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Survey of Overseas General and Ergonomics Relevant Patents

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Objective: The purposes of this study are to survey general and ergonomics relevant patents of major foreign countries, to classify the ergonomics patents into some categories frequently found in the patents lists surfed and to compare the results with those of Korea.

Background: Under today's severe competitions between countries and between companies, the intellectual property has never been more important. It is needed to investigate Korea's positions and worldwide status of patent applications and grants for general and ergonomics patents.

Method: This study was mainly based on relevant websites surfing such as KIPRIS, FPO, EPO, WIPO, etc.

Results: The results showed that while Korea placed fourth in patent applications and grants in 2012, following US, Japan and China, Korea ranked seventh in the number of ergonomics patents. Of the overseas ergonomics patents, the proportion of tool/device was the second highest to category of others, followed by chair/desk, grip/handle and keyboard, etc. Compared to the overseas ergonomics patents, Korea showed a slightly different trend that there were less patents for specific fields of ergonomics such as grip/handle, keyboard, tool/device, etc.

Conclusion: The number of ergonomics patents of Korea was behind most foreign countries surveyed in the number of patent applications and grants of, and there were many categories of overseas ergonomics patents.

Application: This study would be used as a reference or guideline when developing varying ergonomic products or applying to ergonomics patents.

Keywords: Patents, Ergonomics patents, Intellectual property

1. Introduction

As competitions between countries and between domestic as well as international companies are getting more severe, the intellectual property is regarded as an important way for surviving. The intellectual property is largely classified into two categories: copy right related to cultural creation and industrial property contributed to industrial development. The industrial property is grouped into four sub-categories: patent, model utility right, design patent and trademark right (Kim, 2011). Of these industrial properties, the patent is thought to be the most important right needed for surviving in the knowledge-based society.

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A patent is a set of exclusive rights granted by a sovereign state to an inventor or assignee for a limited period of time in exchange for detailed public disclosure of an invention. An invention is a solution to a specific technological problem and is a product or a process. The procedure for granting patents, requirements placed on the patentee, and the extent of the exclusive rights vary widely between countries according to national laws and international agreements. Typically, however, a granted patent application must include one or more claims that define the invention. These claims must meet relevant patentability requirements, such as novelty, usefulness, and non-obviousness. The exclusive right granted to a patentee in most countries is the right to prevent others, or at least to try to prevent others, from commercially making, using, selling, importing, or distributing a patented invention without permission. Under the World Trade Organization's (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights, patents should be available in WTO member states for any invention, in all fields of technology, and the term of protection available should be a minimum of twenty years. Nevertheless, there are variations on what is patentable subject matter from country to country (Wikipedia, 2015a).

Many countries' governments and international companies have been trying to preoccupy word markets though securing standards based on their own patents. Following this, the Korean government and companies have also enforced varying promotion policies or exerted every effort for increasing patents. As an example of these, the Korean government has taken the number of patents applied or granted and technology transferred to industries as a major evaluation tool for projects financially supported. The number or ranking of patents for Korea has been known through media reports or references (Chosun Ilbo, 2015; Kim, 2011; Korean Intellectual Property Office, 2011). However, the trend for domestic and overseas ergonomics patents is not dealt with in any previous study or article. Therefore, the aims of this study are: 1) to survey trend for general and ergonomics relevant patents including design right of major foreign countries such as US, Europe, Germany, France, China, Russia, etc., 2) to classify the ergonomics patents surveyed into some categories such as handle, keyboard, support, etc., and 3) to compare overseas patents to Korean ones.

2. Method

2.1 Data gathering

This study was conducted mainly based on surfing websites such as KIPRIS (Korea Intellectual Property Rights Information System) for US, Europe, PCT, China, Germany, France and Russia (KIPRIS, 2015), FPO (Free Patents Online) for US (FPO, 2015), and relevant web sites such as Wikipedia (Wikipedia, 2015a, b), EPO (European Patent Office) (EPO, 2015a, b), WIPO (World Intellectual Property Organization) (WIPO, 2015). The KIPRIS is equipped with search functions for domestic patents, model utility right, design patents and trademark rights as well as overseas patents. The KIPRIS's overseas patents include those of US, Europe, PCT, Japan, China, GB, Germany, France, Australia, Canada and Taiwan. Here, the PCT represents for the Patent Cooperation Treaty, which is an international patent law treaty, concluded in 1970. It provides a unified procedure for filing patent applications to protect inventions in each of its contracting states. A patent application filed under the PCT is called an international application, or PCT application.

