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(54) A RAILWAY RAIL FASTENING CLIP AND A RAILWAY RAIL-AND-FASTENING ASSEMBLY EMPLOYING IT

(71) We, PANDROL LIMITED, a British company of 7 Rolls Buildings, Fetter Lane, London, EC4A 1JB, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

According to a first aspect of the present invention, a railway rail-fastening clip comprises a rod of resilient metal with a length less than 18 times its thickness which has been bent so as to have, progressing from one end of the rod to the other end, a first portion which starts at said one end of the rod and is a straight or nearly straight leg, then a second portion, then a third portion, then a fourth portion and finally a fifth portion which ends at said other end of the rod, these portions being such that, when the clip is in a particular position, the lowermost points on the opposite ends of the first portion are in the same horizontal plane as one another and the lowermost points on the third and fifth portions are in the same horizontal plane as one another, and the second portion, proceeding from the first portion to the third portion, has a rising part followed by a falling part and when the clip is viewed from above the third and fifth portions appear to be on opposite sides of the axis of the first portion and when the clip is viewed in a horizontal direction parallel to a straight line passing through the lowermost points on the opposite ends of the first portion, said rising part of the second portion is seen to be inclined to the horizontal by, everywhere, less than 45°.

The second plane mentioned above is preferably higher than the first.

Preferably, the rod has a length less than 17 times its thickness, better still less than 16 times its thickness and even better less than 15 times its thickness.

A clip according to the first aspect of the invention is preferably one in which the rising part of the second portion, when viewed as indicated above, is seen to be inclined to

the horizontal by, everywhere, less than 40°.

Preferably, the rising part of the second portion, when viewed as indicated above, is seen to be inclined to the horizontal by about 35° over most of its length.

A clip according to the first aspect of the invention is preferably such that when it is in said position and it is viewed in a horizontal direction perpendicular to a straight line passing through the lowermost points on the opposite ends of the first portion, then, proceeding from the first portion to the lowest part of the third portion, the largest angle of descent, with respect to the horizontal, is seen to be less than 35°. Said largest angle of descent is preferably less than 30°, better still less than 25°, even better less than 20° and even better than that less than 15° and may advantageously be about 10°.

Preferably, when the clip is in said position, the highest point on the upper side of the second portion is lower than the highest point on the upper side of the fourth portion.

A clip according to the first aspect of the invention is preferably such that, when it is in said position, the highest point on the upper side of the second portion is higher than the lowermost point on the third portion by less than twice the thickness of the rod, preferably less than 1.75 times the thickness of the rod, better still less than 1.5 times the thickness of the rod, even better less than 1.3 times the thickness of the rod, advantageously about 1.22 times the thickness of the rod. The clip is preferably such that, when it is in said position, the highest point on the upper side of the second portion is higher than the lowermost point on the first portion by less than 3 times the thickness of the rod, preferably less than 2½ times the thickness of the rod, better still less than twice the thickness of the rod, advantageously about 1.75 times the thickness of the rod.

The clip is preferably made from a rod

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of circular cross-section at least 1 cm. in diameter.

It may be such that, when it is in said position, no part of the clip is vertically above any part of said first portion.

There may with advantage be a flat surface on the side of the fifth portion which is the lower side when the clip is in said position. This flat portion preferably has a length greater than $1\frac{1}{2}$ times or even greater than twice the thickness of the rod.

The clip, when in said position and viewed from above, may look rather like a lower case letter *e* or a mirror image of a lower case letter *e*. The second and third portions may together form a reverse bend and the third and fourth portions may together form another reverse bend, these two reverse bends meeting one another in a smooth continuous curve.

The fifth portion may have been given its final shape by having been supported by a lower support member which has contacted it over a length of more than 1 centimetre when the fifth portion has been pressed downwardly whilst red hot.

A clip according to the first aspect of the invention may be one of which the fifth portion, when it is viewed in plan with the clip in said position, seems to be perpendicular to the axis of the first portion.

