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(54) **SLAB TRACK ADJUSTMENT PLATE AND METHOD OF INSTALLATION**

PLATTENSPURANPASSUNGSPLATTE UND INSTALLATIONSVERFAHREN

PLAQUE DE RÉGLAGE DE VOIE SANS TRAVERSE ET PROCÉDÉ D'INSTALLATION

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Description

Technical Field

[0001] The present invention relates to a slab track adjustment plate which is intended for use in aligning rails during the process of installing railway or crane tracks and to a method of installing a slab track adjustment plate.

Background to the Invention

[0002] Slab track systems are usually installed according to either the "top-down principle" or the "bottom-up principle". In the "top-down" method, firstly a concrete slab is poured along the course where the track will be installed. Rails are then laid down on the slab and may be assembled, or may already have been pre-assembled, with other superstructure elements (fastenings, sleepers or supporting blocks) to form a track panel. The rails are then raised to their approximate intended positions using a series of hydraulic jacks. Adjustment plates are then placed under the rails and include a rail supporting portion which abuts the underside of the foot of each rail at intervals to support the rails. Each adjustment plate is supported on a pair of threaded spindles which engage with threaded holes provided in the adjustment plate. By rotating the spindles, the height of the adjustment plate, and hence the height of the rail, can be adjusted. The support plates generally also allow for lateral positional adjustment of each rail.

[0003] In the case of a rail system with sleepers or crossties, these sleepers or crossties are attached prior to setting the positions of the rails and hence the spacing of the rails is set by the attached sleepers. In the case of a system with no sleepers, then temporary gauge holders may be used to set the correct spacing of the rails.

[0004] A survey vehicle or cart is set onto the rails which are to be adjusted into their final positions. The survey vehicle includes GPS or other positioning detection systems. In the case of installing rails inside a tunnel then survey points or reflectors located at known locations along the insides of the tunnel walls may be used to infer the precise location of the survey vehicle, and hence enable fine adjustment of the height and lateral positions of the rails by way of the adjustment plates.

[0005] After the fine adjustments of the rails are completed, formwork is installed as necessary before concrete is poured to set the rails in their final positions. After the concrete has set the spindles are removed from the adjustment plates, and the adjustment plates and any gauge holders are removed. The holes in the concrete left by the spindles are filled.

[0006] The "bottom-up" principle differs from the top down principle in that the initial concrete pour is made to bring the top surface of the slab to an acceptable design level. Then the rails are set on adjustment plates in the same way as for the "bottom-down" method, but using

spindles of a shorter length. The rails of the track are affixed to the slab using fasteners using resilient plastic pads of appropriate thickness between the slab and the underside of the fasteners to yield an installed track with rails set at their correct heights. The adjustment plates attached to the rails at intervals between the fasteners are used to fine tune the locations of the rails whilst the plastic pads are inserted and before bolts are locked down to affix the fasteners to the slab.

[0007] In existing slab track installation systems, the adjustment plates are installed by a team of two people. Two people are typically required to carry out the task of positioning the adjustment plates under the foot of each rail and making adjustments using the plates to bring the rail to its intended final position.

[0008] Examples of prior art can be found in documents WO2013/030723A1, US2006/011792A1 and US5150835A.

Summary of the Invention

[0009] The present invention provides a slab track adjustment device as defined in the claims. Suitably, the slab track adjustment device includes: a rail support portion for supporting a rail; at least two height adjustment apertures for receiving height adjustment spindles to adjust the effective vertical position of the rail support portion; a lateral adjustment means to adjust the horizontal position of the rail support portion; a removable locking piece which includes a peg and an upstanding prong and wherein the rail support portion is engageable with the foot of the rail so that the adjustment device can hang from the foot of the rail during the process of installing the adjustment device.

[0010] The at least two height adjustment apertures may be internally threaded.

[0011] The adjustment device may include a base-plate.

[0012] The rail support portion may be rotatably mounted in the device.

[0013] The rail support portion may be rotatably mounted to spindle.

[0014] The lateral adjustment means may include a threaded rod which cooperates with a threaded hole which is associated with the spindle.

[0015] The threaded rod may include formations provided at either end of the rod to enable rotational adjustment of the rod.

[0016] The locking piece may further include a spacer formation for setting the cant of the rail.

Brief Description of the Drawings

[0017] An embodiment of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a slab track adjust-

ment device;

Figure 2 is a top view of the slab track adjustment device of figure 1 shown with spindles removed;

Figure 3 is a cross-sectional view along the line A-A of figure 2;

Figure 4 is a cross-sectional view along the line B-B of figure 2;

Figure 5 is a cross-sectional view along the line C-C of figure 2;

Figure 6 shows parts of the adjustment device of figure 1 in association with additional components;

Figure 7 shows two rails of a track being adjusted using a pair of adjustment devices according to figure 1 to install a flat track with canted rails;

Figure 8 shows two rails of a track being adjusted using a pair of adjustment devices according to figure 1 to install a canted track with canted rails; and

Figure 9 shows a modified version of figure 6 showing a locking piece used when installing track with flat rails.

Detailed Description of the Preferred Embodiment

[0018] Referring to figure 1, a slab track adjustment device 10 is shown. The device 10 includes a baseplate 20 which is provided with two height adjustment apertures in the form of two internally threaded holes being the bores of two hex nuts 22, 24 which are welded to baseplate 20. The bores (22a, 24a best seen in figure 2) of nuts 22, 24 receive height adjustment spindles in the form of M30 threaded spindle rods 110, 111. In use the lower ends of the spindle rods rest against a concrete slab. The hex formations 110, 111 at the top of the spindle rods can be rotated using a suitable power tool which effects an adjustment of the vertical position of the baseplate by way of the nuts 22, 24 travelling upwards or downwards on their respective spindles. A spirit level gauge 26 provides a visual indication to enable an operator to make the baseplate horizontal, by rotation of an appropriate spindle rod 110, 111.

[0019] Device 10 further includes a rail support portion in the form of support plates 32. The support plates 32 are attached together by a spacer 37 (best seen in figure 4) and act to support a rail in use to enable the position of the rail to be adjusted. The support plates 32 are rotatably mounted to a horizontally oriented spindle 34 which is slidably attached to the baseplate 20 by two clamp brackets 36.

