

**THE PATENT SCOPE IN THE U.S. AND IN THE U.K.
DOCTRINE OF EQUIVALENTS VERSUS CATNIC/IMPROVER TEST**

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Abstract

The optimal patent breadth represents a fundamental key for balancing the trade – off between desirable and undesirable effects generated by patents. The present paper addresses the dilemma between a broad and a narrow scope by analysing the infringement by equivalency. Hardly any economic and legal literature has been developed with respect to the two main theories in this field, the U.S. Doctrine of Equivalents and the English Catnic/Improver Test.

In particular, the Doctrine of Equivalents and the Catnic/Improver Test, as modified by the Protocol on the interpretation of Article 69 of the European Patent Convention (EPC), are compared within a normative analysis in order to establish the more efficient rule. Both patent systems attempt to balance the inventor's and society's interests. Specifically the Doctrine of Equivalents is quite a flexible theory, which is in favour of a broader scope and thus of a patentee's strong monopolistic position, but with the opportunity of some corrective measures to apply case-by-case. On the contrary, the English system entitles quite a narrow scope according to its tradition, partially extended by the EPC.

No definitive answers can be provided with respect to the socially desirable patent scope; further researches are required. Nevertheless, the U.S. Doctrine of Equivalents seems to be more efficient than the Catnic/Improver Test. In fact, the U.S. theory is characterised by high flexibility and a case – by – case approach, paying particularly attention to giving incentives to technological advance; the empirical data, the

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different solutions provided in some technological areas and some tendencies towards an international harmonization show the consistency and the equilibrium achieved by such theory. However, the American system ought to be improved, especially on the grounds of legal certainty and predictability, while the English and European ones should accelerate the process of convergence towards the American model without losing the extraordinary experience matured in centuries of tradition.

Keywords: patent scope, equivalents

JEL classification: O34

Introduction

By granting the inventor of a new product or process the exclusive rights to use, make and sell it for a certain period of time, patents establish a monopoly in his favour and thus create both desirable and undesirable effects. On one hand, benefits may be accrued by increasing the level of innovations through a monopoly revenue. On the other hand, some disadvantages exist in terms of deadweight losses and high prices due to the lack of substitutes.

The delicate trade – off between gains and losses produced by patent systems has been deeply analysed in all its features, especially with regard to the socially desirable scope. The importance of patent scope becomes clear when infringement cases and rules are addressed: legal principles may represent a key for balancing opposite incentives, particularly concerning equivalents. Indeed, equivalents raise several problems in terms of claims drafting and interpretation and insist on the balancing activity that ought to be undertaken in every decision. Above all, equivalents underline the fundamental role played by economic arguments in providing legal guidelines.

This paper addresses the comparison between the Doctrine of Equivalents and the Catnic/Improver Test from a legal and economic perspective. Hardly any economic and legal literature has been developed in the field of infringement by equivalency, especially with respect to these theories. According to Chisum's opinion¹, this might be due to the complexity of the topic, to the different factual applications and technologies involved, to the trade – off between patentees' and competitors' interests and finally to the effects in terms of distortions of competition.

The first chapter provides a brief analysis on patent scope regarding equivalents, while the second chapter faces the U.S. Doctrine of Equivalents, by illustrating its

¹ See Chisum (2000, 940).

evolution until the recent and debatable *Festo* decision. The economic rationale and the mitigations offered by the doctrine of “prosecution history estoppel” and other remedies, such as the “reverse doctrine of equivalents”, the “all – element” rule and the foreseeable bar, are primarily discussed. The third chapter describes the fundamental features of the *Catnic/Improver* Test and its problematic relationship with article 69 of the Protocol of the European Patent Convention (EPC). The final evolution and the strong debate concerning this harmonization are underlined with particular attention to the economic perspective. The last part concentrates on the comparison between the American and the English systems and elaborates a normative analysis in order to establish the more efficient rule.

1. Classical Economics on patent scope

1.1. The meanings of patent scope

This section deals with the optimal scope of patents, which enable the patentee to protect his invention by bringing an action against those who infringe his patent directly or indirectly. Not only do infringement rules influence and determine patent scope, but they also exercise an indirect effect upon the systems of drafting patent application.

The patent right has two main dimensions: the length, that is the number of years between a patent’s registration and its expiration, and the breadth, which is the degree of similarity between two inventions allowed by the system without infringing the protected patent. The economic value of a patent is strictly connected with its scope, that defines the extent to which its holder can exercise his rights and that allows him to establish whether or not such right has been infringed, especially in the case of equivalent inventions.

In general the broader the patent scope, the stronger is the patentee’s monopolistic power and the wider the market in which he can exercise it, with the consequence of an increase in incentives for innovation. However a double-sided problem arises in terms of these incentives: on one hand a broad patent implies strong protection of pioneer discoveries and promotes innovation and technological research, yet on the other hand it may negatively influence the development of applications or improvements. In fact, a broad patent produces a weaker stimulation for disseminating information and applying new discoveries. Broadly speaking, there are different approaches in case of broad or narrow patents: the first ones encourage fast and duplicative research, while the second ones promote slower and

complementary developments²

The scope is derived from the patent application, which is made up of claims, defining what the inventor considers to be the invention, a specification, that is a full description of it, and eventual drawings.³ Despite this, the scope is mostly characterised by the claims contained and allowed in the patent application. In fact, they determine the degree of control and the power granted to the inventor, as the patent breadth enhances the probability that other discoveries in quite close sectors might have of infringing the patent. The Patent Office and the Courts usually make decisions on patent scope: the former with respect to the claims allowed within a specific patent, the latter during litigation. Several problems may emerge throughout the interpretation of claims, as discretion often delineates the large number of legal rules and principles. For instance, United States Courts refused to consider a patent claim “[..] *like a nose of wax, which may be turned and twisted in any direction, by merely referring to the specification, so as to make it include something more than, or something different from, what its words express [..]*” as stated in *White v. Dunbar*.⁴

Although patent scope may be analysed in terms of rights allocation according to the Coase Theorem⁵, a deeper analysis will reveal the impracticality of this perspective. In fact, in a Coasian world with no or negligible transaction costs, parties will bargain to achieve a Pareto – superior solution and the initial entitlements will be irrelevant.⁶ According to this theory, patent scope will have no effect upon technological research and progress within a competitive market. Unfortunately these assumptions are unrealistic because the real world is characterized by high transaction

² When two inventions are similar but not identical, a broad rule entitles the first inventor of both discoveries, while a narrow one entitles every singular inventor of his discovery.

³ See 35 U.S.C. § 33 and 112 and U.K. Patent Act (1977) §14. According to both, the disclosure element should allow a person skilled in the art to make, perform and use the invention.

⁴ See *White v. Dunbar*, 119 U.S. 47, 51, 7 S.Ct. 72, 74, 30 L.Ed. 303.

⁵ See Coase (1960), Demsetz (1967), Cooter and Ulen (2000, 82), Ko (1992, 782) and Gutterman (1997, 64).

⁶ Every allocation of rights will spontaneously result in allocative efficiency, without consequences regarding overall social benefits. Individual gains of parties will only be affected by different initial entitlements because the final benefits will remain the same as a result of the bargains.

and administrative costs⁷, especially in the case of equivalent inventions⁸, so efficiency will not be reached. In fact, a negotiation between technological pioneer inventors and improvers is extremely improbable because it involves the agreement on the values of both the pioneer invention and its enhancement, coupled with an appropriate division of the exploitation rights.⁹

However the Coase Theorem remains absolutely fundamental: while it stresses the need of patent systems in innovating and promoting progress and scientific investment, as the market mechanisms will fail if left alone, it simultaneously reveals the decisive function performed by patent scope to achieve economic efficiency and a proper technological output.

Furthermore patent scope can be analysed in the light of economic rationale, which might provide substantial arguments in favour of its broadness or narrowness. The famous “consequentialist” theories¹⁰ attempt to justify intellectual property rights on the basis of the benefits flowing from their recognition, generally identified by the advancement in knowledge, industrial progress and economic efficiency. Although there are two main branches of it, the “utilitarianism” and the “teleology”¹¹, the first is recognized in the modern theories of Law & Economics¹² and represents the dominant perspective. According to it, intellectual property rights deserve special protection if the benefits to the society exceed their costs. This view has been developed in the last century in different theories, which coincide with the main

⁷ High informational costs due to asymmetric information and strategic behaviour will complicate the bargains, while licensing will cause enormously high transaction costs. Also the allocation of property rights between technological pioneers and improvers is not a zero-sum game.

⁸ See Cooter and Ulen (2000, 129).

⁹ According to some commentators, the failure of the Coase Theorem can be corrected by means of two legal remedies: on one hand, bargaining among inventors can be increased, for example in the case of joint ventures, though antitrust law may represent a strong obstacle. On the other hand, patent rights may be allocated to the party who values them more, as designed in the “Normative Hobbes Theorem”, even though this solution is not completely persuasive. Hence the scope ought to be broad in the case of pioneer inventions, which have low commercial value alone, while narrow in the opposite case. See Cooter and Ulen (2000, 132) and Merges and Nelson (1990)

¹⁰ See Machlup and Penrose (1950, 17ss) and Gutterman (1997, 8).

¹¹ They both concentrate upon the incentives provided by the law but differ in the way these “good” consequences are identified. The utilitarianism measures them in terms of satisfaction of human preferences, without any judgement on their content, while teleology focuses on what should be identified as good.

¹² See Landes and Posner (1989) and Gutterman (1997, 8).

advantages of patents: the “incentive – to invent”¹³, the “incentive – to – disclose”¹⁴, the “incentive – to – innovate”¹⁵ and the “prospect theory”¹⁶.

All of these theories are in favour of a broad scope, even though no concrete guidelines are suggested. The “incentive – to invent” theory insists on the need of granting patent protection for inventions characterized by high costs in R&D and it approves of a wide scope, as judged necessary for recovering initial investments. Likewise, both the disclosure requirement and the “incentive – to – innovate” theory prefer a broad scope¹⁷ since it can facilitate the process of divulgation and acceleration of innovation; the unique exception is represented by the case of biotechnological innovations. In general, the “prospect” theory opts for an extremely broad scope by emphasizing the steps following the invention and required for its full

¹³ Patents are necessary to give incentives for inventions and to encourage the socially desirable level of investment in R&D, because without them the society will under - invest in inventive activity as a result of the “free rider” behaviour of other competitors, whose imitation will prevent a proper rate of return for the inventors (i.e. for development and research costs). However this theory emphasizes some debatable elements too, as empirical data on R&D activities in a competitive market showed that patents are determinant in selected sectors (i.e. pharmaceutical industry), for smaller firms and new market entrants, while they may not be especially significant in other industries (i.e. electrical engineering). See Gutterman (1997, 38), Einsenberg (1989), Ko (1992, 791), Machlup and Penrose (1950, 17) and Carlton and Perloff (2000, 505).