According to a second aspect of the invention, a railway rail-fastening clip comprises a rod of resilient metal with a length less than 18 times its thickness which has been bent so as to have, progressing from one end of the rod to the other end, a first portion which starts at one end of the rod and is a straight or nearly straight leg, then a second portion, then a third portion, then a fourth portion and finally a fifth portion which ends at said other end of the rod, these portions being such that, when the clip is in a particular position, the lowermost points on the opposite ends of the first portion are in the same horizontal plane as one another and the lowermost points on the third and fifth portions are in the same horizontal plane as one another, and the second portion, proceeding from the first portion to the third portion, has a rising part followed by a falling part and when the clip is viewed from above the third and fifth portions appear to be on opposite sides of the axis of the first portion and when the clip is viewed in a horizontal direction perpendicular to a straight line passing through the lowermost points on the opposite ends of the first portion, the largest angle of descent of said falling part, with respect to the horizontal, is seen to be less than 35° .

According to a third aspect of the present invention, a railway rail-fastening clip comprises a rod of resilient metal with a length of less than 18 times its thickness

which has been bent so as to have, progressing from one end of the rod to the other end, a first portion which starts at one end of the rod and is a straight or nearly straight leg, then a second portion, then a third portion, then a fourth portion and finally a fifth portion which ends at said other end of the rod, these portions being such that, when the clip is in a particular position, the lowermost points on the opposite ends of the first portion are in the same horizontal plane as one another and the lowermost points on the third and fifth portions are in the same horizontal plane as one another, and the second portion, proceeding from the first portion to the third portion, has a rising part followed by a falling part and when the clip is viewed from above the third and fifth portions appear to be on opposite sides of the axis of the first portion, the highest point on the upper side of the second portion being lower than the highest point on the upper side of the fourth portion.

According to a fourth aspect of the invention, a railway rail-fastening clip comprises a rod of resilient metal with a length less than 18 times its thickness which has been bent so as to have, progressing from one end of the rod to the other end, a first portion which starts at one end of the rod and is a straight or nearly straight leg, then a second portion, then a third portion, then a fourth portion and finally a fifth portion which ends at said other end of the rod, these portions being such that, when the clip is in a particular position, the lowermost points on the opposite ends of the first portion are in the same horizontal plane as one another and the lowermost points on the third and fifth portions are in the same horizontal plane as one another, and the second portion, proceeding from the first portion to the third portion, has a rising part followed by a falling part and when the clip is viewed from above the third and fifth portions appear to be on opposite sides of the axis of the first portion, the highest point on the upper side of the second portion being higher than the lowermost point on the third portion by less than twice the thickness of the rod.

According to a fifth aspect of the invention, a railway, rail-fastening clip comprises a rod of resilient metal with a length less than 18 times its thickness which has been bent so as to have, progressing from one end of the rod to the other end, a first portion which starts at one end of the rod and is a straight or nearly straight leg, then a second portion, then a third portion, then a fourth portion and finally a fifth portion which ends at said other end of the rod, these portions being such that, when the clip is in a particular position, the lowermost points on the opposite ends of the first portion

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tion are in the same horizontal plane as one another and the lowermost points on the third and fifth portions are in the same horizontal plane as one another, and the second portion, proceeding from the first portion to the third portion, has a rising part followed by a falling part and when the clip is viewed from above the third and fifth portions appear to be on opposite sides of the axis of the first portion, the highest point on the upper side of the second portion being higher than the lowermost point on the first portion by less than 3 times the thickness of the rod.

In clips according to the second, third, fourth and fifth aspects of the invention, again the second-mentioned plane is preferably higher than the first.

The above particulars refers to the clip when it is not in use, i.e. is unstressed.

According to a sixth aspect of the invention, a railway rail-and-fastening assembly comprises a rail foundation, a rail laid on the rail foundation between two projections extending upwardly from the rail foundation and two clips according to any one or any combination of the first to fifth aspects of the invention, each clip having its first portion substantially parallel to the rail and held down by one of said projections, its third or fifth portion bearing downwardly on the rail flange, directly or through an electrical insulator on the rail flange, and its fifth or third portion bearing downwardly on an unyielding surface which, as seen from the rail, is beyond said first portion.

