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Patent analysis and Research of haze control technology

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Abstract: in this paper, the 1956-2019 incopat patent database for patent retrieval about fog treatment technology at home and abroad, from the trend of the application for a patent for the annual, the types of the applicant, research subject, patent validity, technical means and regional distribution of Angle analysis, hope can through these retrieval and analysis of reference in the governance of fog weather in our country, and promote countermeasures.

Keywords: Haze control; Patent analysis; Countermeasures and Suggestions

Smog is composed mainly of sulfur dioxide, nitrogen oxides and inhalable particulates, which combine with fog to make the sky suddenly dark and gray. Beijing monitors fine particulate matter, or PM2.5, particles with aerodynamic equivalent diameters of 2.5 microns or less. The particles themselves are both pollutants and carriers of toxic substances such as heavy metals and polycyclic aromatic hydrocarbons. Great harm fog, so must be targeted treatment technology to improve or even eliminate it, so far the governance haze focuses mainly in the clean air pollution protective components, manufacturing, research, management methods and monitoring measurement on the four aspects, only do these, haze weather to get effective control.

The patent analysis method is mainly to deeply dig and analyze the technical information contained in the patent, analyze the technological competition situation, the overview of technological innovation and the process of technological evolution, so as to position the technological innovation activities in a scientific and reasonable way. The application of patent analysis method in the field of smog control technology can help government departments, scientific research institutions, high-tech enterprises and other departments to make patent strategic deployment and precise positioning.

1. Decomposition of haze control technology

The technology subject decomposition is the basic work in the early stage of patent analysis, which plays a role of abstracting in abstracting. It is helpful for patent analysts to unify the understanding of the technology branch of this subject from the perspective of technology through clear and accurate technology decomposition to get a technology subject decomposition table. The decomposition of technical topics is carried out around the research technical topics, which should not only facilitate the follow-up data retrieval by analysts, but also conform to the general technical specifications of the industry. [6]

Haze governance technology can be divided into air purification, monitoring and measurement, protection components, governance methods, etc., among which air purification can be directly included in governance methods, so there are three technical branches: protection technology, governance technology and monitoring technology.

2. Patent analysis of haze control technology

2.1 Annual trend of patent applications at home and abroad

There were patent applications for smog in the United States as early as 1957, but the number was small. In the mid-20th century in the United States, the atmospheric ozone concentration near Los Angeles was much higher than that of other places, and Los Angeles was also known as the "smog City", and caused many residents to get sick or die. The United States had to pay attention to this serious pollution problem, and issued relevant policies to curb pollution. As can be seen from the figure, although the number of haze patent applications in the United States shows an increasing trend, the number is not large, which is inseparable from the measures taken by the United States to start the road of environmental protection early.

Japan has seen its fair share of air pollution in the past, with one of the country's four best-known lawsuits, the Yokkaichi asthma case, in the 1960s. At that time, Japan enacted a series of environmental protection laws against air pollution, but their implementation was not smooth. At that time, almost all of Japan's major cities failed to meet the standards according to law. However, after the struggle of the Japanese people, Japan's environmental protection activities gradually attracted people's attention, and its patent applications on smog gradually increased from the 1970s.

Application for a patent on fog China starts relatively late, but its growth trend is very significant, almost 2013 years ago China's related patent applications are few, and then began to surge, this is due to the fog suddenly severe in China in 2013, became a annual keywords, Chinese also are finally starting to realize that the fog haze. Before 2013, China's GDP grew at a high level, but at the same time, emissions of nitrogen oxides, volatile organic compounds, sulfur dioxide, ammonia and PM2.5 increased hundreds of times. [8] Especially in the Beijing-Tianjin-Hebei region, blue skies are almost impossible to see, and people are paying more and more attention to smog. Accordingly, more and more patent applications concerning smog have been filed, reaching a peak in 2017. In September 2013, the State Council issued the Air Pollution Prevention and Control Plan to improve air quality through the air "Ten National Regulations". At the same time, numerous invention patents related to haze have also contributed to the treatment of haze weather, and the air quality has been significantly improved. Patent applications related to haze in China also gradually showed a downward trend.

