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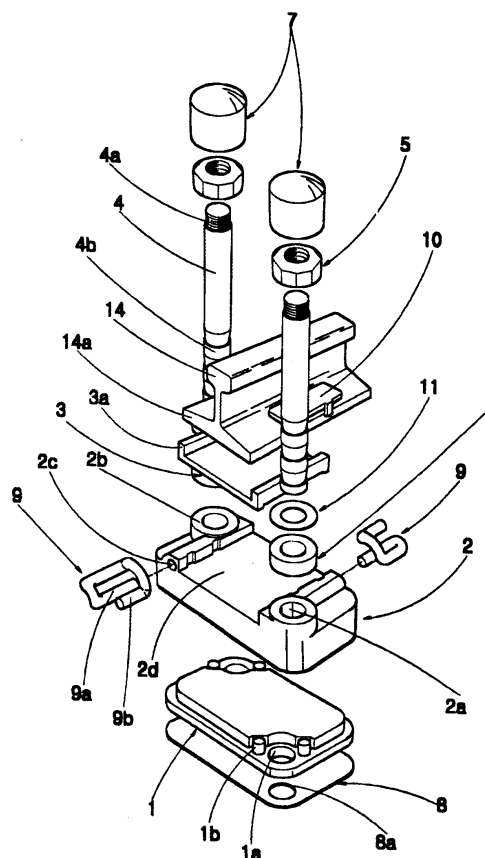
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(54) **Elastic rail pad**

(57) The present invention relates to a device for absorbing the vibration of a rail, the replacement of which is easy. The device comprises a support plate (8) having an anchor hole (8a) for a stay anchor; a thick vibration absorbing pad (1) having an anchor hole (1a); a support plate for the rail (2) having an anchor tube (2b), and a fixing hole (2c) formed at the anchor tube (2b), said fixing hole being formed through the support plate for the rail (2) in parallel with the direction in which the rail is laid, as well as a stay anchor (4) a fixing nut (5) engaged with the thread (4a) provided at the upper end of the stay anchor (4); and a cap (7) for protecting the fixing nut (5). The present invention also provides a pad which is divided into a main body (1-1) and a corner portion (1-2) by the means of the boundary line which is cut diagonally at the inward portion of the center of the anchor hole (1a).

Fig 2



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a device for absorbing the vibration of the rail which is capable of protecting the train, the concrete roadbed, and the buildings near the railroad from the vibration and the shock generated when the train travels on the rail and which is capable of improving the passenger's feeling of the boarding of the train through the enhancement of the silence in travel of the train.

2. Description of the Prior Art

[0002] In subway, it is a general tendency that the concrete roadbed is substituted for the gravel roadbed for the purpose of accomplishing the convenience of maintenance and preventing the environment pollution.

[0003] Since the rail is laid on the concrete roadbed in the subway of the city, the effect of absorbing the vibration is inferior to that obtained from the gravel roadbed of the prior art. Consequently, there are generated noises beyond the critical values between the rail and the wheel of the running train. As a result, there occur several problems, such as difficulty in conversation between the passengers, inconvenience in use of the mobile phone, several bad effects applied to the structure, the train, rail, etc.

[0004] Fig. 1 shows a device for absorbing the vibration of the rail according to the prior art which is installed in the railway bridge, the subway, etc. As shown in Fig. 1, a thin support plate B is laid on a rail tie A. A rubber plate C is laid on the thin support plate B. A lower plate D around the rubber plate C is mounted on the roadbed by means of an anchor bolt E. A rail G is laid on an upper plate F. The rail G is fixed to the upper plate F by means of an insulating plate H, a cover plate I, and a rail fixing member J.

[0005] When the train passes on the rail, noise and vibration are generated. These noise and vibration are absorbed by virtue of the rubber plate of the upper plate D. Molten rubber is poured from the top of the lower plate L, and then the upper plate D is pressed against the bottom of the lower plate, whereby the rubber is squeezed between the lower plate and the upper plate. In this way, the device for absorbing the vibration of the rail according to the prior art is produced.

