намометрического ключа является технологически простой операцией как при наладке нории, так и в процессе эксплуатации. По точности он не уступает используемому иностранными фирмами контролю натяжения, путем снятия в определенной точке ленты ковша и установке приспособления, измеряющего фактический прогиб ленты под действием расчетного усилия на натяжном винте приспособления.

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2. Иванов М.Н. Детали машин / Иванов М.Н. // – М.; «Высшая школа» - 1984: 336 с.

Приведена методика контролю натягу та конструкції механізмів натягу стрічки високопродуктивних норій значної висоти. Приведена конструкція пристрою для реалізації потрібного значення початкового натягу стрічки.

Methods over of control and fundamental charts of tensioners of ribbon are brought for high-performance norias of large height. A construction over of device for realization of necessary values of preliminary pull of ribbon is brought.

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PARAMETRICAL OPTIMIZATION OF BRONZE SLIDING BEARINGS TRIBOSURFACES FORMATION PROCESS

V.S.Martsynkovskyi, Ph.D, assist. professor, Sumy National Agrarian University
V.B.Tarelnik, Doctor of Sciences, Professor, Sumy National Agrarian University
I.V.Konoplianchenko, Ph.D, assist. Professor, Sumy National Agrarian University

In article on the basis of the lead researches the technique and the algorithm is developed of optimum modes definition of formation at side and entrance edges of a bronze bearing surface the additional microrelief consisting of the combined electroerosive covering of structure is made: silver+copper+babbit+silver. The thickness of the combined electroerosive covering, which corresponding electroerosive alloying optimum modes is defined.

Raising of problem is in a general view.

Failure of the machines parts which are being contact at maintenance, is consequence of different kinds physical depreciation: fatigue failures, creep of materials, mechanical depreciation, corrosion, erosion, cavitation, ageing of a material, etc.

The most widespread cause defunctionability of parts and machines end-effector is not breakage, this cause is deterioration and damage of their working surfaces. Thus, products life cycle directly depends on quality of their surfaces which is defined by geometrical characteristics and physicomechanical properties of a surface layer.

Analysis of earlier researches and publications.

In [1] is offered the method of coatingon on bronze plain bearings liners (PBL) alignment coverings of structure: silver + copper + babbit. Alignment coverings are coatingon by a electroerosive alloying method (EEA) with the purpose of durability PBL increase.

In [2] is developed the technique of optimization EEA modes which are necessary for formation on PBL surfaces alignment coverings above specified structure.

In [3] is offered the new way of formation on PBL friction surfaces, by EEA method, the special relief which increasing reliability of work due to increase carrying capacity ability of the combined electroerosive covering (CEEC). The way is realized as follows.

On PBL working surface (fig. 1), by EEA method and means of an electrode-tool, plate electroerosive covering from silver, copper and tin babbit. Thus parameters such as energy of discharge and productivity EEA get out of the table 1.

As per offered method the layers of electroerosive coverings PBL plate in different directions - lengthways, across and the least corner to a surface of the liner (fig. 2).

It is necessary to note, formation of a special regular microrelief is being by process EEA.

Besides at sides and entrances edges are formed the lines of an additional microrelief (fig. 3).

