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References

1. Chervyakov F.I., Sumarokov N.V. Sewing machines, M. "mechanical engineering", 1968, page 472
2. Savostitsky A.V., Melikov E.Kh., Kulikova I.A. Sewing technology. M. "Light industry", 1971, page 568
3. Bobbin winder for a sewing machine, Copyright certificate No. 303385, Bull.
4. Frants V.Ya., Isaev V.V. Sewing machines, M. "Legprombytizdat",1986, pages 29-34
5. Vafaeva Z.S. Global challenges of innovative science. proceedings "Bobbin for a sewing machine"March 06, 2022 pages 49-53
6. Design and methods of calculating parameters of a fibrous material cleaner from large litter Anvar.D., Kuliev T.M. International Journal of Advanced Science and Technology this link is disabled, 2020, 29 (8 Special Issue), pages 444-452
7. Development of an effective resource-saving design and methods for calculating the parameters of gears with compound wheels Djurayev A., Beknazarov J.K., Kenjaboyev S.S. International Journal of Innovative Techology and Exploring Engineering this link is disabled, 2019, 9 (1), pages 2385-2388
8. Teoretiko-experimental method of definition of parameters of the roller with the rubber plug of the device for drawing of the polymeric composition on lines of sewed materials Behbudov S.H., Djuraev A.D, Amonov A.R., Qodirova D.X. International Journal of Innovative Technology and Engineering this link is disabled, 2019. 9 (1). pages 2069-2074
9. Development of desing and substantiation of the parameters of the separator for fibrous materials Khojiev M.T., Juraev A.D, Murodov O.D., Rakhimov A.K. International Journal of recant Technology and Engineering this link is disabled 2019, 8 (2), pages 5800-5811
10. Analysis of the interaction of fibrous material with a multifaceted grid of the cleaner Anvar J., Ozod. International Journal of recant Technology and Engineering this link is disabled 2019, 8 (1), pages 2661-2666

PREPARATION OF A NEW STRUCTURE CREATED FOR SORTING OF GINNING SEEDS

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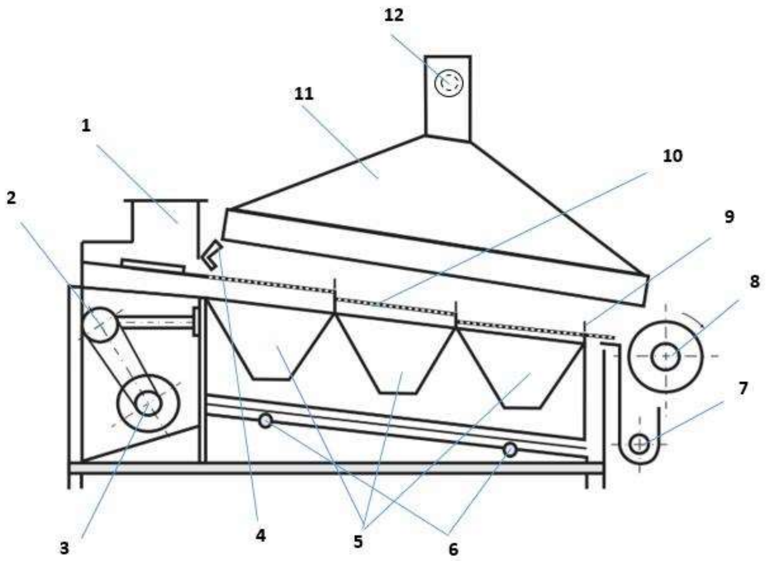
Abstract: This paper researches a pilot copy of a seed sorting device with an improved design. In addition, this article has conducted theoretical and practical studies to determine the effectiveness of seed selection. As a result of these studies, the operating mode of the new construction was determined and the parameters for its effective operation were developed. The geometric parameters of the developed sorting device are recommended for use in the production copy.

Keywords. Seeds, ginning, cotton, cotton fiber, sorting, cleaning, seed fractions, technology, efficiency, spinning, quality, mesh surface.

Introduction. It is known that in many studies [1-4] it was noted that seeds with different fiber content are included in the mass of seeds after the ginning process. In addition, it is clear to many researchers that the mass contains various impurities, broken and damaged seeds, and clean seeds (not necessarily sent to the linter) [5-6]. Previous studies [7-8] have recommended sorting the ginned seeds, returning them to the gin machine, transferring them to the linter battery, sending them to the seed storage and discarding them, respectively, and this has been done using a single technology [9-11].