This study used the only one keyword of 'ergonomics' for searching for relevant patents. It was because 1) other keywords such as human factors, human factors engineering, etc. produced more irrelevant ergonomics patents rather than relevant ones; 2) Several keywords produced separate patents lists by keywords with hundreds or thousands of relevant patents, which makes it very difficult to check if there is any same patent in the lists; and 3) it would be useful to employ just a keyword for classifying and comparing several countries' patents. Among the countries provided by the KIPRIS, the patents of Japan, GB, Canada, Australia and Taiwan were excluded in this study, because search results by using the KIPRIS redundantly included so many same patents or patents extrinsic to ergonomics, or the number of patents browsed was too small for comparing to those of other countries, especially in GB (24 ergonomics patents), or there were so many patents without their titles, especially in Taiwan.

2.2 Patents classification

The surfed patents related to ergonomics were classified into several categories based on their titles and abstracts. The categories were employed on the basis of frequency encountered in the browsed patents, which included grip/handle, chair/desk (bench, stool, stand), plate/tray (container), keyboard (mouse, trackball), shear/scissor, pillow, backpack, tool/device (applicator), support (armrest, elbow rest, back support, leg support, wrist support, chin support, footrest), crutch, others (system, method, process, computer, workstation, mattress, garment, guitar, leash, flooring, cookware, etc.). In case of countries with 1,000 or over relevant patents including US, Europe, PCT and China, just 1,000 patents in the front of the searched patent lists except US were investigated and classified. In case of US, 2,000 patents were surveyed. It was because it took much time to investigate all that many patents, and conformity degree to ergonomics for the patents was gone down as they appeared in the latter part of the searched lists. On the other hand, all patents were examined for countries with less than 1,000 relevant patents such as Germany, France and Russia.

3. Results

3.1 Worldwide status of patents

As of 2015 (2014 in Russia), the total number of patents by country is illustrated in Figure 1. The US had the most patents of all countries investigated, followed by Japan, Germany, China, UK, etc. Korea ranked ninth among the 12 countries shown in the KIPRIS (KIPRIS, 2015). Here, the number of patents is the accumulated number of patents up to now, but the periods are different according to countries. For example, the period for US is from January 1, 1974 to August 13, 2015, but that for Korea is from June 20, 1948 to August 13, 2015.

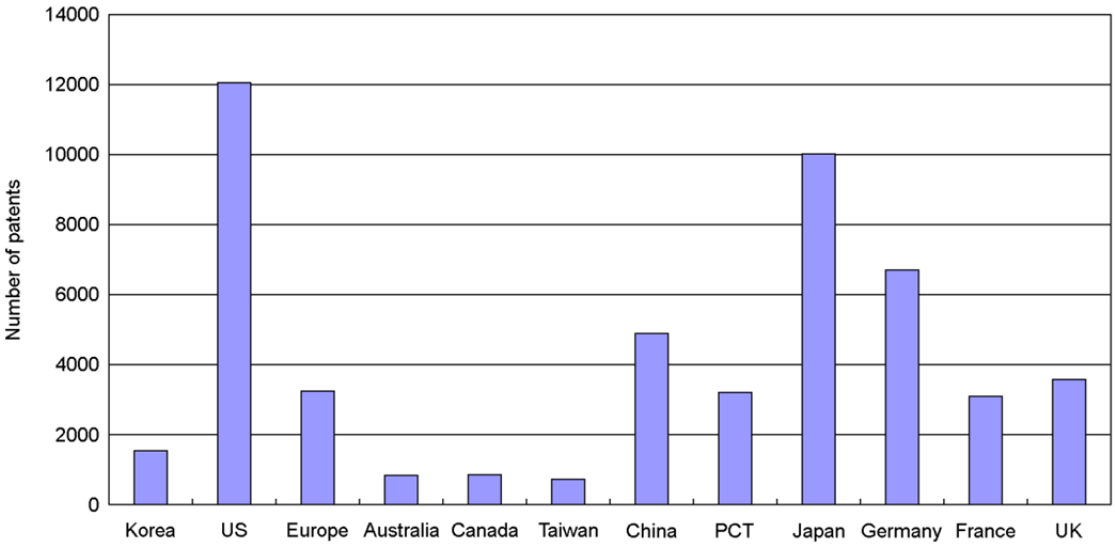


Figure 1. Number of patents by country (unit: 1,000)