[0006] However, the costs for manufacturing the device for absorbing the vibration according to the prior art are very heavy, and the costs and the times necessary for replacing the device for absorbing the vibration of the rail according to the prior art since the entire device is substituted if an abnormal condition of the vibration absorbing rubber is detected.

[0007] Furthermore, even if the elasticity of the rubber

plate 3 is deteriorate a little bit, the shock generated from the rail may be transmitted directly to the upper plate L, thereby the traffic safety being endangered.

5 SUMMARY OF THE INVENTION

[0008] Accordingly, it is an object of the present invention is to provide a device for absorbing the vibration of the rail by which the efficiency for absorbing the vibration of the rail is improved, the replacement of the vibration absorbing pad is easy, the maintenance of the railroad is convenient, the thrust of the rail is prevented, and thus the safe train service is accomplished.

[0009] The foregoing object is accomplished in one embodiment by providing a device for absorbing the vibration of the rail comprising: a support plate having an anchor hole for a stay anchor formed around one of the diagonally opposite corners; a thick vibration absorbing pad having an anchor hole for the stay anchor formed at the position corresponding to that of the anchor hole; a support plate for the rail having an anchor tube which is projected upwardly on the support plate for rail with an anchor hole formed therein, and an fixing hole formed at the anchor tube, said fixing hole being formed through the support plate for the rail in parallel with the direction in which the rail is laid; a stay anchor inserted into the anchor hole of the support plate, the anchor hole of the vibration absorbing pad and the anchor hole of the support plate for the rail for stabilizing the connection therebetween; a fixing nut engaged with the thread provided at the upper end of the stay anchor; and a cap for protecting the fixing nut engaged with the stay anchor.

[0010] The present invention also provides a vibration absorbing pad for repair of the rail which is divided into a main body and a corner portion by the means of the boundary line which is cut diagonally at the inward portion of the center of the anchor hole.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The preferred embodiment of the present invention will now be described by way of example with reference to the accompanying drawings in which:

Fig. 1 is a cross-sectional view of a rail with a device for absorbing the vibration of the rail according to the prior art;

Fig. 2 is an exploded view of a device for absorbing the vibration of a rail according to the present invention;

Fig. 3 is a plan view of the rail with the device for absorbing the vibration of the rail according to the present invention;

Fig. 4 is a cross-sectional view taken along the line A - A of Fig. 3; and

Fig. 5 is a perspective view of a replaceable vibration absorbing pad according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0012] As shown in Fig.2, a device for absorbing the vibration of a rail according to the present invention includes a vibration absorbing pad 1, a support plate for the rail 2, a rail pad 3, a stay anchor 4, a fixing nut 5, a packing 6, and a cap 7.

[0013] The vibration absorbing pad 1 is mounted on a well-known support plate 8 which is arranged on the location where the rail is laid at a concrete roadbed, for accomplishing a secondary vibration absorbing function to the rail. The vibration absorbing pad 1 is in the form of a rectangle with the a lateral width being longer than a longitudinal width, which is made of thick rubber or urethane with low elasticity. The vibration absorbing pad 1 is provided at the two conners opposite diagonally with anchor holes 1a through which the stay anchor 4 is inserted. Also, a pair of positioning set pins 1b is provided at predetermined intervals around each of the anchor holes 1a. The positioning set pins 1b are inserted into pin holes formed around an anchor holes at the lower surface of the support plate for the rail 2, for reinforcing its stability on the stay anchor 4 and its engagement with the support plate for the rail 2.

[0014] The support plate for the rail 2 is provided to the support the rail which is laid on the concrete railroad substantially. The support plate for the rail 2 is made of metal, which is of the same type and also of the same area as the absorbing pad 1. And the support plate for the rail 2 is provided at the locations corresponding to that of the anchor holes 1a of the absorbing pad 1 with anchor tubes 2b which is projected upwardly on the support plate for rail 2. Each of the anchor tubes 2b has an anchor hole 2a formed therein. Near the opposite sides of seats for the rail pads 2d which is provided on the support plate for the rail 2 are formed fixing holes 2c, which are formed through the support plate for the rail 2 in parallel with the direction in which the rail is laid.

