83294
S/138/59/000/010/006/010
A051/A029

15.9130

AUTHORS: Boguslavskiy, D.B.; Dostyan, M.S.; Uzina, R.V.

TITLE: The Application of Carboxyl-Containing Latexes in the Impregnation of Tire Cord. Communication 2

PERIODICAL: Kauchuk i Rezina, 1959, No. 10, pp. 27 - 32

TEXT: Brief reference is made to the first of two articles, where the results of carboxyl-containing latex synthesis and the application of these latexes to increasing the bond stability of rubber-fabric systems (Ref. 1) was discussed. The importance of selecting the right dosage of resorcin-formaldehyde resin in developing the composition of the impregnating materials was stressed, since the adhesiveness and the physico-mechanical properties of the viscose cord depend on it. Figure 1 shows that with an increase in the dosage of the resin in the latex the bond strength of the rubber and the cord increases. The tensile strength and the impact-resistance decreases with an increase in the non-uniformity of the cord resistance. The optimum dosage which would guarantee sufficient adhesiveness of the cord in carboxyl-containing latexes without noticeable changes in the physico-mechanical properties and in the fatigue stability was found to be 12 weight parts of

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The Application of Carboxyl-Containing Latexes in the Impregnation of Tire Cord. Communication 2

resorcin-formaldehyde resin to 100 weight parts of rubber. The effects of the pH value, drying temperature and new impregnating compositions of the cord on the bond stability of the rubber-cord and the tire quality were investigated. Impregnating compositions based on carboxyl-containing latexes of the divinyl-styrene and divinyl type were studied. Rubbers based on CKC-30AM(SKS-30AM), natural rubber and CKB (SKB) were produced. The experimental conditions are outlined. The effect of the pH value of the impregnating material could be regulated by adding potassium hydroxide to increase the pH to over 9, and by adding acetic acid for obtaining a pH value less than 9. Figure 2 shows graphically the effect of the pH of the impregnating composition on the bond stability of the cord and the rubber. When the pH is over 9 the adhesion of the cord to the rubbers made of natural rubber and butadiene-styrene oil-filled rubbers decreases noticeably. Figure 3 shows that the physico-mechanical properties of the adhesive film drop with an increase in the alkalinity of the medium. This is explained by the change in the condensation conditions of the resorcin-formaldehyde resin. This is also assumed to be one of the causes of the decrease in the bond stability indices. Figure 5 shows that at low drying temperature (100 - 110°C) the impregnation of cord with carboxyl-containing la-

The Application of Carboxyl-Containing Latexes in the Impregnation of Tire Cord. Communication 2

texes has little effect. By increasing the temperature to 170°C the bond stability of the cord and the rubber made of natural and synthetic rubber continuously increases and at temperatures of 190 - 200°C it drops abruptly. This is assumed to be due to the peculiarities of the interaction of the resorcin-formaldehyde resin with the high polymers containing carboxyl groups in the molecular chain. Table 2 lists the bond stability indices of the viscose cord with casing rubbers, depending on the type of latex in the impreganting composition. The data proves that by using the new latexes the bond stability of the cord-rubber increases in static as well as repeated deformations. The extent of the stability of the cord-rubber bond, where the cord is impregnated with different latexes, depends on the type of polymer in the casing rubbers, which is explained by the different compatibility of these polymers at the impregnated cord-rubber interface. Stand and operation tests showed that the use of viscose cord in tires, which have been impregnated with carboxyl-containing latexes, increases the bond stability between the tire elements and also increases the tire durability. The bond stability of the cord-rubber, when carboxyl-containing latexes are used as the impregnating material, depends to a great extent on the pH of the impregnating composition and

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on the drying temperature of the impregnated cord. The use of the above-mentioned latexes instead of butadiene-styrene latex СКС-30III (SKS-30Sh) for the impregnation of the tire cord greatly increases the bond stability between the rubber and the cord and increases the durability of the tire. The advantage of the divinyl-carboxyl-containing latexes СКД-1 (SKD-1) over divinyl-styrene СКС-30-1 (SKS-30-1) is proven. There are 6 graphs, 4 tables and 12 references: 9 Soviet, 3 English.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti i Yaroslavskiy shinnyy zavod (Scientific Research Institute of the Tire Industry and Yaroslavl' Tire Plant)

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80601

S/138/60/000/01/09/010

15.9300

AUTHORS: Boguslavskiy, D.B., Tikhomirov, B.P., Epshteyn, V.G.,

TITLE: The Problem of Determining the Character of Destruction Taking Place in Rubber-Cord Systems

PERIODICAL: Kauchuk i Rezina, 1960, No. 1, pp. 51 - 53

TEXT: The usual optical-visual methods such as luminescent analyses and microscopic observation of cross cuts of cord strands are apt to give only an approximate idea of the character of foliation. An attempt is made in this article to determine the nature of foliation in rubber-cord systems by successive introduction of finely dispersed oxalate and of the radioactive isotope Sr^{90} with carrier $CaC_2O_4{}^2$ into the impregnation composition and the carcass rubber. The work was performed in accordance with two methods. The first method consisted in treating the cord strands with $Ca(Sr^{90})C_2O_4$ and after determining their radioactivity, applying them to rubber plates. After vulcanization the cords were removed and the rubber samples examined in regard to their radioactivity. The second method consists in introducing prepared oxalate $Ca(Sr^{90})C_2O_4$ into the carcass rubber from which samples 30x100 mm were cut out; impregnated strands of cord without radio-

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The Problem of Determining the Character of Destruction Taking Place in Rubber-Cord Systems

activity were applied and the samples vulcanized. The cord strands were then removed and examined as to their radioactivity. The application of radioactive isotopes permits the determination of places and the nature of destruction occurring in rubber-cord systems. In case of impregnation of cord with 50-D composition based on SKS-30 latex containing albumin or resorcin-formaldehyde resin destruction usually takes place on the adhesive-rubber interface. With an increase in the content of resorcin-fornaldehyde resin in the impregnation composition and in the tensile strength of the films the probability of direct destruction of the adhesive decreases. The application of carboxyl-containing latex for impregnation contributes to reducing the cases of destructions of cohesion character. Films consisting of carboxyl-containing polymers have a high tensile strength which increases with the addition of resorcin-formaldehyde resin. With the simultaneous improvement of adhesion and cohesion properties of the adhesive the zone of destruction shifts in the direction of the carcass rubber. There are 2 diagrams, 3 tables and 5 Soviet references.

ASSOCIATION: Yaroslavskiy shinnyy zavod (Yaroslav Tire Plant)

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87918

15.9200 2109, 2209
11.2211

S/138/60/000/008/004/015
A051/A029

AUTHORS: Boguslavskiy, D.B.; Epshteyn, V.G.; Ognevskaya, T.Ye.; Lyapina, L.A.; Lyubeznikov, V.K.

TITLE: The Modification of the Properties of Synthetic Rubbers, Containing Active Functional Groups, Using Resorcin-Formaldehyde Resin in the Latex Stage

PERIODICAL: Kauchuk i Rezina, 1960, No. 8, pp. 13 - 18

TEXT: The strengthening effect of resorcin-formaldehyde resin in synthetic rubbers was studied using the usual processing methods, such as coagulation, rolling and mixing, etc. It has been previously shown that in filling butadiene--styrene rubbers in the latex stage using resorcin-formaldehyde resin, the rubber mixtures produced are satisfactorily processed and the vulcanizates have sufficiently high physico-mechanical properties (Ref. 4). The properties of the filled rubbers depend to a great extent on the amount of resin, the molar ratio of resorcin and formaldehyde and on several colloidal-chemical factors. The rubbers investigated were regulated carboxyl-containing СКС -30-1 (SKS-30-1) butadiene-styrene rubbers with 1.2% methacrylic acid, and 2-methyl-5-vinylpyridine СКМВП-15 (SKMVP-

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The Modification of the Properties of Synthetic Rubbers, Containing Active Functional Groups, Using Resorcin-Formaldehyde Resin in the Latex Stage

-15) rubbers. The plasticity according to Carriere was 0.40 - 0.50. The presence of copolymers of active polar substitutes with acidic or basic properties in the molecular chain could affect the condensation process of the thermoreactive resin and thus affect the properties of the rubber-resin mixtures. The process of condensation took 22 - 24 hours at a normal temperature. The effect of the different ratios of the resorcin to the formaldehyde is shown in Figure 1. The optimum molar ratio of the resorcin to the formaldehyde in the strengthening of the methyl-vinylpyridine rubber was found to be 1 : 0.8, and for the butadiene-styrene and carboxyl-containing rubbers, it was found to be within the range of 1 : 1.5 to 1 : 1.8. Apparently the condensation of the SKMVP-15A rubber upon introducing lacquer resins, to the resol stage is activated on the surface of the globules by the pyridine groups having basic properties. In filling the carboxyl-containing and methyl-vinylpyridine rubbers, vulcanizates can be obtained with a tensile strength of 220 - 280 kg/cm^2 contrary to those of natural and butadiene-styrene rubbers. The tear-resistance of the resin-filled butadiene-styrene rubbers is found to be rather low (25 - 30 kg/cm), contrary to that of the carboxyl-containing

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The Modification of the Properties of Synthetic Rubbers, Containing Active Functional Groups, Using Resorcin-Formaldehyde Resin in the Latex Stage

and methylvinylpyridine rubbers (from 52 - 56 kg/cm). The optimum dosage of the resin would depend on the type of rubber being filled and the chemical nature of its functional groups and molecular chain (Fig. 3). It is assumed that the strengthening effect on rubbers with active functional groups from resorcin-formaldehyde resin is due to both the formation of chain-like structures from resin particles, adsorbed at the surface of the latex globules and by the substantial increase in the interaction between the rubber molecules and the filler particles. It was noted that further improvement of the physico-mechanical properties of the resin-filled rubbers could be accomplished by combining the resorcin-formaldehyde resin with carbon black. The latter also increases the rubber-filler gel. The wear resistance is increased when using two fillers (resin and carbon black). The latter exceed rubber filled only with resin by 12 - 20% according to laboratory findings. The following ratios of the resin and carbon black are assumed by the authors to be the optimum values (in weight parts to 100 weight parts of rubber): for SKS-30A, 15 resin, 15 - 20 carbon black; for SKS - 30 - 1, 10 resin, 10-15 carbon black; for SKMVP, 5 resin, 15-20 carbon black. As to the softener used in all the resin-filled rubbers, the most suitable was found to be pine tar. It is

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The Modification of the Properties of Synthetic Rubbers, Containing Active Functional Groups, Using Resorcin-Formaldehyde Resin in the Latex Stage

assumed, the increase in physico-mechanical properties caused by resorcin-formaldehyde is due to the formation of additional bonds between the copolymer chains containing active functional groups capable of interaction. The conclusion is drawn that the observed strength of the rubbers under investigation can be used in the production of highly-stable vulcanizates, with elevated elasticity and low heat formation. There are 7 figures, 1 table and 8 references: 5 Soviet, 1 French 2 English.

