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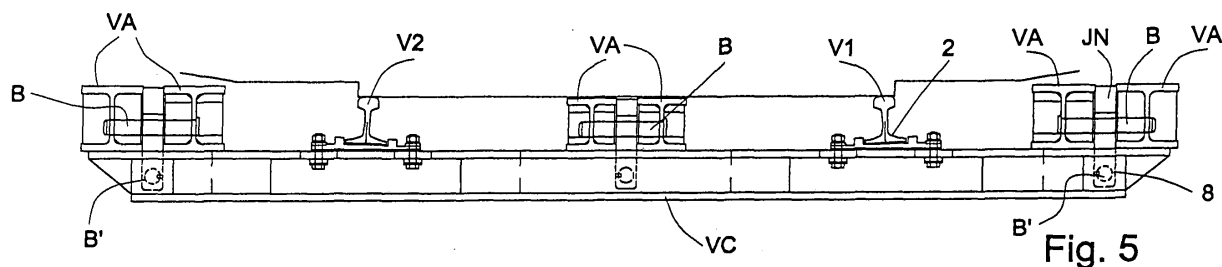
(54) **A high safety, modular system for provisionally supporting working railway tracks during under-track works.**

(57) A high safety, modular system for provisionally supporting working railway tracks during under-track works.

In order to carry out infrastructures such as underpasses under the railway tracks a number of rails are arranged in a parallel arrangement with respect to the railway track, said rails being inferiorly connected to each other by a transversal rail section, this system being nevertheless hard to implement and lacking in solidity.

The modular system of the invention comprises a

plurality of loadbearing crossbeams being arranged in an inferior and transversal arrangement with respect to the railway track rails, said loadbearing crossbeams being parallel to the crossties, and a number of pairs of longitudinal staying beams being arranged in a parallel arrangement with respect to the railway track rails in the middle area between them and at both their sides, said staying beams resting on the plurality of loadbearing crossbeams, the loadbearing crossbeams and the staying beams being joined together by means of lowerable steel blocks.



Description

OBJECT OF THE INVENTION

[0001] The present invention has as its object a high safety, modular system for provisionally supporting working railway tracks during under-track works.

FIELD OF THE INVENTION

[0002] Said modular system provides a given railway track section with added consistency and stability during the works possibly having to be carried out under it, such as an underpass, a tunnel being designed to replace a level crossing, a pedestrian crossing, a ductway passage, etc., in such a way as to allow this railway track to be equally operable for the circulation and transit of trains under the same working conditions it had before the start of the works, with no need for the trains circulating on the railway track to effect a special manoeuvre of some kind while traversing said section or to make important or very limitative speed reductions.

[0003] The present invention has been accomplished in response to the need to assure the proper stability, consistency and strength of a railway track section during the works possibly being carried out in the ground being situated under that railway track section for the purpose of replacing a level crossing or of carrying out a pedestrian crossing, ductways, new infrastructures, etc.

BACKGROUND OF THE INVENTION

[0004] Along the length of a railway track of any kind it is always necessary to carry out works of some kind in the ground spanning the railway track gauge. This is most usually necessary when setting out to build underpasses under the railway track, to replace a level crossing, to build a drain tunnel inferiorly crossing the railway track, a pedestrian crossing, ductways, etc.

[0005] As a consequence of that the train must slow down when traversing said section in order to assure the necessary safety when so doing, taking into account its own weight, the vibrations it generates when passing, etc. On some occasions it is even necessary to discontinue the active use of said section.

[0006] Different systems have been available so far for carrying out underpasses under the railway track, repairing the ballast bed, and generally carrying out jobs or operations of any kind requiring to leave the railway track rails without a supporting base.

[0007] The best known system consists in forming rail bundles being parallel to the railway track and inferiorly connected by a tie member or rail section and clamps being made of steel plate with wedges or of two loops being formed with steel rods being upperly welded to a tubular member and thus clamping the rail bundle assembly and the transverse rail. The system uses the used rail but is very hard to implement and requires a great

amount of labour as well as long intervals with no train circulation and a very restrictive train speed limitation lasting several weeks, all this resulting in a very cost-intensive system.