[0020] As best seen in figure 2, a lateral adjustment means is provided to allow for adjustment of the horizontal position of the support plates 32 (and thus the horizontal position of a rail which is supported on the support plates) in the form of a threaded rod being the shaft of an M14 hex head screw 40 which is of a length of approximately 285mm. The shaft 42 of screw 40 cooperates with a threaded hole 44 provided at the mid-point along the length of spindle 34. An M14 hex nut 46 is keyed to the free end of hex screw 40 which is mounted between

bushes 27 provided at either end of baseplate 20. In this way, the screw 40 is retained to the baseplate 20, and can be rotated by use of an appropriate power tool to act on either end of the hex screw 40. Rotation of the hex screw 40 causes lateral movement of the spindle 34 between its limits of travel which are dictated by the lengths of the spaces provided within the clamp brackets 36. Of course, the direction of travel of the spindle 34 will be determined by the direction of rotation of the hex nut 40, either clockwise or anticlockwise.

[0021] Referring now to figure 6, additional components of the adjustment device 10 are shown. A removable locking piece 50 is used to retain the support plates 32 in association with a rail by engaging with the foot of the rail. Locking piece 50 is engageable with one of the support plates 32 by sliding locking piece 50 so that peg 58 (just visible in figure 6) slides into aperture 38. The locking piece 50 is used to "trap" the foot of a rail between the upstanding prongs 39 of the support plates and the upstanding prong 52 of the locking piece (as seen in figure 7).

[0022] Referring again to figure 6, locking piece 50 includes a spacer portion 54. When attached to the support plates 32 of the adjustment device 10, the spacer portion 54 sits between the underside of the foot of the rail and the upper surface of the support plates 32. The thickness of the spacer portion 54 dictates the cant of a rail which is being adjusted using the device 10 in conjunction with a gauge holder arrangement. A gauge holder is used when installing and adjusting rails which are not fitted to bearers/sleepers.

[0023] As shown in figure 6, the gauge holder arrangement includes an optional gauge bracket 60 which is used in conjunction with each adjustment device 10. The gauge bracket are attached to the support plates 32 of an adjustment device by way of four screws 62 which are inserted through apertures 64. When attached, the web 66 of the gauge bracket lies at a fixed 90 degree angle with respect to the upper faces of the support plates 32.

[0024] Now referring to figure 7, two adjustment devices 10 are shown in use to align two rails 80, 82 which form a track. The track is to be installed flat and a 1/20 inwardly directed cant is to be applied to each rail and no bearers are to be used with the rails.

[0025] Prior to the installation of the rails, a concrete slab 200 is poured along the course of the track. After the concrete slab 200 has set, the rails 80, 82 are laid out in their approximate positions and are raised up to just below their approximate installation height using hydraulic jacks (not shown). Adjustment devices 10 are then attached to the feet of the rails 80, 82 in pairs spaced apart at intervals along the rails (one of these pairs of adjustment devices 10 is shown in figure 7).

[0026] Each adjustment device can be attached in turn to the rails in a two-handed operation carried out by one person. An adjustment device is taken in one hand and is brought into position by raising it up under the rail so that the support plates 32 press against the underside of the

foot of the rail, and the upstanding prong 39 of the support plates 32 encircle the inside edge of the foot of the rail. Then, taking a locking piece in the other hand, the locking piece is attached to the adjustment device by sliding peg 58 into aperture 38 so that spacer portion 54 slides between the underside of the foot of the rail and the upper surfaces of the support plates 32, and the upstanding prong 52 of the locking piece 50 encircles the outer edge of the foot of the rail. The adjustment device is thereby engaged with the rail by the locking piece 50, and can hang from the foot of the rail. With the locking piece 50 attached, the person can therefore remove their hands and leave the adjustment device hanging from the rail and move on to attach the next in the series of adjustment devices.

[0027] In the installation illustrated in figure 7, no bearers or sleepers are attached to the rails 80, 82 and so a gauge holder arrangement is used. The gauge holder arrangement includes a gauge bar 70 which is formed from two identical end pieces 72 which are threadedly received into each end of the bore of a centre piece 74. The effective length of the gauge bar 70 can be adjusted for use in installing tracks of different gauges. The gauge bar 70 is adjusted by rotating the ends 72 with respect to the centre piece 70 to achieve the desired overall bar length for the particular desired gauge. The rotational positions of the end pieces 72, and hence the overall length of the bar 70, are then fixed by tightening locknuts 76.

[0028] The end pieces 72 each have enlarged circular flanges at their outer ends. Each end piece is fitted to a respective gauge bracket 60 by sliding the end of the rod into an open ended 68 provided in the web 66 of each gauge bracket 60 (shown in figure 6). The flange abuts the inside surface of the web 66 and the gauge bar end is fixed in place by tightening a locknut 78 provided on each end piece 72 against the outer surface of the web 66 of the gauge bracket 60. The gauge holder arrangement therefore holds both attached adjustment devices apart by a set distance, and also sets the angular orientation of the support plates so that the upper flat faces of the support plates lie in the same plane.

[0029] When all of the adjustment devices 10 and the gauge holder arrangements are in place along the stretch of track being adjusted, then fine adjustments are made to track to set the rails in their final installed positions. These adjustments are made in a somewhat conventional manner, using the output of a survey vehicle, such as a cart located on the rails, to verify that the rails are in their correct positions along the stretch of track.

[0030] The vertical positions of the rails 80, 82 are adjusted using spindles 100, 101. These are rotated in either direction to adjust the vertical position of the rail, and at the same time to ensure that the baseplate 20 of each adjustment device is horizontal by inspecting each spirit level 26 located on each adjustment device 10. The horizontal positions of the rails 80, 82 are adjusted using the hex screw 40 provided on each adjustment device 10.

[0031] The adjustment procedure is complete when it is deemed that the rails 80, 82 are in their correct final positions within an allowable tolerance. The flat faces of the support plates will now be lying in a plane that is parallel to horizontal line A and a 1/20 cant has been applied to each rail by virtue of the spacer portions 54.

[0032] Appropriate formwork for a second stage of concrete pouring is then installed. Concrete is then poured around the rails to set the rails in position in a usual fashion. The formwork is configured so that the adjustment devices 10 do not become embedded in the second stage concrete pour. It is acceptable for the lower ends of spindles 100, 101 to become embedded in the second stage concrete pour.

[0033] After the second stage concrete has set the spindles are removed by rotating them with a power tool which releases them from being bound by the concrete and allows them to be removed upwardly from the associated threaded holes in the baseplates 20. With the spindles 100, 101 removed, the adjustment devices can then be removed by removing the locking piece associated with each adjustment device and sliding the adjustment device out from under the rail. The adjustment devices 10 can be re-used for adjusting a subsequent stretch of track. The holes left by the spindles are filled and the rail installation is complete.