Examples in accordance with the invention are described below with reference to the accompanying drawings, in which:—

Figure 1 shows a side view of a railway rail-fastening clip, taken in the direction of the arrow I in Figure 2,

Figure 2 shows an end view of the same clip, taken in the direction of the arrow II in Figure 1,

Figure 3 shows a plan view of the same clip,

Figures 4 to 6 show views, corresponding to those of Figures 1 to 3, respectively, of another railway rail-fastening clip,

Figure 7 shows an end view of a railway clip of Figures 1 to 3, which is shown only by means of dotted lines,

Figure 8 shows a side view of the same assembly but without the clip, and

Figure 9 shows a plan view of the same assembly but without the clip.

The clip shown in Figures 1 to 3 is made by bending a rod of resilient steel 28.8 centimetres long, of circular cross-section and 2.00 centimetres diameter (ratio of length: diameter=14.4) so that it has, proceeding from the end A to the end B, a first portion 1 which starts at the end A, a second portion 2, a third portion 3, a fourth portion 4

and a fifth portion 5 which ends at the end B. The places where these portions meet are marked by the lines 1—2, 2—3, 3—4 and 4—5, although it is a matter of opinion exactly where these lines should be.

In Figure 2 the line 7 represents a plane C which is parallel to and below a plane D represented by the line 8, these two planes being horizontal. In the illustrated position of the clip, the plane D contains the lowermost points 10 and 11 on the third and fifth portions 3 and 5 and the plane C contains the lowermost points 14 and 15 on the opposite ends of the first portion 1 (and the lowermost points all along the first portion 1 in this case because the first portion 1 is straight; it could instead be slightly bowed, for example arched). The highest point 9 on the upper side of the second portion 2 is higher than the lowermost point 10 on the third portion by 2.45 centimetres (dimension E) and is higher than the lowermost point 11 on the first portion 1 by 3.5 centimetres (dimension F), these dimensions being respectively 1.22 and 1.75 times the diameter of the rod.

When the clip is viewed in a horizontal direction (see arrow II) parallel to a straight line 13 passing through the lowermost points 14 and 15 on the opposite ends of the first portion 1, it is seen that the second portion 2 has, proceeding from the portion 1 to the portion 3, a rising part 2A followed by a falling part 2B, the angle G between the rising part 2A and the horizontal plane C being everywhere less than 40° and about 35° over most of the length of the part 2A. When the clip is viewed in a horizontal direction (see arrow I) perpendicular to a line (13) passing through the lowermost points on the opposite ends of the first portion 1, then, proceeding from the first portion 1 to the lowest part of the third portion 3, the largest angle H of descent, with respect to the horizontal, is seen to be 10°. No part of the clip is vertically above any part of said first portion 1. The highest point on the upper side of the portion 2 is lower than the highest point on the upper side of the portion 4. When the clip is viewed from above the third and fifth portions 3 and 5 appear to be on opposite sides of the axis of the first portion 1 and the clip looks rather like a mirror-image of a lower case letter e. The illustrated clip is intended to bear upon the flange at one side of a flat-bottomed or flange-footed railway rail. The shape of a corresponding clip to be driven in the same direction and to bear upon the flange at the opposite side of the rail (if such a clip is needed) is shown in Figures 4 to 6. In plan view this clip looks rather like a lower case letter e. Apart from this, the above description of the clip of Figures

1 to 3 and details of angles, dimensions, etc., apply to the clip of Figures 4 to 6.

There is a flat surface 5A 4.4 centimetres long on the lower side of the fifth portion

5 The fifth portion 5 has been given its final shape by having been supported by a lower support member which has contacted it over a continuous length, including the whole of the flat surface 5A, when the fifth portion 5 has been pressed downwardly, whilst red hot, by an upper shaping tool.

10 The second and third portions 2 and 3 together form a reverse bend which is immediately followed by a reverse bend of larger average radius formed by the portions 3 and 4 together, the two reverse bends meeting one another in a smooth continuous curve, as seen in Figure 3.

