



# Nikola Tesla's Patents

Snežana Šarboh<sup>1</sup>

**Abstract – The most important part of the Nikola Tesla's works are his inventions, that are protected by numerous patents granted to him. Despite of significance of the Tesla's patents, an exceptionally small number of papers refers to Tesla's activities related to protection both of his inventions and patents as well. In this paper are presented the results of the latest investigation of Tesla patents both in the U.S. and other countries than the U.S. showing that Tesla had less than 300 patents in 26 different countries.**

**Keywords – Nikola Tesla, Patents, Patent Families, Inventions**

## I. INTRODUCTION

Comparison of biographies of the three great scientists of Serbian origin, namely Milutin Milanković, Mihajlo Idvorsky Pupin and Nikola Tesla, shows considerably more differences than similarities among them. The same conclusion can be derived on the basis of comparative analysis of their works. Differing from the first two mentioned, Nikola Tesla did not make a classical academic carrier for himself. Though he was author of many articles, lectures, as well as works intended both for expert and general public, his papers have not been much cited. His most important works are his inventions, that are protected by numerous patents. Consequently, one can find descriptions and drawings of his inventions in appropriate patent specifications. This is the reason why the patents present the most important part of the works of Nikola Tesla. Keeping in mind that Tesla spent much time and money and put great effort into patenting his inventions as well, it is important to elucidate how many patents he obtained for them.

## II. PATENTS AND INVENTIONS

The answer to this question is very simple indeed. In public, the terms "invention" and "patent" are often used as synonyms. However, although these terms are well known to all of us, their true meanings are very different.

The purpose of a patent is to protect inventions. This protection gives exclusive rights to a patent holder, i.e. rights of property to make, use and sell the protected invention. Further, the patentee has the right to prevent any third person to do the same without his/her consent. Besides the rights on the part of patent owner, there are rights conferred to the

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<sup>1</sup>Snežana Šarboh, MSc, is with Intellectual Property Office, Zmaj Jovina 21, 11000 Belgrade, Serbia, E-mail: [sarbohs@yahoo.com](mailto:sarbohs@yahoo.com)

inventor, as well, those are ethical rights, i.e. the right to be referred to as the creator of the invention. Duration of a patent rights is temporally limited, thus in most countries validity is 20 years, from the filing date of the patent application. Thereupon, it is open for general public and anyone may freely use the invention that was protected by the patent up to that moment. More important is, that the patent validity is territorially limited, i.e. it is in force only in the country, the competent authority of which granted that patent, while in the rest of the world, in all countries where the invention is not protected by a patent, the invention may be used freely.

Despite of significance of the Tesla's patents, an exceptionally small number of papers refers to Tesla's activities related to protection of his inventions and patents as well. One of the important publications about Tesla's activities related to the protection of his inventions is [1]. A list of 112 patents, that Tesla held in the United States, was published in this book, as well as a list of 109 patents that he received in other countries. These lists contain a total of Tesla's 221 patents. In the introductory text titled "Patenti Nikole Tesle", Prof. Aleksandar Marinčić, PhD, claims that the total number of patents, that were issued on behalf of Tesla in the USA, is 112, according to the evidence of the Nikola Tesla Museum, but it is also noted that the list mentioned above, also contains patent No. 613,819, which was approved for an invention named "Filings tube", despite the fact that there was no reliable data that it was granted to Nikola Tesla.

Many books, focussing mainly on Tesla's U.S. patents, were published in other countries, some of them containing complete lists of these Tesla's patents. On the other hand, Tesla's patents, registered in countries other than the United States, have not drawn as much attention, and therefore incomplete, inaccurate and unreliable data thereon have been published. Even today, on the Internet, there is an information that Tesla had more than 700 patents (from the web page [http://en.wikipedia.org/wiki/List\\_of\\_Tesla\\_patents](http://en.wikipedia.org/wiki/List_of_Tesla_patents)), which stands in serious disproportion to the figure of 221 Tesla's patents, specified in [1].