[0015] The rail pad 3 is provided to accomplish a primary vibration absorbing function, which is made of thick rubber or urethane with low elasticity. The rail pad 3 is fitted into the seats for the rail pads 2d of the support plate of the rail 2. The rail pad 3 is provided at the opposite ends thereof with low-cut portions 3a for protecting the sides of the lower portions of the rail, which is of the width thicker than that of the vibration absorbing pad 1.

[0016] The stay anchor 4 is stuck in the concrete roadbed, which is inserted into the anchor hole 8a of the support plate 8, the anchor hole 1a of the vibration absorbing pad 1 and the anchor hole 2a of the support plate for the rail 2 for stabilizing the connection therebetween. In addition, the stay anchor 4 acts as a guiding bar which is capable of guiding smoothly the rail pad 3, the support plate for the rail 2 and the vibration absorbing pad 1 upward and downward as the rail pad 3, the support plate for the rail 2 and the vibration absorbing pad 1 are

pressed down when the train passes on the rail, and as the rail pad 3, the support plate for the rail 2 and the vibration absorbing pad 1 are returned to their positions upwardly after the dynamic load of the train disappears.

The stay anchor 4 is provided at the upper end thereof with a thread 4a, and at the lower end thereof with an anchor portion 4b which is inserted into the anchor hole formed perpendicular to the concrete roadbed. Strong adhesives are filled the gap between the anchor portion 4b and the anchor hole so that the anchor portion 4b is fixedly mounted into the concrete roadbed.

[0017] The fixing nut 5 is engaged with the thread 4a provided at the upper end of the stay anchor 4, for preventing the support plate for the rail 2, the vibration absorbing pad 1 and the support plate 8 from leaving their positions respectively.

[0018] The packing 6 is provided to prevent the physical contact between the upper surface of the anchor hole 2a of the support plate for the rail 2 and the lower surface of the fixing nut 5 and to maintain the tightness of the support plate for the rail 2 when the support plate 8, the vibration absorbing pad 1 and the support plate for the rail 2 are arranged above and below by means of the stay anchor 4 fixedly mounted in the concrete roadbed, and thereafter the fixing nut 5 is engaged with the upper end of the stay anchor 4. The packing 6 is made of rubber or urethane with low elasticity.

[0019] Alternatively, a spring may be used instead of the packing 6.

[0020] The cap 7 is provided to protect the fixing nut 5 engaged with the stay anchor 4. The cap 7 is provided at the inner circumference thereof coming down by the thickness of the edge of a washer 11 from the top with a locking jaw 7a as shown in Fig. 2, which is provided to prevent the cap 7 from coming off unless the cap is forced to separate from the fixing nut 5.

[0021] A rail fixing member 9 and a insulating block 10, which are not mentioned in the aforesaid description of the constructions, are of the same constructions as those of the prior art. And the reference numeral 11 indicates a washer provided on the packing 6.

[0022] Fig. 3 and Fig. 4 are a plan view and a cross-sectional view of the rail with the device for absorbing the vibration of the rail according to the present invention, respectively. A vertical anchor hole 12a is formed in the concrete roadbed 12 on the concentric line with the anchor holes 8a, 1a and 2a, in which strong adhesives 13 is filled. And then, the stay anchor 4 is inserted into the vertical anchor hole 12a. The stay anchor 4 are fixedly mounted in the vertical anchor hole 12a after the strong adhesives is hardened. The anchor hole 12a is of the depth sufficient to depress the shaking of the support plate for the rail 2 insofar as the dynamic load of the train is not activated through the depression of the vibration absorbing pad 1 and the packing 6 caused by the pressure of the engagement therewith when the fixing nut 5 is completely tightened after the support plate 8, the vibration absorbing pad 1, the support plate for

the rail 2, the packing 6 and the washer 11 are fixed into the exposed portions of the stay anchor 4 on the concrete roadbed 12 under the condition that the stay anchor 4 is mounted normally in the concrete roadbed 12.

