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Ermakova E.E. SCIENTIFIC DISCOVERIES IN THE INTELLECTUAL PROPERTY MANAGEMENT REPUBLIC OF BELARUS

Ermakova E.E.

The article addresses the features of scientific discovery as a result of intellectual activity. The attributes of a scientific discovery and its difference from invention, have been identified. The article also considered the retrospective experience of legal protection of scientific discoveries, determined the role of science in modern society development, revealed modern economic and legal challenges resulted from discovery and use of new patterns and phenomena in the intellectual property management system, revealed the main ways of their solution.

Keywords: scientific discovery, intellectual products, intellectual property, world novelty, fundamentality, invention

Introduction

Over the past centuries, science had created many miracles and started playing a critical role in the community development. Human evolution and the development of civilization were determined, first of all, by human achievements in science and technology. The ideas of converting thermal energy into mechanical facilitated activating various mechanisms, constantly improving them, from steam engines to atomic ones. Each 30-40 years we discover new sources of energy, using it for our needs. The use of electricity allows to perform many industrial and entertainment tasks, chemical developments boost crop yields, creation of new materials, production of cosmetics, detergents, etc.; discoveries in medicine help to fight diseases, save people's lives and provide people with a better quality of life. Great discoveries have changed the course of history and the quality of human life. It is well known that it is to the surrounding world that humanity owes most of its great discoveries. It is no coincidence that Marcus Cicero said: "There is nothing more inventive than nature".

Initially, inventions were created by masters and craftsmen, whose activity results were obtained through trials and errors, while intellectual activity was not their main activity. Since the end of the XIX century, there has been a convergence of science and production. The authors of inventions and scientific discoveries were scientists practicing systematic scientific research, research teams were involved in professional research. Recently, science has taken a critical position in states' economy, it enhances technological progress and changes our reality.

The core of all progressive technologies are intellectual products, assets that ensure super profits and high competitive position for a country with new technologies.

The protection of the rights of intellectual property owners is ensured by international legislation and national legislation of countries. Intellectual property (IP) is the result of a human creative activity which can have a very different form, be it a work of art, an invention, a software, a trademark, or other commercial designation [1].

The Stockholm Convention of 1967, which established the World Intellectual Property Organization (WIPO), determined that intellectual property includes rights related to literary, artistic and scientific works; performing artists, sound recordings, radio and television broadcasts; inventions in all fields of human activity; scientific discoveries; industrial designs; trademarks, service marks, brand names and commercial designations; protection against unfair competition, as well as all other rights related to intellectual activity in the industrial, scientific, literary and artistic fields [2].

Scientific discovery is undoubtedly an achievement of research activity, it is a WIPO-recognized intellectual property. At the same time, the Republic of Belarus has no instruments regulating legal and economic relations that arise from creation and use of scientific discoveries. As per Civil Code of the Republic of Belarus, a scientific discovery does not refer to the intellectual products.

A scientific discovery can be the result of numerous theoretical and experimental studies. The emerging scientific hypotheses do not always find support of scientific colleagues and are finally formulated definitively only with time, sometimes it is a matter of more than one decade. Often scientific discoveries are created by chance and completely unpredictably. A scientist working on a specific issue may unexpectedly notice previously unknown natural relationships and identify patterns in a completely different field of science. It is almost impossible to predict and plan new discoveries.

Scientific discovery, as a rule, is a basis for a number of inventions with their next implementation in advanced technologies and production innovations. It is obvious that authors of scientific discoveries need protection, therefore, the issue of giving a certain status to a scientific discovery as the highest form of the intellectual product is quite **relevant**.

The purpose of this study is to determine the role of scientific discovery in community development and to identify the place of scientific discovery within the intellectual property management system, thus involving the following tasks:

- to reveal scientific discovery attributes;

- to make a comparative analysis of scientific discovery and invention;

- to identify the main economic and legal issues in the field of intellectual activity;

- to make proposals regarding the legal protection of scientific discoveries as the highest achievements of research work.

The content of the main issue is analyzed using the historical and legal method. The analysis of the resource component of scientific discoveries sources was implemented using methods of analysis and synthesis, system analysis, comparative analysis allowing to study economic phenomena and processes in all variety of relationships and dependencies.