In order to determine the accurate number of Tesla's patents, registered in the U.S. as well as in other countries, a team of experts - patent engineers of the Federal Intellectual Property Office (now: Intellectual Property Office), visited the Nikola Tesla Museum in 1992 and 1993. Their goal was to study and analyze archive material that is kept there, and based on it, establish a list of all of Tesla's patents, and to determine whether there had been any patent applications filed, for which patents had not been approved, and to check if

any patent applications had been prepared, that Tesla never filed. Members of that team were: Ivan Župunski, PhD, Snežana Šarboh, MSc, Bogdan Todorov, MSc, Ljiljana Kovačević, Jovan Perić and Slobodan Stojković, who spent six months at the Nikola Tesla Museum. In addition, the Federal Intellectual Property Office asked the European Patent Office (EPO) to send a copy of Tesla's patents that are available to the EPO, which they did very shortly thereupon. The patent specifications sent were analyzed in parallel to the Museum's archive, resulting in exceptionally large working material. However, due to circumstances, this material was neither systematized, nor published, except for only one report drafted and submitted thereupon by the expert team to the director of the Federal Intellectual Property Office. The importance of this report confirms the fact that therein, for the first time, was indicated the existence of Tesla's particular patents from other countries, which Tesla used to protect his inventions for which he had no adequate U.S. patents. Namely, this concerns 6 Tesla's patents from Great Britain, belonging to the last period of Tesla's work.

The report mentioned above, served as a basis for making a selection of Tesla's patents published within [2]. In those four books, 112 of Tesla's U.S. patents, as well as the 6 patents from Great Britain, mentioned above, were published in both Serbian and English, which was a significant step forward, regarding earlier works that referred to Tesla's patents.

Considering the importance of the research performed, as Tesla's inheritance was analyzed by the industrial property experts for the first time, and the need to establish a complete and accurate list of Tesla's patents, and being one of the direct participants of this research, I accepted the challenge to process the material gathered and make the obtained results available to the expert public, as well as a wider audience. The processing and study of this material, brought about a number of papers [4]-[9] about Nikola Tesla's patents, that were published successively, starting from 1999, in "*Glasnik intelektualne svojine*". Unification of these papers into a simultaneous presentation of new results that have been obtained in the meantime resulted in the paper that will be presented in the following part.

### III. NIKOLA TESLA'S U.S. PATENTS

Although it is known that Nikola Tesla started his work as an inventor back in the period of 1881-1882, when he worked in Budapest, at the Central Telegraphic Office, there is no information that he tried to acquire a patent for any of his inventions.

The situation changed at the beginning of 1884, after he left for the United States of America, where he started to work for Edison's company Edison Machine Works. Edison was not just a great inventor, but also a smart businessman who successfully lead the company he founded himself and efficiently used the patent system to ensure himself the benefit of a monopolistic position on the market and adequate publicity, resulting in more than thousand U.S. patents. On the other hand, a great number of his patents are not entirely original. By them he only protected improvements of inventions made by other inventors. Edison also had no

scruples to register inventions that had been developed by his employees to his own name, which often lead to conflicts among him and these employees and ended in them leaving Edison's company.

At the time when he was employed in Edison's company, Tesla worked on the development and improvement of dynamo-electric machines, and probably electric arc lamps. However, in this case, Edison usurped the results of another persons work and protected these inventions under his name. Therefore, the public is left without any information about Tesla's first inventions protected by patents. Looking at the list of Edison's patents from this period, one can only make guesses which of these patented inventions had been created by Tesla, and which ones by other of Edison's employees. This kind of Edison's attitude was the reason for conflict between them, but it can be assumed that in this period it was, that Tesla learned about the importance of protection of inventions and how to acquire patents for them.

This is supported by the fact that immediately after leaving Edison's company and starting his own company "Tesla Electric Light & Manufacturing", Tesla filed his first patent application in the USA, for the electric arc lamp (patent application No. 160,574 from 30.03.1885, for which the patent No. 335,786 (shown in Fig. 1.) was granted). Before the end of that year, Tesla filed four more patent applications, one of which also related to electric arc lamps, and the other three to dynamo-electric machines and their regulators.

