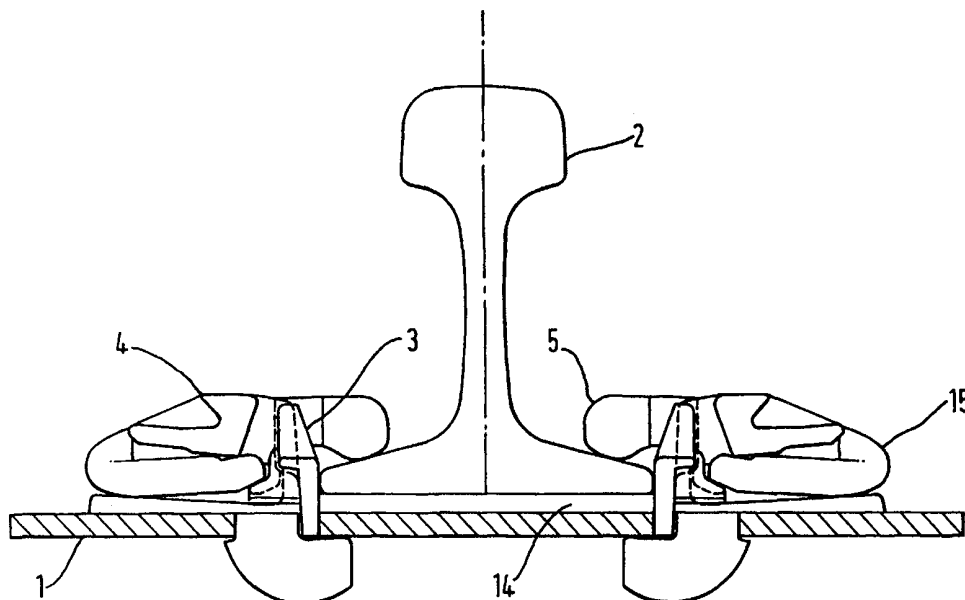




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/GB99/03833</p> <p>(22) International Filing Date: 17 November 1999 (17.11.99)</p> <p>(30) Priority Data: PP 7260 23 November 1998 (23.11.98) AU</p> <p>(71) Applicant (for all designated States except US): PANDROL LIMITED [GB/GB]; 63 Station Road, Addlestone, Surrey KT15 2AR (GB).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): RHODES, David [GB/GB]; 96 Chase Road, Lindford, Hampshire GU35 0RR (GB). GOSLING, David, John [AU/AU]; 4 Calgaroo Crescent, Kingswood, NSW 2747 (AU).</p> <p>(74) Agent: FENLON, Christine, Lesley; Haseltine Lake &amp; Co., Imperial House, 15-19 Kingsway, London WC2B 6UD (GB).</p>	<p>(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> With international search report.</p>	

(54) Title: PRELOADING RAIL CLIPS IN STEEL SLEEPERS



## (57) Abstract

A rail insulator (3), for use with a steel railway sleeper (1), which includes an opening for receiving a shoulder (4), is operatively disposed between a rail (2) and said shoulder (4). The insulator (3) includes a member (11) which operatively extends below a top surface of said sleeper (1) and into said opening (6) so as to lie between the walls of said opening (6) and said shoulder (4) and retain said shoulder (4) in its operative position.

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## PRELOADING RAIL CLIPS IN STEEL SLEEPERS

This invention relates to preloading rail clips and insulators into steel railway sleepers.

5           Steel railway sleepers have been widely used for many years and are usually either formed from strip steel or rolled at the steel mill with an appropriate cross section. The steel thickness is usually in the range of 6-12mm. Shoulders are attached to the sleeper  
10 to provide abutments to locate the rails so that the correct rail gauge width can be maintained. Usually these shoulders also serve as mountings for fasteners which hold the rail down. The fasteners may be ordinary bolts or resilient spring clips.

15           Many different means have been used to fix the shoulders in place. These include bolts and nuts, welding, deforming the top of the sleeper to form a rail abutment for use with clips which fit in pierced holes in the top sleeper surface, and shoulders which  
20 hook into holes in the top sleeper surface. However, in actual track use there have been many problems such as nuts continually coming loose, sleeper cracking around the edges of shoulder welds, sleeper cracking adjacent to deformed abutments which create locally  
25 stiff regions, and sleeper cracking from the edges of holes pierced in high stress areas.