[0008] There are other systems using beams having a given length and thus creating a complete discontinuity between the different modules and thus forcing to create intermediary supports being difficult to execute and maintain, the reinforcements for each rail of the railway track being also independent, the assembly therefore losing rigidity and hence requiring a bigger number of supporting and joining parts.

[0009] There are other systems doing without both the longitudinal and transversal reinforcement of the railway track, said systems merely supporting said track by means of a set of hydraulic jacks being mounted on sliding carriages having to be introduced together with the structure of the underpass in a rapid operation, the railway track being hence merely supported on an unstable assembly with unprotected work sides and in a risky situation as regards the safety of the trains.

[0010] The aforementioned drawbacks have been totally obviated by means of the system of the present invention, said system providing a higher safety for the railway thanks to the higher strength of the system elements and to the higher rigidity and consistency of their mutual assemblage, the railway track with said system being besides in a position to be used with lower limitations as to the speed of the trains both thanks to the system's higher efficiency at supporting the dynamic loads and to the shorter time being needed for installing and removing the system.

[0011] The modular system of the present invention comprises loadbearing crossbeams that have been formed with a special shape in order to fulfil their function as the members being designed to bear and transmit the loads being imposed by the railway, said crossbeams incorporating special elements being designed to establish a linkage with the longitudinally reinforcing or staying beams, said elements being lowerable in order to thus allow to install said loadbearing crossbeams by simply removing the ballast existing between the crossties of the railway track without affecting the ballast underlying said crossties, so that the function of these latter is not affected during the assembly operations, and they don't need to be replaced with others as in the case of the known systems, it being even possible to immediately replace the ballast between the track crossties and the special crossbeams of the supporting structure without the passage of the trains being affected by this operation in the installation and removal stages, and also without affecting the safety during said passage of the trains or the travelling speed along the line, said loadbearing crossbeams being fit to be used with all types of railway tracks with any track gauge and any crosstie type and even in bend sections.

[0012] This is a modular system that can hence be installed to span any track length to be reinforced in such

a way that all its elements are reusable, this eliminating the costs being related with the auxiliary works and other elements having to be wrecked or disposed of after having been used.

SUMMARY OF THE INVENTION

[0013] The high safety, modular system for provisionally supporting railway tracks during under-track works being the object of the present invention is essentially characterised in that it comprises a plurality of loadbearing crossbeams being arranged in an inferior and transversal arrangement with respect to the railway track rails, said loadbearing crossbeams being parallel to the cross-ties and arranged at their same level, and a number of pairs of longitudinal staying beams being arranged in a parallel arrangement with respect to the railway track rails in at least the middle area between them and at both their sides, said staying beams resting on the plurality of loadbearing crossbeams and being securely attached to them, said plurality of loadbearing crossbeams being provided with means for securely fastening the railway track tie plates, the plurality of loadbearing crossbeams and the number of pairs of staying beams being joined together by means of steel blocks being lowerable in order to facilitate the assembly and dismantling operations, said blocks being provided with mutually orthogonal, drilled holes being fit to receive respective bolts for the attachment of the loadbearing crossbeams and the staying beams, the assembly being made up of said plurality of loadbearing crossbeams being arranged in a transversal arrangement with respect to the railway track rails and of longitudinal staying beams making up a grid being able to support the railway track rails and transmitting the railway loads to the ground and/or some intermediary supports.

[0014] The loadbearing crossbeams supporting and fastening the railway track rails have an asymmetric double-T cross-section and are formed by two asymmetric double-T sections having a common lower flange, said loadbearing crossbeams being provided with slots extending through the upper flange for fastening the railway track rail tie plates by means of fasteners, with drilled holes extending through the web for receiving the lower bolt extending through the bearing blocks, with reinforcing members being arranged at the web in the drilled area for absorbing the stresses, and with a housing for the bearing blocks in the lowered position in order to facilitate the introduction of the loadbearing crossbeam from underneath the railway track rails.

[0015] The longitudinally staying beams consist in sections being arranged by pairs and in a parallel arrangement with respect to the track rails, said staying beams hence consisting in three pairs of sections being situated in the middle area and at both sides of the railway track rails, said sections being provided with drilled holes extending through the web in each pair of sections for receiving the bolts transmitting the stresses between the

bearing blocks and the beams.

