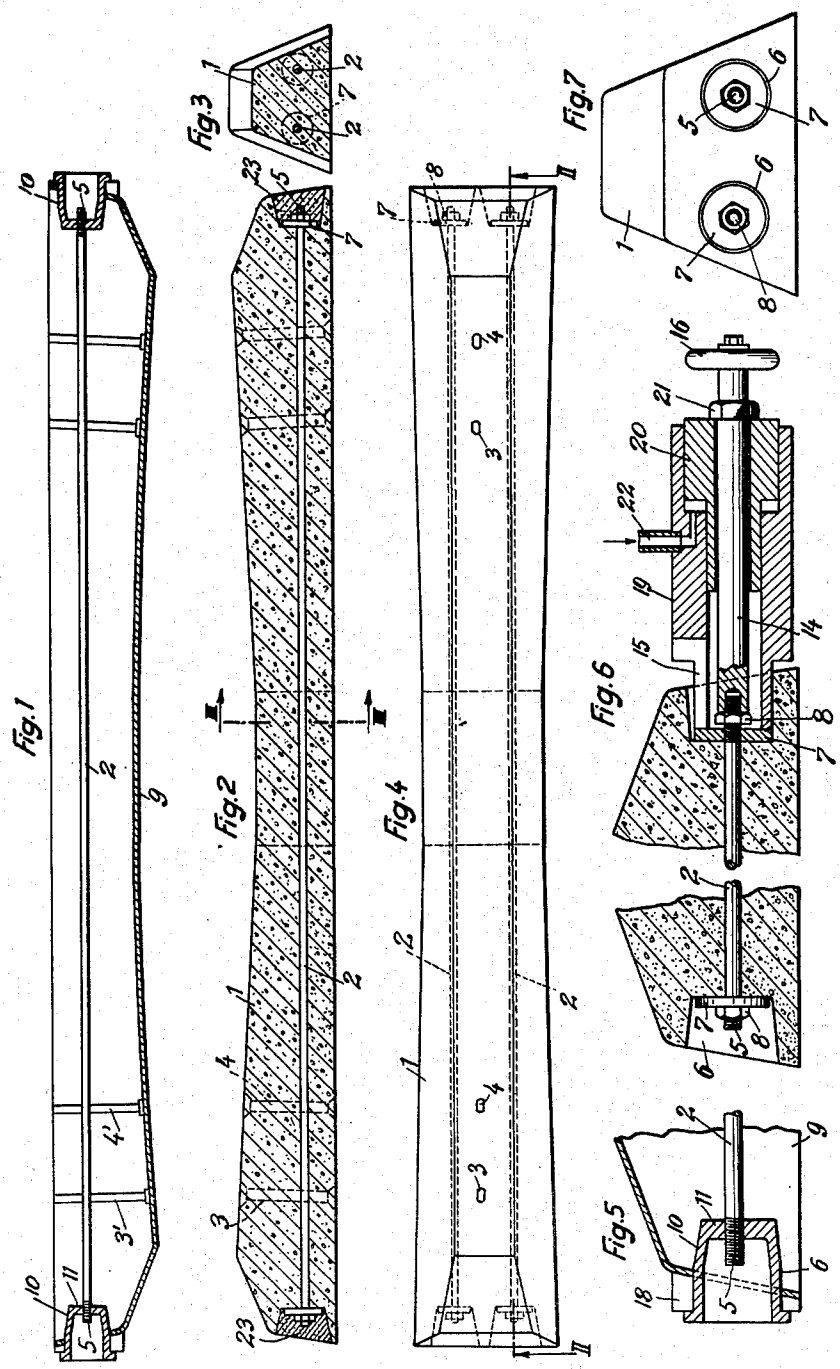
Nov. 30, 1954 W. KARIG 2,695,754

RAILWAY TRACK SLEEPER

Filed July 3, 1951



Inventor
Werner Karig
By Armand E. Western
Attorney

United States Patent Office 2,695,754
Patented Nov. 30, 1954

2,695,754

RAILWAY TRACK SLEEPER

Werner Karig, Hamburg, Germany, assignor to Dyckerhoff & Widmann Kommanditgesellschaft, Munich, Germany

Application July 3, 1951, Serial No. 235,012

1 Claim. (Cl. 238—91)

My invention relates to a railway track sleeper.