          One of the most successful methods of attaching the shoulder is where the shoulder hooks into a round hole near the lateral centre of the sleeper top where  
30 the stresses are relatively low. The highest stresses are near the lateral edges of the sleeper top where the stiffness is greatest. In shoulders of this type, projecting below the shoulder top there is a generally circular stem having a hook and a spur extending from  
35 the bottom of it. In use, the hook extends towards the rail and the spur extends away from the rail.

The hook type fastening as described is prior art and generally works well. However, it has one major disadvantage in that clips cannot be preloaded in the shoulders in a parking position prior to the rail being  
5 installed.

An important issue for railways is the reduction of labour costs associated with laying new track and replacing rails in existing track.

One way of obtaining significant labour cost  
10 reductions is to preload the clips, insulators, and rail pads into the new sleepers at the sleeper manufacturing plant so that when the sleepers are placed in track it is only necessary to drop the rail in place and mechanically push the rail clips into  
15 their final position.

This feature of preloading clips is known for concrete sleepers, but it is not possible for hook-in shoulders for steel sleepers because the shoulders are not actually locked in the sleeper until the rail and  
20 insulators are in place. Consequently, there is a good chance that if it was attempted to press the clips in place without the rail in position, the shoulder would come out of the hole in the sleeper. Even if it were possible to pre-install the clips in the shoulders, the  
25 shoulders could still bounce out of the holes from the impact of shunting and other shocks received while on the rail trucks en route to the track installation site.

Pre-loading costs much less than distributing the  
30 pads, insulators and clips along the track then manually placing the components in place and introducing the clips into the shoulders by hand. Obviously, this is not an efficient process and in addition the labour costs are high because of lost time  
35 in moving workers to and from the moving work site plus the limited track access times.

At the sleeper plant it is possible to largely mechanise the preloading of the components since it is a fixed and easily controlled environment.

Accordingly, it is desirable to allow clips,  
5 insulators and shoulders to be preloaded into a steel sleeper, and to be retained there during transport to the desired site for track work.

According to one aspect of the present invention there is provided a rail insulator for use with a steel  
10 railway sleeper of a type including an opening for receiving a shoulder, said insulator being operatively disposed between a rail and said shoulder, said insulator being characterised in that it includes a member which operatively extends below a top surface of  
15 said sleeper and into said opening so as to lie between the walls of said opening and said shoulder and retain said shoulder in its operative position.

Thus, an embodiment of the present invention provides a new mounting arrangement, in which the  
20 insulator includes a projection or spigot extending into the opening in the sleeper.

This projection serves to prevent relative movement of the sleeper and shoulder, so that in transit the shoulder, insulator and clip assembly does  
25 not come loose from the sleeper. This enables a preloaded sleeper to be prepared, which can then be placed on the intended track ready for the rail to be fixed. This provides a considerable saving in labour over earlier proposals.

30 Preferably, the opening in the sleeper is circular or oval in shape.

Preferably, the shape of the member is such as to substantially fill the cavity in the opening caused by the difference in size between the opening and the part  
35 of the shoulder passing through the opening.

In a preferred embodiment, the insulator is

retained on the shoulder by means of a pair of recesses for receiving a corresponding pair of flanges or wings on said shoulder.

According to another aspect of the present invention there is provided a preloaded sleeper assembly including a steel railway sleeper having two shoulder mounting openings for each rail, and associated with each mounting opening in combination, a shoulder including a hook and a spur inserted through the opening and located in an operative position, an insulator located on said shoulder on the side near the intended rail position, said insulator including a projection which extends into the mounting opening so as to prevent movement of the shoulder towards the intended rail position, and a rail clip mounted on said shoulder in a parking position, so that the shoulders, insulators and clips are retained on said sleeper.

According to a further aspect of the present invention there is provided a method for preloading a steel railway sleeper with shoulders, rail clips and insulators, said sleeper including two shoulder mounting openings for each rail, said shoulder including a hook and spur, said method including the steps of:

- a) inserting said shoulder into said opening and rotating it, so that the hook lies toward the intended rail position and the spur away from it;
- b) locating said insulator onto the shoulder on the side near the intended rail position, said insulator including a projection which extends into the mounting opening so as to prevent movement of the shoulder towards the intended rail position;
- c) driving said rail clip into a preload parking position, such that the shoulder, insulator and clip are retained on said sleeper.

