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Assurance of operate reliability of rolling stock

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The safety of movement of rolling stock is mainly related to operate reliability of conjugated parts of running carriages which are characterized by their ability of no failure operation in complex conditions of service and have a sufficient high strength and wear resistance. Variation of the characteristics of components because of irregular wear has an effect on a decrease of reliability function pairs operation, since the interaction of many main components of running carriages is realized through the contact surface of small area[1-3].

The prediction of reliability and service life of movable joints was considered on the example of friction oscillations dampers in the unit of truck axle box suspension of passenger cars, operating in heavy conditions of loading. The main elements (Fig. 1) of dampers are friction splinton sleeve (1), friction slide blocks (2) and friction pressing rings (3,4). Wear of these components has a negative effect on the operation not only on the damper itself but on the system as a whole.

The investigation of friction damper components offer repair showed that the wear of many components was from 1.5 mm to 5 mm.

The determination of properties of components the analysis of microstructure and investigation of hardness of the worn out details of various complete sets of the units, made of steel 45 and subjected to heat treatment was carried out. There are scores of depth up to 0.5 mm on mated surfaces. Hardness of friction splinton sleeves made 29-34 HRC, and the friction slide blocks and friction pressing rings was 41-46 HRC. Metallographic researches have shown that the hardened layer is completely worn out at the majority of details, there are inclusions of ferrite in structure of the metal and surface hardness does not provide required wear resistance.

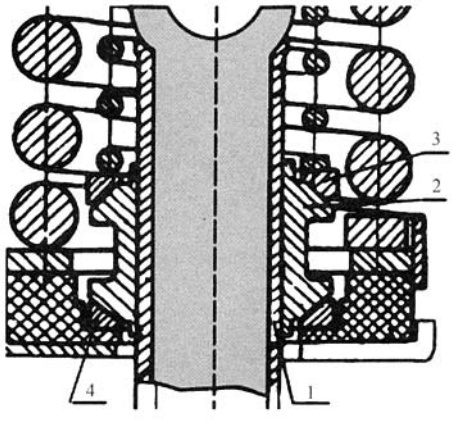

Fig. 1 The components of friction damper

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The worn out friction surfaces of friction splinton sleeves (Fig. 2), friction slide blocks (Figs. 3,4) and friction pressing rings (Fig. 5) are shown in Figs. 2,3,4 and 5, where one can see the areas of friction surfaces setting, their irregular wear and friction slide block edges break off.

The above enumerated data prove that for new components the friction slide blocks movement along friction splinton sleeve is rather stable without seizing and impact. In the process of exploitation the friction splinton sleeve is intensively worn out of true and because of this friction slide blocks are jammed that entails the change of hysteresis of friction damper.

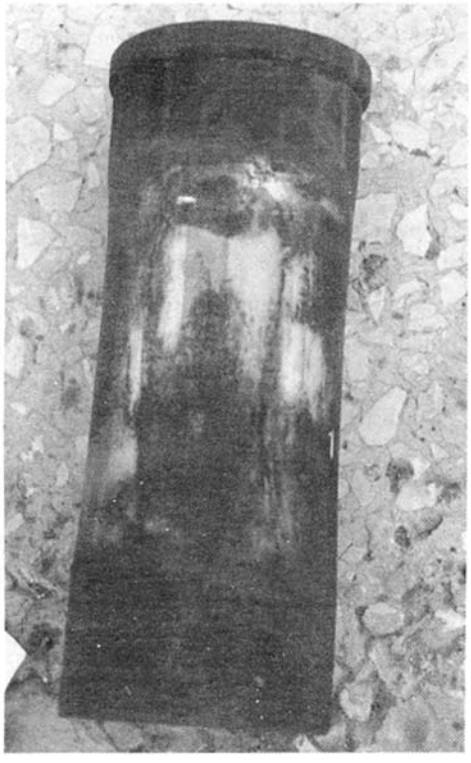

Fig. 2 The wear of friction splinton sleeve

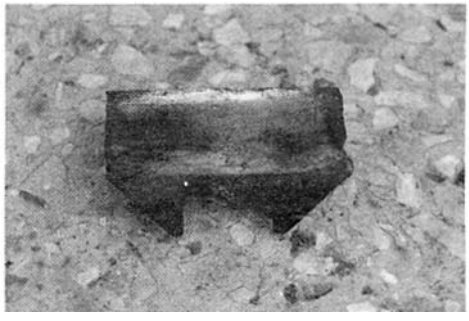

Fig. 3 The wear of friction slide block

Fig. 4 The wear of friction slide block

Fig. 5 The wear of friction pressing ring

The existing structures of friction oscillations dampers have the essential disadvantages, which come from that the contact plots of conjugated surfaces and depend upon the mutual position of friction slide block and friction splinton sleeve. The investigations showed that the contact of the slide block with the sleeve is accomplished on the conical surface. The displacement of the slide blocks up or down changes the surface of fitting to the sleeve owing to changing the sleeve radius. That assures the contact on a variable surface that is peculiar to the contact and leads to irregular wear of friction surfaces that is the cause of unstable operation of the oscillations dampers, which is bound up with seizing and impacts.

Only the replacement of the conical surfaces by flat ones allows to prevent an irregular wear to raise operation life of the friction pair, to assure its stability and to facilitate significantly the conditions friction (Fig. 6) [4].

Such a replacement will bring to that area of contact surface of the friction pair "slide block-sleeve" re-

mains contact on the whole way of transposition of the friction slide block in the process of accenting and lowering of a wing of the axle box in spite of unevenness of railway track ear vibrations.

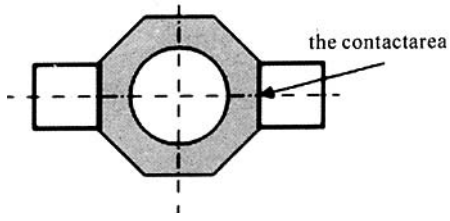

Fig. 6 The change of contact area

Conclusions

The change of contact surface allows to assure the constant and maximum possible surface area of the friction pair "slide block sleeve", as well as to assure an uniform wear of friction surfaces, to raise the operation reliability, to prevent the setting and seizing, and as a result to increase a vehicle run between repairs up to 50% and decrease the expenditures for repair.

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