ASSOCIATION: Yaroslavskiy shinniy zavod (Yaroslavl' Tire Plant)

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The Modification of the Properties of Synthetic Rubbers, Containing Active Functional Groups, Using Resorcin-Formaldehyde Resin in the Latex Stage

Figure 1:

Effect of the Molar Ratio of Resorcin and formaldehyde in the Physical-Mechanical Properties of Resin-filled Rubbers.
1 - SKS-30A; 2 - - SKS-30-1; 3 - - SKMVP-15A.

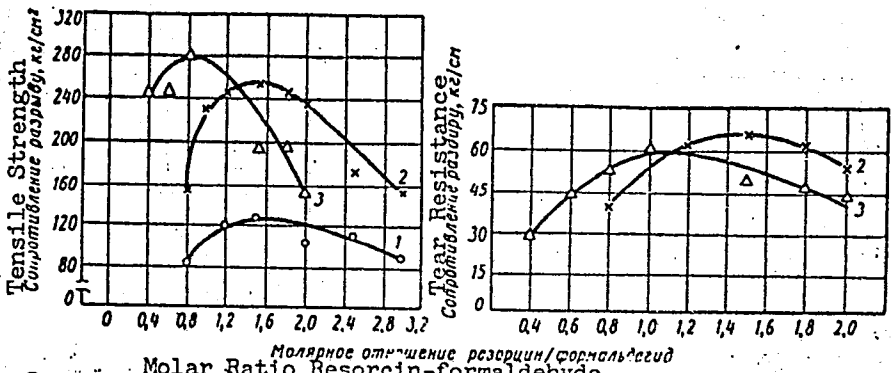

Рис. 1. Влияние молярного отношения резорцина и формальдегида на физико-механические свойства смолонаполненных резин:
1—СКС-30А; 2—СКС-30-1; 3—СКМВП-15А.

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The Modification of the Properties of Synthetic Rubbers, Containing Active Functional Groups, Using Resorcin-Formaldehyde Resin in the Latex Stage

Figure 3:

Effect of Dosage of Resorcin-formaldehyde Resin on the Physical-Mechanical Properties of Rubbers

1 - SKS-30A; 2 - SKS-30-1; 3 - SKMVP-15A.

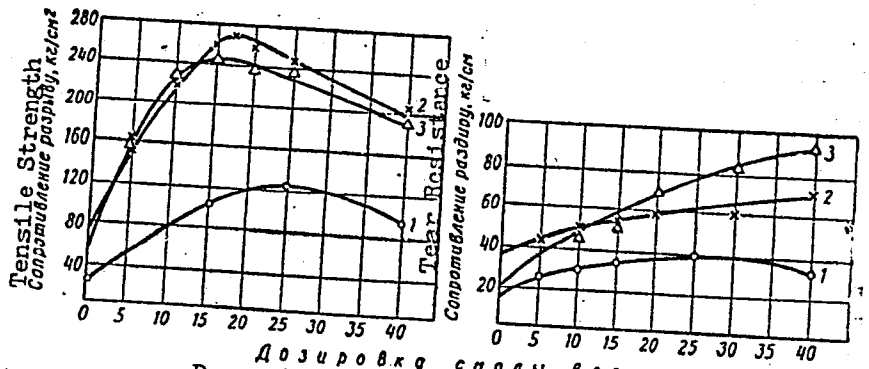

Рис. 3. Влияние дозировки резорцин-формальдегидной смолы на физико-механические свойства резин:
1—СКС-30А; 2—СКС-30-1; 3—СКМВП-15А.

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20862

S/138/61/000/003/001/006
A051/A129

11.2211 also 2209

AUTHORS: Reykh, V. N.; Kalaus, A. Ye.; Boguslavskiy, D. B.; Opalev, A. I.; Dubovik, L. I.; Borodushkina, Kh. N., and Fedorova, Yu. I.

TITLE: Ternary copolymers of butadiene, styrene and 2-methyl-5-vinyl-pyridine

PERIODICAL: Kauchuk i rezina, no. 3, 1961, 2-8

TEXT: The technical properties, including wear-resistance, of butadiene-styrene polymers can be improved by introducing links containing functional groups into the polymer chain. The main shortcomings of the copolymers with 2-methyl-5-vinylpyridine are their poor compatibility with other polymers hampering the achievement of satisfactory tensility of the protector rubber bond with the breaker rubber and a high tendency of the mixtures based on double copolymers to scorching. The present article studies the initial materials and the technical properties of ternary copolymers, development of a formulation on its base and the results on industrial tests of protector rubbers of a new type. Ternary copolymers of butadiene, styrene and 2-methyl-

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Ternary copolymers of...

5-vinylpyridine were synthesized on the base of a polymerization formulation adopted for CKC-30A (SKS-30A). The effect of 2-methyl-5-vinylpyridine on the main physico-mechanical properties of vulcanizates was studied and it was found that the ternary copolymers varied depending on the 2-methyl-5-vinylpyridine content (Table 1). They were found to have a higher tensility index and elasticity as compared to rubbers based on the ternary copolymer with α-methylstyrene. The copolymers of butadiene, styrene and 2-methyl-5-pyridine produced at the ratio of the monomers of 70:25:5 have the most promising properties. Rubbers produced on a CKC-25 MBP-5 (SKS-25 MVP-5) base with gaseous channel and anthracene carbon blacks are superior to similar rubbers based on butadiene-styrene rubber in their wear-resistance and resistance to crack growth in repeated deformations. The formulations of the protector rubbers based on SKS-25 MVP-5 material were developed and an experimental batch of tire casings 6,00 - 16 in size to be used for service tests was manufactured. Table 2 shows the results of the physico-mechanical testing of vulcanizates based on SKS-25 MVP-5 and SKMVP-15A, SKS-30A, SKS-30AM for comparison. The important advantage of butadiene, styrene and 2-methyl-5-vinylpyridine copolymers is said to be the high stability to scorching at elevated temperatures

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(Fig. 1). The effect of certain vulcanizing agents, such as zinc oxide, magnesium oxide, sulfur, as well as certain accelerators, was investigated (Table 3, Fig. 2). The change in the main properties of the vulcanizates depending on the type and amount of carbon black is shown in Figure 3. The noted characteristics of the vulcanizates based on methylvinylpyridine rubbers are thought to be connected with the intensified interaction between the active functional groups in the molecular chain of the copolymer and the carbon black particles, on the surface of which compounds of an acidic nature are adsorbed. In studying the effect of the different softeners, e. g., standard mixtures of rubrax, fuel oil, avtol-18, extract of the phenol purification of petroleum oils, stearin, fatty acids, pine resin and polydienes on the plasto-elastic and physico-mechanical properties, it was seen that the extract of the phenol purification of petroleum oils (ПН-6, PN-6) has the best effect on these properties. Experimental work was carried out to increase the strength of adhesion between the NR breaker tires and the SKS-25 MVP-5 treads by using double-layer treads, where the road rubber contained SKS-25 MVP-5 and the sub-groove rubber SKS-30ARM. The experimental data showed that the fixing of the methylvinylpyridine tread to the NR breaker through a sub-groove layer made of butadiene-styrene rubber ensures a

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Ternary copolymers of...

high strength of adhesion of the doubled system. There are 6 tables, 3 sets of graphs, 9 references: 5 Soviet, 3 English, 1 German.

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy institut sinteticheskogo kauchuka im. S. V. Lebedeva i Yaroslavskiy shinnyy zavod (All-Union Scientific Research Institute of Synthetic Rubber im. S. V. Lebedev and the Yaroslavl' Tire Plant)

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Ternary copolymers of...

(1) Показатели	СКС-27 МВП-3	СКС-25 МВП-5	СКС-23 МВП-7	СКС-20 МВП-10	СКМС-25 МВП-5	СКМС-20 МВП-10
(2) Твердость исходного каучука по дефо, *е*	1050	1400	1290	1250	650	650
(3) Модуль при 300% удлинения, *кг/см²*	108	125	115	121	136	140
(4) Сопротивление разрыву, *кг/см²*	372	354	333	333	295	306
(5) Относительное удлинение, %	550	513	523	510	530	505
(6) Остаточное удлинение, %	18	16	18	15	23	28
(7) Твердость по Шору	65	64	68	63	69	65
(8) Эластичность по отскоку, %						
(9) при 20°	46	46	44	46	35	30
(10) при 100°	54	57	55	57	43	45
(11) Истирание, *см³/квт-ч*	226	185	180	161	—	—

Table 1:

The physico-mechanical indices of standard vulcanizates based on butadiene, styrene (α-methylstyrene) and 2-methyl-5-vinylpyridine copolymer

(1) Indices; (2) Hardness of the initial rubber, according to Defoe, g; (3) Module at 300% elongation, kg/cm^2; (4) Tear-resistance, kg/cm^2; (5) Relative elongation, %; (6) Residual elongation, %; (7) Hardness according to Shore; (8) Elasticity in recoil, %; (9) At 20°C; (10) At 100°C; (11) Wear, $cm^3/kw\text{-}h$.

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Ternary copolymers of...

(1) Показатели	(2) Тип каучука СКС-25 МВП	СКМВП-15А	СКС-30А	СКС-30АМ
(3) Твердость исходного каучука по дефо, г	1450	975	500	500
(4) Модуль при 300% удлинении, кг/см²	96	98	92	95
(5) Сопротивление разрыву, кг/см²	338	242	269	224
(6) Относительное удлинение, %	650	616	619	598
(7) Остаточное удлинение, %	21	22	23	22
(8) Сопротивление раздиру, кг/см	83	95	114	88
(9) Истирание, см³/квт-ч	213	208	312	332
(10) Эластичность по отскоку, %				
(11) при 20°	44	36	38	32
(12) при 100°	49	39	42	40
(13) Температура хрупкости, °С	−67	−70 (по разр.)	−59 (21)	−65
(14) Сопротивление растрескиванию (изгиб), циклы	37 500	26 000	28 000	5 000
(15) Теплообразование по Гудричу при p=8 кг, °С	75	77	74	65
Коэффициент старения				

Table 2:

The physico-mechanical indices of vulcanizates from SKS-25, MVP-5, SKMVP-15A, SKS-30A, SKS-30AM (vulcanization at 143°C for a period of 50 min)

(1) Indices; (2) Type of rubber; (3) Hardness of the initial rubber according to Defoe, g; (4) Module at 300% elongation, kg/cm^2; (5) Tear-resistance kg/cm^2; (6) Relative elongation, %; (7) Residual elongation, %; (8) Tear-resistance, kg/cm; (9) Wear, cm^3/kw-h; (10) Elasticity in recoil, %; (11) At 20°C; (12) At 100°C; (13) Temperature of brittleness, °C; (14) Resistance to crack growth, cycles; (15) Heat formation according to Goodrich, at p=8 kg, °C; (16) Aging coefficient in tear-resistance; (17) According to relative elongation; (18) Temperature stability

Cont. on Card 11/11

Ternary copolymers of...