Preferably, the step of locating the insulator

onto the shoulder includes sliding the insulator over a pair of flanges on the shoulder, to be slidably received in corresponding recesses in the insulator.

5 The insulator may be retained in its located position by the preloaded and parked clip engaging the insulator in that position.

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

10 Figure 1 shows a general cross-sectional view through the longitudinal axis of a sleeper and rail assembly embodying the present invention;

Figure 2 shows a side view of a part of the sleeper of Figure 1;

15 Figure 3 shows an end view of the sleeper of Figure 1;

Figure 4 shows a section through the top of the sleeper showing a shoulder with a shoulder hook being threaded through a sleeper hole;

20 Figure 5 shows the shoulder in its final position in the hole;

Figure 6 shows a view looking upwards at the bottom of an insulator embodying the present invention;

Figure 7 shows a side elevation of the insulator showing the central spigot;

25 Figure 8 shows a plan view of the shoulder; and

Figure 9 shows a sleeper rail seat with all components preloaded in place in readiness to receive the rail.

30 A representation of a completed rail assembly embodying the present invention with a rail 2 resting on a sleeper 1 is shown in Figure 1. To secure the rail 2 to the sleeper 1, use is made of connection elements on each side of the rail. Each connection element is made up of a shoulder 4 and a spring clip 5.

35 Because in many cases (for signal purposes), rail 2 is electrified, insulators are used to isolate the

live rail from other sections. In particular, insulating pad 14 isolates sleeper 1 from rail 2, shoulder insulator 3 isolates the shoulder 4 from the lower edge face of rail 2, and clip toe insulator 5 isolates shoulder 4 from an upper face of rail 2. It can be seen that in accordance with an embodiment of the invention, shoulder insulator 3 has a downwardly projecting spigot 11 (Figure 5) fitting into the opening in the sleeper between the shoulder 4 and the rail 2.

The sleeper 1 has a circular hole 6 (Figures 2 and 3) to receive a hook 7 of shoulder 4, as shown in Figure 4. Hole 6 must be large enough for the stem 8 and spur 9 of hook 7 to be received. The shoulder 4 is inserted in hole 6 by tilting the top towards the position where the rail will sit (left hand side in Figure 4), then feeding hook 7 through hole 6 and moving the shoulder as far as possible towards the intended rail position. Next, the shoulder 4 is rotated back to its normal position with the base of the shoulder top sitting flat on the top of sleeper 1. During this action spur 9 will pass through the hole 6 in sleeper 1. Finally, the shoulder is moved as far back as possible from the intended rail position which causes spur 9 to engage the underside of sleeper 1 adjacent hole 6.

Shoulder insulator 3 is then put into place on shoulder 4 as shown in Figure 5. Downwardly extending spigot 11 fits into the space remaining between stem 8 and sleeper 1, thus retaining shoulder 4 in place against a sleeper contact point 10.

The shoulder insulator 3 with its spigot 11 is shown in various views in Figures 6 and 7. The shape of spigot 11 is such as to match the available space in hole 6 to substantially fill it. Conveniently, hole 6 is circular, although holes of other shapes are



possible. The shoulder stem 8 and spigot 11 would then be shaped to fit into such a hole of different shape. For example, hole 6 could be oval, with a substantially matching oval stem 8. One advantage of this would be  
5 in limiting the amount the shoulder and preloaded clip assembly could rotate prior to fitting the rail, thus ensuring an easy assembly of the rail on site. The hole 6 and matching stem 8 could also be square or pentagonal, but it is desirable to avoid any sharp  
10 corners which act as stress concentrators.

Recesses 12 in insulator 3 are provided to slide downwards over wings on the shoulder 4 and restrain the insulator 3 in all directions except vertically. Alternatively, insulator 3 could be held in place by  
15 the clip 5 sitting, in the preload position, on a part of the insulator 3.

Figure 8 shows the shoulder 4 with hook 7, stem 8 and spur 9. Also shown are side wings 13 which are received in corresponding recesses 12 in insulator 3.