Scientific discovery attributes

The Geneva Treaty on the International Recording of Scientific Discoveries (1978) defines a scientific discovery as "The recognition of phenomena, properties or laws of the material universe not hitherto recognized and capable of verification" [3].

In the Soviet Union, scientific discoveries were registered from 1947 to 1991. The Regulation on Discoveries, Inventions and Rationalization Proposals, understood scientific discovery as the establishment of previously unknown objectively existing laws, properties and phenomena of the material world contributing fundamental changes to the level of knowledge.

Pursuant to modal Law of the member States of the Commonwealth of Independent States of 2010 on protecting the rights to scientific discoveries, scientific discovery is the establishment of previously unknown but objectively existing laws, properties and phenomena of the material world contributing fundamental changes to the level of knowledge.

In 2014, Russia adopted a national standard on scientific discoveries that proposed to register only previously unknown patterns, properties and phenomena.

B.B. Leontiev adds that discoveries are not only the discovery of new phenomena or describing the mathematical formula of this pattern, but also the explanation of the hitherto unexplained phenomenon itself. The explanation should be purely scientific and evidence-based. Therefore, the category of scientific discoveries should include:

- detection and description of new natural objects and phenomena as new effectors;

- descriptions of new, previously unknown natural links and relationships as new systemic patterns, where the best is a mathematical formula tested for any change in this pattern;

- evidence-based explanation of new natural mechanisms as complex relationships and, accordingly, complex patterns, including a description of mechanisms of phenomena which were previously known did not have an evidence-based explanation [4].

In American law, invention means an invention or discovery. Both objects are undoubtedly the products of creative work. However, scientific discovery and invention are somewhat different concepts. If invention is a technical solution that refers to a product or method, then discovery reveals previously unknown patterns, phenomena and properties of the material world. Scientific discovery is characterized by world novelty and validity.

Despite the common features with inventions, scientific discoveries have distinctive features peculiar only to these objects (Table 1).

A scientific discovery is, as a rule, the result of fundamental scientific research, however, other forms, causes and consequences are possible in creative activity. An invention may precede a scientific discovery, because the discovery of patterns, properties and phenomena is often unpredictable and, while working on an invention, a scientist may notice previously unknown natural phenomena.

A scientific discovery always has a world novelty, i.e. a discovery is new if it has not been known in the world before the priority date. The discovery must be reliable, or proven, i.e. theoretically and experimentally justified. Fundamentality involves making major changes in the level of scientific knowledge.

Criteria	Scientific discovery	Invention
Research product	Fundamental research	Applied research
Signs of the object	World novelty, validity, fundamentality	Inventive level, novelty,
		industrial applicability
Accommodation	Regularity, property or phenomenon	Product or method
Subject of the exclusive right	Public domain	Individuals and legal entities
Source	Natural patterns, properties or phenomena	Artificially created object
Intellectual product	Makes changes in the level of cognition	Makes changes in labor
		and technological processes
Importance in scientific	Contributes to the progress of science,	Contribute to creating new industries
and technological progress	acceleration of the scientific revolution	
Practical application	Uncertain in the near term	Industrial applicability is one
		of the protectability criteria
Economic effect	In the long term	Commercialization and profit making
Cost estimation	Impossible	May be estimated

Table 1 – Distinctive characteristics of scientific discovery and invention

A scientific discovery is natural laws, properties or phenomena, i.e. it is something that has always been in nature, but we did not know about it, unlike an invention that was created by man. An invention is an object that did not exist before its creation. In this regard, scientific discoveries are undoubtedly the heritage of mankind, however, many research results are kept in the strictest secrecy, especially if they are military developments.

The regularity (law) of the material world, as the subject to discovery, is the previously unknown objectively existing strong link between phenomena or properties of the material world, the establishment of which makes fundamental changes in the level of cognition [5].

The phenomenon of the material world as the subject of scientific discovery, is a previously unknown objectively existing form of expressing the essence of the object of the material world (nature), the establishment of which makes fundamental changes in the level of cognition [5].

The property of the material world as the subject to scientific discovery, is a previously unknown objectively existing qualitative characteristic of the object of the material world, the establishment of which makes fundamental changes in the level of cognition [5].

