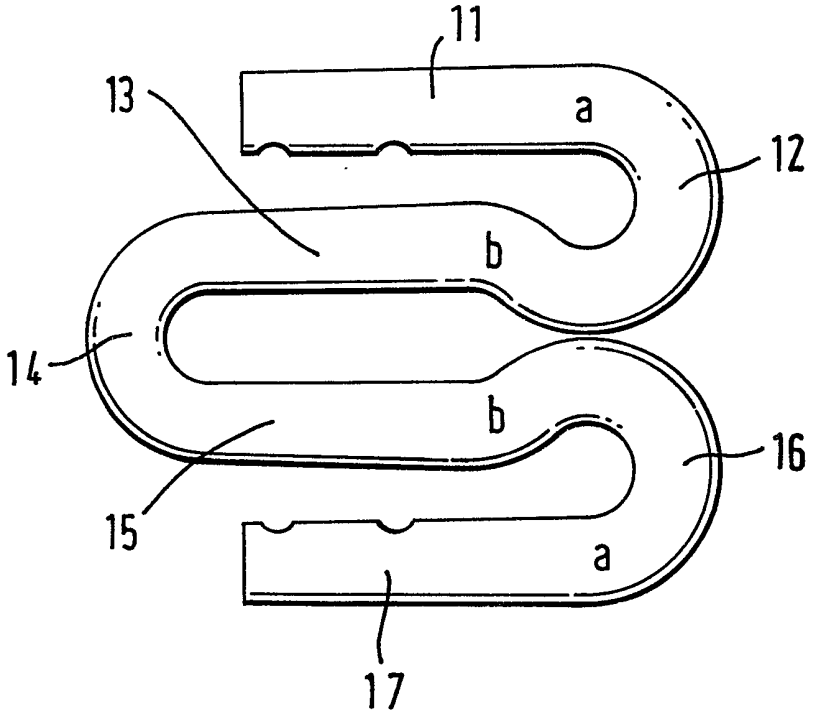
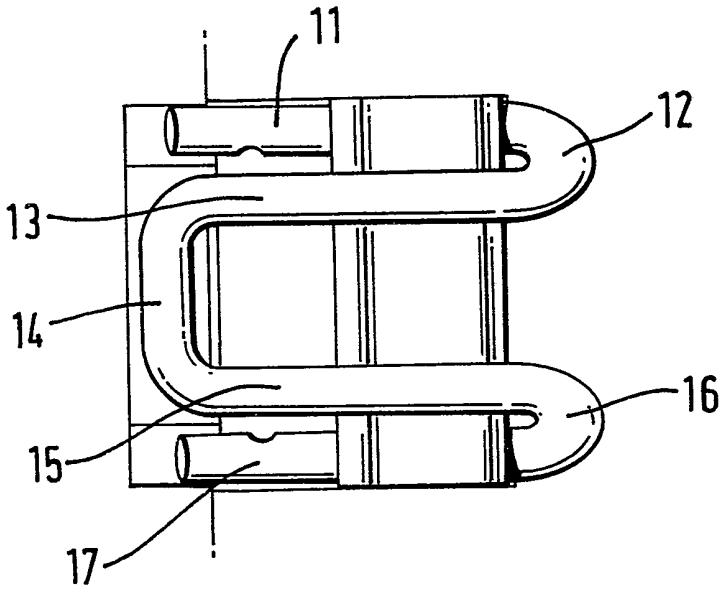