20 In Figure 9, there is shown part of a sleeper with all components preloaded in place to receive a rail. The entire assembly can thus be preloaded in the factory by automated processes, and transported to the site where the rail is to be laid. Once laid in  
25 position, spring clip 5 is simply pushed into its final position using conventional mechanical systems to secure the assembly to the rail. This final state is as shown in Figure 1.

The feature of being able to preload or park the  
30 clips is also useful when replacing rails in track since the machine for removing the clips can be made to move the clips to the preload position instead of completely removing them. This means that after the rail is replaced it is only necessary to use the clip  
35 fitting machine to push the clips back into their final position, thus saving the manual labour required to

pick the clips and other components up from the side of the track.

**CLAIMS:**

1. A rail insulator (3) for use with a steel railway sleeper (1) of a type including an opening (6) for receiving a shoulder (4), said insulator (3) being operatively disposed between a rail (2) and said shoulder (4), said insulator (3) being characterised in that it includes a member (11) which operatively extends below a top surface of said sleeper (1) and into said opening (6) so as to lie between the walls of said opening (6) and said shoulder (4) and retain said shoulder (4) in its operative position.
2. A rail insulator as claimed in claim 1, for use with a steel railway sleeper (1) in which the opening (6) is circular or oval in shape.
3. A rail insulator as claimed in claim 1 or 2, wherein the shape of the member (11) is such as to substantially fill the cavity in the opening (6) caused by the difference in size between the opening (6) and the part of the shoulder (4) passing through the opening (6).
4. A rail insulator as claimed in any preceding claim, further comprising a pair of recesses (12) for receiving a corresponding pair of flanges or wings (13) on said shoulder (4) whereby the insulator (3) may be retained on the shoulder (4).
5. A preloaded sleeper assembly including a steel railway sleeper (1) having two shoulder mounting openings (6) for each rail (2), and associated with each mounting opening (6), in combination, a shoulder (4) including a hook (7) and a spur (9) inserted through the opening (6) and located in an operative position, an insulator (3) located on said shoulder (4) on the side near the intended rail position, said insulator (3) including a member (11) which extends into the mounting opening (6) so as to lie between the

walls of said opening (6) and said shoulder (4) and thereby prevent movement of the shoulder (4) towards the intended rail position, and a rail clip (5) mounted on said shoulder (4) in a parking position, so that the shoulders (4), insulators (3) and clips (5) are retained on said sleeper (1).

