# VIBRATION REDUCTION SECTION PREFABRICATED BALLASTLESS TRACK STRUCTURE HAVING LONGITUDINAL CONNECTING STRUCTURE, AND ASSEMBLY METHOD

## CROSS-REFERENCE TO RELATED APPLICATION

[ 0001] This application is based upon and claims priority of Chinese Patent Application No. 201910884758.9, filed on September 19, 2019, the contents of which are herein incorporated by reference in their entirety.

## TECHNICAL FIELD

[ 0002] The present invention belongs to the technical field of a ballastless track, and more specifically to an assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section, and an assembly method thereof.

## BACKGROUND

[ 0003] The ballastless track refers to a track structure that adopts concrete, asphalt mixture and other integral foundations instead of the loose gravel track bed. Compared with the ballasted track, the ballastless track avoids ballast splashing, has good smoothness and good stability, lengthens service life, improves durability and reduces maintenance work. Therefore, the ballastless track is increasingly being used. The construction of the slab-type ballastless track mainly involves the structures such as a track slab, a filling layer of asphalt mortar or self-compacting concrete, a base or a supporting layer, etc. Among these structures, the base or the supporting layer adopts concrete structure, and the filling layer of asphalt mortar or self-compacting concrete laid on the base or the supporting layer is a structural layer for adjusting the structure of the ballastless track, and supporting and transmitting force.

[ 0004] Currently, the main types of the slab-type ballastless track in China include CRTS I slab-type, CRTS II slab-type and CRTS III slab-type ballastless track. The CRTS

I slab-type ballastless track is a unit slab. There are no longitudinal connection and transverse stopper between each two slabs. The unit slabs are laid on the cast-in-place reinforced concrete base with bosses, which limit the unit slabs. In the unit slab-type ballastless track structure, each track slab is independent after being laid and installed. The disadvantages of the unit slab-type ballastless track structure lie in that after the train runs for a period of time, peeling would occur between the track slabs and the filling layer of asphalt mortar, and the longitudinal ends of the track slabs are prone to warping, which would undoubtedly adversely affect the stability and comfort when the train is running, as well as the service life of the track structure. Although there are corresponding solutions to improve the connection manner, in general, it is still difficult to address the problems, such as the stress and deformation between the slabs, and the complicated preparation process. Furthermore, it is impossible to overcome the problems of difficult assembly and maintenance of the entire ballastless track caused by too many special-shaped slabs in the current ballastless track.

[ 0005] The CRTS II slab-type ballastless track slab adopts a longitudinal connecting manner. The ballastless track slabs are longitudinally connected with each other, by longitudinal connecting structures formed through longitudinally fine rolled twisted steel bars and tensioning locks, and transverse stoppers are provided between slabs. Therefore, the CRTS II slab-type ballastless track can overcome some of defects of the CRTS I slab-type ballastless track. For example, a tensioning lock for longitudinal connection of ballastless track slabs is disclosed in the patent document 201695285U, which realizes the longitudinal connection by connecting and locking the steel bars longitudinally protruded from the track slabs. However, this type of connection is basically equivalent to the connection manner of longitudinal prestressed steel bars, the connecting structure of which is complicated and the construction of which is more cumbersome. Furthermore, in the case that the rigid connection is under the condition of excessive temperature stress, the track slabs may be arched up, which would adversely affect the service life of the track structure, as well as the stability and comfort when the train is running.

[ 0006] A steel bar mechanical connecting device for an assembled concrete building structure is disclosed in the patent document CN204370701U, in which the ends of the steel bars to be connected are jumped-up, and then are pierced to form sleeves, so as to

realize the connection between the steel bars by the sleeves and connecting bolts. However, this type of connecting manner is complicated in structure and cumbersome to construct. The reserved gap between the clamping ring provided on the steel bar sleeve and the steel bar to be connected would also cause the assembled sleeper slabs or track slabs adjacent to each other to be not in the same plane. Moreover, the accuracy during construction is difficult to control.

## SUMMARY

[ 0007] In view of at least one of the above defects or improvement requirements in the related art, the present application provides an assembled sleeper slab-type ballastless track structure equipped with longitudinal connecting structures for vibration damping section, and an assembly method thereof. A plurality of prefabricated short sleeper slabs are arranged at intervals and assembled and connected with each other through longitudinal connecting structures and connecting filling portions to form a long sleeper slab. Limiting steel bars and limiting sleeves are arranged in each of the intervals. One of the limiting steel bar and the limiting sleeve is fixed to the connecting filling portion, and the other of the limiting steel bar and the limiting sleeve is fixed to a foundation under a track, to form a sliding structure for the limiting steel bar and the limiting sleeve and facilitate the up and down movement of the connecting filling portion, which buffers the vibration of the vehicle while achieving longitudinal/transverse limitation. The connecting filling portions achieve the limitation while realizing the connection, which reduces the number of process and facilitates the construction. Furthermore, with the longitudinal connecting structures in the present application, the accuracy during on-site laying construction can be improved, disassembly and installation are convenient, the construction difficulty is reduced, the speed of on-site construction is increased, the structure is simple, and positioning of the sleeper slabs or the track slabs is convenient.

[ 0008] In order to achieve the above objective, according to the first aspect of the present application, an assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section is provided. The assembled ballastless track structure is an assembled sleeper slab-type or track slab-type ballastless

track structure. The assembled ballastless track structure includes prefabricated sleeper slabs or prefabricated track slabs, a cast-in-place layer, a vibration damping layer, a foundation under a track, connecting filling portions, and longitudinal connecting structures for the prefabricated sleeper slabs or the prefabricated track slabs.

[ 0009] A plurality of prefabricated sleeper slabs or prefabricated track slabs are longitudinally arranged at intervals. The prefabricated sleeper slabs or the prefabricated track slabs are assembled and connected, at two transverse ends, to each other in the intervals through the longitudinal connecting structures. In some or all of the ~~internals~~intervals, the connecting filling portions are formed by reinforced concrete structures, such that the connecting filling portions and the prefabricated sleeper slabs or the prefabricated track slabs form an assembled integrated structure, and the prefabricated sleeper slabs or the prefabricated track slabs form a united stressed structure in the shape of a long slab unit.

[ 0010] The longitudinal connecting structures include longitudinal steel bars and split connecting sleeves. The longitudinal steel bars are pre-embedded in two prefabricated sleeper slabs or prefabricated track slabs adjacent to each other and protrude from end surfaces of the two prefabricated sleeper slabs or prefabricated track slabs adjacent to each other. One of the longitudinal steel bars is spaced from another longitudinal steel bar matched with said one of the longitudinal steel bars, and two longitudinal steel bars are longitudinally connected with each other through the split connecting sleeve.

[ 0011] Each of the split connecting sleeves includes two semicircular sleeves and two locking bushes. An inner periphery of each of the two semicircular sleeves is provided with threads. The two semicircular sleeves are engaged and matched with each other at coupling ends of the two longitudinal steel bars. One of the two locking bushes is arranged around one of two ends of an outer periphery of two engaged semicircular sleeves and another one of the two locking bushes is arranged around another one of the two ends of the outer periphery of the two engaged semicircular sleeves to lock the two engaged semicircular sleeves.

[ 0012] Furthermore, the connecting filling portions are provided at two transverse ends of each of at least some of the intervals, and a protruding limiting steel bar is

provided on an upper surface of the foundation under the track in each of at least some of the intervals. In the intervals each provided with both the connecting filling portion and limiting member, a limiting sleeve is embedded in the connecting filling portion and is slidably arranged around the limiting steel bar. The longitudinal connecting structures, the limiting steel bar and the limiting sleeve are wrapped and covered in the same connecting filling portion and formed integrally with the connecting filling portion to simultaneously achieve limitation and connection, such that the plurality of prefabricated sleeper slabs or prefabricated track slabs are assembled to form a track unit with a predefined length and form a united stressed structure.

[ 0013] Alternatively, the connecting filling portions are provided at two transverse ends of each of at least some of the intervals, and a protruding limiting sleeve is provided on an upper surface of the foundation under the track in each of at least some of the intervals. In the intervals each provided with both the connecting filling portion and limiting member, a limiting steel bar is embedded in the connecting filling portion, an outer wall surface of the limiting sleeve is not in contact with the connecting filling portion, and the limiting steel bar is slidably provided in the limiting sleeve. The longitudinal connecting structures, the limiting steel bar and the limiting sleeve are wrapped and covered in the same connecting filling portion and formed integrally with the connecting filling portion to simultaneously achieve limitation and connection, such that the plurality of prefabricated sleeper slabs or prefabricated track slabs are assembled to form a track unit with a predefined length and form a united stressed structure.