15 In Figures 7 to 9, there is shown the flange 21 of a flange-footed railway rail resting on a rubber pad 22 which is laid on the upper surface 23A of a concrete railway sleeper 23. On the two sides of the rail there are two similar arrangements for holding the rail down, although this is shown only in the case of the left-hand side. It includes a clip as described above and illustrated in Figures 1 to 3, only the parts 1, 3, 5 and 5A of the clip being shown, in Figure 7. On the right-hand side of the rail there is again a clip according to Figures 1 to 3 but it is driven in the opposite direction. On the edge of the flange there is placed an elongate electrical insulator 24, consisting of moulded nylon, of approximately L-shaped cross-section, one limb 25 of which lies on the rail flange and has the flat surface 5A of the portion 5 pressing downwardly upon it, this flat surface being parallel to the upper face of that part of the rail flange which is beneath it. The other limb 26 of the insulator 24 lies against the side of the rail flange and has a recess 30 in it.

20 An anchoring member is fixed to the sleeper, this consisting of cast malleable iron and comprising a flat surface 31 lying on the upper surface 23A of the sleeper, a projecting leg 32 extending downwardly into the sleeper, a block portion 33, substantially square as seen in plan, extending upwardly from the surface 31, a concave surface 34 at the top of the block portion 33 and a passage 35 of circular cross-section, having flared mouths 35A, in the block portion 33. The portion 1 of the rail clip is driven in the passage 35 and is held down by the roof of the passage in a position substantially parallel to the rail, whereas the part 3 of the rail clip presses downwardly on the concave surface 34. Part of the block portion 33 lies in the recess 30 in the insulator 24 so that the insulator is prevented from sliding along the rail when the clip is being driven into position, by abutting the block portion 33.

The leg 32 of the anchoring member is formed with protruberances 36 on all four sides and it is cast in the concrete, that is to say incorporated in the concrete before the latter has set.

The insulator 24 could be omitted, the portion 5 of the clip then bearing directly on the rail flange.

The clip could instead be driven so that the portion 3 bears on the rail flange, directly or through the insulator 24, and the portion 5 bears on the surface 34.

WHAT WE CLAIM IS:—

1. A railway rail-fastening clip comprising a rod of resilient metal with a length less than 18 times its thickness which has been bent so as to have, progressing from one end of the rod to the other end, a first portion which starts at said one end of the rod and is a straight or nearly straight leg, then a second portion, then a third portion, then a fourth portion and finally a fifth portion which ends at said other end of the rod, these portions being such that, when the clip is in a particular position, the lowermost points on the opposite ends of the first portion are in the same horizontal plane as one another and the lowermost points on the third and fifth portions are in the same horizontal plane as one another, and the second portion, proceeding from the first portion to the third portion, has a rising part followed by a falling part and when the clip is viewed from above the third and fifth portions appear to be on opposite sides of the axis of the first portion and when the clip is viewed in a horizontal direction parallel to a straight line passing through the lowermost points on the opposite ends of the first portion, said rising part of the second portion is seen to be inclined to the horizontal by, everywhere, less than 45°.

2. A clip according to claim 1 in which the rod has a length less than 17 times its thickness.

3. A clip according to claim 1 in which the rod has a length less than 16 times its thickness.

4. A clip according to claim 1 in which the rod has a length less than 15 times its thickness.

5. A clip according to any preceding claim in which the rising part of the second portion, when viewed as indicated in claim 1, is seen to be inclined to the horizontal by, everywhere, less than 40°.

6. A clip according to any preceding claim in which the rising part of the second portion, when viewed as indicated in claim 1, is seen to be inclined to the horizontal by about 35° over most of its length.

7. A clip according to any preceding claim which is such that when it is in said position and it is viewed in a horizontal

1 to 3 and details of angles, dimensions, etc., apply to the clip of Figures 4 to 6.

There is a flat surface 5A 4.4 centimetres long on the lower side of the fifth portion

5 The fifth portion 5 has been given its final shape by having been supported by a lower support member which has contacted it over a continuous length, including the whole of the flat surface 5A, when the fifth portion 5 has been pressed downwardly, whilst red hot, by an upper shaping tool.