[0034] Referring to figure 8, a modified version of the arrangement of figure 7 is shown in which is being used to install a track which is itself canted with a vertical offset of 150mm between the height of each rail. A 1/20 cant is also applied to the rails. All of the components used are the same as those seen in figure 7. When installing the track shown in figure 8, the adjustment device 10 attached to the rails 80, 82 are adjusted to give the required vertical heights of each rail, according to measurements made by the survey cart (not shown). It is to be noted that baseplates of the adjustment devices 10 themselves still lie in horizontal planes. The support plates 32 pivot on their respective spindles 34 to accommodate the required angular orientations of the rails.

[0035] If flat rails are required to be installed, such as may be found in the vicinity of turnouts or other track crossing sections, then a modified locking piece is used. Referring to figure 9, a modified version of figure 6 is shown in which the locking piece has been replaced with a flat track style locking piece 50a. Locking piece 50a differs from the locking piece 50 seen in figure 6 in that it omits the spacer portion. When locking piece 50a is used, the foot of the rail sits flush with the upper surfaces of the support plates 32. In all other respects, the components shown in figure 9 are identical to those seen in figure 6.

[0036] Whilst the above described method involved a "top-down" slab track installation, embodiments of the invention can also be used in a "bottom-up" style of installation. Indeed, the slim profile enabled in adjustment plates according to the invention, it makes them particularly suitable for "bottom-up" installations because they can be removed easily from under the rail after the

adjustments process has been completed.

[0037] It can be seen that embodiments of the invention provide at least one of the following advantages:

- The adjustment devices can be installed by one person working alone. They are lightweight enough to be comfortably lifted and held in one hand. They can be engaged with the foot of a rail by inserting the locking piece, and can be left to hang from the rail whilst further installation of associated components is carried out such as spindles, gauge holder parts etc.
- The horizontal position of the rail can be adjusted by rotation of a screw shaft which has formations at either end allowing horizontal adjustments to be made by a person standing on either side of the adjustment device.
- The screw shaft engages with a spindle at a point which is located between the two support plates making for smooth and accurate lateral adjustment.
- Can be used in either "top-down" or "bottom-up" installations.

[0038] Any reference to prior art contained herein is not to be taken as an admission that the information is common general knowledge, unless otherwise indicated.

Claims

1. A slab track adjustment device (10) including:

a rail support portion (32) for supporting a rail; at least two height adjustment apertures (22, 24) for receiving height adjustment spindles (110, 111) to adjust the effective vertical position of the rail support portion (32);

a lateral adjustment means 40 to adjust the horizontal position of the rail support portion (32); **characterised in that**

the adjustment device further includes a removable locking piece (50) which includes a peg (58) and an upstanding prong (52);

the rail support portion (32) includes an aperture (38) located in a side face of the rail support portion (32);

wherein the rail support portion (32) is engageable with the foot of the rail by attaching the locking piece (50) to the rail support portion (32) by sliding the peg (58) into aperture (38) so that the upstanding prong (52) of the locking piece (50) encircles the outer edge of the foot of the rail so that the adjustment device (10) can hang from the foot of the rail during the process of installing the adjustment device.

2. A slab track adjustment device (10) according to claim 1 wherein the at least two height adjustment

apertures (110, 111) are internally threaded.

3. A slab track adjustment device (10) according to either of claim 1 or claim 2 which includes a base-plate (20).
4. A slab track adjustment device (10) according to any preceding claim wherein the rail support portion (32) is rotatably mounted in the device.
5. A slab track adjustment device (10) according to claim 4 wherein the rail support portion is rotatably mounted to a horizontally oriented spindle (34).
6. A slab track adjustment device according to claim 5 wherein the lateral adjustment means includes a threaded rod (40) which cooperates with a threaded hole which is associated with the horizontally oriented spindle (34).
7. A slab track adjustment device according to claim 6 wherein the threaded rod 40 includes formations (46) provided at either end of the rod to enable rotational adjustment of the rod..
8. A slab track adjustment device according to any preceding claim wherein the locking piece (50) further includes a spacer formation (54) for setting the cant of the rail.

Patentansprüche

1. Feste-Fahrbahn-Justiervorrichtung (10), einschließlich:

einen Schienentrageabschnitt (32) zum Tragen einer Schiene;

mindestens zwei Höhenjustieröffnungen (22, 24) zum Aufnehmen von Höhenjustierspindeln (110, 111), um die tatsächliche vertikale Position des Schienentrageabschnitts (32) zu justieren; ein Seitenjustiermittel 40 zum Justieren der horizontalen Position des Schienentrageabschnitts (32); **dadurch gekennzeichnet, dass** die Justiervorrichtung ferner ein abnehmbares Arretierstück (50) einschließt, das einen Zapfen (58) und eine aufrechte Zinke (52) einschließt; der Schienentrageabschnitt (32) eine Öffnung (38) einschließt, die sich in einer Seitenfläche des Schienentrageabschnitts (32) befindet;

wobei der Schienentrageabschnitt (32) mit dem Fuß der Schiene in Eingriff gebracht werden kann, indem das Arretierstück (50) an dem Schienentrageabschnitt (32) angebracht wird, indem der Zapfen (58) in die Öffnung (38) geschoben wird, so dass die aufrechte Zinke (52) des Arretierstücks (50) die Außenkante des Fu-

ßes der Schiene umgibt, so dass die Justiervorrichtung (10) während des Vorgangs eines Installierens der Justiervorrichtung von dem Fuß der Schiene hängen kann.

2. Feste-Fahrbahn-Justiervorrichtung (10) nach Anspruch 1, wobei die mindestens zwei Höhenjustieröffnungen (110, 111) mit einem Innengewinde versehen sind.
3. Feste-Fahrbahn-Justiervorrichtung (10) nach entweder Anspruch 1 oder Anspruch 2, die eine Grundplatte (20) einschließt.
4. Feste-Fahrbahn-Justiervorrichtung (10) nach einem vorhergehenden Anspruch, wobei der Schienentrageabschnitt (32) drehbar in der Vorrichtung montiert ist.
5. Feste-Fahrbahn-Justiervorrichtung (10) nach Anspruch 4, wobei der Schienentrageabschnitt drehbar an einer horizontal ausgerichteten Spindel (34) montiert ist.
6. Feste-Fahrbahn-Justiervorrichtung nach Anspruch 5, wobei die Seitenjustiermittel eine Gewindestange (40) einschließt, die mit einem Gewindeloch zusammenwirkt, das mit der horizontal ausgerichteten Spindel (34) assoziiert ist.
7. Feste-Fahrbahn-Justiervorrichtung nach Anspruch 6, wobei die Gewindestange 40 Gebilde (46) einschließt, die an einem der Enden der Stange vorgesehen sind, um eine Drehjustierung der Stange zu ermöglichen.
8. Feste-Fahrbahn-Justiervorrichtung nach einem vorhergehenden Anspruch, wobei das Arretierstück (50) ferner ein Abstandshaltergebilde (54) zum Einstellen der Überhöhung der Schiene einschließt.

