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CONSTRUCTION OF REINFORCED CONCRETE SLEEPERS ON THE RAILWAY AT HIGH-SPEED TRAIN TRAFFIC

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Abstract:
A concave support part of a reinforced concrete sleeper with ribs is proposed, which significantly contributes to a more uniform distribution of stress in the ballast prism, which has a beneficial effect on the work of the roadbed during high-speed train traffic.

Keywords: Ballast prism, earthwork, upper track structure, sleepers, embankment, recesses, geotextiles, high-speed train traffic.

1.INTRODUCTION

When rebuilding existing railways, designing and building new ones for high-speed traffic, it is necessary to solve a whole range of technical and economic problems. It is primarily the issues of ensuring the safety of train traffic, associated with the increase of the forces of interaction of way and rolling stock, with more vibration, more intensive accumulation of residual strain, reduction of service life of the main elements of the permanent way, to increase the volume of works on routine maintenance and repairs of the way [1, 2, 3, 4].

According to [5, 6], the upper structure of the track for high-speed highways should consist entirely of foreign materials and structures, since domestic ones are significantly inferior in terms of manufacturing quality and operational properties.

Reinforced concrete sleepers can experience a significant number of freezing and thawing cycles during their service life, which can lead the concrete to an extreme stress state - if the circumstances are unfavorable, such a cycle can cause damage to the concrete structure as a result of the expansion of water when freezing in its capillary pores. The resulting cracks in the sleeper under consideration propagate in all directions within each cell of the frame, without spreading to neighboring cells. But since the volume of each cell is quite large, the resulting cracks have a large extent.

Mostly metal in concrete sleepers protected from corrosion, however, the presence of cracks in the concrete from the air penetrate the carbon monoxide and chlorine, which leads to corrosion of metal, and later - to the sudden destruction of railway sleepers.

2.RESULTS AND DISCUSSION

To reduce the electrical conductivity of the sleepers and to protect the valve from external influences, high temperature, harsh environments, and as in the manufacture of sleepers from all sides of the rebar, form a protective layer of concrete, the thickness of which is assigned depending on the size of the rebar and the concrete class, the working conditions of railway sleepers and so on. On average, the thickness of the protective layer of concrete on each side of the sleeper should be at least 25 mm [7], which increases the consumption of concrete, its cost, the weight of the sleeper, and as a result, the need to use powerful crane equipment for laying the links of the rail-sleeper grid.

In the manufacture of sleepers, it is necessary to accurately install the finished spatial frame in the metal form and securely fix it in a given position, which makes this sleeper non-technological in mass production.

When laying in the path of these sleepers did not provide the necessary resistance to their movements across and along the way, including in the most difficult conditions (in italics) because of the uneven distribution of the load on the ballast can lead to erratic rainfall ways to oust ballast and sleepers rotate in a vertical plane, which reduces the service life of road between ordinary repairs.

The technical task to which the claimed solution is directed is to create a cheap, structurally and technologically simple sleeper with high accuracy of geometric parameters, high resistance to longitudinal and transverse displacements during operation and the necessary indicators of strength, wear resistance, elasticity and dielectric strength.

The solution to this problem is proposed tie, wire mesh reinforced spatial frame, which is new is that the spatial mesh frame has a honeycomb structure, is the formative element of the sleeper and are made from polymers, including polymer composite material, while the side surfaces of the sleepers made the tabs, located in the area of rail parts or in the middle of the sleepers.

The proposed design of the reinforced concrete sleeper will increase the service life and ensure the reliability of its operation on horizontal and vertical curves of the road route with an increase in the duration of inter-repair work.

Reduce the reinforcement of the reinforced concrete sleeper, its own weight, overall rigidity and increase the ability to dampen the amplitude-frequency characteristics of the rolling stock.

A concave support part of a reinforced concrete sleeper with ribs is proposed, which significantly contributes to a more uniform distribution of stress across the ballast prism, which has a beneficial effect on the work of the roadbed and artificial structures.