Table 2: (continued)

coefficient; (19) According to tear; (20) According to elongation; (21) does not rupture.

(1) Содержание серы, вес. ч. на 100 вес. ч. каучука	(2) Модуль при 300% удлинении, кг/см²	(3) Сопротивление разрыву, кг/см²	(4) Относительное удлинение, %	(5) Остаточное удлинение, %	(6) Сопротивление раздиру, кг/см	(7) Изменение пластичности после прогрева при 110° в течение			
						0 мин.	20 мин.	40 мин.	60 мин.
0	13	23	972	136	20	—	—	—	—
1,0	75	229	707	31	87	0,35	0,33	0,31	0,29
1,5	105	253	605	29	73	0,42	0,38	0,35	0,32
2,0	128	245	502	23	81	0,41	0,40	0,37	0,33
2,5	131	278	510	28	63	0,36	0,35	0,33	0,31

Table 3: Effect of the amounts of sulfur on the physico-mechanical indices of SKS-25 MVP-5 vulcanizates

(1) sulfur content, w.p. to 100 w.p. of rubber; (2) module at 300% elongation, kg/cm^2; (3) tear-resistance, kg/cm^2; (4) relative elongation, %; (5) residual elongation, %; (6) tear-resistance, kg/cm; (7) change in the plasticity after heating at 110°C over a period of: 0 min, 20 min, 40 min, 60 min.

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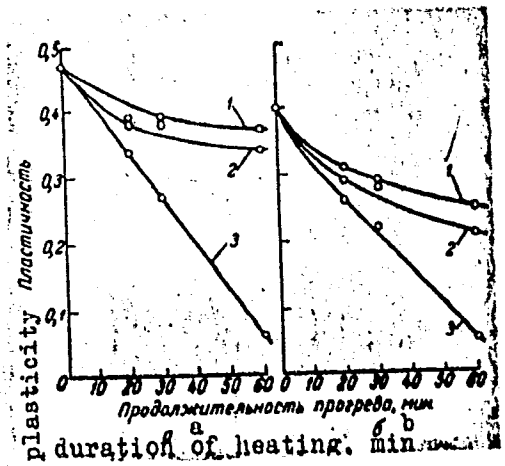
Ternary copolymers of...



plasticity
duration of heating, min

Figure 1:

Change in the plasticity of the rubber mixtures SKS-25 MVP-5 (a) and SKS-30A (b) depending on the duration and temperature of the heating:

1 - 105°C,

2 - 110°C,

3 - 120°C.

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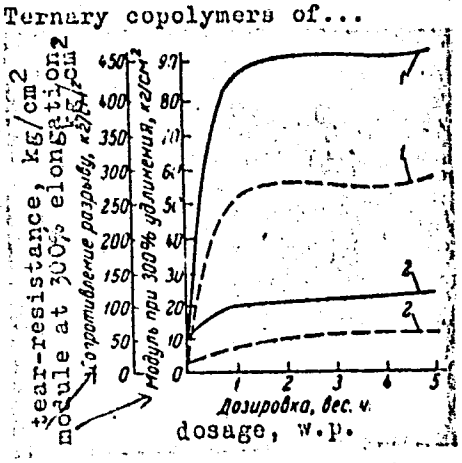
Ternary copolymers of...



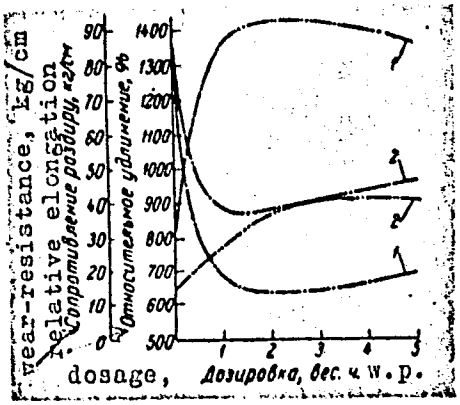


Figure 2: Effect of the dosages of the metal oxides on the physico-mechanical indices of the SKS-25 MVP-5 mixtures (vulcanization at 143°C, 50 min) ——— module at 300% elongation, - - - tear-resistance, -.-.-. relative elongation, -...-.. wear resistance. 1 - zinc oxide, 2 - magnesium oxide.

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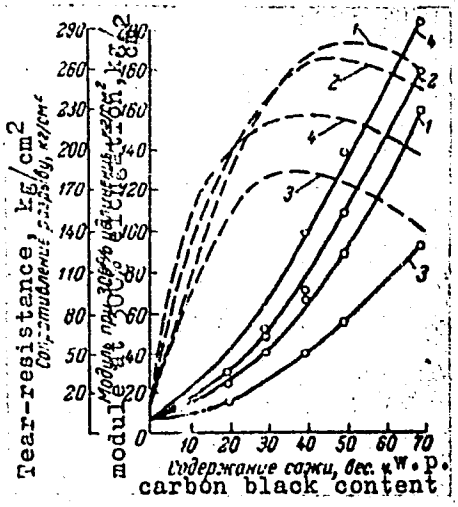
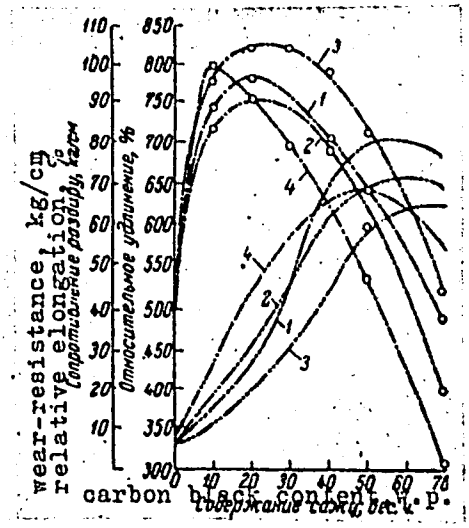
Ternary copolymers of...

Figure 3:





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Ternary copolymers of...

Figure 3: (continued)

Relationship of the physico-mechanical indices of the SKS-25 MVP-5 on the carbon black content

——— module at 300% elongation, - - - tear resistance, -.-.-. relative elongation, -...-.. wear resistance.

1 - channel carbon black, 2 - anthracene carbon black, 3 - oven carbon black, 4 - KhAF carbon black.

(16) по сопротивлению разрыву	0,91	0,88	0,96	0,91
(17) по относительному удлинению	0,62	0,56	0,60	0,55
(18) Коэффициент температуростойкости				
(19) по сопротивлению разрыву	0,47	0,47	0,44	0,49
(20) по относительному удлинению	0,78	0,74	0,97	0,90

Table 2 CONT.

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A051/A126

AUTHORS: Boguslavskiy, D. B., Shmurak, I. L., Borodushkina, Kh. N., Berlin, A. A., Uzina, R. V.

TITLE: The effect of active-polymer additions to case mixes on the strength of adhesion in rubber-cord systems

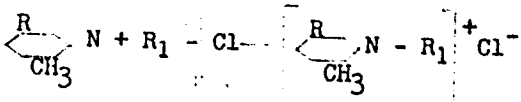
PERIODICAL: Kauchuk i rezina, no. 12, 1962, 15 - 18

TEXT: The effect was studied of carboxyl-containing and methylvinylpyridine rubber, and of chlorosulfopolyethylene polymer additions to case mixes based on 100% butadiene-styrene oil-filled rubber on the adhesive strength of systems with viscous cord saturated with various synthetic latexes. The introduction of carboxyl-containing rubber into БСК (BSK) case mixes increases the adhesive strength continuously in the systems with viscous cord saturated with СКС -30-1 (SKS-30-1) and СКД-1 (SKD-1) latex compositions. Maximum adhesive strength is obtained for rubbers, where the BSK is completely replaced by the SKS-30-1 rubber. Additions of carboxyl-containing SKS-30-1 rubber affect the adhesive strength of the rubber-cord even more in the case of cord saturated with

Card 1/3

The effect of active-polymer additions to...

methylvinylpyridine compositions. Obtained data showed that methylvinylpyridine latexes of high-temperature polymerization do not offer satisfactory adhesive strength of the cord to rubber, based on butadiene-styrene oil-filled rubber. The effectiveness of the additions increases with an increase in the carboxyl-group content in the adhesive, and pyridine-group content in the case rubber. Experimental results have led to the conclusion that a further increase of the adhesive strength of rubber to cord can be accomplished by introducing reactive groups into the adhesive and case mix which, in turn, increase the inter-molecular and chemical interaction at the contact region. Formation of a connection, at the contact region, such as:



in the case of combinations of pyridine adhesives and rubber containing additions of chlorosulfopolyethylene or other chloro-containing polymers, is assumed possible. Thus, it is further concluded that the use of an adhesive containing functional groups in combination with active additions in the case mixes leads

Card 2/3

The effect of active-polymer additions to...

to new possibilities for increasing the adhesive strength in rubber-cord systems. There are 4 figures and 3 tables.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti i Yaroslavskiy shinny zavod (Scientific Research Institute of the Tire Industry and Yaroslavl' Tire Plant)

Card 3/3

BOGUSLAVSKIY, D.B.; UZINA, R.V.; BORODUSHKINA, Kh.N.; SUCHKOVA, M.G.

Effect of the compounding ingredients of carcass rubbers on the adhesive strength of rubber-cord systems. Kauch.i rez. 21 no.1: 29-33 Ja '62. (MIRA 15:1)

1. Yaroslavskiy shinnyy zavod i Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.
(Tire fabrics) (Adhesives)

4

SHVARTZ, A.G., FROLIKOVA, V.G., TYURINA, V.S., ALEKSANDROV, V.V., BOGUSLAVSKIY, D.B.

Perfecting the rubber mixture composition, based on butyl rubber, for diaphragms in the formator-vulcanizers.

Report submitted for the 4th Scientific Research conference on the Chemistry and technology of synthetic and natural rubber. Yaroslavl, 1962

BLOKH, G.A., doktor khimich. nauk, prof.; NEYMARK, I.Ye., doktor khimich. nauk, prof.; BORODUSHKINA. Kh.N., inzh.; BOGUSLAVSKIY, D.B., inzh.; SHEVCHENKO, Yu.G., inzh.

