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PATENTS ACT 1977

SPECIFICATION NO. 2154635A

The following corrections were allowed under Section 117 on 14 October 1985

Front page Heading (72) Inventors
for Hartley Frank Collins
read Hartley Frank Young

THE PATENT OFFICE
24 October 1985

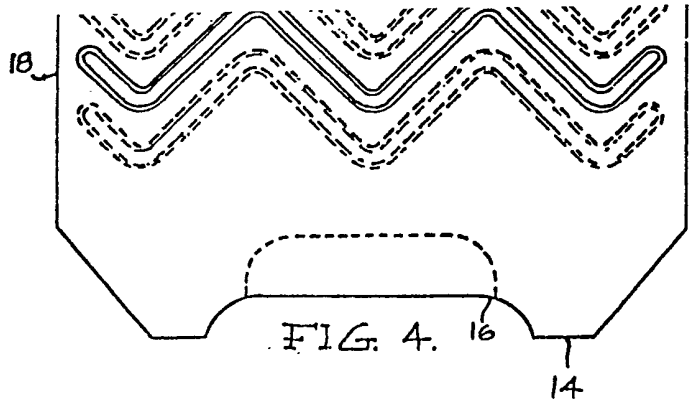

FIG. 4.

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(54) Rail insulation pad

(57) A rail pad to electrically and dynamically insulate a rail from a rail tie is provided by a flexible, resilient pad at least 7.5mm thick with grooves or recesses in at least one surface which have a depth of at least 55% of the pad thickness.

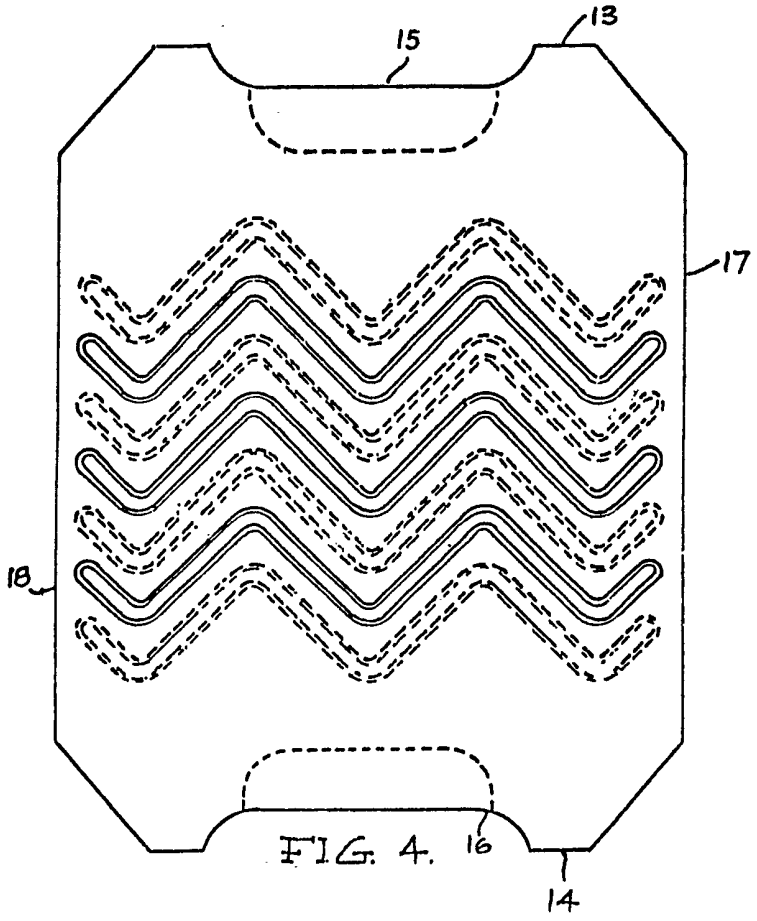

FIG. 4.