[ 0014] Furthermore, the prefabricated sleeper slabs or the prefabricated track slabs include a plurality of pairs of fastening rail supports, preferably 2-10 pairs of fastening rail supports, more preferably 4-6 pairs of fastening rail supports.

[ 0015] Furthermore, each of two longitudinal ends of each of the prefabricated sleeper slabs or the prefabricated track slabs is provided with a notch, and a cover plate is placed on the notch to form a smooth evacuation passage.

[ 0016] Furthermore, the foundation under the track is equipped with a drain along its longitudinal direction.

[ 0017] Furthermore, each of two transverse sides of each of the prefabricated sleeper slabs or the prefabricated track slabs is provided with a drain.

[ 0018] Furthermore, first limiting structures are arranged on both sides of the long slab unit, or second limiting structures are arranged in the long slab unit.

[ 0019] Furthermore, there are slab gaps between a plurality of track units adjacent to each other, and third limiting structures are arranged in some or all of the slab gaps.

[ 0020] As the second aspect of the present application, an assembly method for the assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section described above is provided. The assembly method includes the following steps.

[ 0021] In Step S1, the prefabricated sleeper slabs or the prefabricated track slabs manufactured in a factory are transported to construction site, a predefined number of the prefabricated sleeper slabs or the prefabricated track slabs are longitudinally arranged along the track, and then the prefabricated sleeper slabs or the prefabricated track slabs are initially adjusted and positioned.

[ 0022] In Step S2, the longitudinal steel bars pre-embedded in the prefabricated sleeper slabs or the prefabricated track slabs are connected with each other through semicircular sleeves and locking bushes of a plurality of split connecting sleeves, and then the prefabricated sleeper slabs or the prefabricated track slabs are finely adjusted and positioned.

[ 0023] In Step S3, a plurality of limiting steel bars are provided on the foundation under the track in each of some or all of the intervals, and a limiting sleeve is arranged around each of the limiting steel bars. Reinforced concrete is on-site poured at each of two transverse ends of each of the intervals provided with both the longitudinal connecting structures and the limiting members, to wrap and cover the longitudinal connecting structures, the limiting steel bars and the limiting sleeves. A connecting filling portion is formed after the reinforced concrete is cured, wherein the longitudinal connecting structures, the limiting steel bars, the limiting sleeves and the connecting filling portion are integrally formed to simultaneously achieve limitation and connection.

Reinforced concrete is on-site poured at each of two transverse ends of each of some or all of the intervals in which no limiting steel bars are provided, to wrap and cover the longitudinal connecting structures. Integration and transverse/longitudinal limitation are simultaneously achieved and vertical elastic deformation is allowed by on-site single pouring, such that a plurality of prefabricated sleeper slabs or prefabricated track slabs are assembled to form a track unit with a predefined length and form a united stressed structure.

[ 0024] Alternatively, in Step S3, a plurality of limiting sleeves are provided on the foundation under the track in each of some or all of the intervals, a limiting steel bar is arranged inside each of the limiting sleeves, and a protective member is arranged around each of the limiting sleeves. Reinforced concrete is on-site poured at each of two transverse ends of each of the intervals provided with both the longitudinal connecting structures and the limiting members, to wrap and cover the longitudinal connecting structures, the limiting steel bars and the limiting sleeves. A connecting filling portion is formed after the reinforced concrete is cured, wherein the longitudinal connecting structures, the limiting steel bars, the limiting sleeves and the connecting filling portion are integrally formed to simultaneously achieve limitation and connection. Reinforced concrete is on-site poured at each of two transverse ends of each of some or all of the intervals in which no limiting steel bars are provided, to wrap and cover the longitudinal connecting structures. Integration and transverse/longitudinal limitation are simultaneously achieved and vertical elastic deformation is allowed by on-site single pouring, such that a plurality of prefabricated sleeper slabs or prefabricated track slabs are assembled to form a track unit with a predefined length and form a united stressed structure.

[ 0025] As the third aspect of the present application, an assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section is provided. The assembled ballastless track structure is an assembled sleeper slab-type ballastless track structure, and includes:

[ 0026] a plurality of prefabricated sleeper slabs longitudinally arranged at intervals, an interval being formed between two prefabricated sleeper slabs adjacent to each other;

[ 0027] longitudinal connecting structures, the longitudinal connecting structures including longitudinal steel bars pre-embedded in the prefabricated sleeper slabs and split connecting sleeves arranged in the intervals; each of the longitudinal steel bars in the two prefabricated sleeper slabs adjacent to each other protruding from an end surface of corresponding prefabricated sleeper slab, one of the longitudinal steel bars in one of the prefabricated sleeper slabs being longitudinally connecting with another corresponding longitudinal steel bar in another prefabricated sleeper slab adjacent to the one of the prefabricated sleeper slabs through one of the split connecting sleeves; and

[ 0028] connecting filling portions formed by reinforced concrete structures, each of the connecting filling portions being at least filled in each of some of the intervals to connect the two prefabricated sleeper slabs adjacent to each other.

[ 0029] Alternatively, the assembled ballastless track structure is an assembled track slab-type ballastless track structure, and includes:

[ 0030] a plurality of prefabricated track slabs longitudinally arranged at intervals, an interval being formed between two prefabricated track slabs adjacent to each other;

[ 0031] longitudinal connecting structures, the longitudinal connecting structures including longitudinal steel bars pre-embedded in the prefabricated track slabs and split connecting sleeves arranged in the intervals; each of the longitudinal steel bars in the two prefabricated track slabs adjacent to each other protruding from an end surface of corresponding prefabricated track slab, one of the longitudinal steel bars in one of the prefabricated track slabs being longitudinally connecting with another corresponding longitudinal steel bar in another prefabricated track slab adjacent to the one of the prefabricated track slabs through one of the split connecting sleeves; and

[ 0032] connecting filling portions formed by reinforced concrete structures, each of the connecting filling portions being as least filled in each of some of the intervals to connect the two prefabricated track slabs adjacent to each other.

[ 0033] Furthermore, each of the split connecting sleeves includes two locking bushes, and two semicircular sleeves, and an inner periphery of each of the two semicircular sleeves is provided with threads.

[ 0034] The two semicircular sleeves are engaged and matched with each other at coupling ends of the two longitudinal steel bars.

[ 0035] One of the two locking bushes is arranged around one of two ends of an outer periphery of two engaged semicircular sleeves and another one of the two locking bushes is arranged around another one of the two ends of the outer periphery of the two engaged semicircular sleeves to lock the two engaged semicircular sleeves.

[ 0036] As the fourth aspect of the present application, an assembly method for the assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section described above is provided. The assembled ballastless track structure is an assembled sleeper slab-type ballastless track structure, and the assembly method includes the following steps.

[ 0037] A predefined number of the prefabricated sleeper slabs are longitudinally arranged along the track, and then the prefabricated sleeper slabs are initially adjusted and positioned.

[ 0038] One of the longitudinal steel bars in one of the prefabricated sleeper slabs is longitudinally connected with another corresponding longitudinal steel bar in another prefabricated sleeper slab adjacent to the one of the prefabricated sleeper slabs through one of the split connecting sleeves.

[ 0039] Each of the connecting filling portions is filled in each of at least some of the intervals.

[ 0040] Alternatively, the assembled ballastless track structure is a track slab-type ballastless track structure, and the assembly method includes the following steps.

[ 0041] A predefined number of the prefabricated track slabs are longitudinally arranged along the track, and then the prefabricated track slabs are initially adjusted and positioned.

[ 0042] One of the longitudinal steel bars in one of the prefabricated track slabs is longitudinally connected with another corresponding longitudinal steel bar in another

prefabricated track slab adjacent to the one of the prefabricated track slabs through one of the split connecting sleeves.

[ 0043] Each of the connecting filling portions is filled in each of at least some of the intervals.

[ 0044] The above further improved technical features may be combined with each other as long as not causing conflicts with each other.

[ 0045] In general, the above technical solutions conceived by the present application have the following beneficial effects compared with the related art.

[ 0046] (1) In the assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section in the present application, the connecting structure is simple, and the assembled ballastless track structure only includes split connecting sleeves and exposed steel bars. The sleeper slabs or the track slabs adjacent to each other are arranged in the same horizontal plane, and connected with each other by the exposed steel bars adjacent to each other. Therefore, the longitudinal and transverse positioning of the track arrangement structure as well as the prefabrication of the sleeper slabs or the track slabs through a formwork can be completed.