Molecular sieves and problems of rubber vulcanization. Izv. vys. ucheb. zav.; tekh. leg. prom. no.4:46-53 '63. (MIRA 16:10)

1. Dnepropetrovskiy khimiko-tekhnologicheskiy institut (for Blokh). 2. Institut fizicheskoy khimii AN UkrSSR (for Neymark.) 3. Dnepropetrovskiy shinyy zavod (for Borodushkina, Boguslavskiy, Shevchenko). Rekomendovana kafedroy tekhnologii reziny Dnepropetrovskogo khimiko-tekhnologicheskogo instituta.

ACCESSION NR: AP4017159 S/0138/64/000/002/0001/0005

AUTHORS: Borodushkina, Kh. N.; Blokh, G. A.; Boguslavskiy, D. B.; Gendler, T. R.; Neymark, I. Ye.

TITLE: Vulcanization of rubber compounds in the presence of filled zeolites

SOURCE: Kauchuk i rezina, no. 2, 1964, 1-5

TOPIC TAGS: rubber, rubber compound, vulcanization, scorching, accelerator, Altax, Santocure, phenylguanidine, zeolite, filled zeolite, ammonia, methylamine, dimethylamine, ethanolamine, adsorption, kinetics of desorption

ABSTRACT: The vulcanization of protective and brake rubber compounds from natural and butadiene-styrene rubbers of the SKMS-30ARKM brands was conducted in the presence of synthetic zeolites of the NaKh type with pores 10 A in diameter, filled with ammonia, methylamine, dimethylamine, monoethanolamine, and diethanolamine. These filled zeolites were used in the capacity of secondary accelerators of vulcanization (instead of Altax and diphenylguanidine) in combination with the basic accelerator Santocure. It was found that an increase of ammonia content in protective and brake rubber compounds to 0.25 and 0.40% (by weight), respectively,

Card 1/3

ACCESSION NR: AP4017159

permitted the production of materials with a higher degree of vulcanization, while still preserving the resistance of the compounds to scorching. The use of ammonia-filled zeolites also resulted in a substantial saving of time, achieving within 30 minutes a degree of vulcanization for protective rubber equal to that attained by Altax in 50 minutes. Methylamine and dimethylamine exert a similar effect on the vulcanization of rubber compounds when used in association with zeolites. While the ethanolamines are known to act as accelerators of vulcanization, their direct application causes (within 20-26 minutes at 110C) some scorching of the compounds during the working operation. However, when adsorbed on zeolites, monoethanolamine and diethanolamine impart to brake-rubber compounds a state of plastic flow which lasts for 37-39 minutes. It was found that the physical and mechanical properties of these vulcanized rubbers were practically identical with those of the vulcanizates produced with the aid of Altax and diphenylguanidine. The kinetics of desorption of amines from zeolites at various temperatures was studied, and it was observed that a 10-minute heating at 140C caused the desorption of only 40% monoethanolamine and 18% diethanolamine. The capacity of zeolites to retain the amines at elevated temperatures lessens the danger of scorching in the vulcanization process. Orig. art. has: 3 tables and 2 charts.

Card 2/3

ACCESSION NR: AP4017159

ASSOCIATION: Dnepropetrovskiy khimiko-tekhnologicheskiy institut, Dnepropetrovskiy shinnyy zavod i institut fizicheskoy khimii AN SSSR (Dnepropetrovsk Chemical and Technical Institute, Dnepropetrovsk Tire Plant and Institute of Physical Chemistry, AN SSSR)

SUBMITTED: 00 DATE ACQ: 23Mar64 ENCL: 00

SUB CODE: CH NO REF SOV: 007 OTHER: 001

Card 3/3

BORODUSHKINA, Kh.N. [Borodushkina, Kh.M.]; BLOKH, G.A. [Blokh, H.A.]; BOGUSLAVSKIY, D.B. [Bohuslav'kyi, D.B.]; NEYMARK, I.Ye. [Neimark, I.IE.]; GENDLER, T.R. [Hendler, T.R.]

Molecular sieves [zeolites) as rubber curing accelerators. Dop. AN URSR no.8:1084-1087 '64. (MIRA 17:8)

1. Dnepropetrovskiy khimiko-tekhnologicheskiy institut; Dnepropetrovskiy shinnyy zavod i Institut fizicheskoy khimii AN UkrSSR. Predstavleno akademikom AN UkrSSR F.D. Ovcharenko.

SHCHICHKO, Z.V. [Shchychko, Z.V.]; SIMAKOVA, E.P. [Symakova, E.P.]; BOGUSLAVSKIY, D.B. [Bohuslavs'kyi, D.B.]; BLOKH, G.A. [Blokh, H.A.], doktor khim. nauk; PIVOVAROVA, Yu.V. [Pyvovarova, IU.V.]; BORODUSHKINA, Kh.N.

Increasing the strength of the bonds between the elements of automobile tires. Khim. prom. no.4:21-22 O-D '64.
(MIRA 18:3)

SAPRONOV, V.A.; KURPICHEVA, T.N.; TOKAREVA, L.T.; CHAVCHICH, T.A.; LEVIT, G.M.; BORODUSHKINA, Kh.N.; BOGUSLAVSKIY, D.B.

Effect of some formula and technological factors on the quality of butyl rubber diaphragms for the forming and vulcanizing equipment. Kauch. i rez. 23 no.5:14-19 My '64.

(MIRA 17:9)

1. Dnepropetrovskiy shinnyy zavod.

BORODUSHKINA, Kh.N.; BLOKH, G.A.; BOGUSLAVSKIY, D.B.; GENDLER, T.R.; NEYMARK, I.Ye.; PIONTKOVSKAYA, M.A.

Synthetic zeolites as carriers of rubber vulcanization accelerators. Kozh. obuv. prom. 6 no.6:14-19 Je '64. (MIRA 17:9)

CHAVCHICH, T.A.; LEVIT, G.M.; SAPRONOV, V.A.; BORODUSHKINA, Kh.N.; BOGUSLAVSKIY, D.B.; OMEL'CHENKO, R.Ya.

Some characteristics of the vulcanization of butyl rubber with alkylphenol formaldehyde resins. Kauch. i rez. 23 no.10:12-16 O '64. (MIRA 18:2)

1. Dnepropetrovskiy shinnyy zavod.

L 39769-65 EWT(m)/EWP(j)/T Pc-4 RM
ACCESSION NR: AP5005389

[illegible]

[illegible]

TOPIC TAGS: rubber, resin, vulcanization, formaldehyde/BSA novolak, SKD rubber, SKS 30 1 rubber

ABSTRACT: The authors have presented experimental [illegible] a number of varieties of general-purpose rubber [illegible] alkylphenolformaldehyde resins. Various combinations [illegible] were tested for standard properties. [illegible] vulcanizates of these general-purpose rubber [illegible]

L 39769-65
ACCESSION NR: AP5005389

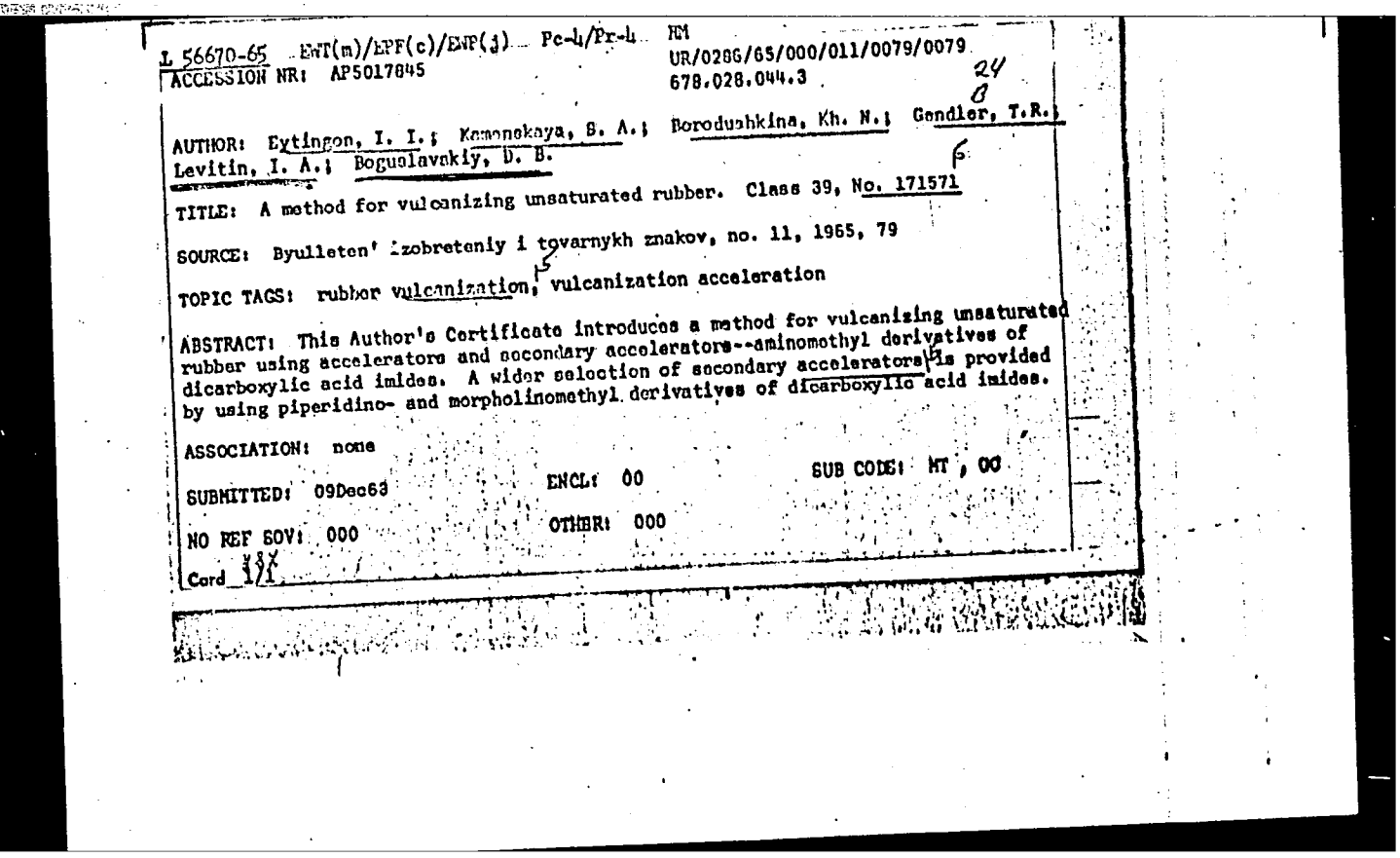
[illegible] volcanizates, as [illegible]

[illegible]

SUBMITTED: [illegible] ENCL: 00

NO REF SOV: 005 OTHER: 005

Card 2/2



L 56670-65 EWT(m)/EPF(c)/EWP(j) Pc-4/Pr-4 RM
ACCESSION NR: AP5017845 UR/0286/65/000/011/0079/0079
678.028.044.3

AUTHOR: Eytingon, I. I.; Komonskaya, S. A.; Borodushkina, Kh. N.; Gendler, T.R.; Levitin, I. A.; Bogoslavskiy, D. B.