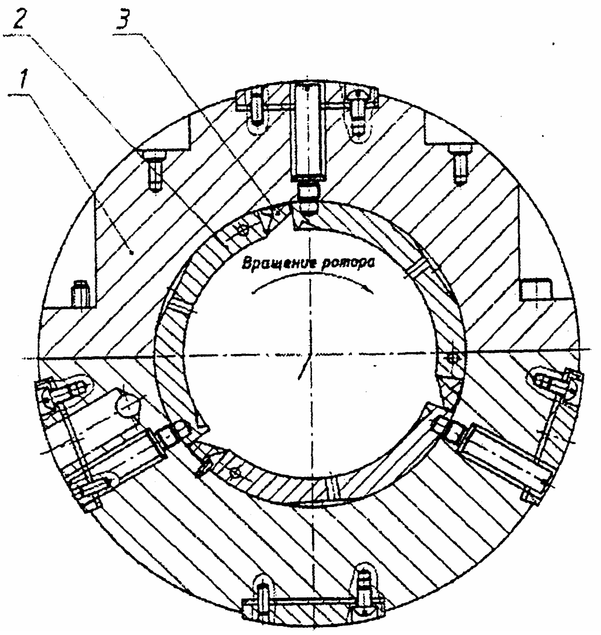


Figure 1. The damping pedestal bearing, top view: 1 - bearing body, 2 - PBL, 3 – scrapers

Table 1

Optimum modes EEA and layers thickness at formation CEEC of structure: silver + copper + babbit

№	Electrode material	Energy of discharge W_p, J	Productivity EEA T, min/sm^2	Layers thickness h_l, mkm
1	silver	0,2	1,3	15
2	copper	0,17	1,35	16
3	babbit B 83	0,02	2,2	30

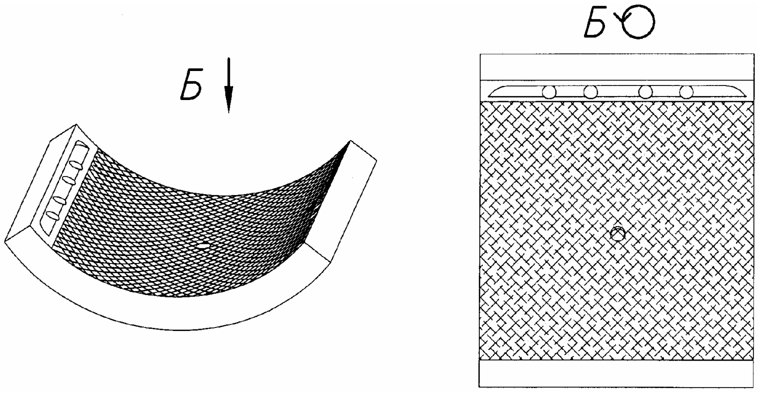


Figure 2. PBL with a special microrelief of a surface

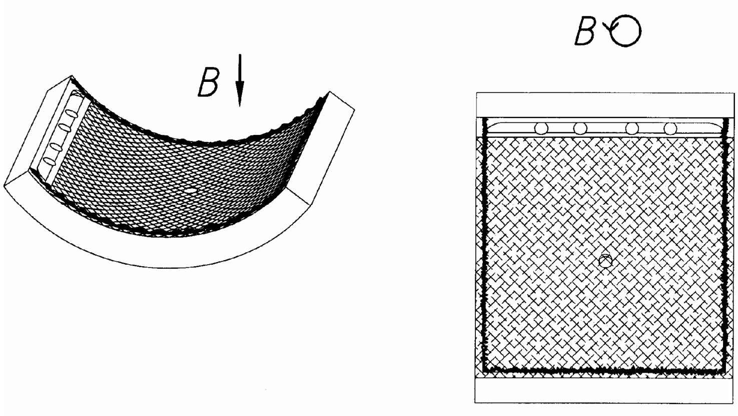


Figure 3. The bearing liner with a additional lines of microrelief

Increase of carrying capacity is explained by curves of pressure in the bearing, where the line a - is pressure on PBL with a smooth surface before plate CEEC, b - pressure on PBL with CEEC and with the generated microrelief, c - pressure on PBL with CEEC, which is generated by a microrelief and with additional lines of a microrelief on edges (fig. 4).