[0016] The bearing blocks are parallelepipedic members having a square base and being provided with two mutually orthogonal drilled holes for receiving the connecting bolts, and with an upper tab for properly aligning the flanges of the staying beams.

[0017] These and other features will be best made apparent by the following detailed description whose understanding will be made easier by the accompanying three sheets of explanatory drawings showing a practical embodiment being cited only by way of illustrative example not limiting the scope of the present invention.

DESCRIPTION OF THE DRAWINGS

[0018]

Fig. 1 is a plan-view illustrating the modular system of the invention once having been joined, assembled and placed at the railway track. Fig. 1A is a larger scale detail view of Fig. 1.

Fig. 2 is a side elevational view of Fig. 1.

Fig. 3 is a plan-view illustrating the loadbearing crossbeam.

Fig. 4 is a transversal view of the railway track illustrating the loadbearing crossbeam in an elevational view with the block sets in a lowered position allowing to introduce said loadbearing crossbeam from underneath the railway track, the former having been positioned under the latter.

Fig. 5 is a view being similar to Fig. 4 and illustrating the loadbearing crossbeam being shown in an elevational view and incorporating three pairs of staying beams being bolt-joined by means of the vertically positioned block sets, said loadbearing crossbeam having been positioned under the railway track and having the bolts in their respective places. Fig. 5A is a detail view of the bearing blocks.

Fig. 6 is a view being similar to Fig. 5 and illustrating the loadbearing crossbeam being shown in an elevational view, the three pairs of staying beams being shown here having been secured and fastened with the block sets in an upright position, said loadbearing crossbeam having been positioned under the railway track, the bolts having been placed and tightened.

Fig. 7 is a perspective and fragmentary view illustrating the modular system of the invention in its assembled state and showing a loadbearing crossbeam and three pairs of fragmentary staying beams with the block sets and the tightening screws.

Figs. 8 and 9 are each a fragmentary view with a different perspective angle illustrating the mutual relationship in the arrangement of the staying beams, the loadbearing crossbeams, the block sets and the bolts.

DETAILED DESCRIPTION OF A PREFERRED EM-

BODIMENT OF THE INVENTION

[0019] According to the drawings the high safety, modular system for provisionally supporting working railway tracks during under-track works being the object of the present invention has been devised in order to impart an added strength, solidity, consistency and stability to a railway track section having been singled out for carrying out works in the ground being situated underneath said railway track section.

[0020] As can be appreciated in Figs. 1 and 2 the modular system of the invention comprises an assembly of loadbearing crossbeams -VC- being arranged in a transversal and perpendicular arrangement with respect to the railway track rails -V1- and -V2-, said loadbearing crossbeams having been joined with pairs of staying beams -VA- being parallel to the track rails -V1- and -V2-. The joining of the transversal loadbearing crossbeams -VC- with the longitudinal staying beams -VA- is carried out by means of a bearing block set -JN- (see the figures).

[0021] With respect to the train rails -V1- and -V2- the loadbearing crossbeams -VC- are positioned as if they were crossties -T- of the original track section, that is to say that they are perpendicular to the track rails -V1- and -V2-, are situated under them, and are parallel to the crossties -T- and occupy the space existing between the very crossties -T- but with no contact with them, as can be appreciated in Figs. 1 and 2.

[0022] The loadbearing crossbeams -VC- consist in composite sections with various types of loadbearing cross-section and with auxiliary arrangements such as oblong holes -1- for fastening the railway track rails -V1- and -V2- by means of the corresponding tie plates -2-, and openings -3- for fixing the steel blocks -JN- and attaching the pairs of longitudinal staying beams -VA-, -VA- to the loadbearing crossbeams.

[0023] The loadbearing crossbeams -VC- have an asymmetric double-T under-track cross-section whose central and end sections are formed by two asymmetric double-T shapes having a common lower flange, and they have the drilled holes -1- in the upper flange for fastening the tie plates -2- for the track rails -V1-/-V2- with screws -4-, said drilled holes being oblong holes for allowing to carry out the positioning in the bent track sections and to thus compensate the curvature of the bend, said loadbearing crossbeams also having drilled holes -5- being provided in the web for the introduction of the lower bolt -B'- into the bearing blocks -JN-, and reinforcing members -6- being provided at the web in the area of the drilled hole -5- in order to absorb the shearing stresses, and intermediary sections -7- for the transmission of the stresses through an overlapping arrangement of the webs, said loadbearing crossbeams also having a housing -8- for the bearing block -JN- in the lowered position in order to facilitate the introduction of the loadbearing crossbeams -VC- from underneath the track rails -V1- and -V2-. Said loadbearing crossbeams additionally incorporate a dual electric insulation (not shown) in order

to prevent a communication between both track rails.