FIG. 10a



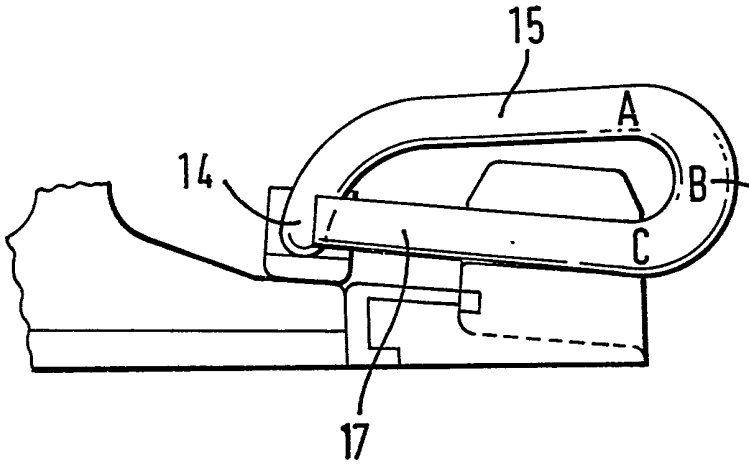


FIG. 10b

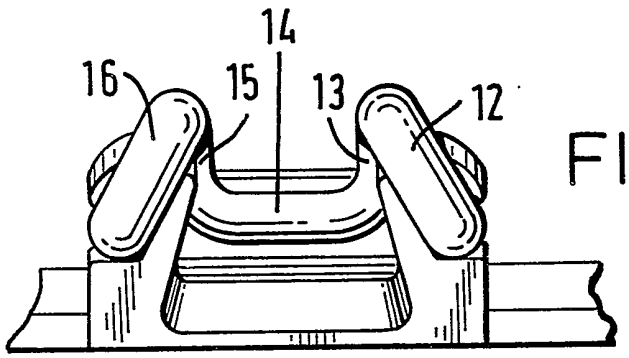


FIG. 10c

RAILWAY RAIL-FASTENING CLIP

The present invention relates to a railway rail-fastening clip.

GB-1,510,224 discloses a rail clip, proposed by the present applicants, which has become known as an "e-clip", because when viewed from a particular direction it has in plan the shape of a letter "e". Such an e-clip is formed by bending a metal rod, of length less than eighteen times its thickness, so as to have, proceeding from one end of the rod to the other, a first portion which is substantially straight, the one end of the rod constituting a free end of the first portion, a second portion which is a reverse bend, a third portion, a fourth portion which is another reverse bend, and a fifth portion, the construction of the clip being such that it can be placed in a position in which the first portion is horizontal and the third and fifth portions, when viewed from above, appear to lie on opposite sides of the first portion. When the clip is in use, the first portion, or centre leg, of the clip is located inside a corresponding passageway in a rail shoulder, secured to the rail foundation alongside the rail, and the fifth portion of the clip bears down on a flange of the rail itself, or, more commonly, on an insulator between the clip and the rail.

The e-clip was introduced by the applicants as an improvement over one of their prior rail clips disclosed in GB-861,473, known as a PR-clip, and one way in which it differed from the PR-clip was that the centre leg of the e-clip was shorter than that of the PR-clip, enabling the e-clip to be made of less material and accordingly at lower cost. However, in shortening the centre leg, the e-clip lost an advantage provided by the centre leg of the PR-clip, namely that

the PR-clip can be positioned accurately simply by driving the clip until the free end of the centre leg thereof abuts the closed end of the passageway in the rail shoulder.

According to a first aspect of the present invention there is provided a clip for fastening a railway rail to a rail foundation, which clip is made of a rod of resilient material such that it has at least one bent portion of which the axial cross-sectional area is greater than that of the remainder of the clip.

Such clip may have at least one bent portion of which the axial cross-sectional area is the same as comparable prior art clips, whereas other portions of the clip are of reduced axial cross-sectional area thereby enabling a clip embodying the first aspect of the present invention to be made of less material than a comparable prior art clip, whilst maintaining the strength of the bent portion which is subject to higher stress than the other portions of the clip.

Preferably, the or each bent portion is a portion of the clip to which an external force is applied so as to drive the clip into an associated clip anchoring device.

A first embodiment of the clip is approximately M-shaped in plan and has, proceeding from one end of the rod to the other, a substantially straight first part, a bent second part, a third part, a bent fourth part, a fifth part, a bent sixth part, and a substantially straight seventh part, the axial cross-sectional area of the said second and sixth parts being greater than that of the other parts of the clip.

A second embodiment of the clip comprises, proceeding along the rod from one end thereof to the other, a first portion which is substantially straight, the said one end of the rod constituting a free end of

the said first portion, a second portion which is a reverse bend, a third portion, a fourth portion which is another reverse bend, and a fifth portion, the construction of the clip being such that it can be placed in a position in which a longitudinal axis of the first portion extends horizontally and the third and fifth portions, when viewed from above, appear to lie on opposite sides of the said first portion, wherein the axial cross-section of more than a tenth of the length of the said first portion of the clip is smaller in area than the axial cross-section of at least a region of the said second portion of the clip.