¹⁴ Patents foster and accelerate inventive activity by means of disclosure, otherwise there would be no public access to valuable and new information. Furthermore no patent systems would create high social costs and wastes due to duplicative researches. However many scholars are quite sceptic, as the utility of disclosure clearly depends on sectors considered and on other factors such as national policies, access system and technological state of countries. See Gutterman (1997, 47).

¹⁵ Patents encourage the investment in innovation by emphasizing post – inventive activities and considering all of the steps required for the commercial exploitation of the new creation during the patent monopoly. This advantage was firstly stressed by Schumpeter, according to whom competition based on new commodities and technologies is the engine for promoting and fostering scientific progress. See Schumpeter (1950, 81ss), Ko (1992, 799), Scherer (1984, 53) and Gutterman (1997, 52).

¹⁶ The grant of patents with a broad scope may perform a prospect function in terms of affording investments in further research, avoiding duplicative researches and coordinating his activity with other firms during the development of the discovery. Moreover, patents may simplify and stimulate bargains by eliminating the risks involved in the negotiations between the patentee and society, even though high transaction costs and the “race-to-invent” might complicate the situation. See Kitch (1977, 256), Ko (1992, 799) and Gutterman (1997, 57). This theory is the most consistent with the analysis of the allocation of property rights developed by Posner and Demsetz within the Law & Economics research. See Demsetz (1967).

¹⁷ The scope should concern not only the information disclosed in the specification and in the claims, but also the eventual applications, in order to avoid “free rider” behaviours. See Merges and Nelson (1990, 844), Ko (1992, 800), Cohen (2001, 30), Einseberg (1989).

exploitation and commercialisation.

On the contrary, criticism and scepticism on the maintenance and the excessive broadness of patent are still common among many scholars who believe that the costs of protection exceed the benefits obtained in exchange. In fact patents produce disadvantages, which refer not only to the increase of prices due to the monopoly, but also embody different kinds of distortions: the losses derived from the “Tragedy of the Anticommons”¹⁸, the waste of resources caused by the “race – to – invent”, the high transaction and administrative costs generated by the definition of claims drafting.

Above all the phenomenon of the “Tragedy of the Anticommons” may create an under – use of resources due to the fact that there are exclusive rights as a result of double externalities, on the static and the dynamic ground.¹⁹ In the real world, characterized by high transaction costs, the Anticommons problem affects patents since the patented invention risks to be under – used with respect to an efficient level of technology, scientific progress and welfare gain.²⁰

1.2 Equivalent inventions

The theoretical analysis of patent scope becomes more and more complicated when it is applied to equivalent inventions. They can be defined as those discoveries, which are essentially the same, in terms of function and result, as other ones that have been already patented. Equivalent inventions are connected with the basic distinction between pioneer inventions and their improvements or applications. In fact, every pioneer invention, which was formulated in a famous U.S. sentence²¹ as “ *[..] a patent covering a function never before performed, a wholly novel device, or one of such novelty and importance as to make a distinct step in the progress of the art [..]*”

¹⁸ It occurs “[..] when multiple owners hold rights to exclude others from a scarce resource and no one exercise an effective privilege on use [..]”. See Depoorter, Parisi and Shulz (2000, 2001, 2002) and also Heller (1998). Patents represent the typical case of vertical Anticommons problem, which refers to a situation characterised by a vertical relationships between exclusion property rights in terms of their sequential exercise.

¹⁹ The different holders of property rights cannot completely internalise the costs derived from the enforcement of their exclusion rights. These externalities are due to the actual cost created by the reduction or exclusion of the value of the right (static point of view) and the future costs produced as a result of the under - use of resources (dynamic perspective).

²⁰ This might be the result of the failure of the negotiation between parties when a product requires the application of several patented products or processes. The systems of licences, which would solve this obstacle, might be complicated and prevented by the supra - mentioned high transaction costs.

²¹ See *Westinghouse v. Boyden Power Brake Co.*, 170 U.S. 537, 561 –2 (1898).

enables a broad range of equivalents.

The decision whether or not to issue a broad patent may strongly influence its economic effects by imposing excessively high costs compared to the benefits accrued. However the dilemma between a broad and a narrow patent cannot be simplified in this way because it involves too many factors whose trade – off appears quite problematic. The difference between broad and narrow patents is mainly underlined in the field of Research and Development (R&D). Some pioneer inventions may not have an immediate commercial value but a high potential of developing in many applications and improvements. The criteria of efficiency are apparently in favour of broad patents when the social value of investment in fundamental research exceeds the social value of investment in developing applications, while narrow patents should be preferred in the opposite situation.²² On the contrary, a study²³ demonstrated that fundamental research might be discouraged if pioneer inventors are not entitled to receive anything from the sale of commercial applications, especially if their value is enormously superior to the basic discovery. Therefore the dilemma reappears as soon as commercial applications and pioneer inventions are considered as joint products of basic research.

Many economists have studied the legal boundaries of the patent grant to figure out the socially desirable patent breadth and to draft efficient legal rules. Some studies²⁴ have focused on the static trade – off between the incentives provided to potential inventors by the patent system and the social costs due to the monopoly granted to the patentee and to anticommons issues²⁵. This fundamental point of view has been debated by many commentators²⁶, who have underlined the important role played by the eventual substitutes of patented inventions. In fact, Gilbert and Shapiro²⁷, together with Klemperer²⁸, recognize that broadening the patent scope may reduce the number of potential substitutes and consequently increase social costs.

Conversely Merges and Nelson, whose assumptions are shared in this study,

²² See Cooter and Ulen (2000, 131).

²³ See Chang (1991).

²⁴ See Nordhaus (1969, 70).

²⁵ The value of a patent right is a function of the costs associated with the establishment and the enforcement of its boundaries. Uncertainty due to unclear boundaries might obviously increase these costs in a relevant way.

²⁶ See Gilbert and Shapiro (1989). Klemperer (1988) and Merges and Nelson (1990).

²⁷ Klemperer (1988).

²⁸ Merges and Nelson (1990).

partly disagree with this view²⁹, by stressing the economic meaning of patent scope and its effects on R&D from a dynamic point of view. In fact, substitutes might include not only subsequent discoveries, which can surrogate the initial invention, but also improvements and enhancements that represent social gains. According to these economists, patent scope can be used as a means for balancing incentives in investments and benefits gained, however a deep analysis ought to take into account additional elements, such as different actors involved, levels of technology, specific sectors of industry, the efficiency in the long – run and costs derived from litigation and uncertainty.

In addition, conditions for improving pioneer inventions should be preferred and fostered, even at the expense of preserving the domination of pioneer firms. They concluded that “[...] without extensively reducing the pioneer’s incentives, the law should attempt at the margin to favour a competitive environment for improvements, rather than an environment dominated by the pioneer firm [...]”³⁰ because the benefits gained by the pioneer firm may be offset by the loss of competition in the technological market. Moreover they pointed out that there is a proportional relationship between the speed of innovations and the number of inventions: an increase in R&D activities will lead to more inventions, which will promote positive effects on the future growth of economic productivity.

Therefore their analysis is quite comprehensive, as it stresses the post-invention process for the development and the subsequent improvements. In particular, incentives to invent ought to embody post-invention conditions favourable to the inventor, while the social costs of a patent should include the potential risks of reducing competition in the market of improvements within a specific technology.

2. The Doctrine of Equivalents

2.1. Main principles and evolution

The Doctrine of Equivalents, also known as “DOE”, is a remedy of equity according to which there may be infringement when an accused infringing device (or process) is an equivalent to that claimed in the patent³¹. Specifically a patentee can invoke this

²⁹ See Merges and Nelson (1990, 868ss).

³⁰ See Merges and Nelson (1990, 843-4).

³¹ Obviously the most common kind of infringement is the literal one, which occurs when the accused device falls literally within the patent scope. The 35 U.S.C., also known as the “Patent Act”, governs patent law within the United States; a patent is issued by the Patent and Trademarks Office (PTO) when the invention is characterized by novelty, utility and

theory against the producer of a device “[..] if it performs substantially the same function in substantially the same way to obtain the same result [..]”³². This jurisprudential theory makes it possible to extend the patent scope beyond the literal language of the patent claims; it is considered to be an exemption³³ and it has repeatedly given rise to divisions and critiques not only within the Federal Circuit but also among legal scholars.

Its controversial nature is the result of the common dilemma with regard to patent policy. There is a trade – off between the interest in a clear and certain definition of the patent scope on the one hand, and in a fair and equitable entitlement of the patent value on the other one. In fact, lack of clarity may impede the desirable level of investments in R&D, whereas excessively strict and literal evaluation of the scope can decrease the value of the patent. A sort of mitigation is offered by the doctrine of the “prosecution history estoppel”³⁴.

The Doctrine of Equivalents can be applied not only to pioneer inventions, but also to secondary discoveries, meant as combinations of elements to produce a new result, even if the range available may vary.³⁵ At the beginning of its development it was used only for mechanical components, but it was later extended also to chemical ingredients in different devices and formulas.

From an historical point of view, the concept of infringement by equivalency has been developed over almost 150 years of history, but some decisions performed a special role regarding it. Firstly, “Winans v. Denmead”³⁶ consists in the major pronouncement by the Court in the past, even if the doctrine was already established

non-obviousness. The scope is determined on the basis of claims, which should be integrated in the specification and drawings in order to be interpreted in an adequate way.

³² See *Sanitary Refrigerator Co. v. Winters*, 280 U.S. 30, 42, 50 S. Ct. 9, 13, 74 L.Ed. 147. The equivalency of function, way and result is also known as the “triple identity” test or FWR test.

³³ See *Royal Typewriter Co. v. Remington Rand. Inc.*, 168 F. 2d 691, 692 (2d Cir. 1948), as quoted in *Chisum* (2001, 874).

