

SOME DISCUSSION ON PATENTABILITY [n.1]

Yin Xin Tian [n.2]

1. Introduction

The problem of what subject matter may be regarded as a patentable invention has existed since the very beginning of the patent system. For more than two centuries, the dispute concerning this problem of basic importance to patent practice has never stopped. Up to now, unfortunately, there is still no clear and precise boundary line between patentable and unpatentable subject matter. The reason for this situation is rather complex including many factors such as the influence of traditional patent practice, differences between the various legal systems, and considerations based upon the interests of individual countries, etc., but the most important factor is the continuous development of science and technology. The fundamental purpose of the patent system is to promote the progress of science and technology, therefore patent practice should not adhere to conventional conceptions whenever the current situation of industry requires some changes to fit in with it. Looking back to the historical evolution of patent law in various countries, the examples of breaking away from the traditional conceptions are rare. It looks as if the patentability problem will remain through the whole life of the patent system as long as science and technology advance.

*28 However, at least one point has been accepted by everyone, namely that it is impossible to grant a patent right for every creation. This undoubted fact produces the absolute necessity of setting forth the conditions for granting a patent in every patent law. In addition to the detailed requirements concerning the drafting of patent documents, the substantive conditions with regard to the subject matter of an application according to the Chinese Patent Law (hereinafter CPL) can be divided into two categories. First, to obtain a patent, an applicant must present something which is an "invention" within the meaning of the patent law. By means of this condition, the subject matter which can not be regarded as an invention is excluded firstly from patent protection. Moreover, some of the subject matter within the scope of invention, such as food, chemically obtained substances, etc., are further excluded from patent protection for various special reasons. [n.3] Second, an application which has passed the first test will be rejected if its subject matter is not distinct from the prior art existing before its filing date, i.e., it should be rejected for lacking of novelty or inventive step.

From the viewpoint of the rationale of a decision, the two categories of conditions are independent of each other in the sense that whether one condition is satisfied does not require that the other one is fulfilled as the precondition, while from the viewpoint of the logic of assessment, there should be a certain order for the carrying out of said two tests,

i.e., it is necessary to consider the novelty and inventive step requirements only after the condition of "invention" has been satisfied. It will be apparent from the detailed discussion of this article that to isolate the two categories of conditions from each other is important for patentability assessment.

One troublesome problem is the proper position of the requirement of industrial application. A patentable invention must be susceptible of industrial application, the converse rule, however, is not true. Some *29 consideration has been given to the requirement of industrial application when we construe the meaning of invention within the meaning of the patent law. For example, methods of the diagnosis or for the treatment of diseases cannot be regarded as invention for the reason of lack of industrial application. [n.4] On the other hand, the industrial application criterion as stipulated by CPL also combines some further requirements which are irrelevant to the meaning of invention, such as repeatability, beneficial effects for society, etc. [n.5] Therefore, it would be proper to say that the requirement of industrial application is located somewhere between the two categories of conditions.

The purpose of this article is to discuss some problems in the first category, particularly the definition of invention and the patentability of several kinds of subject matter which are often discussed among patent practitioners.

2. Definition of Invention

2.1 Several existing definitions

Since the term "invention" used in the patent law has its specific meaning, it is natural for many people to look for a simple and precise definition with the hope of providing both the patent office and the public with a rigid standard, so that a solid patent system can be formulated. As a matter of fact, however, there are only a few countries which have set forth a positive definition for the term "invention" in their respective patent laws.

One special example in Section 101 of the U.S. Patent Law entitled "Inventions patentable" which reads as follows.

Whoever invents or discovered any new and useful process, machine, manufacture or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor....

The above clause is more properly to be regarded as a provision which specifies the categories of patentable inventions rather than to serve as a definition. It would be impossible to make any distinctions if we only followed this clause without the help of further guidance provided by the U.S. case law.

*30 Another example is the definition given by Sec. 2(1) of the Japanese Patent Act which reads as follows.

An invention is a highly advanced creation of technical ideas by which a law of nature is utilized.

The "Regulation of Inventions, Discoveries, and Suggestions" of the Soviet Union stipulated that

Invention is a new technical solution which has substantive features and active effects and can be used to solve certain technical problems in any field of economy, cultural construction, as well as defence.

In some countries, such definitions have been provided by their judicial authorities in spite of the fact that there is no positive definition in their patent laws. For example, the Supreme Court of the Federal Republic of Germany (hereinafter BGH) provided a very famous definition in one of its leading decisions as follows.

A patentable invention is defined as a technical instruction to human being how to methodically utilize controllable natural forces to achieve a causally predictable result. This result is the direct result of said controllable natural forces without the necessity of the interference of human intellectual activities. [n.6]

The above definition has been cited again and again by the German Patent Office, the Federal Patent Court, as well as the BGH itself and plays a significant role in German patent practice.

Although the so-called "invention" implies the requirement of novelty according to ordinary understanding, the patent law, as mentioned before, has provided different and detailed stipulations which are designed specifically for expressing this requirement. For this reason, we need not consider the phrases such as "highly advanced", "new", "with substantive features", "active effects", etc. in the definitions cited above when we focus our attention on the meaning of invention. By combining the essential aspects, we can form a theoretical definition as follows.

The term "invention" used in patent law means a technical solution which utilizes a law of nature or controllable natural forces. [n.7]

*31 2.2 Some discussion

In the above definition, the requirement to be a "technical solution" takes the central position. But it will be difficult to investigate in depth the meaning of "technical". If we believe that the meaning of invention should be defined for reason of its abstractness and obscureness, then it seems to me that the term "technical" is confronted with nearly the same problem and provides no better explanation.