In this work, the results of the scientific-research works carried out in this direction until now have been deeply analyzed. As a result, the advantages and disadvantages of the created devices were identified and research directions were selected. Taking into account the main shortcomings of the devices designed for sorting or cleaning the dried seeds, a new device scheme was developed for practical research (Fig. 1).

Based on the analysis of the conducted researches, it was determined that it is necessary to improve the technologies that provide the opportunity to improve the quality of lint and increase the production of fibers suitable for spinning in cotton ginning enterprises, in order to increase their efficiency, the accuracy of seed sorting, and to ensure their ecological safety. solution was selected as a main focus for further research [12].



Here are 1 inlet pipe, 2 eccentric shaft, 3 electric motor, 4 rubber limiter, 5 hoppers into which seed fractions fall, 6 bearings, 7 dirt auger, 8 saw drum separating long fiber seeds, 9 digging piles , 10-oscillating mesh surface and 11-air intake shell, 12-air intake fan

Figure 1. Technological scheme of the improved sorting device

When this device works, the seeds come to the mesh surface 10 through the inlet pipe 1, and here they start to move along the sections separated by the piles 9. Since the width of the surfaces that make up the mesh surface of the sections increases from the beginning to the bottom, the seeds begin to be sorted according to their fiber. The mesh surface 10 receives the vibration from the eccentric shaft 2 driven by the engine 3, and bearings 6 are placed under the surface carriage to create amplitude. A small fan 12 is mounted on top of the shell 11 to trap and expel dust.

In the technological process of cotton processing, it is necessary to create a device that captures fractions that are not well ginned, and it requires a theoretical study of the exit of these fractions from a normally functioning gin.

In [13], it was proved that there are two types of residual fibers in the ginning cotton seeds, which are loosely bound fibers and fibers that have not yet been completely separated from the seeds by sawing. The reason for the appearance of free fibers is the large difference in the rotation speed of the raw material roller and the saw cylinder. In order to prevent the causes of this formation and not to damage the seeds, in order to completely retain the fibers in the raw material shaft in the imperfectly formed process, the non-formed fractions should be additionally crushed and directed to the teeth of the saw cylinder.

The amount of free fibers and incompletely ginned seeds from gin depends not only on its normal functioning, but also on a number of other factors. These conditions can be caused by the following: high humidity of raw cotton; failure to replace saw cylinders or damaged teeth, individual saws on time; malfunction or lack of piles in seed combs [14-16].

The preparation of unginned fractions, as well as the choice of technology and their further processing, require the distribution of cotton seeds according to the degree of shrinkage and the knowledge of the content of free fibers, which are underestimated in them after ginning [17-18]. For this purpose, we selected 200 seeds for research from a fractional batch selected after a normal working gin under the production conditions of a cotton gin, and this experiment was repeated until 95% of results were obtained. The fibers in the selected fractions were divided into 7 groups according to their length, and the results were measured. The measurement results are presented in Table 1.

Table 1

The length of fibers present in ginseng seeds

№	Lint and fiber length, mm						
	0-5	5-10	10-15	15-20	20-25	25-30	30-35
1	30	77	67	17	3	3	3
2	34	55	72	16	5	4	4
3	35	67	65	19	6	5	3
4	33	74	61	21	4	3	4
5	39	65	71	13	5	4	3

Methods. We use the following formula:

$$P(X, \leq \xi \leq X_2) = -\Phi\left(\frac{X_1-\bar{X}}{\sigma}\right) + \Phi\left(\frac{X_2-\bar{X}}{\sigma}\right) \qquad (1)$$