[0024] As for the bearing blocks -JN- (see Fig. 5A), they consist in a steel member having the shape of a parallelepiped with a square base and being provided with two circular drilled holes -9a- and -9b- being perpendicular to each other, said drilled holes being fit to receive the lower and upper connecting bolts -B'- and -B-, said blocks also having an upper tab -10- for the proper alignment of the flanges of the pair of staying beams -VA-, -VA-, and a drilled hole for fastening the lower bolt by means of a screw.

[0025] The longitudinal staying beams -VA-, -VA- being arranged in pairs in their turn consist in respective reinforced, industrial sections being arranged in a parallel arrangement with respect to the track rails -V1- and -V2- and in three pairs, i.e. a central one on the track axis, and two lateral pairs at the sides of the track rails in the outside area, said staying beams -VA- having modular lengths being multiples of a fixed number so as to thus allow to form stiffening members of different lengths with the smallest number of parts being together and arranged in an alternated arrangement between beams so as to thus maintain the biggest loadbearing cross-section for the assembly, a cross-section being reinforced by strips -11- at the flanges in the area of each beam which coincides with the joint with that forming the pair with it, drilled holes in the web of the beams for receiving the bolts -B- and -B'- being provided for transmitting the stresses between the bearing blocks -JN- and the loadbearing crossbeams -VC-, bearing strips on the inner side of the flanges for shortening the working span of the load transmitting bolts, brackets for reinforcing the load transmission area, and clamping screws -12- between the flanges for joining each pair of staying beams thereby counteracting the torsional stresses.

[0026] These block sets -JN- (Fig. 5A) are fit to join the loadbearing crossbeams -VC- and the pairs of staying beams -VA- together, and they are lowerable as can be seen in Fig. 4 so as to thus allow to pass and place the loadbearing crossbeams -VC- from underneath the train rails -V1- and -V2- and between the crossties -T- (Figs. 1 and 2).

[0027] As has been said, the system assembly and placement process starts with the introduction and placement of the loadbearing crossbeams -VC- from underneath the track rails -V1- and -V2- and in a perpendicular arrangement with respect to these latter and in a parallel arrangement with respect to each other and to the crossties and between the spaces of the crossties -T-, for such a purpose previously removing the ballast existing between the crossties -T- (Figs. 1 and 2), and with the block sets -JN- previously fit into the housings -8- being provided in the loadbearing crossbeams -VC- and in a lowered position thus allowing to pass said loadbearing crossbeams from underneath the track rails -V1- and -V2- (Fig. 4). Once having been placed the loadbearing crossbeams -VC- are securely attached to the track rails -V1- and -V2- by means of the tie plates -2-.

[0028] Once having placed the loadbearing crossbeams -VC- and having fastened them to the track rails -V1- and -V2- one proceeds to position the pairs of staying beams -VA-, -VA-. Initially the staying beams -VA- are placed in three pairs in a stable manner and without fastening them on the loadbearing crossbeams -VC-. One of said pairs is placed on the central axis of the railway track and the other two lateral pairs are situated in the outer region adjoining the track rails -V1- and -V2- as can be seen in Figs. 1, 4, 5 and 6. Each of the three precited pairs is thereupon longitudinally shifted in parallel with the track rails -V1- and -V2- till finally bringing them to the position where they can be joined to the loadbearing crossbeams -VC- through the intermediary of the bearing blocks -JN- and the bolts -B- and -B'- and screws.

[0029] Once already having placed the staying beams -VA- in the position where they can be joined to the loadbearing crossbeams -VC- the block sets -JN- are placed in an upright position (Figs. 5, 6, 8 and 9) and the bolts -B- are then passed through them, said bolts also extending through the web of the staying beams -VA- (Figs. 5, 7, 8 and 9) and thus fixing the relative position between the loadbearing crossbeams -VC- and the staying beams -VA-.