³⁴ This theory enables to prevent the patentee from expanding the scope of his claims. In fact, as the prosecution history refers to the record of all the claims presented in the original application, the patent owner may later attempt to use the DOE in order to recapture that claim scope given up during prosecution, by way of those amendments which were necessary for the grant of the patent. See above, 2.3.

³⁵ See *Imhaeuser v. Buerk*, 101 U.S. 647, 655, 25 L.Ed. 945, *Continental Paper Bag Co. v. Eastern Paper Bag. Co.*, 210 U.S. 405, 414 – 415, 28 S.Ct. 748, 749, 52 L.Ed. 1122, *Seymour v. Osborne*, 11 Wall. 516, 556, 20 L.Ed. 33 and *Gould v. Rees*, 15 Wall. 187, 192, 21 L.Ed. 39.

³⁶ See *Winans v. Denmead*, 56 U.S. (15 How) 330, 14 L. Ed. 717 (1853).

before.³⁷ Secondly, “Graver Tank v. Linde Air Prods. Co.”³⁸ represents one of the most leading sentences on the doctrine, since it has introduced the requirement of “inter-changeability”. Finally, the more modern decision, except the recent Festo³⁹, is known by two names because it was judged in two courts: “Hilton Davis v. Warner – Jenkinson” in the Federal Circuit and “Warner – Jenkinson v. Hilton Davis” in the Supreme Court.⁴⁰ This chapter will address the evolution of the Doctrine of Equivalents, as the principles fixed in several decisions constitute the core until the recent Festo case.

“Winans v. Denmead” was the first decision in which the Supreme Court extended patent protection beyond the literal meaning of the claims by means of the Doctrine of Equivalents. The case dealt with a new kind of railroad car to carry coal, whose form drawn by Winans was “cylindrical and conical” instead of rectangular as the previous cars. Denmead, one of Winans’ competitors, built railroad cars which were “octagonal and pyramidal” in shape but whose advantages were essentially the same of Winans’ cars. A divided Supreme Court reversed the previous trial judge decision by asserting the existence of infringement, as it would have not been reasonable to literally apply the content of the claims as the car was “[.] *so near to true circle as substantially to embody the patentee’s mode of operation and thereby attain the same kind of result as was reached by his invention [.]*”.

After Winans a wide series of cases confirmed the application of the theory in several different settings, although Graver Tank illustrates a key judicial precedent in the evolution of this theory. In fact, it stresses that fairness in patent protection can sometimes be more important than certainty on patent scope⁴¹. The case involved the alleged infringement of the patent for an electric welding process and of the fluxes to be used with, which had been patented by Linde Air Prods. Co. The two electric welding compositions in question were similar, with regard to the mechanical methods and the results in terms of kind and quality of weld, except for the fact that

³⁷ See Merges (2001, 917), who underlines this position in spite of the contrary Court’s opinion in Graver Tank. The previous cases emphasized the extension of the scope in limited situations, such as in the case of imitation and addition only of a “colourable” variation. See Gray v. James, 10 F. Cas. 1015, 1 Peters, C.C. 394, 397 – 98, 1 Robb Patent Cases 120, 124 (C.C.D. Pa. 1817) (No 1015) (Washington Circuit Judge).

³⁸ See Graver Tank & Mfg v. Linde Air Prods. Co., 339 U.S. 605 (1950).

³⁹ See Festo Corp. v. Shoketzu Kinzoko Kogyo Kabushiki Co. Ltd., 234 F.3d. 558 (2000). It is discussed in details at 2.5 *infra*.

⁴⁰ See 62 F.3d 1512 (Fed. Cir 1995) and reversed and remanded 520 U.S. 17 (1997).

⁴¹ This final position prevailed in the case, although some judges disagreed completely with it, such as Mr. Justice Black and Mr. Justice Douglas. See the quotations in Chisum (2001, 882).

the Graver Tank's one used magnesium instead of manganese. While the trial Court stated that there was infringement on the basis of four fluxes claims, the Court of Appeals reversed this decision. In the end, the Supreme Court reinstated the judgement of the trial court by considering the magnesium a simple substitute of manganese and consequently the product "[...] *the result of imitation rather than experimentation or invention* [...]"⁴².

In this decision the fundamental nature of the doctrine is identified as preventing a fraud on a patent. This means that the concept of equivalency should depend on the content of the patent, on the state of prior art and on many specific circumstances, like the functions performed, the purposes intended to achieve and the degree of interchangeability known by a person reasonably skilled in the art.⁴³ In particular, this decision centred on whether the alleged product used an element known to be "interchangeable" at the time the patentee had filed his application. The Court declared that there is infringement when an interchangeable part, whose characteristics were known at the time of the application, was substituted. Instead, if no one knew the eventual interchangeability at that time, no infringement could be held. In addition, this case was determinant because it ruled that a complete identity was not required for every purpose and from every point of view. For instance products, which have different purposes, may be identical.

Moreover, this case encouraged the birth and the development of two schools of thought on the Doctrine of the Equivalents, both supported by the opinion itself.⁴⁴ The first one is based on the idea that patent infringement by equivalency has no exceptional character and it exists if the "triple identity test"⁴⁵ is satisfied. In addition, a jury is in charge of solving disputes on the test since it is a question of fact. On the contrary, the second school considers on the one hand the doctrine as exceptional and on the other the triple identity test not an exclusive means for judging the infringement by equivalency. In fact, it ought to be complemented by other factors, such as the knowledge of the patented device by the alleged infringer. Finally, a judge should evaluate the eventual application of the doctrine, either before or after submitting some facts to the jury.

⁴² See the opinion of the Court in the words of Mr. Justice Jackson.

⁴³ These elements of equivalence should be proved on the basis of facts; evidences may consist of testimony of experts, documents, disclosures of prior art, which ought to be balanced.

⁴⁴ See Chisum (2000, 883).

⁴⁵ The "triple identity" test (FWR), which consists of the same function, way and result performed by the accused product or process, has been challenged in several situations as it is quite abstract.

In the meantime a different doctrine, called the “reverse doctrine of equivalents”, was developed as a defence to a claim of literal infringement. In fact, it limits the extension of patent scope when claims are written in a too broad way. This means that “[..] where a device is so far changed in principle from a patented article that it performs the same or a similar function in a substantially different way, but nevertheless falls within the literal words of the claim, the doctrine of equivalency may be used to restrict the claim and defeat the patentee’s action for infringement [..]”⁴⁶.

Warner – Jenkinson v. Hilton Davis was a determinant decision from a historical point of view because both the Federal Circuit and the Supreme Court addressed the major controversial characteristics of the Doctrine of Equivalents. This double case dealt with processes for removing impurities from food and drug dyes⁴⁷, which were also subject to Food & Drug Administration regulation as ingested by humans. The debatable and uncertain core of the dispute concerned the “pH” limitation during the claimed process. In fact, the original independent claim contained no “pH” limitation, as the specification pointed out that the decrease of “pH” was only a preference. Unfortunately the examiner rejected the application as unpatentable for prior art⁴⁸ so the attorneys of Hilton Davis amended the patent application by introducing the “pH” limitation from 6.0 to 9.0. Three years later, in 1986, Warner – Jenkinson developed the accused process, which included membrane ultra – filtration but operated at a “pH” of 5.0. Consequently the dispute concentrated on the reasons for the amendment of the lower limit at a “pH” of 6.0. At trial a jury found the infringement under the Doctrine of Equivalents, notwithstanding the alleged process was developed in a independent way, with a different “pH” and above all without the knowledge of others’ work.

At this point the Federal Circuit intervened *en banc* and, though fractured, confirmed the infringement and clarified boundaries and content of the doctrine. Firstly the majority held that the “triple identity test” is not a unique method for determining equivalency, since the “insubstantial differences” standard has the same importance and sometimes represents the decisive test instead. Therefore they recognized that the “pH” variation was unsubstantial and the triple identity could

⁴⁶ See Graver Tank, as quoted in Chisum (2000, 910) and Merges (2001).

⁴⁷ Principally Hilton Davis’ patent application discloses and claims an “ultra – filtration” process based on osmosis through a membrane. See Hilton – Davis Chemical Co. v. Warner – Jenkinson Co. 62 F.3d 1512 (Fed. Cir 1995) and reversed and remanded 520 U.S. 17 (1997).

⁴⁸ In fact, a patent entitled to Booth already existed and referred to a similar process with different ingredients and especially a “pH” above 9, preferably from 11 and 13. See Chisum (2000, 885).

have been positively applied. In addition, they denied the view according to which there is an “equitable threshold” to the application of the doctrine because the patentee must not prove the bad faith or the intentional conduct of the alleged infringer. Finally, they stated that the decision on DOE belongs to a jury.

The Supreme Court granted Warner – Jenkinson’s petition for a *writ of certiorari* and reversed the decision of the Federal Circuit by remanding for additional considerations. It pointed out that claims ought to be interpreted in the light of the specification, as well as the prosecution history and that “[..] *the determination of equivalence should be applied as an objective inquiry on element – by – element basis [..]*”. Regarding the prosecution history estoppel it established that “[..] *if the patent – holder demonstrates that an amendment required during prosecution had a purpose unrelated to patentability, a court must consider that purpose in order to decide whether an estoppel is precluded. Where the patent holder is unable to establish such a purpose, a court should presume that the purpose behind the required amendment is such that the prosecution history estoppel would apply [..]*”⁴⁹.

In conclusion, the Supreme Court suggested the need to provide some useful guidelines with respect to the concept of substantial differences and highlighted the role of the “all elements” approach to equivalency⁵⁰, which means that there must be an equivalent with respect of each element of a patent claim and that a pure equivalence between the claimed and the accused subject matter “as a whole” is not sufficient and that “*it is important to ensure that the application of the doctrine...is not allowed such broad play as to effectively eliminate that element in its entirety[..]*”⁵¹ in order to achieve its purpose. Moreover, the Court stressed that the DOE should be applied at the time of infringement, and affirmed the position of the Federal Circuit concerning the competence of the jury to decide such a case.

2.2. Economic foundations

The Doctrine of Equivalents is clearly an expansive doctrine in the sense that it extends the scope of a patent claim beyond its literal meaning. Its influence on patent scope and consequently on the economic value of the patent is so relevant that the Courts tend to apply it carefully. The risk of too broad application with negative

⁴⁹ See the opinion of the Supreme Court in the words of Justice Thomas, as quoted in Chisum (2000, 887ss).