Compared with China, the United States and Japan, the number of patents filed on smog in Europe has fluctuated occasionally, but its growth has been relatively steady. Europe has a vast area with few people, so it can achieve extensive green coverage in both cities and villages. Besides, it has a high utilization rate of clean energy and ecological farming, and the government has launched relevant environmental protection policies early and has rich experience in pollution control. Therefore, patent applications for haze in Europe are relatively rare.

2.2 Patent situation of China's smog control technology

Fifty percent of China's patent applications for smog control technology come from companies, 33 percent from individuals and 14 percent from universities. The proportion of enterprises in patent application has obvious advantages among the three, because enterprises generally have certain economic strength, and large enterprises can attract more excellent talents. Individual applications came in second, but were scattered; The low proportion of colleges and universities has something to do with the research direction set by the school's major. However, colleges and universities can seek cooperation with enterprises, for universities have precious scientific research talents and enterprises have capital and market. School-enterprise cooperation is a win-win situation, which can make China's patent cause more dynamic.

Specific to management technology research and development of fog subject: Yang machinery

manufacturing co., LTD. Wuxi bridge application are mainly concentrated in 2015, the patent content are mainly concentrated in the mask, filter, filter, catalyst, paint, etc., the application of inventor Shen Qiu is the legal representative of the company, so the big probability were invented to company business and prospect, but Yang machinery manufacturing co., LTD. Wuxi bridge now all patent in failure state, and now the company's main business scope is the numerical control machine tools and textile machinery and so on, can consider the company's business transformation. E I DU PONT DE NEMOURS AND COMPANY is a global enterprise in the United States with a wide range of businesses, including electronic materials, food, engineering plastics, construction, etc. Applications are filed mainly in the United States AND Japan, AND the validity of these applications is 63 percent. Jiangsu Ruifeng Science and Technology Industrial Co., Ltd. is a high-tech enterprise that develops and produces environmental protection and energy saving products, and takes the lead in air purification and clean technology. The company occupies a large proportion of patents in air purification equipment, mainly using nano adsorption and PM2.5 filtering method to clean air.

In the individual application, Xiong Xiaoning very give prize, after Yang machinery manufacturing co., LTD. Wuxi bridge, an application for a patent for his 39, there are 20 invention application, 18 utility model and an invention authorization, in addition, Xiong Xiaoning also has other aspects of the patent application, such as new self-help pay cost charging socket the manhole cover, window cover, resistance to high humidity and strong light colored tires and so on, and with haze governance related patent are nearly all in 2016.

2.3 Analysis on the legal status of China's patent for haze control

As can be seen from figure 1, China's air pollution prevention and control patents account for the largest proportion of authorization, reaching 44%, and there are still 20% of patents in the examination stage, which are expected to be granted effectively. But it is worth noting that there are 20% of the prevention and control of atmospheric patent rights terminated, because China's fixed number of year of the atmospheric pollution control for the most part patent application within 20 years, this phenomenon may be the cause of the patent holder voluntarily give up patent or not according to the regulation pay an annual fee, it also suggests that the efficiency of the air pollution prevention and control technology has the very significant. 16% of patents were withdrawn or rejected, suggesting that there is still a lot of low-quality patent applications out there that could be exploited in troubled waters, which should also be noted.