At least in Chinese, the term "technical" has a very broad meaning. [n.8] In addition to conventional industrial technology, there are many other things such as plant cultivation methods, business managerial strategies, cosmetic methods, even football techniques, bridge playing techniques, etc. which can also be covered by this term. Of course, it is not difficult for a patent practitioner to distinguish the patentable ones among these different

things when dealing with a practical patent application. But, the essential factors which govern this examination are actually some other principles established during the long period of patent practice rather than the meaning of the term "technical" per se. When someone says that a cosmetic method, for example, is not a "technical solution", he has actually provided consciously or unconsciously this term with some limitations which are scarcely to be regarded as the intrinsic requirements embraced by it.

There are also some difficulties even if we only consider the technology in the industrial field. The meaning of "technical" may be relatively clear in the period of the first industrial revolution represented by steam engines. Nowadays, however, its scope has become more and more obscured along with the rapid development of some modern technology such as computer software, signal processing, genetic engineering, etc. Some creations in these fields are still subjected to unsettled dispute in connection with their patentability. Accordingly, it would be proper to say that the term "technical" alone can only provide us with some preliminary guidance, but its meaning is not clear and precise enough to serve as a credible criterion.

Can the definition become a perfect one by incorporating the further requirement of utilizing natural law or natural forces into it? In my opinion, the answer would be a negative one because there are still some doubts which cannot be removed satisfactorily.

*32 According to the basic logic underlying Japanese practice, the so-called "technical idea" has a relatively broad meaning which covers also some subject matter located outside the conventional industrial field, such as educational methods, etc., but a patentable invention can only be a creation of technical ideas by which a law of nature is used. [n.9] To serve as a credible criterion, we must make sure whether the above rationale is also true in its converse direction, i.e. whether every technical idea utilizing a natural law will form a patentable invention. It is obvious that the answer depends on the degree to which the scope of the so-called "law of nature" can be extended. A famous Japanese scholar defined a law of nature as a rule which is existing in nature and is discovered by human practice. [n.10] Now, let us consider the critical path method which can be used in railway transportation management to optimize the utilization of railway carriages for the purpose of improving the efficiency of transportation. The method, just as every theorem of geometry, is undoubtedly a law of nature which is indeed a rule "existing in nature and discovered by human practice". Once the rule has been recognized, one can create such a technical idea as the transportation method mentioned above. However, according to the patent practice of Japan, the method is usually regarded as a scheme for doing business, and therefore is unpatentable.

In a broad sense, the whole of mathematics can be regarded as the science which makes use of numerals and symbols to express the natural laws in a highly abstract manner. [n.11] As the most simple example, let *33 us consider the widely used irrational number e , i.e., the base of natural logarithms. In spite of the fact that the number can be defined in a purely mathematical manner by the sum of an infinite series, said number is actually an objective measure of the changing rules of many physical quantities, and therefore is full of physical meaning. As for many functions and equations such as Bessel functions,

Maxwell field equations, thermal conduction partial differential equations, etc., much more direct utilizations can be obtained because they are all abstracted from practical engineering problems and reveal more clearly the relationships between various physical or chemical quantities. However, the mere fact of representing natural laws and being full of technical applications can not make mathematical methods as such patentable. Moreover, some technical solutions which depend mainly on mathematical methods will meet with difficulty in respect to their patentability in many countries, including Japan. [n.12] It would be right to say that the practical situation is somewhat difficult to be explained according to the Japanese definition.

German scholars have developed a set of fundamental conceptions in order to define the patentable invention precisely. It has been said that "in many other countries an approach in principle similar to the one in Germany can be traced but in very few countries indeed has it been carried out with such devotion and to such a state of perfection." [n.13]

In contrast with the Japanese logic, Germany has provided the term "technical character" with a much more restricted meaning by incorporating the requirement of utilizing natural forces into it. This conclusion is supported by the "Test Method" decision in which the BGH observed that "if the alleged invention is no more than a teaching, the following of which does not demand the use of controllable natural forces beyond the human mind, it is not of a technical nature, even though the use of a machine for carrying out the invention is appropriate or even seems to be the only feasible instrument and such is also proposed by the applicant." [n.14]

Some questions in addition to the definition of controllable natural forces per se may arise from the above observation, i.e., when and how should the natural forces be used? I would like to discuss this point by reference to a real appeal case handed down by the Reexamination Board *34 of the Chinese Patent Office. [n.15] The patent application in this case is concerned with a method for evaluating the contaminated degree of a tide-influenced river, which, as claimed, consists of (I) providing a special sampling points distribution, (II) carrying out conventional water analyses on the samples taken from said sampling points, (III) determining the average staying time of the contaminants discharged into the river, and (IV) carrying out calculation on the obtained data according to a given formula to obtain the required results. The Board reversed the rejecting decision made by examiner and pointed out that the claimed subject matter cannot be regarded as a mathematical method as such and the teaching considered as a whole forms indeed a technical solution which is susceptible of industrial application. However, we might be puzzled by the question of whether said method makes use of any controllable natural force or not if we tested it by the German definition. One may give an affirmative reply by pointing out the fact that electrical or mechanical forces have to be utilized when we carry out the sampling and measuring steps during the procedure of implementing said method. If the logic underlying this assessment is acceptable, we have to agree in a similar manner that every computer-related method is patentable because electrical force is absolutely necessary for operating a computer. Apparently, this reasoning does not coincide with the opinion of the BGH.