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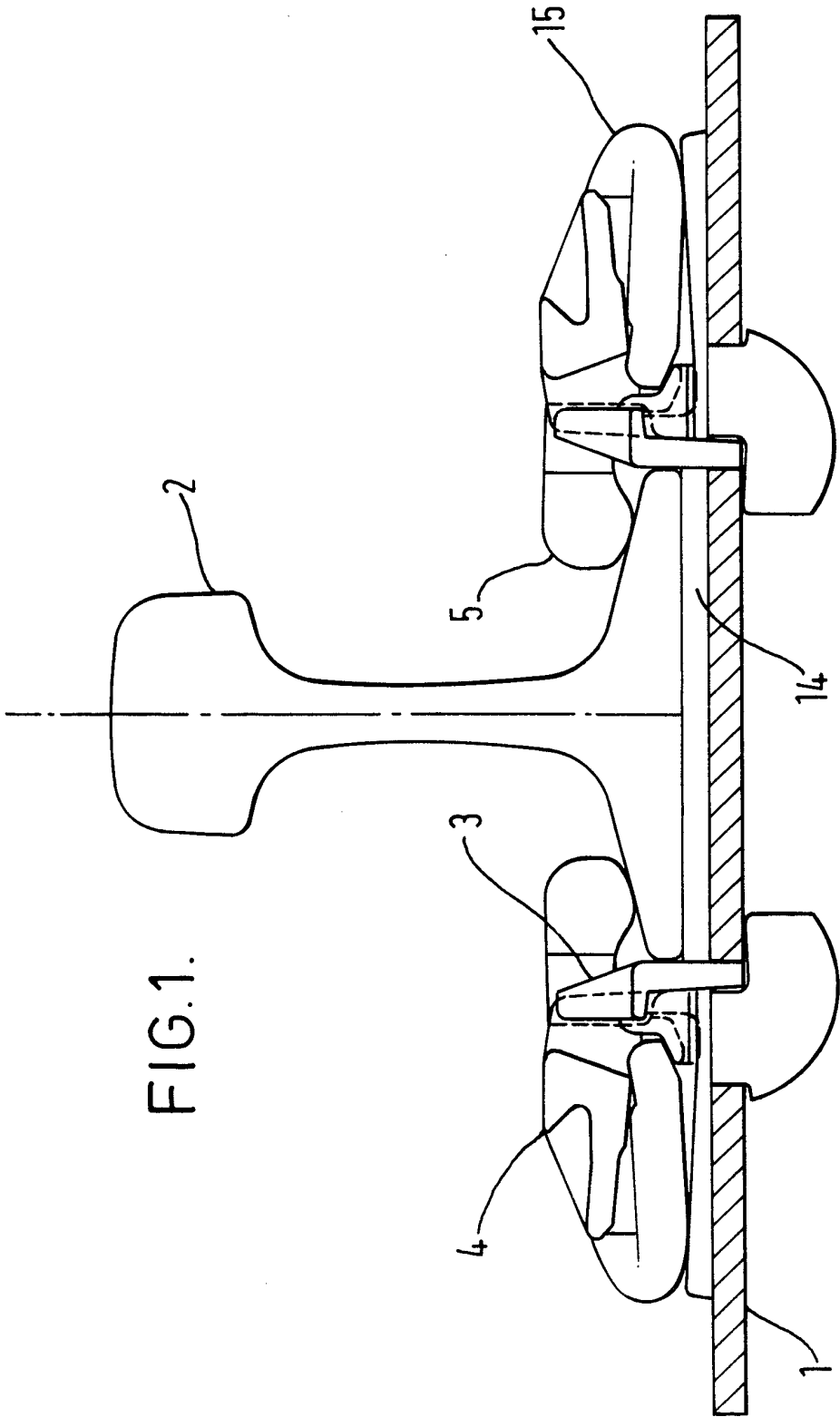
6. A method for preloading a steel railway sleeper (1) with shoulders (4), rail clips (5) and insulators (3), said sleeper (1) including two shoulder mounting openings (6) for each rail (2), said shoulder (4) including a hook (7) and spur (9), said method including the steps of:

a) inserting said shoulder (4) into said opening (6) and rotating it, so that the hook (7) lies toward the intended rail position and the spur (9) away from it;

b) locating said insulator (3) onto the shoulder (4) on the side near the intended rail position, said insulator (3) including a member (11) which extends into the mounting opening (6) so as to lie between the walls of said opening (6) and said shoulder (4) thereby to prevent movement of the shoulder (4) towards the intended rail position; and

c) driving said rail clip (5) into a preload parking position, such that the shoulder (4), insulator (3) and clip (5) are retained on said sleeper (1).

7. A method as claimed in claim 6, wherein the insulator (3) is retained in its located position by the preloaded and parked clip (5) engaging the insulator (3) in that position.



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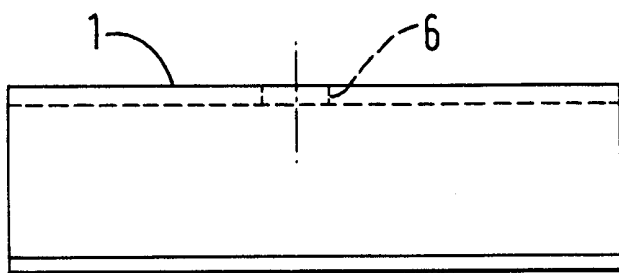


FIG. 2.

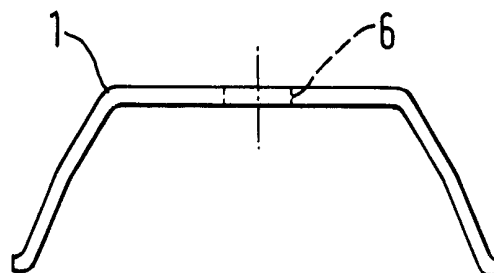


FIG. 3.