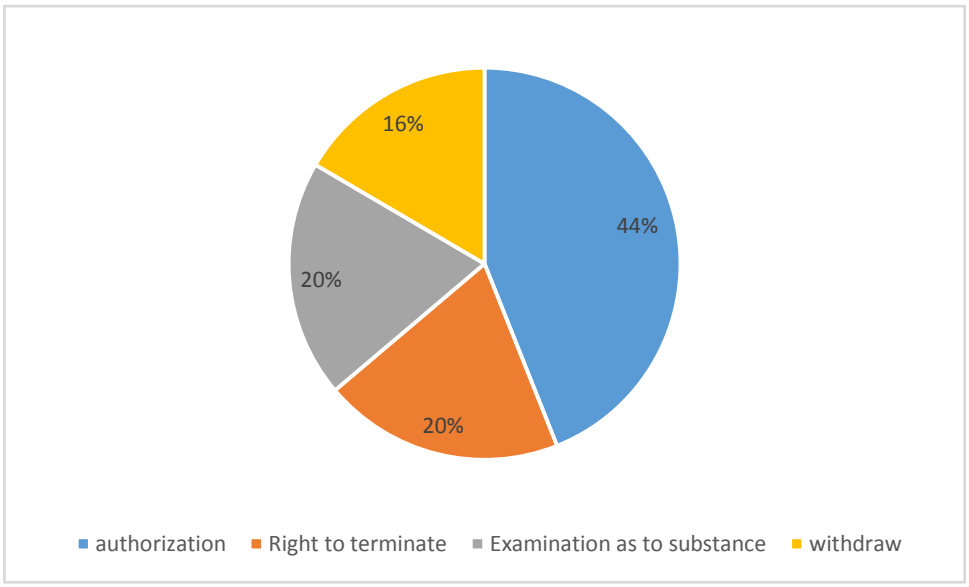

FIG. 1 patent law status of air pollution prevention and control in China

2.4 Research on Hot spots of China's smog control Patent Technology

Figure 11 shows the distribution of haze governance in various technical aspects. It can be seen from the figure that patent applications related to haze governance are mainly concentrated in B01D. F24F; Among the three technical directions of A41D, the first one is B01D technology, whose category is described as "separation". Haze governance is mostly to separate the particles such as dust and nitric acid in the haze, so as to obtain clean air. This is the most common and basic method of haze governance, so it accounts for a relatively high proportion.

The F24F class is described as air conditioning and humidification; Ventilation, of which F24F13 technology has the largest number, is mostly used to produce purifiers, air conditioners, ventilation systems, etc., which are the main products of haze control nowadays.

At number three is A41D technology, whose class is described as outerwear. Protective clothing. Clothing accessories, the technology is used to produce anti-smog masks; Anti-smog clothing; Anti-haze masks are also a kind of anti-haze products that can be seen everywhere in our daily life.

It is worth noting that A23L technology ranks the tenth, which is mostly used to produce food, food or non-alcoholic beverages. Therefore, anti-haze food and health products, such as beverages and chewing gum, are also gradually entering people's lives.

