

LINKS OF NON-FREE MECHANICAL MAN-MADE SYSTEMS

P. D. Balakin

Omsk State Technical University,
Russia, Omsk, Mira Ave., 11, 644050

The paper gives a complete classification of the links of non-free mechanical technogenic systems. It is shown that the joint use of holonomic and non-holonomic constraints in mechanical systems allows the creation of systems with adaptive properties.

The main method of synthesis of such systems is an additional motion to the main motion of the links, which can be either a small motion of self-adjustment or elastic deformation, or significant coming from the control circuit integrated in the system.

Keywords: mechanical system; additional to the main movement of the links; built-in control circuit.

References

1. Balakin P. D., Zgonnik I. P. Dlinnokhodovyye mekhanizmy s minimal'noy bokovoy reaktsiyey v postupatel'noy pare [Long-stroke mechanisms with minimal side reaction in the translational pair] // Omskiy nauchnyy vestnik. Ser. Aviatcionno-raketnoye i energeticheskoye mashinostroyeniye. *Omsk Scientific Bulletin. Series Aviation-Rocket and Power Engineering*. 2018. Vol. 2, no. 1. P. 17–21. DOI: 10.25206/2588-0373-2018-2-1-17-21. (In Russ.).
2. Gappoyev T. T., Golobokov M. G. Strukturnyy analiz i klassifikatsiya ustroystva preobrazovaniya vrashchatel'nogo dvizheniya v vozvratno-postupatel'noye i naoborot [Structural analysis and classification of the device for conversion of rotary motion into reciprocating motion] // Izvestiya Gorskogo gosudarstvennogo agrarnogo universiteta. *Proceedings of Gorsky State Agrarian University*. 2013. Vol. 50, no. 2. P. 186–189. (In Russ.).
3. Kozhevnikov S. N. Osnovaniya strukturnogo sinteza mekhanizmov [Foundations of structural synthesis of mechanisms]. Kiev: Naukova dumka Publ., 1979. 232 p. (In Russ.).
4. Reshetov L. N. Samoustavnivayushchiyesya mekhanizmy: Spravochnik [Self-aligning mechanisms: Handbook]. Moscow: Mashinostroyeniye Publ., 1985. 272 p. (In Russ.).
5. Balakin P. D., Zgonnik I. P. Mekhanicheskiye avtovariatory v privodakh transportnykh mashin [Mechanical Variators in the Drives of Transportation Vehicle] // Izvestiya vysshikh uchebnykh zavedeniy. *Mashinostroyeniye. Proceedings of Higher Educational Institutions. Machine Building*. 2016. No. 1 (670). P. 65–70. (In Russ.).
6. Balakin P. D. Automatic control of the preload in adaptive friction drives of chemical production machines // AIP Conference Proceedings. 2017. Vol. 1876, Issue 1. DOI: 10.1063/1.4998842. (In Engl.).
7. Soltakhanov Sh. Kh. Osnovy mekhaniki golonomnykh i negolonomnykh sistem [Fundamentals of mechanics of holonomic and non-holonomic systems]. Moscow: FIZMATLIT Publ., 2013. 184 p. ISBN 978-5-9221-1455-4. (In Russ.).
8. Zegzhda S. A., Soltakhanov Sh. Kh., Yushkov M. P. Negolonomnaya mekhanika. Teoriya i prilozheniya [Non-holonomic mechanics. Theory and applications]. Moscow: FIZMATLIT Publ., 2009. 344 p. ISBN 978-5-9221-1080-8. (In Russ.).
9. Lobov N. A. Nekotoryye zamechaniya po dinamike negolonomnykh sistem [Some remarks on the dynamics of non-holonomic systems] // Vestnik MGTU im. N. E. Baumana. Ser. «Mashinostroyeniye». *Herald of the Bauman Moscow State Technical University*. 2005. No. 2. P. 118–125. (In Russ.).
10. Shemelova O. V. Uravneniya dinamiki upravlyayemykh sistem s negolonomnymi svyaziyami [Equations of dynamics of controlled systems with nonholonomic constraints] // Vestnik Kazanskogo tekhnologicheskogo universiteta. *Herald of Kazan Technological University. Series «Mechanical Engineering»*. 2013. Vol. 16, no. 12. P. 285–288. (In Russ.).

BALAKIN Pavel Dmitriyevich, Doctor of Technical Sciences, Professor, Head of Machine Science Department.

SPIN-code: 5494-0218

AuthorID (RSCI): 267798

AuthorID (SCOPUS): 57191041281

Address for correspondence: tmm@omgtu.ru

For citations

Balakin P. D. Links of non-free mechanical man-made systems // Omsk Scientific Bulletin. Series Aviation-Rocket and Power Engineering. 2018. Vol. 2, no. 3. P. 9–12. DOI: 10.25206/2588-0373-2018-2-3-9-12.

Received 29 May 2018.

© P. D. Balakin