Scientific discovery as an intellectual product makes fundamental changes in the level of cognition and, as a result, affects the creation of inventions. Based on scientific discoveries, new areas of science and technology start to develop, facts and phenomena find their scientific explanation, new opportunities and methods for solving practical problems open up, the basis is laid for increasing the level of knowledge, which later lead to applied achievements, the transition to a new technological order is implemented.

As defined by UNESCO, the status of fundamental research is awarded to the developments that contribute to the discovery of the laws of nature, understanding interconnection between phenomena, properties and objects of reality [6].

At the stage of fundamental scientific research in the field of natural sciences, the desire to commercialize their outcomes is not so clearly expressed, since all possible ways of using global, large-scale scientific discoveries to obtain superprofits are not yet clearly seen. Of much greater demand on the world market are scientific and technical developments resulting from applied experimental design and technical developments [7].

Often, even scientists themselves cannot predict the consequences of their research developments. Sometimes scientific discoveries are ahead of society and it takes time for the level of technology to be ready to accept the revealed patterns or phenomena.

The issues of identifying and registering scientific discoveries have been raised by such scientists as B.B. Leontiev, V.I. Mukhopad, Yu.V. Yakovets, E.A. Salitskaya.

Science and sustainable development of society

Science in the modern world has become one of the most crucial tools for ensuring progressive economic development. This is explained by at least two main circumstances. First, the ability to generate and implement achievements of scientific and technological progress turns into one of the factors of ensuring competitiveness of both the national economy as a whole in the global competitive environment, and individual producers in specific markets. Second, at present, science itself is becoming a specific sphere of commodity production which creates a very expensive product intellectual property objects [8].

By the end of the 20th century it became obvious to everyone that the level of development and dynamism of the innovation sphere – science, knowledge-intensive industries and companies, global technology markets – determines boundaries between rich and poor economies, creates the basis for sustainable economic growth. Technological progress has changed not only the scale and structure of production in industrially developed countries, but also considerably influenced the quality of life, people's relationships with each other and the world around [9].

A high level of scientific efficiency and the efficiency of using scientific discoveries and inventions is one of the main indicators of the country's competitiveness. Economies with the greatest financial, military and political influence on the world order today are scientific and technological leaders whose path is defined as post-industrial, informational, or digital development of society, in other words, a knowledge-based society.

Scientific discoveries are the top form of the results of intellectual activity in the field of cognition, the initial base for subsequent acquiring the ways to apply this increment of knowledge in inventions and implementation in innovations, in producing fundamentally new technology [10]. (Fig. 1)



Figure 1 – Scientific and technological chain of society development

Any scientific or technical achievement depends on the general level of development of science and technology on the whole, that is, it must be prepared by all prior development [11]. The source of technological innovation is fundamental science. Scientific discoveries are the basis for developing technology, the successful use of which results in economic growth. Economic competitiveness and efficiency are determined not only by creating intellectual products, but also by successful inventions introduction into production process.

The country's competitiveness in the global economy much depends on the ability to produce and export knowledge-intensive, high-tech products. All modern technologies use the most complex combinations of materials, processes, topologies of integrated circuits and other components enabling creation of the final product. This might be a car, a smartphone, an airplane. Constructing an atomic bomb requires knowledge of nuclear physics. Today, any school textbook describes an atomic bomb, but not every country has the opportunity to build this weapon. Not every country can afford to engage in space research, creation of new drugs, etc.

History shows that introducing new technologies has influenced economic growth and the population's standard of living. A new stage of evolution created conditions for the development and implementation of next-generation innovations. Technologies applied today are outcomes of prior scientific research and developments, as well as the quality of life that we have now is largely the result of scientific research and developments in such areas as medicine, education, environment [12].

General presentation of affairs in scientific research

Legal issues of scientific discovery are characterized by the lack of definition of scientific discovery status in the system of intellectual property objects.

So, a scientific discovery is not recognized as an IP object, the authors' rights are not registered with the patent office, nor a security document for a scientific discovery is issued. However, patterns, phenomena and properties revealed in nature, as a rule, are accompanied by a number of inventions that often find commercial application. Moreover, inventions created on the basis of scientific discovery are the basic ones and become the fundament of new directions of technology or a step towards new technological order.

