LETTER

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TRÉSOR-ECONOMICS

The patent system in Europe

- Several reports published in recent years have highlighted the gap that has opened up between Europe (notably France) and the United States in terms of the number of patents filed. Taking the number of "triadic patents" (filed simultaneously in the United States, Japan and with the European Patent Office), the European Union (EU) filed 35 patents per million head of population versus 66 in the United States and 106 in Japan. Differences between various patent systems are one factor, among others, accounting for this gap: the European patent, in particular, is deemed unduly costly and is accused of inhibiting innovation in Europe.

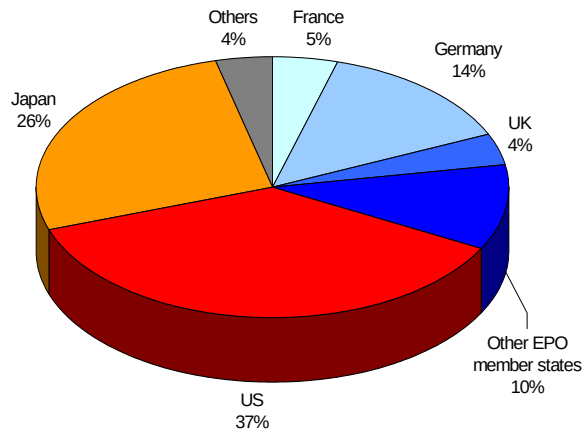
- Here we review these countries' respective performances against a series of patent-related indicators in order to identify reasons for this gap and assess the likely gains to be expected from possible improvements to the European system. This approach is based on economics and does not take into account other factors such as national languages protection.

- The difference between patent-filing ratios for Europe and the United States is entirely due, in the first place, to lower R&D spending in the EU and not to lower patent productivity for a given level of R&D spending.

- Even so, the existing European patent system could be made more efficient. It has two major defects, namely the need to translate patents into all of the languages concerned, which raises the cost of the patent, and above all the profusion of administrative and legal formalities to be performed in the different countries once the patent has been granted.

- Additional proposals have been made with a view to remedying each of these defects. The London Agreement of 2000 would drastically reduce the translation obligations, and the "Community patent" proposed by the European Commission in 1975 would significantly improve the protection afforded to patents by automatically covering the entire territory of the EU. By enabling innovative firms to release additional funds and/or affording them greater protection for their innovations, changes such as these could provide a stimulus to R&D in Europe.

Breakdown by country of origin of "triadic" patents filed in 2003



Source: OECD (2006)

DGTPE
DIRECTION GÉNÉRALE DU TRÉSOR ET DE LA POLITIQUE ÉCONOMIQUE

1. Patents are a public instrument for supporting innovation. As an indicator of R&D efficiency, their number shows that research is more productive in Europe than in the United States, for a given level of R&D spending

1.1 Patents are an instrument of public policy designed to stimulate R&D by protecting innovation

A patent is a deed of ownership of an invention conferring on its holder a monopoly right for a limited period of time and in a given territory. The inventor can either exploit the invention himself or sell licences to exploit it in return for payment.

Patent applications are generally filed with a national patent office (the *Institut National de la Propriété Intellectuelle*-national intellectual property institute-in the case of France). At the international level, however, the European Patent Office (EPO-31 member states), and the World Intellectual Property Organisation (WIPO-128 member states) enable the granting of national patents simultaneously in all of their participating states.

To be "patentable", an invention must satisfy three criteria: i) it must be new, ii) its conception must be inventive, and iii) it must be capable of being applied industrially. Over and beyond this general definition, however, the scope of patentable inventions may vary from one country to another. For example the United States and Japan consider software to be patentable, *a priori*, whereas the EPO will at most consider only certain inventions implemented by computer and presenting a "technical effect".

A patent is a trade-off between two at first sight contradictory economic objectives, namely to stimulate corporate R&D spending and to ensure the proper dissemination of new knowledge to society at large.

The granting of a patent gives value to an innovation thanks to the temporary market power given to the inventor, even though the resulting restriction on competition inhibits the proper dissemination of knowledge. By protecting the firm that makes an invention from being copied by its competitors, a patent allows governments to boost the private return on R&D and hence stimulate innovation.