[0023] After the stay anchor 4 is mounted, the stay anchor 4 is inserted into the anchor hole 8a of the support plate 8, the anchor hole 1a of the vibration absorbing pad 1 and the anchor hole 2a of the support plate for the rail 2. Thereafter, The packing 6 and the washer 11 are arranged one after another on the anchor tube 2b of the support plate for the rail 2. At this time, the total heights of the support plate 8, the vibration absorbing pad 1, the support plate for the rail 2, the packing 6 and the washer 11 are higher than the lower boundary line of the thread 4 of the stay anchor 4. As the heights of the vibration absorbing pad 1 and the packing 6 are reduced resiliently by means of the engagement of the fixing nut 5, however, the support plate for the rail 2 is depressed at the suitable pressure, thereby the shaking of the support plate for the rail 2 being prevented.

[0024] At this time, any error in the height of the concrete roadbed may be compensated by adjusting the thickness of the support plate 8.

[0025] After the fixing nut 5 is completely engaged, the rail pad 3 is placed firmly on the seats for the rail pads 2d of the support plate for the rail 2. At this time, the rail pad 3 is in contact with the opposite sides of the support plate for the rail 2 by the low-cut portions 3a of the rail pad 3.

[0026] The rail 14 is laid on the rail pad 3. Then, the insulating block 10 is arranged on the flange 14a of the rail 14, on which the pressing portion is placed. Thereafter, the fixing end 9a of the rail fixing member 9 is inserted by force into the fixing hole 2c of the support plate for the rail 2. As a result, the rail 14 is stabilized by the pressing portion 9b applying the strong force to the upper surface of the insulating block 10.

[0027] Finally, the cap 7 is applied to the fixing nut 5 to protect the fixing nut 5 and provide the good appearance. In addition, the cap 7 can not come off from the fixing nut 5 easily by virtue of the locking jaw 7a. Consequently, the fixing nut 5 can not be released easily.

[0028] The vibration absorbing pad 1 as mentioned above is used for the initial construction of the rail, while a vibration absorbing pad 5 as shown in Fig. 5 is used for repair of the rail. When it is required to replace the used vibration absorbing pad 1 whose endurance term expired with a new vibration absorbing pad, it is necessary for unfastening the fixing nut 5, and then pulling out the support plate for the rail 2 in order to the replace the vibration absorbing pad 2. However, such a replacement requires excessive costs, takes a plenty of time, and is very inconvenient.

[0029] In order to eliminate the drawbacks caused in replacement of the rail pad, it is required to provide a novel method for replacing only the vibration absorbing pad 1 easily without pulling out the other elements under the condition that the rail 14 is laid on the concrete road-

bed. The vibration absorbing pad 1-1 and 1-2 for repair as shown in Fig. 5 eliminates the drawbacks as mentioned above. The vibration absorbing pad 1-1 and 1-2 are divided into the main body 1-1 and the corner portion 1-2 by the means of the boundary line which is cut linearly at the side edge and the front edge or at the side edge and the rear edge such that the it passes the location spaced inwardly from the set pins 1b.

[0030] When it is required to replace the vibration absorbing pad 1 with the replaceable vibration absorbing pad 1-1 and 1-2, a few rail fixing members of the device for absorbing vibration of the rail are pulled out from the fixing holes of the support plate for the rail 2 to lift up the rail to be replaced. The cap 7 is released from the rail to be replaced, and then the fixing nut 5 is loosened properly to remove the vibration absorbing pad 1. Next, the support plate for the rail 2 is lifted up by means of a lever or s hydraulic jack in order to obtain space necessary to remove the vibration absorbing pad 1 and insert a new vibration absorbing pad. Thereafter, the used vibration absorbing pad 1 is removed, the main body of the new vibration absorbing pad 1-1 is inserted from the lower side surface of the support plate for the rail 2, the corner portion of the new vibration absorbing pad 1-2 is inserted from the left and the right, and then the rail is returned to the original position. The new vibration absorbing pad 1-1 and 1-2 is not come off by means of the set pins 1b.