The second and third portions 2 and 3 together form a reverse bend which is immediately followed by a reverse bend of larger average radius formed by the portions 3 and 4 together, the two reverse bends meeting one another in a smooth continuous curve, as seen in Figure 3.

In Figures 7 to 9, there is shown the flange 21 of a flange-footed railway rail resting on a rubber pad 22 which is laid on the upper surface 23A of a concrete railway sleeper 23. On the two sides of the rail there are two similar arrangements for holding the rail down, although this is shown only in the case of the left-hand side. It includes a clip as described above and illustrated in Figures 1 to 3, only the parts 1, 3, 5 and 5A of the clip being shown, in Figure 7. On the right-hand side of the rail there is again a clip according to Figures 1 to 3 but it is driven in the opposite direction. On the edge of the flange there is placed an elongate electrical insulator 24, consisting of moulded nylon, of approximately L-shaped cross-section, one limb 25 of which lies on the rail flange and has the flat surface 5A of the portion 5 pressing downwardly upon it, this flat surface being parallel to the upper face of that part of the rail flange which is beneath it. The other limb 26 of the insulator 24 lies against the side of the rail flange and has a recess 30 in it.

An anchoring member is fixed to the sleeper, this consisting of cast malleable iron and comprising a flat surface 31 lying on the upper surface 23A of the sleeper, a projecting leg 32 extending downwardly into the sleeper, a block portion 33, substantially square as seen in plan, extending upwardly from the surface 31, a concave surface 34 at the top of the block portion 33 and a passage 35 of circular cross-section, having flared mouths 35A, in the block portion 33. The portion 1 of the rail clip is driven in the passage 35 and is held down by the roof of the passage in a position substantially parallel to the rail, whereas the part 3 of the rail clip presses downwardly on the concave surface 34. Part of the block portion 33 lies in the recess 30 in the insulator 24 so that the insulator is prevented from sliding along the rail when the clip is being driven into position, by abutting the block portion 33.

The leg 32 of the anchoring member is formed with protruberances 36 on all four sides and it is cast in the concrete, that is to say incorporated in the concrete before the latter has set.

The insulator 24 could be omitted, the portion 5 of the clip then bearing directly on the rail flange.

The clip could instead be driven so that the portion 3 bears on the rail flange, directly or through the insulator 24, and the portion 5 bears on the surface 34.

WHAT WE CLAIM IS:—

1. A railway rail-fastening clip comprising a rod of resilient metal with a length less than 18 times its thickness which has been bent so as to have, progressing from one end of the rod to the other end, a first portion which starts at said one end of the rod and is a straight or nearly straight leg, then a second portion, then a third portion, then a fourth portion and finally a fifth portion which ends at said other end of the rod, these portions being such that, when the clip is in a particular position, the lowermost points on the opposite ends of the first portion are in the same horizontal plane as one another and the lowermost points on the third and fifth portions are in the same horizontal plane as one another, and the second portion, proceeding from the first portion to the third portion, has a rising part followed by a falling part and when the clip is viewed from above the third and fifth portions appear to be on opposite sides of the axis of the first portion and when the clip is viewed in a horizontal direction parallel to a straight line passing through the lowermost points on the opposite ends of the first portion, said rising part of the second portion is seen to be inclined to the horizontal by, everywhere, less than 45°.

2. A clip according to claim 1 in which the rod has a length less than 17 times its thickness.

3. A clip according to claim 1 in which the rod has a length less than 16 times its thickness.

4. A clip according to claim 1 in which the rod has a length less than 15 times its thickness.

5. A clip according to any preceding claim in which the rising part of the second portion, when viewed as indicated in claim 1, is seen to be inclined to the horizontal by, everywhere, less than 40°.

6. A clip according to any preceding claim in which the rising part of the second portion, when viewed as indicated in claim 1, is seen to be inclined to the horizontal by about 35° over most of its length.