At the same time, public policymakers must ensure that the patent system permits the proper dissemination of new knowledge in the economy. For this, it can theoretically modulate the duration of a patent[1], its cost to the applicant, or again the scope of the invention covered (the number of "claims", i.e. the number of innovative characteristics accepted within a single patent). The patent is granted, moreover, in exchange for publication of the invention.

Patents are not necessarily the best form of protection for an inventor. The latter may prefer to protect his trade secret-a less costly approach, *a priori*, and potentially longer-lasting.

From the society's point of view, the impact of trade secret protection is ambiguous:

- If it works (if the secret is kept for over 20 years), it permits the financing of new innovations but it prevents the dissemination of new knowledge and may lead to inefficient duplication of research effort;
- If it does not work, it increases competition, since firms that pierce the secret will have an incentive to replicate or even improve the innovation more rapidly.

It is therefore difficult to say which form of protection-patent or trade secret-is socially preferable. An american study shows that secrecy would appear to be the preferred mean of protection in the case of process innovations, while patents tend to be preferred in the case of product innovations, which can be disassembled by competitors in order to find out how they work[2]. The situation is more balanced in France.

1.2 Based on indicators of triadic patents[3], R&D is most efficient in Germany and Japan. R&D productivity in the United States is close to that of France but below that of Europe

In terms of R&D productivity (and bearing in mind the limitations inherent in the patent indicator, see box 1), Germany is the country with the largest number of triadic patents filed in 2003 per billion dollars of annual average spending on R&D[4] between 1993 and 2002[5] (158). It has a slight lead over Japan (151) on this indicator, and a greater one over the United States (86), the United Kingdom (80) and France (75).

(1) In 1994, the General Agreement on Tariffs and Trade set the maximum duration of patent protection in the 125 signatory states at 20 years.

(2) R.C. Levin, A. Klevorick, R.R. Nelson, S. Winter (1987), "Appropriating the Returns from Industrial Research and Development", *Brookings Papers on Economic Activity, pp. 783-820*.

(3) The Triad comprises the United States, Japan and the member states of the European Patent Office (EPO). A patent is said to be "triadic" if it is filed jointly in the United States, Japan and Europe (with the EPO).

(4) The R&D spending index is the Gross Domestic Expenditure on R&D. We do not split between public and private R&D.

(5) We consider the average of R&D spending over the last 10 years, so that we take into account the lag between research and innovation.

Similarly, Germany had the best ratio in 2003 in terms of the "number of triadic patents filed per thousand research workers[6]" (28.8), some way ahead of Japan (20.9), the United States (16) and France (14.7).

According to these indicators, Germany then is the country with most productive R&D, along with Japan, with a clear lead over France, the United States and the United Kingdom. Each of these countries requires nearly twice as much resources as Germany to file the same number of triadic patents. Several factors may account for this situation: Germany is more specialised in sectors with a high propensity to file patents and where the average cost of a patent is lower (in car manufacturing, notably), and it has a dense network of internationally-oriented medium and large firms.

Box 1: **Taking the number of patents filed as an indicator of innovation**

Supplementing the indicators of R&D effort (the most commonly-used being "R&D intensity"[a]), patent statistics are generally used to measure the efficiency of a country's R&D spending. This is because a patent is filed only if a research project is presumed to be successful, i.e. when it has culminated in an innovation.

Patent indicators are only an imperfect image of a country's innovation performance.

In the first place, an innovation may not be patented. This happens if the inventor prefers to protect his invention as a trade secret, but also if he chooses to publish his invention or if the invention occurs in a non-patentable field. Moreover, the patent indicators record only patent applications, not patents granted, even if the competent patent office ends up rejecting the application.

Next, differences between patent systems have a direct impact on the number of patents filed with the various offices. The scope of coverage afforded by a patent mechanically influences the number of patents required to protect an invention, and the limits to patentability vary from one system to another: this implies that certain innovations may be covered by one or more patents in one country but may not be patentable in another.

Further, not all patented innovations are of equal importance, so that it is misleading to count the number of patents without also considering their worth. In practice, many patents cover inventions that remain unexploited and are therefore of doubtful value.

Finally, the "patent" indicator generally fails to establish a linkage between innovation and the R&D effort that lies behind it. This is because patent applications are recorded according to the applicant's place of residence, and not according to the place where the research was carried out. In the case of a legal entity, this will be the registered office of the company that owns the patent. Consequently, a country could theoretically have a large number of patents ascribed to it even though no R&D had been done within its frontiers[b].