Perhaps just for the purpose of preventing the scope of patentable subject matter from being broadened excessively, the BGH had set some important limits to its definition. In the "Rolled Bar Cutting" case, the Court reiterated that the mere presence of technical features in a claim is without relevance if these features are not a part of the inventive kernel of the invention (Wesen der Erfindung) by citing some of its earlier decisions. The Court found that in the case at issue (I) the use of natural forces is not a part of the solution to the problem, and (II) the described result -- the cutting of the bars -- is not achieved directly by the use of the teaching but only after the utilization of technical means which, however, does not take part in the solution. According to this opinion, one has to determine at first what the inventive kernel is and only then can one carry out correctly the assessment of the natural forces criterion when dealing with a patent application consisting of both technical and nontechnical features. This approach makes the field in which an invention essentially lies crucial to the issue of whether that *35 invention is or is not technical in nature. [n.17] Moreover, to determine the inventive kernel of an invention is often a difficult thing which is actually a part of the examination of novelty and inventive step. By reference to the appeal case mentioned above, for example, one may be puzzled by the question of whether the steps making use of natural forces -- sampling and analyzing -- locate inside or outside the inventive kernel.

To sum up, due to the fact that patent protection is available to almost every branch of science and technology and patentable subject matter has a very broad scope which embraces various inventions of quite different styles, a definition intended for covering all of these things can only be expressed in a highly abstract manner. On the other hand, however, a definition which can be used as a credible criterion for patentability assessment must have sufficient degree of definiteness. This contradiction determines that the attempt of providing a positive definition for the term "invention" is too difficult to meet with success. It seems to me that the so-called "technical solution", "a law of nature", "controllable natural forces" are also very abstract conceptions which have to be defined further. To investigate in depth the meaning of these terms will probably go into the field of philosophy where the discussion may become a more complex and therefore more confusing one. In other words, to define a concept by using other conceptions with a similar degree of abstractness will be useless for its clarification. As a matter of fact, the majority of countries have given up the attempt and turned to a more feasible strategy, i.e. setting forth a negative definition by specifying individually the subject matter which is held unpatentable.

2.3 The relationship between the definitions of CPL and its Implementing Regulation

What the CPL adopts is also a negative manner of definition which is expressed by its Art. 5 and Art. 25. [n.18] On the other hand, however, this strategy is not followed by its Implementing Regulation in view of the fact that the latter has provided us with a positive definition by Rule 2, paragraph 1, which reads as follows.

Invention in the Patent Law means any new technical solution relating to a product, a process or improvement thereof.

*36 Therefore, we are confronted with the situation that the same concept has been defined respectively by CPL and its Implementing Regulation from two opposite directions.

A distinctive feature of CPL is that it stipulates three categories of patents in the same law, namely patent for inventions, patent for utility models, and patent for designs. It is therefore understandable that the term "invention" used in CPL is also intended for specifying the patent for inventions in addition to its ordinary meaning in common with that implied by the patent laws of other countries. An explanation of the legislative purpose of Rule 2 is that "CPL does not include any provision concerning the meaning of invention, but it is necessary for us to define the meaning of utility model and design in the Implementing Regulation. For the purpose of completeness, we also set forth a definition for invention at the same time." [n.19] It is clear from the above explanation that Rule 2 is designed mainly for the purpose of distinguishing the three categories of patents from each other. However, Rule 2 is vested with stronger force late by the stipulations of Rule 53, 54, and 66, i.e., Rule 2 becomes the only provision of the Implementing Regulation which can be used as one of the statutory grounds for rejecting a patent application and as one of the reasons for filing an opposition or a request for invalidation among the other provisions of CPL.

This situation will bring about unavoidably some problems, e.g., what is the relationship between the said two definitions? Is it possible that an application which cannot be rejected under the negative definition of CPL may be considered as an unpatentable one according to the positive definition of Rule 2?

It is obvious that the relevant provisions of CPL should be followed as a priority. This is not only because CPL is superior to its Implementing Regulation in the sense of legislative levels, but also for the reason that the stipulation of Rule 2 is more abstract than that of CPL and therefore is more difficult to assess. In fact, some subject matter such as foods, substances obtained by chemical methods, etc. are excluded from patent protection for some special reasons rather than because they are incapable of forming a technical solution as required by Rule 2. In other words, to be a technical solution is not the sufficient condition of patentability.

In my opinion, the so-called "technical solution" should be defined in such a manner that its scope is opposite to that of scientific discoveries, *37 rules for performing mental activities, and some subject matter without industrial applications. Whenever we intend to reject a patent application in accordance with the definition of Rule 2, we had better answer firstly the following question, i.e., what will its subject matter be if we are not able to recognize it as a technical solution? If it is actually difficult to put its subject matter into any category mentioned above, we should doubt whether the original impression is correct or not. [n.20] In other words, subject matter which can be excluded from patent protection by Rule 2 should not go beyond the excluded scope defined by CPL.

By combining the above two aspects, we can draw a general conclusion that the definitions of CPL and its Implementing Regulation must be explained in such a consistent manner that there is neither an overlapping area nor a vacuum area left therebetween. This attitude will help us to establish a sounder standard for carrying out patentability assessment.