[0031] Regardless of the vibration absorbing pads 1 and 1-1, in case that the rail 14 is laid as shown in Fig. 2, when the train passes on the rail, the dynamic load of the train is absorbed first at the rail pad 3 before it is transmitted to the support plate for the rail 2. However, the unabsorbed dynamic load is transmitted to the support plate for the rail 2. The support plate for the rail 2 is lowered a little bit under the guidance of the stay anchor 4 by virtue of the dynamic load transmitted to the support plate for the rail 2. The vibration absorbing pads 1 and 1-1 are depressed by the lowered support plate for the rail 2 to accomplish the secondary absorbing function.

[0032] Upon accomplishment of the secondary absorbing, the vibration caused by the dynamic load of the train is almost never transmitted to the concrete roadbed 12. As soon as the train is passed, the support plate for the rail 2 is returned upwardly by virtue of the force of the restitution of the vibration absorbing pad 1. As a result, the rain 14 is returned to the original position by virtue of the force of the restitution of the vibration absorbing pad as mentioned above and the force of the restitution of the rail pad 3.

[0033] As mentioned above, with the device for absorbing the vibration of the rail, the up-and-down motion thereof is carried out freely as the support plate for the rail 2 is lowered downwardly under the guidance of the stay anchor 4 when it is subject to the dynamic load and the support plate for the rail 2 is returned upwardly under the guidance of the stay anchor 4 when the dynamic

load transmitted to the support plate for the rail 2 disappears, whereas the front and rear motion as well as the right and left motion, and the unequal subsidence thereof are prevented completely. As a result, there is no possibility of derailment of the train.

[0034] The device for absorbing the vibration of the rail according to the prior art uses four small anchor bolts (Φ 26 MM), which are replaced frequently due to corrosion thereof at the damp weather. In contrast, the device for absorbing the vibration of the rail according to the present invention has an excellent durability since the device for absorbing the vibration uses two larger anchor bolts (Φ 40 MM).

[0035] Particularly, if the thickness of the vibration absorbing pad, it is possible to maximize the vibration absorbing effect since the support plate for the rail is stabilized in engagement with the stay anchor. In addition, it is possible to improve the durability of the concrete roadbed and the train, and to improve the passenger's feeling of the boarding of the train.

[0036] Also, with the vibration absorbing pad (Fig. 5) comprising the main body and the corner portion which includes a portion of the anchor hole, it is convenient to replace the vibration absorbing pad when it is antiquated or damaged, it is easy to maintain the vibration absorbing pad, and it is possible to reduce the costs including the replacement time for the vibration absorbing pad and the personnel expenses.

[0037] Furthermore, it is possible to form the good appearance, and to reduce the size and the weight as compared to the device for absorbing the vibration of the rail according to the prior art since only the cap and the fail fixing member are exposed.

(4).

2. The device for absorbing the vibration of the rail as claimed in claim 1, wherein the vibration absorbing pad (1) is a vibration absorbing pad (Fig. 5) for repair of the rail which is divided into a main body (1-1) and a corner portion (1-2) by the means of the boundary line which is cut diagonally at the inward portion of the center of the anchor hole (1a).

Claims

1. A device for absorbing the vibration of the rail comprising: a support plate (8) having an anchor hole (8a) for a stay anchor formed around one of the diagonally opposite corners; a thick vibration absorbing pad (1) having an anchor hole (1a) for the stay anchor formed at the position corresponding to that of the anchor hole (8a); a support plate for the rail (2) having an anchor tube (2b) which is projected upwardly on the support plate for rail (2) with an anchor hole (2a) formed therein, and an fixing hole (2c) formed at the anchor tube (2b), said fixing hole being formed through the support plate for the rail (2) in parallel with the direction in which the rail is laid; a stay anchor (4) inserted into the anchor hole (8a) of the support plate (8), the anchor hole (1a) of the vibration absorbing pad (1) and the anchor hole (2a) of the support plate for the rail (2) for stabilizing the connection therebetween; a fixing nut (5) engaged with the thread (4a) provided at the upper end of the stay anchor (4); and a cap (7) for protecting the fixing nut (5) engaged with the stay anchor