Let's look at the first interval:

$$P_{1=}P(0 \leq \xi \leq 3) = -\Phi\left(\frac{6-10,26}{6,0811}\right) + \Phi\left(\frac{3-10,26}{6,0811}\right) = \Phi(-1,6872) + \Phi(0,8649) = -0,0465 + 0,1949 = 0,1484 \qquad P_1{=}0,1484$$

$$P_{2=}\Phi\left(\frac{10-10,26}{6,0811}\right) - \Phi\left(\frac{6-10,20}{6,0811}\right) = \Phi(-0,0428) - \Phi(0,8649) = -0,0499 - 0,1939 = 0,3050 \qquad P_2{=}0,3050$$

$$P_{3=}\Phi\left(\frac{15-10,26}{6,0811}\right) - \Phi\left(\frac{10-10,20}{6,0811}\right) = \Phi(-0,7795) - \Phi(0,0125) = 0,7623 - 0,4920 = 0,2006 \qquad P_3{=}0,2903$$

$P_4=\Phi\left(\frac{20-10,26}{6,0811}\right)-\Phi\left(\frac{15-10,20}{6,0811}\right)=\Phi(1,60)-\Phi(0,7795)=0,9432-0,8320=0,1132$

P_4=*0,1132*

$P_5=\Phi\left(\frac{25-10,26}{6,0811}\right)-\Phi\left(\frac{20-10,20}{6,0811}\right)=\Phi(2,3239)-\Phi(1,600)=(1-0,0237)-0,0452=$ $0,9763-0,9452=0,0311$ P_5=*0,0311*

$P_6=\Phi\left(\frac{30-10,26}{6,0811}\right)-\Phi\left(\frac{25-10,20}{6,0811}\right)=\Phi(3,246)-\Phi(3,3239)=(1-0,0007)=$ $(1-0,0072)=0,0013=0,0026-0,0065$ P_6=*0,0065*

$P_7=\Phi\left(\frac{35-10,26}{6,0811}\right)-\Phi\left(\frac{30-10,20}{6,0811}\right)=\Phi(4,0663)-\Phi(3,2460)=(1-0,000)=$ $(1-0,0047)=1-0,0033=0,0047$ P_7=*0,0047*

To calculate values

$$\Phi(X_i)=\frac{1}{\sqrt{2\pi}}\int^{xi} l^{\frac{t^2}{2}}\,dt \qquad (2)$$

taking the formula, $\Phi(X_i)$ when calculating the value, the table of values with the calculation of Laplace's normative functions was used [19].

Here, P_i is the theoretical data representing the probability of failure of the seeds. $\sum P_i$ - these probability estimates obey the general normal distribution law.

P_i	$\sum P_i$
$P_1=0,1484$	0,1484
$P_2=0,3050$	0,4534
$P_3=0,2903$	0,8437
$P_4=0,1132$	0,9569
$P_5=0,0311$	0,9880
$P_6=0,0065$	0,9945
$P_7=0,0047$	0,9992

Column 16 of Table 2 shows the difference between empirical and theoretical distribution functions, namely:

$$D=|F_n(X)-F(X)| \qquad (3)$$

Results. It is necessary to check the hypothesis about the compliance of the observed phenomenon with the normal law [20] according to the criteria of scientific work. According to this criterion, it will have a very strict significance level – *P*=0,2.

In this case D =0,0569; n =200.

$$\lambda=D\sqrt{2}=0,0569\sqrt{200}=0,0569\cdot 14,142=0,8047\ \lambda=0,8047$$

Table 2

Results of the interval study

Lint class by length	Interval	The center of the fiber interval	(1) n_i	(2) n_i	(3) n_i	(4) n_i	(5) n_i
1	2	3	4	5	6	7	8
1	0-5	2,5	30	34	36	33	39
2	5-10	7,5	77	65	67	74	65
3	10-15	12,5	67	72	65	61	71
4	15-20	17,5	17	16	19	21	13
5	20-25	22,5	3	5	6	4	5
6	25-30	27,5	3	4	5	3	4
7	30-35	32,5	3	4	3	4	3

Table 2 continued

Average n_i	n_i/n	$\sum n_i/n$	$X_{ўрт}\, n_i/n$	σ^2	P_i	$\sum P_i$	$EP_i \sum n_i/n$
9	10	11	12	13	14	15	16
33	0,164	165	0,4054	10,55	0,1484	0,1484	0,0166
62	0,31	0,475	2,318	3,08	0,3050	0,4534	0,0216
63	0,345	0,835	4,304	1,33	0,2303	0,8437	0,0077
24	0,12	0,4562	2,039	4,45	0,1132	0,9569	0,0007
7	0,035	0,975	0,078	3,74	0,0311	0,9800	0,0150
3	0,015	0,99	0,48	3,9	0,0065	0,9945	0,0045
2	0,01		0,32	7,41	0,0047	0,9992	0,0008