TITLE: A method for vulcanizing unsaturated rubber. Class 39, No. 171571

SOURCE: Byulleten' izobreteniy i tovarnykh znakov, no. 11, 1965, 79

TOPIC TAGS: rubber vulcanization, vulcanization acceleration

ABSTRACT: This Author's Certificate introduces a method for vulcanizing unsaturated rubber using accelerators and secondary accelerators--aminomethyl derivatives of dicarboxylic acid imides. A wider selection of secondary accelerators is provided by using piperidino- and morpholinomethyl derivatives of dicarboxylic acid imides.

ASSOCIATION: none

SUBMITTED: 09Dec63 ENCL: 00 SUB CODE: MT, OC

NO REF SOV: 000 OTHER: 000

Card 1/1

VYSHESLAVOVA, V.A.; IONOVA, T.V.; SULEYMANOVA, Z.I.; MARKOVA, L.A.; OSOKIN, L.L.; ROMANENKO, A.K.; GUSLISTAYA, Ye.G.; DASHEVSKIY, I.Ya.; BOGUSLAVSKIY, D.B.; UZINA, R.V.

Specific features in the technological process of viscose cord production at the Dnepropetrovsk tire factory. Kauch.i rez. 24 no.1:1-4 Ja '65. (MIRA 18:3)

1. Dnepropetrovskiy shinnyy zavod i Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.

L 01149-66 EWT(m)/EPF(c)/EWP(j) RM

ACCESSION NR: AP5022000 UR/0286/65/000/014/0076/0076
678.043.044

AUTHOR: Boguslavskiy, D. B.; Borodushkina, Kh. N.; Malinovskiy, M. S.; Kolenskaya, A. I.; Kupriyanova, O. N.; Romanov, A. S.; Sapronov, V. A.; Trokay, S. P.; Chavchich, T. A.; Yurilina, L. N.; Kovaleva, V. F.

TITLE: A method for vulcanizing rubber. Class 39, No. 172984

SOURCE: Byulleten' izobreteniy i tovarnykh znakov, no. 14, 1965, 76

TOPIC TAGS: vulcanization, rubber, polymer, polyester plastic

ABSTRACT: This Author's Certificate introduces a method for vulcanizing rubber by using alkylphenolformaldehyde resins in the presence of chloride-containing polymer accelerators. A wider selection of accelerators is provided by using polyester resins--products of condensation of glycerine α-monohydrochloride with phthalic and/or maleic anhydride.

ASSOCIATION: none

SUBMITTED: 16Nov63 ENCL: 00 SUB CODE: MT

NO REF SOV: 000 OTHER: 000

Card 1/1 DP

L 7883-66 EWT(m)/EWP(j) RM

ACC NR: AP5025013 SOURCE CODE: UR/0286/65/000/016/0079/0079

AUTHORS: Boguslavskiy, D. B.; Borodushkina, Kh. N.; Kupriyanova, O. N.; Mal'tsev, V. N.; Sapronov, V. A.; Chavchich, T. A.

ORG: none

TITLE: A method for the vulcanization of rubbers by alkylphenolformaldehyde resins. Class 39, No. 173921

SOURCE: Byulleten' izobreteniy i tovarnykh znakov, no. 16, 1965, 79

TOPIC TAGS: rubber, vulcanizing agent, halogen organic compound, vulcanizate, resin, formaldehyde, vulcanization

ABSTRACT: This Author Certificate presents a method for vulcanizing rubbers by alkylphenolformaldehyde resins in the presence of vulcanizing accelerators—halogen-containing organic substances. To improve the method, the halogen-containing organic compounds are added in the form of halogenated esters of aromatic and aliphatic carboxylic acids.

SUB CODE: 11 / SUBM DATE: 12Apr63

Card 1/1 nw

UDC: 678.028.294:678.044:547.29'26

BOGUSLAVSKAYA, K.V.; VALOVA, G.M.; GRISHCHUK, N.F.; DROZD, L.C.; KOLOBENIN, V.N.; PRYAKHINA, S.F.; SOKOLOV, V.D.; BOGUSLAVSKIY, D.B.

Single-stage manufacture of carcass compounds with the addition of sulfur during processing in the rubber mixer. Kauch. i rez. 24 no.10:12-14 '65. (MIRA 18:10)

1. Dnepropetrovskiy shinnyy zavod i Dnepropetrovskiy filial Nauchno-issledovatel'skogo instituta shinnoy promyshlennosti.

L 44366-66 EWT(m)/EWP(j)/EWP(k)/T/EWP(e)/EWP(t)/ETI IJP(c) RM/WH/WW/JD
ACC NR: AP6019736 (A) SOURCE CODE: UR/0063/66/011/003/0348/0350

AUTHOR: Nosnikov, A. F.; Borodushkina, Kh. N.; Boguslavskiy, D. B.; Chernukhina, A. F.; Khamutov, A. I.; Blokh, G. A.

ORG: Dnepropetrovsk Institute of Chemical Technology im. F. E. Dzerzhinskiy (Dnepropetrovskiy khimiko-tekhnologicheskiy institut); Dnepropetrovsk Tire Plant (Dnepropetrovskiy shinnyy zavod); VNII of Glass Fibers (VNII steklovolokna)

45
B

TITLE: Porous silicon fibers acting as carriers of gaseous vulcanizing agents and accelerators

SOURCE: Vses khim obshch. Zh, v. 11, no. 3, 1966, 348-350

TOPIC TAGS: vulcanization, rubber, silicon plastic

ABSTRACT: The effect of porous silicon fibers containing hydrogen sulfide, ammonia, and sulfur dioxide on the physicomechanical properties of tire rubbers was investigated. The pore diameters ranged from 2.8 Å to 75 Å. The vulcanization temperature was 143-163°C and the vulcanization duration was 10-80 minutes. The fiber contents in the rubber were as high as 10%. Up to 10 wt %, the incorporation of the silicon fibers affected neither the vulcanization process nor the mechanical properties of the tire rubbers. It was found that rubbers prepared using ammonia accelerator were qualitatively as good as those vulcanized with sulfur compounds and diphenylguanidine ac-

UDC: 666.86+675.5

Card 1/2

L 44366-66
ACC NR: AP6019736

celerator. In all cases, the tire rubbers vulcanized with ammonia exhibited excellent mechanical properties. Orig. art. has: 2 figures, 2 tables.

SUB CODE: 11/ SUBM DATE: 16Jun65/ ORIG REF: 004

Card 2/2 hs

L 44175-66 EWT(m)/EWP(j) IJP(c) RM

ACC NR: AP6011230 (A) SOURCE CODE: UR/0413/66/000/006/0073/0073 34 B

INVENTOR: Boguslavskiy, D. B.; Borodushkina, Kh. N.; Kupriyanova, O. N.; Malinovskiy, M. S.; Sapronov, V. A.; Chavchich, T. A.

ORG: none

TITLE: Method of vulcanizing synthetic rubbers by alkylphenolformaldehyde resins. Class 39, No. 179915

SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 6, 1966, 73

TOPIC TAGS: vulcanization, synthetic rubber, phenolformaldehyde, benzene, resin

ABSTRACT: An Author Certificate has been issued for a method of vulcanizing synthetic rubbers by alkylphenolformaldehyde resins in the presence of haloid-containing compounds. To speed up the vulcanization process, α,β-dibromethyl benzene is used as the haloid-containing compound. [Translation] [NT]

SUB CODE: 11/13/ SUBM DATE: 30Jan65/

Card 1/1 UDC: 678.7.028.294.044:547.539

ROSTAPSHOV, M.F.; BOGUSLAVSKIY, D.S. [Bohuslavs'kyi, D.S.]; NEGROBOVA, M.Ya. [Nehrobova, M.IA.]

Nonsymptomatic infectious lymphocytosis in children. Ped. Akush. i gin. 24 no.6:24-26 '62. (MIRA 17:4)

1. Vtoraya infektsionnaya bol'nitsa g. Zaporozh'ya (glavnyy vrach O.G. Rodionova [Rodionova, O.H.]).

ZEYGERMAKHER, G.A.; NEGROBOVA, M.A.; BOGUSLAVSKIY, D.S.

Case of familial ovalocytosis. Probl. gemat. i perel. krovi 9 no.4:44-45 Ap '64. (MIRA 17:11)

1. 2-ya infektsionnaya bol'nitsa (glavnyy vrach O.R. Rodionova), Zaporozh'ye.

YUKEL'SON, I.I.; BOGUSLAVSKIY, E.A.

Oxidative dehydrogenation of n-butenes to divinyl in the presence of oxygen. Izv. vys. ucheb. zav.; neft' i gaz 8 no.1:18 '65.
(MIRA 18:2)

1. Voronezhskiy tekhnologicheskiy institut.

L 24721-66 EWT(m)/EWP(j) RM

ACC NR: AP6009510 SOURCE CODE: UR/0413/66/000/005/0020/0020

AUTHOR: Yukel'son, I. I.; Boguslavskiy, E. A. 16 B

ORG: none

TITLE: Preparation of divinyl. Class 12, No. 179304 [Announced by the Voronezh Institut of Technology (Voronezhskiy tekhnologicheskiy institut)]

SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 5, 1966, 20

TOPIC TAGS: divinyl, catalytic oxidation, butene, oxidation

ABSTRACT: An Author Certificate has been issued describing a method of preparing divinyl by catalytic oxidation of normal butenes with oxygen or air at an elevated temperature in the presence of water vapors. To broaden the variety , surface oxidized granules of steel or cast iron are suggested as a catalyst. [LD]

SUB CODE: 11/ SUBM DATE: 01Jun64/

Card 1/1 FV UDC: 547.315.2.07

SHABLYGIN, A.I.; YELISEYEV, V.G.; BOGUSLAVSKIY, E.I.

Problems of an efficient working of complex lodes. Zap. LGI 49 no.1:36-44 '64. (MIRA 18:8)

BOGUSLAVSKIY, E.I.