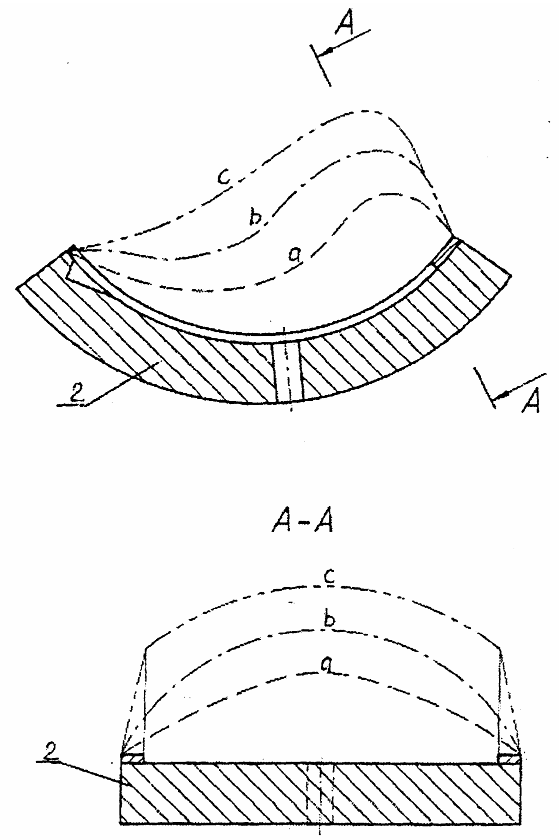


Figure 4. The curves of pressure in the sliding bearing with a different variants of manufacturing PBL

Apparently in last variant type PBL we have upper pressure, that promotes increase carrying capacity ability

Optimization of EEA modes at CEEC plate is in detail enough described in [2] and the received optimum modes are resulted in tabl. 1.

Formulation of aims of the article (raising of task).

Thus, **the purpose** of present article is EEA modes optimization for formation at sides and entrances edges PBL the lines of an additional microrelief.

Materials and research methods.

TECHNIQUE OF RESEARCHES

Researches were spent on equipment EEA of model «EIL - 8A» with use of samples sizes 10x10x8 mm from bronze OSC 5-5-5. Thickness of a covering layer measured by a micrometer, and a surface roughness measured on the device profilograph- roughness indicator models “201” of a factory "Calibre" by removal and processings profile records. Productivity of process (T) EEA defined as necessary time of 100 % continuity coverings at surface of the sample 10x10 mm. At EEA bronze samples used electrodes from soft antifrictional materials: silver, copper and babbit B83.

RESULTS OF RESEARCHES

Results of dependence of a surface roughness (Ra), layer covering thickness (h_l) and EEA process productivity (T) from energy of discharge (W_p), at plate babbit on bronze PBL with a covering from silver and copper, which have been generated according to modes in tabl. 1, are presented in tabl. 2. Besides in tabl. 2 are presented results of the same parameters (Ra, h_l and T) after babbit coverings burnishing by electrode from silver at W_p = 0,04J. In this case babbit, as more fusible material, is melt and fill the grains and microroughnesses, before generated covering, reducing a roughness and thickness of a covering layer.

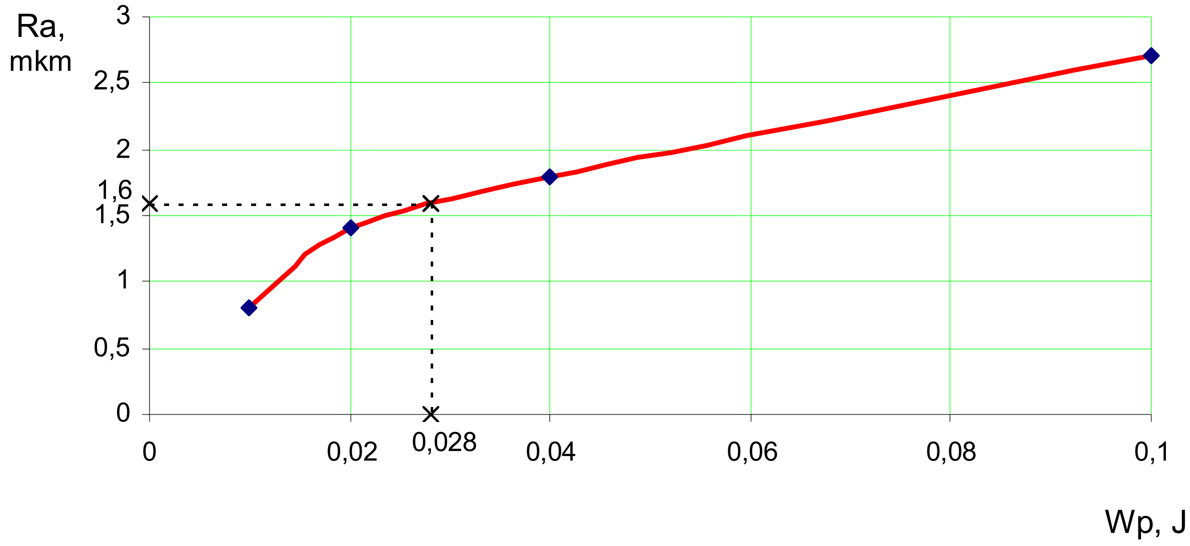
On fig. 5 are presented dependences of a surface roughness (a) and layer thickness (b) from energy of discharge at silver burnishing of a bronze surface sample with CEEC from silver, copper and babbit.