[ 0047] (2) In the assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section in the present application, the manufacturing method thereof is simple. The sleeper slabs or the track slabs adjacent to each other are pre-connected by split connecting sleeves, which improves the assembly accuracy, reduces the production cost, and meets the requirements for fast and efficient production of the prefabricated slabs.

[ 0048] (3) In the assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section in the present application, on-site construction only needs to lay the prefabricated sleeper slabs or the track slabs in place, install the split connecting sleeves, and pour the filling material at one time to ensure that the sleeper slabs or the track slabs are arranged at the same level, and the speed of on-site construction is fast.

[ 0049] (4) In the assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section in the present application, a plurality of prefabricated sleeper slabs or prefabricated track slabs which can be assembled and connected correspondingly with each other are provided, so that the prefabricated sleeper slabs or prefabricated track slabs are arranged at intervals along the track direction on the foundation under the track. Correspondingly, the longitudinal connecting structures are provided between two prefabricated sleeper slabs or prefabricated track slabs adjacent to each other to be correspondingly and matchingly connected with each other. Concrete then is poured in the connecting region, so that the prefabricated sleeper slabs or prefabricated track slabs form an assembled integrated structure. Therefore, the effective connection of the prefabricated sleeper slabs or prefabricated track slabs is achieved and a united stressed structure in a form of a long slab unit is formed, which ensures the integrity of the connection and assembly of the prefabricated sleeper slabs or prefabricated track slabs, and improves the assembly accuracy and reliability of the ballastless track structure.

[ 0050] (5) In the assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section in the present application, a plurality of prefabricated short sleeper slabs are arranged at intervals and assembled and connected with each other through the longitudinal connecting structures and the connecting filling portions to form a long sleeper slab. The limiting steel bars and the limiting sleeves are arranged in each of the intervals. One of the limiting steel bar and the limiting sleeve is fixed to the connecting filling portion, and the other of the limiting steel bar and the limiting sleeve is fixed to a foundation under a track, so that the limiting steel bar and the limiting sleeve form a slidable structure, which facilitates the up and down movement of the connecting filling portion, and buffers the vibration of the vehicle while achieving longitudinal and transverse limitation. The connecting filling portions achieve the limitation while realizing the connection, which reduces the number of process and facilitates the construction.

[ 0051] (6) In the assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section in the present application, the longitudinal connecting structures include longitudinal steel bars and sleeves. One of the

longitudinal steel bars is pre-embedded in one of the prefabricated sleeper slabs and spaced from another corresponding longitudinal steel bar and connected with it through a sleeve. Or a sleeve is pre-embedded in the prefabricated sleeper slabs, and two ends of a longitudinal steel bar are respectively connected to the two sleeves. The flexible arrangement of the steel bars and the sleeves achieve the connection between two prefabricated sleeper slabs adjacent to each other.

[ 0052] (7) In the assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section in the present application, it is assembled through a plurality of prefabricated sleeper slabs, and it is an overall assembled structure. Once the ballastless track structure has track hazards in the later application process, the post-pouring region of the hazard position of the track structure can be destroyed to unlock the prefabricated sleeper slabs at the hazard position, so that the prefabricated sleeper slabs or the track unit at the hazard position can be replaced or adjusted, which significantly reduces the maintenance time and maintenance cost of the ballastless track.

[ 0053] (8) In the assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section in the present application, a certain length of the prefabricated sleeper slabs are provided to assemble them into a track unit. According to different regions of use, sleeper slabs with different length can be used. In addition, the prefabricated sleeper slabs are short slabs, which can improve the curvilinear adaptability of the prefabricated sleeper slabs, reduce the types and quantity of non-standard slabs and curved slabs, reduce the prefabrication cost of the sleeper slabs, improve the economy of the ballastless track structure, and facilitate the later laying and fine adjustment.

[ 0054] (9) In the assembly method for the assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section in the present application, the sleeper slabs are firstly manufactured into short slabs in the factory, and then transported to the construction site. The two short slabs adjacent to each other are connected by the longitudinal connecting structures, and then connected and fixed by the connecting filling portions, so that the short sleeper slabs can be assembled

into a long sleeper slab. Before pouring the connecting filling portions, the limiting steel bars or the limiting sleeves are fixed on the foundation under the track, and the foundation under the track is fixedly connected with the limiting sleeves or the limiting steel bars by correspondingly pouring the connecting filling portions. The limiting steel bars and the limiting sleeves are movably connected with each other, to achieve the longitudinal and transverse fixation and buffering effect. The assembly method is simple and the assembled structure is stable.

## BRIEF DESCRIPTION OF THE DRAWINGS

[ 0055] FIG. 1 is a schematic view of an assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section in embodiments of the present application;

[ 0056] FIG. 2 is an exploded view of an assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section in embodiments of the present application;

[ 0057] FIG. 3 is a transverse cross-sectional view of an assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section in embodiments of the present application;

[ 0058] FIG. 4 is a schematic view of first embodiment of limiting members;

[ 0059] FIG. 5 is a schematic view of second embodiment of limiting members;

[ 0060] FIG. 6 is a schematic view of third embodiment of limiting members;

[ 0061] FIG. 7 is a schematic view of fourth embodiment of limiting members;

[ 0062] FIG. 8 is a longitudinal cross-sectional view of a longitudinal connecting structure;

[ 0063] FIG. 9 is a top plan view of a longitudinal connecting structure; and

[ 0064] FIG. 10 is a partial schematic view of a longitudinal connecting structure.

## DETAILED DESCRIPTION

[ 0065] In order to make the purpose, technical solutions and advantages of the present application more clear and obvious, the present application will be further illustrated in detail in combination with accompanying drawings and embodiments hereinafter. It should be understood that the specific implementations described here are used only to explain the present application, rather than limit it.

[ 0066] Furthermore, the technical features involved in the various implementations of the present application described below may be combined with each other as long as not causing conflicts with each other.

[ 0067] An overall schematic view of an assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section in the preferred embodiments of the present application is shown in FIG.1 and FIG. 2. The assembled ballastless track structure is an assembled sleeper slab-type or track slab-type ballastless track structure. In FIG.1 and FIG. 2, prefabricated sleeper slabs or prefabricated track slabs longitudinally arranged at intervals along a longitudinal direction are correspondingly connected and assembled to form a ballastless track structure. In the following preferred embodiments of the present application, the prefabricated sleeper slabs 1 are preferably taken as an example for illustration. Of course, the prefabricated sleeper slabs can also be correspondingly connected and assembled through the arrangement manner in the following preferred embodiments to form a ballastless track structure.

[ 0068] In the preferred embodiments of the present application, the ballastless track structure includes prefabricated sleeper slabs 1, a cast-in-place layer 2 and a foundation under a track 3 which are successively and matchingly arranged. Furthermore, the foundation under the track 3 in the preferred embodiments is arranged along the track direction. Preferably, the foundation under the track 3 can be a concrete base or a foundation fillback layer formed by pouring cement concrete. The foundation under the

track 3 is configured to bear the prefabricated sleeper slabs 1 and steel rails 5 arranged on the sleeper slabs 1, as well as the train running on the steel rails 5. In the preferred embodiments, the width and thickness of the foundation under the track 3 are not specifically defined, which can be selected according to actual needs, and is not described in detail here. Preferably, as shown in FIG. 3, a drain 301 is correspondingly provided on the foundation under the track 3, to discharge and reduce the water accumulated in the track in time. In the prefered embodiments, the drain 301 can be further arranged along the track direction. Preferably, the drain 301 can be arranged in the middle portion of the foundation under the track 3. Of course, preferably, it can also be two drains 301 arranged side-by-side at both sides of the foundation under the track 3, or it can be one drain 301 arranged at either side of the foundation under the track 3, which can be selected according to actual needs, and is not described in detail here.

[ 0069] Furthermore, in the preferred embodiments, the cast-in layer 2 is arranged between the prefabricated sleeper slabs 1 and the foundation under the track 3. The cast-in layer 2 can be obtained by placing the prefabricated sleeper slabs 1 above the foundation under the track 3 and by pouring after corresponding connection, rough adjustment and fine adjustment, so that the prefabricated sleeper slabs 1 and the foundation under the track 3 are closely attached to each other, to subject the vertical force transmitted by the prefabricated sleeper slabs 1, and play a role in buffering and uniformly keeping the force. The arrangement of the cast-in layer 2 can fully achieve the adjustment of the prefabricated sleeper slabs 1 during the construction process, to ensure the levelness and flatness of the track at each position in the ballastless track, and guarantee the operation stability of the track. In the preferred embodiments, after the prefabricated sleeper slabs 1 are correspondingly arranged above the foundation under the track 3, the distance between each of the prefabricated sleeper slabs 1 and the foundation under the track 3 is adjusted, so that the steel rails 5 arranged on each of the prefabricated sleeper slabs 1 can be correspondingly connected with each other, and the corresponding splicing accuracy of the track is ensured. Furthermore, in the preferred embodiments, after the prefabricated sleeper slabs 1 are arranged above the foundation under the track 3, there is a certain distance therebetween, and then the prefabricated sleeper slabs 1 are roughly adjusted and finely adjusted. And then concrete with corresponding thickness is

poured into the space between the prefabricated sleeper slabs 1 and the foundation under the track 3 to form the cast-in layer 2 of the ballastless track structure.