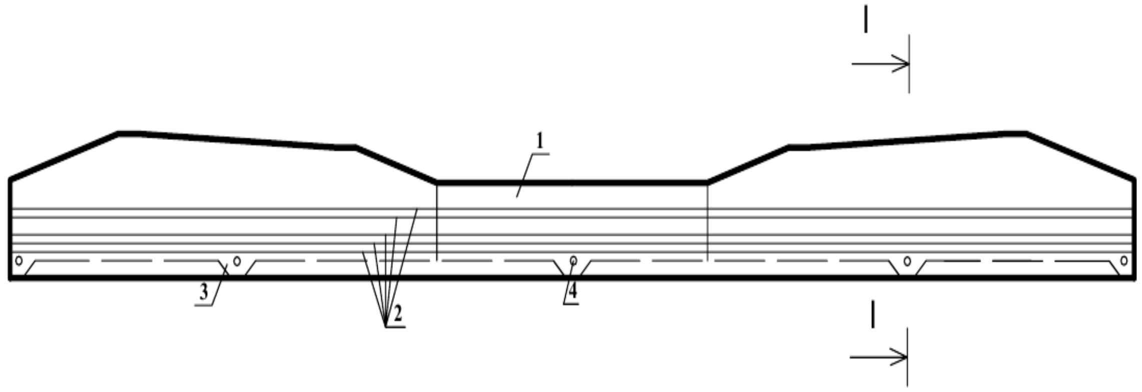

Fig. 1. Reinforced concrete sleeper with a ribbed support part

The drawing of Fig. 1 shows a general view of a reinforced concrete sleeper with a ribbed support part, Fig. 2-a top view, Fig. 3-a view of the sole of the sleeper, fig. 4-section I-I.

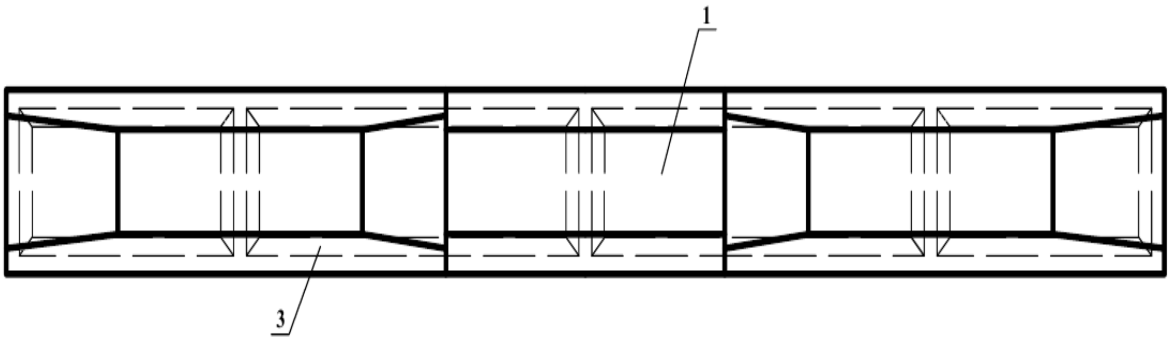

Fig. 2. Reinforced concrete sleeper with a ribbed support part.

The proposed sleeper 1, has a reduced coefficient of reinforcement (there is no one row of reinforcement, ¾ of which is used in the reinforcement of the ribs). By reducing the reinforcement 2 in the central section of the sleeper 1, its overall rigidity decreases, which increases its elasticity and helps to dampen some of the vibration vibrations from moving vehicles, especially during high-speed traffic. The hollow part of the base of the sleeper 1 and the rib 3 increases the contact area of the sleeper and the ground of the ballast prism, which leads to a more uniform distribution of stress. To ensure full contact ribbed basic parts sleepers 1 and soil ballast must vibration impact during installation of rail-sleeper grid that increases the strength of the ballast section, the effects of vibration and horizontal load.

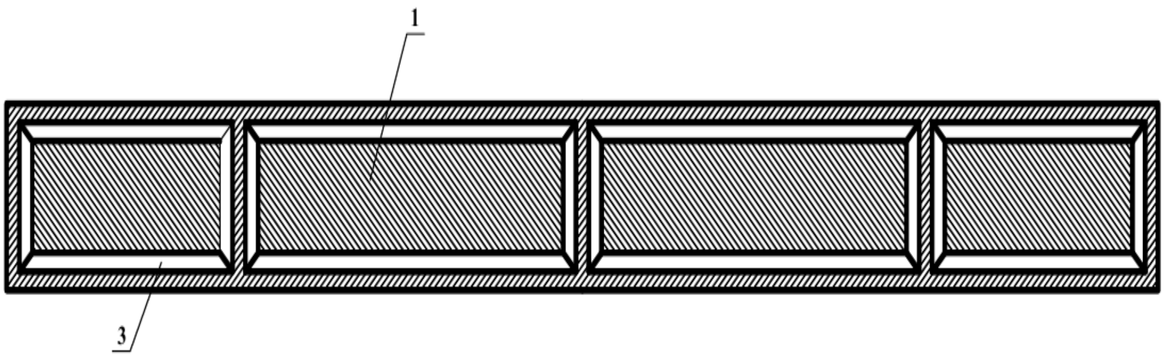

Fig. 3. Reinforced concrete sleeper with a ribbed support part.