It is the object of my invention to provide an improved sleeper which is of a particularly simple design and, therefore, lends itself to mass production at low cost. Further objects of my invention are to afford a possibility of compensating for any decrease of the stress set up in reinforcing bars of the sleeper by repeatedly tensioning said bars; to do away with expensive tensioning beds and heavy moulds; to provide for particularly simple anchoring means capable of cheap manufacture; to afford an effective protection of all steel elements from corrosion; and to afford easy salvage and recovery of the reinforcing bars for renewed use in event of destruction of the sleeper.

Further features of the invention and particulars regarding the advantages obtainable will appear from the following description of a preferred embodiment of the novel sleeper illustrated in the accompanying drawings in which:

Fig. 1 is a longitudinal section through a moulding device for producing the novel sleeper;

Fig. 2 is a longitudinal section through the finished sleeper taken along the line II—II of Fig. 4;

Fig. 3 is a cross section taken along the line III—III of Fig. 2;

Fig. 4 is a plan view of the finished sleeper;

Fig. 5 is a partial section on an enlarged scale through the moulding device shown in Fig. 1;

Fig. 6 is a longitudinal section through the sleeper similar to that in Fig. 2, the central portion being shown broken away and a hydraulic ram being attached for setting up a tensile stress in one of the draw bars; and

Fig. 7 is an end view of the sleeper shown in Fig. 6.

My novel sleeper comprises a body **1** of concrete having two longitudinal parallel passages and two reinforcing steel draw bars of circular cross section extending through such passages and being free from any bonding relation to the surrounding concrete and, therefore, longitudinally movable therein. Preferably, the draw bars consist of a natural hard steel having a high yield point amounting to at least 60 kilograms per square millimeter. The sleeper is produced by means of a moulding device shown in Fig. 1 consisting of a sheet metal mould having a bottom wall, side walls and end walls, being open at the top. In the mould two pairs of cores 3', 4' are provided for producing openings in the sleeper adapted to receive wooden plugs **3**, **4** which are inserted in the concrete body for the later attachment of rail or chair holding-down bolts. The mould **9** is shaped in conformity with the desired dimensions of the sleeper body. In each of the end walls of the mould having preferably a thickness exceeding that of the side walls, a pair of openings is provided and a cup-shaped member **10** is inserted in each opening. The bottom **11** of each of the cup-shaped members **10** has a centrally located tapped bore adapted to be engaged by the threaded end **5** of the reinforcing draw bar **2**. The cup-shaped members **10** are so screwed on both ends of the draw bars **2** that the latter are held in proper position within the mould **9** under a slight tension sufficient to prevent any undesirable displacement incidental to the process of tamping the concrete in the mould. From Fig. 5 it will be noted that the cup-shaped member **11** has a marginal flange resting on a wedge-shaped member **18** which surrounds the cup-shaped member and is placed on the slightly inclined end wall of the mould **9**.

The threads of the threaded ends **5** of the draw bars **2** have been formed by a cold rolling process. In this

rolling process, a part of the material which is displaced by the rollers to form the grooves of the thread is compressed towards the core of the bar and another portion of the material is squeezed outwardly beyond the outer diameter of the bar to form the ridges of the thread. Owing to such deformation of the material, the tensile strength thereof is considerably increased. Thus, it has been found that the draw bar which preferably consists of a natural hard steel has, in the core of its threaded ends **5**, a yield point which is per average 15 per cent, at least 10 per cent, higher than the yield point of the steel between the threaded ends **5**. The increase in tensile strength in the threaded ends has the effect of compensating for the reduced cross section of said ends. Therefore, the total tensile strength of the draw bar measured at its threaded ends **5** will be substantially the same as that measured in the central unthreaded portion.

It will be readily appreciated that the cup-shaped members **10** provide for a pair of conical pockets **6** in each of the end faces of the concrete body **1**. The pockets **6** serve to accommodate anchoring means comprising washers **7** bearing on the bottoms of the pockets and nuts **8** engaging the threaded ends **5** of the draw bars. Preferably, such nuts consist of a material of a lower hardness than that of the draw bars, for instance of standard mild steel as used for screws.