The rights of inventors are protected by law; when acquiring their rights, inventors do not have any economic and legal relations with the author of a scientific discovery. In other words, companies acquiring the rights to inventions make a profit, transfer part of this profit as payments for the use of IP objects to the owners of these rights, but all these cash flows bypass scientists who made this discovery.

Scientific discovery creators who invested their talent and work have the right to count on moral remuneration as well, that is, be able to have non-property rights to the results of creative work.

The most important factor determining the level of a country's scientific potential and, ultimately, the effectiveness of scientific and scientific-technical activities, is its financing.

In Belarus, research and development funding is provided for the main types of work: fundamental scientific research, applied scientific research and experimental development. When studying the structure of financing in these areas, it can be seen that larger half of the costs are sent to experimental development, their share is 60% of all costs, and 14% is spent on basic research. At the same time, about half of all expenditures sent to basic research fall on natural sciences, approximately 20% on technical, 10% on agricultural, and 7% on medical sciences.

Such structure of science funding is quite justified and is primarily associated with limited resources, which is why we always have to choose. The same structure of internal research and development costs by type of work is observed in Russia, almost the same structure of costs in European countries and the USA.

It is obvious that the achievements of applied research cannot be effective without fundamental knowledge. The use of technologies such as computed tomography and other precise diagnostics is possible thanks to x-ray discovery. Following the discovery of electromagnetic waves, A.S. Popov created radio, resulting in radio engineering receiving its development. The discovery of penicillin was the salvation of mankind in the twentieth century, followed by creation various antibiotics. The discovery of electricity still allows us to improve technology based on the achieved level of understanding fundamental processes.

But fundamental research would not go without support of applied developments since they involve various instruments, devices and equipment in their research. Thus, fundamental and applied sciences develop in complementarity and mutual enrichment of each other.

Global trends in economic development are characterized by accelerated pace of scientific and technological progress and an increasing share of the intellectual component of production processes. Today, intellectual potential is a fundamental factor in the strategic growth of the economy. That is why spending on research and development in high-tech countries is constantly growing and amounts to 2.5-3.5% of GDP.

The main issue of the Belarusian science is the low science intensity of the national GDP, being 0.6% in recent years, whereas the threshold level for the country's scientific and technological security is set at 1.0%.

The state strategy "Science and Technology: 2018-2040" provides for an increase in investment in research and development at a faster pace against GDP dynamics, including through a systematic increase in the science intensity of GDP. The strategy assumes the sustainable provision of the GDP knowledge intensity indicator at the level of 3% by 2040 [13].

The country's scientific and technical potential is determined by the availability of specialists and their quality. Belarusian science is characterized by low indicators of the number of personnel engaged in research and development. The number of full-time employment researches per 1,000 engaged in economy is 4.12 people, which is more than two times down than in technologically developed countries. In Russia, this figure in 2019 was 5.6. It should be noted, however, that this indicator has been growing over last four years, and the absolute number of researchers in Belarus is also

increasing. A negative trend is the reducing number of highly qualified personnel, doctors and candidates of sciences, among researchers. Their number decreased by 22% and 13%, respectively, compared to 2005.

Patent statistics in one form or another are increasingly used as a characteristic of the effectiveness of research activities. The number of patents granted to an enterprise or country may reflect their technological dynamism. The study of the growth in the number of patent classes can suggest the directions of technological progress [14].

The dynamics of patenting shows the change in inventive activity over the surveyed period. Statistical data are divided by nationality of the applicant and the patent holder. The systematized information helps to assess the level of national scientific and technical activity, reflects the level of international participation in the field of innovation. In the process of analyzing patent statistical information, it is possible to assess the link between patent activity and economic growth, determine the R&D cost effectiveness, and make forecasts of inventive activity.

The patenting trend of the last ten years in Belarus remains unchanged. Since 2011, there has been a drop in inventive activity, the number of registered objects of industrial property is down 3.4 times by 2019. (Fig. 2)



Figure 2 – Number of patents granted to national applicants for industrial property objects [15]

The current situation with the level of inventive activity is reflected in the export indicators of high-tech products. Its share in the total volume of output exports is 3%, while high-tech products import exceeds exports by 3.6 times.

