CLAIMS

1. A separation-prevention structure of a concrete-filled steel tube member and a sleeper block of a ballastless track, the separation-prevention structure being used in a concrete-filled steel tube sleeper of the ballastless track, the concrete-filled steel tube sleeper comprising two or more sleeper blocks (1) and a plurality of concrete-filled steel tubes (2) for connecting the sleeper blocks (1), the sleeper blocks (1) being formed by means of concrete pouring, each of the concrete-filled steel tubes (2) being formed by filling a hollow steel tube with concrete and arranged in a mold for manufacturing two sleeper blocks (1) adjacent to each other, and integrated with the two sleeper blocks (1) by means of concrete pouring during a pouring process of the sleeper blocks (1);

wherein an outer end part of the hollow steel tube, which is buried in the sleeper block (1), is enlarged in a radial direction ~~is provided with~~to form a part (3) with an enlarged radial width, the part (3) with the enlarged radial width having a length range smaller than 50 mm, the part (3) with the enlarged radial width is filled with concrete during a filling process of the hollow steel tube, and then the part (3) with the enlarged radial width is integrated with the sleeper block (1) by means of concrete pouring during the pouring process of the sleeper block (1).

2. The separation-prevention structure of the concrete-filled steel tube member and the sleeper block of the ballastless track of claim 1, wherein a cross section of the part (3) with the enlarged radial width is of a circular, elliptic or elongated shape.

3. The separation-prevention structure of the concrete-filled steel tube member and the sleeper block of the ballastless track of claim 1, wherein the number of the hollow steel tubes is two, and one of the two hollow steel tubes is arranged at one side of a buried member of the sleeper block and the other one of the two hollow steel tubes is arranged at another side of the buried member of the sleeper block;

or the number of the hollow steel tubes is three, and the three hollow steel tubes are

arranged in a manner that connection lines between center points of cross sections of the three hollow steel tubes constitute a triangle.

4. A concrete-filled steel tube sleeper of a ballastless track, comprising two or more sleeper blocks (1) and a plurality of concrete-filled steel tubes (2) for connecting the sleeper blocks (1), and further comprising the separation-prevention structure of the concrete-filled steel tube member and the sleeper block of the ballastless track of any one of claims 1 to 3.

5. A construction method for the concrete-filled steel tube sleeper of the ballastless track of claim 4, comprising the following steps:

Step 1: selecting a hollow steel tube with a length of 2000 mm and an outer diameter of 40 mm;

Step 2: enlarging an outer diameter of two end parts of the hollow steel tube having a length range of 0-50 mm to 45-48 mm by using a flaring tool;

Step 3: spraying and filling high-pressure concrete filling materials from one end part of the hollow steel tube to another end part of the hollow steel tube, and densely filling the part (3) with the enlarged radial width with concrete;

Step 4: maintaining the concrete-filled steel tube member to form a plurality of prefabricated concrete-filled steel tubes (2);

Step 5: placing the concrete-filled steel tubes (2) and a steel reinforcement cage into a mold for producing the sleeper, and pouring concrete materials, so that the concrete-filled steel tubes (2) are inserted in the sleep blocks (1) by pouring.

6. A separation-prevention structure of a concrete-filled steel tube member and a sleeper block of a ballastless track, the separation-prevention structure being used in a concrete-filled steel tube sleeper of the ballastless track, the concrete-filled steel tube sleeper comprising two or more sleeper blocks (1) and a plurality of concrete-filled steel tubes (2) for connecting the

sleeper blocks (1), the sleeper blocks (1) being formed by means of concrete pouring, the concrete-filled steel tubes (2) being configured as follows: hollow steel tubes are arranged in a mold for manufacturing two sleeper blocks (1) adjacent to each other, and then, by means of concrete pouring during a pouring process of the sleeper blocks (1), the hollow steel tubes are integrated with the sleeper blocks (1) and filled with concrete at the same time;

wherein an outer end part of the hollow steel tube, which is buried in the sleeper block (1), is enlarged in a radial direction ~~is provided with~~to form a part (3) with an enlarged radial width, the part (3) with the enlarged radial width having a length range smaller than 50 mm, during the pouring process of the sleeper blocks (1), the part (3) with the enlarged radial width is filled with concrete, and integrated with the sleeper block (1) by means of concrete pouring.

7. The separation-prevention structure of the concrete-filled steel tube member and the sleeper block of the ballastless track of claim 6, wherein a cross section of the part (3) with the enlarged radial width is of a circular, elliptic or elongated shape.

8. The separation-prevention structure of the concrete-filled steel tube member and the sleeper block of the ballastless track of claim 6, wherein the number of the hollow steel tubes is two, and one of the two hollow steel tubes is arranged at one side of a buried member of the sleeper block and the other one of the two hollow steel tubes is arranged at another side of the buried member of the sleeper block;

or the number of the hollow steel tubes is three, and the three hollow steel tubes are arranged in a manner that connection lines between center points of cross sections of the three hollow steel tubes constitute a triangle.

9. A concrete-filled steel tube sleeper of a ballastless track, comprising two or more sleeper blocks (1) and a plurality of concrete-filled steel tubes (2) for connecting the sleeper blocks (1), and further comprising the separation-prevention structure of the concrete-filled steel tube member and the sleeper block of the ballastless track of any one of claims 6 to 8.