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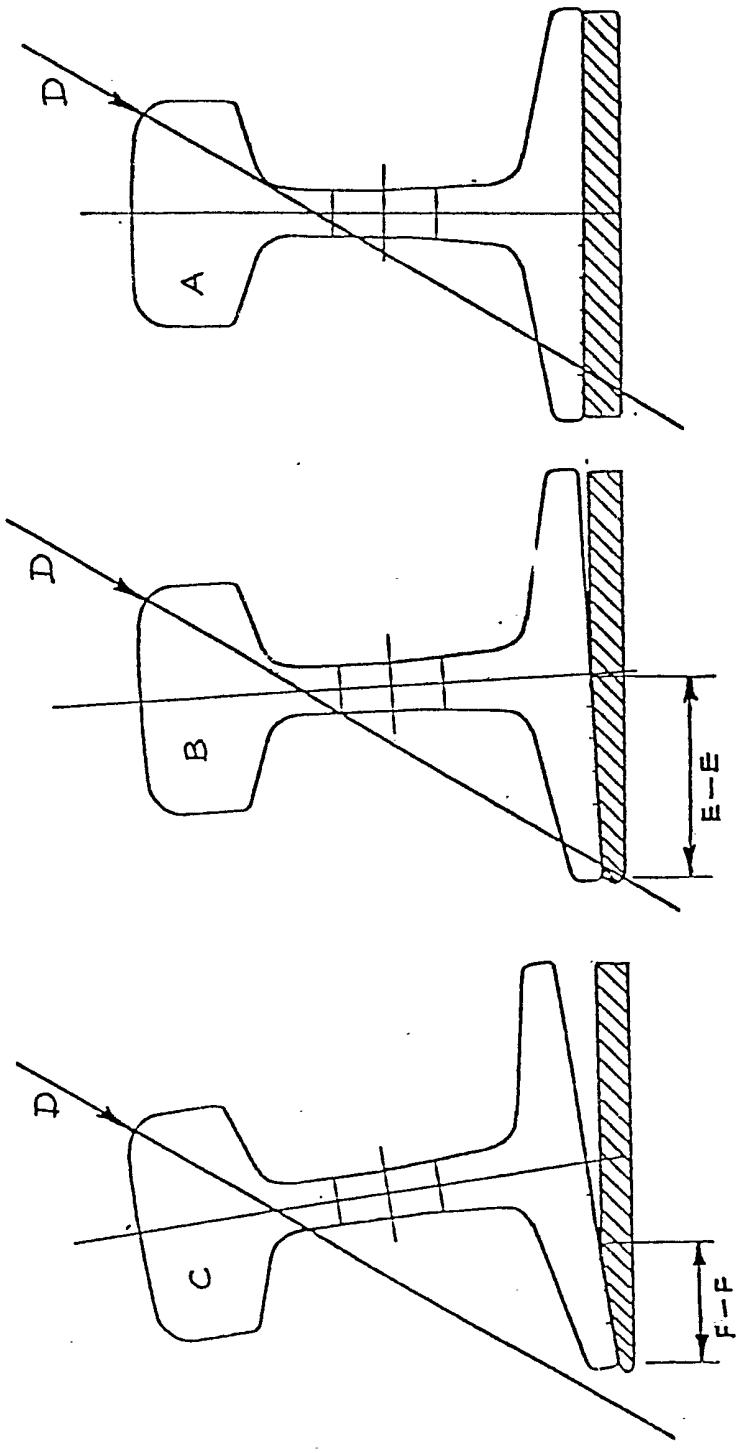