The following year, 1886, Tesla filed only three patent applications, two of them concerning regulators for dynamo-electric machines, and the third concerning the thermo-magnetic motor. On the other hand, the U.S. Patent Office issued Tesla's first six patents, the first patent No. 334,823 relating to a commutator for dynamo-electric machines, although he filed this application on May, 6th, 1885, one month after he filed his first U.S. patent application mentioned above.

During 1887, Tesla submitted six new patent applications. Except the first two applications, one relating to regulators for dynamo-electric machines and the other concerning the pyromagneto-electric generator, the other applications already belonging to the field of polyphase alternating currents and relating to motors and generators based on them. However, three of the applications mentioned, had to be divided, on request of the U.S. Patent Office. They believed that the subject of the application did not meet the conditions for unity of invention, so that Tesla had to derive one divisional application from each initial patent application, 252,132 from October 12th, 256,652 from November 30th, and 258,787 from December 23rd. And so the total number of Tesla's patents reached nine in 1887.

However, this figure is not final. Namely, after having a look at the archive material that is kept at the Nikola Tesla Museum, it has been determined that besides the applications filed to the U.S. Patent Office, for which he received appropriate patents, Tesla also filed a number of applications that had not been approved for different reasons. An example is Tesla's patent application No. 239,481, filed 26.5.1887, from which Tesla divided a divisional patent application on 25.5.1889, under No. 312,069, for which Tesla received the

patent No. 428,057, for an invention named the pyromagneto-electric generator. However, after looking at the list of Tesla's U.S. patents, it is obvious he did not acquire a patent for the initial patent application No. 239,481. Based on the preserved data, it seems that this patent application was rejected.

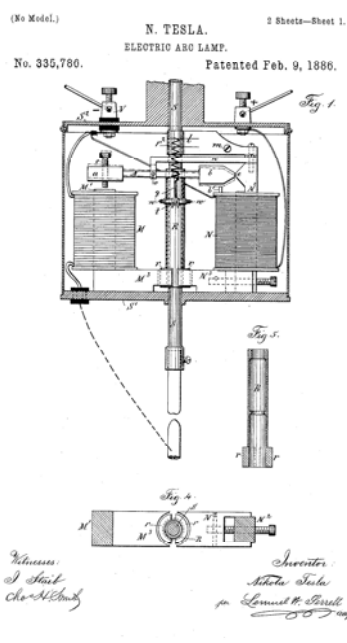


Fig. 1. A page of patent specification of U.S. patent No. 335,786

This means that the number of patent applications filed by Tesla, in some years was higher than the number specified here, which refers only to patent applications for which Tesla acquired patents.

Tesla's activity on filing patent applications increased during the two following years. In 1888, he filed ten patent applications, one of which was divided, which brings the final number of Tesla's patent applications to eleven. The following year, 1889, Tesla filed fifteen patent applications, which is the biggest number of patents filed in one year throughout his whole career. In the following year, 1890, the number of patent applications filed was significantly lower, only six. The inventions Tesla requested protection for through patent applications in the three years mentioned, mainly dealt with polyphase alternating currents.

During 1891, Tesla filed 7, in the following year only 3, and in 1893 he filed another 6 patent applications. The subjects of these applications still mainly concerned polyphase currents and their application, e.g. for lighting, electric railways, and other. It is interesting that in this period Tesla received his first two patents in the field of mechanical engineering, for the reciprocating engine and the steam engine.

In the meantime, the focus of Tesla's work shifted towards high frequency alternating currents. This caused a two year pause in filing patent applications, after which came a period

when Tesla again filed a larger number of applications, namely 9 in 1896, and another 6 applications in 1897, and one divisional application, after which he filed another 6 patent applications in 1898. In the following two years, Tesla filed a smaller number of applications, but the U.S. Patent Office insisted on having them divided, so that the number of filed applications in 1899 increased from 2 to 4, and in 1900 from 4 to 6 applications. In the following year, Tesla filed 2 applications, and in 1902 only one.