10. A construction method for the concrete-filled steel tube sleeper of the ballastless track of claim 9, comprising the following steps:

Step 1: selecting a hollow steel tube with a length of 2000 mm and an outer diameter of 40 mm;

Step 2: enlarging an outer diameter of two end parts of the hollow steel tube having a length range of 0-50 mm to 45-48mm by using a flaring tool;

Step 3: forming a plurality of prefabricated hollow steel tubes;

Step 4: placing the hollow steel tubes and a steel reinforcement cage into a mold for producing the sleeper, spraying high-pressure concrete filling materials from one end part of the hollow steel tube to another end part of the hollow steel tube until a sleeper block cavity and the part (3) with the enlarged radial width, which are located at the another end part of the hollow steel tube, are filled with the high-pressure concrete filling materials, and then continually filling, a sleeper block cavity and the part (3) with the enlarged radial width which are located at the one end part of the hollow steel tube, with the high-pressure concrete filling materials, so that concrete-filled steel tubes (2) are inserted in sleep blocks (1) by pouring;

Step 5: maintaining the concrete-filled steel tube sleeper.

11. A separation-prevention structure of a concrete-filled steel tube member and a sleeper block of a ballastless track, the separation-prevention structure being used in a concrete-filled steel tube sleeper of the ballastless track, the concrete-filled steel tube sleeper comprising at least two sleeper blocks (1) and a plurality of concrete-filled steel tubes (2) for connecting two sleeper blocks (1) adjacent to each other, each of the concrete-filled steel tubes (2) being formed by filling a hollow steel tube with concrete, the separation-prevention structure comprising a part (3) with an enlarged radial width and concrete with which the part (3) with the enlarged radial width is filled, an end part of the hollow steel tube being enlarged in a radial direction to form the part (3) with the enlarged radial width, the part (3) with the enlarged radial width being buried into the sleeper block (1), the part (3) with the enlarged radial width having a length smaller than 50 mm.

~~12. The separation-prevention structure of claim 11, wherein the part (3) with the enlarged radial width has a length smaller than 50 mm.~~

~~13~~12. The separation-prevention structure of claim 11, wherein the part (3) with the enlarged radial width is filled with concrete during a filling process of the hollow steel tube, and then the part (3) with the enlarged radial width is integrated with the sleeper block (1) by means of concrete pouring during a pouring process of the sleeper block (1);

or during the pouring process of the sleeper block (1), the part (3) with the enlarged radial width is filled with concrete, and integrated with the sleeper block (1) by means of concrete pouring.

~~14~~13. The separation-prevention structure of claim 11, wherein a cross section of the part (3) with the enlarged radial width is of a circular, elliptic or elongated shape.

~~15~~14. The separation-prevention structure of claim 11, wherein the number of the hollow steel tubes is two, and one of the two hollow steel tubes is arranged at one side of a buried member of the sleeper block (1) and the other one of the two hollow steel tubes is arranged at another side of the buried member of the sleeper block (1);

or the number of the hollow steel tubes is three, and the three hollow steel tubes are arranged in a manner that connection lines between center points of cross sections of the three hollow steel tubes constitute a triangle.

~~16~~15. The separation-prevention structure of claim 11, wherein the hollow steel tube has a circular cross section, and the part (3) with the enlarged radial width is wider than a body part of the hollow steel tube in the radial direction by 4-8 mm.

~~17~~16. A concrete-filled steel tube sleeper of a ballastless track, comprising at least two sleeper blocks (1), a plurality of concrete-filled steel tubes (2) for connecting two sleeper blocks (1) adjacent to each other, and the separation-prevention structure of any one of claims 11 to ~~16~~15.

~~18~~17. A construction method for the concrete-filled steel tube sleeper of the ballastless track of claim ~~17~~16, comprising the following steps:

enlarging two end parts of a hollow steel tube in a radial direction by using a flaring tool, to form a part (3) with an enlarged radial width;

arranging the hollow steel tube between molds for two sleeper blocks (1) adjacent to each other, wherein the part (3) with the enlarged radial width is arranged in the molds for the sleeper blocks (1); and arranging a steel reinforcement cage in the molds for the sleeper blocks (1);

spraying high-pressure concrete from one end part of the hollow steel tube to another end part of the hollow steel tube, to fill the hollow steel tube, the part (3) with the enlarged radial width and the molds for the sleeper blocks (1) with concrete to form the concrete-filled steel tube (2), the separation-prevention structure and the sleeper blocks (1) respectively.

~~19~~18. A construction method for the concrete-filled steel tube sleeper of the ballastless track of claim ~~17~~16, comprising the following steps:

enlarging two end parts of a hollow steel tube in a radial direction by using a flaring tool, to form a part (3) with an enlarged radial width;

spraying high-pressure concrete from one end part of the hollow steel tube to another end part of the hollow steel tube, to fill the hollow steel tube and the part (3) with the enlarged radial width with concrete to form the concrete-filled steel tube (2) and the separation-prevention structure respectively;

arranging the concrete-filled steel tube (2) between molds for two sleeper blocks (1) adjacent to each other, wherein the separation-prevention structure is arranged in the molds for the sleeper blocks (1); and arranging a steel reinforcement cage in the molds for the sleeper blocks (1);

pouring concrete into the molds for the sleeper blocks (1) to form the sleeper blocks (1).