The number of patents by country and announcement day of 2014 is shown in Figure 2, which reveals that Korea had the fifth most patents, following US, China, Europe, Taiwan. Here, the data for PCT and Japan are those by publication date of 2014, not by announcement day of 2014.

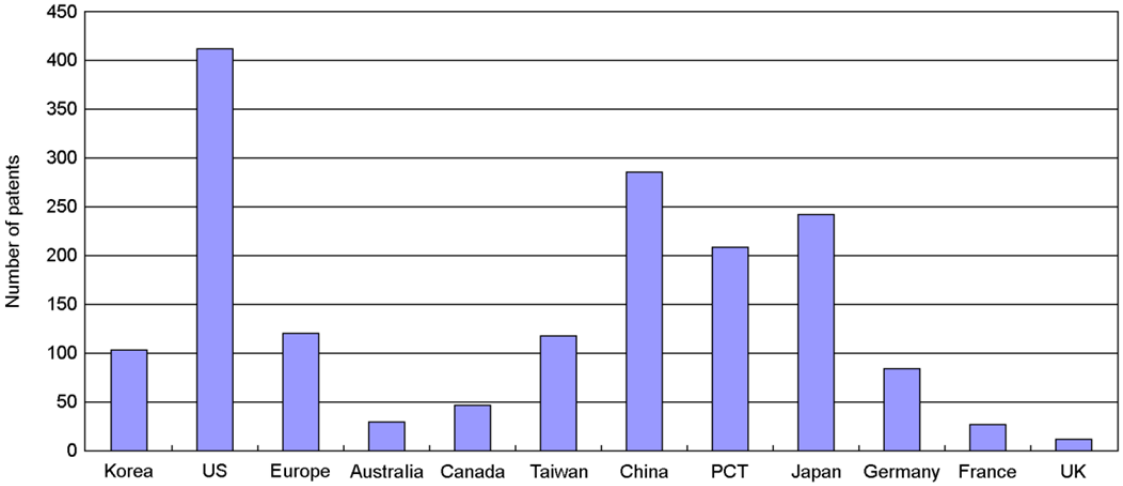


Figure 2. Number of patents of 2014 by country

Rankings of patent applications and grants by country of 2012 appear in Table 1, which are based on the world intellectual property indicators by the WIPO (Wikipedia, 2015b). As shown in the table, Korea placed fourth in the patent applications and grants, following Japan, US and China, and followed by Europe, Russia, Canada, etc.). Three percentages of US patents granted in 2014 are from Korea, which ranked sixth, followed by US (22%), Germany (20%), Japan (17%), France (7%), and China (4%) (EPO, 2015a).

Table 1. Rankings of patents by country

Rank	Country	Applications	Rank	Country	Grants
1	China	652,777	1	Japan	274,791
2	United States	542,815	2	United States	253,155
3	Japan	342,796	3	China	217,105
4	South Korea	188,915	4	South Korea	113,467
5	European Patent Office	148,560	5	European Patent Office	65,665
6	Germany	61,340	6	Russia	32,880
7	Russia	44,211	7	Canada	21,819
8	India	43,955	8	Australia	17,724
9	Canada	35,242	9	France	12,913
10	Brazil	30,116	10	Mexico	12,358

Of international enterprises, Samsung headed the list of Europe top applicants with 2,541 applications in 2014, followed by Philips, Siemens and LG (Table 2). Among the ten most active filers, five companies came from Europe, three from Asia, and two from the US. The majority of these companies work in the electronics and IT sectors (EPO, 2015b). In US, Samsung ranked second, following IBM and followed by Cannon, Sonny, Microsoft, etc. Of the top ten companies in US, two are from Korea and four from US and Japan, respectively (Chosun Ilbo, 2015).