λ_{Φ} we get the following according to the table for [20]:

$$\lambda_{0,8} = 1{,}07 \ ie \ \lambda < \lambda_{\ 0,8}$$

(0,8016<1,07)

Therefore, according to the hypothesis of the normality of the distribution law of the determined fractions, they should have been lintered twice downwards. In our case, the parameters of the normal distribution are as follows:

$$a = \bar{X} = 10{,}26, \quad \sigma = 6{,}0811$$

i.e., the probability of a cotton blend being separate can be studied separately for certain fractions.

In order to improve the quality of the produced lint and increase the fiber output, the task of studying the fractional composition of the ginned seeds depending on their fiber content and residual fiber level is set.

We considered the issue of the distribution of demonized seeds in the following fractions:

- regenerating seeds;
- twice-lintered fractions;
- single linter fractions;
- non-linter seeds.

For this purpose, we conducted studies and analysis of ginned seeds and their fiber content and residual fiber in several cotton ginning enterprises. In this case, the output of fractions after sorting: single- and double-lintered seeds, and fiber seeds, which should be re-sintered, made it possible to determine the homogeneity of the formation.

The range of the amount of distribution by seeds is equal to:

$$R_e = Q_{кат} - Q_{кич} \quad (4)$$

Here $Q_{кат}$ ва $Q_{кич}$ - the largest and smallest amount of seeds included in a given fraction.

Now let's consider the range of the distribution of seed fractions for seeds prone to double linter at different values of gin productivity:

a) minimum productivity Q_1=7.4 kg/saw hour

b) average productivity Q_1=9.5 kg/saw hour

c) maximum productivity Q_1=12.2 kg/saw hour

Q1

100	108	105	106	107	108	109	110	112	113	115	118	119
1	1	1	1	1	2	5	1	2	2	1	1	1

Q2

107	108	109	111	112	115	116	117	119	120	121
1	2	3	2	3	3	1	1	2	1	1

Q3

112	115	116	117	118	119	121	123	124
1	1	2	5	4	3	2	1	1

The interval for the distribution of fractions will be equal to:

a) Rmin=19; b) Ror=14; c) Rmax=12

We find the arithmetic mean using the following formula:

$$\bar{C} = \sum_{i=1}^{n} C_i q_i / \sum_{i=1}^{n} q_i \qquad (5)$$

a) $\bar{C}_{min} = 109{,}7$; b) $\bar{C}_{ўр} = 113{,}25$; c) $\bar{C}_{max} = 116{,}1$

In that case, exclusion $\Delta\bar{C}_i$ a group of seeds prone to double linters $\bar{C}$ in terms of average value is the following:

$$\Delta C = C_i - C$$

From this we find the mean square constraint:

$$\delta = \sqrt{\sum_{i=1}^{Q_n} (C_i - \bar{C})^2 \frac{q_i}{2C}} \qquad (6)$$

a) $\delta_{min} = 4{,}42$; b) $\delta_{or} = 4{,}25$; c) $\delta_{max} = 2{,}65$

Conclusions. We proved that the distribution of random variables (the number of double linter seeds) obeys the normal distribution law. Using it, it is possible to determine the probability density of the number of seeds that will be lintered twice, that is:

$$y = \frac{1}{S\sqrt{2\pi}} \cdot exp\left\{\frac{\Delta C}{2S^2}\right\} \qquad (7)$$

Now we calculate the Laplace functions, taking into account the following:

$$Z_i = \frac{\Delta C_i}{S}$$

a) Q_1

Z_1	Z_2	Z_3	Z_4	Z_5	Z_6	
-2,1946	-1,5158	-1,0639	-0,6371	-0,6109	-0,3846	
Z_7	Z_8	Z_9	Z_{10}	Z_{11}	Z_{12}	Z_{13}
-0,1584	0,06787	0,3264	0,7468	1,1991	1,8778	2,1041