[ 0070] Preferably, in order to improve the reliability of the connection between the cast-in layer 2 and the prefabricated sleeper slabs 1 and the reliability of the connection between the cast-in layer 2 and the foundation under the track 3, in the preferred embodiments, a roughening process is performed on the lower surface of the prefabricated sleeper slab 1 and/or the upper surface of the foundation under the track 3. That is, the roughness of the lower surface of the prefabricated sleeper slab 1 and/or the upper surface of the foundation under the track 3 is increased and the flatness of the lower surface of the prefabricated sleeper slab 1 and/or the upper surface of the foundation under the track 3 is decreased. Therefore, each of the static friction between the cast-in layer 2 and the prefabricated sleeper slabs 1 and the static friction between the cast-in layer 2 and the foundation under the track 3 is increased, which further improve the stability of the connection between the cast-in layer 2 and the prefabricated sleeper slabs 1 and the stability of the connection between the cast-in layer 2 and the foundation under the track 3. Therefore, the prefabricated sleeper slabs 1 and the foundation under the track 3 form a united track stressed structure through the cast-in layer 2, thereby further improving the force stability of the ballastless track structure.

[ 0071] Furthermore, the prefabricated sleeper slabs 1 in the preferred embodiments are shown in FIG. 1 and FIG. 2, and have a slab-like structure. Furthermore, the prefabricated sleeper slabs 1 are preferably non- prestressed slabs. Of course, the prefabricated sleeper slabs 1 can be in the form of prestressed slabs, which can be achieved by using relevant technical means in the related art according to actual needs. Furthermore, a plurality of prefabricated sleeper slabs 1 can be successively arranged on the foundation under the track 3 at intervals along the track direction and correspondingly connected in series with each other to form an integrated ballastless track structure. Two prefabricated sleeper slabs 1 adjacent to each other are matchingly connected after the sides thereof align with each other. Furthermore, in the preferred embodiments, a plurality of pairs of fastening rail supports, which are configured for correspondingly installing the steel rails 5, are arranged on top of the prefabricated sleeper slabs 1 at intervals along the track direction. In the preferred embodiments, 4 pairs of the fastening rail supports are arranged at

intervals on the prefabricated sleeper slabs 1. Of course, the number of pair of the fastening rail supports arranged on the prefabricated sleeper slabs 1 can be set according to the length of the prefabricated sleeper slabs 1 or an interval between two fastening rail supports adjacent to each other, for example, 2 pairs, 3 pairs, 5 pairs, 6 pairs, 7 pairs, 8 pairs, 9 pairs, 10 pairs, etc. Preferably, the number of pair of the fastening rail supports can be further specifically set to 4 to 6 pairs.

[ 0072] Furthermore, in the preferred embodiments, a longitudinal connecting structure is provided between the two prefabricated sleeper slabs 1 adjacent to each other. Furthermore, in particular, in the preferred embodiments, longitudinal steel bars 102 are provided at the sides of the two prefabricated sleeper slabs 1 which can be correspondingly connected with each other. The longitudinal steel bars 102 are arranged along the length direction of the prefabricated sleeper slabs 1, i.e., the track direction of the ballastless track structure. Furthermore, in the preferred embodiments, there are a plurality of longitudinal steel bars 102 arranged at intervals at the sides of the prefabricated sleeper slabs 1. Therefore, after the two prefabricated sleeper slabs 1 are aligned with each other, the longitudinal steel bars 102 on the corresponding sides of the two prefabricated sleeper slabs 1 can be aligned with each other respectively, and then correspondingly connected with each other. Preferably, in the preferred embodiments, two longitudinal steel bars 102 correspondingly aligned with each other are provided with a sleeve. One end of the sleeve can be correspondingly connected with one of the longitudinal steel bars 102 arranged at one side of one of the prefabricated sleeper slabs 1, and the other end of the sleeve can be correspondingly connected with another corresponding longitudinal steel bar 102 at one side of another prefabricated sleeper slab 1 adjacent to the one of the prefabricated sleeper slabs 1, so that the two prefabricated sleeper slabs 1 can be correspondingly connected with each other through the sleeve.

[ 0073] As shown in FIG. 8, FIG. 9 and FIG. 10, preferably, in the preferred embodiments, longitudinal steel bars 102 are pre-embedded in the two prefabricated sleeper slabs 1 adjacent to each other and protrude from end surfaces of the two prefabricated sleeper slabs adjacent to each other. One of the longitudinal steel bars 102 is spaced from another longitudinal steel bar matched with said one of the longitudinal steel bars, and two longitudinal steel bars 102 are longitudinally connected with each other

through a split connecting sleeve 104. The split connecting sleeve 104 includes two semicircular sleeves 1041 and two locking bushes 1042. An inner periphery of each of the two semicircular sleeves 1041 is provided with threads. The two semicircular sleeves are engaged and matched with each other at coupling ends of the two longitudinal steel bars 102. One of the two locking bushes 1042 is arranged around one of two ends of an outer periphery of two engaged semicircular sleeves 1041, and another one of the two locking bushes 1042 is arranged around another one of the two ends of the outer periphery of the two engaged semicircular sleeves 1041 to lock the two engaged semicircular sleeves. Preferably, an outer periphery of each of the two ends of the two semicircular sleeves 1041 and an inner periphery of each of the two locking bushes 1042 are tapered, and the taper of each of said outer periphery and said inner periphery is smaller than the self-locking angle. Preferably, an outer periphery of each of the two ends of the two semicircular sleeves 1041 and an inner periphery of each of the two locking bushes 1042 are also provided with engaging threads matched with each other.

[ 0074] Of course, the connection of the longitudinal steel bars 102 is not limited to the above form, and can also achieved by providing a connecting member for the corresponding longitudinal steel bars 102. One end of the connecting member is welded with one of two longitudinal steel bars 102 and another end of the connecting member is welded with another one of two longitudinal steel bars 102, to achieve the longitudinal connection of the two prefabricated sleeper slabs 1. Moreover, the longitudinal connecting structures are not limited to the above-mentioned form of the longitudinal steel bars 102, but it can be preferably selected in other forms according to actual needs. For example, in another preferred embodiment, connecting plates are provided on the sides of the two prefabricated sleeper slabs 1 adjacent to each other, and then longitudinal bolts are correspondingly provided for correspondingly connecting the two prefabricated sleeper slabs 1 with each other, thereby achieving the longitudinal connection of the prefabricated sleeper slabs 1. Alternatively, in another preferred embodiment, structures, such as pre-embedded steel plates, pre-embedded iron parts, etc., are pre-embedded into the end of the prefabricated sleeper slabs 1, and in the later stage, a firm and reliable connection is formed by bolting, welding or hinging, etc., to achieve the assembly and connection of the prefabricated sleeper slabs 1.

[ 0075] Furthermore, in the preferred embodiments, a plurality of longitudinal steel bars 102 are arranged on the side for connection of each of the prefabricated sleeper slabs 1, and are provided at two ends of said side. In the preferred embodiments, four longitudinal steel bars 102 are arranged on each of the two ends of said side. That is, eight longitudinal steel bars 102 are arranged on the side for connection of each of the prefabricated sleeper slabs 1. Therefore, the two prefabricated sleeper slabs 1 can be connected by 8 sleeves after being aligned with each other. In the preferred embodiments, the longitudinal steel bars 102 and the sleeves correspondingly form a longitudinal connecting structure, to achieve the longitudinal connection of the prefabricated sleeper slabs 1, and then form an integrated unit along the track direction. Of course, all of the longitudinal steel bars 102 arranged between the two prefabricated sleeper slabs 1 can be correspondingly and matchingly connected with each other by sleeves, or part of the longitudinal steel bars 102 arranged between the two prefabricated sleeper slabs 1 can be correspondingly and matchingly connected with each other by sleeves.