⁵⁰ It was firstly adopted in *Pennwalt Corp. v. Durand-Wayland Inc.* (833 F.2d. 931 Fed. Cir. 1989), even though not mentioned in the *Hilton Davis* case. Nevertheless the reaffirmation of this rule might create some problems, particularly due to the difficulties to define what an element is.

⁵¹ See *Warner – Jenkinson* in the words of Justice Thomas, as quoted in Chisum (2000, 892).

consequences in terms of social welfare and incentives to innovation has concerned courts in several cases; consequently, it is usually balanced by the application of the “prosecution history estoppel”, which is a limiting theory instead.

In general, Courts’ criteria to define the “spectrum” of equivalents are based on the level of technological advance provided by a new product or process in comparison with the state of art of a previous patent. In other words when a patent is a mere improvement, equivalents are barely found, even in the case of modest variations, while a pioneer invention entitles to a “*broad range of equivalents[.]*”⁵².

Some authors⁵³ have expressed their opinions in favour of broad claims for pioneer discoveries from an economic point of view. On the contrary other commentators⁵⁴ have focused on the specific features of the invention and on the level of technology involved, especially on the degree of unforeseeability at the time the patent was issued. Not only should “insubstantial” variations be considered presumed for an infringement under equivalency, but also the use of new technology and progress may become a way to overcome the original patent. Many cases⁵⁵ had to address this problem with opposing decisions, as the application of the Doctrine of Equivalents may encourage improvements on a basic technology. Nowadays the dominant perspective has developed that new technology can produce infringement.⁵⁶ In fact, the Texas Instruments’ case⁵⁷ decided that there was no infringement in the case of major improvements in all the essential elements of a hand – held calculator. In particular, the improvements involved the materials, the changes in the number of the components, the increased efficiency in singular components and the enhancement of the overall design. The principle suggested in this opinion consists of considering not only the significance of a patented device, but also the advance represented in the accused device, especially by focusing on the specification of the pioneer patent as well.⁵⁸ Consequently the Federal Circuit stated

⁵² See *Brill v. Washington Elec. & Ry. Co.* 215 U.S. 527 (1910), *Kinzenbaw v. Deere & Co.*, 741 F.2d. 383, 222 U.S.P.Q. (BNA) 929 (Fed. Cir. 1984) and *Boyden Power – Brake Co. v. Westington*, 170 U.S. 537, 569 (1898), as quoted in *Merges* (2001, 918).

⁵³ See *Chang* (1995) and *Cooter and Ulen* (2000, 130).

⁵⁴ See *Merges* (2001, 919 ss.) and *Merges and Nelson* (1990, 857).

⁵⁵ See *Graver Tank and Texas Instruments Inc. v. United States Int’l Trade Comm’n*, 805 F.2d. 1558, 1563, 231, U.S.P.Q. (BNA) 833, 835 (Fed.Cir. 1986).

⁵⁶ This principle is subject to two caveats: first, it can be applied so long as new technologies do not perform a different function or in a different way and second when the reverse doctrine of equivalents cannot be used.

⁵⁷ See *Texas Instruments Inc. v. United States Int’l Trade Comm’n*, 805 F.2d. 1558, 1563, 231, U.S.P.Q. (BNA) 833, 835 (Fed.Cir. 1986).

⁵⁸ See *Merges* (2001, 922).

that “[..] it is the entirety of the technology embodied in the accused devices that must be compared with the patent disclosure [..]” and that “[..] the total of the technological changes beyond what the inventor disclosed transcends...equitable limits...and propels the accused devices beyond a just scope for the patent [..]”⁵⁹. Contrasting opinions exist, as the Doctrine of Equivalents is sometimes considered obscure and unpredictable: some precedents⁶⁰ are in favour of improvements and applications, since infringement has been denied in the case of a large commercial value.

In any event, there are two other devices that can favour the alleged infringer by mitigating or eliminating the Doctrine of Equivalents: blocking patents, which consists of granting a broad patent to an inventor and at the same time a narrower one on some improvement to a different holder⁶¹, and the above mentioned “reverse doctrine of equivalents”. The last one may be applied in the case of substantial technological improvements in order to correct those inefficiencies derived from “holdup” powers of the original patentee concerning improvements with a relevant cost – saving technology.

In conclusion, what is certain is that the Doctrine of Equivalents should be applied in an effective way in order to generate and contribute to a fast technical advance. Hence, patent policies ought to take into account on the one hand the degree of improvement offered by a new device in comparison with the previously patented one, and on the other hand the kind of inventive activity. As Merges and Nelson pointed out⁶², multiple and competitive sources of invention should be preferred to a system, in which few organizations control the whole development, because they enable the achievement of more rapid scientific progress from a social point of view. Instead non – rivalry has been characterized by slow technical advance and sometimes broad patents on multiple – component system of devices have led to inefficiencies due to blockages, partially solved by means of costly licences.

2.3. *The role of the prosecution history estoppel*

The doctrine of the “prosecution history estoppel” can be regarded as a mitigation of the Doctrine of Equivalents since it limits the efforts to expand the patent scope.

⁵⁹ See *supra* at footnote 57

⁶⁰ See *Westington v. Boyden Power Brake Co.* 170 U.S. 537, 572 (1898).

⁶¹ This usually implies that the broader patent dominates the other one by requiring to pay royalties within a licence mechanism.

⁶² See Merges and Nelson (1990, 908).

Indeed, the “prosecution history” is the record of the process that leads to the grant of the patent, which is called “patent prosecution”.⁶³ The prosecution history performs two main functions in infringement analysis: on the one hand it represents a tool for drafting and interpreting claims, on the other hand it may be used to prevent the patentee from expanding the scope of his claims. In fact, the patent owner may later attempt to use the Doctrine of Equivalents as a means for recapturing claim scope given up during prosecution by way of amendments. During the prosecution process it may be common to present amendments to proposed claims in order to overcome an eventual rejection of the examiner. The “prosecution history estoppel” supersedes the Doctrine of Equivalents and it is justified from an economic point of view by the notice function of the claim and by third – party reliance and certainty.

As the Supreme Court pointed out in the Walker – Jenkinson decision⁶⁴, the prosecution history estoppel is connected to “[...] *the role of claims in defining an invention and providing public notice [...]*” and to the “[...] *primacy of the PTO in ensuring that the claims allowed cover only subject matter that is properly patentable in a proffered patent application [...]*”. In this case, as already mentioned, the Court adopted an “all elements” approach and emphasized that an estoppel should apply only to claim amendments for reasons relating to the prior art or to patentability. In spite of this, the decision has not clarified whether patentability refers only to prior art based reasons, such as the novelty and the non - obviousness, or also to other motivations, like non – enablement, lack of written description or indefiniteness. In particular, the Court established that the burden of proof on the reasons for amendments should be borne by the patent owner. In the absence of any explanation, it would be assumed that the reasons related to patentability and equivalency would be precluded as to amended element. Nevertheless, this presumption is not absolute and it might be rebutted, although every reason depends on the specific facts of the dispute. Although in previous decisions⁶⁵ a flexible bar rule was followed, the uncertainty concerning the reasons “related to patentability”, the presumption and its rebuttal, and the effect on the equivalency has led to the Festo decision⁶⁶.

⁶³ See 35 U.S.C. § 101 – 102 – 103. During the patent prosecution, a Patent Office examiner analyses an application to establish whether it is patentable. The statutory requirements for patentability are novelty, utility and non - obviousness .

⁶⁴ See *Hilton – Davis Co. v. Warner – Jenkinson Co.* 62 F.3d 1512 (Fed. Cir 1995) and reversed and remanded 520 U.S. 17 (1997).

⁶⁵ See *Litton Systems Inc. v. Honeywell Inc.* 140 F.3d. 1449 (Fed. Cir. 1998), *Hughes Aircraft Co. v. United States*, 140 F.3d 1470 (Fed. Cir. 1998) and *Cybor Corp. v. FAS Technologies Inc.* 138 F.3d 1448 (Fed.Cir. 1998).

⁶⁶ See *Festo Corp. v. Shoketsu Kinsoku Kogyo Kabushiki Co. Ltd.* 234 F.3d. 558 (Fed. Cir. 2000).

2.4. Recent modifications: the Festo case

The Festo case⁶⁷, which arose in 1999, dealt with two patents granted to an inventor on a device that employs magnets to move a piston back and forth inside a cylinder. Their claims illustrate a pair of sealing rings, each having a lip on one side, which wipe away impurities from the inside of the cylinder. In this way they keep the inside of the cylinder clean. After the Festo Corporation started selling its patented device, the alleged infringer did the same with a similar, but not identical device, which did not use two one-way sealing rings, but a ring with a two-way lip. Even if there was clearly no direct infringement due to the different structure of the two devices, a dispute was born concerning the application of the Doctrine of Equivalents. In fact, the inventor has introduced some amendments by adding the sealing rings in his claims during the patent application. The alleged infringer argued that the “prosecution history estoppel” should have barred the application of the Doctrine of Equivalents to expand the claims to cover devices without two sealing rings because of the above – mentioned amendments. The District Court for the District of Massachusetts found the infringement under the Doctrine of Equivalency so the condemned infringer, SMC Corporation, presented an appeal in front of the Federal Circuit.

In 2000 the Court of Appeals for the Federal Circuit (CAFC) decided the Festo case and adopted the rule of rigid or “complete” bar, according to which the prosecution history estoppel should be applied for any amended claim element. Therefore the case – by – case approach set in the Hughes decision was overruled and the previous judgement of infringement reversed. Specifically, the CAFC stated that the Doctrine of Equivalents could not be used in order to expand the patent scope: no range of equivalents would have been available for a narrowing limitation made by amendment during prosecution, if the amendment was made for a reason related to patentability. As a previous Supreme Court’s decision had ruled that in absence of other explanations amendments made during prosecution were presumed to be for a reason related to patentability, the Doctrine of Equivalents would not have been applied to narrowing claim amendments.⁶⁸

⁶⁷ Ibidem.

⁶⁸ The Court tackled five questions for rehearing *en banc*. First, it established that “*a substantial reason related to patentability*” did not refer only to overcoming prior art but also to other statutory requirements. Second, a “voluntary” amendment should have been treated in the same way as the one suggested by the examiner’s rejection. Finally, with respect to the third and the fourth questions, it ruled that the application of the prosecution history estoppel to a claim element excluded any range of equivalents on it, as well as in the case of “unexplained” amendments. The fifth question that deals with the meaning of the “all element” rule on equivalency, was not refined and explained by the Court.