3. Some Unpatentable Subject Matter

It has long been established that theories, mathematical methods, scientific discoveries, and rules for performing mental activities, etc. are not inventions in the meaning of patent law. However, said conclusion is correct only if the claims of a patent application are directed to this subject matter or activities as such. As a matter of fact, one can find out easily from these patent documents that there are many patented inventions in which the technical solutions are closely related to scientific discoveries or mathematical methods. It is obvious that we cannot reject an application simply for the reason that it includes as a part of it some unpatentable materials. The experiences of patent examination have taught us that to determine the patentability of a patent application of this kind is not an easy job even if the negative manner of definition has been provided by patent law.

In some existing literature, the attention of the authors is concentrated mainly on the meaning of individual terms adopted by patent law. In my opinion, it is better for us to investigate firstly what substantial distinction we can find out between the various categories of unpatentable subject matter as a whole and the patentable inventions.

It is well known that a patent right is an exclusive right or a monopoly granted for a creation made by an inventor. This feature implies *38 a basic precondition of patent protection. In accordance with the stipulation of Art. 11 CPL, said monopoly means that

"After the grant of patent right, ... no entity or individual may, without the authorization of the patentee, exploit the patent, that is to make, use, or sell the patented product, or use the patented process for production or business purposes."

Therefore, it is possible and necessary to grant a patent only if the claimed subject matter can be made, used, or sold for production or business purposes. It seems to me that the delicate distinction between patentable and unpatentable is located just at this point in many cases. For example, the optimum seeking method per se is merely a mathematical theory with the basic function of enabling everyone to establish in his mind a concept which coincides with natural laws. It would be unimaginable for us to grant a patent right for said theory per se to inhibit others from learning and using this method, because performing mental activities in everyone's mind is one of the fundamental personal freedoms which cannot be taken away for any reason. This may be the most basic reason for excluding mathematical methods from patent protection. On the other hand, if said method is applied to an industrial process to solve certain technical problems, then the whole teaching will become a patentable invention. The essential distinction between them is that the latter only represents a specific application of said mathematical theory and is able to be used for production purposes, and therefore satisfies the basic

precondition of patent protection. To grant such a patent will not damage the personal freedom of others at all.

This opinion will become clearer along with the following discussion.

3.1 Scientific discoveries

It has been well-known in everyday life that the two terms "discover" and "invent" have apparently different meaning. For example, we can say "I have discovered a box under the table" rather than "I have invented a box under the table." However, said two terms are closely related to each other in the fields of science and technology.

On the one hand, many inventions are created on the basis of relevant discoveries, e.g., without the discoveries of the properties of P-N junctions there would not be the invention of the transistor. On the other hand, an invention can also promote further discoveries, e.g., a newly developed powerful telescope makes it possible for astronomers to discover some unknown celestial bodies. In this aspect, we are all familiar with the examples provided by various textbooks. Now, the *39 discussion will be focused on the problem of what general conclusion we can draw from these examples.

According to one of the existing theories, discoveries belong to the domain of "recognizing the objective world existing in nature", while inventions belong to the domain of "improving the objective world by human efforts". [n.21] This theory may be correct in the sense of philosophy, but is not sufficient to serve as a patentability standard for distinguishing discoveries from inventions. For example, it is well-known that various measuring methods make up a main class of patentable inventions, but, if we follow the above theory, measurements should be regarded as discoveries because to measure a quantity is indeed an activity for "recognizing the objective world existing in nature."

A relatively strict criterion is as follows.

Discoveries are new knowledge of natural laws, natural phenomena, or natural substances which have already occurred or existed in nature but have not yet been known by human beings. In contrast, an invention must include as a part of it something which is not existing in nature but created by human effort. [n.22]

According to this criterion, it is justifiable to exclude a discovery from patent protection on the ground that no matter how meritorious the discovery may be to the enrichment of our knowledge no one should expect to derive any monopoly from a purely natural event as such. This criterion can solve successfully the above mentioned difficulty in connection with the patentability of measuring methods. It does not matter that we accept the conclusion that measurements are of the nature of recognizing the objective world, but measuring methods are not existing in nature but created by human beings, therefore they should be regarded as inventions.

It seems to me that the essential distinction between discoveries and inventions is whether a thing has existed in nature rather than whether it has been known by human beings, because the latter is actually the consideration towards the novelty requirement which is just the common condition to be fulfilled by both discoveries and inventions. However, a vexing problem is how to define the meaning of "existing in nature" which is often the central point at issue. The answer to this problem is of vital importance to the patentability of substance in nature, particularly substances isolated from raw plants or other sources without substantial changes except as to their purities or stabilities. [n.23] In this *40 aspect, the Guidelines of EPO provide us with the following observations that

To find a substance freely occurring in nature is also mere discovery and therefore unpatentable. However, if a substance found in nature has firstly to be isolated from its surroundings and a process for obtaining it is developed, that process is patentable. Moreover, if the substance can be properly characterized either by its structure, by the process by which it is obtained or by other parameters and it is "new" in the absolute sense of having no previously recognized existence, then the substance per se may be patentable.

Accordingly, the meaning of "existing in nature" is confined within narrow limits which cover only the substances "freely occurring in nature."

It has been accepted as generally true that to find out a new property of a known material or article is mere discovery and therefore unpatentable. A question associated with this conclusion is whether this principle can be circumvented by simply putting a newly discovered property to a practical use. The Guidelines of EPO also gives us an affirmative answer to this question. [n.24] This attitude represents an important limitation on the scope of discoveries due to the fact that almost every newly discovered property has various practical uses and therefore it is very easy for the discoverer to make a patentable invention by simply combining said property with whatever practical use as long as it satisfies other conditions such as industrial application and inventive step. The result is not substantially different from patenting a property as such in some cases.