FIG. 1

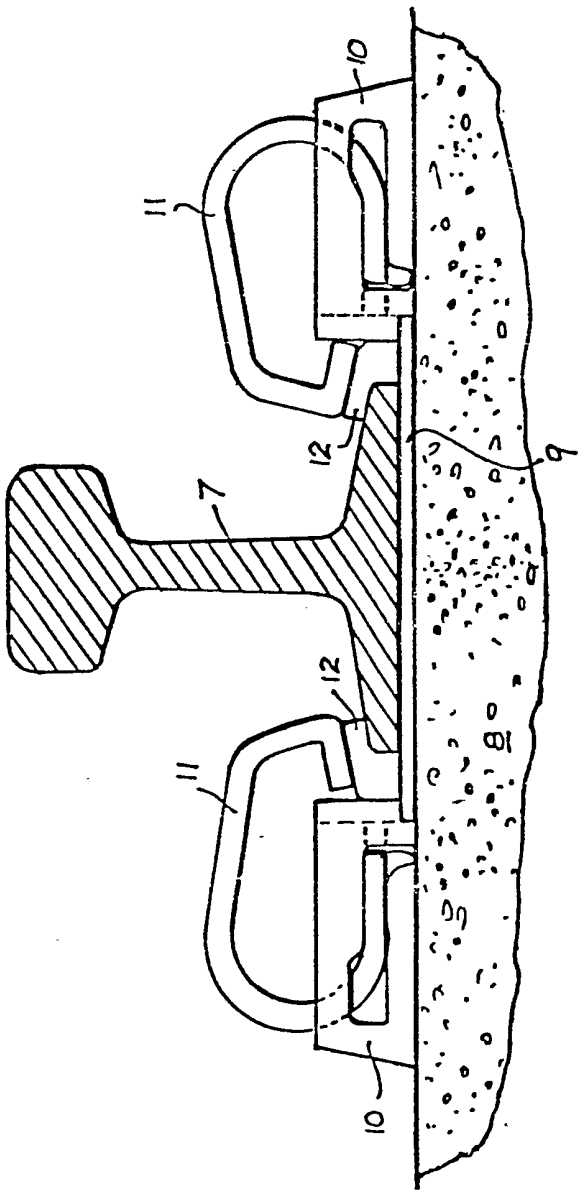

FIG. 2.