Revendications

1. Dispositif de réglage de voie sur dalles (10) incluant :
 - une partie de support de rail (32) destinée à supporter un rail ;
 - au moins deux ouvertures de réglage de hauteur (22, 24) destinées à recevoir des broches de réglage de hauteur (110, 111) pour régler la position verticale effective de la partie de support de rail (32) ;
 - un moyen de réglage latéral 40 pour régler la position horizontale de la partie de support de rail (32) ; **caractérisé en ce que**
 - le dispositif de réglage inclut en outre une pièce de verrouillage amovible (50) qui inclut une che-

ville (58) et une pointe dressée (52) ;
la partie de support de rail (32) inclut une ouverture (38) située sur une face latérale de la partie de support de rail (32) ;
dans lequel la partie de support de rail (32) peut entrer en prise avec le pied du rail en attachant la pièce de verrouillage (50) à la partie de support de rail (32) en glissant la cheville (58) dans l'ouverture (38) de sorte que la pointe dressée (52) de la pièce de verrouillage (50) encercle le bord externe du pied du rail de sorte que le dispositif de réglage (10) peut être suspendu depuis le pied du rail pendant le processus d'installation du dispositif de réglage.

2. Dispositif de réglage de voie sur dalles (10) selon la revendication 1 dans lequel les au moins deux ouvertures de réglage de hauteur (110, 111) sont filetées de manière interne.
3. Dispositif de réglage de voie sur dalles (10) selon l'une ou l'autre de la revendication 1 ou de la revendication 2, qui inclut une plaque de base (20).
4. Dispositif (10) de réglage de voie sur dalles selon l'une quelconque des revendications précédentes dans lequel la partie de support de rail (32) est montée en rotation dans le dispositif.
5. Dispositif (10) de réglage de voie sur dalles selon la revendication 4 dans lequel la partie de support de rail est montée en rotation sur une broche orientée horizontalement (34).
6. Dispositif de réglage de voie sur dalles selon la revendication 5 dans lequel le moyen de réglage latéral inclut une tige filetée (40) qui coopère avec un trou fileté qui est associé à la broche orientée de manière horizontale (34).
7. Dispositif de réglage de voie sur dalles selon la revendication 6 dans lequel la tige filetée 40 inclut des formations (46) fournies au niveau de chaque extrémité de la tige pour permettre le réglage en rotation de la tige.
8. Dispositif de réglage de voie sur dalles selon l'une quelconque des revendications précédentes dans lequel la pièce de verrouillage (50) inclut en outre une formation d'espaceur (54) destinée à régler le dévers du rail.

