Laminated nanoelastomeric structures for antivibration devices

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Rubber and rubberlike materials (elastomers) have a capability of absorbing input energy much better than other construction materials, therefore elastomers are widely used in manufacturing of the antivibration and compensating devices, shock-absorbers, joints, ets.

Laminated elastomeric structures (reinforced elastomers) consist of alternating thin layers of rubber and adhesive–bonded reinforcing layers of much more rigid material (usually metal); geometric shapes and number of layers may be different, at least three (Fig.1). The main aim of such devices designing is to achieve optimal mechanical properties required for specific applications. The mechanical properties of rubber which are necessary for the optimal design of antivibration devices are next: bulk modulus of compression, dynamic and static shear modulus, energy dissipation factor; characteristics "force – displacement" are calculated based on these properties. In this work the variational method of obtaining the stiffness characteristics is described based on Ritz method, using the principle of minimum of total potential energy of deformation. The weak compressibility of the rubber elements and deformation of intermediate non-elastomeric layers are taking into account. It is shown, that instead of traditional rubber more advantageous to use the rubber with sulfur nanoparticles, as well as graphite-rubber, offered by Panasonic Poly Technology Company, with termal conductivity factor is 20 W/m*K. As an example the flat multi-layered package of rectangular form under axial compression is presented.

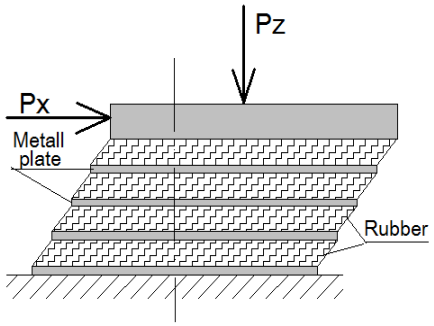

Fig.1 Package of flat-type thin-layered rubber-metall elements under compression and shear loading.

References

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