

Prediction trends exterior designs gondola by analyzing arrays infringement

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S u m m a r y . The article describes the analysis of changes in patenting designs gondola car bodies over the past 20 years and their development prospects. It was conducted during the study of the dynamics of patenting designs gondola in leading countries. There is the distribution of patent fund by country patent search and problems of structural components. The article displays the dynamics of patenting in the country.

K e y w o r d s : body, gondola, patent search of the technical solutions.

improvement of basic units and structures in general - the chronological development of the system over time, which must not be based on an analysis of patent information content determines the future development of alternative designs.

INTRODUCTION

Improving of technical level of produced freight cars and their competitiveness on the international market on the basis of new scientific and technological development is an important task of the transport sector of Ukraine.

In accordance with the state program "Ukrainian wagon" which was approved by the Ministry of Infrastructure of Ukraine on February 4th 2011 one of the main objectives was to create models of freight cars of new generation. According to the Cabinet of Ministers of Ukraine dated September 7, 2011 № 942 "On approval of the list of priority thematic areas of research and scientific and technological development for the period up to 2015 and the Law of Ukraine" On Amending the Law of Ukraine "On priority directions of science and technology "dated September 9, 2010 N 2519-VI of the priority directions of science and technology until 2020, which resulted in forecasting the development and

PROBLEM DESCRIPTION AND THE ANALYSIS OF RECENT RESEARCH

The operation of modern gondolas showed the significant design flaws, which entail additional costs for repairs. Gondola is the most easy-to-break type of rolling stock. The line of basic constructions of gondola has more than 20 models, but they all have a certain number of drawbacks. The above is confirmed by the fact that solid support body in some places can receive serious damage in operation, including cracks in the welds pillars pivot in the joints and lower substrate binding and cracks in vertical sheets of intermediate transverse beams in the area of the low link. These damages are caused by significant tensions that arise in operation [2-7,10, 13, 17]. The above proves the relevance of the deployment of research and development work to address scientific and applied tasks - development of new structural solutions and patent searches.

One of the important stages of the research and determine trends, current and future level of performance cars is to analyze patent search. The

patent research regulated by the state standard GOST 3575-97 in Ukraine. It sets out the basic terms and procedures for patent research. The patent research is important for budget institutions or partially financed from the state budget. Mathematical methods of calculation and analysis of the patent fund allow assessment of trends object technology. Using these methods defined areas of structures, including long-term trends and who have exhausted their potential [1, 8-16, 18-21]. The relevance of the chosen research topic is determined by the fact that the prediction of gondola structures can decide in the direction of search and research, upgrades designs of cars in general.

THE PURPOSE OF THE ARTICLE

The article presents an analysis of the dynamics of patenting designs gondola body for the past 20 years and prospects for their development. The analysis conducted in the study of the dynamics of patenting designs gondola in leading countries.

MAIN CONTENT

The patent information is most valuable material for the prediction of construction technical system which is the body gondola because of its specificity, novelty, accuracy, concentration, completeness of information about the technical nature.

Analysis of the entire array of patent information allows us to trace not only the evolution of structures, but also to determine the status for a given period and identify prospects. To identify existing structures of gondola body patent search conducted in the following countries: Germany, U.S., EU, China, Canada, Ukraine and Russia. There was the search of technical information in journals, newsletters, directories listed industrial countries. The depth patent search was defined research objectives: determine trends and identify the most promising developments. Using patent information is based on the fact that the patent application is implemented in 10-12 years in the first sample and another 8 years - in mass production. The analysis revealed that the average time of development in the production of patented technical solutions to improve the gondola is 17-20 years. [15,16].

The distribution of patent search by countries is shown in figure 1

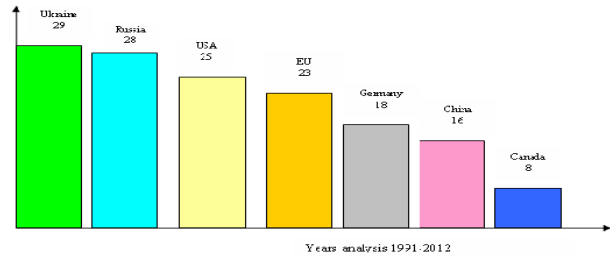


Fig. 1. The distribution of patent fund by country

The distribution of patent search is valuable information but it gives only a generalized notion of patenting by country patent search and more valuable information is the direction of body structures from patents.