In the beginning of the specified period, most applications dealt with high frequency alternating currents and electric circuit controllers. Later, Tesla focussed more on radio and remote control, and electrical energy transmission through natural media. With this series of patents, Tesla's activity on filing patent applications from the field of electrotechnics, ended.

The next patent application in the USA, Tesla filed in 1909, and it was from the field of mechanical engineering, but it had to be divided into two separate applications, following the request of the U.S. Patent Office - one for Tesla's pump and the other for Tesla's turbine. After a new pause, in 1913 and 1914, Tesla filed one application for a speed indicator and the other for a fountain. A sharp increase in the number of patent applications filed, followed in 1916, when a total of 6 applications were filed, for inventions including a lightning protector, a valvular conduit, a flow meter and others.

The last two applications, for which he acquired patents, the first being a basic application, the other one being an additional application, Tesla filed in 1921 and 1927, the subject of which was a method of and apparatus for aerial transportation.

According to the current list published in [4], Tesla had 112 registered U.S. patents. Based on comparison of this list to other available sources, it can be assumed that this is the final number of Tesla's U.S. patents. The list does not include patent No. 613,819 any longer, which had been associated with Tesla's name. By looking at the corresponding patent specification it was found that this patent refers to an invention under the title of "Illuminating torch" by inventor George Kelly from Mineral Point, Wisconsin. Instead, in the afore-mentioned list is included Tesla's reissued patent No. 11,865 relating to method of insulating electric conductors, the respective specification of which is amended to a certain extent compared to the one of corresponding patent No. 655,838.

#### IV. NIKOLA TESLA'S U.S. PATENTS REGISTERED IN OTHER COUNTRIES THAN THE UNITED STATES

Except in the United States, Nikola Tesla also protected his inventions in other countries. Contrary to the list specified above, that contains 112 of Tesla's patents and which could be claimed to be final to a high degree of certainty, the work to establish a corresponding list of Tesla's patents in countries other than the United States, has not been finished yet. The list of patents given in the [1] containing 109 patents that Tesla had acquired in 25 different countries, has already been addressed. In the journal "Glasnik intelektualne svojine", in

[5] at the end of August 2003, I published one list of Nikola Tesla's patents that included 141 patents from 26 countries. Although this list contained 32 more patents, completely unknown up to that moment, than the list mentioned before, at the moment of its publication there were already some indications that it is not final, either.

Further adding to this list, that was continued, was based on my own and the efforts of Mr. Slobodan Stojković, resulting in complete bibliographical information and patent specifications for another 25 of Tesla's patents, except a part of bibliographical data concerning patents No. 47012 and 47885 from Germany, the source for which was [3]. The results of this research will be presented soon in appropriate monography. The current list contains bibliographical information about 166 patents from 26 different countries, whereby it is necessary to note that the survey of patents is given separately for New South Wales and Victoria, and for Australia, which the two previously mentioned British colonies became part of in 1901.

Now the patent No. 199580 from Germany has been removed finally from the list of Tesla's patents in countries other than the United States. There is a copy of this patent's drawings in the archive of the Nikola Tesla Museum, but other parts of the document are missing. By analyzing the corresponding patent specification downloaded from the web site of the German Patent Office, it has been found that the patentee of this patent was Paul Lupa, for the invention titled "Spülversatzleitung mit inneren Querrippen zur Erzeugung einer zusammenhängenden, schützenden Kruste aus dem Versatzgut". The document probably came into Tesla's possession because the Imperial Patent Office in Berlin, Germany put it in opposition to Tesla's patent application titled "Valvular Conduit", protected by the U.S. patent No. 1,329,559. On the other hand, the current list includes bibliographical data about 13 unknown patents until now from Belgium, 13 from Great Britain, 2 from Danmark, 1 from Italy, 5 from Canada, 4 from Germany, 1 from Norway, 2 from Sveden and 16 from France, i.e. total of 57 unknown Tesla's patents compared to the list published in [1].