7. A clip according to any preceding claim which is such that when it is in said position and it is viewed in a horizontal



- direction perpendicular to a straight line passing through the lowermost points on the opposite ends of the first portion, then, proceeding from the first portion to the lowest part of the third portion, the largest angle of descent, with respect to the horizontal, is seen to be less than 35°.
8. A clip according to claim 7 in which said largest angle of descent is less than 30°.
9. A clip according to claim 7 in which said largest angle of descent is less than 25°.
10. A clip according to claim 7 in which said largest angle of descent is less than 20°.
11. A clip according to claim 7 in which said largest angle of descent is less than 15°.
12. A clip according to claim 7 in which said largest angle of descent is about 10°.
13. A clip according to any preceding claim which is such that, when it is in said position, the highest point on the upper side of the second portion is lower than the highest point on the upper side of the fourth portion.
14. A clip according to any preceding claim which is such that, when it is in said position, the highest point in the upper side of the second portion is higher than the lowermost point on the third portion by less than twice the thickness of the rod.
15. A clip according to any preceding claim which is such that, when it is in said position, the highest point on the upper side of the second portion is higher than the lowermost point on the third portion by less than 1.75 times the thickness of the rod.
16. A clip according to any preceding claim which is such that, when it is in said position, the highest point on the upper side of the second portion is higher than the lowermost point on the third portion by less than 1.5 times the thickness of the rod.
17. A clip according to any preceding claim which is such that, when it is in said position, the highest point on the upper side of the second portion is higher than the lowermost point on the third portion by less than 1.3 times the thickness of the rod.
18. A clip according to any preceding claim which is such that, when it is in said position, the highest point on the upper side of the second portion is higher than the lowermost point on the third portion by about 1.22 times the thickness of the rod.
19. A clip according to any preceding claim which is such that, when it is in said position, the highest point on the upper side of the second portion is higher than the lowermost point on the first portion by less than 3 times the thickness of the rod.
20. A clip according to any preceding claims which is such that, when it is in said position, the highest point on the upper side of the second portion is higher than the lowermost point on the first portion by less than $2\frac{1}{2}$ times the thickness of the rod.
21. A clip according to any preceding claim which is such that, when it is in said position, the highest point on the upper side of the second portion is higher than the lowermost point on the first portion by less than twice the thickness of the rod.
22. A clip according to any preceding claim which is such that, when it is in said position, the highest point on the upper side of the second portion is higher than the lowermost point on the first portion by about 1.75 times the thickness of the rod.
23. A clip according to any preceding claim and made from a rod of circular cross-section at least 1 cm. in diameter.
24. A clip according to any preceding claim and such that, when it is in said position, no part of the clip is vertically above any part of said first portion.
25. A clip according to any preceding claim in which there is a flat surface on the side of the fifth portion which is the lower side when the clip is in said position.
26. A clip according to claim 25 in which the flat portion has a length greater than $1\frac{1}{2}$ times the thickness of the rod.
27. A clip according to any preceding claim in which the clip, when in said position and viewed from above, looks rather like a lower case letter *e* or a mirror image of a lower case letter *e*.
28. A clip according to any preceding claim in which the second and third portions together form a reverse bend and the third and fourth portions together form another reverse bend, these two reverse bends meeting one another in a smooth continuous curve.
29. A clip according to any preceding claim in which the fifth portion has been given its final shape by having been supported by a lower support member which has contacted it over a length of more than 1 centimetre when the fifth portion has been pressed downwardly whilst red hot.
30. A clip according to any one of claims 1 to 26 in which the fifth portion, when it is viewed in plan with the clip in said position, seems to be perpendicular to the axis of the first portion.
31. A railway rail-fastening clip substantially as described above and shown in Figures 1 to 3 or 4 to 6 of the accompanying drawings.
32. A railway rail-fastening clip comprising a rod of resilient metal with a length less than 18 times its thickness which has been bent so as to have, progressing from one end of the rod to the other end, a first portion which starts at one end of the rod and is a straight or nearly straight leg, then a second portion, then a third portion, then a fourth portion and finally a fifth portion



which ends at said other end of the rod, these portions being such that, when the clip is in a particular position, the lowermost points on the opposite ends of the first portion are in the same horizontal plane as one another and the lowermost points on the third and fifth portions are in the same horizontal plane as one another, and the second portion, proceeding from the first portion to the third portion, has a rising part followed by a falling part and when the clip is viewed from above the third and fifth portions appear to be on opposite sides of the axis of the first portion and when the clip is viewed in a horizontal direction perpendicular to a straight line passing through the lowermost points on the opposite ends of the first portion, the largest angle of descent of said falling part, with respect to the horizontal, is seen to be less than 35°.