[0030] Once having fixed the relative position between the loadbearing crossbeams -VC- and the staying beams -VA- with the passage of the bolts -B- one proceeds to securely fasten the staying beams -VA- to the loadbearing crossbeams -VC- by means of the respectively transversal and longitudinal clamping screws -12- and -13-, respectively, as can be appreciated in Figs. 6 and 7, thus then forming the definitive loadbearing configuration of the system of Figs. 1 and 2.

[0031] For the dismantling process the assembly process is followed in reverse order. The clamping screws -12- and the bolts -B-, -B'- between the loadbearing crossbeams -VC- and the staying beams -VA- are firstly removed. The staying beams -VA- are thereupon removed and the block sets -JN- are then lowered in order to remove the loadbearing crossbeams -VC-, and the ballast between the crossties -T- for the track rails -V1- and -V2- is finally reinstalled.

[0032] The load transmission system is especially designed so that the assembly being made up of all the elements forms a grid being able to support the track rails -V1- and -V2- and transmitting the railway loads to the ground or some intermediary supports and thus allowing to clear an empty space under the track rails -V1- and -V2- as necessary in order to carry out works for creating new infrastructures or maintaining the existing ones.

[0033] The function of the crossties -T- is not affected during the assembly operations, and they don't need to be replaced with others as in the case of other known systems, it being even possible to immediately reinstall the ballast between the track crossties -T- and the special supporting beams (the loadbearing crossbeams -VC-) without for such a purpose affecting the passage of the trains in the assembly and disassembly stages or the

traversing safety or the travelling speed along the line, the system of the invention being fit to be used with all kinds of railway tracks with any track gauge and any crosstie type and even in bend areas, all elements being easily assemblable and disassemblable as well as reusable thanks to their modular distribution to cope with any track length to be strengthened and supported, the cost for restoring the normal track conditions being hence lower. The crossties do not need to be reinstalled because they remain in position from the start.

[0034] With the system of the present invention an inertia increase is obtained in all of the loadbearing sections of the system, this allowing to clear bigger empty spaces under the track for carrying out the works being planed in order to build and maintain infrastructures as necessary, the system also allowing to obtain a more secure fastening between the elements and a better packing of the track and as such acquiring a higher rigidity and consistency, so that the joint cooperation of the elements allows to increase the load distribution thereby reducing the stress concentration as well as the strains.

[0035] The system having been shown can have the configuration and components being best suited for such functions. It is possible to use the components having been described or any other components being ideally suited to fulfil the same type of function.

[0036] The invention can within its essentiality be put into practice in other embodiments differing only in detail from the one having been described above only by way of example, said other embodiments also falling within the scope of the protection being sought. This invention can hence be carried out with the best suited means, components and accessories, and its integrating elements can be replaced with others being technically equivalent, all this falling within the scope of the appended claims.

