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Tamura

[11] **3,831,842**

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[54] **RAIL FASTENING DEVICE**

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[52] **U.S. Cl.** **238/349,** 238/282, 238/283, 238/304, 238/310

[51] **Int. Cl.** **E01b 9/66**

[58] **Field of Search** 238/349, 282, 310, 333, 238/346, 337, 354, 361–365, 283, 304

[56] **References Cited**

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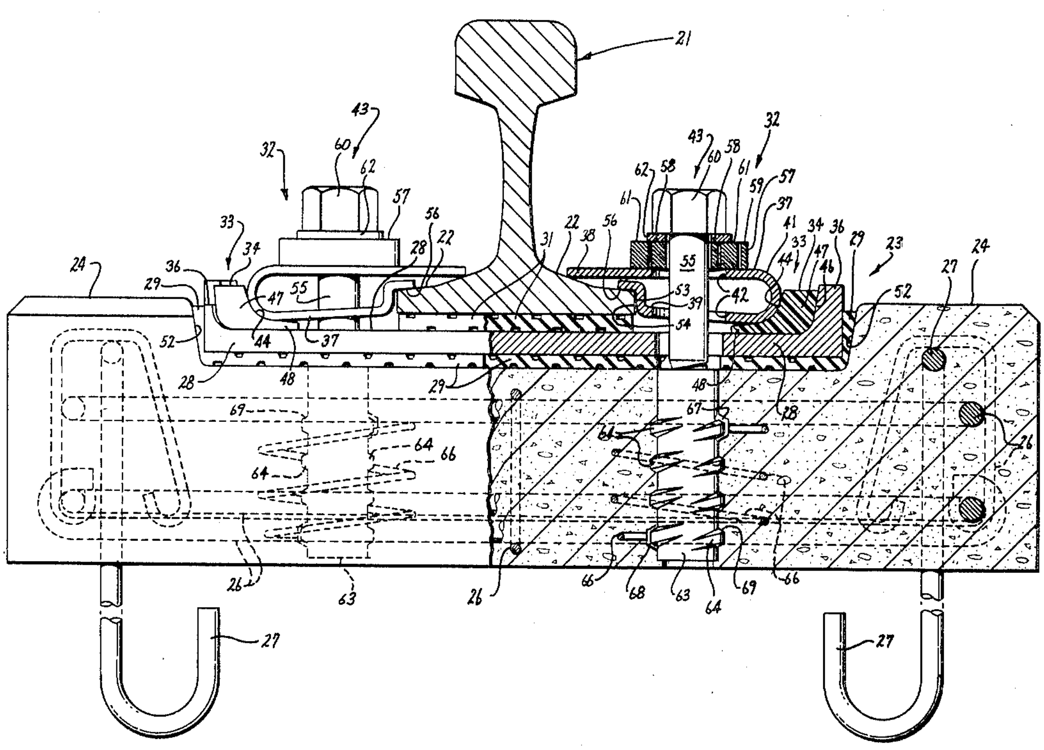
Primary Examiner—M. Henson Wood, Jr.
Assistant Examiner—Richard A. Bertsch
Attorney, Agent, or Firm—Warren, Rubin & Chickering

[57] **ABSTRACT**

A rail fastening device for securement of a longitudinally extending rail means to support structure by spring clip means is disclosed. A rail alignment means, including wedge means, mounted in engagement with the spring clip means and formed to laterally displace the spring clip means, and accordingly the rail means, is provided to enable precise alignment of the rail means and the gauge between adjacent rails. The spring clip means is free for lateral movement, as is the rail, and the alignment means is used to support lateral loading forces as well as align the rail means. The wedge means is formed of electrically insulating material, as is a pad under the rail and sockets into which fasteners for the spring clips are mounted, to insulate the rail means electrically from the supporting structure. A rail fastening device for tracks with and without ballast is shown as well as specific spring clip configurations and a locking washer for the spring clips.