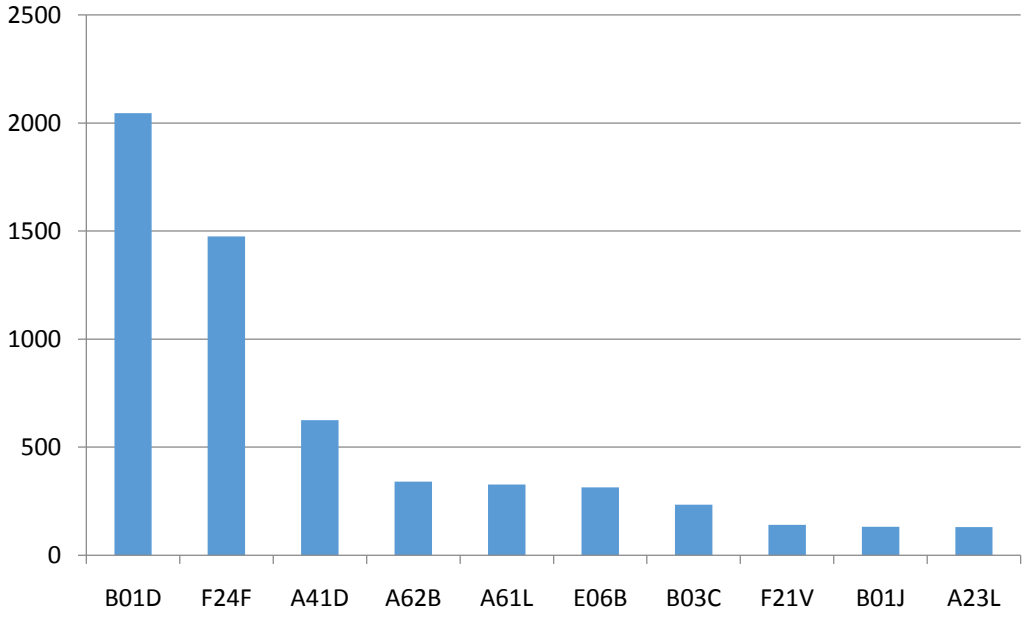

Figure 2 Main IPC distribution of Haze control technologies in China

2.5 Research on patent distribution of Haze control technology in Chinese provinces and regions

Jiangsu province has 167 universities, the number of which ranks the first in China, corresponding to the number of its talent reserve can also be seen. 2016 colleges and universities in jiangsu province invention patent grant won the national first grade, measure of colleges and universities in jiangsu province for patent invention and application of enthusiasm, strong academic atmosphere for fog treatment technology of the invention provides a good environment, in addition, the economic condition is better also in jiangsu province, it also provides a good patent invention and application of the support.

Guangdong province, which ranks the second, has a very strong economic strength. Among the four most developed cities, Guangzhou and Shenzhen, both of which are located in Guangdong. Guangdong, which

has ranked first in GDP in China for 30 consecutive years, is no less attractive to talents than other cities. In terms of patent application, relevant enterprises, talents and policies of Guangdong province have laid a solid foundation for the invention and application of smog control technology patents.

The economic foundation and the number of colleges and universities in Zhejiang province have laid a foundation for the invention and application of patents. In addition, Zhejiang province also has the policy support for enterprise patents and various patent subsidy policies, which effectively encourage enterprises and individuals to carry out the r&d and application of patents.

Beijing as China's economic, cultural and political center, economic strength and talent resources is beyond doubt, Beijing has the highest institution of higher learning and Peking University, tsinghua university, has China's first national high-tech industrial development zone, zhongguancun science park, in addition, Beijing is the worst-hit areas of haze weather, the fog into the public view in 2013, in January that year, Beijing has 26 days in fog. So it is not surprising that Beijing ranks fourth.

3. Conclusions and Suggestions

From the number of patent applications for haze control technology over the years from 1956 to 2019, it can be seen that the United States is the leader in the number of patent applications for haze control technology. Although the number of applications is not large, the United States has a very early application year and has good patent awareness. Japan and Europe saw slightly fewer applications and generally stable trends. China, on the other hand, started to grow rapidly in 2013, and the number of patent applications gradually slowed down after 2017. When analyzing the types of patent applicants, we can see that enterprises account for a large proportion, while universities account for a relatively small proportion. Enterprises have unique advantages in patent application, such as professional technicians and technical team, sufficient capital chain, and determined research direction, which are important conditions to promote patent research and development application. Although there are also knowledgeable and highly skilled researchers in universities, researchers should follow the research direction of universities, which to some extent restricts the patent invention and application of haze control technology. Through the analysis of patent validity, we find that one point that cannot be ignored in the process of patent retrieval and analysis is that patent rejection, withdrawal and invalidation account for more. In addition, it can be found in the patent search that some patent applications contain partially duplicate patents, and the applicant only changes the name of the product to apply for the same technical scheme. This is all a reflection of the low quality of patents.

China's approach to haze prevention and control is relatively scattered, so it is necessary to change the past management philosophy and integrate all available scientific and technological resources to serve haze prevention and control. [9] Enterprises account for a much larger proportion of patent applicants in China than universities, and this model of going it alone is not conducive to the development of innovation. Technical cooperation alliance is based on enterprises, universities, scientific research institutions, governments and individuals to cooperate with each other according to their respective advantages and characteristics, and promote the upgrading of the whole industry related to smog control through technological progress. In the course of cooperation, the interests and risks of all parties are Shared, and all parties work together for win-win results. In the technical cooperation, the government's policy support, enterprise's operation, investment system and platform support, and researchers from scientific research institutions and universities inject talents' energy, many of them work together and cooperate with multiple parties to jointly study relevant technologies of haze control.

Only 44% of fog treatment technology patents authorized patents, this is a notable problem, low quality

of patents is not only unable to have much effect on the environment improve the fog haze, but also a waste of resources, which takes up resources to doing this, this would require the inventor to improve their personal quality and ability, do not blindly go to apply for a patent for some petty profit, at the same time, the state intellectual property office to cultivate staff work level, the good control the quality of the patent.

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