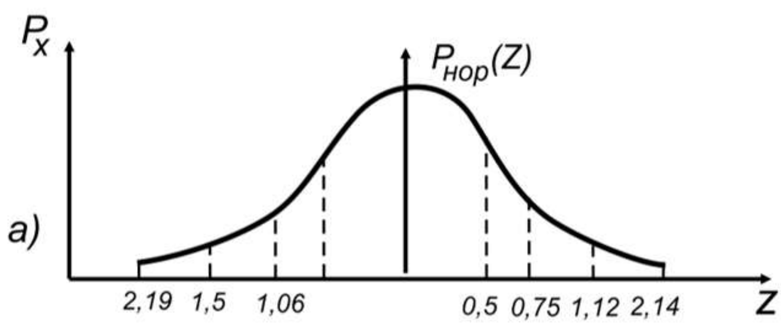
b) Q_2

Z_1	Z_2	Z_3	Z_4	Z_5	Z_6
1,4705	-1,2559	-1,0	-0,5294	-0,2941	0,4118
Z_7	Z_8	Z_9	Z_{10}	Z_{11}	
0,6770	0,5824	1,2924	1,5882	1,8235	

c) Q_3

Z_1	Z_2	Z_3	Z_4	Z_5	Z_6
-2,3019	-1,1698	-0,7924	-0,4151	0,0377	0,3396
Z_7	Z_8	Z_9			
1,0943	1,8491	2,2265			

a) Q_1



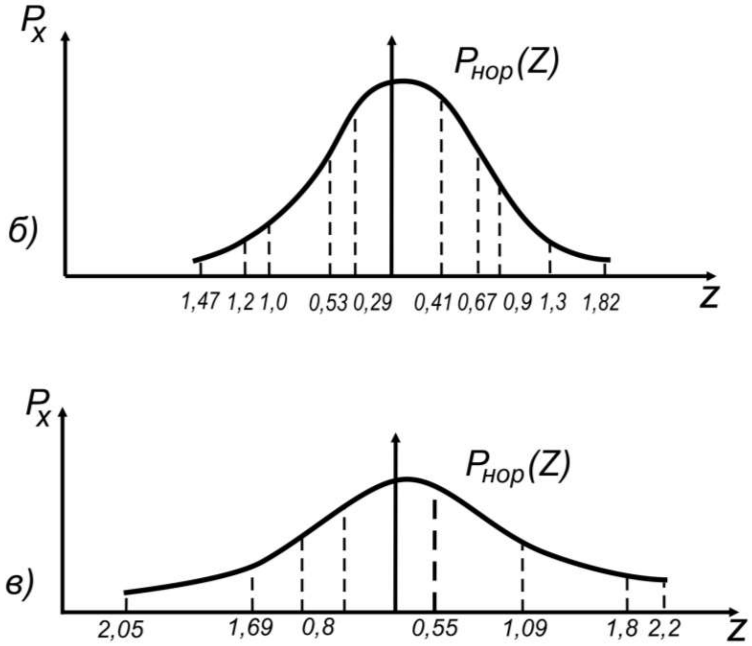


Figure 2. Limits of permissible fluctuations for seeds prone to double linters

$$\Phi_0(Z_1) = \Phi_0(-2{,}1916) = -\Phi_0(2{,}1946) = -0{,}4861$$
$$\Phi_0(Z_{13}) = \Phi_0(2{,}104) = 0{,}4821$$

b) Q_2

$$\Phi_0(Z_1) = \Phi_0(-1{,}4705) = -\Phi_0(1{,}4705) = -0{,}4292$$
$$\Phi_0(Z_{11}) = \Phi_0(1{,}8235) = 0{,}4656$$

c) Q_3

$$\Phi_0(Z_1) = \Phi_0(-2{,}3019) = -\Phi(2{,}3019) = -0{,}4893$$
$$\Phi_0(Z_9) = \Phi_0(2{,}2265) = 0{,}4868$$

Permissible fluctuation limits of the number of seeds to be lintered twice are given in Fig. 2.