Fig 1

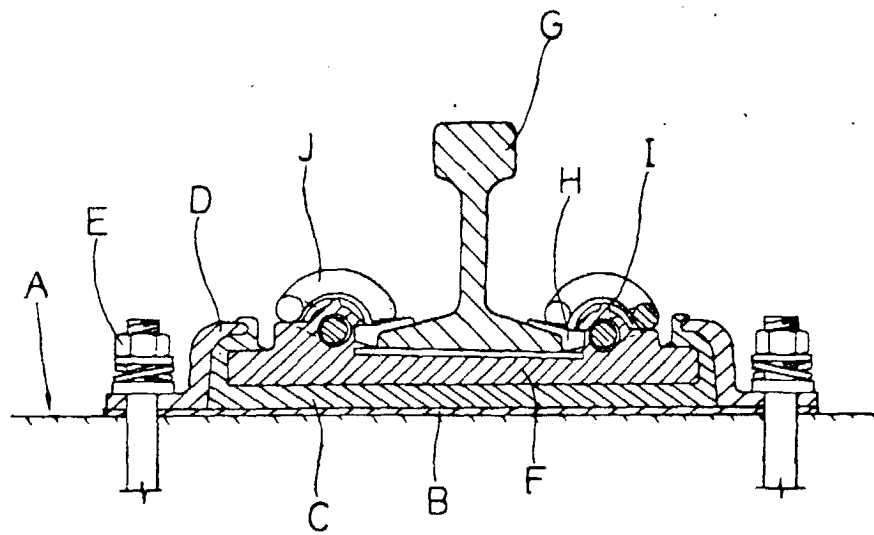


Fig 2