Preferably, the area of the axial cross-section is substantially uniform along the length of the said second portion of the clip.

Desirably, the axial cross-section of at least a part of the said first portion decreases progressively in area, proceeding from a first end of that part to a second end thereof that is closest to said free end of the said first portion, such that the said second end has a smaller axial cross-sectional area than a region of the said second portion adjacent to the said first portion. Preferably, said part constitutes approximately 30% of the length of the said first portion.

Desirably, in such a case, the said second end of the said part is constituted by said free end of the said first portion.

Preferably, so as achieve accurate location of the first portion of the clip according to the second embodiment more easily, whilst retaining the advantage of requiring less material, the said first portion extends at least partially under the said fourth portion, as viewed from above when the clip is in the said position. In particular, the said metal rod, before being formed into a clip having such a centre

leg, may be of substantially uniform axial cross-sectional area and of length less than 18 times its thickness.

Desirably, the axial cross-section of the said first portion decreases progressively in area along its entire length, such that the area of the axial cross-section of the first portion is smallest at the said free end thereof.

In such circumstances, it is preferable that the first portion is such that, when said first portion is located within a passageway of an anchoring device for retaining the clip, that part of its surface which is uppermost extends substantially parallel to an upper internal surface of said passageway.

Alternatively, the axial cross-section of at least a part of one or more of the said third, fourth and fifth portions desirably undergoes a progressive reduction in area, proceeding from a first end of that part to a second end thereof that is closest to a free end of the said fifth portion, such that the said second end has a smaller axial cross-sectional area than a region of the said second portion adjacent to the said third portion.

Desirably, in such a case, the axial cross-section of at least a part of one of the said third, fourth and fifth portions undergoes such a reduction in area, the axial cross-section of the others of the said third, fourth and fifth portions being of substantially uniform area along the respective lengths of those portions.

According to a second aspect of the present invention there is provided a method of manufacturing a clip according to the second embodiment of the first aspect of the present invention, wherein before, after or during a process of bending a metal rod to form the said first to fifth portions of the clip, the axial

cross-section of a part of that portion of the rod which is to form said first portion is reduced in area as compared to another portion of the rod which is to form said second portion, the reduction in area being achieved without loss of material from the rod and said part constituting more than a tenth of the length of said first portion of the finished clip.

Preferably, said reduction in area is achieved by rolling the part concerned. Alternatively, said reduction in area may be achieved by drawing out the part concerned thereby to extend and taper it.

According to a third aspect of the present invention there is provided an assembly for fastening a railway rail to a rail foundation, comprising a clip according to the second embodiment of the first aspect of the present invention and an anchoring device, secured to the said rail foundation alongside the rail, having a passageway therein, one end of which is closed, in which the said first portion of the clip is located when the assembly is in use, wherein the said free end of the first portion abuts the said closed end of the passageway.

Preferably, when the uppermost surface of the first portion extends parallel to the upper internal surface of the passageway, that part abuts the said upper internal surface, thereby improving the resistance of the clip to pull-out from the anchoring device.

According to a fourth aspect of the present invention there is provided a method of installing a clip according to the second embodiment of the first aspect of the present invention in an anchoring device having a passageway with a closed end, wherein the said first portion of the clip is driven into the said passageway until the said free end of the first portion abuts the closed end of the passageway.

It should be noted that, whilst it has been known previously to chamfer the free end of the centre leg, so as to round off any burrs there might be around that free end and so prevent any difficulties such burrs might otherwise have caused during insertion of the centre leg into the passageway of the rail shoulder, only a very small length of the centre leg was ever so chamfered. Typically, a 45^{o} chamfer extending 3mm from the end of the centre leg of a clip is applied, although chamfers of up to 5mm have been known.

It has been known in "e-clip" type rail clips to flatten the fifth portion of the clip during manufacture, this being the portion that commonly bears down on a rail flange, so as to increase the area of the surface that is in contact with the flange or an interposed insulator. However, this does not enable a saving in material to be made over e-clips that have not been so formed, nor does it result in a larger axial cross-sectional area of the flattened portion.