15 Claims, 4 Drawing Figures



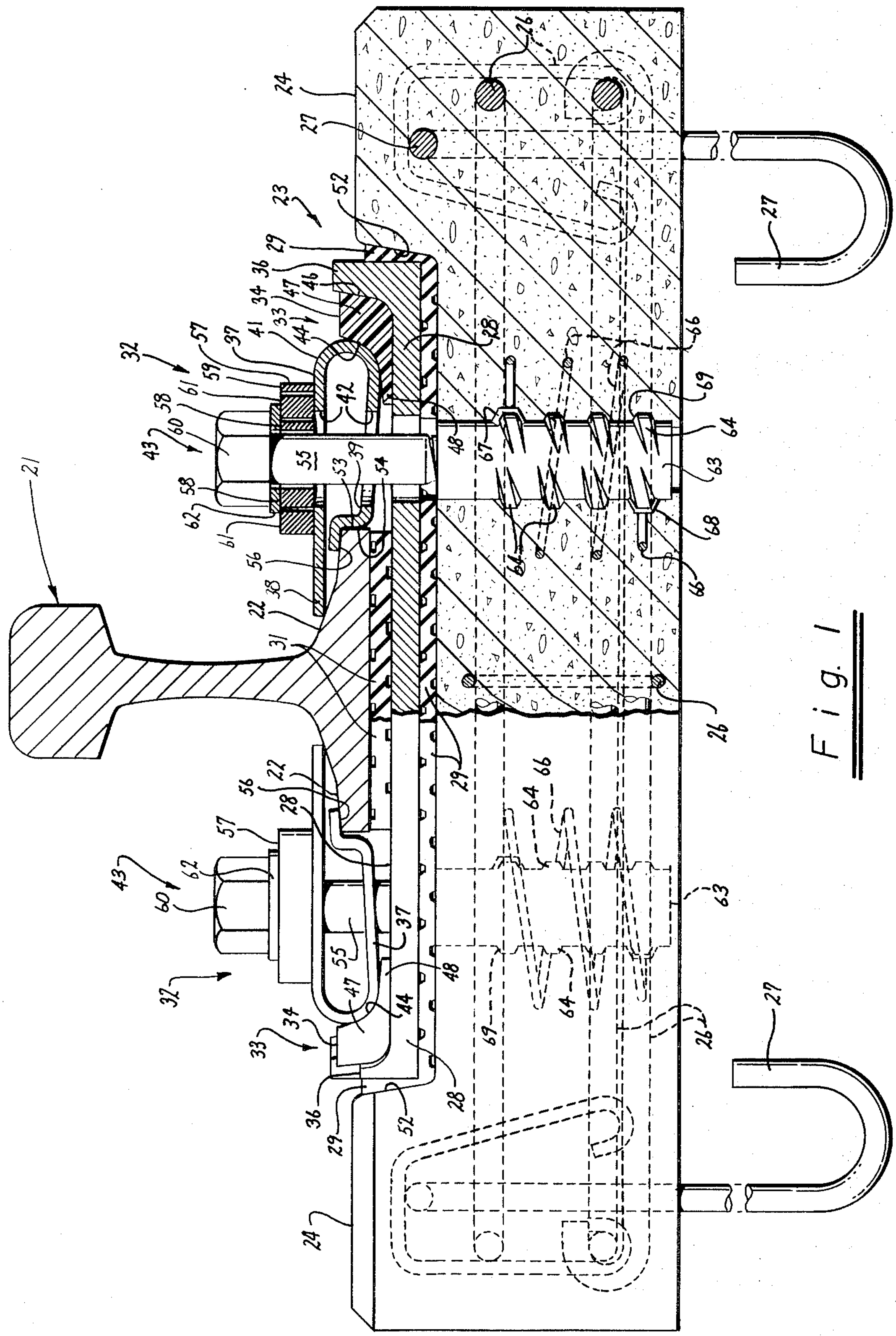


Fig. 1

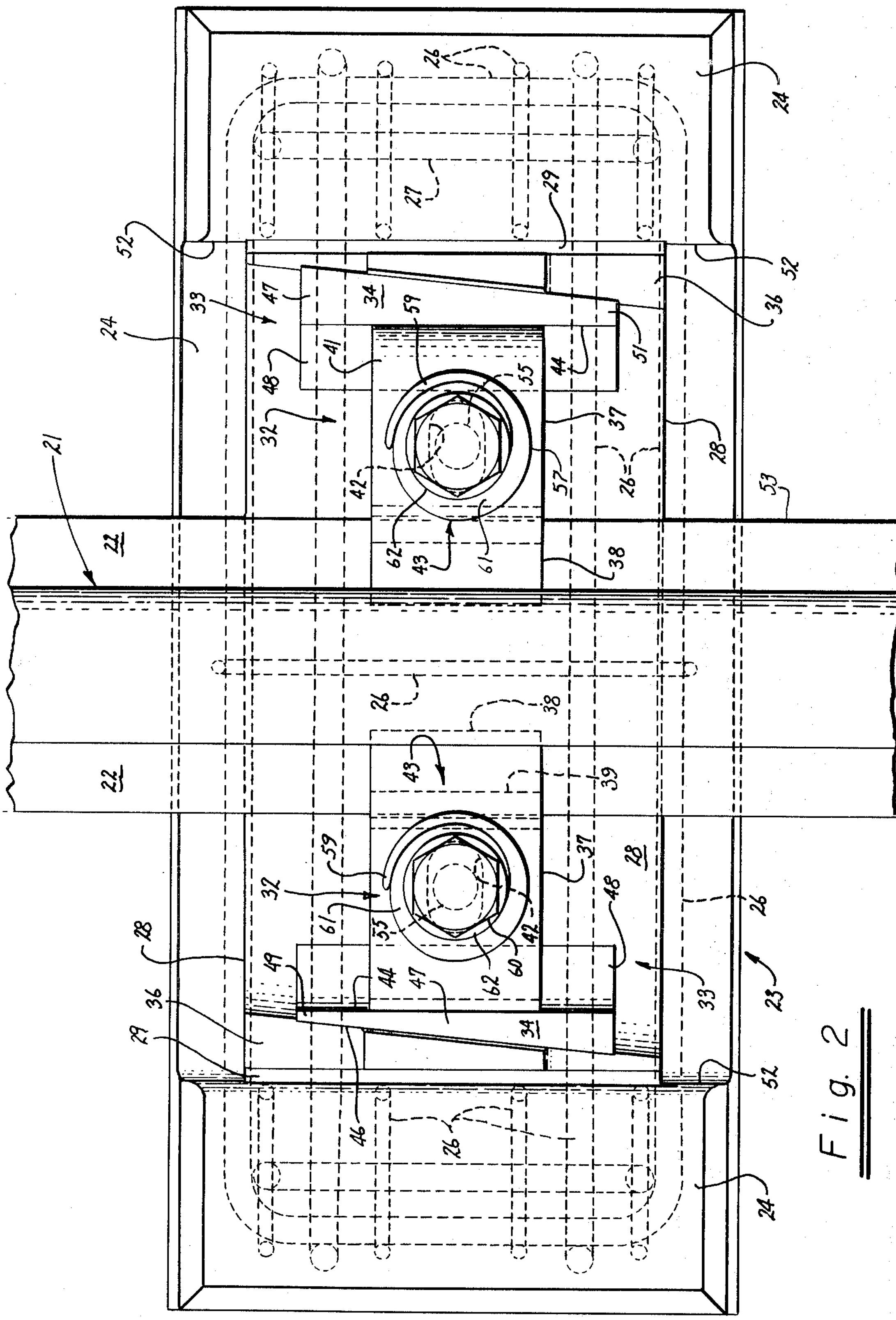

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Fig. 2

Fig. 3

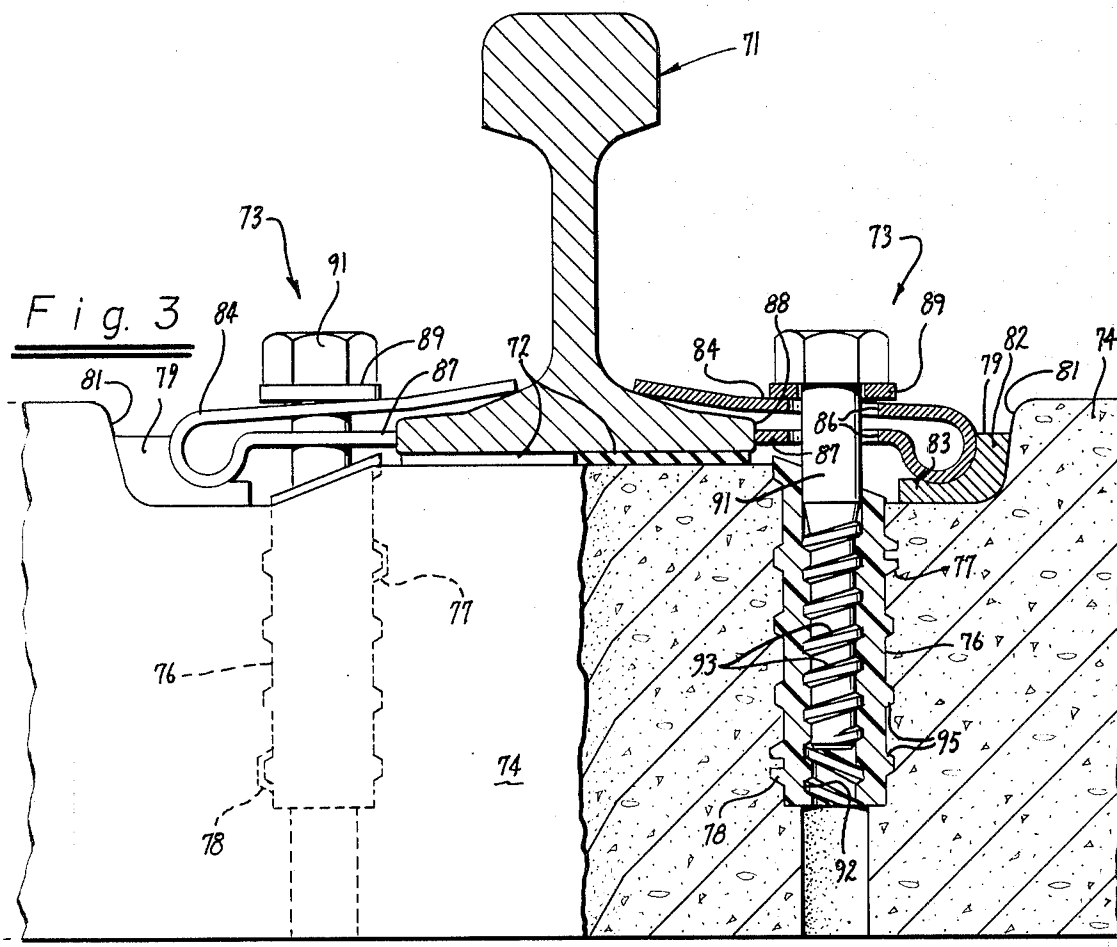
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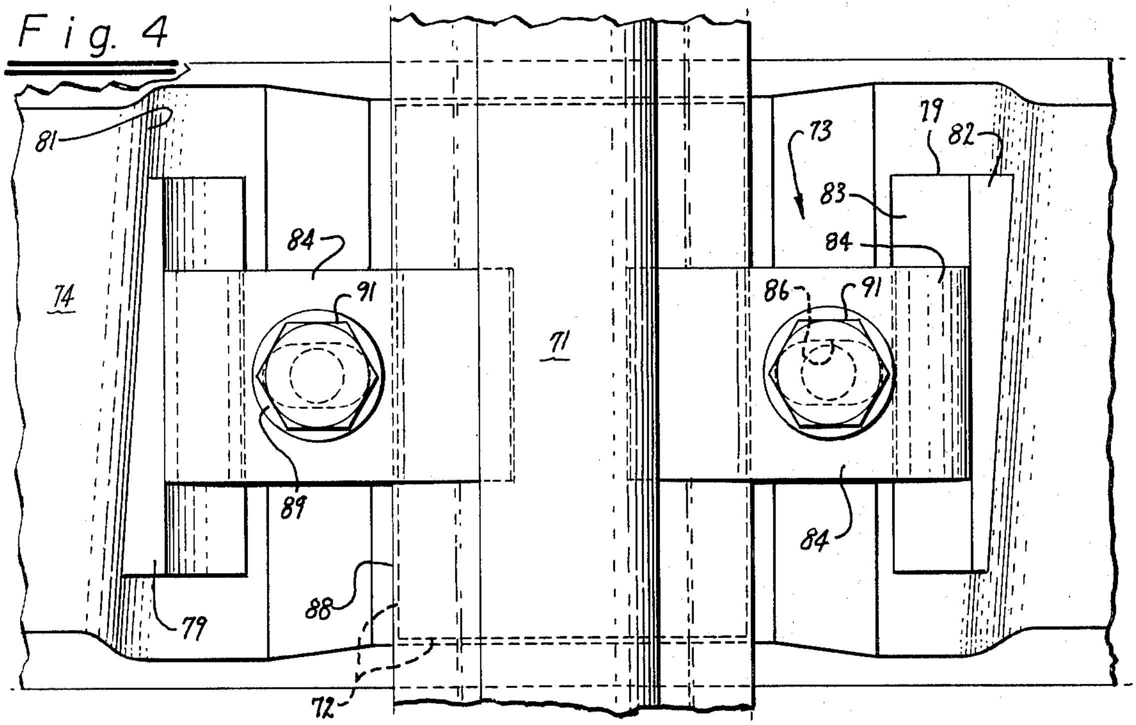
Fig. 4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RAIL FASTENING DEVICE

BACKGROUND OF THE INVENTION

In recent years considerable interest has developed in connection with the use of high-speed railway systems for the transportation of people and freight. While techniques and apparatus for creating the necessary railways for conventional trains are well established, high-speed equipment has brought with it many new problems and requirements for the rails and rail supporting structures on which the new trains run.

