

## Dynamic vibration absorber for shaft machining

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**Abstract.** The article is concerned with a new method that minimizes the vibration level of non-rigid axisymmetric parts on lathes. A schematic diagram of the vibration absorber control path is given. Its configuration is changing due to fictitious elastic stiffness parameters, as well as damping and the part-support subsystem weight. A functional dual circuit diagram of an automatic vibration level control system for non-rigid shafts machining is presented and its working principle is described

Cutting process is the main source of forced vibrations in the operation of metal-cutting machines. It is possible to minimize vibration during cutting in various ways. These are relatively simple process techniques and special vibration absorbers. Vibrations can also be reduced by increasing the rigidity of the TOS (machining process system), using tools with improved geometry, optimizing cutting modes, and using dynamic vibration absorbers. The disadvantage of a dynamic vibration absorber is that it operates only at a certain frequency that corresponds to its resonant mode. Linear dynamic vibration absorbers that restore the elastic suspension forces are effective only in the case of strictly fixed excitation frequencies of rigid parts of the shaft type, and therefore their use is limited [2, 3, 4]. Even minor changes in the frequency of vibration sharply reduce the effectiveness of its operation, since it is removed from the resonant mode. Linear dynamic vibration absorbers that restore the elastic suspension forces are effective only in the case of strictly fixed excitation frequencies of rigid parts of the shaft type, and therefore their use is limited [6]. It is advisable to use such vibration absorbers in systems that have a time-constant vibration spectrum. Vibration absorbers equipped with automatic control systems are the most efficient in terms of minimizing the level of vibrations [1, 5]. The use of nonlinear elastic elements in dynamic absorbers slightly expands the scope of their application. If the parameters of the absorber are selected properly it allows preventing the unacceptable resonant vibrations in the process of shafts machining in a wider range of excitation frequencies. However, when the excitation frequency changes over a wider range (for example, in transient modes), nonlinear dynamic vibration dampers also turn out to be ineffective, and in these cases, it is advisable to design controlled vibration absorbers with automatic frequency adjustment [5]. Changing fictitious parameters method is proposed of the part-support system using a feedback loop to ensure minimization during cutting. The schematic diagram of the system under consideration is shown in Fig. 1.

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# Shaft Vibration Absorber

**J. P. Den Hartog**



## **Shaft Vibration Absorber:**

*Dynamic Vibration Absorbers* Boris G. Korenev, Boris Grigor'evich Korenev, Leonid M. Reznikov, 1993-11-02 A detailed and extensive description regarding the theory of passive dynamic absorbers not requiring additional energy sources Considers the peculiarities in solving vibration absorption problems using the simplest double mass linear model of the protected structure and absorber Examines design schemes and offers data on the efficiency of complicated absorber models Deals with the problems of vibration damping of continuous and multimass systems Describes practical applications of the vibration protection theory for various constructions and objects *Mechanical Vibrations, 2nd Edition* Mehta J.S. and Kailey A.S., Written specifically for the students of Mechanical Engineering Mechanical Vibrations is a succinctly written textbook Without being verbose the textbook delves into all concepts related to the subject and deals with them in a laconic manner Concepts such as Freedom Systems Vibration Measurement and Transient Vibrations have been treated well for the student to get profounder knowledge in the subject **The Engineering of Sport** Steve Haake, 1996-01-01 Science and technology has been used more and more in the last few decades to gain advantage over competitors Quite often however the actual science involved is not published because a suitable journal cannot be found The Engineering of Sport brings together work from a very diverse range of subjects including Engineering Physics Materials and Biomechanics The Engineering of Sport represent work which was represented at the 1st International Conference on the Engineering of Sport held in Sheffield UK in July 1996 Many sports were represented and the material covered split into nine topics covering aerodynamics biomechanics design dynamics instrumentation materials mechanics modelling motion analysis and vibrations It should be of interest to specialists in all areas of sports research **Mechanical Vibrations** J. P. Den Hartog, 2011-03-23 This book grew from a course of lectures given to students in the Design School of the Westinghouse Company in Pittsburgh Pa in the period from 1926 to 1932 when the subject had not yet been introduced into the curriculum of our technical schools From 1932 until the beginning of the war it became a regular course at the Harvard Engineering School and the book was written for the purpose of facilitating that course being first published in 1934 In its first edition it was influenced entirely by the author's industrial experience at Westinghouse the later editions have brought modifications and additions suggested by actual problems published in the literature by private consulting practice and by service during the war in the Bureau of Ships of the U S Navy The book aims to be as simple as is compatible with a reasonably complete treatment of the subject Mathematics has not been avoided but in all cases the mathematical approach used is the simplest one available In the third edition the number of problems has again been increased while the principal changes in the text concern subjects in which recent advances have been made such as airplane wing flutter helicopter ground vibration torsional pendulum dampers singing ships propellers and electronic instruments **Official Gazette of the United States Patent Office** United States. Patent Office, 1971 **Principles of Automotive Vehicles** United States. Department of the Army, 1956 Technical

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