The Distribution Patent Foundation on issues of patent search by countries is shown in figure 2

Analyzing the problem areas are the main structural elements to be baskets gondola upgrades are: a wall socket, frame, removable roof sheathing. This dramatically upgraded body gondola through the introduction of various forms of profiling in Russia and Ukraine. Directions for searching of solutions to implement new profiles with ample roof are prevalent in the United States and Chinese. Development of reverse body has evolved in Europe. Covering improvement is engaged by scientists in Canada.

The analysis of the patent was based on the so-called patent numbers that show the distribution of patent documents in time. Generally, the study of the dynamics of patenting is conducted for each selected direction for the region as a whole, separately for each country search. In addition, the dynamics of patenting is determined separately for domestic security document and in general, the "global" data. Determining the quantitative characteristics of the dynamics of the study area can be done by various methods, the most famous of which is to compute the so-called coefficient of dynamic (dynamic curves), the value of which characterizes the intensity of a particular area. Method of calculating dynamic coefficients is rather complicated and time-consuming [18]. The prospect of technical areas revealed by regression analysis selected array of inventions, consistently developing specific technical solution or signs. The criteria adopted by the prospects of the dynamics of patenting rates offered by N.M. Timofeevov [20]:

$$N_i = N_0 \cdot e^{t_i}, \quad (1)$$

N_i - The number of applications per year t_i

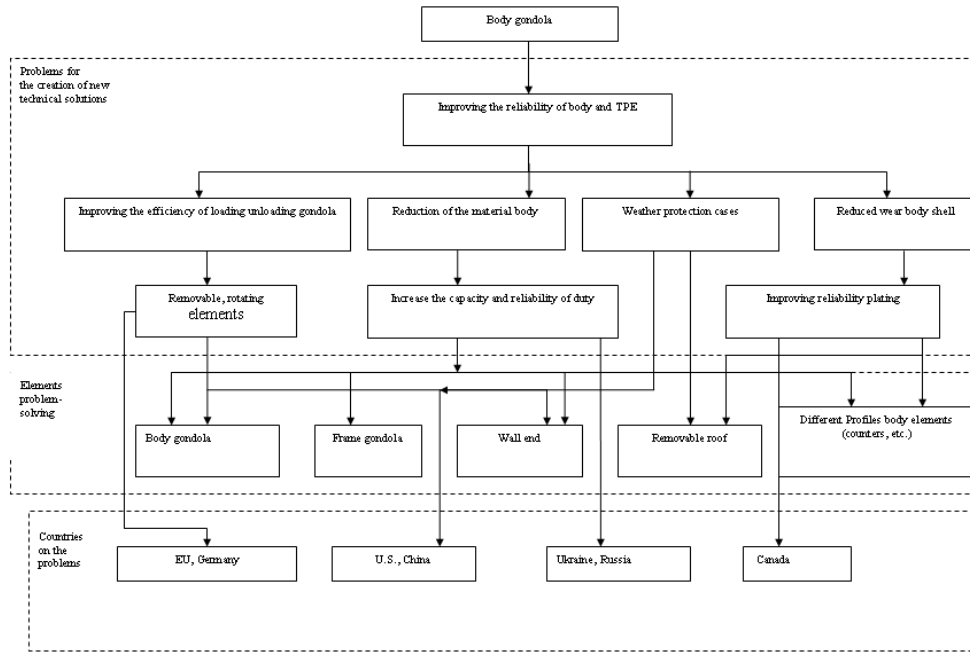


Fig. 2. Distribution of the patent fund issues

N_0 - The number of patents per year at beginning point,
 e - base of natural logarithms,
 B - coefficient of prospects,
 $t_i = \tau_i - \tau_0$ number of years,
 τ_i - current year,
 τ_0 - year of origin.

Year of the origin; we obtain a linear relationship, which is solved by the method of least squares(1):

$$\ln N_i = \ln N_0 + \epsilon t_i \quad (2)$$

Let $\ln N_i = y_i, \ln N_0 = a$, and get $y_i = a + \epsilon t_i$ or

$$y_i = \bar{y} + \epsilon(t_i - \bar{t}) \quad (3)$$

Where: $\bar{t} = \frac{\sum_{i=1}^k t_i}{K}, \bar{y} = \frac{\sum_{i=1}^k y_i}{K}$ k-number of points on axis «t»

Prospect coefficient ϵ is given by formula:

$$\epsilon = \frac{\sum_{i=1}^k (y_i - \bar{y})(t_i - \bar{t})}{\sum_{i=1}^k (t_i - \bar{t})^2} \quad (4)$$