The Court justified the adoption of a “complete bar” rule, against the precedents set by the Supreme Court, by stressing that the scope of equivalents available had never been definitively discussed and solved by it in the previous decisions. In addition, the Court emphasized that the certainty following to the notice function of patent claims should be preferred. In fact, a flexible rule makes the range of equivalents highly unpredictable before going to Court, so it is “unworkable” and it increases the transaction costs of litigation and it discourages investments in improvements.⁶⁹ .

On May the 28th of 2002 the Supreme Court decided to reverse the Court of Appeals for the Federal Circuit’s decision on the Festo case and ruled that the Doctrine of Equivalents should be applied in a flexible manner. Therefore, the case was remanded to the Circuit to determine if prosecution history estoppel really represents an obstacle for the application of the Doctrine of Equivalents. The Supreme Court insisted on two aspects of the decision by the CAFC: firstly whether or not the previous decision had been correct to apply the prosecution history estoppel in the case of narrowing claims for reasons related to patentability during patent application. Secondly, it faced the problem of the scope of any estoppel.

The Supreme Court agreed with the CAFC on the first question and denied that only the amendments concerning the prior art should give rise to an estoppel. On the second question, the Supreme Court disagreed with the Federal Circuit’s opinion and judged that some degrees of flexibility are required in the application of the estoppel. In particular, when the Court is unable to determine the purpose underlying a narrowing amendment, it should assume that the patentee surrendered all subject matter between the broader and the narrower language. Also the patentee should bear the burden of showing that the amendment does not surrender the particular equivalent in question and might be expected to draft claims by encompassing readily known equivalents. Finally, there can be situations in which the amendments cannot be viewed as surrendering a particular equivalent, such as when they were unforeseeable at the time of the application or the rationale underlying the amendment may bear no more than a tangential relation to the equivalent in question. Referring this last point, the Court expressed that the patentee bore the burden of proving “[..] *that at the time of the amendment one skilled in the art could not reasonably have been expected to have drafted a claim that would have literally*

⁶⁹ This relevant modification would have induced patent applicants to be more careful in drafting patent claims and to narrow the usual scope in order to reduce the eventual limitations. Furthermore, patentees would have obtained a strong incentive in enforcing their patents against third parties, because amended patent claims might have been construed more narrowly than before.

encompassed the alleged equivalent [..]”.

In short, the rule of a flexible bar was re – established by the Supreme Court because at the time of drafting the narrowed limitation, one could not anticipate creating such precise language in the description that no one could devise an equivalent. Furthermore there would have been a high risk that the modification of the flexible bar rule would have led to changes in the patentee’s strategy by imposing appeals to the rejection instead of limitation of the original application. After the reversal decision of the Supreme Court, the Federal Circuit had to re – address again the Festo case. The first oral hearing was held on September 30th of 2002, in which the CAFC requested the parties to face some issues. Particularly many important procedural questions ought to be solved: firstly whether the rebuttal of the presumption is a question of law or fact and consequently if a judge or a jury should address it; secondly which factors are relevant for proving and overcoming the presumption and finally if a rebuttal determination requires factual finding and to be remanded to the district court.

On February 6th of 2003, the Court heard another oral argument in the ongoing case, in which the judges attempted to clarify some debatable elements in the relationship between the Doctrine of Equivalents and the prosecution history estoppel.⁷⁰

On 26th September 2003 the CAFC⁷¹ finally clarified that the rebuttal of the presumption of surrender – including the criteria of foreseeability, tangentialness, and reasonable expectations of those skilled in the art – is a question of law to be determined by the court, not a jury, even if there are underlying facts to be found. This is consistent with the traditional view of prosecution history estoppel as being equitable in nature. Furthermore, the CAFC established which factors should be considered relevant by providing some general guidance. Nevertheless it refused to adopt any set lists because recognizing that it could not “*anticipate all of the circumstances in which a patentee might rebut the presumption of surrender*”. Consequently the Court “*left to development on a case-by-case basis*” the factors encompassed by the rebuttal criteria. In this particular case, the Federal Circuit held that the patentee could not satisfy the “*tangentialness*” or “*other reason*” criteria.

⁷⁰ The discussion of the case involved the first problem, concerning which the counterpart, the SMC, stated that this was a case of law which should be decided by a judge. On the contrary, Festo Corporation argued in favour of a jury. Most of the judges opposed to the idea suggested by Festo Corporation that a patentee had a Seventh Amendment right to a jury trial on the application of the prosecution history estoppel.

⁷¹ See *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 2003 U.S. App. LEXIS 19867 Fed. Cir. Sept. 26, 2003.

This decision confirms that the application of prosecution history estoppel and the availability of the Doctrine of Equivalents turn upon the nature of and reasons for claim amendments. Several interesting points can be inferred, as the *Festo* decision will have full retroactive effect and it will apply to all granted patents and to all pending litigation that has not been concluded with a final judgment, including appeals.⁷²

In conclusion, the *Festo* case will influence the Doctrine of Equivalents in a strong way, especially in strengthening the position of the patent owner and in creating greater flexibility in the prosecution of patent applications. Furthermore, patent applicants should be careful in drafting claims in order to avoid or at least minimize the application of the prosecution history estoppel.

3. The Catnic / Improver Test

3.1. Content and function

The English Patent system⁷³, which is one of the oldest and most developed ones in the world, is based on a different approach concerning equivalents,⁷⁴ since the patent scope depends mostly on the interpretation of claims contained in the application.⁷⁵

As the European Patent Convention (EPC)⁷⁶ entitles national law to deal with the nullity and the infringement of a European patent, article 69 EPC and the Protocol on

⁷² In fact, as the Federal Circuit largely restricted a court's inquiry as to prosecution history estoppel to the patent and the prosecution history, prosecution history estoppel defenses will, in many instances, be resolvable by summary judgment. In addition, one may ask if an inventor is obliged to claim equivalents foreseeable not only at the time narrowing amendments are made (or risk estoppel under *Festo*), but also when he drafts the original claims.

⁷³ It is governed by the U.K. Patent Act 1977.

⁷⁴ According to the U.K. Patent Act, there is infringement when the alleged infringer has performed one of the activities listed in section 60 without the patentee's consent and within the territory of United Kingdom.

⁷⁵ In particular, a series of rules has been developed by Courts to provide some guidelines concerning this delicate task: a patent specification must be read as a whole; the description and the drawings should be used to interpret the claims; the patent document ought to be considered from the point of view of a person skilled in the art and understood according to the common general knowledge available at the time of publication.

⁷⁶ The European patent represents a bundle of national patents that generate the same effects and rights within all the Member States. The Convention was ratified in 1973 by the Member States, who recognized the importance of harmonisation of national patent laws within the European Community and it became effective in 1978. See EPC art. 64(3).

its interpretation define a common basis for patent claims interpretation also in the U.K.: they provide middle ground between a strict literal interpretation and a broader one.

Under the previous British Patent Act 1949, a test called “pitch and marrow” was developed in order to interpret inventions. It concentrated on the differences between the variant and the patented invention to establish if they were material, i.e. whether or not they differed in essential elements. According to this criterion, if all of the essential components were present in the variant, there was infringement even though the differences of non-essential elements were relevant. Consequently, the inventor should have carefully drafted the patent claims to avoid an easy exclusion from infringement in case of slight and insignificant modifications.

This general interpretative approach favoured a “textual” infringement and narrow scopes: every element and limitation contained in a claim was considered essential. Accordingly, claims used to be written in a quite broad way. This practise was modified by Lord Diplock in one of the most important House of Lords’ decisions: the *Catnic v. Hill and Smith* in 1982⁷⁷.

This decision, in which was stated that patents should be interpreted on the basis of a “purposive construction” instead of a literal one, represents the beginning of a fundamental standpoint within English Courts.⁷⁸ The decision involved several variants of steel lintels. The two devices were clearly similar, except for the rear support, which was claimed vertical in the patent while at an angle of 84 degrees in the accused product. Lord Diplock introduced a radical modification by stating that claims ought to be read through the eyes of a person skilled in the art but at the same time according to the purpose or the function of the invention.⁷⁹ This means that the infringement depends on whether a person skilled in the art would have understood that strict compliance with a particular word or phrase was intended by the patentee to be an essential requirement of the invention. In the case, the person skilled in the art, a builder, would have recognized that the vertical position of the rear support depended on the load – bearing capacity of the lintel. As the reduction of this capacity

⁷⁷ See *Catnic v. Hill and Smith* (1982) RPC 183, 241 (HL).

⁷⁸ The British approach was also called “fence – post” because it limited claim interpretation to the boundary of monopoly; it was clearly in favour of legal certainty. See Cornish (2000, 241) and Bainbridge (2002, 495).

⁷⁹ “A patent specification should be given a purposive construction rather than a purely literal one derived from applying to it the kind of meticulous verbal analysis in which lawyers are too often tempted by their training to indulge”. See the words of Lord Diplock in *Catnic Ltd v Hill & Smith Ltd*, as quoted in Bainbridge (2002, 395), and also Cornish (1999, 245) and Bently and Sherman (2001).

due to the modification was extremely small, it was decided that the two devices performed the same function and consequently there was infringement.

This new rule was accepted as effective in the 1977 Patent Act and confirmed in many subsequent decisions⁸⁰, notwithstanding it was ruled under the previous legislation. Although the purposive interpretation may provide a greater protection in favour of patentees and subsequently increase the scope of the monopoly, this may not be always true. In fact, the degree of broadness is based on a specific judgement case by case, in which claims may not be read broadly or against the alleged infringer. Lord Diplock himself underlined that sometimes the person skilled in the art should interpret claims in a literal way and hence limit the scope. This can happen when there is a risk of excluding the patent because of the existence of quite close prior art or when the kind of languages and parameters used by the patentee seems to have been on purpose.