Tesla had most approved patents in Great Britain and France - 29 in each country, and a little surprising is the fact that he had 24 patents in Belgium, while having 18 patents in Germany and 12 in Italy. Tesla had a significantly lower number of granted patents in other countries, which goes from 1 to 7.

As noted in the text "Nikola Tesla's patent's" in the [1], up to the present day, the general opinion was that on the list of Tesla's patents approved in countries other than the United States, "there were no patents from the field of power systems and that the first patents refer to Tesla's arcing oscillator, from 1891". However, analyzing the aforementioned list of patents Tesla registered in countries other than the United States, it is obvious that the real situation is essentially different. Tesla already began to file patent applications in countries other than the U.S. one year after he filed his first patent applications in the United States. His first patent application outside the U.S., Tesla filed in Great Britain on 9.2.1886, for improvements in electric arc lamp and received patent No. 1,877 (shown in Fig. 2.) for it. In the same year, in Great

Britain, he also filed a patent application for improvements in regulators for dynamo-electric machines, and shortly after he filed a patent application for the same invention in Canada. In 1888, he began to protect his inventions related to polyphase alternating currents and corresponding motors and generators, in Germany and France, and the following year in Belgium, too. This completely changes all we know about Tesla's activities related to the protection of his inventions outside the United States, and shows that these activities began 5 years earlier than it had been previously thought. Also surprising is the scope of his activities. Namely, between 1886 and 1890, Tesla filed applications in the specified countries and received a total of 24 patents.

A.D. 1886, 9th FEBRUARY. N<sup>o</sup> 1877.

PROVISIONAL SPECIFICATION.

Improvements in Electric Lamps.

I NIKOLA TESLA, formerly of Smiljan Lika, border Country of Austro-Hungary, but now of Main Street, Rahway, State of New Jersey, United States of America Electrician do hereby declare the nature of this invention to be as follows:—

In these improvements I make use of two helices, one in a shunt and the other in the main circuit that includes the carbons.

An armature lever swings between the upper ends of the cores of these helices and at the other ends of the cores are pole pieces between which is an armature that is connected to a tubular clamp around the upper carbon holder, and this tubular clamp is suspended from the aforesaid armature lever. The cores and pole pieces of said helices, the swinging armature lever and the armature of the clamp, form a compound magnet.

The electric current passes from the + binding post through the shunt helix of high resistance to the - binding post, also from the + binding post the current passes through the carbon holders and carbons to the main line helix, and a branch from this helix goes to the - binding post and the end of said helix is connected to one of the pole pieces of the shunt magnet and is insulated. When the energy of the shunt core is increased by the increased resistance of the arc, the clamp is moved to allow the carbons to feed, and when the current through the shunt is abnormally strong, the armature of the clamp coming into contact with the pole of the shunt magnet, closes a branch circuit, that allows the electric current to pass through the clamp and the branch and a part of the main helix to the negative binding post, so that the continuity of the circuit is preserved and the shunt magnet is not injured, and as soon as the carbons come into contact and a path for the current is re-established through them, the carbons are separated to form the arc.

The ends of the swinging armature lever are curved, so also are the adjacent pole pieces of the respective cores and the poles at the other end of the cores converge to the faces that act upon the armature at the bottom of the tubular clamp, and there is a spring that tends to swing the armature clamp away from the aforesaid insulated pole pieces.

Dated this 9th day of February 1886.

BREWER & SON,  
For the Applicant.

Fig. 2. The first page of patent specification of the British patent No. 1,877

Tesla's activity related to the protection of his inventions in countries other than the U.S. covers the period from 1886 to 1922, which means that it lasted 36 years, 7 years less than in the United States. It is obvious that there had been big differences in the number of filed patent applications from year to year, a few years being exceptional in regard to this: 1889 (one of them is shown in Fig. 3.), 1898, 1900, 1901, 1910, 1921 and 1922. In every one of these years, Tesla filed more than 10 patent applications.