[ 0076] Furthermore, a plurality of prefabricated sleeper slabs 1 can be connected with each other along the longitudinal direction to form a long slab unit with a certain length by correspondingly connecting with the longitudinal connecting structures. Therefore, in the preferred embodiments, the ballastless track structure can be constituted by correspondingly combining one or more long slab units. Furthermore, in the preferred embodiments, the long slab unit can form an integrated stressed structure with the foundation under the track 3 through the cast-in layer 2. That is, the long slab unit can form a track unit. Therefore, the ballastless track structure can be formed by correspondingly assembling a plurality of track units along the longitudinal direction, and each track unit is an integrated stressed structure to subject the force of the ballastless track structure.

[ 0077] Furthermore, in the preferred embodiments, a slab gap is arranged between the long slab units, and a limiting structure for correspondingly achieving the limitation of the long slab unit is correspondingly arranged in the slab gap. Preferably, the limiting structures can further be bosses, cylindrical members, etc. The limiting structures can be selectively provided or provided in each slab gap, which can be selected according to actual needs, and is not described in detail here.

[ 0078] Of course, the limitation of the long slab unit is not limited to the above-mentioned limiting structures, which can be in other forms according to actual needs. For example, in one preferred embodiment, the limiting structures are arranged at both sides of the long slab unit, and the limiting structures on the sides of the long slab unit are correspondingly connected with the foundation under the track to achieve the limitation of the long slab unit. Preferably, the limiting structures can further be anchor steel bars or connecting bosses vertically arranged on the sides of the prefabricated sleeper slabs 1. Correspondingly, in another preferred embodiment, the surfaces of part or all of the prefabricated sleeper slabs 1 in the long slab unit can be provided with through hole structures or sleeves connecting two surfaces of each prefabricated sleeper slab in the vertical direction. After the long slab unit is assembled in place, the limitation of the long slab unit can be achieved by planting bars or providing limiting steel nails in the above-mentioned through holes or sleeves. The steel bars for planting bars or the limiting steel nails are correspondingly and matchingly arranged in the foundation under the track to ensure the stability of the limitation of the long slab unit. In addition, the limitation of each long slab unit can also be provided in other forms according to actual needs, which is relatively easy to achieve by using related technical means in the related art. Therefore, it is not described in detail here.

[ 0079] Furthermore, in the preferred embodiments, after the two prefabricated sleeper slabs 1 adjacent to each other are connected with each other through the longitudinal connecting structure, a connecting filling portion can be correspondingly provided on the longitudinal connecting structure. Preferably, the filling portion is obtained by on-site pouring reinforced concrete into an interval between the two prefabricated sleeper slabs 1 adjacent to each other. Of course, in the preferred embodiments, the connecting filling portion can be correspondingly provided between the two transverse ends of each of all of the intervals, or the connecting filling portion can only be correspondingly provided between the two transverse ends of each of some of the intervals, which can be selected according to actual needs. Preferably, in the preferred embodiments, before on-site pouring the reinforced concrete on the longitudinal connecting structures, a hoop stirrup can be preferably arranged on the longitudinal connecting structures, so that a plurality of the longitudinal connecting structures in the interval between two slabs adjacent to each

other are connected into an integrated structure. The number of the hoop stirrups can be set to one, or more than one which are arranged to be spaced from each other along the longitudinal direction. Moreover, the connection manner of the hoop stirrup and the longitudinal connecting structures is not specifically limited here. The hoop stirrup and the longitudinal connecting structures can be connected by welding or bundling, which is not specifically limited here. Furthermore, after the longitudinal connecting structures between the two prefabricated sleeper slabs adjacent to each other are correspondingly connected with each other, and the hoop stirrup and the longitudinal connecting structures are matchingly connected to form an integrated frame structure, the reinforced concrete is correspondingly on-site poured onto the above-mentioned integrated frame structure, so that the arrangement stability of the connecting filling portion between the two prefabricated sleeper slabs 1 is higher. A plurality of prefabricated sleeper slabs 1 can correspondingly form a stable long slab unit, that is, form a united stressed structure, so that each prefabricated sleeper slab 1 in the long slab unit is not subjected to a force separately, but is subjected to a force as a whole, thereby ensuring the force stability of the long slab unit and even the ballastless track structure.

[ 0080] Preferably, the slab body 101 is provided with notches at two sides for matching connection thereof. Preferably, the notches are semi-annular. Moreover, after the two prefabricated sleeper slabs 1 are aligned with each other at their sides and matchingly connected with each other, two notches at said two facing sides for matching connection can be aligned with each other to form an annular notch. As shown in FIG. 1, then, a corresponding cover plate is provided on the formed annular notch, so that the region between two steel rails 5 on the ballastless track structure is horizontal, which facilitates walking and preventing the garbage on the sleeper surface from falling into the drain 301.

[ 0081] Preferably, a middle portion of each of end surfaces of two sides for matching connection of each of the prefabricated sleeper slabs 1 is provided with a semi-annular notch. The arrangement of the notch enables both ends of each end surface form a convex structure respectively. The longitudinal steel bars 102 can be correspondingly arranged on the end surfaces of two convex structures. That is, when the two prefabricated sleeper slabs 1 are correspondingly connected with each other, the convex structures at the ends

of one prefabricated sleeper slab 1 can be aligned with the convex structures at the ends of the other prefabricated sleeper slab 1, so that the longitudinal steel bars 102 correspondingly arranged on the convex structures are aligned with each other, so that the prefabricated sleeper slabs 1 can be correspondingly connected with each other by the longitudinal steel bars 102.

[ 0082] In the above preferred embodiment, the connection between the two prefabricated sleeper slabs 1 adjacent to each other is achieved by pre-embedding the longitudinal steel bars 102 into the end surfaces of each prefabricated sleeper slab 1. This is one preferred method in the embodiment of the present application, but not the only arrangement method. For example, in another preferred embodiment, sleeves are correspondingly provided on the end surfaces of each prefabricated sleeper slab 1, so that after the two prefabricated sleeper slabs 1 are correspondingly arranged on the foundation under the track 3, the sleeves arranged on the facing sides of the two prefabricated sleeper slabs 1 are aligned with each other. And then longitudinal steel bars are correspondingly provided in each set of sleeves aligned with each other, so that one end of each longitudinal steel bar is correspondingly connected to the corresponding sleeve on the side of one of the prefabricated sleeper slabs 1, and another end of the longitudinal steel bar is connected to the corresponding sleeve on the side of the other one of the two prefabricated sleeper slabs 1. Therefore, the two prefabricated sleeper slabs 1 can be correspondingly connected with each other by correspondingly matching a plurality set of sleeves with the corresponding longitudinal steel bars, in which each set of the sleeves is connected with the corresponding longitudinal steel bars.

[ 0083] Of course, the longitudinal steel bars or sleeves on the end surfaces of the prefabricated sleeper slabs 1 can be pre-embedded or arranged in other forms. For example, connecting plates are provided on the end surfaces of the prefabricated sleeper slabs 1, and then one end of each longitudinal steel bar or each sleeve is correspondingly welded to one of the connecting plates to achieve positioning.

[ 0084] In order to meet the requirements for the vibration damping section, a vibration damping layer 6 is arranged between the cast-in-place layer 2 and the foundation under the track 3. The vibration damping layer 6 is not fixed with the self-compacting concrete

layer 2 and the reinforced concrete backfill layer 3, and is configured for buffering the vibration generated by the train operation. Preferably, the vibration damping layer may be of point support type, strip support type or surface support type. The vibration damping layer 6 is arranged at the lower part of the post-poured layer. After pouring, the poured layer and the vibration damping layer 6 constitute a unified structure, which improves mass of participating in vibration. For the convenience of construction, firstly, a post-poured layer can be applied to level the foundation under the track. And then a vibration damping layer is directly provided, the track slab system is adjusted, to buffer the vibration generated by the train operation through the arrangement of the vibration damping layer 6.

[ 0085] A plurality of prefabricated sleeper slabs or prefabricated track slabs are longitudinally arranged at intervals. The connecting filling portions 402 are provided at two transverse ends of each of some or all of the intervals, and limiting members 4 are provided in each of some or all of the intervals. Furthermore, the number of the limiting members can be one or more, which can be selected according to the setting form of the limiting members or actual needs. Moreover, in the track direction of the ballastless track, limiting members can be provided in each of all or some of the intervals between the prefabricated sleeper slabs 1, which can be selected according to actual needs, and is not described in detail here.