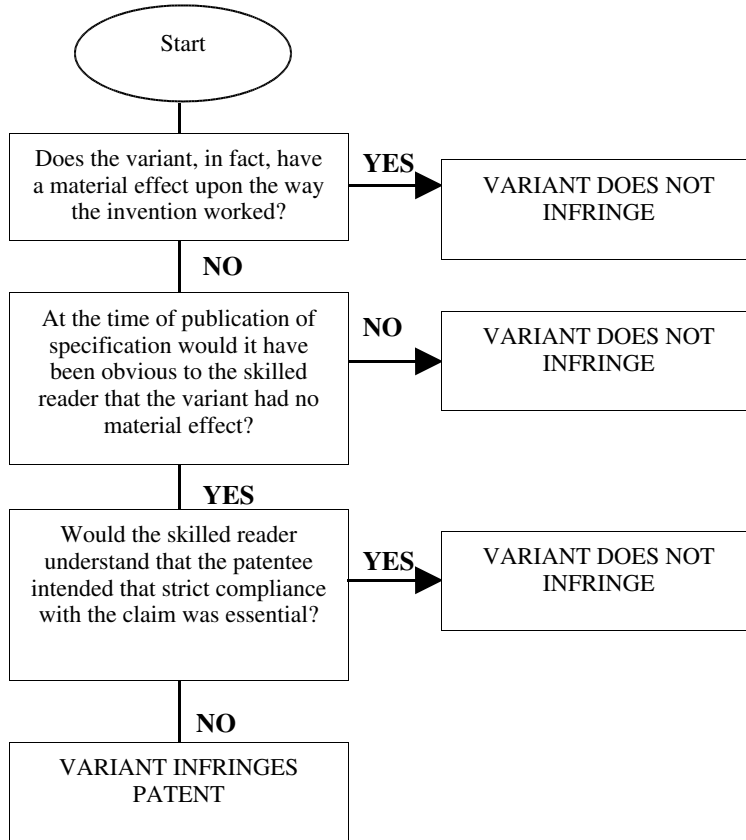
The criterion suggested by Lord Diplock in the *Catnic* case was reformulated in a three part test by Hoffman J in the decision *Improver Corp v Remington Consumer Products Ltd*⁸¹, also known as the “*Epilady* case”. The case involved two mechanically equivalent devices for removing hair from arms and legs, which clearly performed the same function in the same way.

The test, which has been lately called the “*Improver* questions” or the “*Protocol* questions”⁸², can be read below as a flowchart. It is based on two questions of fact and on one of law: it is asked if the variant materially changes the technical result, and in the negative case if the variant was obvious at the date of publication of the patent. Finally it faces the problem whether the skilled reader would nevertheless have understood that the patentee intended to confine his claim to the primary meaning of the words used. A positive answer to the third question would exclude infringement, while a negative one would lead to the conclusion that the patentee drafted the claim with a figurative meaning by including not only the literal meaning but also some variants. Lord Hoffman held that there was no infringement by answering to the *Catnic/Improver* Test respectively no, yes and yes.

⁸⁰ See *Kastner v. Rizla* (1995) RPC 585, 594, *Beloit Technologies v. Valmet Paper Machinery* (1997) RPC 489, *Minnesota Mining & Manufacturing v. Plastus Kreativ AB* (1997) RPC 737, *Codex v. Racal – Milgo* (1983) RPC 369, *Anchor Building v. Redland Roof Tiles* (1990) RPC 283.

⁸¹ See *Improver Corp v Remington Consumer Products Ltd* (1990) FSR 181-189.

⁸² In spite of different names, here it will always be referred to by the expression *Catnic/Improver* Test.



Flowchart 1, based on Bainbridge (2002, 397).

The purposive approach and the Catnic/Improver Test have become the main principles for interpreting claims and determining infringement. Unfortunately, this test implies a certain degree of uncertainty, which apparently collides with the “*fair protection for the patentee with a reasonable degree of certainty for third parties*” requested in the Protocol on the interpretation of article 69 of the European Patent Convention. Moreover it surely increases the transaction costs in a significant way.⁸³ The main danger, which is particularly strong with respect to the third question, consists of being influenced by the knowledge of the alleged infringement in interpreting the claims. Indeed it is a question of law and it refers to the interpretation based on the words used by the patentee. Furthermore, it has been objected that the Catnic/Improver Test may operate against the defendant because an *interim* might be

⁸³ See Bainbridge (2002, 397). The Catnic/Improver questions cannot be applied in the case of an omission of whole features of the claim and there is no variant where there is a range of numbers with an upper and lower limit. If the equivalent lacks one or more advantages of the patented device, infringement should not be ruled. See *Consafe Engineering (UK) Ltd v Emtunga UK Ltd* (1999) RPC 154.

used in a more open and generous way.

The Catnic/Improver questions have been applied in one of the most famous and delicate cases, the “Epilady case”, which involved several national Courts. The Court of Appeal in Hong Kong⁸⁴ ruled on the case but it could not determine the third question of the test. Consequently, it denied the infringement by establishing a different approach, according to which there was infringement if all the essential integers in the patent specification and claims were present in the accused product and the person skilled in the art would have understood that the patentee did not intend to enclose these variations.

Unfortunately, the European Courts could not reach any uniformity in their decisions in the matter of patent interpretation. In fact, an Austrian Court found that the infringement by equivalency requires an “immediate understanding” that the alleged product or process is substantially similar to that one claimed, otherwise there is no equivalence. On the contrary, a German Court⁸⁵ in a parallel case ruled in favour of infringement and held that a claim can be extended to the “more general principle deductible by abstraction”, if an expert is able to do it by determining a more general teaching. Also a Dutch Court recognized that there was infringement as the product fell into the “general inventive idea” expressed in the claims. In both cases the Courts considered claims wording as “*decisive basis*” in interpretation, rather than patentee’s intentions.

The most diverging views emerged with respect to the third question: for instance, the English court in the Epilady case held that the hypothetical skilled person was not “*assumed to be skilled in patent law and he would be entitled to think that the patentee had good reasons for limiting himself, as he obviously appears to have done*” to the literal meaning of the words. On the contrary the German court, analysing that same text, held that the skilled reader, on the basis of the prior art, could make an abstraction: this “*belonged to the expert knowledge and was disclosed by the claims of the patent in issue seen in the light of the description*”.

This decision provoked many discussions in Europe: scholars and practitioners could not accept the fact that various national courts may rule in different ways with respect to the same patent. Despite the possibility of different interpretations, the European patent should have better harmonized the European patent law; hopefully this will happen soon when the Community patent enters in force.

⁸⁴ See *Improver Corp v Raymond Industries Ltd* (1991) FSR 223. Obviously the case was decided under the Patents Act 1977, that was in force at that time in Honk Kong.

⁸⁵ See (1993) 24 I.I.C. 803 at 823.

3.2. *The relationship with the European patent law*

The European Patent Convention plays an important role in national infringement disputes and is fundamental to achieve uniformity among them. Article 69 of the EPC provides a guideline for interpreting the scope of protection conferred by a European patent. It establishes that the “[...] *extent of the protection conferred by a European Patent [...] shall be determined by the terms of the claims [...]*” and that “[...] *nevertheless the description and drawings shall be used to interpret the claims [...]*”⁸⁶. The Protocol on the interpretation of Article 69 of the Convention, adopted lately, points out that “[...] *Article 69 should not be interpreted in the sense that the extent of the protection conferred by a European Patent is to be understood as that defined by the strict literal meaning of the wording used in the claim, the description and drawings being employed only for the purpose of resolving an ambiguity found in the claims. Neither should it be interpreted in the sense that the claims serve only as a guideline and that the actual protection conferred may extend to what from a consideration of the description and drawings by a person skilled in the art, the patentee has contemplated. On the contrary, it is to be interpreted as defining a position between these extremes which combines a fair protection for the patentee with a reasonable degree of certainty for third parties [...]*”⁸⁷.

Section 125 of the Patent Act 1977 has the same effect in the United Kingdom, as it provides that the Protocol on the interpretation shall apply for the purposes of §125(1) as it applies to art. 69 EPC. There have been many decisions of the British Patent Courts and also of the Court of Appeal affirming the proposition that the “purposive construction” approach is in accordance and consistent with the Protocol. However, in *PLG Research Ltd v Ardon International Ltd*⁸⁸ the Court of Appeal attempted to consider the *Catnic* test as legal history and stated the predominance of the European Convention over it without expressing any other guidance concerning the interpretation of the Protocol.

Afterwards the Court of Appeal in *Kastner v Rizla Limited*⁸⁹ and the English Patent Court in *Assidoman Multipack Limited v The Mead Corporation*⁹⁰ realised that the previous decision was irrelevant to the court’s final decision and therefore *obiter dictum*. Hence, the validity of *Catnic* was reaffirmed, especially in *Beloit*

⁸⁶ See EPC art. 69.

⁸⁷ See the Protocol on the interpretation of article 69 of the Convention.

⁸⁸ See *PLG Research Ltd v Ardon International Ltd* (1995) FSR 116.

⁸⁹ See *Kastner v Rizla Limited* (1995) RPC 585.

⁹⁰ See *Assidoman Multipack Ltd v Mead Corp* (1995) FSR 225.

Technologies Inc v Valmet Paper Machinery Inc⁹¹. The most recent cases, such as Wairheit v. Olimpya tools and Kirin – Hamgen Inc. v. Transkaryotic Therapies Inc.⁹², have confirmed the Catnic/Improver Test by illustrating the development of this principle.

In the recent Wheatley v Drillsafe case⁹³, the English Court underlined that the third question should not be interpreted in the sense that a person skilled of art could re-write or re-think it according to the patentee's intention only on the basis of the alleged infringement device. Instead a "unitary exercise" of the purposive construction should be done.⁹⁴

However, in the case of infringement under equivalence, Courts are very careful not to use the term "equivalents"; for instance, in Amersham Pharmacia Biotech v Amicon⁹⁵, Lord Justice Aldous stated "[...] *I do not believe that the Protocol introduced into our law a doctrine of infringement by equivalent effect by use of a different mechanism. That may be for the future [...]*".

3.3. Divergent comments

The compatibility between the Catnic/Improver Test and the Protocol still represents a disputable topic. On the one hand some commentators⁹⁶ doubt that the English rule fully meets the requirements set out in the Protocol. On the other hand, many precedents show consistency between the two rules and some jurists⁹⁷ expressed their belief that a certain tendency of European Courts to follow the Catnic/Improver approach has been developing.

Some authors⁹⁸ have disagreed with the current English interpretation: for

⁹¹ See *Beloit Technologies Inc v Valmet Paper Machinery Inc* (1995) RPC 705.