Ore drawing from shrinkage stopes branched on the rise. Zap. LGI 49 no.1:45-50 '64. (MIRA 18:8)

BELILOVSKIY, Yefim Solomonovich; BOGUSLAVSKIY, Eduard Yelizarovich; BINUS, Mark Semenovich; VOLODIN, Aleksey Pavlovich; KUNIN, Izyaslav Kopelovich, SELEKTOR, Spartak Mikhaylovich; CHUB, Vasiliy Fedoseyevich; YAMKOVOY, Grigoriy Tikhonovich; DMITRIYEV, A.P., otv. red.; KOVAL', I.V., red.izd-va; MAKSIMOVA, V.V., tekhn.red.

[Improvement of underground mining methods and equipment in the Krivoy Rog Basin] Sovershenstvovanie tekhniki i tekhnologii podzemnoi dobychi rudy v Krivorozhskom basseine. [By] E.S.Belilovskii i dr. Moskva, Gos.nauchno-tekhn.izd-vo lit-ry po gornomu delu, 1961. 238 p. (MIRA 15:3)
(Krivoy Rog Basin--Iron mines and mining)
(Automatic control)

KRASAVIN, Aleksandr Pavlovich; POPOV, Nikolay Nikolayevich; BOGUSLAVSKIY, Emil' Iosifovich. Prinimali uchastiye: TISHCHENKO, V.I.; KLYKOV, M.V.; YEROKHIN, G.M., red. izd-va; LAVRENT'YEVA, L.G., tekhn. red.

[Mine worker] Zaboishchik na rudnikakh. Moskva, Gosgortekhizdat, 1963. 150 p. (MIRA 16:8)
(Mining engineering)

BOGUSLAVSKIY, E.I., inzh.; YELISEYEV, V.G., inzh.

Technical and economic evaluation of systems of working steeply pitching seams. Iav.vys.ucheb.zav.; gor.zhur. 6 no. 12:83-87 '63. (MIRA 17:5)

1. Leningradskiy ordenov Lenina i Trudovogo Krasnogo Znameni gornyy institut imeni G.V.Plekhanova. Rekomendovana kafedroy razrabotki rudnykh mestorozhdeniy.

BOGUSLAVSKIY, G.I.

Labeling bags of sugar. Sakh.prom. 30 no.3:52 Mr '56. (MLRA 9:7)

1.Dubovyazovskiy sakharnyy zavod.
(Sugar industry)

BOGUSLAVSKIY, G.I.

Results of the general campaign and contest for inventions. Sakh. prom.30 no.11:3-4 N '56. (MLRA 10:2)

1. Dubovyazovskiy sakharnyy zavod.
(Sugar industry)

1. BOGUSLAVSKIY, G. N.

2. USSR (600)

4. Sugar--Storage

7. Using "pergamyn" instead of racks in sugar warehouses, Sakh. prom., 27, No. 1, 1953.

9. Monthly List of Russian Accessions, Library of Congress, April, 1953, Uncl.

BOGUSLAVSKIY, G.V., inzh.

Conditions of gripping the blank by the rolls of inclined piercing mills. Obr.met.davl. no.2:18-22 '53. (MIRA 12:10)

1. Novotrubnyy zavod im. Stalina.
(Rolling (Metalwork))

BOGUSLAVSKIY, G.V., inzh.

Strength of mandrel noses of piercing mills. Sbor.st.CHPI no.8:94-107 '58. (MIRA 11:9)
(Forging machinery)

BOGUSLAVSKIY, G.V., inzh.

Plotting the horizontal projection of the contact surface of pipes with rolls and straightening devices of automatic mills. Sbor.st. CHPI no.8:144-151 '58. (MIRA 11:9)
(Rolling (Metalwork)) (Pipe, Steel)

Boguslavskiy, G.V.

25(1) PHASE I BOOK EXPLOITATION SOV/2305

Chelyabinsk. Politekhnicheskiy institut

Voprosy teorii i praktiki obrabotki metallov davleniyem (Problems in the Theory and Practice of Metal Forming) Moscow, Mashgiz, 1959.
103 p. (Series: Its: [Sbornik] vyp. 14) Errata slip inserted. 5,000 copies printed.

Reviewers: V.B. Skornyakov, Candidate of Technical Sciences, V.G. Belakin, Engineer, N.A. Bedin, V.A. Korshunov, I. I. Kozhinskiy, L.A. Kritsshteyn, B. N. Malyarovskiy, M.A. Shubik, and D. I. Fishman; Ed.: V.N. Vydrina, Candidate of Technical Sciences; Exec. Ed. (Ural-Sibarian Division, Mashgiz): A.V. Kaletina, Engineer; Tech. Ed.: N.A. Dugina.

PURPOSE: The collection of articles is intended for engineers, technicians, and scientific workers in metal forming.

COVERAGE: This collection of articles, written by staff members of the Chelyabinskiy politekhnicheskiy institut (Chelyabinsk Polytechnical Institute), deals with problems on the theory, processes, and equipment of metal forming.

Card 1/5

Problems in change of shape and state of stress of parallelepipeds and cylindrical bodies subjected to flattening in plane parallel forging heads are discussed. The essentials of the theory of the interaction between strip and roll, and the question of slip along contact surfaces during rolling are explained. An analytic method for the kinematic design of steam-distribution mechanisms for steam hammers is presented. Precision stamping of thin-walled parts of intricate shape is described. An investigation of the function of repeaters in in-tandem rolling mills is discussed. An article on the testing of electric heating furnaces is also included. No personalities are mentioned. References follow several of the articles.

TABLE OF CONTENTS:

Problems in the Theory and Practice of Metal Forming SOV/2305

Boguslavskiy, G.V. [Engineer]. Deformation of Round Bodies During Radial Reduction Between Flat Plates 35

The article deals with an experimental investigation of the above phenomenon. The author presents mathematical data and the conclusions reached concerning the nonuniformity and distribution of deformations in radial and longitudinal directons. The project was supervised by Professor V.V. Sheveykin, Doctor of Technical Sciences.

Boguslavskiy, G.V. Internal Forces Active During Plastic Deformation 48

Experiments in press forming carried out in 1956 on 315 specimens are described. Internal forces were measured by a special dynomometer and a press. Simultaneous measurements of total pressure, radial forces, and reduction were recorded. Diagrams showing the relationship between these factors are shown for different specimen shapes and conclusions are presented. This project was also supervised by V.V. Shveykin.

Card 3/ 5

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206010014-7

Problems in the Theory and Practice of Metal Forming SOV/2305

AVAILABLE: Library of Congress

Card 5/5

GO/fal
9-21-59

25(1) SOV/148-59-1-15/19

AUTHOR: Boguslavskiy, G.V., Engineer

TITLE: Deformation in Round Bodies in Radial Rolling Between Flat Plates (Deformatsiya v kruglykh telakh pri radial'nom obzhatii mezhdu ploskimi plitami)

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy - Chernaya metallurgiya, 1959, Nr 1, pp 127-134 (USSR)

ABSTRACT: With reference to contradictory hypotheses on the distribution of stresses in cross sections of round specimens subjected to rolling, information is given on experiments carried out under supervision of Professor V.V. Shveykin, Doctor of Technical Sciences, for the purpose of determining the distribution of radial deformation in cylindrical specimens. Tests were performed on lead discs and specimens of 50 mm in diameter and 150 mm length. Graduation of the co-ordinate network on the butt-ends of the specimens was made by a special stamp with large and deep graduation lines. The author presents graphs and formulae showing the effect of general radial reduction on the radial deformation of concentric circumferences. The following conclusions are made: Deformation of round speci-

Card 1/2

Deformation in Round Bodies in Radial Rolling Between Flat Plates

mens is non-uniform and does not depend on their diameter; radial deformation along the horizontal increases from the periphery to the center of the cross section; ovality and radial deformation in height decreases at the beginning of increasing radial reduction and subsequently increases from the periphery to the center; in all the planes of cross sections of round bodies radial rolling causes compression along the vertical and stretching along the horizontal. There are 6 sets of graphs and 5 references, 2 of which are German and 3 Soviet.

ASSOCIATION: Chelyabinskiy politekhnicheskiy institut (Chelyabinsk Polytechnical Institute)

SUBMITTED: December 16, 1958

BOGUSLAVSKIY, G.V., inzh.

Deformation of circular solids cogged between flat dies.
Sbor. st. CHPI no.14:35-47 '59. (MIRA 12:9)
(Deformations (Mechanics))

BOGUSLAVSKIY, G.V., inzh.

Internal stresses during plastic deformation. Sbor. st. CHPI no.14:48-62 '59. (MIRA 12:9)
(Deformation (Mechanics))

BOGUSLAVSKIY, I.; BOCHAROV, Yu., nauchnyy sotrudnik.

Method for establishing work norms in the repair of open-hearth furnaces. Sots.trud.no.11:86-90 N '56. (MLRA 10:1)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut ogneuporov chermet.
(Steel industry--Production, Standards)
(Furnaces)

BOGUSLAVSKIY, I.; BOCHAROV, Yu.; YENTOV, O.

Method for developing increased norms. Sots.trud no.9:89-93 S '57. (MIRA 10:9)
(Machinery industry--Production standards)

BOGUSLAVSKIY, I.

ANAN'YEV, A.; BOGUSLAVSKIY, I. (Moskva)

Route system of accounting at a shoe factory. Bukhg.uchet 24 no.4:37-40 Ap '57. (MIRA 10:12)

1. Nachal'nik finansovo-bukhgalterskogo otdela Moskovskogo gorodskogo upravleniya legkoy promyshlennosti (for Anan'yev).
2. Glavnyy bukhgalter fabriki model'noy obuvi No.3 Moskovskogo gorodskogo upravleniya legkoy promyshlennosti (for Boguslavskiy).
(Shoe industry--Accounting)

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AUTHORS: Sil'vestrovich, S. I., Boguslavskiy, L. A. SOV/20-129-6-46/69

TITLE: Increase in the Strength of Glass as a Consequence of Its Treatment With Organosilicon Compounds

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 129, Nr 6, pp 1362 - 1365 (USSR)

ABSTRACT: The low value of mechanical strength of glass as compared with the theoretical strength computed from the values of atomic bonds is due to the inner structural defects as well as to the ultramicroscopic surface cracks (Ref 1). The authors investigated the possibility of increasing the strength of glass by simultaneous chemical and thermal treatment. The glass surface was exposed to the chemical effect of organosilicon compounds combined with various methods of heat treatment. The test material was industrial window glass of the Gor'kovskiy steklozavod (Gor'kiy Glass Factory) with the composition (in %): SiO_2 72; Al_2O_3 1.43; Fe_2O_3 0.12; CaO 7.37; MgO 4.03; SO_3 0.38; Na_2O 14.72. The glass samples were parallel epipeds, thickness: 6 or 3 mm, width: 6 mm, length: 42 mm; all facets were ground and polished. The limit of the bending stress was 5.1 kg/mm^2.