Table 2

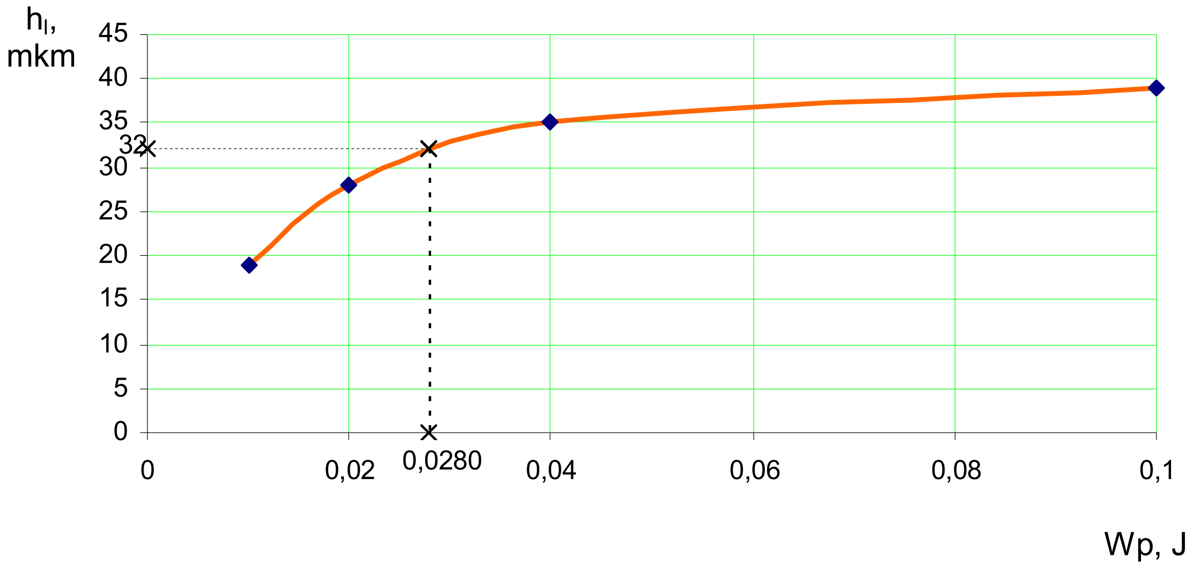
Dependence Ra, h_l and T at babbit plate on bronze samples with a covering from silver and copper with next burnishing by silver from energy of discharge W_p

Parameter	Electrode material	Energy of discharge W_p , J			
		0,01	0,02	0,04	0,1
Ra, mkm	babbit B83	0,9	1,6	2,5	4
h_l, mkm		20	30	41	48
T, min/sm^2		2,5	2,2	1,8	1,2
	silver	W_p = 0, 04 J			
Ra, mkm		0,8	1,4	1,8	2,7
h_l, mkm		19	28	35	39
T, min/sm^2		2,7	2,7	2,7	2,7

Under the graph (fig. 5) it is possible to define energy of discharge and the covering thickness which corresponds roughness Ra = 1,6 microns.



a



b

Figure 5. Dependences Ra and h_l from W_p at silver burnishing of a bronze surface sample with CEEC from silver, copper and babbit.