In many situations, particularly rapid transit applications in urban areas, it is not possible or desirable to use conventional ballast as support for the ties or sleepers to which the rails are secured. Accordingly, the sleepers must be bolted directly on a relatively rigid concrete or steel roadbed. This mounting approach requires that the fastening device used to secure the rails to the sleepers or used to secure the sleepers to the roadbed must take on some of the characteristics or functioning of ballast, namely, the rail fastening structure should be elastic.

As the conventional train travels down a track, it subjects the rails and the supporting structure to a complex pattern of horizontal and vertical forces. As the speed of the train increases, the dynamic loading on the rails becomes more complex and critical. Misalignment of the rails and variances in the gauge between the rails can be particularly troublesome in high-speed railway systems since the speed of the trail will cause extremely high loading forces in the transverse or lateral direction with respect to the rails. These lateral loading forces can be quite substantial on curves even when the rails are properly aligned. Additionally, high-speed railway systems have increased problems of fatigue and durability as a result of the high stresses and vibrational forces encountered.

High-speed railway systems further often require much more comprehensive and sophisticated control of the trains, including the use of the rails to convey electronic control signals. Thus, while a third rail or power rail is often employed, the rails on which the trains run are also used to monitor and control the progress of trains. Electrical insulation of the rails from ground and from each other is, therefore, of extreme importance if a reliable control system of any sophistication is to be used.

Several rail fastening configurations have been designed specifically for the high-speed railway. Typical of such devices is the device of U.S. Pat. No. 3,576,293, which is designed for use in fastening rails to a supporting structure which does not have any ballast. This structure includes means for adjusting the alignment of the rails and provides for electrical insulation between the rails and the roadbed. The rail fastening device of U.S. Pat. No. 3,576,293 is, however, somewhat complex in nature and provides for alignment of the rail by means of a series of discrete laterally spaced settings. While adequate for many applications, some roadbed standards require that the gauge of the track be held within zero to 3 millimeters over a 10 meter length of track, or up to 1 millimeter over a 2 meter length of track, for each of the rails with respect to the center line as well as the spacing between the rails. These, for example, are the specifications for the rails on the high-speed Japan National Railway. So important is the precise maintenance of gauge on that railway that all of the spring clips along the line are inspected daily and adjusted as required. This is done every night with the aid of machines and computers. Accordingly, it is absolutely essential that the rail alignment means in a rail fastening device be simple in its construction and easily adjustable through a continuum of settings to meet the precise gauge requirements.

Typical of some other rail fastening devices which have been developed for use with high-speed railways are the devices set forth in U.S. Pat. Nos. 3,610,526, 3,451,621 and 3,246,843. These rail fastening devices are primarily directed to the problem of insulating the rails from the ground and from each other, as well as a variety of spring clip constructions for clamping the rails to the supporting roadbed. Little consideration is given to the problem of adjusting the alignment of the rails on a periodic or recurring basis.

Accordingly, it is an object of the present invention to provide a rail fastening device having rail aligning means which may be used to more easily and precisely adjust the gauge and alignment of rails mounted on a roadbed.

It is another object of the present invention to provide a rail fastening device having alignment means which provides high strength, reliable support for lateral loading forces to which the rail is subjected.

It is another object of the present invention to provide a rail fastening device including alignment means which may be readily employed on tracks with or without ballast.

It is still another object of the present invention to provide a rail fastening device in which the electrical insulation of the rails from ground and from each other is more reliable and accomplished by a minimum of insulating means.

It is a further object of the present invention to provide a rail fastening device which has improved strength and durability, is economical to install and maintain, and is adaptable to a wide variety of roadbed specifications.

The rail fastening device of the present invention has other objects and features of advantage which will become apparent from and are set forth in the drawings and described in more detail hereinafter.

SUMMARY OF THE INVENTION

The rail fastening device of the present invention is comprised, briefly, of an improved rail alignment means mounted to a rail supporting structure and positioned in engagement with a spring clip used to clamp the rail to the rail supporting structure. The spring clip and the rail are mounted for lateral displacement with respect to the supporting structure, and the alignment means includes a wedge formed to laterally displace the spring clip, and accordingly the rail, with respect to the support structure upon movement of the wedge, preferably along the longitudinal axis of the rail. The rail alignment means further preferably includes a wedge which is formed to support and transfer lateral loading forces from the spring clip through the aligning wedge to the supporting structure. The wedge is formed for selective releasable securement to the supporting structure to fix the lateral placement of the rail, preferably by clamping the spring clip down against a portion of the wedge. The alignment wedge means is preferably further formed of electrically insulating material, as is a socket in the support structure to which the spring clips are secured to provide a high-strength electrically insulated fastening device. A spring clip, particularly well suited for use on tracks having no ballast is provided, as is a lock washer formed to resist loosening of the spring clips by reason of vibrations encountered in the system.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is an end elevational view, partially in cross-section, of a rail fastening device constructed in accordance with the present invention and for use on a track having no ballast.

FIG. 2 is a top plan view of the rail fastening device of FIG. 1 with the rail fragmented.

FIG. 3 is an end elevational view, partially in cross-section, of an alternative embodiment of the rail fastening device of the present invention for use on tracks having ballast.

FIG. 4 is a top plan view of the rail fastening device of FIG. 3 with the rail fragmented.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1 and 2, a longitudinally extended rail means **21** having bottom flange portion **22** is fastened by the device of the present invention to a support structure, generally designated **23**, which includes a concrete sleeper **24** having reinforcing members **26** embedded therein. Certain of the reinforcing members, namely, members **27**, may be employed as anchors to cast the concrete tie or sleeper **24** directly into an additional supporting structure, such as a concrete roadbed (not shown). Since it is contemplated that the concrete sleeper **24** of FIGS. 1 and 2 is to be fastened rigidly to a supporting structure, rather than being mounted on ballast such as gravel or the like, the supporting structure in FIGS. 1 and 2 further includes a metallic base plate **28** and an underlying electrically insulating and vibrationally dampening pad **29**. Mounted on base plate **28** is a second electrically insulating and vibrationally dampening pad **31**, which is positioned beneath rail **21**, and spring clip means **32** is mounted to support structure **23** and engages flange portion **22** of the rail to clamp the rail to the support structure.