Reference will now be made, by way of example, to the accompanying drawings, in which:-

Figure 1 shows a side view of a clip embodying the first aspect of the present invention;

Figure 2 shows a plan view of the clip of Figure 1;

Figure 3 shows a side view of another clip embodying the first aspect of the present invention;

Figures 4 and 5 show respective plan and front elevational views of the clip of Figure 3;

Figure 6 shows a side view of a further clip embodying the first aspect of the present invention; and

Figures 7 and 8 show respective plan and front elevational views of the clip of Figure 6; and

Figure 9a shows a side view of yet another clip embodying the first aspect of the present invention and

Figure 9b shows a plan view of the clip concerned in a rail fastening assembly; and

Figures 10a, 10b and 10c show respective plan, side and rear views of a still further clip embodying the first aspect of the present invention in a rail fastening assembly.

The clip shown in Figures 1 and 2 is made of a metal rod. The clip comprises, proceeding along the rod from one end thereof to the other, a first portion, or centre leg, 1 which is substantially straight, a bent second portion 2, a third portion 3, a bent fourth portion 4, and a fifth portion 5. When the clip is viewed from above, as shown in Figure 2, the third portion 3 and fifth portion 5 lie respectively on opposite sides of the first portion 1. As illustrated in Figure 1, the fourth portion 4 has a rising part 4a and a falling part 4b, such that the fourth portion 4 is substantially arched. The second portion also has a rising part 2a and a falling part 2b, but the rising part 2a is inclined, with respect to the longitudinal axis of the said first portion 1, by a comparatively small angle which is less than 45^{o}. The underside of the fifth portion 5 is provided with a substantially flat surface 5a which, when the clip is in use, bears downwardly upon the flange of a rail or, more commonly, upon an insulator provided between the clip and the rail.

The centre leg 1 has a part 1a in the vicinity of a free end 1b thereof, which is tapered, i.e. the axial cross-section of that part progressively decreases in area, towards the free end, and extends partially under the fourth portion 4. Not only does such tapering on the centre leg of the clip permit that portion to be inserted more easily into a passageway in a rail shoulder, it also achieves lengthening of the centre leg as compared to that of the afore-mentioned e-clip,

without having to use a longer rod. Thus, as with the e-clip, the clip of Figs. 1 and 2 may be formed of a metal rod which is of substantially uniform thickness and of length less than eighteen times its thickness. Such lengthening of the centre leg enables the clip to be installed in a rail shoulder more accurately, particularly by automatic clip-driving machines, as the clip can be driven into the passageway until the free end of the lengthened centre leg abuts the closed end of the passageway. Thus, such a clip, which embodies the first aspect of the present invention, can combine the advantages of easier and more accurate installation and cheaper cost as compared to prior art clips.

The centre leg of the clip may be tapered by drawing out one end of the metal rod, which is to form the clip, while it is still red hot, thereby to extend and taper that portion of the rod.

Alternatively, the reduction in area of the axial cross-section may be achieved by rolling part of the metal rod. Such reduction can achieve, for example, a ten millimetre extension of the centre leg, as compared to that of an "e-clip".

Although it is particularly advantageous to reduce the axial cross-sectional area of the free end 1b of the centre leg 1 in such a way as to lengthen that centre leg 1 as compared to conventional e-clips, simply reducing the axial cross-sectional area of any part of the centre leg 1 without achieving an increase in length thereof as compared to conventional e-clips can result in a significant decrease in the amount of material used, and hence also in the cost of making the clip.

In this respect, the applicants believe that it would be particularly desirable to reduce the axial cross-sectional area of the whole length of the centre leg 1. Clips having such centre legs 1 are shown in

Figs. 3 to 5 and 6 to 8, but, apart from the feature described below with reference to those Figures, those clips are otherwise substantially the same as the clip of Figures 1 and 2.

In addition to the centre leg, it may be desirable to reduce the axial cross-sectional area of at least part of any or all of the third, fourth and fifth portions of such clips, but not the second portion thereof since this portion of the clips is subject to higher stress than the other portions.