The use of the number of triadic patents as an indicator partially helps to overcome these shortcomings.

One approach frequently adopted in order to remedy the discrepancies attributable to differences between systems and thus limit bias in international comparisons, is to count the number of "triadic patent families" (or "triadic patents") applied for, in other words the number of patents for which applications are filed both in Europe (with the EPO), the United States and Japan, rather than the number of patents filed. In particular, it is assumed that innovations patented in the three main intellectual property territories must be important innovations, in fields in which patentability is accepted unambiguously. On the other hand this type of indicator obviously cannot count innovations that the inventor prefers to protect as a trade secret.

Table 1: International comparison of the number of triadic patents filed in 2003(*)

France	Germany	United Kingdom	EPO member states	United States	Japan
2,356	7,111	2,024	16,902	19,222	13,564

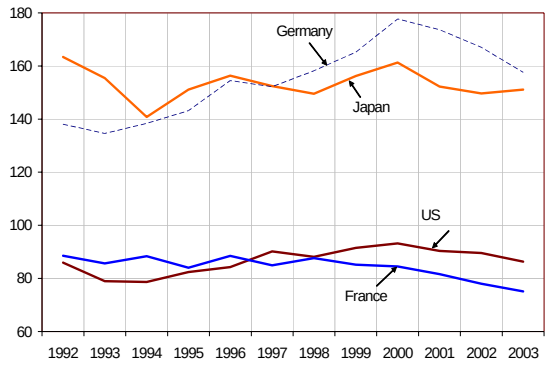
Source : OCDE (2006)-DGTPE

(*) Nearly 53,000 triadic patents were filed in 2003, of which nearly 95% originated in the United States (36%), the "EPO" zone (32%) and Japan (26%).

a. Ratio of a country's Gross Domestic Expenditure on R&D to GDP.
b. Thus, for example, the statistics ascribe to the Netherlands, Finland or Switzerland patents filed respectively by Philips, Nokia or Nestlé, whereas in many cases the inventors work and reside not in the country where the parent company is located, but in a subsidiary located in another country.

(6) Average number of research workers ("full-time equivalent") per year and per country over the previous ten years.

Chart 1: Number of triadic patents (per bn $ of annual R&D spending over 10 yrs)



Source: OECD, DGTPE calculations

Taken as a whole, EPO member states filed 103 triadic patents in 2003 per billion dollars spent, and 16.1 per thousand research workers, which is more than the United States for an equivalent research effort[7]. Europe therefore does not lag the United States in terms of R&D efficiency[8]. Thus, some alarmist reports should be watered down: they are based on skewed indicators (such as the number of patents in relation to GDP or population) that fail to distinguish between the volume of R&D and its productivity, with only the first indicator possibly giving rise to some concern.

While the number of triadic patents in relation to GDP[9] is greater in the United States (1.76 in 2003) than in France and in the EPO bloc (1.42), in reality the gap reflects above all a difference in R&D investment (1.7% of GDP in the EPO zone, and 2.2% in France, versus 2.7% in the United States in 2003[10]). Consequently the "gap" as observed via these indicators between Europe and France on the one hand and the United States on the other, flows less from any problem with the production function of R&D than from an insufficiency of inputs mobilised and/or interesting projects[11].

2. The European patent, providing protection in 31 countries, currently has two main shortcomings, namely high cost and inadequate legal security

2.1 The EPO centralises the filing, examination and granting of a single "European patent" for 31 countries. After being granted the patent is split into national patents subject to the local law of each member country

Generally, patent systems around the world are national and independent, which breeds duplication of costs and formalities between offices and jurisdictions.

An inventor must apply for (and defend) a patent in each country in which he wishes to protect his invention, which can prove very costly. Insofar as the new knowledge provided by an innovation is theoretically a global public good, the best intellectual property system would be one consisting of a "worldwide patent". Under this system, only a single application and granting procedure would be required with a world patent office.

This is not currently feasible due to the different legislative systems and disagreements over the limits to patentability. The result is the existence of several independent systems side by side.

In Europe, the "European patent" is based on a single application procedure, but it then splits into independent national patents governed by the law of each State, which may require translation of the patent into its national language.

The European patent grew out of the European Patent Convention (EPC, 1973) and is granted by the EPO (a non-Community organisation). It can protect an inventor in as many countries as he wants among the Office's 31 members. Upon completion of a common granting procedure, the European patent becomes a bundle of national patents, any infringements and disputes over validity being tried before national courts where necessary.