Before the mould **9** is filled with concrete, the draw bars **2** are provided with a bond-preventing coating, for instance of a bituminous material or a plastic. This coating shall prevent the bars from being firmly bonded to the surrounding concrete.

After the concrete has been compacted, the cup-shaped members **10** are unscrewed from the bars **2** and removed. The mould is then preferably deposited in an air-conditioned chamber in order to accelerate and control the setting of the concrete. After the concrete has set the sleeper body is discharged from the mould by inverting the latter and subjecting it to a slight vibration.

When the setting of the concrete has sufficiently proceeded, a tensile stress is set up in the reinforcing bars by the operation described hereinafter. For this purpose, one end of each draw bar in anchored to one end face of the sleeper body, preferably by slipping washers **7** over the ends of the bars and by screwing nuts **8** thereon. Then hydraulic rams indicated at **13** in Fig. 6 are imposed on the other end face of the body and are connected with the other ends of the draw bars. Preferably, the tubular casing **19** of each fluid-operated ram has a reduced end extending into the pocket **6** and resting upon the washer **7** placed therein, the reduced end of the tubular casing having a lateral opening **15** affording access by a suitably shaped wrench to the nut **8**. The spindle **14** of the ram is slidable within a central bore of the piston **20** thereof and is provided with a nut **21** resting on the end face of the piston **20**. Moreover, the spindle **14** has a hand wheel **16** and a tapped bore adapted to be screwed on the threaded end **5** of the bar **2**.

After the spindle **14** has been thus attached to the bar **2**, the nut **21** is tightened whereby the piston **20** is moved to its left end position and then a suitable fluid under pressure, such as oil, is admitted to the cylindrical space **13** provided in the casing **19**. For that purpose, the space **13** communicates with a pipe **22** connected to a suitable source of pressure fluid, such as a pump not shown. The pressure of the fluid adapted to be accurately controlled in such a manner as to exert a predetermined tensile stress in the draw bar **2**. As a result, the nut **8** will be lifted from the washer **7**, whereupon it is tightened by the above mentioned wrench inserted through the opening **15** until it re-engages the washer **7**.

The body **1** of concrete is then permitted, for a certain period of time, to gradually shrink under the compression produced. Therefore, I prefer to store the sleeper after the rams have been removed therefrom for a suitable period of time, for instance for a few days, and to then repeat the tensioning process described, re-attaching the ram and again setting up the required stress in the bars tightening the nuts. When no substantial further shrinking can be expected, the supply of fluid under pressure is cut off and the spindle **14** is unscrewed from each of the bars **2** and the rams are removed from the sleeper. Sub-

esquently, the pockets **6** from which the rams were removed are filled with a suitable filling medium, such as cement. The plugs **23** of cement thus formed in the pockets adhere sufficiently to the threaded ends of the bars **2** to be securely held in place. If desired, the filling material may be of a kind not subject to shrinking and adapted to adhere firmly to the wall of the pockets. The pockets **6** provided at the other end of the sleeper may be similarly filled up with concrete or any other suitable material. That may be done at any time after the assembly of the washers **7** and the nut **8**.

Instead of inserting the bars **2** in the mould **9** prior to the introduction of the concrete, rod-shaped cores of a slightly larger diameter than the bars **2** are mounted in the mould in lieu of the bars **2**. Such cores are later removed from the concrete body leaving longitudinal passages or channels therein. The steel bars **2** are then subsequently inserted in such passages. With this method the bars **2** need not be provided with any bond-preventing coating.

Preferably, however, all of the steel elements of the sleeper, such as the bars **2** and the anchoring means **7**, **8**, in order to prevent corrosion thereof, are electrically insulated from the concrete by a coherent coating consisting of an electrically insulating material, such as a bituminous material or a plastic. For this purpose, the steel elements may be initially provided with an insulating coating and, if an additional bond-preventing coating is required, the latter may be superimposed on the insulating coating.