For the mode of assessment of the reliability of the regression slope coefficient in having random variation, was conducted in relation to the value of this quantity standard deviation of the experimental points (S_b). Thus test the significance of the slope coefficient (per Student) was determined from the equation

$$t_\alpha = \frac{\epsilon}{S_\epsilon} \quad (5)$$

where:

$$S_\epsilon = \sqrt{\frac{S^2}{\sum_{i=1}^k (t_i - \bar{t})^2}} \quad \text{- standard deviation for the prospect coefficient:}$$

$$S = \sqrt{\frac{\sum_{i=1}^k (\bar{y} - y_i)^2}{K - 2}} \quad \text{- standard deviation for the regression line.}$$

For existing tables so-called Student's distribution $\frac{\epsilon}{S_\epsilon}$ for the ratio and the number of degrees of freedom defined width of the confidence interval. Were selected for analysis only those values in, for which bilateral confidence probability was at least 90%.

Figure 3 graphs the regression dynamics patenting gondola body on the countries and technical areas of the body structures.

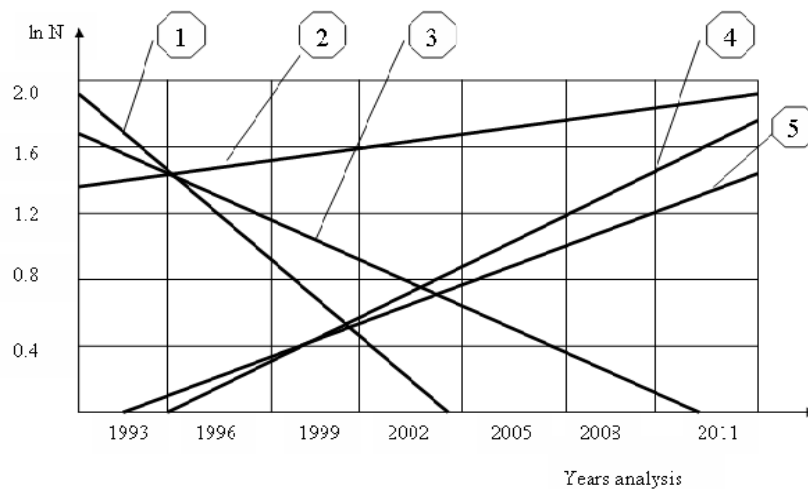


Fig. 3. The dynamics of patenting body gondola Country Patent Search

1. Canada ($b=-0,181, S_b=0,087, =2,08$)
2. US and Germany ($b=0,032, S_b=0,031, =1,03$)
3. the USA and China ($b=-0,142, S_b=0,072, =1,92$)
4. Ukraine ($b=0,315, S_b=0,12, =2,625$)
5. Russia ($b=0,304, S_b=0,15, =2,03$)

The analysis of patenting trends in technical development and improvement of gondola body should be complemented by statistical studies. The most significant inventions in each direction patented in many countries. This so-called "patent-analogues", they are sometimes 60% of the total amount of patents. The practical value of such inventions confirmed production experience in priority countries.

Therefore latitude extent of patenting and patent solutions also allow for a comparative assessment of the prospects of individual inventions and various technical areas.

CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE USE

The greatest test of significance patents gondola body prevails in countries such as Ukraine and Russia.

The results of the research allow identifying the main directions for the development work of modernization of gondola body.

REFERENCES

1. **Eaton J., Kortum S., 1996.:** Trade in ideas: Patten, you and productivity in OECD. / Journal of the global economy. Number 40. 251-278.
2. **Danko M.I. 2012.:** Udoshonalennja organizacijno-tehnologichnoji modeli vikoristanija vantagnih vagoniv riznoji formi vlasnosti na zaliznicah Ukrajinii / M.I.Danko, D.V. Lomotko, V.V. Kuleshov // Zb. nauk. prac.- Kharkiv: UkrDAZT. - Vip. 129. - 5-11.
3. **Fomin O.V., 2012.:** Formalicija procedyri stvorennija ta postanovki novih modelej vantagnih vagoniv na virobniectvo v suchasnih ymovah/ O.V. Fomin // Vagonnij park. Kharkiv. - № 7(64)/2012 19-21
4. **Fomin O.V., 2012.:** Metod otsinky nadiynosti elementiv kuzoviv suchasnyh zaliznychyh napivvagoniv z urahuvannjam tsenzurovannja vybirky [Tekst]/ O.V.Burlutskyy// Zb. Naukovykh prats'. - Donets'k: DonIZT, 2012. - Vyp.№29.-215-221 – (Seriya "Tehnichni nauky)
5. **Fomin O.V., 2013.:** Optimizacijne proektuvannja elementiv kuzoviv napivvagoniv ta organizacija ih virobniectva: monografija/ O.V.Fomin. – Donetsk:DonIZT UkrDAZT. 2013. - 252.
6. **Fomin O.V., 2012.:** Rozrobka metodyky vprovadzhennja riznyh profiliv v yakosti skladovyh elementiv nesuchyh system vantazhnyh vagoniv. [Tekst]/O.V. Fomin// Visnyk Natsionalnogo technichnogo universytetu "HPI". - Kharkiv. - 26'2012. 29-33
7. **Fomin O.V., 2012.:** Vyznachennja perspektyvnyh napryamkiv proektuvannja nesuchyh system u vantazhnomu vagonobuduvanni [Tekst]/ O.V. Fomin// Shidno-Yevropeyskyy zhurnal peredovyh tehnologii. - Kharkiv. - №3/7(57). 32-35
8. **Heebyung K., 2008.:** Functional approach for studying technological progress: Extension to energy technology / K Heebyung, L Christopher A Magee /Technological Forecasting & Social Change -, V.75, Issue 6, 735-758.
9. **Heebyung K., 2006.:** A functional approach for studying technological progress: Application to information technology / K Heebyung, L