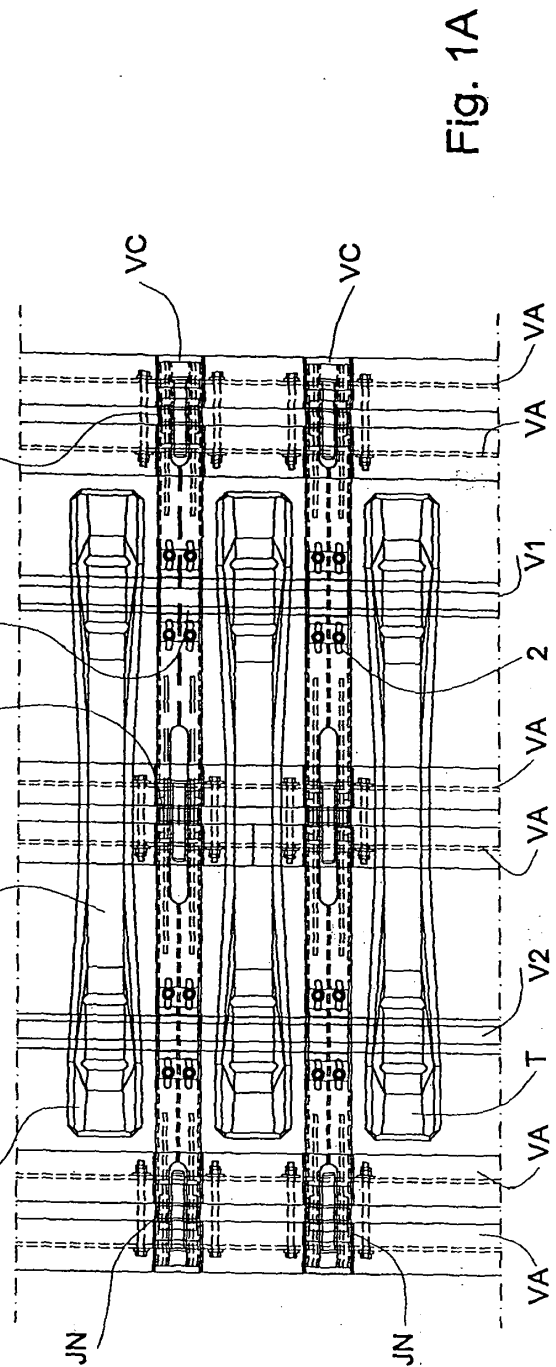
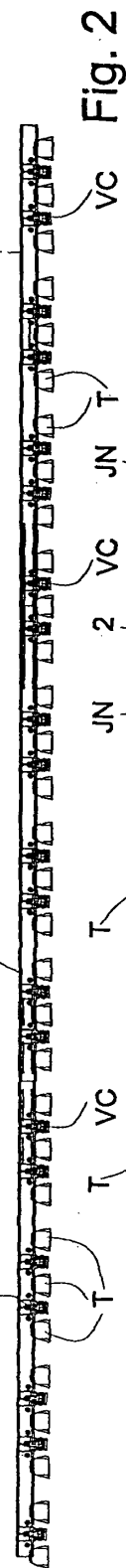
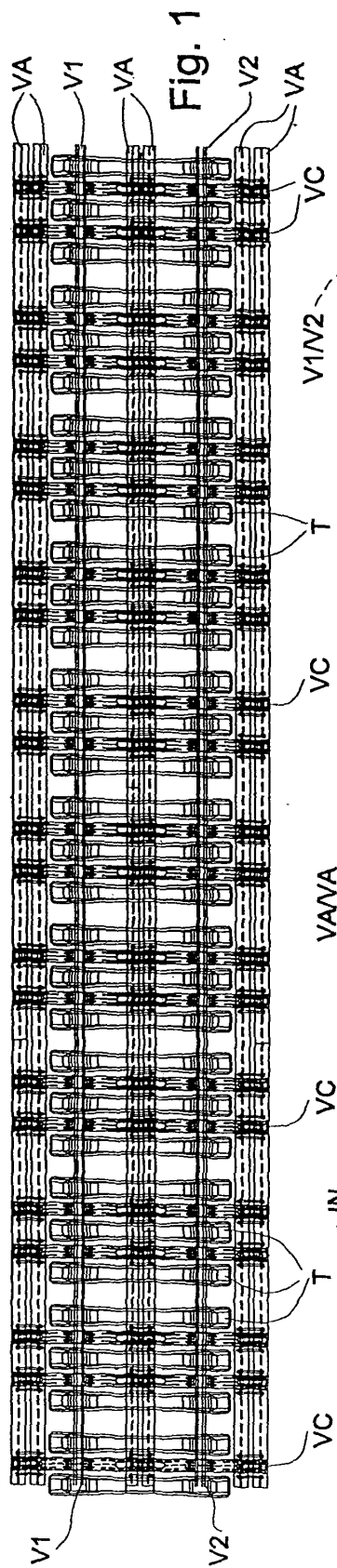
Claims