In a preferred embodiment of my invention the concrete body **1** has a length of 7.5 to 8 ft., a width of about 1 ft. and an average height of 6 to 8". The draw bars may have a diameter of about ¾". Preferably, the tension set up in the bars of that diameter amounts to 26,000 kilograms. However, it may vary between wide limits, preferably between 20,000 kilograms and 30,000 kilograms. Accordingly, the tensile stress existing within the steel bars of the finished sleeper amounts to 97 kg./mm.^{2}, but it may vary between 75 and 112 kg./mm.^{2} depending on the yield point of the steel.

The use of the fluid-operated ram for producing the tensile stress in the draw bars offers the great advantage that the exact tensile stress produced can be accurately defined by using fluid under a predetermined accurately measured pressure. For this purpose, an ordinary pressure gauge not shown is co-ordinated to the source of fluid under pressure or to the pipe **22** communicating therewith. Experience has shown that my improved sleeper is particularly well adapted to withstand severe shocks such as are liable to destroy ordinary concrete sleepers not subject to such a high compressional stress as produced by the draw bars **2**. The use of natural hard steel offers particular advantages for such stresses, since such steel is capable of withstanding much more powerful shocks than steel hardened by the usual heat treatment. In event of severe shocks acting on my novel sleeper, the draw bars will be uniformly subjected over their entire length to the additional stress produced thereby yielding uniformly thereto, as distinguished from such reinforcing rods as are firmly bonded in the concrete in the orthodox manner. My invention is based on the discovery that it is not sufficient in the manufacture of a concrete sleeper to set up a predetermined compressional stress therein by a single operation, it being necessary, because of the

subsequent shrinking of the concrete, to renew the stresses once or several times.

The disposition of the anchoring means **5** and **7** in pockets provided in the end faces of the sleeper offers the advantage of a neater appearance of the sleeper and of a better protection of the anchoring means from damage. The use of the cup-shaped members **10** has proved to be instrumental in the provision of a simple and effective process of manufacture, since they do not only insure the proper position of the draw bars within the mould but will also protect the threads of the ends **5** of the bars from being soiled with concrete which would interfere with the later attachment of the nuts **8** and of the spindle **14**.

While I have described my invention with reference to a preferred embodiment thereof, I wish it to be clearly understood that the same is capable of numerous modifications within the scope of the appended claim. Thus, the number of draw bars provided in the sleeper may be other than two and the dimensions of the various elements and the shape thereof may be modified within wide limits.

What I claim is:

A railway track sleeper comprising a body of reinforced pre-stressed concrete, said sleeper having opposite end faces, pockets provided in each of said end faces, and arranged to form opposed pairs of pockets with one pocket of a pair being in one end face and the other pocket of a pair being in the other end face, longitudinal passages extending through said sleeper and terminating at opposite ends in the bottom of said pockets, washers bearing on the bottoms of each of said pockets, draw bars extending through said passages, each of the bars having a continuous coating of material covering the outer surface thereof and insulating said bars from said concrete, said draw bars each having threaded ends extending through the washers received in an opposed pair of pockets, and nuts on said threaded ends bearing against said washers, said threaded ends being formed by cold rolling, said draw bars consisting of a natural hard steel having within said threaded ends a tensile strength of at least 10% higher than between said threaded ends, and said bars having a yield point of at least 60 kilograms per square millimeter between said threaded ends, and a tensile stress of at least twenty thousand kilograms being applied to said draw bars through positioning of said nuts against said washers, said nuts, washers and the ends of said bars being receivetd within said pockets and the remainder of said pockets being filled with an impervious filling medium capable of adhering to the walls of the pocket and said bars and sealing said bars, threads, washer and nuts from the atmosphere.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,618,056	Charlwood	Feb. 15, 1927
2,075,633	Anderegg	Mar. 30, 1937
2,397,728	Dowsett et al.	Apr. 2, 1946
2,413,990	Muntz	Jan. 7, 1947
2,495,100	Henderson	Jan. 17, 1950
2,535,100	Sourwine	Dec. 26, 1950
2,538,437	Bagon	Jan. 16, 1951
2,538,443	Delvaux	Jan. 16, 1951