*Mémoire descriptif*

à l'appui d'une demande de

Brevet d'Invention de 20 Ans

Par

Perfectionnement dans le mode de fonctionnement des moteurs électro-magnétiques à l'aide de courants alternatifs.

Par

M. Nikola Tesla

Électricien à New-York ( États-Unis d'Amérique )

On sait que certains systèmes de machines à courant alternatif ont la propriété, lorsqu'elles sont reliées en circuit avec un générateur de courant alternatif, de marcher comme un moteur synchronisme avec celui-ci. Mais bien que le courant alternatif fasse marcher le moteur après qu'il a atteint un degré de vitesse synchronique avec celle du générateur, il ne le mettra pas en marche. En conséquence, dans tous les cas qui se sont présentés jusqu'ici, où l'on faisait marcher ces moteurs synchrones, comme on les appelle, on a adopté certains moyens pour amener les moteurs en synchronisme avec le générateur, ou à peu près, avant qu'on applique le courant alternatif du générateur pour les actionner. En certains cas, on a utilisé à cet effet des dispositifs mécaniques; dans d'autres, on a construit des systèmes de moteurs spéciaux ou compliqués. Cette invention consiste en un moyen ou procédé beaucoup plus simple pour faire fonctionner des moteurs synchroniques, et qui ne nécessite pratiquement aucun autre appareil que le moteur lui-même. En d'autres termes, pour

Fig. 3. The first page of description of the first Tesla's patent in Belgium No. 85866

The next question related to Tesla's patent applications in countries other than the U.S., refers to the inventions he intended to protect by them. Are there some new, previously unknown inventions? But there are no major surprises, apart from some smaller exceptions, which will be referred to later. The content of these patents is dictated by the fact that each patent is territorially limited, i.e. it is valid only for one country, being the reason why Tesla had to file a separate application in each country where he wanted to protect his inventions. This is the reason why there are many patents in different countries for the same invention. The set of patents that protect the same invention in different countries is called a patent family, while the patents that constitute a patent family, are called analogues. Of all the patents constituting a patent family, the first, i.e. the earliest application is the most important, for multiple reasons. First, the date of this application is closest to the true date of creation of the invention. Second, this patent application and/or the corresponding patent is often published first, thus becoming a part of the present state of technical knowledge, i.e. the state of the art and preventing other persons to protect the same invention by themselves. Third, it is an indication of which country the inventor is most interested in, because in that country, he/she would naturally file the corresponding application first. In our reference material there is no term that

would describe a patent that was approved based on the first application filed, because the term "basic patent", which would otherwise most adequately describe this case, is already being used for a patent in connection with an additional application or a patent of addition. Therefore, in the following text, the term "original patent" is used instead.

## V. TESLA'S PATENTS REGISTERED IN COUNTRIES OTHER THAN THE UNITED STATES IN THE FORM OF ANALOGUES, THE PATENT FAMILIES OF NIKOLA TESLA'S PATENTS AND NIKOLA TESLA'S ORIGINAL PATENTS

Starting from the assumption that Tesla first filed patent applications for his inventions in the United States, and only after that in other countries, it had to be determined which patents from countries other than the U.S. corresponded to which U.S. patents, that is, for which U.S. patents they are analogues. It is obvious that Tesla often joined a number of his U.S. patent applications into a single patent application intended for filing in other country or countries, in order to reduce the costs of invention protection. Some of the patent applications are joined together in complete form, as it is the case, for example with the patent applications for which he was approved U.S. patents No. 336,961 and 336,962 concerning regulators for dynamo-electric machines, while with other joined patent applications, only some of their parts were included, as is the case with applications referring to U.S. patents No. 685,953, 685,954 685,955 685,956, 685,957 and 685,958, the subject of which is the method of and apparatus for utilizing effects transmitted through natural media. The biggest number of patent applications that Tesla joined into a single application was seven and referred to electrical circuit controllers.