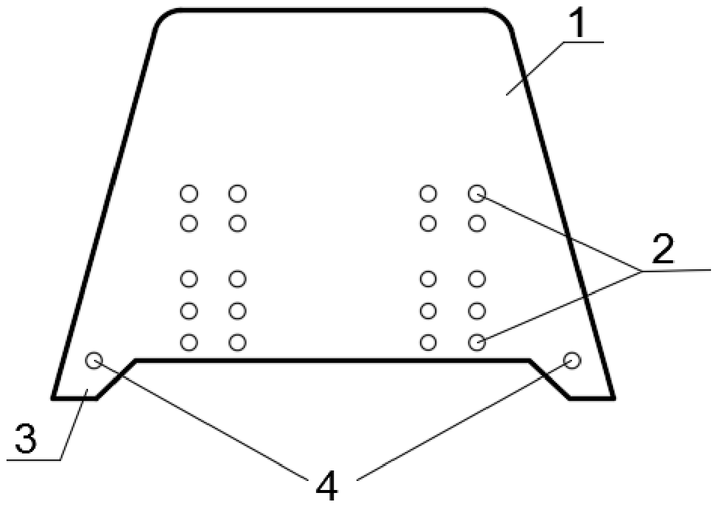

Fig. 4. Reinforced concrete sleeper with a ribbed support part.

The reinforcement 4 in the ribs 3 of the sleeper 1 ensures their safety from shear forces arising on the horizontal and vertical curves of the road route, and also preserves the sleeper 1 from the action of vertical shock loads of the rolling stock. All this leads to a stable operation of the upper structure of the track and increases the time between repairs will give a reasonable economic effect in the operation of the railway.

3.CONCLUSION

The proposed structural changes of the reinforced concrete sleeper with a ribbed support surface allows increased resistance on the horizontal curves of the road route from centrifugal forces, and also reduces the shear deformations of the sleeper grid on the sections of ascent or descent from the braking of the rolling stock. The concave part of the sleeper support increases the angle of load transfer to the ballast prism, which reduces the stress in the latter, which means that the stress on the roadbed is also reduced, i.e. the compression layer in the roadbed decreases and, accordingly, the sediment of the roadbed will decrease during high-speed train traffic. Reducing the reinforcement of the reinforced concrete sleeper, its own weight, and stiffness increases the ability to dampen the amplitude-frequency characteristics of the rolling stock.

REFERENCES

1. Kiselev I. P. Vremya stroit VSM / I. P. Kiselev / / Transport construction. - 2007. - No. 1. - p. 12-17.
2. Zhinkin, G. N., and Prokudin, I. V., Study of the behavior of the ground surface at v < 200 km/h, LIIZhT. – 1976.
3. Zhinkin G. N., Prokudin I. V. Study of ground vibrations in high-speed train movement / / LIIZhT – - 1976.
4. Kozlov I. S. Influence of the design of intermediate fasteners on the bearing capacity of the earthen bed of high-speed railway lines. / Dissertation for the degree of Candidate of Technical Sciences. / PGUPS. SPb., - 2009. p. - 166.
5. Nikonov A.M. Upper structure of the high-speed highway path / A.M. Nikonov, E. A. Manyugina / / Trudy IV nauch. - tehn. conference with international participation "Modern problems of railway track design, construction and operation". Moscow, MIIT. – 7-8 November 2007. - p. 217-218.
6. Nikonov A.M. Verkhneye stroenie putei dlya VSM [The upper structure of the path for the HSR]. conference with international participation "Modern problems of railway track design, construction and operation". Moscow, MIIT. – November 19-20, 2008. - p. 183-185.
7. GOST 33320 -2015. Reinforced concrete sleepers for railways. General technical conditions. Moscow. 2016