A typical example in this aspect is the medical uses of known materials. In some cases, the materials per se may have existed in nature and their therapeutical effects are produced by their intrinsic properties which should be considered as also existing in nature. What the inventors do in these situations are nothing but discoveries of said properties. It is true that a lot of research work such as pharmacological and toxicological tests has to be completed before providing the patients with a practically usable medicine, but this fact makes no difference because to make a discovery also involves a large amount of research work in many cases. However, the first medical use inventions have been held patentable by the stipulations of EPC and an exception from the general principle of novelty has been designed specially for providing them with product-like patent protection. [n.25] In recent years, the BGH *41 and the Enlarged Board of Appeal of EPC have confirmed respectively the patentability of the second medical uses of medicaments. [n.26] [n.27] It would be somewhat difficult to explain these developments according to the above criterion, but we can feel easy if we consider the basic precondition of patent protection mentioned above because to produce or to sell

whatever medicaments will make up the behaviours for production and business purposes.

The above discussion also gives me a chance to explain why we should not consider the requirements of novelty and inventive step at this stage. Supposing someone finds out that a known transparent material is capable of absorbing within a certain waveband light radiation which is harmful to childrens' eyes and makes use of said material to produce a lamp shade, then he accomplishes an invention. In this case, the kernel of the invention is actually the discovery of said property if to make a lamp shade from said material is a very simple thing which does not involve any inventive concept. When dealing with a patent application of this kind, we cannot divide its subject matter into two parts and then deny its patentability if the essential part which determines the presence of inventive step is actually a discovery. In contrast, we must consider its subject matter as a whole and draw an affirmative conclusion as long as an invention is described and claimed in the application. In other words, the patentability assessment should be irrelevant to the question as to on which portion its novelty and inventive step mainly depend.

3.2. Rules and methods for performing mental activities

This category of subject matter covers the rules and method for carrying out in human brains the activities such as conceptualizing, memorying, analyzing, deducing, judging, etc. The Examination Guidelines of the Chinese Patent Office suggest that rules and schemes for playing games or doing business can also be included in this category due to the fact that CPL does not provide any specific provision to deal with these activities. [n.28]

Once again, we have to find out the essential distinction between the rules for performing mental activities and patentable inventions if we wish to carry out the assessment correctly and consistently.

Since all of the inventions are the results of human intelligence, it will be nonsense to inquire into the question of whether mental activities *42 are involved during the procedure of making an invention. In contrast, the substantial point is whether the implementing procedure of a completed invention still depends upon mental activities of the person who carries it out. In order to illustrate this point more clearly, I would like to engage in some detailed discussion by reference to a real problem, namely the patentability of the methods of Chinese ideographs (or Chinese characters).

Chinese characters originate from pictographic schemes which have become a special written language through the historical development of several thousands of years. Due to the intrinsic difference between Chinese characters and the alphabetical writing widely used in the western countries, how to input efficiently the former into computers has become a serious problem which is in urgent need of settlement. In recent years, considerable progress in this field has been achieved along with the appearance of a large number of encoding methods. Some of these methods have been proved to be very

successful in the sense of their fast inputting rate and simplicity for learning which will promote greatly the utilization of computers in China. Since the entering into force of CPL in 1985, the Chinese Patent Office has received many applications related to these encoding methods. However, the patentability of these methods is still subject to dispute.

First of all, we have to define precisely the problem to be discussed. The Chinese characters computer processing technology includes two categories of works. The first one is to provide the rules by which Chinese characters can be converted into some symbols which can be input into a computer by means of, for example, a keyboard, the second one is to develop the associated hardware and/or software required for performing the subsequent operations such as keyboard inputting, storing, logical calculation, and outputting, etc., on said converted symbols. There is no doubt as to the patentability of hardware and the problem of software will be discussed separately in the latter part of this article; therefore we have to discuss here only the patentability of the encoding methods, as such.

The encoding methods as such can be divided in principle into two main categories, namely the character structure-dependent encoding methods and the character pronunciation-dependent encoding methods. But, no matter what method we intend to use, mental activities of the person who carries out the method are absolutely necessary during the encoding procedure. In-so-far as the first category of methods is concerned, every code obtained consists of the symbols representing the strokes of a Chinese character. For example, an encoding method makes use of four symbols representing respectively the first three strokes and the *43 last stroke of a Chinese character to form a complete code. However, the forms and writing sequences of the strokes of Chinese characters are very complex, which have only a few regularities with a lot of exceptions. Only a person who is familiar with Chinese characters can recognize correctly what the first three strokes and the last stroke should be. The dependence of the methods of the second category on mental activities is even clearer because the encoding methods of this kind can only be carried out by a person who can speak Chinese correctly. For these reasons, it would be proper to include the encoding methods as such into the scope of rules and methods for performing mental activities.

Actually, the encoding procedure for each of the Chinese characters to be encoded is finished once said character has been converted into the symbols such as ABCD. Special equipment such as a keyboard designed especially for carrying out an encoding method is of course patentable. This conclusion, however, bears no relationship to the patentability of the encoding methods, just like a specially designed chessboard is patentable while a rule for playing chess is not patentable.

From the practical point of view, only the hardware and software for performing an encoding method can be made, sold, or used for production and business purpose. Nothing can be protected even if we grant patent rights for an encoding method because the method is carried out virtually in every individual's mind.