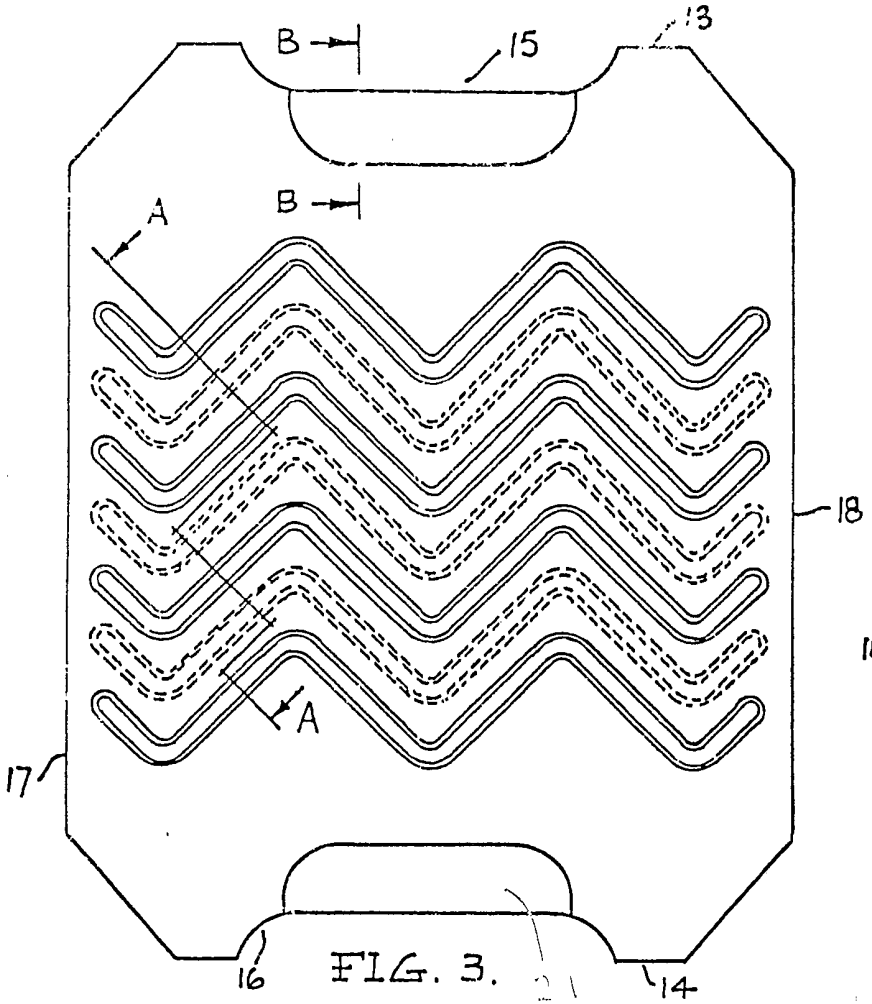

FIG. 3.

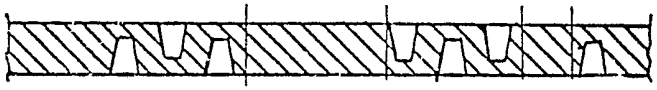

FIG. 5.

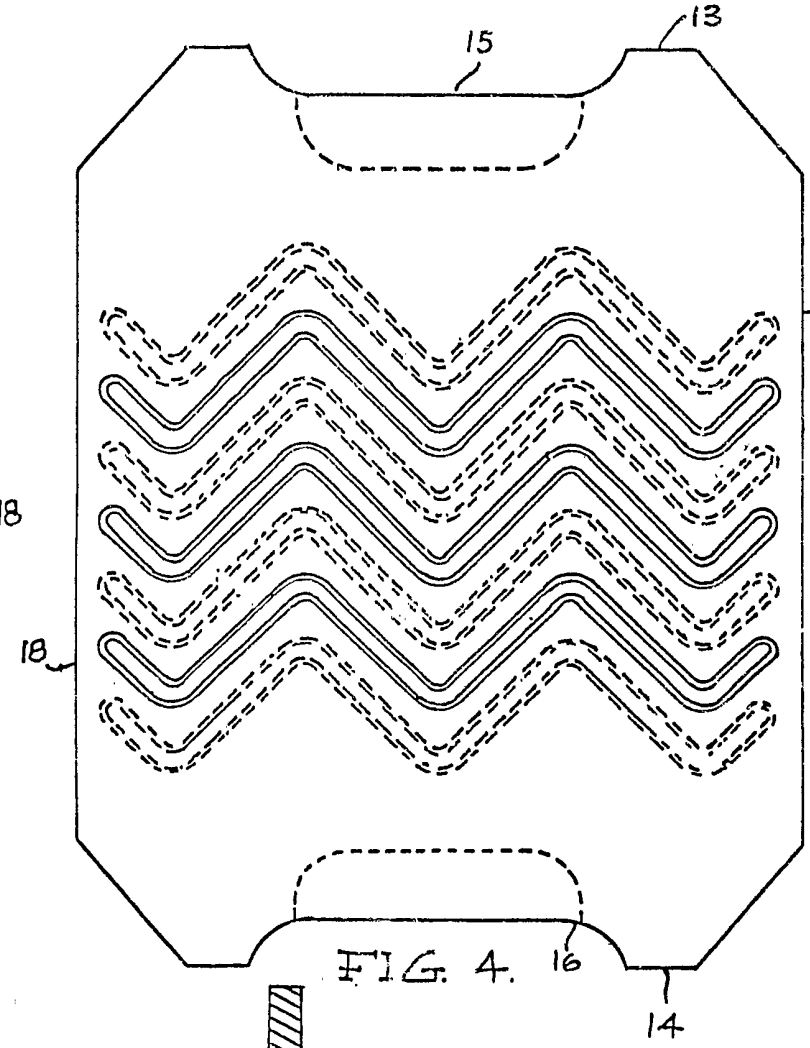

FIG. 4.