- Christopher A Magee// Technological Forecasting & Social Change –1061-1083.
10. **Lomotko D.V., 2012.:** Sovremennij gruzovoy podvignoy sostav novogo pokolenija kak prioritetnoe napravlenie razvitija ukrainskih geleznih dorog / D.V. Lomotko // Vagonnij park. Kharkiv. – № 10(67)/2012. 6,7.
 11. **Mario H., 2005.:** Technometrics: Origins, historical evolution and new directions / Technological Forecasting & Social Change. – 944-979.
 12. **Malkov V., Vlasova A., Nosko P., Stavitsky V. 2011.:** Метод of the dynamic analysis the mechanism. TEKA Kom. Mot. i En erg. Roln. –OL PAN, 11A. –Lublin, 145-150.
 13. **Moroz V.I., 2009.:** Formalizovane opisnne konstrukcii zaliznichnih vantagnih vagoniv / V.I. Moroz, O.V. Fomin // Zb. nauk. prac.- Kharkiv: UkrDAZT, 2009. - Vip. – 173-179.
 14. **Myamlyn S.V., 2009.:** Prohnozuvannya design of biaxial trolley car / SV Myamlyn AS Matsyuk Bulletin of DIIT- 24-29.
 15. **Orlova N., 1988.:** Guidelines for the study of the level and trend of technological development based on patent information. - M.: Fire Prevention – 42.
 16. **Park V., 2006.:** International patents, patent rights and technology gaps // Working Paper. American University, Department of Economics, 2001.
 17. **Sergienko N.I., 2012.:** I ezdit dolshe, I ekonomit bolshe .../ N.I. Sergienko // Magistr. – №91 (1777), 28.11–04.12.2012 – 4
 18. **Skornyakov E., 2000.:** Guidelines for conducting patent research / Skornyakov E., Omarov T., Chelisheva O., M.: INIT Rospatent.-245.
 19. **Spiryagin M., Spiryagin V., Kostenko I., 2011.:** Modelling of a controlled tractive wheelset for a bogie of a rail way vehicle based on noise spectrum analysis TEKA Kom. Mot. i En erg. Roln. –OL PAN, 11A. – Lublin, 232-244.
 20. **Timofeev N.M. 1970.:** Opyt forecasting the development of machinery industry on the basis of statistical analysis of patents. / N.M. Timofeev, N.M. Madatov. -M.: Clarendon Press Atomizdat 58.
 21. **Zainetdynov R.I., 2000.:** Razvitie metodov otsenki rabotosposobnosti nesushchih konstruktsii podvizhnogo sostava s ispol'zovaniem zakonomernosti samoorganizatsii I samopodobiya: Diss. dokt. tehn. nauk. – M.:MIIT. – 435.

ПРОГНОЗИРОВАНИЕ ТЕНДЕНЦИЙ РАЗВИТИЯ КОНСТРУКЦИЙ КУЗОВА ПОЛУВАГОНОВ НА ОСНОВЕ АНАЛИЗА МАССИВОВ ПАТЕНТОВ

Алексей Фомин, Алексей Бурлуцкий

Аннотация: В статье представлены анализ динамики патентования конструкций кузовов полувагонов за последние 20 лет и перспективы их развития. Анализ проведен при исследовании динамики патентования конструкций полувагонов по ведущим странам. Определены распределение патентного фонда по странам патентного поиска и проблематика конструктивных составляющих. Приведена динамика патентования по странам.
Ключевые слова: кузов, полувагон, патентный поиск технических решений.