The mental activity-dependent feature is also the essential distinction between the encoding methods and computer programs. A program can be performed automatically to achieve the desired result without the interference of human intelligence once the program is accomplished and stored in a computer. This would be one of the reasons why some computer-related inventions can be regarded as patentable subject matter because to grant a patent of this kind is by no means to prohibit others from performing mental activities in their brains. Suppose someone provides an encoding method by which the Chinese characters can be identified automatically and then inputted into a computer, it will be located outside the scope of rules for performing mental activities and become a patentable invention.

In brief, a general conclusion can be drawn from the above discussion that a method should be considered as a rule for performing mental activities if the desired result of said method can only be obtained by the interference of human intelligence, or, in other words, if at least one of its indispensable steps can only be carried out in human brains. This criterion leaves enough elbowroom to fit in with the further development of science and technology because some subject matter held unpatentable nowadays may become patentable in the future if the technical *44 means for carrying it out have been changed. It is notable that the criterion is somewhat similar to the BGH definition, therefore it would be better to use said definition as a criterion for distinguishing the rules for performing mental activities from the patentable inventions.

One may argue that it is also necessary for a skilled man to conduct some mental activities during the procedure of implementing a patented invention in some cases. Can we say that human intelligence is also an indispensable condition in those situations? This doubt is not difficult to remove. As mentioned above, an invention must include something created by human efforts; therefore its exploitation always requires some preparations which may involve some mental activities indeed. The essential distinction, however, is that a patented invention can be repeatedly carried out independently of mental activities once all the necessary conditions are ready, while a rule for performing mental activities requires the participation of human intellectual activities as an indispensable condition of its implementation at any time.

Finally, in my opinion, it would be improper to include all of the rules and schemes for playing games or doing business into the scope of mental activities according to the above discussion. These activities are mentioned separately as different unpatentable subject matter in the provisions of, for example, the EPC. This fact helps to show that they cannot be used to overlap each other. No trouble will arise by this opinion because a patent application related to the rules and schemes for playing games or doing business can be rejected under the ground of lack industrial application.

3.3. Programs for computers and mathematical methods

The patentability of programs for computers has long been a famous problem. Strictly speaking, the problem at issue is not whether a computer program expressed in the form

of a set of instructions is patentable or not. If someone files a patent application with its claim consisting solely of such a program, he will receive a rejection in every case. What we have to discuss here is actually the so-called "computer-related inventions" which means "a computer or computer-aided apparatus or method operating under programmed control to perform a novel, non-obvious function". [n.29]

One question which is worth asking at first is why the computer-related inventions brought about such a difficult dispute. In my opinion, *45 the main reason should be attributed to the contradiction between the newly developed computer science and the traditional conceptions of patentability. On one hand, computer programs usually relate to mathematical calculations (including numerical calculations and logical operations) which as such have long been regarded as unpatentable subject matter. People were afraid that the principle followed by the patent system throughout the whole of its history will be destroyed if we grant irrationally a patent right for computer related- inventions. Moreover, a computer, particularly a general purpose computer, can perform quite different operations only by means of different programs without the necessity of changing any hardware of it. This fact gives us a strong feeling that to patent a computer-related invention is not substantially different from putting an abstract idea per se under someone's monopoly in many situations. On the other hand, in comparison with conventional machines and apparatus, computers have a distinctive feature, i.e. they may be used to perform operations which could only be carried out previously in human brains, even some operations which are too complex to be carried out by human beings. In the past, the abstract subject matter such as mathematical methods remained in the domain of human intelligence, while all of the patentable products and processes can only be used to perform operations of an unintelligent nature. There was a clear gap left there between by which we can easily distinguish them from each other. Now, computers make it possible to utilize directly various mathematical algorithms in almost every technical field, therefore the originally clear gap has become obscured and disappeared gradually. This change will bring about inevitably some problems which represent a challenge to certain traditional concepts. In the past three decades, computers and their uses developed very rapidly, which has changed considerably the appearance of the whole of industry and even the everyday life of human beings. As the results of highly inventive works and the object of keen competitions, computer programs are in urgent need of reliable legal protection. It may be just for the purpose of accommodating patent practice to this requirement that the patentability standards concerning computer-related inventions in many countries have changed gradually along the direction in favor of the applicants.

In the United States, early case law was concentrated mainly on the problem of how to deal with mathematical algorithms involved in computer related-inventions. Before 1981, the dominant approach was to divide a patent application of this kind into two parts, namely conventional technology and mathematical calculation. If the former is already known and its novelty and non-obviousness only depend on the introduction *46 of the latter, the application will be regarded as an attempt for wholly pre-empting the mathematical formulas and therefore unpatentable. [n.30] This approach ignores the above mentioned fact that computers can be used to connect said two parts together to form an invention which is exploitable for production or business purposes.

In 1981, the U.S. Supreme Court gave up this approach in its famous "Diamond v. Diehr and Lutton" decision in which the Court pointed out that "the fact that one or more steps in Respondents' process may not, in isolation, be novel or independently eligible for patent protection is irrelevant to the question of whether the claim as a whole recite subject matter eligible for patent protection under Sec.101" [n.31] In this decision, a two-step testing method has been developed by the Court. The first step is to determine whether a claim, directly or indirectly, comprises a mathematical algorithm. If this is not the case, the invention and the second step is not carried out. However, if the claim comprises a mathematical algorithm, it is necessary to determine in the second step whether the whole invention is performing a function which the patent law was designed to protect. If that is the case, then the claim satisfies the requirement of Sec.101. This decision does not only change the attitude of the U.S. Patent and Trademark Office towards the patentability of computer-related inventions, but also has significant influence upon other countries.