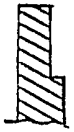

FIG. 6.

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SPECIFICATION

Rail insulation pads

This invention relates to rail fastening systems and in particular rail insulating pads which are used to electrically and dynamically insulate the rail from the rail tie.

Australian patent 479377 discloses a commonly used form of rail insulating pad which is of thin cross-section and provides tapered side edges to reduce the incidence of damage or cracking to the rail pad.

Where concrete rail ties are used it has been found that cracking or splitting of the tie can be caused by impact forces arising from flattened portions in the train wheels circumferences or from the train wheel striking indentations or protrusions in the rail (e.g. a welding seam). It has been realized that one means of reducing the incidence of this type of damage was to utilize a rail pad with force attenuation properties as well as electrical insulating properties. An obvious solution was to provide a thicker rail pad of an elastic material such as rubber.

However, thickness alone is not the answer. Attempts have been made to provide improved attenuation. Australian patent specification (lapsed) No. 28158/71 discloses a pad having a series of ribs on its upper and lower surfaces which it is claimed reduce vibration and noise. Australian patent specification 508353 discloses a rail pad of high density polyethylene (a resilient but non flexible hard material) which incorporates a series of radial recesses intended to reduce cracking of the pad due to non-uniform rail and rail tie surfaces.

Although the provision of ribs or recesses in the rail pads may have some effect in reducing damage to rail ties and to the pads themselves the incidence of damage will still be high particularly in curved sections of track where the loads to which the pads and rail ties are subjected are concentrated on one side of the rail.

It is an object of this invention to improve the force attenuation properties of rail insulation pads.

To this end the invention provides in a rail fastening system of the kind in which a rail is fastened to a rail tie by a rail seat consisting of a rail tie a rail pad between the tie and the rail; a pair of rail clamp supports secured to said tie on either side of said rail and abutting said rail pad; rail clamp associated with each rail clamp support each clamp having a portion secured in said clamp support and a portion bearing down on said rail flange, and a clamp insulator lying on said rail flange to electrically insulate said rail flange from said rail clamp and said clamp support, the improvement comprising the provision of a rail pad to electrically and dynamically insulate said rail tie from said rail which pad is composed of a flexible, resilient material of thickness greater than 7.5mm and is provided with grooves or recesses of an average depth greater than 55% of the thickness of the pad to provide force attenuation. The invention also resides in the rail pad construction.

Prior art pads of resilient and flexible material which were thicker than 7.5mm did not use recesses having an average depth greater than 55% of the thickness of the pad.

If grooves are used and are placed on both surfaces these can be staggered in array so that the grooves on opposite surfaces are separated by walls which extend the full thickness of the pad. The depth of the grooves is preferably from 65% to 75% of the thickness of the pad. By using this construction of rail pad the overall thickness of the pad can be reduced to achieve similar attenuation values to the prior art pads. This enables harder material to be used than was previously thought feasible.

Although force attenuation is increased by using softer material for the pad, damage to the pad is more likely to occur with softer material. This is particularly so on curved sections of track where the load is concentrated on one edge of the rail and with softer material, the edges cut into the pad. To further explain the problem overcome by this invention reference is made to Figs. 1A B and C which illustrate a conventional thick rail pad which is used to provide high force attenuation. Where the pad is located on curved track and the load is applied along the line D as shown in 1A the pad initially will deflect vertically as shown in 1B which results in a reduction in the bearing width E–E being reduced. This reduction in bearing width means that greater deflection of the pad results which in turn results in a further reduction of bearing width as shown in F–F in Fig. 1C. This leads to instability of the rail seat and excessive wear on the rail pad.