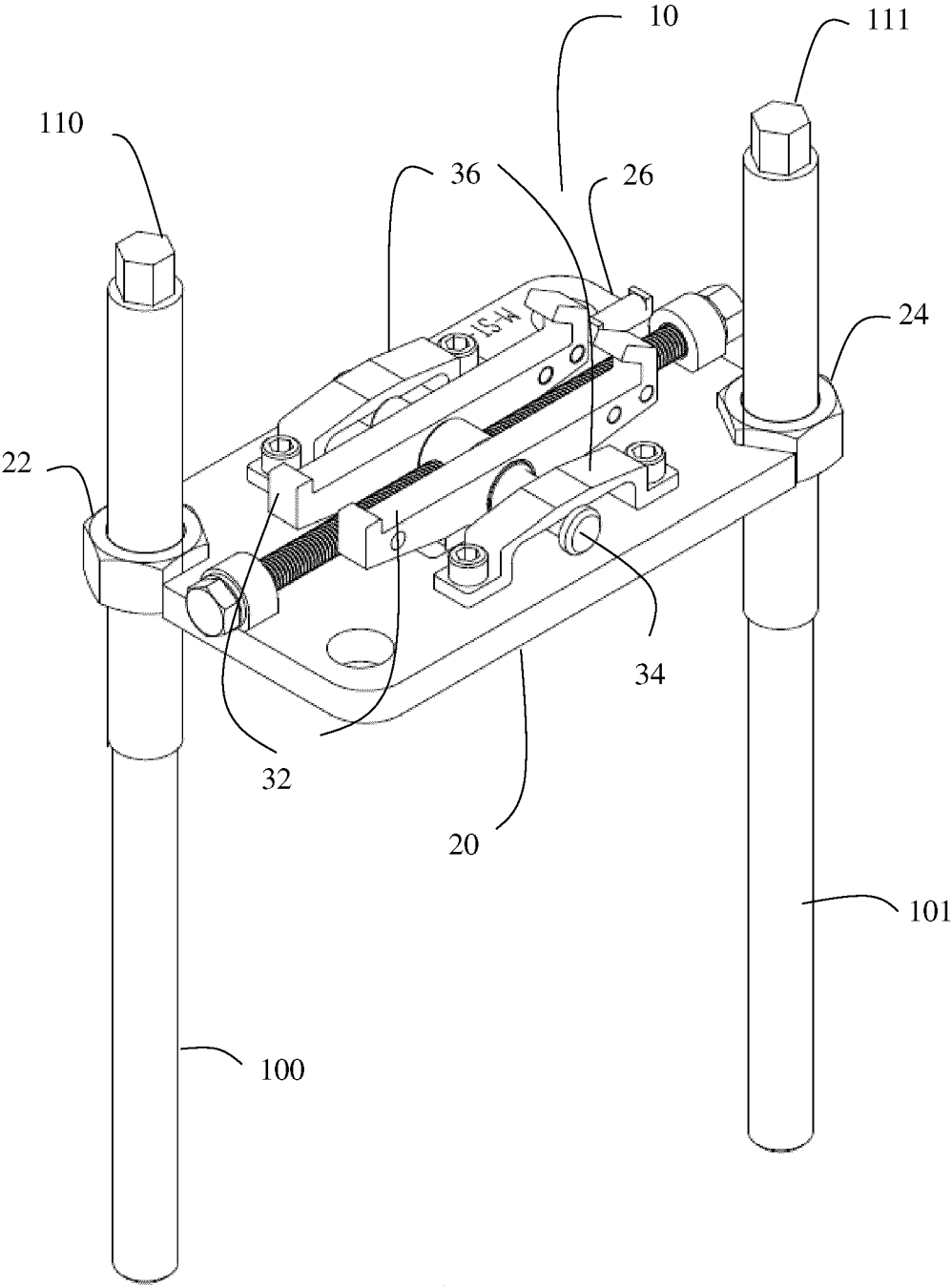


Fig 1

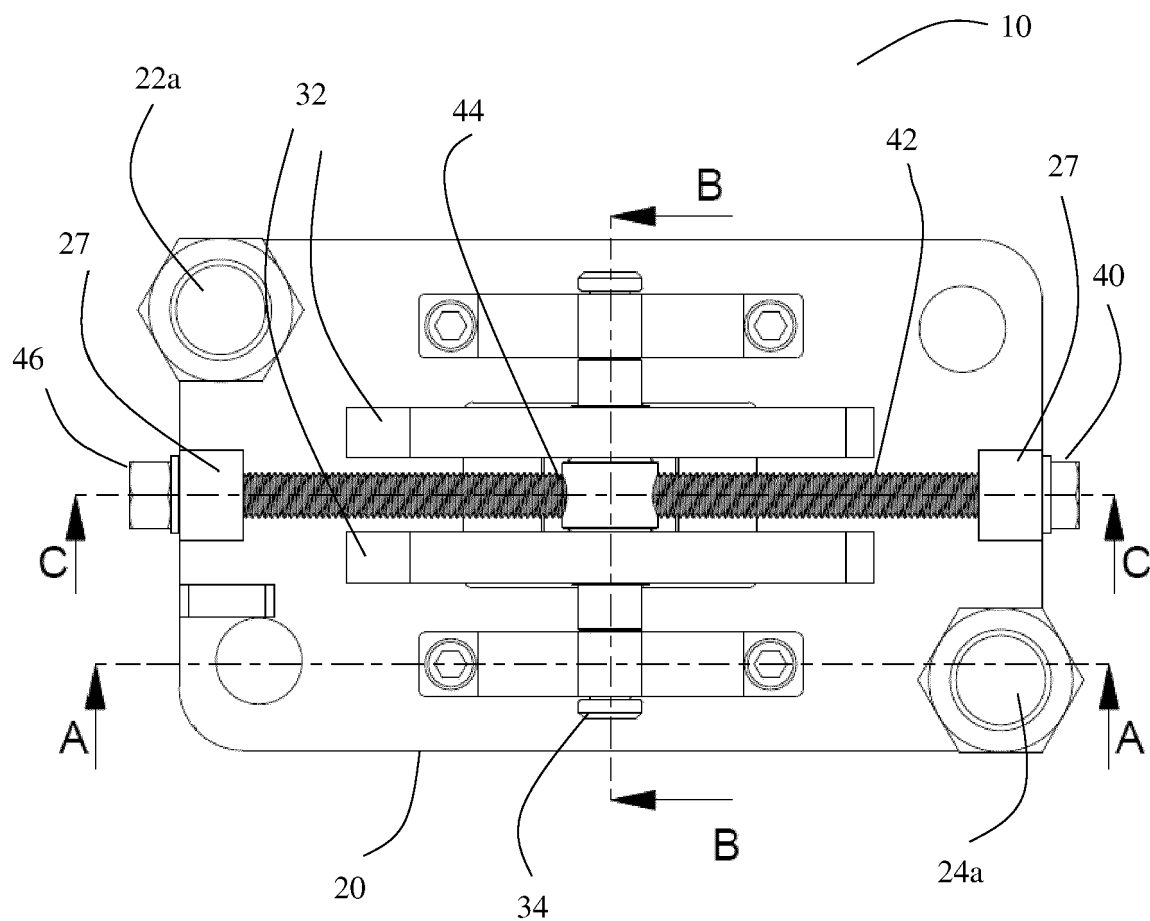


Fig 2

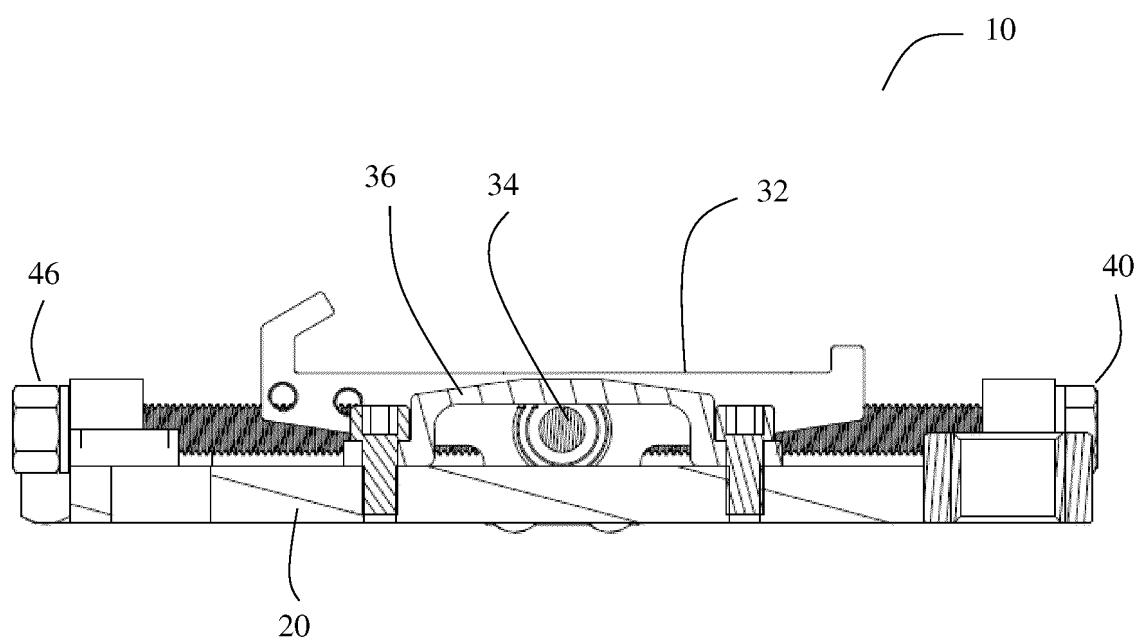