[ 0086] The limiting members 4 include limiting steel bars 401 and limiting sleeves 403. The connecting filling portions 402 connect two slab bodies 101 into an integrated structure by connecting the longitudinal connecting structures 102 between the two slab bodies adjacent to each other. The connecting filling portions 402 are arranged on the cast-in-place layer 2 and the vibration damping layer 6 to be adapted to the up and down displacement caused by vibration. The limiting steel bar 401 and the limiting sleeve 402 are arranged in cooperation with the connecting filling portion 402, in which the liming steel bar 401 and the limiting sleeve 402 are matched with each other to form an integrated vertical implant structure in the connecting gap. The vertical implant structure is matched with the connecting filling portion 402 to achieve the transverse and longitudinal limitation, to form a structure in which the vertical implant structure is partially movable connected with the foundation under the track 3. That is, one of the

limiting steel bar 401 and the limiting sleeve 403 is fixedly connected with the foundation under the track 3, and the other of the limiting steel bar 401 and the limiting sleeve 403 is movably connected with the foundation under the track, rather than forming an immovable connecting structure, so that the vertical implant structure can vertically move while achieving the transverse and longitudinal limitation, thereby better buffering the vibration generated by the train operation.

[ 0087] In the first embodiment of the limiting members 4, as shown in FIG. 4, the limiting sleeves 403 are fixedly arranged in the connecting filling portion 402, the height of each of the limiting sleeves 403 is flush with the height of the connecting filling portion 402, and the bottom of each of the limiting sleeves 403 is not connected with the foundation under the track 3. The connecting filling portion 402 is a post-poured structure. Each of the limiting sleeves 403 is placed in a gap between the protrusions before pouring, and the connecting filling portion 402 is formed by pouring, of which the height is flush with that of each of the limiting sleeves 403. A limiting steel bar 401 is arranged in each of the liming sleeves 403, and the bottom of each of the limiting steel bars is fixed in the foundation under the track 3, to achieve the transverse and longitudinal limitation. There are several ways for fixing and connecting the bottom of each of the limiting steel bars and the foundation under the track 3. Preferably, the bottom of each of the limiting steel bars 401 is fixed with the foundation under the track 3 by threaded connection.

[ 0088] Furthermore, in the second embodiment, as shown in FIG. 5, the limiting steel bars 401 are T-shaped limiting screws. The head of each of the limiting screws is arranged on top of each of the limiting sleeves 403, and not connected with corresponding limiting sleeve 403 and the connecting filling portion 402. Therefore, the limiting steel bars would not limit the up and down movement of the connecting filling portions 402, thereby buffering the vibration generated by the train operation and simultaneously achieving the transverse and longitudinal limitation. In the third embodiment, as shown in FIG. 6, the limiting steel bars 401 are inverted T-shaped limiting screws. The bottom of each of the limiting screws is arranged in the foundation under the track 3 to achieve the fixation of each of the limiting steel bars 401. The top of each of the limiting steel bars 401 is not slidably connected with the connecting filling portion and each of the limiting sleeves 403.

[ 0089] In the fourth embodiment of the limiting members 4, as shown in FIG. 7, the limiting steel bars 401 are arranged in the connecting filling portion 402, and the top of each of the limiting steel bars 401 is fixedly connected with the connecting filling portion 402. The bottom of each of the limiting steel bars 401 is spaced from the vibration damping layer 6, and the bottom of each of the limiting steel bars 401 is higher than the vibration damping layer 6. The limiting sleeves 403 are fixed in the foundation under the track 3, and are not fixedly connected to the connecting filling portion 402. An isolating sleeve 404 is provided between each of the limiting sleeves 403 and the connecting filling portion 402, and slidably connected with the limiting sleeve. The height of each of the limiting sleeves 403 is lower than the height of the connecting filling portion 401, and the limiting steel bar 401 is arranged in each of the limiting sleeves 403. The limiting steel bars 401 and the limiting sleeves 402 arranged in the connecting filling portion 402 are matched with each other to achieve the transverse and longitudinal limitation. At the same time, the spacing height between each of the limiting steel bars 401 and the vibration damping layer 6 achieves the up and down movement of the connecting filling portion 402, to buffer the vibration generated by the train operation.

[ 0090] As another aspect of the present application, an assembly method for the assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section is provided. The assembly method includes the following steps.

[ 0091] In Step S1, the prefabricated sleeper slabs 1 manufactured in a factory are transported to construction site, a predefined number of the prefabricated sleeper slabs are longitudinally arranged along the track, and then the prefabricated sleeper slabs are initially adjusted and positioned.

[ 0092] In Step S2, the longitudinal steel bars 102 pre-embedded in the prefabricated sleeper slabs are connected with each other through semicircular sleeves 1041 and locking bushes 1042 of a plurality of split connecting sleeves 104, and then the prefabricated sleeper slabs are finely adjusted and positioned.

[ 0093] In Step S3, a plurality of limiting steel bars are provided on the foundation under the track in each of some or all of the intervals, and a limiting sleeve is arranged

around each of the limiting steel bars. Reinforced concrete is on-site poured at each of two transverse ends of each of the intervals provided with both the longitudinal connecting structures and the limiting members, to wrap and cover the longitudinal connecting structures, the limiting steel bars and the limiting sleeves. A connecting filling portion is formed after the reinforced concrete is cured, wherein the longitudinal connecting structures, the limiting steel bars, the limiting sleeves and the connecting filling portion are integrally formed to simultaneously achieve limitation and connection. Reinforced concrete is on-site poured at each of two transverse ends of each of some or all of the intervals in which no limiting steel bars are provided, o wrap and cover the longitudinal connecting structures. Integration and transverse/longitudinal limitation are simultaneously achieved and vertical elastic deformation is allowed by on-site single pouring, such that a plurality of prefabricated sleeper slabs or prefabricated track slabs are assembled to form a track unit with a predefined length and form a united stressed structure.

[ 0094] Alternatively, in Step S3, a plurality of limiting sleeves are provided on the foundation under the track in each of some or all of the intervals, a limiting steel bar is arranged inside each of the limiting sleeves, and a protective member is arranged around each of the limiting sleeves. Reinforced concrete is on-site poured at each of two transverse ends of each of the intervals provided with both the longitudinal connecting structures and the limiting members, to wrap and cover the longitudinal connecting structures, the limiting steel bars and the limiting sleeves. A connecting filling portion is formed after the reinforced concrete is cured, wherein the longitudinal connecting structures, the limiting steel bars, the limiting sleeves and the connecting filling portion are integrally formed to simultaneously achieve limitation and connection. Reinforced concrete is on-site poured at each of two transverse ends of each of some or all of the intervals in which no limiting steel bars are provided, to wrap and cover the longitudinal connecting structures. Integration and transverse/longitudinal limitation are simultaneously achieved and vertical elastic deformation is allowed by on-site single pouring, such that a plurality of prefabricated sleeper slabs or prefabricated track slabs are assembled to form a track unit with a predefined length and form a united stressed structure.

[ 0095] In the assembled sleeper slab-type ballastless track structure and the assembly method thereof in the present application, the structure of the ballastless track is simple, and the assembly method thereof is also simple. The ballastless track structure is formed by assembling a plurality of sleeper slabs, so that the ballastless track structure can be rapidly obtained by assembling, which is effectively suitable for the application environment of subway. The sleeper slabs in the present application are prefabricated, and then the ballastless track structure is assembled by assembling the sleeper slabs. The assembly form is simple and the assembly efficiency is high, which can significantly improve the assembly efficiency of the ballastless track structure and shorten the assembly period. The longitudinal connecting structures are correspondingly provided on the end surfaces of two sides of the prefabricated sleeper slab, so that the two sleeper slabs can be correspondingly connected with each other through the longitudinal connecting structures, to effectively achieve the connecting between the sleeper slabs. The limiting members are correspondingly provided at the position where the two sleeper slabs are connected with each other, which limit the longitudinal position of the sleeper slabs, so that the operation stability of the track is effectively ensured and the operation accuracy of the track is guaranteed. Furthermore, the limiting members and the longitudinal connecting structures can be integrally formed, which can simultaneously achieve limitation and connection of the sleeper slabs, significantly shorten the arrangement period of the sleeper slabs, and improve the arrangement efficiency of the ballastless track.

[ 0096] Herein, the bottom of each of the limiting steel bars 401 is fixed in the foundation under the track by means of threaded connection or pouring. The limiting steel bar 401 is arranged in each of the limiting sleeves 403, and the limiting sleeves 403 are fixedly connected with the connecting filling portion 402.

[ 0097] Herein, there is height spacing between the bottom of each of the limiting steel bars 401 and the foundation under the track 3. The limiting steel bars 401 are connected with the connecting filling portion 402, the limiting sleeves 403 are fixedly connected with the foundation under the track 3, and each of the limiting steel bars 401 is slidably connected with the corresponding limiting sleeve 403, so that the limiting steel bars 401 move up and down with the connecting filling portion 402 to buffer the vibration.