Where a harder material is used the load is spread over a larger area because a greater surface contact is maintained between pad and rail because vertical deflection is reduced. It is preferred in this invention to use a flexible, resilient rubber pad of Duro hardness in the range of 68 to 90 on the Shore-A scale.

It will be appreciated that there is a conflict between the requirement to prevent damage to the pad which can be achieved by using harder, less resilient pads and damage to the rail tie which can be prevented by using more resilient rail pads.

A further aspect of this invention provides a rail insulation pad of a relatively hard resilient and flexible material having in the central portion of both the upper and lower surfaces of the pad a concentration of grooves and or recesses to provide attenuation of the forces

applied during passage of a railway vehicle and having a low concentration of such recesses or grooves on the edge portions of the pad adjacent to the rail edges. Besides reducing the number of grooves adjacent the rail edges, it is also possible to increase the rigidity of the pad by using grooves of shallow depth. Preferably the depth will be less than 50% of pad thickness more preferably about 30%. In particular, it is the grooves adjacent to the rail edges which are preferably of shallow depth to increase the pads rigidity adjacent the rail edges.

This arrangement ensures that the pad provides good attenuation of the forces applied through the rail to the rail tie to protect the tie while at the same time providing good bearing capacity adjacent the rail edges where damage to the rail pad is most likely to occur and also prevent rail instability.

If surface contact between the pad and the rail or rail tie is required the area of contact should be low and the structure of the pad be such that the spring rate is low and high attenuation will occur. This can be provided by having the central region corrugated with grooves having sloping sides to reduce the bearing capacity of this portion of the pad, because the sloping walls of the corrugations when under load will be in shear, not compression. It is possible using this construction to use corrugations parallel to the longitudinal dimension of the rail extending completely across the pad.

When thicker high force attenuating rail pads are used, considerable vertical deflection of the pad will occur. This deflection will of course vary with the hardness of the pad material but is also related to pad thickness. The thicker the pad the greater the vertical deflection. This vertical deflection under load causes the pad to deform in a lateral direction from under the rail seat with each load pulse arising from the passage of a train wheel. However, the portion of the pad located between the rail and the rail clamp support shoulder is completely enclosed by the clamp support and the rail and this restricts such a lateral deformation. Instead the pad tends to deform upwardly under the clamp insulator which lies partly on the rail flange and partly on the rail pad between the flange and the clamp support. This upward force and movement on the clamp insulator leads in some cases to an early fatigue failure of the clamp insulator.

To overcome this particular difficulty this invention provides that a recess be incorporated in the rail pad in the portion of the pad which abuts the clamp support. This recess can be a hollow in the upper or lower surface of the pad or grooves into the upper or lower surface which have the effect of reducing the volume of the pad in that portion of the pad.

Such a recess will provide sufficient room for the pad to deform into, under load, without applying force to the clamp insulator. Preferably a recess is provided in the upper surface which lies beneath and within the boudary of the clamp insulator. It is preferred that the recess represents at least 10% preferably 25% of the volume of the pad lying between the edge of the clamp support which is parallel to the rail and the rail edge. The volume of the recess may be greater than 50% of the volume of this portion of the pad but no further advantage is obtained.

This invention will now be described with reference to the drawings in which

Figure 2 is a schematic view of a rail seat showing the position of the rail pad,

Figure 3 is top plan view of one rail pad of this invention,

Figure 4 is a bottom plan view of the pad of Fig. 3.

Figure 5 is a sectional view along A–A of Fig. 3, and

Figure 6 is a sectional view along B–B of Fig. 3.

The rail seat as shown in Fig. 2 comprises the rail 7, the rail tie 8 and between them the rail insulation pad 9. On either side of the rail 7 and embedded in rail tie 8 are two rail clip support shoulders 10 and fitted to each is a clip 11 which bears down on the flange of rail 7. A clip insulator 12 insulates each clip 11 from the flanges of rail 7.