⁹² See *Auchinloss v Agricultural and veterinary supplies* (1997) RPC 397 CA, *Union Carbide v BP Chemicals* (1999) RPC 409 CA, *Warheit v. Olympia Tools Ltd* (2002) EWCA Civ. 1161(CA) and *Kirin-Amgen v. Transkaryotic Therapies Inc.* (No2) (2002) EWCA Civ. 1096.

⁹³ See *Wheatley v Drillsafe (2000) Ltd* (2001) RPC 7.

⁹⁴ This case dealt with a method for making a circular hole in a tank lid, by means of a rotary hole-cutter, and it is famous for the three different applications of the Catnic test by three judges: while the same conclusion was achieved with respect to the first two questions, the third one divided the judges.

⁹⁵ See *Amersham Pharmacia Biotech v. Amicon*.

⁹⁶ See *Turner* (1999).

⁹⁷ See *Franzosi* (1999).

⁹⁸ See *Turner* (1999).

instance Turner attacked it directly by proposing seven good reasons why it is wrong. He first argued that the purposive construction of patent claims is based on the knowledge of claims purpose, which cannot be established by the person skilled in the art as he is completely ignorant of patent law. In addition, its high degree of inflexibility will prevent a person skilled in the art from anticipating and predicting all the future applications and variations when the patent is granted. Even though there is a potential risk in this sense, this point of view does not take into account that the person skilled in art is only asked to evaluate the material effect, the obviousness and patentee's intention on strict compliance of the device, as the legal consequences will be drawn by judges and lawyers.⁹⁹ Secondly, Catnic is argued to be incompatible with claims purpose because two conflicting approaches are mixed up: the idea that the purpose of the claims is to define the outer boundary of the monopoly on the one hand, and on the other that claims should identify the essential features of the invention for the information of the person skilled in the art. In addition, the inconsistency between the test and the European Protocol is challenged: article 69 combines a reasonable degree of certainty with a fair protection for the patentee, while the effects of the Catnic approach differ substantially. In particular, the English test is accused of lacking the required flexibility, which is fundamental for balancing reasonable certainty and fair protection.¹⁰⁰ In addition, the Catnic/Improver Test is accused not to achieve the goal of harmonisation within Europe, as it differs conceptually from those approaches, which insist on what claims convey to the skilled person instead of what the patentee intended and they are interpreted broader than in United Kingdom.¹⁰¹

Although it cannot be denied that there are some differences between the original Catnic/Improver Test and article 69 in light of the Protocol, in my opinion the English test should not to be abolished and replaced by the European article. In fact, both the English and the German approaches contribute to the creation of this

⁹⁹ I believe that Turner's point of view is accurate when it highlights the possibility that the reader skilled in art may be influenced by the knowledge of the accused product, but this does not always happen. As underlined, there is only a potential risk.

¹⁰⁰ This lack of flexibility consequently narrows the scope of protection for the patentee by forcing him to draft patent claims in a careful way, otherwise some irrelevant modification can be introduced without infringing the patent. Turner wondered that if this approach were rigorously followed, it would achieve complete certainty at the expense of fair protection, since a patent would only be infringed by a variant from a strict meaning of the words of the claim. Otherwise, especially if the patentee's intention is not clear, the court would neither assume that equivalents are included nor that they are excluded. In this way the degree of uncertainty would be increased.

¹⁰¹ Turner also argued that the Catnic/Improver rule did not respect the precedents of English case law .

article by attempting to balance two extremes and to provide a fair and certain principle on scope and prosecution.

On the other hand, some jurists¹⁰² believed that a certain uniformity of criteria and a trend of European Courts to follow the Catnic/Improver approach have been developing. Obviously this does not imply any result in terms of uniformity of decision and it might be a source of inefficiency. In fact, the division not only between different national courts but also within the judges of the same one reduces legal certainty and increases transaction costs in an unacceptable way. However this trend is demonstrated by Franzosi analysing three European cases: the German Muller-Hilti case, which was decided also in France and Switzerland¹⁰³, the English Wheatley v Drillsafe decision and the Italian Forel v. Lisec¹⁰⁴, in which the Catnic/Improver Test was used with some variations to fill the gap previously existing in the Italian jurisprudence.

4. An economic analysis of equivalents: a comparison between the US and the UK

4.1. Similarities and differences

After the comprehensive study developed in the two previous chapters on both the American and the English patent systems, it is now possible to address the legal comparison.

First of all, the Doctrine of Equivalents appears to be quite an advanced and independent theory, which provides general criteria for solving cases of infringement under equivalence. On the contrary, the English Catnic/Improver Test, as influenced by the Protocol on the European Patent Convention, focuses on the claims interpretation in case of infringement, by offering general principles to apply and adapt specifically for equivalents. Indeed, the British rule addresses whether there is

¹⁰²See Franzosi (1999).

¹⁰³This case was ruled in different ways: some courts held the infringement, while others denied it on the basis of the Catnic methodology. It represents a good example of the danger of an analysis based on the criterion of the technical problem in defining patent scope and it is also important because of the dicta of BGH concerning the DOE.

¹⁰⁴This case was decided by the Court of Appeal of Milan, which stated that there was no infringement on the basis of two principles: a conscious limitation cannot extend to equivalents and a technically significant difference between the alleged infringement and the claim cannot constitute infringement. This decision has been considered as a perfect example of the Catnic/Improver Test application with respect to the first and third questions; the second principle is not mentioned but it can be implied in the first one.

non-literal infringement of a claim feature, but this may not be as different as determining whether a claim equivalent falls within the scope, although in some cases the variant and equivalent may be the same.

Secondly, regarding the content of these two rules, the Catnic/Improver Test is made up of three questions, mostly characterised by the role played by a person skilled in the art in understanding whether the patentee intended the claims in the sense of a strict compliance with their literal meaning. The first Catnic question asks whether the variant has the same effect and purpose as the claim feature in question, while U.S. Courts emphasize the equivalence between them by means of the triple test (FWR test)¹⁰⁵ that concentrates on the differences in terms of functions, ways to obtain it and technical results achieved between the patented invention and the alleged device. The two rules are sometimes considered quite similar: the FWR test, coupled with the requirement of substantiality, would have the same meaning as the first and second Catnic/Improver questions because the way in which the invention worked represents the main feature of the FWR test and the obviousness determined by a person skilled in the art can complete the analysis. Instead, in my opinion those approaches differ, particularly on whether the prosecution history should be used to bar the application of the American doctrine or to discover the patentee's intentions concerning the English claims. The British rule completely avoids the investigation of patent prosecutions that is fundamental in the "prosecution history estoppel" doctrine. Courts refuse to investigate patent application since this research is often difficult, costly and inconclusive.¹⁰⁶ Besides, the measure of equivalents is based on different parameters in term of time: in the U.S. the time of infringement is considered, on the other hand in the U.K. the priority date counts.

In addition, the DOE is enriched by some mitigations with respect to uncertainty toward third parties, such as the "prosecution history estoppel", the "all-element rule", the "reverse doctrine of equivalents" and the recent criteria introduced in the Festo Supreme Court's decision (for instance the foreseeable bar). On the contrary, neither the English Patent Act nor the European Patent Convention contain any similar moderations: they only rely on a general reference to the third parties' certainty.

Particularly, the Festo foreseeable bar test investigates whether the equivalent could not have been literally included within the claim scope at the time of the application; in the positive case the bar prevents equivalents. On the contrary, the Catnic/Improver Test does not exclude the possibility that the applicant did not

¹⁰⁵The FWR test refers to function, way and result.

¹⁰⁶See Cornish (2000, 245).

include within the claim scope a variant, which could have been foreseen but this fact may complicate the proof concerning the third question. Consequently the Catnic/Improver Test seems to be more generous and open, although it offers no general mitigations.

The application of the DOE is based on the patentee's proof that the equivalent was foreseeable at the time of infringement but not of application, while the second Improver question stresses whether it was obvious to substitute the variant at the date of publication of the application. Therefore, at the publication date, the variant must be foreseeable under the Catnic/Improver, but at the date of filing the same feature may be required to have been unforeseeable under the Festo foreseeable bar test. In other words, the two rules differ completely as the Catnic/Improver questions focus on the extension of claim features to non-literal variants, which the skilled person in the art would understand as clearly being within the scope of the claim feature. The U.S. approach, instead, requires that the skilled person could not have foreseen the equivalent. As a result, a modification can be held foreseeable at the date of publication according the Catnic/Improver rule, but unforeseeable at the date of filing the application within the same litigation.

The U.S. and the U.K. judiciary systems are also different concerning the role of judges and juries. In fact, English judges belonging to Patent Courts or the Court of Appeal are generally competent to decide the infringement cases, while a jury can be sometimes in charge of determining them in the United States. This may imply a greater predictability of decisions in the case of judges instead of a jury. This topic is particularly controversial, as in the U.S. the recent Festo case has just solved the problem in favour of judges.

Both doctrines are affected by a high degree of uncertainty, especially due to the contrasting opinions between judges. While in the U.S. conflicts are mainly limited between different sections of the Federal Circuit, the CAFC, and the Supreme Court, the situation is more complicated in United Kingdom and generally in Europe. The controversial compatibility of the Catnic/Improver Test with the Protocol on Article 69 is still discussed and only some commentators have completely accepted it. In addition, the situation has been worsened by the fact that there are divisions between different national judges, even with respect to the conclusion on the same case in different countries. Hence, the degree of legal uncertainty is extremely high, almost unacceptable, and the need of the Community Patent, a unitary title within the whole European Community, has been strongly emerging.

By comparison, their purposes apparently coincide: both the Doctrine of Equivalents and the Catnic/Improver questions emphasize the balance between

inventors' and public interests, although the American system seems to be more effective. Indeed it entitles a quite broad scope with the consequence of a practise of drafting medium scope claims, while the English one have traditionally chosen a narrower scope and a greater certainty. In conclusion, the Doctrine of Equivalents is quite a flexible theory, which is in favour of a broader scope and thus of a patentee's strong monopolistic position, although some corrective measures can be applied in order to balance it case-by-case. On the contrary the English system, according to its tradition, entitles quite a narrow scope, even slightly extended by the European Patent Convention.

4.2 Tendencies toward harmonization

Some positive tendencies in favour of an international harmonization of patent laws have been developing in this field: many signals can be shown in this direction.