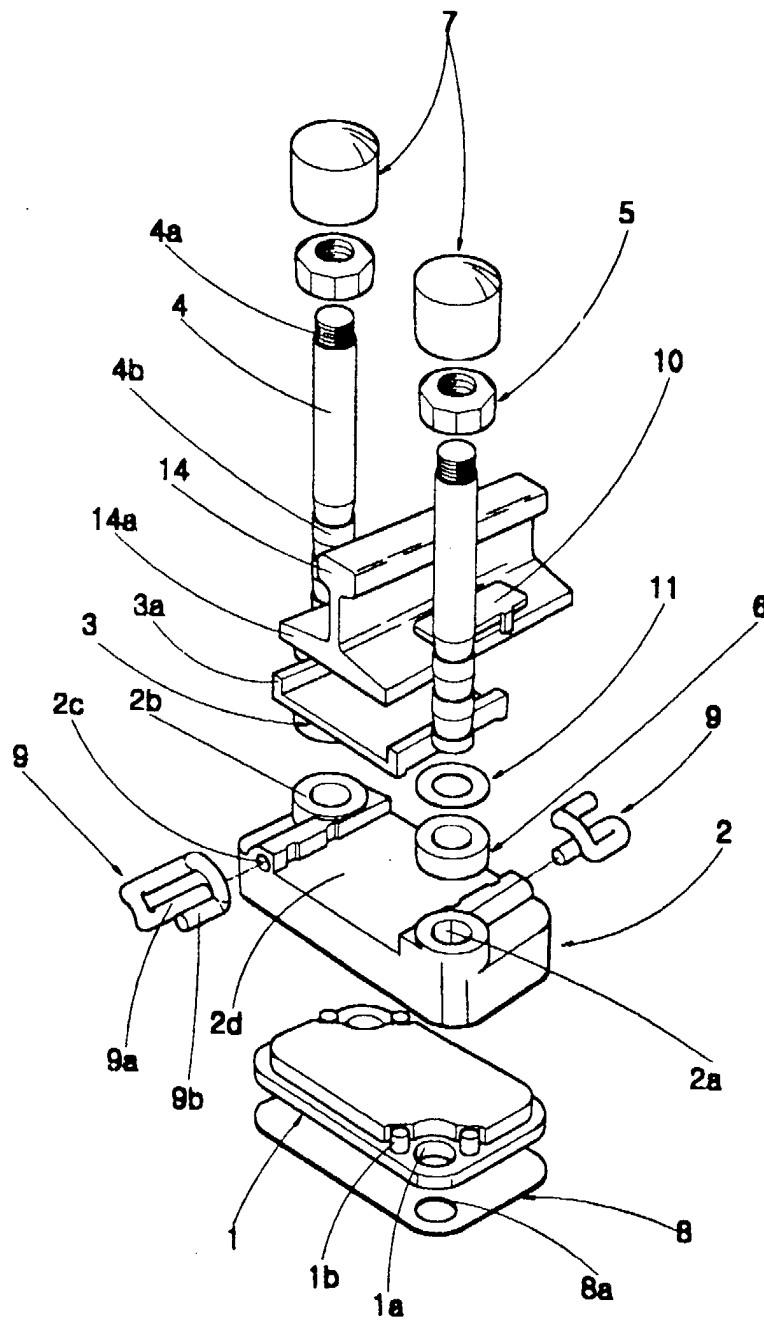


Fig 3

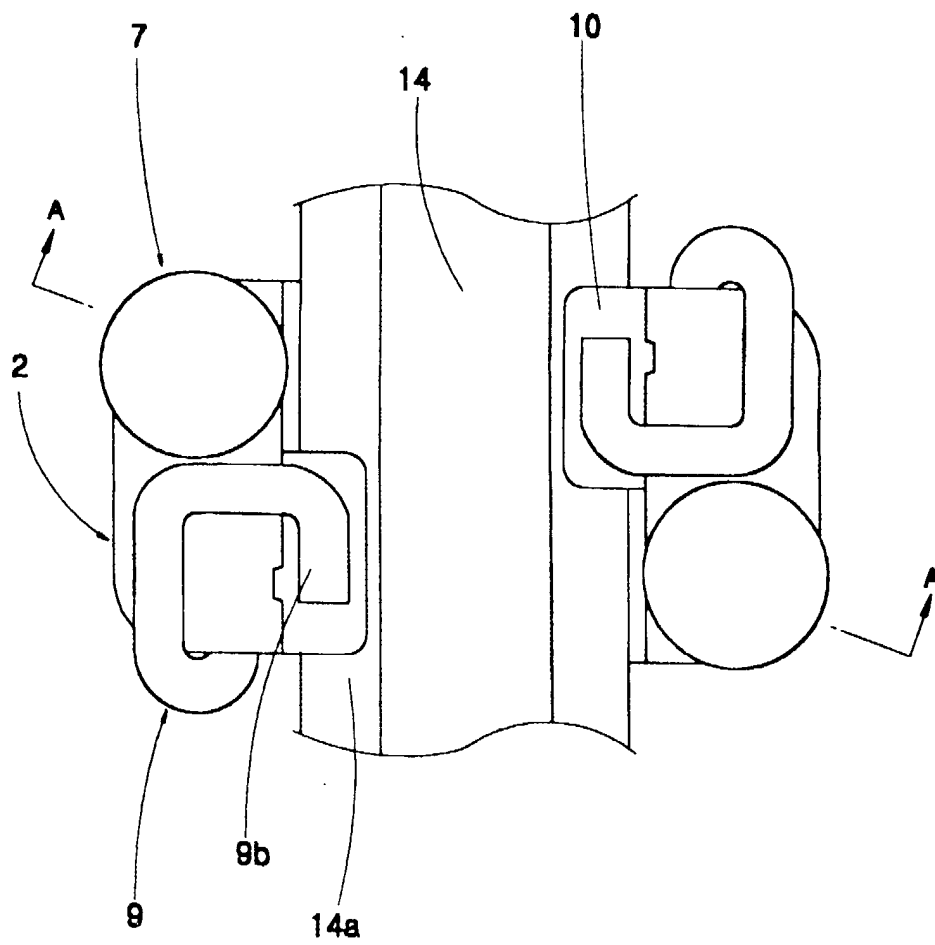