The leaders in the global market are only the owners of technologies enabling production of fundamentally new products. It is not easy for Belarusian enterprises to compete in high-tech market segments with multinational corporations possessing significant innovative, technological and financial capabilities, therefore, one of the ways to solve the country's technological development is equity participation in the financial and economic activities of multinational corporations, since only giants can stand in a tough competition on global ranks.

The solution to this problem is planned to be implemented in the future. In July 2021, the Belarusian National Academy of Sciences of Belarus and National Research Center «Kurchatov Institute» of Russia signed a cooperation roadmap for the period up to 2030. The roadmap of cooperation includes activities in nuclear energy, genetic research, nuclear medicine, the development of unmanned aerial vehicles, and other areas [16].

Conclusion

The conducted research made it possible to determine the nature of a scientific discovery, its distinctive features and to establish the main problems of an economic nature with respect to creating intellectual property objects and legal issue with reference to protecting the results of scientific and technical activities.

The most valuable strategic resources of any modern state are scientific discoveries as the best raw materials for creating innovative monopoly technologies, industries, markets and, accordingly, for creating new goods, jobs, replenishing the budget and, as a result, for the development of its national economy [17].

A scientific discovery is an outcome of fundamental research that characterizes patterns, properties and phenomena not previously identified in nature. Currently, there are no scientific discoveries in the list of results of intellectual activity of the Civil Code of the Republic of Belarus. It is necessary to provide legal protection for scientific discoveries, to amend the Civil Code of the Republic of Belarus, to adopt a law regulating relations emerging in connection with the use of scientific discoveries.

The discovery is undoubtedly a public domain. However, the significance of a scientist who has discovered new natural laws and phenomena must be legally defined. The author of a scientific discovery is the most important link in the technological chain, and therefore protecting the rights of the author of the discovery requires legislative consolidation of non-property rights. It is also necessary to legislatively ensure the right of material remuneration of the author of a scientific discovery based on results of the use of inventions derived from this discovery. The relevant changes will contribute to increasing the creative activity of scientists and the development of scientific and technological progress.

Belarus needs to develop its own scientific potential and create conditions to implement inventions in the production of competitive, fundamentally new products. Scientific and technical cooperation between Belarus and Russia is likely to create the necessary foundation for improving the level of intellectual development and harmonize legislation in the field of intellectual property.

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Stankevich D.V. SOCIAL ENTREPRENEURSHIP IN BELGIUM

Stankevich D.V.

Abstract: the article addresses the issues of social entrepreneurship in Belgium. It examines the main organizational forms of social enterprises operating in that country, analyzes statistical data on the number of employees in the industry and the number of enterprises over the period of 2008 to 2017, compares the indicators of socio-economic development of Belgium and the Republic of Belarus. The study was implemented with the financial support of the Belarusian Republican Foundation for Fundamental Research inside research project "Developing social entrepreneurship in the Republic of Belarus" (No. G20M-050).

Keywords: social entrepreneurship, association, cooperative, full-time equivalent (FTE)

World experience in social sector development shows that social entrepreneurship affects the development of society. In turn, "social entrepreneurs act as agents of change in the social sector by accepting the mission of creating and maintaining social value (and not just private value), recognizing and relentlessly using new opportunities to fulfill this mission, participating in the process of continuous innovation, adaptation and learning" [1]. In other words, "social entrepreneurs create social value through innovation and the use of financial resources for the social, economic and public development of the country" [2]. Of interest is the experience of Belgium, one of the most progressive countries in the field of support and development of social entrepreneurship. The prerequisites for the emergence of social entrepreneurship in Belgium are "the historical development of the non-profit sector and cooperative traditions" [3]. The development of social economy and the institution of social enterprises in Belgium is a significant political challenge. The main activity within the framework of its implementation is aimed at creating and developing new organizational and legal forms of activity, opening and supporting enterprises in order to prevent social isolation of citizens of the country. In addition, "the modern economic and social policy of the country is aimed at finding ways to more effectively solve a number of major problems" [4] among which unemployment is a key issue (7.7% in 2017). The Belgian model of