On the received energy of discharge (fig. 6) we define a surface roughness (a), layer thickness (b) and productivity EEA (c) at plate a covering from babbit.

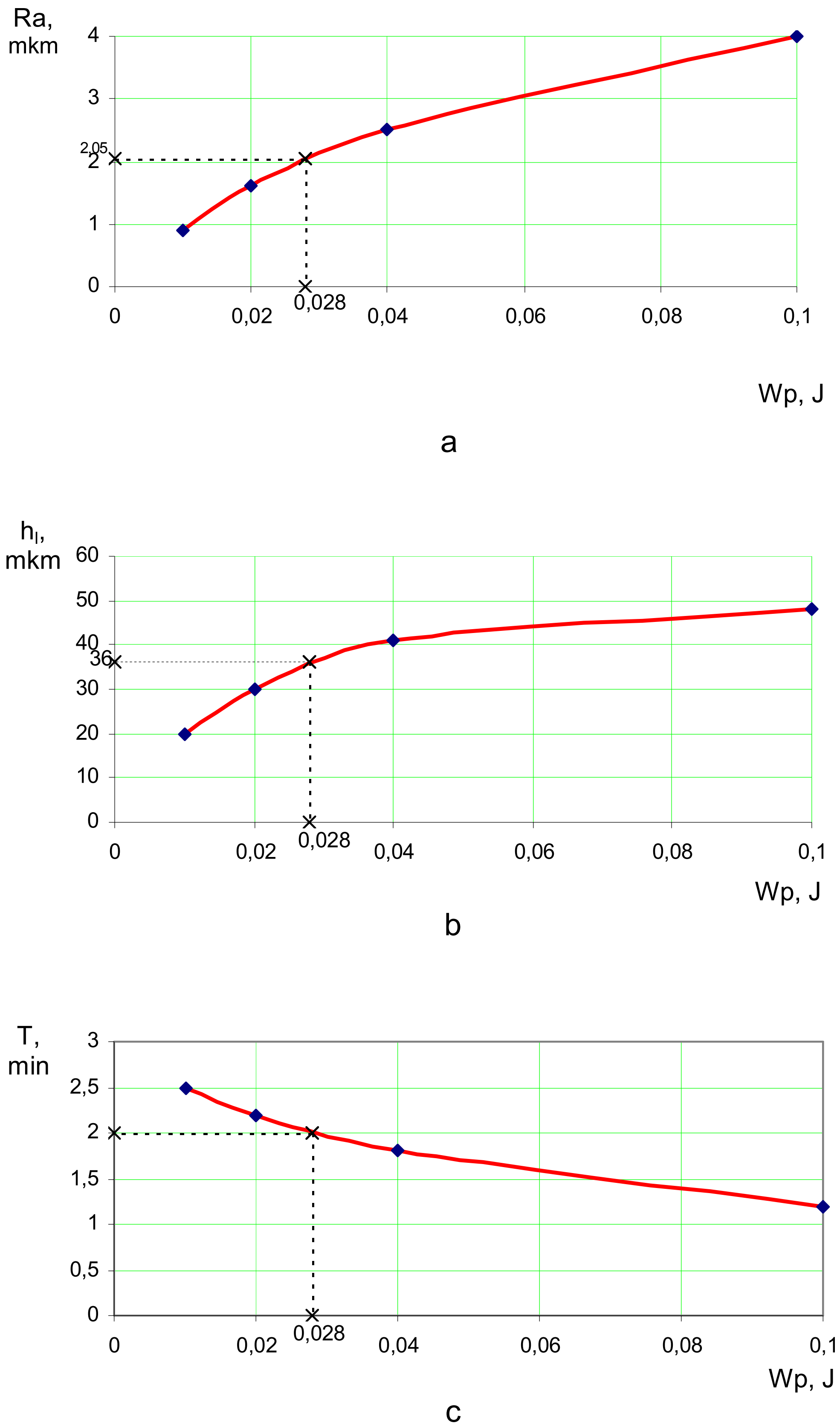


Figure 6. Dependences a surface roughness (a), layer thickness (b) and productivity EEA (c) at plate a babbit covering from energy of discharge .