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The samples were rinsed in a weakly alkaline solution and allowed to lie in a 5% HCl solution for 30 minutes at room temperature. Pores and a very fine silica film were formed on the surface by partial leaching. This favors the combination of the later-formed polymer film with the glass. At first, the glass was kept for 5-15 minutes in monomeric organosilicon compounds diluted with benzene. Then the samples underwent thermal treatment between 200 and 650° and were cooled in the air. Thus, the mentioned polymer $[SiO_2]_n$ surface film was to be formed. Figure 1 shows that the glass was best solidified by strongly concentrated $(C_2H_5)_2SiCl_2$ and $C_6H_5SiCl_3$ solutions and a heat treatment at 650°. The polymer film "cements" the glass surface and, apparently, closes the microcracks. The mechanical strength of the glass was doubled by heat treatment at 200-300°, and trebled at 650°. Moreover, the glass was chilled in an organosilicon liquid. The glass samples were heated to mollification in the furnace, and then rapidly dipped into a diethylpolysiloxane liquid with increased heat resistance. Previously, the liquid

Increase in the Strength of Glass as a Consequence of Its Treatment With Organosilicon Compounds SOV/20-129-6-46/69

had been heated to 200°, 180°, 160°, 140°, etc. The chilled samples were dried at 200°. Figure 2 shows that the strength of the glass increases rapidly due to this hardening. This increase depends on the temperature difference Δt between the heated glass and the hardening liquid. With an optimum Δt, the bending stress of the 3-mm glass increases 11 times, that of the 6-mm glass even more (Fig 2). The inner residual stresses are only slightly higher than those in the usual hardening of glass in the air. Thus, the increased strength of the glass hardened in the above manner is, above all, due to the effect of the polymer film ("armor"). The new method has numerous advantages. The name of A. F. Ioffe is mentioned in the paper. The authors thank Professor I. I. Altaygorodskiy for his interest in their investigation. There are 2 figures and 8 references, 7 of which are Soviet.

ASSOCIATION: Moskovskiy khimiko-tekhnologicheskiy institut im. D. I. Mendeleyeva (Moscow Institute of Chemical Technology imeni D. I. Mendeleyev)

PRESENTED: July 24, 1959, by P. A. Rebinder, Academician
SUBMITTED: July 22, 1959

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15(2) SOV/72-60-1-4/17

AUTHORS: Sil'vestrovich, S. I., Boguslavskiy, I. A.

TITLE: The Use of Organosilicon Compounds to Improve Glass Properties

PERIODICAL: Steklo i keramika, 1960, Nr 1, pp 7-12 (USSR)

ABSTRACT: The authors of the present paper studied the influence of organosilicon compounds on glass properties. In their investigations at the Chair of Glass Technology of the Moskovskiy khimiko-tekhnologicheskiy institut imeni Mendeleyeva (Moscow Institute of Chemical Technology imeni Mendeleyev) they tried to study the physicochemical glass properties more thoroughly than it was done in previous papers by A. P. Kreshkov, M. G. Voronkov, and B. I. Dolgov, A. Ya. Korolev, L. M. Vinogradova. The investigations dealt with the hydrophobic nature, the chemical stability, thermal stability and mechanical strength of glass treated under certain conditions with organosilicon compounds. The investigation results are given in figures 1-6 and in the table. The mechanical strength of glass is increased by the elimination of surface cracks as was shown in the papers by S. N. Zhurkov, G. M. Bartenev, A. I. Ivanova, M. S. Aslanova, and P. A. Rebinder. In conclusion, the authors state that a high increase in the strength of glass hardened in an organo-

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The Use of Organosilicon Compounds to Improve Glass Properties

silicon liquid (varnish of type MK-4V) greatly depends on the character of the resulting polymeric film $(SiO_2)_n$. The chemical stability of a glass hardened in this way is also increased considerably. Hardening of the glass in organosilicon liquids permits glass sorts with different physicochemical properties to be obtained. The values of glass strength thus obtained already attain those of steel so that metals can be replaced by glass in constructions. The method recommended by the authors to increase the glass strength should be widely used in industry. There are 6 figures, 1 table, and 6 Soviet references.

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S/072/60/000/009/005/007
B021/B058

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AUTHOR: Boguslavskiy, I. A.

TITLE: Increasing the Thermal Stability of Glass by the Method of Thermochemical Treatment

PERIODICAL: Steklo i keramika, 1960, No. 9, pp. 26-28

TEXT: The work under review was conducted at the GSPKB (Gosudarstvennoye soyuznoye proyektno-konstruktorskoye byuro po steklu - All-Union State Planning and Design Office for Glass). The possibility was investigated of increasing the thermal stability of glass by treating its surface with organosilicon compounds. This method was elaborated at the Kafedra tekhnologii stekla (Chair of Glass Technology) of the MKhTI (Moskovskiy khimiko-tekhnologicheskiy institut imeni D. I. Mendeleyeva - Moscow Institute of Chemical Technology imeni D. I. Mendeleyev). The glass was heated in the furnace until it reached plasticity, and organosilicon compounds was applied afterwards by atomization of their solutions. The dependence of the thermal stability and the degree of hardness of the glass on the length of treatment with such solutions is shown in Figs. 1

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Increasing the Thermal Stability of Glass by the Method of Thermochemical Treatment

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and 2. Heat-resistant glasses of high strength and free from optical distortion can be produced by uniform cooling of the glass during tempering according to the new method, combined with the enrichment of its surface with silicon. Thus, great possibilities present themselves for the application of organosilicon compounds in glassmaking. There are 2 figures.

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77475
SOV/103-21-1-6/22

AUTHOR: Boguslavskiy, I. A. (Moscow)

TITLE: On the Non-Offset Evaluation of the Useful Signal Non-linearly Depending on Unknown Parameters

PERIODICAL: Avtomatika i telemekhanika, 1960, Vol 21, Nr 1, pp 42-47 (USSR)

ABSTRACT: A method is explained in the study using the linear theory to non-offset determination of the useful signal in the presence of noises when signal nonlinearly depends on unknown parameters. This method may be used for smoothing coordinates and velocity projections of an artificial earth satellite, or of a cosmic rocket moving in the passive section of its range, without making dynamic errors. Description of the method: The random process Z(t) is given in the form:

$$Z(t) = \Phi(c_1, c_2, \ldots, c_n, t) + m(t),$$

where Φ is the useful signal; c_k are random parameters;

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m(t) is the noise. Let the transformation I transform Φ into a function of form $\sum_{k=1}^{n} c_k W_k(t)$

with the a priori known $W_k(t)$, and let there be a transformation II which converts back into function Φ, the result of the application of transfromation I. It is assumed that $Z_1(t)$ is a result of the application to Z(t) of transformation I and that it may be given approximately in the form:

$$Z_1(t) = \sum_{k=1}^{n} c_k W_k(t) + m_1(t),$$

Here $m_1(t)$ is the noise random process, the correlation function of which may be expressed by the probability characteristics of noise m(t). The quantity $Z_1(t)$ is applied to the input of the element of optimum non-offset filtration. During a fixed memory time T the funnction

$$\sum_{k=1}^{n} c_k W_k(t)$$

appears in the output of this element with diminished random errors. Applying transformation II to this signal function $\Phi(c_1, c_2, \ldots, c_n, t)$ is obtained without dynamic errors. When transformation II only insignificantly "raises" the noise in the output of the optimum linear element, the random errors during time T will be decreased. Let the useful signal Φ satisfy the following nonlinear equation:

$$a_0(t)\frac{d^n\Phi}{dt^n} + a_1(t)\frac{d^{n-1}\Phi}{dt^{n-1}} + \cdots + a_n(t)\Phi = F[t, \Phi] \qquad (1)$$

with unknown initial conditions:

$$c_1 = \Phi(0), \quad c_2 = \Phi^{(1)}(0), \ldots, c_n = \Phi^{(n-1)}(0).$$

Card 3/9 The useful signal Φ is a nonlinear function of unknown

parameters $c_1, c_2 \ldots, c_n$; due to the presence of function $F(t, \Phi)$ in the right hadd side of Eq. (1). From Eq. (1) it follows that:

$$\Phi(c_1, c_2, \ldots, c_n, t) = \sum_{k=1}^{n} c_k W_k(t) + \int_0^t W(t, \tau) F[\tau, \Phi] d\tau, \qquad (2)$$

where $W_k(t)$ is the solution of the homogeneous equation

$$a_0(t)\frac{d^n W_k}{dt^n} + a_1(t)\frac{d^{n-1} W_k}{dt^{n-1}} + \cdots + a_n(t) W_k = 0$$

at defined initial conditions, and $W(t, \tau)$ is the impulse transient function of the corresponding linear dynamic element. From Eq. (2) it follows that transformation I must be determined by equation:

$$Z_1(t) = Z(t) - \int_0^t W(t, \tau) F[\tau, Z(\tau)] d\tau, \qquad (3)$$

Card 4/9 and transformation II must be determined by equation:

$$Z_2(t) = Z^*(t) + \int_0^t W(t, \tau) F[\tau, Z(\tau)]\, d\tau, \qquad (4)$$

where $Z^*(t)$ is the result of the optimum non-offset filtration of process $Z_1(t)$. $Z_2(t)$ will differ from $\Phi(c_1, c_2, \ldots, c_n, t)$ only by random errors during time T. Time T is determined from solution of the optimization problem. In the majority of practical cases Eq. (4) is changed into form:

$$Z_2(t) = Z^*(t) + S\left\{\int_0^t W(t, \tau) F[\tau, Z(\tau)]\, d\tau\right\},$$

where $Z^*(t)$ is optimum non-offset evaluation of function

$$S\left\{\sum_{k=1}^{n} c_k W_k(t)\right\}.$$

during time T. Determimation of smoothed magnitudes of trajectory elements of the artificial earth satellite: A method is discussed of determining the smoothed

magnitudes of coordinates and projections of velocity of an artificial earth satellite, without giving dynamic errors. In order to simplify the calculations, movement of the sputnik in one plane is considered. Let x,y be coordinates of the sputnik with respect to the rectangular coordinate system, with its origin in the center of the earth: this coordinate system does not participate in the revolution of the earth. Neglecting the influence of the atmospheric braking force, and the influence of the nonsphericity of the earth, the coordinates x and y satisfy the following nonlinear differential equations:

$$\ddot{x} = -gR^2 \frac{x}{(x^2+y^2)^{\frac{3}{2}}}, \quad (5)$$

$$\ddot{y} = -gR^2 \frac{y}{(x^2+y^2)^{\frac{3}{2}}}, \quad (6)$$

where R is earth radius and $g = 9.81$ m/sec^2. Thus, for instance, x(t) is expressed by equation:

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$$x(t) = x(0) + \dot{x}(0)\,t - \int_0^t \frac{gR^3(t-\tau)\,k(\tau)}{[x^2(\tau)+y^2(\tau)]^{\frac{3}{2}}}\,d\tau \qquad (7)$$

Let the following random process be investigated:

$$Z_x(t) = x(t) + m_x(t),$$

where $m_x(t)$ are random errors of measurements of coordinate $x(t)$ by means of radio and optical methods located on the surface of the earth. From Eq. (7) it follows that transformation I is determined by equation:

$$Z_{x1}(t) = Z_x(t) + \int_0^t \frac{gR^3(t-\tau)\,Z_x(\tau)}{[Z_x^2(\tau)+Z_y^2(\tau)]^{\frac{3}{2}}}\,d\tau, \qquad (9)$$

Card 7/9 and transformation II is determined by equation:

$$Z_{x2}(t) = \dot{Z}_x(t) - \int_0^t \frac{gR^3(t-\tau)\,Z_x(\tau)}{[Z_x^2(\tau)+Z_y^2(\tau)]^{\frac{3}{2}}}\,d\tau. \qquad (10)$$

In this case function $W(t, \tau)$ has no filtering properties but if time T is limited within practical values the disturbance $m_{x1}(t)$ of $Z_{x1}(t)$ coincides with the disturbance $m_x(t)$. The determination of time T is given in the appendix of the article. In a similar manner an unbiased filtration of the randim errors appearing during measurement of coordinate y can be made. In order to determine the projections of the velocity vector $V_x(t)$, $V_y(t)$ of the sputnik, transformation I in form (9), and transformation II in form

$$V_x(t) = V_x^*(t) - \int_0^t \frac{gR^2 Z_x(\tau)}{[Z_x^2(\tau) + Z_y^2(\tau)]^{\frac{3}{2}}} d\tau,$$

may be used. Here $V_x^*(t)$ is a result of the optimum unbiased differentiation of the random process $Z_{x1}(t)$.

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On the Non-Offset Evaluation of the Useful Signal Nonlinearly Depending on Unknown Parameters

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It is also outlined how to solve these when the earth nonsphericity or the atmospheric braking force are accounted for. The same method may be used for obtaining the smoothed magnitudes of coordinates and projections of velocity of the cosmic rocket having a complex movement under the influence of the gravitational field of the earth and of several celestial bodies. The participation of V. S. Pugachev at a seminar for probability methods of automatic control theory at the Institute for Automation and Telemechanics of A. S. USSR, February 16 and March 2, 1959, is mentioned. V. S. Pugachev gave a general solution for optimum evaluation of the useful signal in the presence of noises when signal depends nonlinearly on unknown parameters. There are 4 Soviet references.

SUBMITTED: April 2, 1959

Card 9/9

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78163
SOV/103-21-3-9/21

AUTHOR: Boguslavskiy, I. A. (Moscow)

TITLE: On a Drive Circuit With a Given Equation of Motion

PERIODICAL: Avtomatika i telemekhanika, 1960, Vol 21, Nr 3, pp 340-343 (USSR)

ABSTRACT: The author discusses operation of a drive with a given equation of motion in an automatic control system consisting of electronic, or passive, RC elements. The input f(t) and output x(t) coordinates of the drive are related by the following equation:

$$\sum_{k=0}^{n} a_k \frac{d^k x(t)}{dt^k} = \sum_{k=0}^{m} b_k \frac{d^k f(t)}{dt^k}. \qquad (1)$$

In systems built of passive elements a change in coefficients of Eq. (1) requires a change in the parameters of all passive elements. It is shown

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that this disadvantage can be removed when certain voltages proportional to x(t) are introduced into the system. In this case several flexible feedbacks (Fig. 1) are connected in parallel to the drive and to the basic rigid negative feedback.

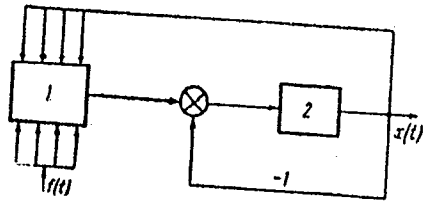

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Fig. 1. (1) circuit of passive elements; (2) drive.

An analysis is made for the system shown on Fig. 2.

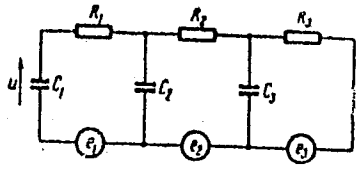

Fig. 2.

When Eq. (1) is given in the form:

$$(p^3 + a_2 p^2 + a_1 p + a_0)\, x(t) = (b_2 p^2 + b_1 p + b_0)\, f(t), \qquad (3)$$

On a Drive Circuit With a Given Equation of Motion

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where a_i and b_i are known constant coefficients. Two cases are discussed: when x(t) is the angular velocity and when x(t) is the angle of rotation of the output shaft. The method described may also be used for the case when the parameters a_i and b_i of Eq. 1 are known time functions. The subject matter of this study is part of the author's lecture given at the Second All-Union Conference on Theory of Automatic Control. There are 3 figures; and 1 Soviet reference.

SUBMITTED: May 15, 1959

Card 4/4

BOGUSLAVSKIY, I., inzh.; SIL'VESTROVICH, S., kand.tekhn.nauk

Reinforced glass. Tekh.mol. 28 no.4:5 '60. (MIRA 13:11)
(Glass, Safety)

43756

S/081/62/000/023/069/120
B180/B144

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AUTHOR:: Boguslavskiy, I. A.

TITLE: New possibilities of strengthening glass

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 23, 1962, 497, abstract 23K457 (Steklo. Byul. Gos. n.-i. in-ta stekla, no. 2(111), 1961, 26-30)

TEXT: The article considers the possibility of using organosilicon compounds (silicones) to strengthen glass and also gives some data on the thermochemical method of achieving this. In this method the silicones react with glass which has first been brought up to high temperatures, above the brittle point. This gives an increase of up to 35-50 kg/mm^2 in the bending strength. If the thermochemical treatment is combined with etching the increase will be as much as 60-75 kg/mm^2. For 5 mm glasses the average bending strength is 100-120 kg/mm^2, and for 3 mm glasses 130-150 kg/mm^2, which brings the strength of plate glass almost up to that of glass fibers. [Abstracter's note: Complete translation.]

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L 15688-63 EWP(q)/EWT(m)/BDS AFFTC/ASD Pq-4 WH

ACCESSION NR: AR3003593 S/0081/63/000/008/0499/0499

SOURCE: RZh. Khimiya, Abs. 8M70

59

AUTHOR: Boguslavskiy, I. A., Pukhlik, O. I.

TITLE: Some data concerning the nature of the strengthening of glass by a thermochemical method

CITED SOURCE: Steklo. Byul. Gos. n.-i. in-ta stekla, no. 4 (113), 1961, 24-27

TOPIC TAGS: glass strengthening glass annealing

TRANSLATION OF ASSTRACT: For the verification of the effect of the structure of glass on its strength in the process of thermochemical treatment, methods were investigated by us for the determination of micro-strength and micro-hardness of glass, and also of the effect of additional thermal treatment to remove stresses created in the glass on its strength properties. The samples studied were polarized glass of vertical extraction of thickness 5 mm, which had been treated by a thermochemical method in liquids with various cooling capacities. It was determined that with an increase of the intensity of cooling, the resistance to bending increases, and micro-hardness is reduced. The

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micro-strength of the treated samples of glass was 300-320 kg/sq mm (of the initial glass, 184 kg/sq mm). Upon cleansing the surface layers of glass after sudden cooling, a gradual rise in micro-hardness was observed. Annealing of glasses strengthened by the thermochemical method was carried out at temperatures of 630° (1 hr) and 400° (150 hr); in this a structural factor also appeared; upon high-temperature annealing, considerably deeper structural changes occur. It was suggested that the considerable strengthening of glass in the process of thermochemical treatment is explained both by the creation of higher compressing stresses and the elimination of surface defects during cleansing and also by structural changes in the glass. Bibliography of 9 titles. See also R. Zh. Khim., 1963, 5M70. S. Iofe

DATE ACQ: 12Jun63 SUB CODE: CH,MA ENCL: 00

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27582
S/072/61/000/010/001/001
B105/B101

AUTHOR: Boguslavskiy, I. A.

TITLE: Production of high-strength glasses

PERIODICAL: Steklo i keramika, no. 10, 1961, 19 - 22

TEXT: A thermochemical method for strengthening glass has been developed by GSPKB po steklu (GSPKB for Glass). Glass panes were heat-treated to the softening point and then dipped into polymeric organosilicon liquids with equal composition but different thermophysical properties. Their structural formula reads:

$$(C_2H_5)_3\,Si - \left[O - \overset{\overset{C_2H_5}{|}}{\underset{\underset{C_2H_5}{|}}{Si}} - O - \overset{\overset{C_2H_5}{|}}{\underset{\underset{C_2H_5}{|}}{Si}} - \right]_n O - Si\,(C_2H_5)_3.$$

The degree of polymerization was 5 and 15. The influence of the surface condition of the glass on its strength was studied. Some of the glasses were prepared by polishing according to specifications of the Institut

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Production of high-strength .....

khimii silikatov (Institute of Silicate Chemistry). Sheet glass of the following composition served as initial material (%): 71.9 SiO_2, 7.6 CaO, 15.2 Na_2O, 3.2 MgO, 1.5 Al_2O_3, 0.4 SO_3. The bending test was carried out by a method developed at FTI AN SSSR. A hardening degree of 2.2 N/cm was obtained with the polymer liquid n = 15 for 5 mm glass, and 3.5 N/cm with the polymer liquid n = 5. Additional etching with HF increased the strength to 100 - 150 kg/mm^2, according to I. I. Kitaygorodskiy, V. L. Indenbom (DAN SSSR, t. 108, No. 5, 1956), and Professor F. F. Vitman, who supposed that glass can be strengthened considerably by a comparatively small increase of its hardness beyond 5N/cm. The initial and the final strength of thin glasses are higher than those of thick ones due to a more rapid cooling of the former. It is noted that sheet glass with a bending strength of 100 - 150 kg/mm^2 and a thickness of 3 - 5 mm can be manufactured. M. V. Strel'tsina and O. N. Khalizeva participated in the experiments. There are 2 figures, 3 tables, and 7 Soviet references.