However, the above criterion became obscured when the U.S. Supreme Court reiterated its position in *Park v. Flook* that "no patent can be granted for a mathematical formula in the abstract and this principle cannot be circumvented by simply limiting the use of the formula to a particular technological environment or showing some insignificant post-solution activities". [n.32] It is true that a mere insignificant post-solution activity cannot render an otherwise unpatentable mathematical method patentable because some technical uses can always be found for every mathematical formula. But, the difficulty is how to determine whether the technical solution described in a patent application should be regarded as "insignificant post-solution activities" or not. Unless we can answer this question properly, any technological use of every mathematical formula will be in danger of being rejected.

In the Federal Republic of Germany, the patentability of computer related inventions was subjected to the influence of the definition of invention^{*47} and the theory of inventive kernel at the very beginning. The BGH observed in its landmark decision of "Disposition Program" that

The teaching to control a data processing system according to a specific computer program may be patentable only if (I) the program requires and teaches a new, inventive structure of such system, or if (II) the program includes the teaching to use the system in a new, therefore not customary and non-obvious way. [n.33]

The principle established by this decision is still followed by the German Patent Office and the Federal Patent Court. [n.34]

I have read with great interest the first decision concerning the patentability of computer-related inventions handed down by the Board of Appeal of EPC in 1986. [n.35] In this decision, the Board made a wide ranging discussion which covers nearly all of the existing problems related to inventions of this kind such as industrial application, the distinction between mathematical methods and patentable inventions, requirements for claim drafting, and novelty of specially programmed known computer, etc. In comparison

with the U.S. decision mentioned above, this decision represents a further progress which can be concluded as following two points.

(1) The decision shows that the Board does not intend to accept the opinion that a data processing system is patentable only if some innovation has been introduced into the system structure. The Board pointed out particularly that making a distinction between embodiments of the same invention carried out in hardware or in software is inappropriate as it can fairly be said that the choice between these two possibilities is not of an essential nature but is based on technical and economic considerations which bear no relationship to the inventive concept as such.

We must admit that a computer is also a machine at the final analysis.

The fact that a machine of this kind is able to perform some operations which could only be carried out previously by human brains does not require us to set forth additional conditions for computer-related inventions. This standpoint implies that patentability does not depend on the question of whether any computer program is involved in an invention or in what manner the program is intended to be carried out, but depends on the question of what technical problem the programs can be used to solve. Therefore, a computer-related invention which is *48 otherwise patentable should not be excluded from patent protection only for the reason that it can be carried out by an appropriately programmed general purpose computer. What we must exclude from patent protection are computer programs which are used to perform pure mathematical calculations or activities lacking industrial application. Accordingly, it would be enough to consider these conditions alone when we deal with computer-related inventions.

(2) Once the above attitude has been established, the problem which remains to be solved is how to deal with mathematical algorithms involved in a patent application. Art. 52(3) EPC stipulates that mathematical methods as such are not patentable. As mentioned before, the most difficult thing is to determine whether a patent application is directed to a mathematical method "as such" or not. It would be very easy to bring about a dispute if we carry out the evaluation by inquiring into the question of what the inventive kernel is or whether the technical application of a mathematical formula should be regarded as insignificant post-solution activities. In this aspect, the Board pointed out that an affirmative conclusion can be obtained if

a mathematical method is used in a technical process, that process is carried out on a physical entity (which may be a material object but equally an image stored as electric signal) by some technical means implementing the method and provides as its result a certain change in that entity. The technical means might include a computer comprising suitable hardware or an appropriately programmed general purpose computer.

The standpoint will not only increase the opportunities of granting a patent right for computer-related inventions, but also create a relatively credible criterion which can be evaluated somewhat easily.

The only point which is not very convincing is what the Board said in connection with novelty of the apparatus claim that

A computer of known type set up to operate according to a new program cannot be considered as forming part of the state of art as defined by Art.54(2) EPC.

In that situation, what we can find outside the state of art is actually a new use of said computer which may only be protected by a process claim. It would be unreasonable to provide a known computer, particularly a general purpose computer, with patent protection only for the reason that different programs have been stored into said computer. It is doubtful whether the novelty exception stipulated by Art.54(5) EPC designed specifically for the first medical use inventions can be applied in this situation.

Insofar as the stipulations of CPL are concerned, it should be noted that neither "programs for computers" nor "mathematical methods" *49 is mentioned among the subject matter excluded from patent protection. Of course, this fact does not mean that there is no limit in this aspect, but the provisions of CPL indeed make it easier for us to adopt a favourable attitude towards the computer-related inventions.

4. Conclusion

The fundamental purpose of patent law determines that the patentability problem is closely related to the development of science and technology. It is not necessary to investigate the meaning of individual terms used in patent law from the academic or philosophic approach. In contrast, the factors which are more important in many cases are: (I) whether the subject matter is allowable to be monopolized, i.e. to be produced, sold, or used for production or business purpose, and (II) whether the subject matter is in urgent need of the patent protection in the light of the practical situation of industry. The evolution of the patentability of medical use inventions, microbiological varieties, substances obtained by chemical process, as well as computer related-inventions are good examples which can be used to support this conclusion.

[n.1]. This article is selected from the paper, written by the same author, presented to the First National Symposium on Industrial Property held by the Industrial Property Association Of China in November, 1988.