References

1. Obidov A., Mamatqulov O., Sultonov M. Theoretical analysis of the movement of Cotton piece on the slope surface. International conference, 27.04.2018, Berlin, 151-156.
2. A.Obidov, Kh.Akhmedhodjaev, O.Sarimsakov, Q.Holikov. Investigation of the Properties of Fibrous Cotton Seeds, for Sorting on a Mesh Surface. Engineering, 2018, 10, 572-578.
3. Биргер И.А. Прочность. Устойчивость. Колебания. Москва, 2012, 567 с. (https://www.ozon.ru/publisher/kniga-po-trebovaniyu-5297160/)
4. Полякова Д.А. и др. Отходы хлопчатобумажной промышленности. // Справочник.. – М.: Легпромбытиздат, 1990. - 208 с.
5. Obidov A.A., Sultanov M., Mamatkulov O. Study of the dependence of their characteristics on the processing of ginned seeds. FarPI scientific and technical magazine, Special issue, No. 3, 2018, pp. 22-27.
6. Birger I.A. Strength. Sustainability. Fluctuations. Moscow, 2012, 567 p. (https://www.ozon.ru/publisher/kniga-po-trebovaniyu-5297160/)
7. Polyakova D.A. etc. Waste of the cotton industry. // Directory .. - M .: Legprombytizdat, 1990. - 208 p.

8. Akhmedkhodzhaev Kh.T. other. Investigation of the process of impact interaction of cotton seeds // Cotton industry. 1992. No. 5-6.
9. Novitsky I.I. Some physical and mechanical properties of cotton seeds. – Oil and fat industry. 1964. No. 5.
10. Akhmedkhodjaev H.T., Yakubov D., Obidov A.A. Ways of sorting fiber seeds after the ginning process. // Collection of articles of NamMII international scientific and practical conference. - Tashkent, 2002. - p. 389-392.
11. Akhmedkhodzhaev Kh.T., Boyturaev U.G., Tajibaev M.A. Probability of seeds coming out of a genie with varying degrees of hairiness. - T .: 1993. - 29 p. - Dep. in UzNIINTI No. 1451-Uz.
12. Isakhanov Kh.I. Study of the process of regeneration of under-ginned cotton seeds before lintering and the creation of a device for its implementation: Dis. … cand. tech. Sciences. - Tashkent: TITLP, 1986.- 243 p.
13. Akhmedkhodzhaev Kh.T., Karimov A.I., Obidov A.A. Study of the vibration movement of cotton seeds on vibrating carriages of parallel ossonation. // Journal of Textile Problems. - Tashkent, 2003. - No. 4. - P.65-67.
14. Obidov Avazbek, Sultonov Mirzaolim, Muhksinov Ibrohim, Abdullaev Shokir. The Theoretical Studies of the Cultivation of Three Cotton Seeds along the Plain. Engineering
Vol.10 No.08(2018), 514-520 P.
15. A.A.Obidov M.M.Sultanov. To research the method of separating fibers suitable for spinning on a needle drum. International scientific and practical conference CUTTING EDGE-SCIENCE. June 29-30, 2020 Shawnee, USA, 128-131 P.
16. Sultonov M.M. Obidov A.A. Study of fiber motion in a needle drum fiber separation device. Universum: Technical science, 5-74, 33-37 P.
17. Mirzaolim Sultanov, Avazbek Obidov. Investigation of working parts of fixed device designed to separate spinning fibers from fibrous waste that can be spun. Journal of Critical Reviews, JCR. 2020; 7(4): 2314-2322, doi: 10.31838/jcr.07.04.362, 5614-5623 P.
18. Obidov A.A. Investigation of the working surface of a new seeding machine // Journal of Textile Problems. - Tashkent: TITLI, 2006. - №2. - 29-32 p.
19. Avazbek Obidov, Muhiddin Vokhidov, Jahongir Abdurahmonov. Exploring the Efficiency of Experimental Construction of Sorting Ginned Cotton Seed Machine. Engineering, Scientific Research Publishing. Vol.13 No.1, January 2021.
20. Obidov A.A. Improvement of the technology of cleaning and sorting of ginned seeds. Dissertation of Candidate of Technical Sciences. - Tashkent: TITLI, 2007. - 200 p.

CARRYING OUT THEORETICAL STUDIES OF THE COTTON REGENATOR

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Abstract: In this paper, it was determined the strength of a newly installed slatted drum shaft by improving the design of the regenerator and conducting experiments on it. Based on the research, it was determined that the minimum value of the strength reserve coefficient is equal to 166, and it was concluded that this shaft fully meets the specified requirement for the device.

Keywords. Cotton raw material, impurities, regeneration, regenerator, colostrum grid, drum, drum shaft, planks, torque, weight

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