Initially a European patent must be applied for in just one of the official EPO languages (English, German or French), and its claims must be translated into the other two languages after the patent has been granted. Thereafter, in order to recognise the patent, each State designated in the application can require the applicant to translate the application in full into its national language (all EPO member countries avail themselves of this right in practice).

The European patent possibly protects more important innovations, on average, than American and Japanese patents.

Among the three main intellectual property territories, Europe is by far the one with the fewest patents filed each

(7) The gap has been relatively stable since 1995.
(8) France's efficiency, though slightly lower, is still comparable to that of the United States.
(9) Expressed in millions of dollars.
(10) OECD (2006).
(11) Moreover, the gap in R&D intensity between France and the United States is widening, since France's aggregate R&D effort has declined over the past ten years (from 2.29% to 2.16% of GDP), whereas that of the United States has grown (from 2.51% to 2.68%).

year[12]. The EPO received 128,679 patent applications in 2005, compared with 390,733 for the US Patent and Trademark Office (USPTO) and 427,078 for the Japan Patent Office (JPO). In theory, these differences can be explained by differences in the scope of patentability, to differences in companies' strategies (some being content to protect themselves solely in their home territory), or again to differences in the hoped-for returns from patents (depending on their respective costs, the European patent working out more expensive in the end, see section 2.2). American and Japanese patents more often that European patents cover inventions not protected elsewhere (only 49% of European patents are filed by "local" firms, versus 53% in the United States and 87% in Japan).

This could indicate in particular that the European system screens applications effectively, identifying and rejecting "strategic" patent applications. The latter concerns applications that do not fully satisfy the criteria of patentability and whose overriding aim is not to secure effective protection of the innovation. The EPO's expertise is internationally acknowledged, having until now maintained rigorous standards, unlike the American system notably (with the granting of patents that are worthless, whose scope is too broad, or that even fail to satisfy the legal criteria for granting patents)[13].

2.2 The European patent costs around twice or three times as much as American or Japanese patents owing to translation costs

A European patent costs between €30,000 and €45,000 on average, with translation accounting for around 40% of the cost.

The cost of a European patent application varies, depending on the number of countries designated, the length of time for which the patent is maintained, the length of the application text, and the technological field covered. The average cost is €31,000[14], to which should be added possible litigation costs (this is rare since there are few litigations) which may be considerable when patents have to be defended in each country. Translation costs average between €1,000 and €1,500 per country but can rise to €5,000 for the least common languages[15].

The extra cost of the European patent relative to American and Japanese patents stems mainly from the cost of translating the patent, but it is due also to the duplication of administrative and legal formalities.

The cost of a patent partly reflects its quality: the work of the examiners demands considerable legal and technical skills and the best experts. Theoretically, therefore, one can justify the additional cost of the European patent relative to the American and Japanese patents by its better-quality examination process.

Nevertheless three further reasons appear to account for the extra cost, namely:

- The applicant is required to supply translations of the patent for each of the designated States[16],
- The application must pay procedural and maintenance fees in each of the national offices,
- If legal action is required, the applicant will have to institute proceedings in each of the countries in which his patent is in dispute or infringed.

Table 2: Comparison of the average cost of patents (excluding litigation costs)

US patent in force for 10 years	Japanese patent in force for 10 years	European patent designating 10 countries and in force for 10 years	European patent designating 10 countries and in force for 20 years
€15,000	€15,000 à 20,000	€30,000	€100,000

Source: Progexpi (2003).

NB: these costs represent non-discounted amounts for application fees, charges relating to formalities, cost of translations if any, and annual fees up to the 10th year (except where otherwise indicated).

(12) Sources: EPO, Japan Patent Office (JPO) and United States Patent and Trademark Office (USPTO), 2005.

(13) J. Tirole (2003), "Protection de la propriété intellectuelle: une introduction et quelques pistes de réflexion" (Protecting intellectual property: an introduction and some avenues for reflection), *Rapport du Conseil d'Analyse Économique*.

(14) International Property Rights Helpdesk, March-April 2005.

(15) In 2003 the European Commission estimated the cost of translating a patent into 1 language at €1,550, at €10,850 for translation into 7 languages (as for the average European patent), and at €32,550 for translation into 21 languages.