[ 0098] Preferably, the connecting filling portions 402 are reinforced concrete, and the connecting filling portions 402 adopt an on-site concrete pouring process.

[ 0099] As shown in FIG. 1, FIG. 2, FIG. 8 and FIG. 9, in one embodiment, an assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section is provided. The assembled ballastless track structure is an assembled sleeper slab-type ballastless track structure, and includes a plurality of prefabricated sleeper slabs 1, longitudinal connecting structures, and connecting filling portions 402 formed by reinforced concrete structures. The plurality of prefabricated sleeper slabs 1 are longitudinally arranged at intervals, and an interval is formed between two prefabricated sleeper slabs 1 adjacent to each other. The longitudinal connecting structures include longitudinal steel bars 102 pre-embedded in the prefabricated sleeper slabs 1, and split connecting sleeves 104 arranged in the intervals. Each of the longitudinal steel bars 102 in the two prefabricated sleeper slabs 1 adjacent to each other protrude from an end surface of corresponding prefabricated sleeper slab 1. One of the longitudinal steel bars 102 in one of the prefabricated sleeper slabs 1 is longitudinally connecting with another corresponding longitudinal steel bar 102 in another prefabricated sleeper slab 1 adjacent to the one of the longitudinal steel bars 102 through one of the split connecting sleeves 104. Each of the connecting filling portions 402 is at least filled in each of some of the intervals to connect the two prefabricated sleeper slabs 1 adjacent to each other.

[ 00100] Specifically, each of the split connecting sleeves 104 includes two locking bushes 1042 and two semicircular sleeves 1041, and an inner periphery of each of the two semicircular sleeves 1041 is provided with threads. The two semicircular sleeves 1041 are engaged and matched with each other at coupling ends of the two longitudinal steel bars 102. One of the two locking bushes 1042 is arranged around one of two ends of an outer periphery of two engaged semicircular sleeves 1041 and another one of the two locking bushes 1042 is arranged around another one of the two ends of the outer periphery of the two engaged semicircular sleeves 1041 to lock the two engaged semicircular sleeves

[ 00101] Correspondingly, an assembly method for the assembled ballastless track

structure equipped with longitudinal connecting structures for vibration damping section provided in the above embodiment mainly includes the following steps.

[ 00102] In Step 1, a predefined number of the prefabricated sleeper slabs 1 are longitudinally arranged along the track, and then the prefabricated sleeper slabs are initially adjusted and positioned.

[ 00103] In Step 2, one of the longitudinal steel bars 102 in one of the prefabricated sleeper slabs 1 is longitudinally connected with another corresponding longitudinal steel bar 102 in another prefabricated sleeper slab 1 adjacent to the one of the prefabricated sleeper slabs 1 through one of the split connecting sleeves 104.

[ 00104] In Step 3, each of the connecting filling portions 402 is filled in each of at least some of the intervals.

[ 00105] As shown in FIG. 1, FIG. 2, FIG. 8 and FIG. 9, in another embodiment, the assembled ballastless track structure is a track slab-type ballastless track structure, and includes a plurality of prefabricated track slabs 1, longitudinal connecting structures, and connecting filling portions 402 formed by reinforced concrete structures. The plurality of prefabricated track slabs 1 are longitudinally arranged at intervals, and an interval is formed between two prefabricated track slabs 1 adjacent to each other. The longitudinal connecting structures include longitudinal steel bars 102 pre-embedded in the prefabricated track slabs 1, and split connecting sleeves 104 arranged in the intervals. Each of the longitudinal steel bars 102 in the two prefabricated track slabs 1 adjacent to each other protrude from an end surface of corresponding prefabricated track slab 1 adjacent to each other. One of the longitudinal steel bars 102 in one of the prefabricated track slabs 1 is longitudinally connecting with another corresponding longitudinal steel bar 102 in another prefabricated track slab 1 adjacent to the one of the prefabricated track slabs 1 through one of the split connecting sleeves 104. Each of the connecting filling portions 402 is at least filled in each of some of the intervals to connect the two prefabricated track slabs 1 adjacent to each other.

[ 00106] Specifically, each of the split connecting sleeves 104 includes two locking bushes 1042, and two semicircular sleeves 1041, and an inner periphery of the two

semicircular sleeves 1041 are provided with threads. The two semicircular sleeves 1041 are engaged and matched with each other at coupling ends of the two longitudinal steel bars 102. One of the two locking bushes 1042 is arranged around one of two ends of an outer periphery of two engaged semicircular sleeves 1041 and another one of the two locking bushes 1042 is arranged around another one of the two ends of the outer periphery of the two engaged semicircular sleeves 1041 to lock the two engaged semicircular sleeves.

[ 00107] Correspondingly, an assembly method for the assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section provided in the above embodiment mainly includes the following steps.

[ 00108] In Step 1, a predefined number of the prefabricated track slabs are longitudinally arranged along the track, and then the prefabricated track slabs are initially adjusted and positioned.

[ 00109] In Step 2, one of the longitudinal steel bars 102 in one of the prefabricated track slabs 1 is longitudinally connected with another corresponding longitudinal steel bar 102 in another prefabricated track slab 1 adjacent to the one of the prefabricated track slabs 1 through one of the split connecting sleeves 104.

[ 00110] In Step 3, each of the connecting filling portions 402 is filled in each of at least some of the intervals.

[ 00111] Those skilled in the art can easily appreciate that, what are described above are merely preferred embodiments of the present application, and are not to limit the present application. And any modification, equivalent and improvement within the spirit and principles of the present application shall be covered in the protective scope of the present application.

CLAIMS

1. An assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section, the assembled ballastless track structure being an assembled sleeper slab-type or track slab-type ballastless track structure, the assembled ballastless track structure comprising prefabricated sleeper slabs or prefabricated track slabs, a cast-in-place layer, a vibration damping layer, a foundation under a track, connecting filling portions, and longitudinal connecting structures for the prefabricated sleeper slabs or the prefabricated track slabs;

wherein a plurality of prefabricated sleeper slabs or prefabricated track slabs are longitudinally arranged at intervals, the prefabricated sleeper slabs or the prefabricated track slabs are assembled and connected, at two transverse ends, to each other in the intervals through the longitudinal connecting structures; in some or all of the intervals~~internals~~, the connecting filling portions are formed by reinforced concrete structures, such that the connecting filling portions and the prefabricated sleeper slabs or the prefabricated track slabs form an assembled integrated structure, and the prefabricated sleeper slabs or the prefabricated track slabs form a united stressed structure in the shape of a long slab unit;

wherein the longitudinal connecting structures comprise longitudinal steel bars and split connecting sleeves; the longitudinal steel bars are pre-embedded in two prefabricated sleeper slabs or prefabricated track slabs adjacent to each other and protrude from end surfaces of the two prefabricated sleeper slabs or prefabricated track slabs adjacent to each other, one of the longitudinal steel bars is spaced from another longitudinal steel bar matched with said one of the longitudinal steel bars, and two longitudinal steel bars are longitudinally connected with each other through the split connecting sleeve; and

wherein each of the split connecting sleeves comprises two semicircular sleeves and two locking bushes, an inner periphery of each of the two semicircular sleeves is provided with threads, the two semicircular sleeves are engaged and matched with each other at coupling ends of the two longitudinal steel bars, and one of the two locking bushes is

arranged around one of two ends of an outer periphery of two engaged semicircular sleeves and another one of the two locking bushes is arranged around another one of the two ends of the outer periphery of the two engaged semicircular sleeves to lock the two engaged semicircular sleeves.

2. The assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section of claim 1,

wherein the connecting filling portions are provided at two transverse ends of each of at least some of the intervals, and a limiting member is provided in at least some of the intervals, wherein each limiting member includes a protruding limiting steel bar ~~is~~ provided on an upper surface of the foundation under the track ~~in each of at least some of the intervals; in the intervals each provided with both the connecting filling portion and limiting member~~, and a limiting sleeve ~~is~~ embedded in the connecting filling portion and ~~is~~ slidably arranged around the limiting steel bar, the longitudinal connecting structures, the limiting steel bar and the limiting sleeve are wrapped and covered in the same connecting filling portion and formed integrally with the connecting filling portion to simultaneously achieve limitation and connection, such that the plurality of prefabricated sleeper slabs or prefabricated track slabs are assembled to form a track unit with a predefined length and form a united stressed structure; or

wherein the connecting filling portions are provided at two transverse ends of each of at least some of the intervals, and a limiting member is provided in at least some of the intervals, wherein each limiting member includes a protruding limiting sleeve ~~is~~ provided on an upper surface of the foundation under the track ~~in each of at least some of the intervals; in the intervals each provided with both the connecting filling portion and limiting member~~, and a limiting steel bar is embedded in the connecting filling portion, an outer wall surface of the limiting sleeve is not in contact with the connecting filling portion, the limiting steel bar is slidably provided in the limiting sleeve, the longitudinal connecting structures, the limiting steel bar and the limiting sleeve are wrapped and covered in the same connecting filling portion and formed integrally with the connecting filling portion to simultaneously achieve limitation and connection, such that the plurality of prefabricated sleeper slabs or

prefabricated track slabs are assembled to form a track unit with a predefined length and form a united stressed structure.