Analyzing Tesla's patents in countries other than the United States revealed two surprising facts. First, not all of Tesla's U.S. patents are the earliest analogues, i.e. the original patents. Namely, Tesla first filed the patent application concerning method of and apparatus for aerial transportation in Great Britain, on 4.4.1921, and only 5 months after, on 9.9.1921 he filed the same application in the United States, which means that the British patent application had been filed first, and therefore the British patent No. 185,446, and not the U.S. patent No. 1,655,113, is the original patent. Second, for another 6 British patents from that period, there are no corresponding U.S. patents, because Tesla did not file any patent applications for them at all, or because the U.S. Patent Office rejected his applications. It is interesting that the subjects of the mentioned British patents are Tesla's inventions from the field of mechanical engineering, the first being improvements in the construction of gas and steam turbines (No. 186,082), the second, improved process of and apparatus for production of high vacuum (No. 179,043), third, improved method of and apparatus for the economic transformation of the energy of steam by turbines (No. 186,083), fourth, improved method of and apparatus for deriving motive power from steam (No. 186,084), fifth,

improvements in methods of and apparatus for the generation of power by elastic fluid turbines (No. 179,544) and sixth, process of and apparatus for balancing rotating machine parts (No. 186,799).

By analyzing the available data, it has been determined that Nikola Tesla received 278 patents in 26 different countries. Namely, he had 116 original patents, i.e. 109 U.S. patents and 7 patents from Great Britain. With these 116 patents, Tesla protected a total of 125 different inventions. The rest of his patents, that is 162 patents, are analogues of the original patents. The inventions Tesla had protected in the most countries are his pump and turbine (U.S. patents No. 1,061,142 and 1,061,206). Tesla received a total of 22 patents for these inventions, in 21 different countries. The average number of members per patent family of Tesla's patents is 3.38. This means that one original patent was in the average accompanied by more than two analogues in other countries. On the other hand, even 54 of Tesla's original patents do not have analogues in other countries, whereas it should be noted that all of them are U.S. patents.

Looking at the data available, it can be said with a great extent of certainty, that the list of Tesla's original patents is final, as well as the list of inventions that Tesla's had protected by original patents. However, as far as the corresponding analogues are concerned, the situation is different and there is still a possibility that Tesla's previously unknown patents could be discovered in some countries. For example, it has been determined that Tesla had 29 patents each in Great Britain and France, which generally protected the same inventions. On the other hand, comparing these patents to each other, it can be seen that they do not always have the same invention as a subject, and therefore it has not yet been ensured whether Tesla had protected his fountain, lightning protector and valvular conduit in Great Britain, for which he had patents in France. There is also a possibility that Tesla protected some of his first inventions concerning electric arc lamps or regulators for dynamo-electric machines in France and probably in Belgium, which leaves space for further research. There is also a possibility that another patent from Germany exists, because in some lists of Tesla's patents, as is, for example, the list published on the Internet site [www.wikipedia.org](http://www.wikipedia.org), it is specified that Tesla had 19 patents in Germany, if the patent No.199580 from Germany is not included, which was mentioned above. However, that number is relatively small, but adding these patents to the available data is worth the effort.

Except above mentioned patent applications resulting in original patents, Nikola Tesla Museum, Tesla also filed at least 33 patent applications, but was not given any patents. Tesla wanted to protect at least 39 inventions by these patents, 28 of which he did not succeed to protect in any other country.

## VI. CONCLUSION

On the basis of the performed investigation, it can be said that Tesla had 116 original patents, i.e. 109 U.S. patents and 7 British patents, protecting 125 of his inventions. It has also been found that Tesla had 162 analogues of these patents, which means that he, in total, received 278 patents in 26 different countries. The average number of members per patent family of Tesla's patents is 3.38. This means that one original patent was in the average accompanied by more than two analogues in other countries. On the other hand, even 54 of Tesla's original patents do not have analogues in other countries, whereas it should be noted that all of them are U.S. patents. The investigation also implies that total number of Tesla's patents could be about 300, though it is considered that the number of the Tesla's original patents is final.

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