(16) An application designating the 31 member states of the EPO must be translated into 22 languages.

Box 2: **Impact on innovation of the cost of the European patent**

The cost of the European patent is borne by all companies wishing to protect an invention in Europe, regardless of origin. Theoretically, therefore, the cost of the European patent does not distort competition between Europe and the United States (or Japan). Moreover, any change in this cost would be unlikely to have much of an impact on the patent-filing strategies of large international firms or on the protection of "important" innovations, which are systematically patented worldwide.

Theoretically, the only firms for which the cost of the European patent influences their innovation strategy are:

- Those that file patents only with the patent office of their country of origin or with the EPO,
- And those that file no patents at all but that would do so if the cost of European protection were lower.

Consequently, for European SMEs with innovations that are a priori "minor" but that could open the way to more important incremental innovations, a cut in the cost would probably generate additional demand for European patents (substituting for national patents or instead of protecting the innovation as a trade secret). This reduction in cost could, moreover, prompt additional R&D spending and better dissemination of innovations through allocation of the cost differential to effective R&D spending, the increased hoped-for return on innovation, and substitution of patents for trade secrets, etc. Finally, a reduction in the cost of the European patent could enhance Europe's attractiveness to research centres, not all of whose output is necessarily intended to culminate in triadic patents.

2.3 The absence of a centralised jurisdictional system for the European patent breeds legal insecurity for applicants and dispersal of technical expertise

An applicant is obliged to resort to the courts in each country designated, with sometimes sharp variations in legal procedures and jurisprudence. As a result, divergent interpretations between judges in different countries may lead to a patent being approved in one country and cancelled in another, thereby reducing the patent's legal security for firms.

From a theoretical point of view, the greater the uncertainty over the future return on the patent, the lower the hoped-for return on it. Consequently, the variety of intellectual property regimes within the EPO zone could encourage, where possible, recourse to other forms of protection such as trade secret protection, or even reduce the incentive to innovate if no other means of protection than the patent is available[17].

The profusion of national jurisdictions able to rule on a patent's validity may also highlight the shortage of persons qualified to assess a potential innovation's originality. Centralised legal treatment of these issues could yield rising returns. That is because it takes a critical mass of patent examinations to develop the necessary capacity to review technical applications effectively, and because the "marginal cost" (in human terms notably) declines as the number of applications handled rises. Centralisation would also lead to more coherent jurisprudence, enhance the authority of the competent jurisdiction, and raise user confidence.

3. The shortcomings in the European- patent system have prompted a number of proposals

3.1 The most advanced plan to reduce the extra cost of the European patent, namely the London Agreement, is a compromise on translations that would reduce the cost of a patent by between 20 and 30% while safeguarding the three official languages regime.

Several solutions aimed at reducing translation-related costs for the European patent were envisaged in the 1990s. However, consensus proved elusive on either the possibility of limiting translations to the three official languages of the EPO or on the proposal to abandon translation requirements entirely provided the patent was available in English.

The so-called London Agreement, put forward by the European Commission in October 2000, represents a reduction in translation requirements that could halve the cost of the European patent.

Should it take effect, the London Agreement would provide that applicants in countries that ratify it no longer have to

(17) Industrial secrecy is inefficient as a means of protection for some product innovations, since competitors have merely to disassemble the product in order to discover how it works.

supply a translation of the patent into the languages of other countries party to the agreement, provided it is filed in one of the three EPO languages, i.e. English, French or German, and that the claims (an essential feature of the patent defining its legal scope) are translated into each of these three languages.

Moreover, the London Agreement limits the possibility for each state party to demand translation of a patent into its national language exclusively to the patent's claims (which are in any case available in English, French and German)[18].

Application of the Agreement by the thirteen countries that have signed it to date would halve the costs of translation and validation, and would reduce the total cost of obtaining a patent by a quarter[19].

The expected savings could be greater still if the 31 EPO member countries ultimately ratify the Agreement. This could then reduce the total cost of obtaining a European patent by more than 50%.

In the event of dispute, and only then, the Agreement stipulates that the patent should be translated in full into the language of the competent court (a person accused of patent infringement is presumed not to have knowingly committed the infringement unless proved otherwise if he has not had access to the text of the patent in his language). However, this clause does not significantly diminish the gain to be expected from the London Agreement, given the scarcity of European patent infringements ("a few hundred in twenty years of existence"[20]).