In order to provide for the rapid and precise adjustment of the alignment of rail **21**, rail alignment means, generally designated **33**, is mounted to support structure **23** and positioned in engagement with spring clip means **32**. Unlike the device of U.S. Pat. No. 3,576,293, rail **21** is not adhesively secured to pad **31**, nor is pad **31** secured to base plate **28**. Thus, rail means **21** is mounted for lateral displacement thereof with respect to support structure **23**, in order to enable periodic adjustments of the gauge and alignment of the rail. Similarly, spring clip means **32** is formed and mounted for lateral displacement with respect to the support structure., as will be set forth in more detail hereinafter. Alignment means **33** includes a wedge means or wedge element **34** which is formed to laterally displace spring clip means **32**, and accordingly rail **21**, with respect to support structure **23**, upon movement of wedge element **34** with respect to the spring clip and support structure. As best may be seen in FIG. 2, wedge element **34** is preferably formed for movement in a direction along the longitudinal axis of rail means **21** in order that it may successively position variable thicknesses of the wedge element between the spring clip and side shoulder portion **36** of base plate **28**, which shoulder forms a part of supporting structure **23**. Thus, wedges **34** mounted between the spring clips and the supporting structure, afford a rail alignment means which enable precise lateral displacement and fixing of rails **21** through a continuum of lateral positions by simply unclamping spring clip means **32**, adjusting the wedge members longitudinally, and reclamping the spring clips.

It is an additional important feature of the present invention that the alignment means provide an improved structure for supporting lateral loading forces on rail **21**. As best will be seen in FIG. 1, spring means **32** includes a U-shaped spring element **37** having vertically superimposed leg portions **38** and **39** and a connecting loop portion **41**. Spring element **37** is preferably formed from an elongated, flat strip of resilient material, such as high-strength steel, and the spring element is further preferably formed with openings **42** through legs **38** and **39** which are elongated in a direction perpendicular to the longitudinal axis of rail means **21**. As thus formed, legs **38** and **39** engage the flange of rail **21** and can be laterally displaced to effect displacement of the rail without being impeded by bolt means **43**.

Since the spring clip is free to be laterally displaced by lateral loading forces on rail **21**, wedge **34** is further formed to enable support of the lateral loading forces which are transmitted to the spring clip. Thus, wedge **34** of the aligment means is formed with a load bearing surface **44** which is mounted in engagement with the outside surface of loop portion **41** of the spring clip. Wedge **34** has a second oppositely facing surface **46** which bears on shoulder **36** so that lateral loading forces are supported by the shoulder portion of the supporting surface. As so formed and mounted, alignment means **33** not only provide a simple and effective way of adjusting the gauge and alignment of the rail, but it allows the spring clip to function not only to clamp the rail downwardly to the roadbed, but also to afford the resilient support in the lateral direction, without depending upon flexure or bending of bolt means **43**. In prior installations, the lateral forces applied to the rail have been transferred by spring clips to the tie-down bolts, causing repetitive bending of these bolts and eventual fatigue and failure of the same. While bolts **43** do engage spring clip **37**, it is wedge **34** which supports the spring clip against lateral deflection under dynamic condition rather than bolt means **43**. The compressive loading of wedge **34** and the substantial bearing surface area involved makes this type of support of the lateral thrust forces much more reliable than attempting to support the same by relying primarily on spring clip bolts.

Since it is necessary not only to be able to rapidly adjust the alignment of the rail, but to be able to maintain the rail alignment, the rail alignment means is further formed for releasable securement of wedge **34** at any precise predetermined location to substantially fix the lateral placement of the rail means. It is not possible under cynamic loading conditions to absolutely fix the placement of the rail means, nor is this desirable. Wedge **34** cannot, however, be allowed to be longitudinally displaced under dynamic load conditions so as to allow the rail to permanently creep from its fixed location. In order to releasably secure the wedge **34** to a supporting structure at any of a continuum of locations, it is preferable to form wedge **34** as an elongated member having an L-shaped cross-section with an upright, wedge-shaped leg **47** and a horizontal leg **48** disposed and extending beneath or below loop portion **41** of the spring element. Thus, when bolt means **43** is released, wedge **34** is free to be longitudinally reciprocated with leg portion **48** thereof sliding along underneath loop **41** of the spring clip. When the desired lateral alignment of rail **21** has been achieved, the bolts may be cinched down causing spring clip **37** to clamp down on flange **22** of the rail and leg **48** of the alignment wedge. Leg **48** of wedge **34** is preferably formed of opposed upwardly and downwardly facing parallel surfaces, since there is no need for any wedging action in a vertical direction between the support surface and spring element **37.**

As thus far described, alignment means **33** has included a single wedge element. It is possible to form the fastening device of the present invention with a wedge element on one side of rail **21** with the opposed side of the rail being held against the wedge element by techniques such as a set screw or resilient biasing means, such as a spring. In order to enhance the precision with which the rail may be aligned and improve the lateral support characteristics under cynamic loading, it is preferable that the support structure include a pair of shoulders **36** on either side of the rail, a pair of spring clip elements **37** on either side of the rail, and a pair of wedges **34** positioned between the shoulders and spring clips and formed for movement in a longitudinal direction to effect lateral displacement of the rail. As best may be seen in FIG. **2,** it is further preferable that shoulders **36** be skewed or inclined relative to the longitudinal axis of the rail with mating surface **46** of wedges **34** being similarly skewed or inclined. Thus, the skewed or inclined mating shoulders **36** and **46** will effect lateral displacement of the spring clip upon longitudinal movement of the wedge, while surface **44** on the wedge member slides parallel to the outside surface of loop **41** on the spring clip. Still further, narrow ends **49** and **51** of the opposed wedge member **34** are facing in the opposite direction. In this orientation, simultaneous movement of both wedge members in the same direction will cause the rail to be displaced laterally in one direction and movement of the wedges in the opposite direction will cause the rail to be laterally displaced in the other direction. If, for example, wedges **34** are both moved upwardly, as shown in FIG. **2,** rail **21** will be displaced to the right, while if they are moved downwardly, rail **21** will be displaced to the left. It is preferable that the angle at which the shoulders **36** and mating surfaces **44** are skewed relative to the longitudinal axis of the rail be the same for both wedges on either side of the rail so that for any unit longitudinal movement of either wedge the lateral displacement is the same. Positioning the wedges to face in opposite directions results in an alignment means in which it is easy to coordinate the movement of the alignment wedges with the direction in which the rail is displaced.