The rail insulation pad as shown in Figs. 3 to 6 comprise the edge portions 13 and 14 which lie adjacent the longitudinal edges of the rail. The edge recesses 15 and 16 are complementary in shape to the portions of the rail clip support shoulders which abut that portion of the rail pad. The edges 17 and 18 of the pad of Figs. 3 and 4 lie laterally under the rail. The upper surface of the pad as shown in Fig. 2 lies against the bottom of the rail. The pad of Figs. 3 to 6 is 10mm thick and maybe made of rubber or a synthetic plastics material having a poissons ratio of approximately 0.55. This means a compression of 1mm to the vertical thickness will cause widening in the lateral dimension of about 0.55mm. As explained above however such an expansion cannot occur if the surface movement is restricted by friction. The pad is composed of resilient, flexible rubber of hardness Duro 80 on the Shore-A scale. The grooves 19 are 7mm deep and are arranged in chevron formation such that grooves alternate from one surface to the other. Recesses 20 and 21 are provided in the upper surface of the pad adjacent the edge recesses 15 and 16 respectively. These edge recesses provide a 25% reduction in the volume of the pad lying between the face of clip support 10 which is parallel to the rail and the edge of rail 7.

From the above, it can be seen that this invention provides improved attenuation of

forces to which the rail pad is subjected.

CLAIMS

1. In a rail fastening system of the kind in which a rail is fastened to a rail tie by a rail seat consisting of a rail tie a rail pad between the tie and the rail; a pair of rail clamp supports secured to said tie on either side of said rail and abutting said rail pad; rail clamp associated with each rail clamp support each clamp having a portion secured in said clamp support and a portion bearing down on said rail flange, and a clamp insulator lying on said rail flange to electrically insulate said rail flange from said rail clamp and said clamp support, the improvement comprising the provision of a rail pad to electrically and dynamically insulate said rail tie from said rail which pad is composed of a flexible, resilient material of thickness greater than 7.5mm and is provided with grooves or recesses of an average depth greater than 55% of the thickness of the pad to provide force attenuation.

2. The improvement of claim 1 wherein the average depth of the grooves is from 65 to 75% of the pad thickness.

3. The improvement of claim 1 wherein the portion of the rail pad abutting the rail clamp support is recessed or grooved in the upper or lower surface of the pad to reduce the volume of the pad in that portion.

4. The improvement as defined in claim 3 wherein the upper surface of the portion of the pad abutting the clamp support is recessed such that the volume of the pad, lying between the edge of the clamp support parallel to the rail and the rail edge, is reduced by at least 10%.

5. The rail pad as defined in claim 1.

6. The rail pad of claim 5 wherein the average depth of the grooves is from 65 to 75% of the pad thickness.

7. The rail pad of claim 5 wherein the portion of the rail pad abutting the rail clamp support is recessed or grooved in the upper or lower surface of the pad to reduce the volume of the pad in that portion.

8. The rail pad of claim 7 wherein the upper surface of the portion of the pad abutting the clamp support is recessed such that the volume of the pad, lying between the edge of the clamp support parallel to the rail and the rial edge, is reduced by at least 10%.

9. The rail pad of claim 6 wherein the pad is grooved on both its upper and lower surface, such that the grooves on each surface are laterally and alternately spaced from each other.

10. The rail pad of claim 5 wherein the grooves have sloping sides.

11. A rail insulation pad comprising a substantially rectangular substantially flat pad of resilient material adapted to be situated at least partly beneath a rail, that part of the pad which is adapted to lie beneath the rail being at least 7.5 mm thick and being provided with grooves or recesses which extend, on average, through at least 55% of the said thickness.

12. A rail insulation pad as claimed in any preceding claim in which the material of the pad is of hardness 68 or greater on the Shore-A scale.

13. A rail insulation pad substantially as specifically herein described with reference to the accompanying drawings.

14. A rail fastening system substantially as specifically herein described with reference to the accompanying drawings.

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