1. A high safety, modular system for provisionally supporting working railway tracks during under-track works, said modular system being of the type consisting in a number of rails (VA) being parallel to the railway track and inferiorly connected to the railway track rails (V1/V2) by a rail section or transverse loadbearing crossmember (VC), said assembly being made up of the rails and the loadbearing crossmember being solidly held together by means of clamps; said modular system being **characterised in that** it comprises a plurality of loadbearing crossbeams (VC) being arranged in an inferior and transversal arrangement with respect to the railway track rails (V1, V2), said loadbearing crossbeams being parallel to the crossties (T) and arranged at their same level, and a number of pairs of longitudinal staying beams (VA, VA) being arranged in a parallel arrangement with respect to the railway track rails (V1, V2)

in at least the middle area between them and at both their sides, said staying beams resting on the plurality of loadbearing crossbeams (VC) and being securely attached to them, said plurality of loadbearing crossbeams (VC) being provided with means (1, 4) for securely fastening the tie plates (2) for the railway track rails (V1, V2), the plurality of loadbearing crossbeams (VC) and the number of pairs of staying beams (VA, VA) being joined together by means of steel blocks (JN) being lowerable in order to facilitate the assembly and dismantling operations, said blocks being provided with mutually orthogonal, drilled holes (9a, 9b) being fit to receive respective bolts (B', B) for the attachment of the loadbearing crossbeams (VC) and the staying beams (VA), the assembly being made up of said plurality of loadbearing crossbeams (VC) being arranged in a transversal arrangement with respect to the railway track rails (V1, V2) and of longitudinal staying beams (VA, VA) making up a grid being able to support the railway track rails (V1, V2) and transmitting the railway loads to the ground and/or some intermediary supports.

epipedic members having a square base and being provided with two mutually orthogonal drilled holes (9a, 9b) for receiving the connecting bolts (B, B'), and with an upper tab (10) for properly aligning the flanges of the staying beams (VA).

2. A modular system as per claim 1, **characterised in that** the loadbearing crossbeams (VC) supporting and fastening the railway track rails (V1, V2) have an asymmetric double-T cross-section and are formed by two asymmetric double-T sections having a common lower flange, said loadbearing crossbeams being provided with slots (1) extending through the upper flange for fastening the tie plates (2) for the railway track rails (V1, V2) by means of fasteners (4), with drilled holes (5) extending through the web for receiving the lower bolt (B') extending through the bearing blocks (JN), with reinforcing members (6) being arranged at the web in the area having the drilled holes (5) for absorbing the stresses, and with a housing (8) for the bearing blocks (JN) in the lowered position in order to facilitate the introduction of the loadbearing crossbeam (VC) from underneath the railway track rails (V1, V2).
3. A modular system as per claims 1 and 2, **characterised in that** the longitudinally staying beams (VA, VA) consist in sections being arranged by pairs and in a parallel arrangement with respect to the track rails (V1, V2), said staying beams hence consisting in three pairs of sections being situated in the middle area and at both sides of the railway track rails (V1, V2), said sections being provided with drilled holes extending through the web in each pair of sections for receiving the bolts (B) transmitting the stresses between the bearing blocks (JN) and the beams (VC/VA).
4. A modular system as per claims 1, 2 and 3, **characterised in that** the bearing blocks (JN) are parallel-