33. A railway rail-fastening clip comprising a rod of resilient metal with a length of less than 18 times its thickness which has been bent so as to have, progressing from one end of the rod to the other end, a first portion which starts at one end of the rod and is a straight or nearly straight leg, then a second portion, then a third portion, then a fourth portion and finally a fifth portion which ends at said other end of the rod, these portions being such that, when the clip is in a particular position, the lowermost points on the opposite ends of the first portion are in the same horizontal plane as one another and the lowermost points on the third and fifth portions are in the same horizontal plane as one another, and the second portion, proceeding from the first portion to the third portion, has a rising part followed by a falling part and when the clip is viewed from above the third and fifth portions appear to be on opposite sides of the axis of the first portion, the highest point on the upper side of the second portion being lower than the highest point on the upper side of the fourth portion.

34. A railway rail-fastening clip comprising a rod of resilient metal with a length less than 18 times its thickness which has been bent so as to have, progressing from one end of the rod to the other end, a first portion which starts at one end of the rod and is a straight or nearly straight leg, then a second portion, then a third portion, then a fourth portion and finally a fifth portion which ends at said other end of the rod, these portions being such that, when the clip is in a particular position, the lowermost points on the opposite ends of the first portion are in the same horizontal plane as one another and the lowermost points on the third and fifth portions are in the same horizontal plane as one another, and the second portion, proceeding from the first portion to the third portion, has a rising part followed by a falling part and when the clip is viewed from above the third and fifth portions appear to be on opposite sides of the axis of the first portion, the highest point on the upper side of the second portion being higher than the lowest point on the third portion by less than twice the thickness of the rod.

35. A railway rail-fastening clip comprising a rod of resilient metal with a length less than 18 times its thickness which has been bent so as to have, progressing from one end of the rod to the other end, a first portion which starts at one end of the rod and is a straight or nearly straight leg, then a second portion, then a third portion, then a fourth portion and finally a fifth portion which ends at said other end of the rod, these portions being such that, when the clip is in a particular position, the lowermost points on the opposite ends of the first portion are in the same horizontal plane as one another and the lowermost points on the third and fifth portions are in the same horizontal plane as one another, and the second portion, proceeding from the first portion to the third portion, has a rising part followed by a falling part and when the clip is viewed from above the third and fifth portions appear to be on opposite sides of the axis of the first portion, the highest point on the upper side of the second portion being higher than the lowest point on the first portion by less than 3 times the thickness of the rod.

36. A clip according to any one of claims 1 to 30 or 32 to 35 which is such that, when it is in the position specified in claim 1, 32, 33, 34 or 35, the second plane mentioned in the relevant one of those claims is higher than the first.

37. A railway rail-and-fastening assembly comprising a rail foundation, a rail laid on the rail foundation between two projections extending upwardly from the rail foundation and two clips according to any preceding claim, each clip having its first portion substantially parallel to the rail and held down by one of said projections, its third portion bearing downwardly on the rail flange, directly or through an electrical insulator on the rail flange, and its fifth portion bearing downwardly on an unyielding surface which, as seen from the rail, is beyond said first portion.

38. A railway rail-and-fastening assembly substantially as described above with reference to Figures 7 to 9 of the accompanying drawings or with the modification that the clip is substantially as shown in Figures 4 to 6 of the accompanying drawings.



39. A railway rail-and-fastening assembly comprising a rail foundation, a rail laid on the rail foundation between two projections extending upwardly from the rail foundation and two clips according to any preceding claim, each clip having its first portion substantially parallel to the rail and held down by one of said projections, its fifth portion bearing downwardly on the rail flange, directly or through an electrical insulator on the rail flange, and its third portion bearing downwardly on an unyielding surface which, as seen from the rail, is beyond said first portion.

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