Fig 3

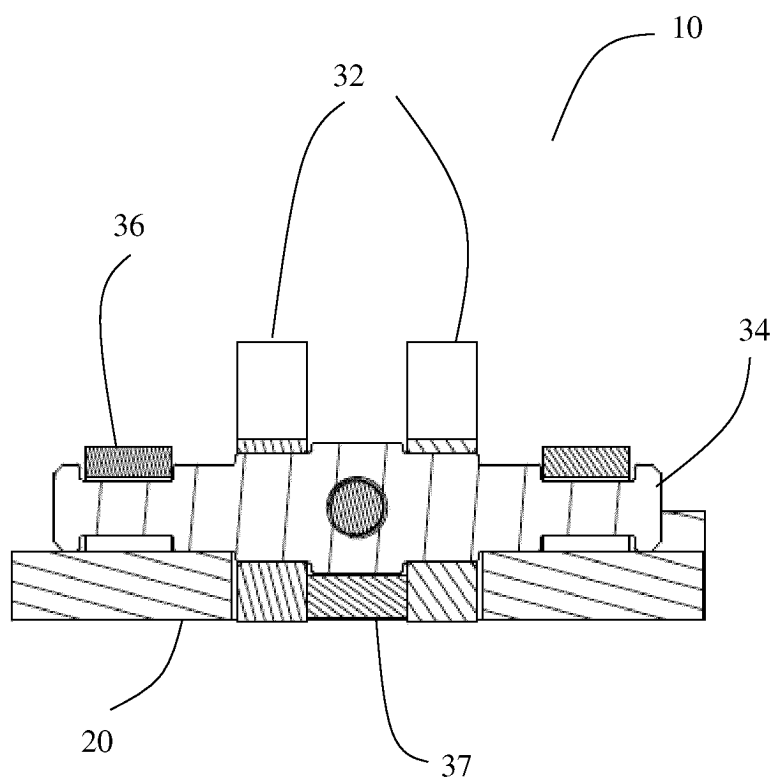


Fig 4

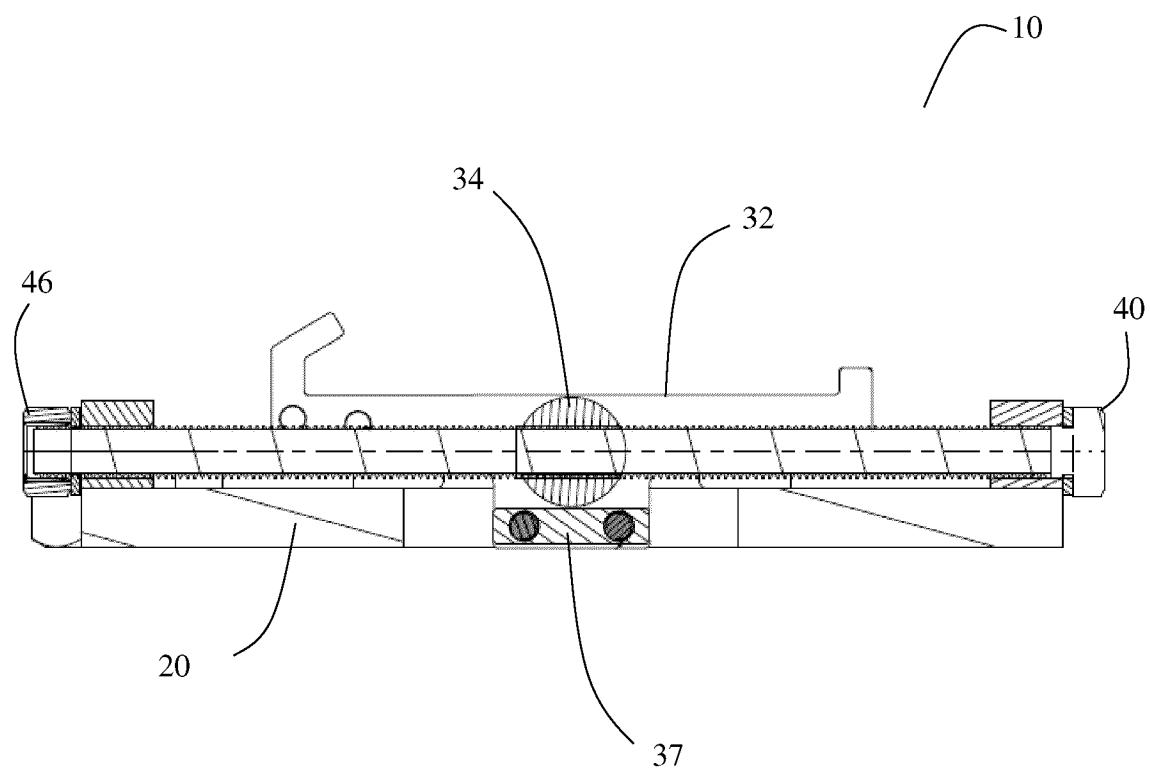


Fig 5