Firstly, during the Diplomatic Conference of November 2000¹⁰⁷ on the amendment of the European Patent Convention, it has been suggested to modify the Protocol on the Interpretation of Article 69 by the introduction of a new Article 2. The originally proposed new article said: "*(1) For the purpose of determining the extent of protection conferred by a European patent, due account shall be taken of means which at the time of the alleged infringement are equivalent to the means specified in the claims. (2) A means shall generally be considered as being equivalent if it is obvious to a person skilled in the art that using such means achieves substantially the same result as that achieved through the means specified in the claim.*"¹⁰⁸ Unfortunately the conference adopted a different text and reduced the final wording: "*For the purposes of determining the extent of protection conferred by a European patent, due account shall be taken of any element which is equivalent to an element specified in the claims*". This modification belongs to the "EPC 2000", which will enter into force two years after ratification by 15 contracting states. So far, only four states have ratified the new text and it will probably take another couple of years for the necessary minimum 11 further states to ratify. When the amended Protocol comes into force, it will firmly establish a kind of Doctrine of Equivalents in Europe. Despite this, the limitation will produce only the elevation to a statutory level of the rule, according to which only "due account" will be taken of any element, which is equivalent to an element specified in the claims. This is not so different from the solution provided in the Catnic/Improver questions, thus some commentators¹⁰⁹

¹⁰⁷The previous intergovernmental conference was held in June of 1999. See DeVile (2001).

¹⁰⁸Ibidem.

¹⁰⁹See Steinfl (2000).

have claimed a failure of the attempt on world-wide harmonization. Even though they pointed out that the European Convention missed a great occasion to introduce an equivalent test, based on the prosecution history and on the time of infringement, I do not agree with this position.

Instead, it is easy to note that this future change will offer a positive sign of the willingness of the EC of getting closer to the U.S. doctrine, on the ground of the time of infringement and of the substantially same result found obvious by a person skilled in the art. This represents the first step towards a compromise between two different and old traditions. At the same time, the recent Supreme Court's decision on the Festo case has introduced the foreseeability at the time of invention, which is closer to the specific attention of the British system to the priority date and to the patentee's intention when he filled in the application and drafted claims.

This trend toward harmonization has an enormous economic impact on the patent value: eventual barriers between countries may be eliminated with a result of decrease in transaction and administrative costs and increase in the degree of certainty and predictability.¹¹⁰

4.3. Cost – benefit analysis

The legal comparison constitutes the premise for developing a cost – benefit analysis between the two theories, which implies the estimation of gains and losses derived from a singular rule in order to confront them and determine the more efficient solution provided in terms of net benefit. Benefits consist of the private gains derived from the patent reward and protection, and of the social ones in terms of innovation, dissemination and acceleration of inventive processes. On the other hand, costs are quite significant since they refer to transaction and administrative costs incurred by inventors in drafting claims, obtaining a patent during the prosecution and receiving an adequate protection in case of infringement. Moreover they include the social deadweight loss and other losses due to the Anticommons and rivalry problems, coupled with the eventual reduction in technological advance. Legal uncertainty and unpredictability may also represent a cost for both inventors and society.

The U.S. patent system, as characterised by the Doctrine of Equivalents, entitles quite a broad patent scope, with the consequence of a wide and strong monopoly. The broader scope increases the negative effects in terms of distortions but it is also mitigated by the results in terms of innovation and of R&D activities.

On the contrary, the English system and its Catnic/Improver Test are in favour of

¹¹⁰See the CIPA Seminar, 18th September 2002, "UK Drafting Health Check Post Festo".

a narrower scope and of weaker monopolistic powers. Although this may be positive in terms of reduction of deadweight loss, the level of innovation and R&D is clearly inadequate in Europe, as the “innovation paradox”¹¹¹ can testify. Therefore benefits in the U.K. are clearly inferior than in the U.S., while the amount of costs is debatable. In fact, social costs are in part reduced in terms of deadweight loss; at the same time inventors’ costs are high and the legal system is vitiated by unacceptable uncertainty and unpredictability due to judges’ contrasting opinions in the United Kingdom and in the European Community especially.

In addition, the indirect effect exercised by infringement rules on the systems of drafting patent applications has to be analysed. The English language, used in both the American and the British system, is ambiguous and characterised by a high degree of flexibility and consequently lack of clarity: every word and expression can be twisted and adapted according to the circumstances. Therefore, the possibility for the English system to compensate the narrower scope granted, by writing not only more precise but also broader claims, might increase significantly the amount of the transaction costs. Moreover, administrative costs will levitate too with a strong opposition of practitioners and patent agents as a result. This means that the potential reduction in costs and the increase in benefits due to a greater certainty for third parties are quite debatable because a high degree of uncertainty will probably remain. The recent American experience on the Festo case might be interpreted as an important signal of the impracticality of this option, since benefits will be probably outweighed by the high transaction and administrative costs. In fact, the attempt of the Federal Circuit to achieve legal certainty and protection of third parties by means of a complete bar failed; the Supreme Court reversed this decision by stressing the intrinsic weaknesses of this solution.

Furthermore, some empirical data published by the World Intellectual Property Organization (WIPO)¹¹² and the Trilateral Statistical Reports¹¹³ demonstrate that the

¹¹¹The innovation paradox refers to a condition in which the European R&D results are inferior to those ones in the U.S. and in Japan, in spite of the quantity and quality of European researches. It was firstly underlined in the Green Paper on innovation of 1995.

¹¹²See <http://www.wipo.int/ipstats/en/index.html>.

¹¹³See <http://www.european-patent-office.org/tws/sr-2.htm>. The Trilateral Statistical Report 2001 contains statistical information from the three major patent offices in the world: the European Patent Office (EPO), the U.S. Patent and Trademarks Office (USPTO) and the Japan Patent Office (JPO). It provides a full description of worldwide patenting activities during the 2000 and 2001 and it is the result of the cooperation between these three authorities. It illustrates a general overview of the world economy, based on the data collected by IMF and OECD, by taking into consideration the imperfect relationship between economic, technological and political factors.

number of applications filed and patents issued in the United States is greater than in the United Kingdom and in the whole European Community with respect to the European Patent during 2000 and 2001. This seems to confirm that the results in innovation are superior in the United States compared to Europe and particularly to the United Kingdom. Obviously it should be taken into account that the United States have invested in the past years in R&D activities an amount that is more or less the same of Japan, Germany, France, Italy and United Kingdom together, although they are apparently investing more in military technology and in pure research than other countries.¹¹⁴

¹¹⁴See Carlton and Perloff (2000, 507).

	U.S.A	U.K.	E.P.O.
(2000)	331,773		
applications filed	(295,926) ¹¹⁵	233,223	143,074
patents granted	157,496	33,756	27,523
(2001)	375,657		
applications filed	(326,508) ¹¹⁶	264,706	158,290
patents granted	166,038	39,649	34,704

Table 1, based on data published in WIPO and Trilateral Statistical Reports.

From a general point of view, it can be inferred that both systems are characterised by high costs, whose amounts cannot be exactly identified. It can be assumed that the tragic European judiciary situation can more or less balance the recent uncertainties introduced by the *Festo* case, while the higher administrative costs produced by the “prosecution history estoppel” theory can be partly outweighed by the gains generated in flexibility and promotion of innovation. However, my analysis apparently ends in favour of the Doctrine of Equivalents and its broad scope, as the benefits are certainly superior to the *Catnic/Improver* Test, even though the amount of costs is still debatable and requires additional researches.

5. Final implications on scope

This analysis has deepened the comparison between two of the major and oldest patent systems in the world, the United States and the English ones. It has also highlighted the extreme complexity of determining the optimal scope, mainly because of the delicate trade – off between the patentee’s and society’s interests. Furthermore, it has underlined how different principles in the infringement under equivalence may influence rules about drafting patent applications, especially claims and specification.¹¹⁷

¹¹⁵There are some differences between the two sources of data.

¹¹⁶*Ibidem*.

¹¹⁷In fact, principles on equivalents cannot be considered an independently adjustable component of a national patent system: every modification affects other rules and produces

On the one hand, the U.S. Doctrine of Equivalents is a flexible and independent theory, which entitles quite a broad patent scope, a practise of drafting medium scope claims but at the same time it can be mitigated case – by – case by means of several doctrines: “prosecution history estoppel”, “all – element – rule”, “reverse doctrine of equivalents”, “foreseeable bar” and so on.

On the other hand, the English doctrine has evolved towards a broader scope compared to its original tradition, which was quite narrow and characterized by a high degree of certainty. The European Patent Convention introduced Article 69 and its Protocol not only to find a compromise between the English and the German approaches, but also to get closer to the U.S. doctrines on claim interpretation and especially on equivalents, as the last modification has shown.

The law and economics analysis of the two systems was based on the concept of dynamic efficiency, since the allocative one cannot provide enough justifications for the maintenance and the scope of patents. On the contrary, a dynamic perspective enables to take into account not only the allocation of scarce resources but also their modification in content and dimensions, as a direct consequence of inventive activities.

The balance between opposite incentives, which is the aim of the present study, has referred to Merges’ and Nelson’s economic and dynamic model¹¹⁸. According to these authors, reductions in patent scope may not be always negative and at the same time broad patents may generate inefficient results. Therefore a too wide scope may be inadequate, since many distortions in terms of market prices and in the direction of the scientific research might arise.

No definitive answers can be provided with respect to the socially desirable patent scope, especially because it depends on too many factors which this analysis cannot take into account; consequently additional researches are required. As Merges and Nelson¹¹⁹ suggested, no unique blanket rule may be determined on patent scope.

However the cost – benefit analysis, developed on the basis of the legal comparison, apparently emphasizes the greater efficiency of the U.S. patent system, and in particular of its Doctrine of Equivalents, compared to the British Catnic/Improver Test. The high flexibility, the case – by – case approach and the particular attention to promote technological advance of both pioneer inventions and

collateral effects.

¹¹⁸See Merges and Nelson (1990, 839ss).

¹¹⁹See Merges and Nelson (1990, 839ss).

improvements might outweigh the broader scope granted by the U.S. Doctrine of Equivalents in an efficient way, as the the empirical data and the different solutions provided in some technological areas can show. Nevertheless, many questions remain open because the final result is not so evident and the conclusions may be controversial, especially in the light of the recent trends toward harmonization.

In spite of its apparent superiority, the American system ought obviously to be improved, especially on the grounds of legal certainty and predictability. On the other hand, the European patent system, and the English one should accelerate the process of harmonization and convergence toward the American model without losing the extraordinary experience matured in centuries of tradition.

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