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New feature of the solution of a Timoshenko beam carrying the moving mass particle.
(English) [Zbl 1269.74135](#)
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Summary: The paper deals with the problem of vibrations of a Timoshenko beam loaded by a travelling mass particle. Such problems occur in a vehicle/track interaction or a power collector in railways. Increasing speed involves wave phenomena with significant increase of amplitudes. The travelling speed approaches critical values. The moving point mass attached to a structure in some cases can exceed the mass of the structure, i.e. a string or a beam, locally engaged in vibrations. In the literature, the travelling inertial load is often replaced by massless forces or oscillators. Classical solution of the motion equation may involve discussion concerning the contribution of the Dirac delta term, multiplied by the acceleration of the beam in a moving point in the differential equation. Although the solution scheme is classical and successfully applied to numerous problems, in the paper the Lagrange equation of the second kind applied to the problem allows us to obtain the final solution with new features, not reported in the literature. In the case of a string or the Timoshenko beam, the inertial particle trajectory exhibits discontinuity and this phenomenon can be demonstrated or proved mathematically in a particular case. In practice, large jumps of the travelling inertial load is observed.

MSC:

[74K10](#) Rods (beams, columns, shafts, arches, rings, etc.)
[74H45](#) Vibrations in dynamical problems in solid mechanics

Cited in **6** Documents

Keywords:

[moving mass](#); [travelling inertial load](#); [Timoshenko beam](#); [Lagrange equation](#)

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