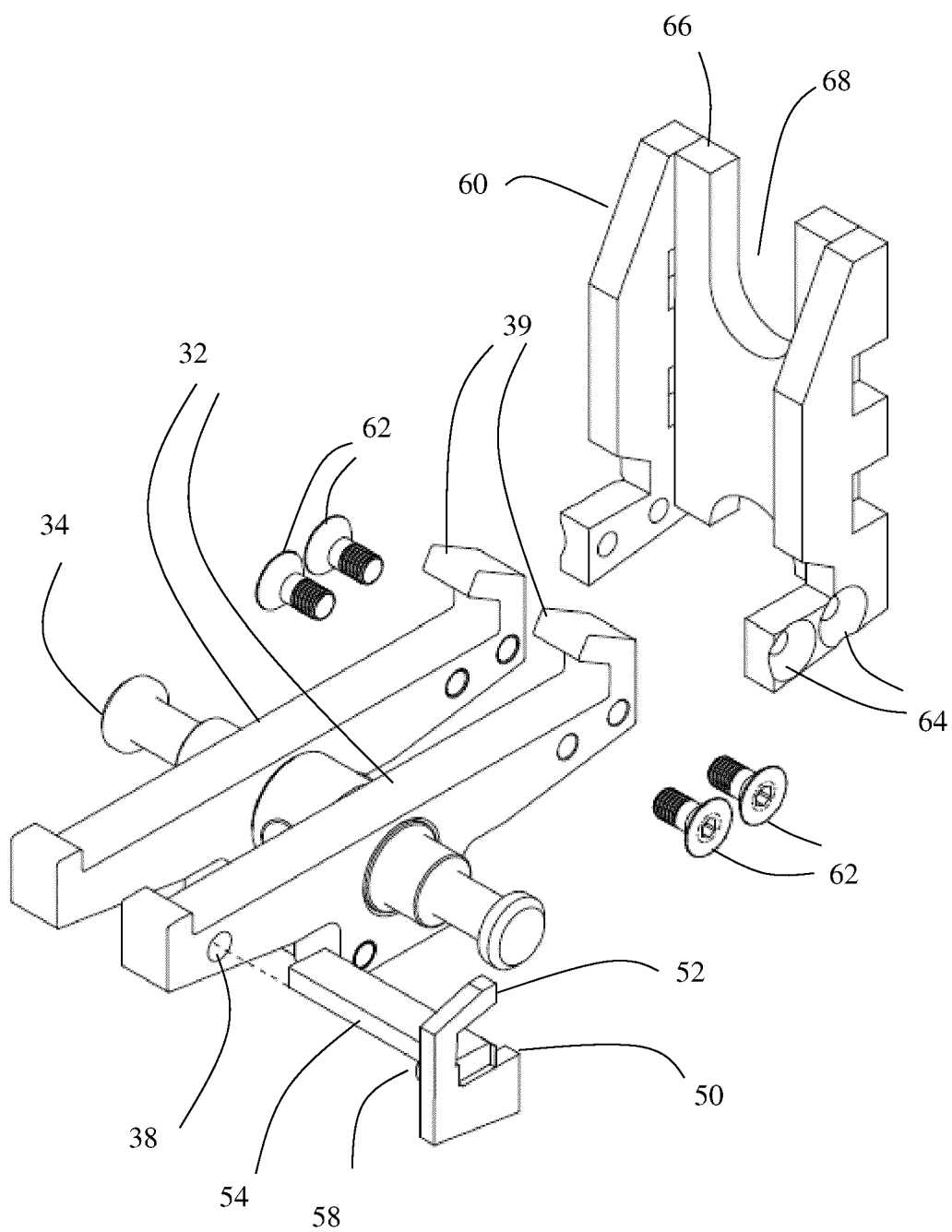


Fig 6

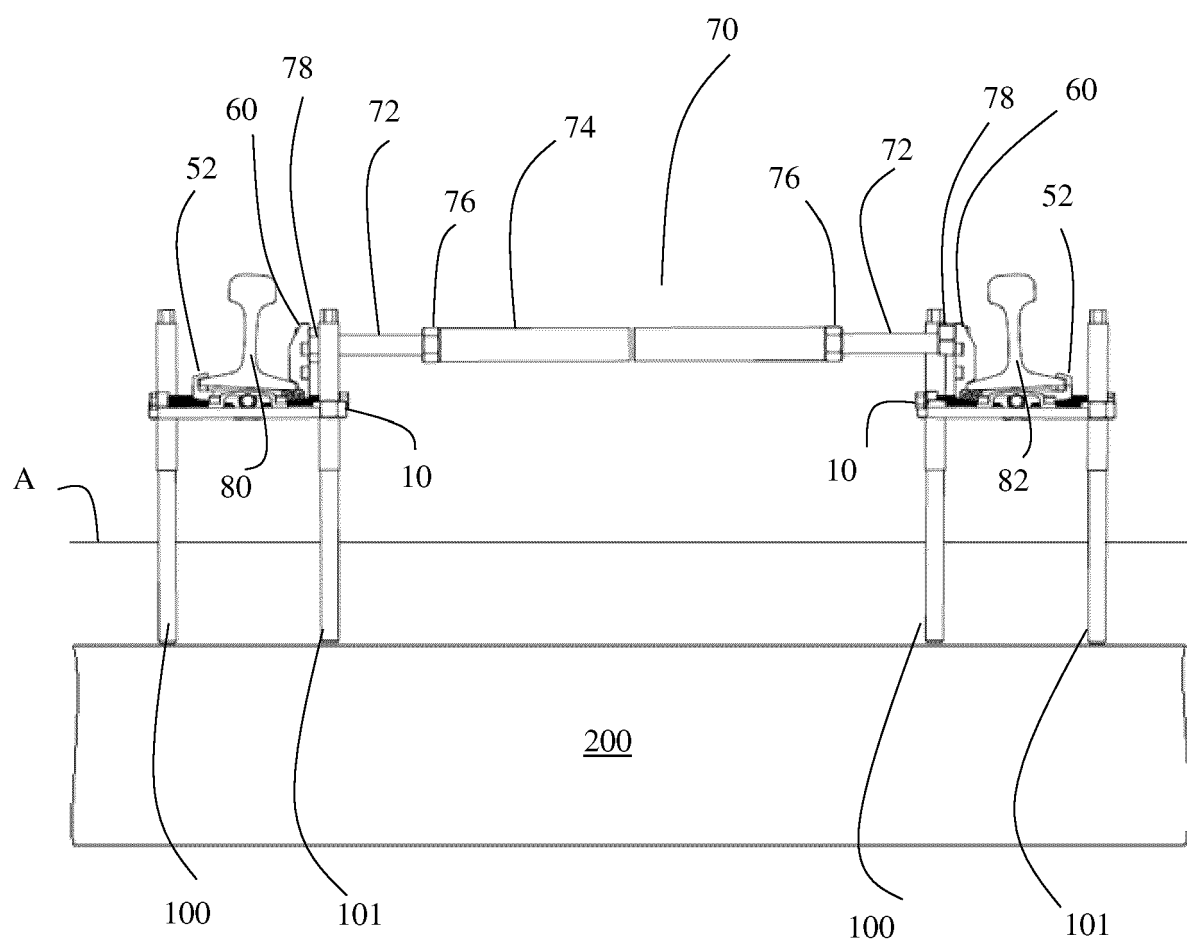


Fig 7

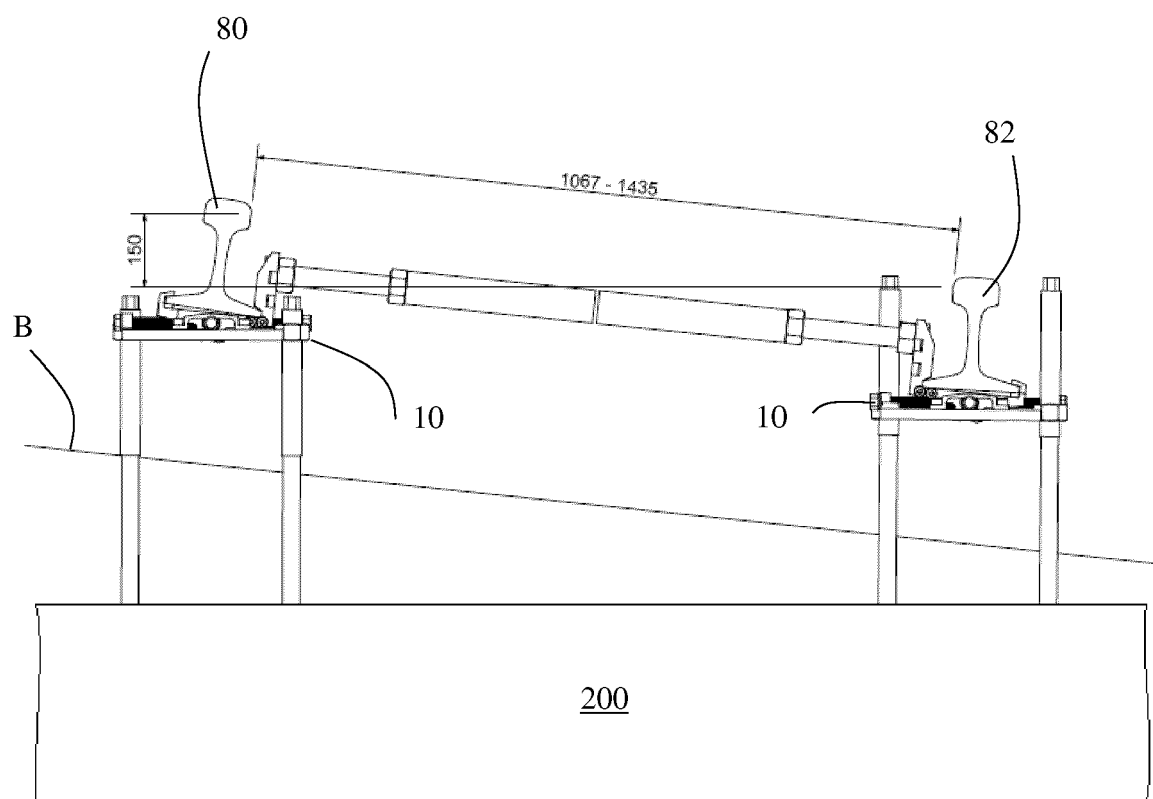


Fig 8