What is needed for the London Agreement to take effect?

Seven countries have ratified the London Agreement to date, namely: Denmark, Germany, Iceland, Latvia, Monaco, Slovenia and the United Kingdom. Six other countries, France among them, have signed but not ratified it[21]. Other countries, such as Spain and Italy, have stated that they have no intention of signing it. To take effect the London Agreement must be ratified by at least eight contracting States, including Germany and the United Kingdom, which have already done so, and France.

3.2 In the longer term, the draft "Community patent" would remedy certain shortcomings in the European patent by centralising dispute procedures.

The protection afforded by the Community patent would automatically apply throughout the territory of the European Union.

The Community patent arose out of the Luxembourg Convention[22], which all EU member states signed in 1975, and several attempts have been made to revive it over the past 30 years[23]. This Community patent would mark a further step towards federalism with respect to the protection of intellectual property in Europe, but it has not yet come into force. It can do so only via a European regulation, adopted unanimously by member states.

A Community patent would be subject to a common application procedure, as with the European patent[24] at present, but it would have a unitary effect and would apply indivisibly across the territory of the European Union[25]. A common appeal court governed by Community law would ensure uniform interpretation of the law at the Community level[26].

Implementation of the Community patent would significantly enhance the effectiveness of the patent system in Europe. The great advantage of this patent would be its unitary character (as opposed to being "multi-national" as in the case of the European patent): it would institute a single application, examination and granting procedure, as well as a single dispute procedure (the latter taking place before a centralised, and specialised, jurisdiction[27]). This would eliminate inefficient duplication of

(18) In addition, States party to the agreement that do not have one of the three EPO languages as an official language can demand translation in full of the patent into the language of their choice from among these three.

(19) For an application in the 8 most commonly designated EPO member countries. G. Vianès (2001), "Brevet européen: les enjeux de l'accord de Londres" (The European patent: what is at stake in the London Agreement), *Mission de Concertation sur le Brevet Européen.*

(20) G. Vianès (2001), op. cit.

(21) France signed the agreement in June 2001 but it has not been ratified by French Parliament.

(22) This gives a unitary definition of the effects attaching to European patents applied for in respect of the territory of the European Union.

(23) Notably in 1997, with the drafting of the European Commission "Green paper on the Community patent and the patent system in Europe", and later via a political agreement on the broad outlines of the draft at the European Council meeting of 3 March 2003.

(24) It would be granted by the EPO: as proposed by the European Council, the application would legally be an application for a "European patent" but would directly designate the territory of the Union (and not a specific country). In practice, for applicants this type of application would supersede applications for the existing European patents.

(25) NB: seven of the EPO's members are not members of the European Union.

(26) IPR Helpdesk, "European patent and Community patent in the light of the new developments".

tasks by the different national offices and courts, and should lead to greater legal security and unified jurisprudence throughout the Community. For all these reasons, France (i.e. the French President) has repeatedly supported this project.

However, the Community patent contains a number of burdensome provisions with respect to translation requirements.

The Convention does indeed provide for mandatory translation into the 23 Community languages, which would spell very high costs: more than €30,000[28] in translation costs per patent (this extra cost would not be offset by the probable reduction, relative to the European patent, in the examination fees and in the cost of procedures relating to the defence of the patent).

Progress on the proposed Community patent is currently impeded by the very high expected cost of translations, and by divergent views as to the future role of the national patent offices. In practice the proposal cannot move forward unless prior compromises are reached on the issue of translation. On this view, the entry into force of the London Agreement on the language regime for the European patent could contribute to progress in the negotiations between countries over the reduced translation requirements. This could be seen as a concession in order to arrive at an economically efficient Community patent one day.

With a view to reviving the projected Community patent, France further proposed in October 2006 an intermediate plan for the "communitisation" of European patent litigation procedures. This has been submitted to the European Commission and the Finnish Presidency of the European Council.

In January 2006, moreover, the European Commission launched a public consultation to determine what was needed in order to institute a Community patent as soon as possible. The findings of this consultation could serve as a basis for new Commission proposals on the subject in the course of 2007.

Benjamin GUÉDOU

(27) The "Community Patent Court", a specialised court that would be based in Luxembourg.
(28) "Rapport sur le brevet communautaire" (Report on the Community patent) by R. Karoutchi (2001).

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