With further reference to the clips of Figures 3 to 5 and 6 to 8, as can be seen in Figures 3 and 6 particularly each of these clips has a tapered centre leg 1 which is tilted such that an uppermost part 1c thereof extends in such a direction that, when the centre leg 1 is within a passageway of an anchoring device, the uppermost part 1c lies parallel to an upper internal surface, i.e. the roof, of the passageway. Installation of a rail-fastening clip into an anchoring device forces the uppermost part of the centre leg 1 of the clip against the roof of the passageway. Thus, the uppermost part 1c of the centre leg 1 of the clips of Figures 3 to 5 and 6 to 8 abuts the roof of the passageway along its entire length, thereby increasing the resistance of such clips to pull-out from the anchoring device.

As with prior art clips, it may be desirable, as illustrated in Figures 3 to 8, to form a chamfer 1d at the free end of the centre leg 1, so as to remove burrs which might otherwise have hampered insertion of the clip.

The clips shown in Figures 1 to 8 have features in common with the afore-mentioned "e-clip". However, the present invention may also be applied to a clip which is not of the "e-clip" type.

In this regard, reference will now be made to the

clips shown in Figures 9a and 9b and Figures 10a to 10c.

The clip in each case is approximately M-shaped in plan and is made of a rod of resilient material bent so as to have, proceeding from one end of the rod to the other, a substantially straight first part 11, a bent second part 12, a substantially straight third part 13, a bent fourth part 14 which bears on a rail when the clip is in use, a substantially straight fifth part 15, a bent sixth part 16, and a substantially straight seventh part 17.

The clip of Figures 9a and 9b has third, fourth and fifth parts 13, 14, 15 which have respective longitudinal axes lying substantially in a first plane and first, second, sixth and seventh parts 11, 12, 16, 17 which have respective longitudinal axes lying substantially in a second plane, the first plane being inclined with respect to the second plane (Figure 9a, dotted line) except when the clip is bearing on a rail when the first and second planes are substantially coincident (Figure 9a, unbroken line).

The longitudinal axes of the second and sixth parts 12, 16 of the clip of Figures 10a to 10c lie substantially in respective planes which are inclined with respect to a plane containing the first and seventh parts 11, 17, the third and fifth parts 13, 15 lying in a further plane which is above the plane containing the first and seventh parts 11, 17.

In each case, the second and sixth parts 12, 16, denoted by the letters a-b in Figures 9a and 9b and A-B-C in Figures 10a to 10c, are thicker in cross-section than the other parts of the clip, since the parts 12 and 16 are subject to greater stress than the remainder of the clip and must be of a particular thickness, whereas the other parts need not be so thick.

Thus, the invention can be applied to railway rail

fastening clips made from a rod of resilient material not only of the "e-clip" type, but also of any other type where a reduction in the material required to make the clip, without consequent weakening of the clip in regions thereof subject to the highest stress, would be advantageous.

CLAIMS:

1. A clip for fastening a railway rail to a rail foundation, which clip is made of a rod of resilient material such that it has at least one bent portion of which the axial cross-sectional area is greater than that of the remainder of the clip.

2. A clip as claimed in claim 1, wherein the or each bent portion is a portion of the clip to which an external force is applied so as to drive the clip into an associated clip anchoring device.

3. A clip as claimed in claim 1 or 2, wherein the said clip is approximately M-shaped in plan and has, proceeding from one end of the rod to the other, a substantially straight first part, a bent second part, a third part, a bent fourth part, a fifth part, a bent sixth part, and a substantially straight seventh part, the axial cross-sectional area of the said second and sixth parts being greater than that of the other parts of the clip.

4. A clip as claimed in claim 1 or 2, comprising, proceeding along the rod from one end thereof to the other, a first portion which is substantially straight, the said one end of the rod constituting a free end of the said first portion, a second portion which is a reverse bend, a third portion, a fourth portion which is another reverse bend, and a fifth portion, the construction of the clip being such that it can be placed in a position in which a longitudinal axis of the first portion extends horizontally and the third and fifth portions, when viewed from above, appear to lie on opposite sides of the said first portion, wherein the axial cross-section of more than a tenth of the length of the said first portion of the clip is smaller in area than the axial cross-section of at least a region of the said second portion of the clip.