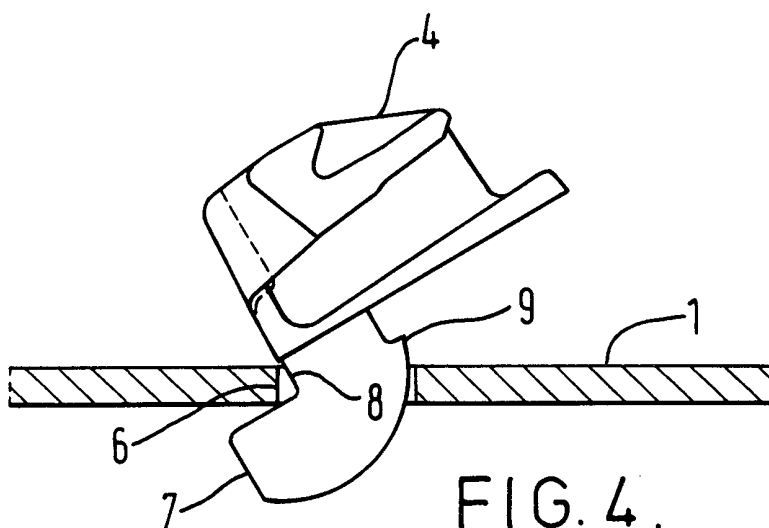


FIG. 4.

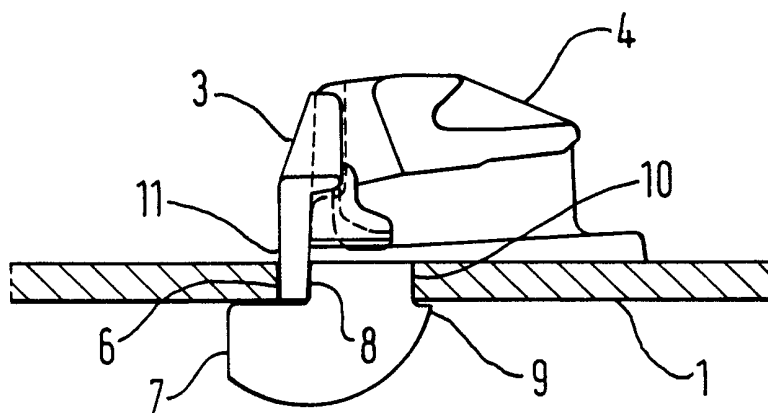


FIG. 5.

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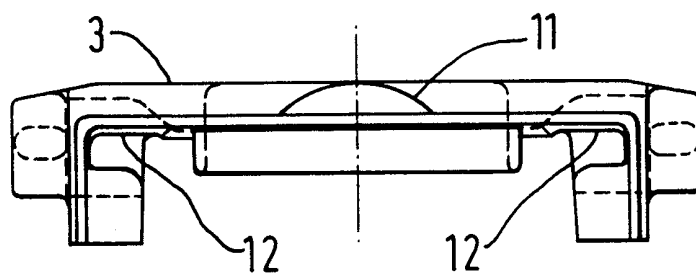


FIG. 6.

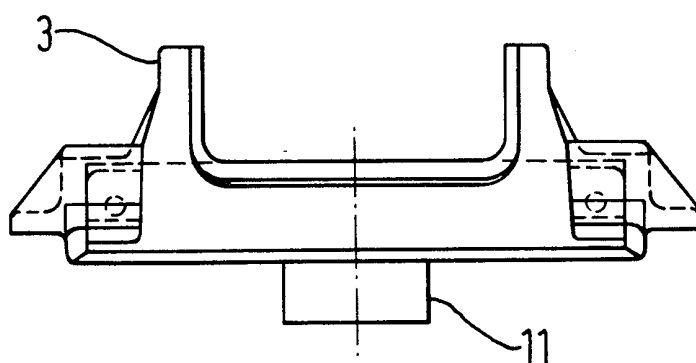


FIG. 7.