Fig 4

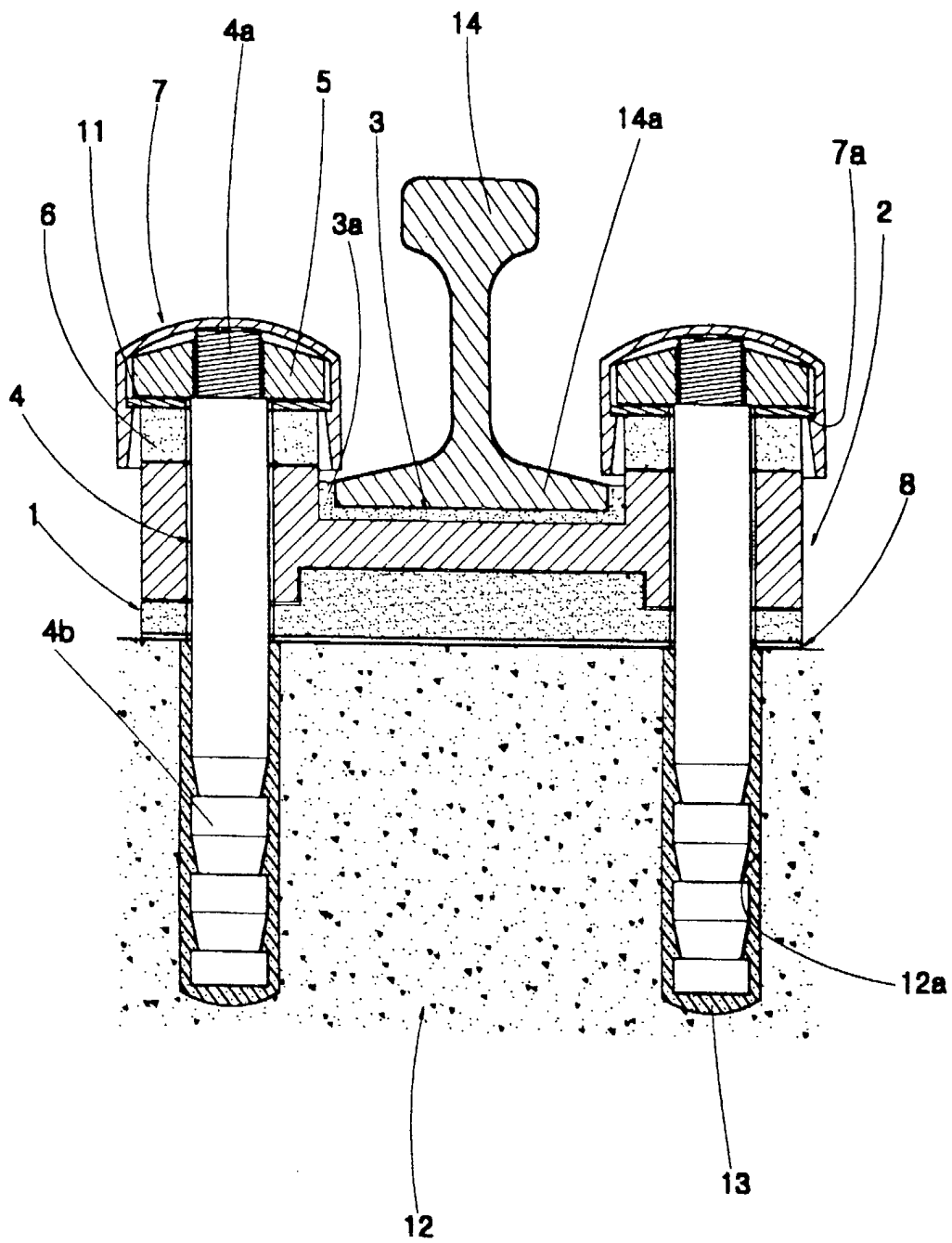


Fig 5