5. A clip as claimed in claim 4, wherein the area of

the axial cross-section is substantially uniform along the length of the said second portion of the clip.

6. A clip as claimed in claim 4 or 5, wherein the axial cross-section of at least a part of the said first portion decreases progressively in area, proceeding from a first end of that part to a second end thereof that is closest to said free end of the said first portion, such that the said second end has a smaller axial cross-sectional area than a region of the said second portion adjacent to the said first portion.

7. A clip as claimed in claim 6, wherein said part constitutes approximately 30% of the length of the said first portion.

8. A clip as claimed in claim 6 or 7, wherein the said second end of the said part is constituted by said free end of the said first portion.

9. A clip as claimed in any one of claims 4 to 8, wherein the said first portion extends at least partially under the said fourth portion, as viewed from above when the clip is in the said position.

10. A clip as claimed in claim 9, wherein the said metal rod, before being formed into the clip, was of substantially uniform axial cross-sectional area and of length less than 18 times its thickness.

11. A clip as claimed in claim 8, 9 or 10, wherein the axial cross-section of the said first portion decreases progressively in area along its entire length, such that the area of the axial cross-section of the first portion is smallest at the said free end thereof.

12. A clip as claimed in claim 11, wherein the first portion of the clip is such that, when said first portion is located within a passageway of an anchoring device for retaining the clip, that part of its surface which is uppermost extends substantially parallel to an upper internal surface of said passageway.

13. A clip as claimed in any one of claims 4 to 12,

wherein the axial cross-section of at least a part of one or more of the said third, fourth and fifth portions undergoes a progressive reduction in area, proceeding from a first end of that part to a second end thereof that is closest to a free end of the said fifth portion, such that the said second end has a smaller axial cross-sectional area than a region of the said second portion adjacent to the said third portion.

14. A clip as claimed in claim 13, wherein the axial cross-section of at least a part of one of the said third, fourth and fifth portions undergoes such a reduction in area, the axial cross-section of the others of the said third, fourth and fifth portions being of substantially uniform area along the respective lengths of those portions.

15. A clip for fastening a railway rail to a rail foundation as hereinbefore described with reference to Figures 1 and 2, or Figures 3 to 5, or Figures 6 to 8, or Figures 9a to 9b, or Figures 10a, 10b and 10c, of the accompanying drawings.

16. A method of manufacturing a clip of the type claimed in any one of claims 4 to 15, wherein before, after or during a process of bending a metal rod to form the said first to fifth portions of the clip, the axial cross-section of a part of that portion of the rod which is to form said first portion is reduced in area as compared to another portion of the rod which is to form said second portion, the reduction in area being achieved without loss of material from the rod and said part constituting more than a tenth of the length of said first portion of the finished clip.

17. A method as claimed in claim 16, wherein said reduction in area is achieved by rolling the part concerned.

18. A method as claimed in claim 16, wherein said reduction in area is achieved by drawing out the part

concerned, thereby to extend and taper it.

19. An assembly for fastening a railway rail to a rail foundation, comprising a clip as claimed in any one of claims 4 to 15 and an anchoring device, secured to the said rail foundation alongside the rail, having a passageway therein, one end of which is closed, in which the said first portion of the clip is located when the assembly is in use, wherein the said free end of the first portion abuts the said closed end of the passageway.

20. An assembly as claimed in claim 19, comprising a clip as claimed in claim 12, wherein the said uppermost part of the surface of said first portion abuts the upper internal surface of said passageway.

21. A method of installing a clip of the type claimed in any one of claims 4 to 15 in an anchoring device having a passageway with a closed end, wherein the said first portion of the clip is driven into the said passageway until the said free end of the first portion abuts the closed end of the passageway.

Patents Act 1977

Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number

9209328.5

Relevant Technical fields

(i) UK Cl (Edition K) E1G

(ii) Int CL (Edition 5) E01B

Search Examiner

D HAWORTH

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search

9 JULY 1992

Documents considered relevant following a search in respect of claims 1-3

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2218445 A (ALLEVAND)	1 and 2
X	GB 2214545 A (C E HEREWARD)	1 and 2
X	GB 1510224 A (PANDROL)	1 and 2

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

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