Table 2. Top ten applicants or grants by company

Europe			US		
Rank	Company	Applicants	Rank	Company	Grants
1	Samsung	2,541	1	IBM	7,534
2	Philips	2,317	2	Samsung	4,952
3	Siemens	2,133	3	Cannon	4,055
4	LG	1,638	4	Sonny	3,224
5	Huawei	1,600	5	Microsoft	2,829
6	BASF	1,530	6	Toshiba	2,608
7	Qualcomm	1,459	7	Quelcom	2,590
8	Robert Bosch	1,438	8	Google	2,566
9	Ericsson	1,347	9	LG	2,122
10	Intel	1,054	10	Panasonic	2,095

3.2 Ergonomics relevant patents

The number of patents related to ergonomics by country is shown in Figure 3. Of the eight countries including PCT, US had the overwhelmingly most ergonomics patents, followed by PCT, Europe and China. Korea had the seventh most ergonomics patents, which was behind the ranks of patent applications and grants by country in Table 1. Furthermore, the number of ergonomics patents of Korea was very small, compared to other countries'. As in the total number of patents by country, the data in Figure 3 also are the number of ergonomics patents accumulated from the year when patents were announced or published in each

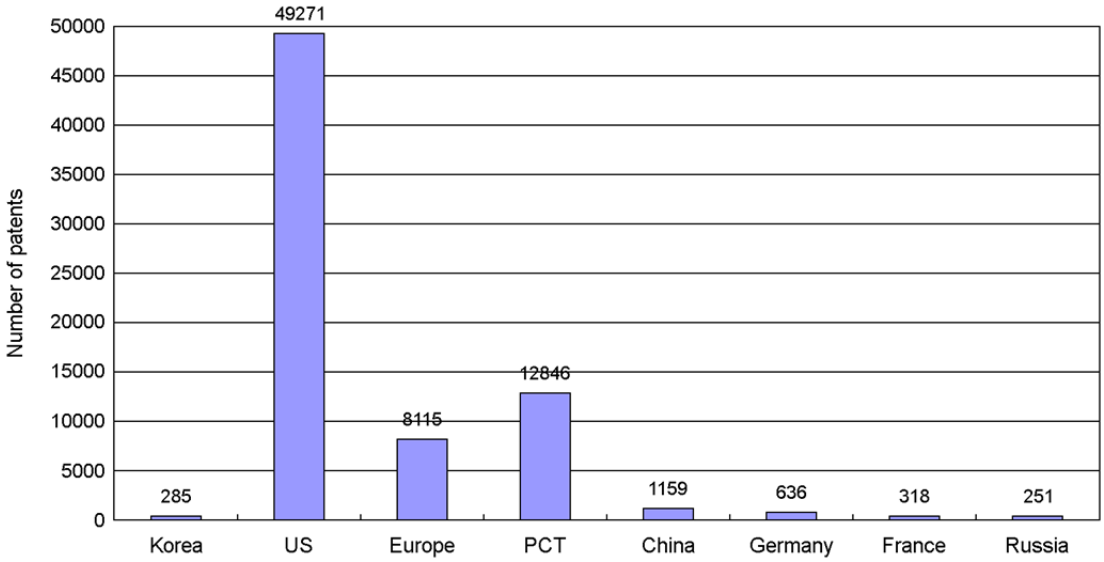


Figure 3. Number of ergonomics patents by country

country up to 2015. Here, the patents of Korea included patents and model utility rights except for ones rejected and withdrawn, and those for foreign countries were ones granted.

3.3 Classification by category

The results of classification by the category mentioned in 2.2 Patents classification revealed that the proportion of tool/device was the second highest to the category of others except France, generally followed by chair/desk, grip/handle and keyboard (Table 3). In the classification, the categories of shear/scissor and crutch had the lowest percentage of ergonomics patents. The percentage for the category of others was the lowest in US (38.6%), but the proportions of other countries were higher than 50.0%. This means that there are far more categories of ergonomics patents than the number of categories (10) used in this study. Compared to US, Europe and PCT, the number of patents of Korea for grip/handle were far behind, and the proportion of 'others' category was high. This was because there were so many soft and comprehensive patents such as systems and methods. Here, the US patents data were from FPO, not from KIPRIS, and included 118,923 patents, applications and design patents. The patents of all countries surveyed included patents and model utility rights.