[n.2]. Member of the Patent Reexamination Board of the China Patent Office (CPO) and Chairman of the Technical Board of Appeal on Physics. This article is the first of a series written for IDEA -- The Journal of Law and Technology by individual members of the China Patent Office Re-Examination Board (the appellate tribunal of the CPO) with which President Robert H. Rines of the Franklin Pierce Law Center has, since 1985, established an on-going exchange of views and ideas leading to intellectual property law study by several Board members at the Law Center.

[n.3] Art. 25 CPL, which reads as follows:

"For any of the following, no patent right shall be granted

- (1) scientific discoveries,
- (2) rules and methods for mental activities,
- (3) methods for the diagnosis or for the treatment of diseases,
- (4) food, beverages and flavorings,
- (5) pharmaceutical products and substances obtained by means of chemical process,
- (6) animals and plant varieties,
- (7) substance obtained by means of nuclear transformation.

For processes used in producing products referred in items (4) to (6) of the proceeding paragraph, patent right may be granted in accordance with the provisions of this Law."

[n.4] Shen Yao Zheng et al., "Introduction to Industrial Property", pp. 32.

[n.5] Art. 22 CPL, paragraph 4, which stipulates that "Practical applicability means that the invention or utility model can be made or used and can produce effective results." See also the "Examination Guidelines of CPO" (unpublished), chapter 8.

[n.6] This definition has been formulated by the BGH in its famous "Red Dove" decision handed down in 1969. Its English version is published in IIC, Vol. 1, No. 1, 1970, pp. 136-140.

[n.7] To select only the term "controllable natural forces" from the BGH's definition is supported by the BGH's "Disposition Program" decision in which the Court observed that "although the claimed rule without doubt represents a teaching for systematic action, which leads to a causally predictable result, no controllable natural forces are used in arriving this result". The English version of this decision is published in IIC, Vol. 8, No. 9, 1977, pp. 558- 565.

[n.8] According to the explanation of Xin Hua Chinese Dictionary, the term "technology" means "the experiences and knowledge accumulated by human beings during the procedure of recognizing and improving the nature, as well as the skills for carrying out various operations".

[n.9] Yoshifuji Karasaku, "Introduction to Patent Act" (sixth edition), pp. 49-55, in which the author pointed out that "The term 'technology' can be defined as the practical means or methods for realizing whatever purpose of human being. The fields in which said means or methods are intended to be used are irrelevant to the above definition. Accordingly, there are equally some technology in the fields other than industry, such as

the music instruments playing techniques, etc. It should be noted that said techniques are not patentable because they do not make use of any law of nature. On the other hand, there are also some technology which do not utilize any law of nature even though they are exploitable in the field of industry," and "According to an opinion held by many people, the term 'technology' should relate only to natural science. This opinion is not correct because we cannot incorporate the requirement of utilizing a law of nature into the meaning of technical ideas if the stipulation of the Patent Act is followed strictly."

[n.10] Supra, footnote 9, pp. 46.

[n.11] Friedrich Engels, "Natural Dialectics" (Chinese version), pp. 279. In which, the author highly appreciated the creation of infinitesimal calculus, but he observed at the same time that "People may argue that the creations of this kind are the results of purely free imagination of human being there is not anything existing in nature in correspondence with them. But, just to the contrary, the nature has provided models for all of these imaginable quantities".

[n.12] According to the "Examination Standard for Computer-Related Inventions" formulated by the Japanese Patent Office, an automatic friction factor measuring method characterized by using a mathematical formula is cited as an example of the unpatentable subject matter.

[n.13] Henri W. Hanneman, "The Patentability of Computer Software", pp. 167.

[n.14] IIC, Vol. 9, No. 4, 1977, pp. 363-366.

[n.15] The No. 5 Decision handed down by the Patent Reexamination Board of the Chinese Patent Office (unpublished).

[n.16] GRUR, 1981, pp. 39-42.

[n.17] Decision of the Technical Board of Appeal 3.4.1., "Official Journal EPC", 1-2/1988, pp. 19-25.

[n.18] Art. 5, CPL, which stipulates that "No patent right shall be granted for any invention-creation that is contrary to the laws of the state or social morality or that is detrimental to public interest". As to Art. 25 CPL, see footnote 3 supra.

[n.19] Tang Zong Shun, "Explanation of the Patent Law of the People's Republic of China", pp. 10.

[n.20] This attitude is implied by the Decision cited by footnote 15, supra.

[n.21] "Examination Guidelines of CPO", Chapter 5.

[n.22] Zhao Yuan Guo et al., "Practical Manual of the Chinese Patent Law", pp. 114-115.

[n.23] R.S. Crespi, "Patenting in the Biological Science", pp. 38-45.

[n.24] "Guidelines of EPO", Part C, Chapter IV, pp. 31.

[n.25] Art. 52(4) EPC and Art. 54(5).

[n.26] IIC, Vol. 15, 1984, pp. 214-225.

[n.27] IIC, Vol. 16, 1985, pp. 83-90.

[n.28] Supra, footnote 21, chapter 5.

[n.29] Supra, footnote 13, Introduction.

[n.30] Parker v. Flook, 437 U.S. 584 (1978) 198 USPQ 193.

[n.31] Diamond v. Diehr and Lutton, 450 U.S. 175 (1981), 209 USPQ 1.

[n.32] Supra, footnote 30.

[n.33] Supra, footnote 7.

[n.34] Decision of the Federal Patent Court of Germany, "Official Journal EPO", 1-2/1988, pp. 58-60.

[n.35] Decision of the Technical Board of Appeal 3.5.1., "Official Journal EPO", 1/1987, pp. 14-23.