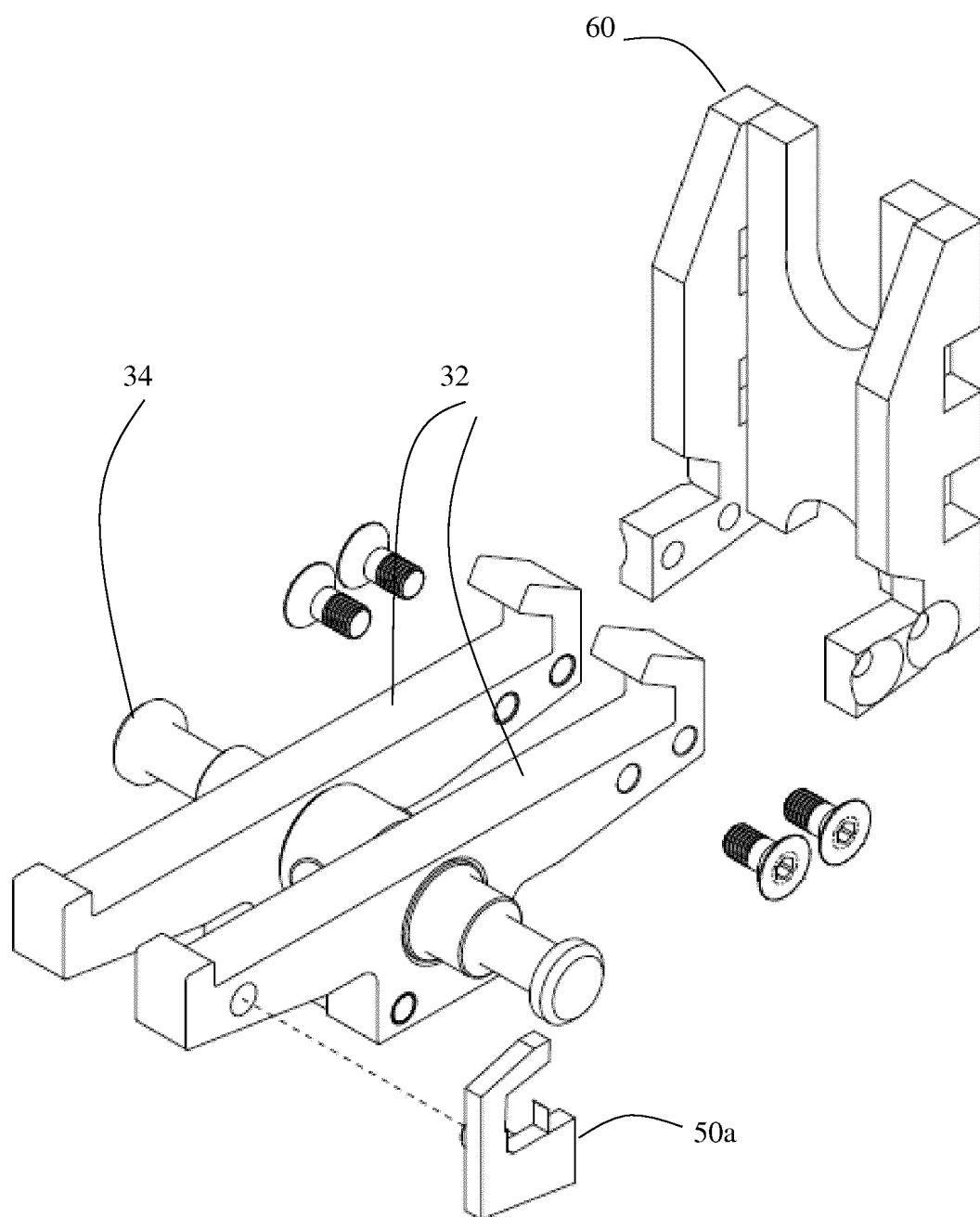


Fig 9

REFERENCES CITED IN THE DESCRIPTION

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