Table 3. Classification of ergonomics patents by category

Country	No patents	Category (%)										
		Grip/ handle	Chair/ desk	Plate/ tray	Keyboard	Shear/ scissor	Pillow	Back- pack	Tool/ device	Support	Crutch	Others
Korea	285	1.4	3.2	1.8	6.7	0.4	0.7	1.8	7.7	2.5	0.0	74.0
US	118,923	13.4	11.6	2.1	10.9	0.8	1.3	1.1	14.0	5.1	1.4	38.6
Europe	8,115	4.4	5.9	1.6	3.1	0.1	0.1	0.4	29.6	3.5	0.1	50.3
PCT	12,846	6.6	6.1	2.5	5.6	0.6	0.6	1.0	16.8	4.3	0.5	53.8
China	1,159	3.1	7.7	0.6	4.4	0.6	2.7	0.5	8.4	1.4	0.1	67.8
Germany	636	7.1	6.8	0.8	3.8	0.3	0.2	0.5	13.7	3.3	0.0	62.7
France	318	4.7	9.4	0.6	3.1	0.6	0.2	0.6	5.3	2.5	0.0	71.4
Russia	251	2.4	5.2	0.0	1.2	0.4	0.0	0.0	8.4	1.2	0.0	78.5
Total	142,248	9.1	9.9	1.8	75.4	0.6	1.2	0.9	18.3	4.3	0.7	63.7

4. Discussion and Conclusions

This study investigated worldwide status of general and ergonomics patents for major foreign countries, the latter of which were classified into ten categories according to their frequency in the browsed patent lists. The results showed that while the current total number of patents of Korea was behind the advanced countries, Korea placed fourth in patent applications and grants in 2012, following US, Japan and China. The Number of ergonomics patents was also far behind the advanced countries including China. Of the classified categories for foreign countries, the patents for tool/device were the most, followed by chair/desk, grip/handle and keyboard. Korea showed a slightly different trend that the patents for grip/handle were much less than other countries. In addition, there were more soft and comprehensive patents such as systems and methods rather than those for specific ergonomic components like grip/handle, tool/device, keyboard, etc., compared to advanced countries of US, Europe and PCT. This may imply that considering the advanced countries' trend, effort should be focused on developing more patents for specific

ergonomics fields rather than those of ergonomics itself for spreading ergonomics patents.

The WIPO established the international patent classification (IPC) by the Strasbourg Agreement 1971, which provides for a hierarchical system of language independent symbols for the classification of patents and utility models according to the different areas of technology to which they pertain (WIPO, 2015). Webpages of patent relevant governmental affiliations of major foreign countries such as US, Korea, EPO, etc. or international organizations are equipped with functions to browse patents by the IPC. However, since the IPC does not include explicit categories related to ergonomics, this study used different categories in Table 3 based on the frequency of ergonomics patents searched for classifying the ergonomics patents. This made it difficult to search patents for specific fields of ergonomics such as categories shown in Table 3 rather than ergonomics itself on the webpages. It is possible to search the patents for specific fields of ergonomics by using multiple keywords and logical operators such 'ergonomics and (grip or handle), but there was a significant problem that the search results produced had so many non-relevant patents. Consequently, the difficulty for searching the patents for specific fields of ergonomics could be barrier for spreading and using the ergonomics patents. For overcoming this problem, it is recommended that specific fields of ergonomics widely used in product and software developments be included in the IPC system including section as well as subsection, class, subclass and group of the eight sections.

This study would be used as a reference or guideline when developing varying ergonomic products or applying ergonomic patents. However, the results of this study should be used with caution because the study employed just a keyword of ergonomics for searching for ergonomics patents among varying keywords related to ergonomics and investigated just the sample of 1,000 patents (2,000 patents for US) for countries with 1,000 or over patents. So, further research on examining all ergonomics patents using vary ergonomics relevant keywords is needed.

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