3. The assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section of claim 2, wherein the prefabricated sleeper slabs or the prefabricated track slabs comprise a plurality of pairs of fastening rail supports.

4. The assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section of claim 3, wherein each of two longitudinal ends of each of the prefabricated sleeper slabs or the prefabricated track slabs is provided with a notch, and a cover plate is placed on the notch to form a smooth evacuation passage.

5. The assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section of claim 4, wherein the foundation under the track is equipped with a drain along its longitudinal direction.

6. The assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section of claim 4, wherein each of two transverse sides of each of the prefabricated sleeper slabs or the prefabricated track slabs is provided with a drain.

7. The assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section of claim 2, wherein first limiting structures are arranged on both sides of the long slab unit, or second limiting structures are arranged in the long slab unit.

8. The assembled ballastless track structure equipped with longitudinal connecting structures

for vibration damping section of claim 2, wherein there are slab gaps between a plurality of track units adjacent to each other, and third limiting structures are arranged in some or all of the slab gaps.

9. An assembly method for the assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section of any one of claims 2 to 8, comprising the following steps:

S1：transporting prefabricated sleeper slabs or prefabricated track slabs manufactured in a factory to construction site, longitudinally arranging a predefined number of the prefabricated sleeper slabs or the prefabricated track slabs along the track, and then initially adjusting and positioning the prefabricated sleeper slabs or the prefabricated track slabs;

S2: connecting the longitudinal steel bars (102), which are pre-embedded in the prefabricated sleeper slabs or the prefabricated track slabs, with each other through semicircular sleeves (1041) and locking bushes (1042) of a plurality of split connecting sleeves (104), and then finely adjusting and positioning the prefabricated sleeper slabs or the prefabricated track slabs;

S3: providing a plurality of limiting steel bars on the foundation under the track in each of some or all of the intervals; arranging a limiting sleeve around each of the limiting steel bars; on-site pouring reinforced concrete at each of two transverse ends of each of the intervals provided with both the longitudinal connecting structures and the limiting members, to wrap and cover the longitudinal connecting structures, the limiting steel bars and the limiting sleeves; forming a connecting filling portion after the reinforced concrete is cured, wherein the longitudinal connecting structures, the limiting steel bars, the limiting sleeves and the connecting filling portion are integrally formed to simultaneously achieve limitation and connection; on-site pouring reinforced concrete at each of two transverse ends of each of some or all of the intervals in which no limiting steel bars are provided, to wrap and cover the longitudinal connecting structures; simultaneously achieving integration and transverse/longitudinal limitation and allowing vertical elastic deformation by on-site single pouring, such that a plurality of prefabricated sleeper slabs or prefabricated track slabs are

assembled to form a track unit with a predefined length and form a united stressed structure; or

providing a plurality of limiting sleeves on the foundation under the track in each of some or all of the intervals; arranged a limiting steel bar inside each of the limiting sleeves; arranging a protective member around each of the limiting sleeves; on-site pouring reinforced concrete at each of two transverse ends of each of the intervals provided with both the longitudinal connecting structures and the limiting members, to wrap and cover the longitudinal connecting structures, the limiting steel bars and the limiting sleeves; forming a connecting filling portion after the reinforced concrete is cured, wherein the longitudinal connecting structures, the limiting steel bars, the limiting sleeves and the connecting filling portion are integrally formed to simultaneously achieve limitation and connection; on-site pouring reinforced concrete at each of two transverse ends of each of some or all of the intervals in which no limiting steel bars are provided, to wrap and cover the longitudinal connecting structures; simultaneously achieving integration and transverse/longitudinal limitation and allowing vertical elastic deformation by on-site single pouring, such that a plurality of prefabricated sleeper slabs or prefabricated track slabs are assembled to form a track unit with a predefined length and form a united stressed structure.

10. An assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section, the assembled ballastless track structure being an assembled sleeper slab-type ballastless track structure, and comprising:

a plurality of prefabricated sleeper slabs longitudinally arranged at intervals, an interval being formed between two prefabricated sleeper slabs adjacent to each other;

longitudinal connecting structures, the longitudinal connecting structures comprising longitudinal steel bars pre-embedded in the prefabricated sleeper slabs and split connecting sleeves arranged in the intervals; each of the longitudinal steel bars in the two prefabricated sleeper slabs adjacent to each other protruding from an end surface of corresponding prefabricated sleeper slab, one of the longitudinal steel bars in one of the prefabricated sleeper slabs being longitudinally connecting with another corresponding longitudinal steel bar in

another prefabricated sleeper slab adjacent to the one of the prefabricated sleeper slabs through one of the split connecting sleeves;

connecting filling portions formed by reinforced concrete structures, each of the connecting filling portions being at least filled in each of some of the intervals to connect the two prefabricated sleeper slabs adjacent to each other; or

the assembled ballastless track structure being an track slab-type ballastless track structure, and comprising:

a plurality of prefabricated track slabs longitudinally arranged at intervals, an interval being formed between two prefabricated track slabs adjacent to each other;

longitudinal connecting structures, the longitudinal connecting structures comprising longitudinal steel bars pre-embedded in the prefabricated track slabs and split connecting sleeves arranged in the intervals; each of the longitudinal steel bars in the two prefabricated track slabs adjacent to each other protruding from an end surface of corresponding prefabricated track slab, one of the longitudinal steel bars in one of the prefabricated track slabs being longitudinally connecting with another corresponding longitudinal steel bar in another prefabricated track slab adjacent to the one of the prefabricated track slabs through one of the split connecting sleeves;

connecting filling portions formed by reinforced concrete structures, each of the connecting filling portions being as least filled in each of some of the intervals to connect the two prefabricated track slabs adjacent to each other;

wherein each of the split connecting sleeves comprises two locking bushes, and two semicircular sleeves, an inner periphery of each of the two semicircular sleeves being provided with threads;

wherein the two semicircular sleeves are engaged and matched with each other at coupling ends of the two longitudinal steel bars; and

wherein one of the two locking bushes is arranged around one of two ends of an outer periphery of two engaged semicircular sleeves and another one of the two locking bushes is

arranged around another one of the two ends of the outer periphery of the two engaged semicircular sleeves to lock the two engaged semicircular sleeves.

~~11. The assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section of claim 10, wherein each of the split connecting sleeves comprises two locking bushes, and two semicircular sleeves, an inner periphery of each of the two semicircular sleeves being provided with threads;~~

~~wherein the two semicircular sleeves are engaged and matched with each other at coupling ends of the two longitudinal steel bars; and~~

~~wherein one of the two locking bushes is arranged around one of two ends of an outer periphery of two engaged semicircular sleeves and another one of the two locking bushes is arranged around another one of the two ends of the outer periphery of the two engaged semicircular sleeves to lock the two engaged semicircular sleeves.~~

~~12~~11. An assembly method for the assembled ballastless track structure equipped with longitudinal connecting structures for vibration damping section of claim 10~~ or 11~~, the assembled ballastless track structure being an assembled sleeper slab-type ballastless track structure, the assembly method comprising the following steps:

longitudinally arranging a predefined number of the prefabricated sleeper slabs along the track, and then initially adjusting and positioning the prefabricated sleeper slabs;

longitudinally connecting one of the longitudinal steel bars in one of the prefabricated sleeper slabs with another corresponding longitudinal steel bar in another prefabricated sleeper slab adjacent to the one of the prefabricated sleeper slabs through one of the split connecting sleeves;

filling each of the connecting filling portions in each of at least some of the intervals; or

the assembled ballastless track structure being an track slab-type ballastless track structure, the assembly method comprising the following steps:

longitudinally arranging a predefined number of the prefabricated track slabs along the track, and then initially adjusting and positioning the prefabricated track slabs;

longitudinally connecting one of the longitudinal steel bars in one of the prefabricated track slabs with another corresponding longitudinal steel bar in another prefabricated track slab adjacent to the one of the prefabricated track slabs through one of the split connecting sleeves;

filling each of the connecting filling portions in each of at least some of the intervals.