It should be further noted, that shoulders **36** can be formed parallel to rail **21** with an inclined surface being provided on the outer surface of spring clip **37** or by a second wedge disposed between shoulder **36** and wedge **34,** although such approaches may have attendant manipulation or manufacturing inconveniences. Similarly, it is possible to have the shoulders **36** skewed in the same direction so that narrow ends **49** and **51** are facing the same direction. This orientation results in the wedges having to be moved in opposite directions to effect lateral adjustment of the rail. Moreover, if the wedges have to move in opposite directions, a shortening of the bearing surfaces which engage the spring clips tends to result when attempting to get full lateral adjustment.

As shown in FIGS. **1** and **2,** the rail fastening device can be used in roadbeds having no ballast. Since the ballast is eliminated, pads **31** and **29** are provided to dampen vibrational forces and to give the required elastic properties to the overall fastening device. Since lateral loading forces are transferred through alignment means **34** to shoulder **36** of base plate **28,** it is a further feature of the present invention to form pad **29** as a U-shaped pad positioned between base plate **28** and sleeper **24** and particularly between shoulder **36** and a corresponding shoulder **52** of concrete member **24.** Concrete member **24** is provided with a recess defined by shoulders **52** into which U-shaped pad **29** and U-shaped base plate **28** are mounted. The spring clip and alignment wedge are resilient but are relatively rigid and inelastic. They, therefore, transfer lateral loading forces to the base plate **46,** and pad **29** between shoulders **36** and **52** affords necessary lateral elasticity and vibration dampening which is required on a track having no ballast.

While the multiple pad configuration of FIGS. **1** and **2** achieves elasticity in the rail fastening device, it creates certain new problems in connection with the spring clip that have been solved to increase the strength and reliability of the fastening device. As best may be seen in FIG. **1,** rail flange portion **22** has an upwardly facing surface which leg **38** of the spring clip engages. In addition, the rail flange is formed with a longitudinally extending outwardly facing edge **53** which lower leg **39** engages. The end of lower leg **39** is formed with an L-shaped extension with surface **54** thereof engaging edge **53** and surface **56** extending upwardly and laterally to engage the upwardly facing surface of flange **22.** This L-shaped end of the lower leg of clip **37** insures that the lower leg of the clip does not become lodged between rail **21** and base plate **28** as a result of the elastic mounting to the concrete sleeper. As will be seen, by contrast, the fastening device of FIG. **3** does not include a spring clip having an L-shaped lower leg extension, since that fastening device is for use with ballast and vertical movement of the rail is accommodated in part by the ballast rather than completely by pads mounted beneath the rail.

The elasticity of the rail fastening device when formed as shown in FIGS. **1** and **2** further subjects bolt means **43** to greater stress forces and increased vibration. Thus, the tendency for the bolt means to become loosened in a rail fastening device for a track without ballast is greater than in the situation where ballast is employed. Accordingly, it is a further feature of the present invention in order to increase the reliability of the rail fastening device that bolt **43** is secured against loosening by spiral-shaped lock washer **56.** Washer **56** is formed with an inner coil portion **58** resiliently biased toward a vertically displaced position from an outer coil portion **59,** with intermediate coil portion **61** further being of greater thickness than either of coil portions **58** or **59.** Mounted on top of lock washer **57** is a flat washer **62** which pushes inner coil portion **58** downwardly on outer coil portion 59 and intermediate coil portion 61 upon rotation of bolt 43 to produce an axial clamping force. Thus, while the coil portions 58, 59 and 61 are shown in horizontal alignment in FIG. 1, release of nut 43 will cause the inner portion to become vertically displaced with respect to the outer portion. The variation in the thickness of the coil portions as well as their spiral configuration may also be seen in FIG. 2. The resilient axial spring action of lock washer 57 insures a constant pressure on the head 60 of bolt 55.

In order for the spring clip means 32 to clamp rail 21 to the supporting structure for support of the rail under the complex and concentrated dynamic loading forces, the spring clip means must include a device for reliably anchoring the spring clip to the concrete sleepers or ties. In the device of the present invention, spring clip means 32 includes a socket 63 fixedly secured in concrete sleeper 24 and formed for securement of bolt 55 thereto. Socket 63 is formed with an internal threaded bore, shown in FIG. 3, and bolt 55 is formed with a mating external threaded shaft. Since there are substantial axial loading forces generated clamping the rail to the sleeper, it is a further feature of the present invention to form socket 63 with outwardly extending shoulders 64 which protrude from the periphery of the sockets 63 into the concrete member. Socket 63 is placed in the concrete member at the time of casting the same so that the concrete surrounds each of the protruding shoulders 64. Additionally, the socket includes a metal reinforcing element 66, here shown in the form of a spiral-shaped rod, mounted in a boss 67 and a second boss 68 at opposite ends of socket 63. Reinforcing element 66 provides a strengthening of the concrete adjacent to bolt socket 63 which is highly desirable in light of the fact that the reinforcing bars 26 cannot be placed in too close proximity to the area of the socket and the axial loading forces on the concrete at the socket can be substantial. Accordingly, the socket of the present invention carries its own reinforced element to insure that the concrete adjacent to the socket has sufficient strength.