Results of the lead researches are presented in tabl. 3.

Table 3

Optimum modes EEA and layers thickness at formation CEEC of structure: silver + copper + babbit + silver

№	Electrode material	Energy of discharge W_p, J	Productivity EEA T, min/sm^2	Layers thickness h_l, mkm
1	silver	0,2	1,3	15
2	copper	0,17	1,35	16
3	babbit B 83	0,028	2,0	36
4	silver	0,04	2,7	32

Thus, the technique of optimum modes definition of formation at side and entrance edges of a bronze bearing surface the lines of additional microrelief can be presented in the form of algorithm.

The essence of algorithm consists in the following

1. Experimental dependences Ra = f (Wp) and T = f (W_p) are by defined at EEA bronze by silver.

2. Under dependence Ra = f (Wp) graph is defined the optimum energy of discharge W_p corresponding roughness Ra = of 1,6 microns.

3. Under dependence T = f (Wp) graph we define productivity EAA, which corresponds optimum energy of discharge W_p.

4. By experimental we define dependences Ra = f (Wp) and T = f(Wp) at EEA plate silver by copper.

5. Under dependence Ra = f (Wp) graph is defined the optimum energy of discharge W_p corresponding roughness Ra = of 1,6 microns.

6. Under dependence T = f (Wp) graph we define productivity EAA, which corresponds optimum energy of discharge W_p.

4. By experimental we define dependences Ra = f (Wp) and T = f(Wp) at EEA plate silver by babbit B83.

8. Under dependence graph Ra and h_l from W_p, at silver burnishing of a bronze surface sample with CEEC from silver, copper and babbit we can define energy of discharge and thickness of a covering which corresponds to roughness Ra = 1,6 microns.

9. On the received energy of discharge we define productivity EAA and layers thickness at plate a covering from babbit.

Conclusions

On the basis of the lead researches it is possible to draw following conclusions:

1. The technique and the algorithm is developed of optimum modes definition of formation at side and entrance edges of a bronze bearing surface the additional microrelief consisting of the combined electroerosive covering of structure is made: silver + copper + babbit + silver.

2. The thickness of the combined electroerosive covering, which corresponding electroerosive alloying optimum modes is defined.

Literature

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У статті розглянуті методи підвищення надійності та довговічності підшипників ковзання які полягають в нанесенні на поверхні бронзових вкладишів комбінованих електроерозійних покриттів та формування спеціального мікрорельєфу.

Метою дійсної роботи є оптимізація режимів електроерозійного легування для формування на бічних і вхідних краях вкладишів підшипників смуг додаткового мікрорельєфу.

На підставі проведених досліджень розроблена методика й складений алгоритм визначення оптимальних режимів формування на бічних і вхідних краях поверхні бронзових вкладишів підшипників смуг додаткового мікрорельєфу, що складає з комбінованого електроерозійного покриття складу: срібло+мідь+бабіт+срібло. Визначено товщину комбінованого електроерозійного покриття, що відповідає оптимальним режимам електроерозійного легування.

В статье на основании проведенных исследований разработана методика и составлен алгоритм определения оптимальных режимов формирования на боковых и входных краях поверхности бронзовых вкладышей подшипников полос дополнительного микрорельефа, состоящего из комбинированного электроэрозионного покрытия состава: серебро+медь+баббит+серебро. Определена толщина комбинированного электроэрозионного покрытия, соответствующая оптимальным режимам электроэрозионного легирования.

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