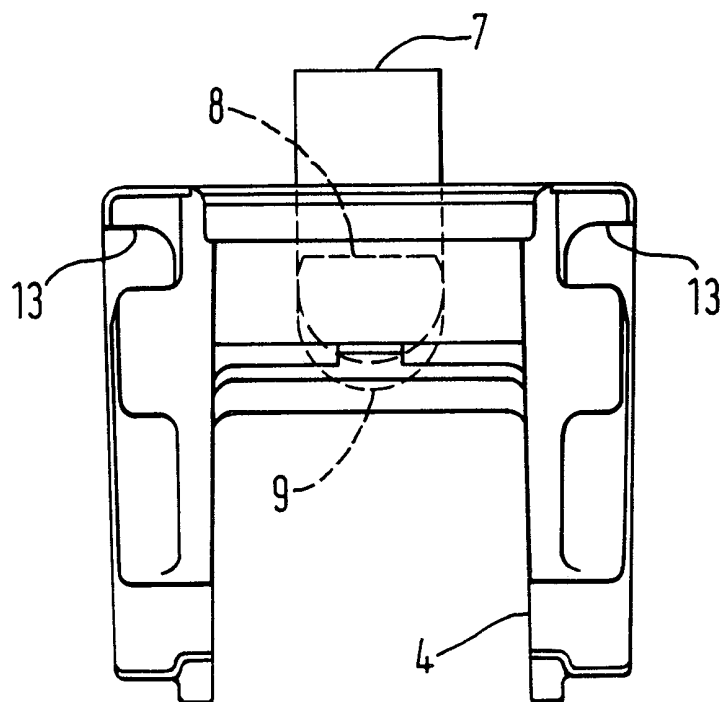
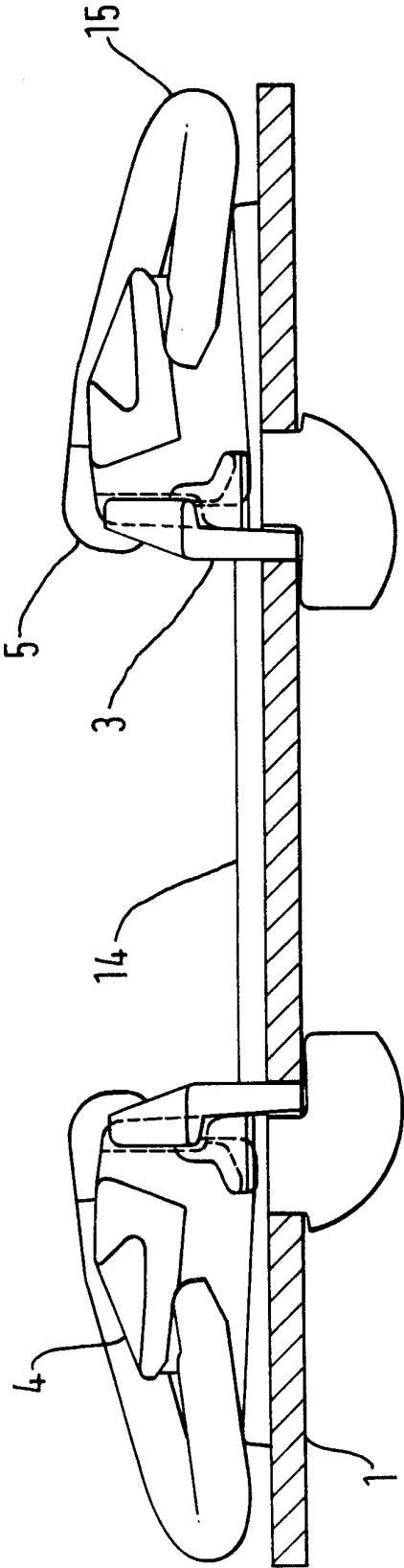


FIG. 8.

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FIG.9.





# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 99/03833

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 E01B9/34

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 E01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 083 706 A (BRATCHELL ROBERT L) 28 January 1992 (1992-01-28) abstract; figures ----	1, 3, 5, 6
A	DE 41 16 306 A (SALZGITTER PEINE STAHLWERKE) 19 November 1992 (1992-11-19) figures ----	1, 3, 5, 6
A	GB 2 316 702 A (BRITISH STEEL PLC) 4 March 1998 (1998-03-04) abstract; figures ----	1, 3, 5, 6
A	GB 2 228 958 A (PANDROL LTD.) 12 September 1990 (1990-09-12) abstract; figures -----	1, 3, 5, 6



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Date of the actual completion of the international search

2 February 2000

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# INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

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