In order to further insure that the socket 63 does not fail, it is another feature of the present invention that shoulders 64 extend around the socket and are inclined on the exterior surface thereof in the same direction as the threads are inclined in the internal threaded bore of the socket, as best may be seen in FIG. 3. Additionally, shoulders 64 are positioned on oppositely facing sides of the socket so that the inclined and opposed protrusions form a couple in a direction opposite to the tendency for the socket to rotate in the concrete under upward axial forces on bolt 55. Thus, when bolt 55 is urged upwardly, there is a tendency for socket 63 to rotate within the concrete in reaction to the upward forces on the bolt. Inclining shoulders 64 in the same direction as the threads on the internal part of the bolt and placing them on oppositely facing sides of the socket result in a coupling force which resists rotation of socket 63 in the sleeper 24. Additionally, the upper surfaces 69 of shoulder 64 are preferably oriented so that a force normal to surfaces 69 has a radial or outwardly extending component. This construction of shoulder 64 causes the upward loading forces on the concrete to diverge radially or outwardly from socket 63 to spread the axial loading forces more evenly throughout the concrete member. Additionally, the spacing between spiral shoulders should be ample to provide a thickness of concrete with which to carry the axial loading forces. The shoulders on one side may be arranged between the shoulders on the other side to enable the proper spacing.

Referring now to FIGS. 3 and 4, a rail fastening device constructed in accordance with the present invention for use in fastening rail 71 to concrete sleeper 74 by spring clip means 73 for use on a track having ballast is shown. Since part of the elasticity of the roadbed will be accommodated by the ballast, the support structure for rail 71 does not require a tie plate or base plate, such as plate 28, nor is a second pad 29 required. An electrically insulated and vibrationally dampening pad 72 is, however, interposed between concrete sleeper 74 and rail 71. For simplicity of illustration, reinforcing members have not been shown in concrete sleeper 74, and the helical reinforcing member which would be carried by bosses 77 and 78 of socket 76 is also not shown.

The rail alignment means of the device (FIGS. 3 and 4) is substantially the same as shown in connection with the rail fastening device of FIGS. 1 and 2 with the exception that alignment wedge member 79 is mounted in direct engagement with a recessed shoulder 81 in concrete member 74. As will be seen in FIG. 4, the upwardly extending leg 82 of alignment means 79 has a wedge-shaped configuration and horizontally extending leg 83 is defined by parallel surfaces so that longitudinal movement of wedges 79 will effect a successive positioning of a greater or lesser width of leg 82 between spring clip 84 and shoulder 74 to effect lateral displacement of the rail. Again, spring clip 84 is formed with elongated openings or holes 86 to accommodate lateral displacement. Additionally, the narrow ends of the wedge-shaped members are facing in opposite directions and shoulders 74 are skewed relative to the longitudinal axis of the rail to mate with the alignment wedges. The alignment wedges 79 mate with the spring clip 84 to support lateral loading forces from the supporting structure in addition to providing means for precisely aligning the rail. As was also the case with the alignment wedges of FIGS. 1 and 2, wedge 79 is locked in place to substantially fix the placement of rail 71 by clamping down on spring clip 84.

SInce ballast is used with the device of FIGS. 3 and 4, vertical deflections of the rail 71 with respect to supporting sleeper 74 are less and spring clip means 73 can be modified from the form as shown in FIGS. 1 and 2. It should be noted, however, that the spring clip means shown in FIGS. 1 and 2 is adequate for use on a track having ballast. The lower leg 87 of spring clip 84 can now be formed in a conventional manner to engage the edge 88 of rail 71 without danger of leg 87 becoming wedged beneath rail 71 and concrete tie 74. Thus, the spring clip of FIGS. 3 and 4 is formed substantially in the same manner as shown in U.S. Pat. No. 3,246,843, although the spring clip is now mounted to enable precise variable alignment of the rail. In addition, the reduction in vertical vibration and deflection by use of ballast enables elimination of lock washer 57 of the device of FIGS. 1 and 2 and allows a flat washer 89 to be used with bolt 91.

The electrical insulation afforded by the rail fastening device of the present invention can be most clearly illustrated by the device of FIG. 3. As is conventionally done, pad 72 under rail 71 is formed of an electrically insulating and vibrationally dampening material such as rubber. Spring clips **84** are preferably formed of a metallic material, such as steel, which is electrically conductive. Accordingly, alignment wedge **79** is formed from a high-impact strength, hard and resilient material which is also electrically insulating. Since the alignment wedge must support lateral loading forces without wide deviation in the gauge between the rails, it is preferable that the wedges be formed of a fiber reinforced plastic having a high-impact strength stability under widely ranging temperature conditions, low moisture absorption and good strength against surface abrasion. A fiberglass reinforced plastic which can be injection molded may be advantageously used to form wedges **79**. Since bolt **91** is also preferably metallic, it is necessary that socket or plug **76** be formed from an electrically insulating material. The approach in most prior art devices has been to attempt to electrically insulate the bolt from the spring clip rather than trying to insulate the connection between the bolt and the concrete sleeper. Again, socket **76** may advantageously be formed from a fiber reinforced plastic having high tensile and compression loading strengths. This material may be readily injection molded to provide a plug or socket having an internal threaded bore **92** into which threads **93** on the bolt mate as well as the external shoulder protrusions **95**. Thus, pad **72**, socket **76** and alignment wedge **79** provide the necessary insulation between rail **71** and support member **74** so that the rail is insulated from the ground and from a second rail mounted on the same support structure. This insulation enables the rails to be used for the sophisticated control circuitry now being employed in high-speed railway equipment.

I claim:

1. In a rail fastening device for securement of longitudinally extending rail means to a support structure with an electrically insulating and vibration dampening pad interposed therebetween and with spring clip means engaging a portion of said rail means and formed for and clamping said rail means to said support structure, said spring clip means and said rail means being formed and mounted for lateral displacement thereof with respect to said support structure, the improvement comprising:

rail alignment means mounted to said support structure and positioned in engagement with said spring clip means, said alignment means including wedge means formed to laterally displace said spring clip means with respect to said support structure upon movement of said wedge means relative to said spring clip means and said support structure.