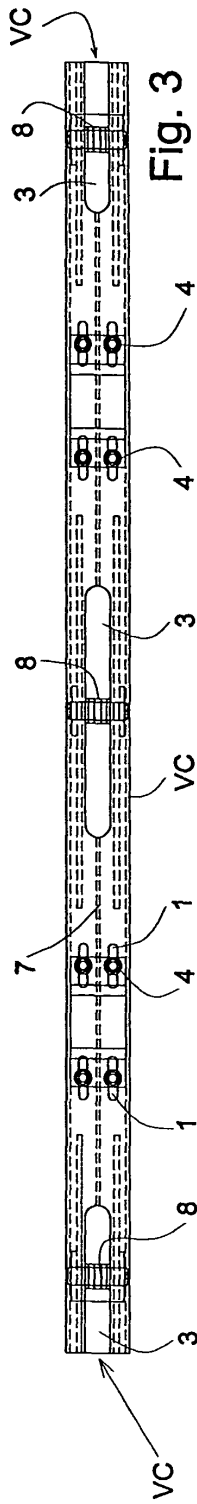


Fig. 3

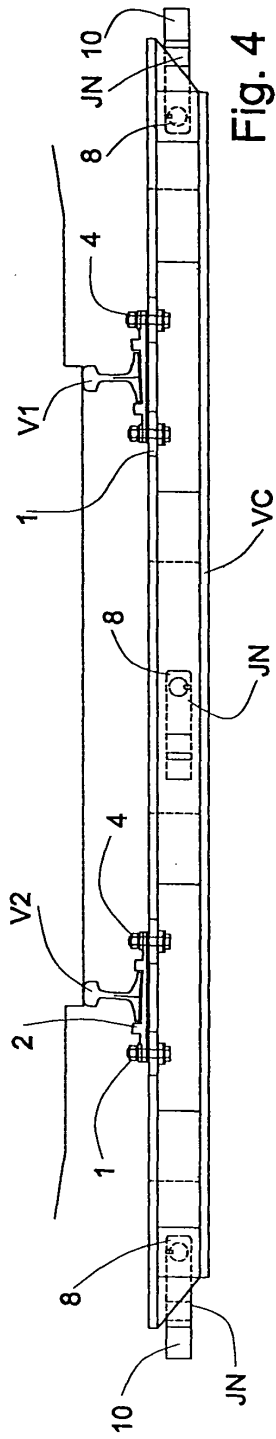


Fig. 4

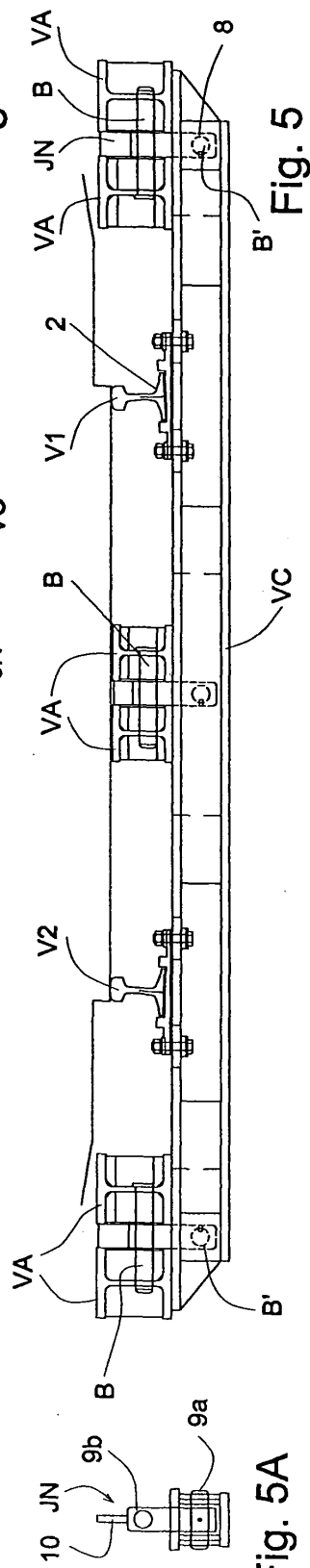


Fig. 5

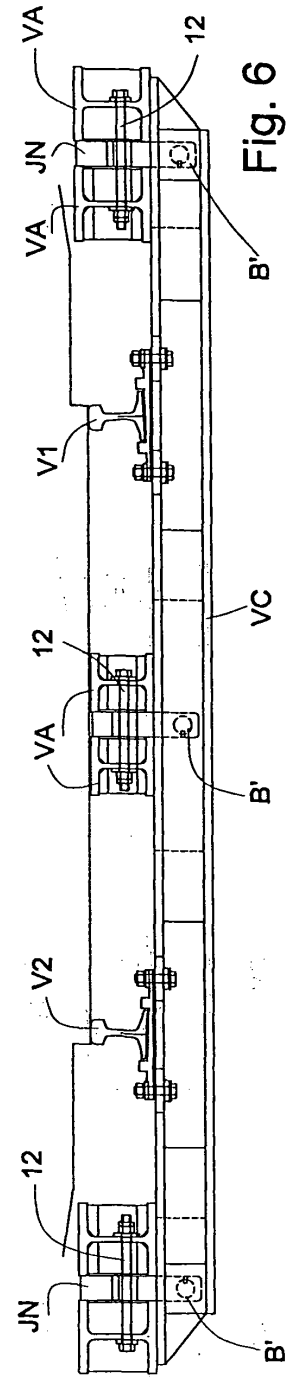


Fig. 6

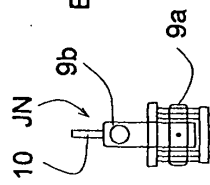


Fig. 5A