2. A rail fastening device as defined in claim **1** wherein,

said support structure includes a side shoulder portion laterally spaced apart from said rail means; and

said wedge means is mounted between said side shoulder portion and said spring clip means and is formed for movement in a direction along the longitudinal axis of said rail means relative to said spring clip means and said shoulder portion to effect lateral displacement of said spring clip means and said rail means.

3. A rail fastening device as defined in claim **2** wherein,

said spring clip means is formed and positioned to engage and support said rail means against lateral loads;

said wedge means is formed with a load bearing surface mounted in engagement with a portion of said spring clip means and positioned to support lateral loads thereon; and

said support shoulder is formed and positioned to engage and support said wedge means against lateral loads whereby lateral loading forces on said rail means are transferred from said spring clip to said alignment means and finally are supported by said shoulder portion of said support structure.

4. A rail fastening device as defined in claim **3** wherein,

said spring clip means includes a spring element having an opening therethrough and bolt means formed to draw said spring element down against said support structure to effect clamping of said rail means, said bolt means being mounted in said opening, engaging said spring element and secured to said support structure; and

said wedge means includes a wedge element having a wedge shaped portion extending along a side of said spring element and said securement means is provided by a second portion of said wedge means extending below said spring element and positioned for clamping between said spring element and said support structure by said bolt means.

5. A rail fastening device as defined in claim **3** wherein,

said spring clip means includes a U-shaped spring element having vertically superimposed leg portions and a connecting loop portion, said spring element being formed from an elongated flat strip of resilient material with the outside surface of said loop portion bearing upon said load bearing surface on said wedge means and said leg portions engaging said rail means.

6. A rail fastening device as defined in claim **5** wherein,

said rail means is formed with a bottom flange portion having a longitudinally extending upwardly facing surface terminating in a longitudinally extending outwardly facing edge; and

said spring element is formed with an upper leg extending laterally over said bottom flange portion and engaging said upwardly facing surface and a lower leg formed to engage said edge and to further extend upwardly and laterally to engage a portion of said upwardly facing surface.

7. A rail fastening device as defined in claim **1** wherein,

said support structure includes a pair of relatively spaced apart side shoulder portions, said rail means being mounted between said shoulder portions;

said spring clip means is formed as a pair of spring elements with one of said spring elements mounted on each side of said rail means and between rail means and said shoulder portions, and said spring clip means further includes bolt means securing each of said spring elements to said support structure; and

said alignment means is formed as a pair of wedge elements with one of said wedge elements positioned between each of said spring elements and said shoulder portions and both of said wedge elements being formed for movement in a direction along the longitudinal axis of said rail means to effect lateral displacement of said rail means.

8. A rail fastening device as defined in claim 7 wherein,

said shoulder portions are skewed relative to said longitudinal axis of said rail means; and

said wedge elements each have a first surface parallel to said rail means and engaging said spring elements and an oppositely facing second surface engaging said shoulder portions and skewed to said first surface to provide a wedge-shaped horizontal cross-section over the length of said wedge elements, said wedge elements being mounted with the narrow ends of said wedge-shaped cross-section facing in opposite directions.

9. In a rail fastening device for securement of longitudinally extending rail means to a support structure with an electrically insulating and vibration dampening pad interposed therebetween and with spring clip means engaging a portion of said rail means and formed for and clamping said rail means to said support structure, said spring clip means and said rail means being formed and mounted for lateral displacement thereof with respect to said support structure, the improvement comprising:

rail alignment means mounted to said support structure and positioned in engagement with said spring clip means, said alignment means including wedge means formed to laterally displace said spring clip means with respect to said support structure upon movement of said wedge means relative to said spring clip means and said support structure, and said wedge means being formed from a high impact strength, hard, resilient, electrically insulating material.

10. A rail fastening device as defined in claim 9 wherein,

said wedge means include a wedge element formed as an elongated member having an L-shaped cross-section with the upright leg of said L-shaped cross-section providing a wedge shaped portion extending along a side of said spring means and the horizontal leg of said L-shaped cross-section providing a second portion of said wedge element extending below said spring means, said wedge shaped portion and said second portion defining a continuous, smooth, arcuate surface in contact and mating with said spring means.

11. A rail fastening device as defined in claim 9 wherein,

said shoulder portions of said support structure are provided by a metallic base plate underlying said pad, and an electrically insulating and vibrationally dampening U-shaped pad is positioned beneath said base plate and alongside said shoulder portions, said base plate and pad being mounted in a recess in a concrete support member.

12. A rail fastening device as defined in claim 9 wherein,

said support structure includes a concrete support member;

said spring clip means includes a socket fixedly secured in said concrete member and formed for securement of said bolt means thereto,

said socket being formed with outwardly extending shoulders from the periphery thereof into said concrete member, and said socket includes a metal reinforcing element secured to the exterior of said socket and electrically insulated from said bolt means, said reinforcing element extending into said concrete support member adjacent said socket to reinforce the same.

13. A rail fastening device as defined in claim 12 wherein,

said socket is formed with a threaded bore dimensioned to receive said bolt means; and

said shoulders are inclined on the exterior of said socket in the same direction as the threads in said threaded bore, and said shoulders are further positioned on oppositely facing sides of said socket and formed with upper surfaces oriented so that a force normal to said surfaces has a radial component thereto.

14. A rail fastening device as defined in claim 9 wherein,

said spring clip means includes socket means formed from high strength electrically insulating material and fixedly secured to said support structure, and bolt means releasably secured to said socket means and secured to the remainder of said spring clip means, said wedge means, said socket and said pad being the only contacts between said support structure and the remainder of the components forming said rail means and rail fastening device.

15. A rail fastening device as defined in claim 9 wherein,

said opening in said spring element is elongated in a direction perpendicular to the longitudinal axis of said rail means to accommodate lateral displacement of said spring element with respect to said bolt means; and

said bolt means includes a bolt and a spiral-shaped lock washer having an inner coil portion thereof resiliently vertically biased toward a displaced position from an outer coil portion thereof and having intermediate coil portion of greater thickness than either of said inner and outer coils, said lock washer being positioned to effect locking of said bolt against loosening upon clamping of said lock washer against said spring element.

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