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Patent Eligibility of Signal Claims¹

Stephen G. Kunin and Bradley D. Lytle

INTRODUCTION

What is a signal claim and why is it sought? A propagated signal claim is directed to a transient manufactured phenomena, such as an electrical, optical or acoustical signal. Signal claims, if drafted properly, provide an excellent way of obtaining patent protection for software and other digital functionally descriptive information transported via or in connection with a propagation medium. Such claims enable patent owners to have broad patent protection against those direct infringers who produce and transport software on propagation media such as wires, air, water and fiber optics². As compared with conventional method and apparatus claims, detecting infringement is often easier with signal claims because the signals are frequently outputted from a device and sent over a publicly accessible medium, such as wireless channels or the Internet. They make it cheaper to protect data or software inventions that can be communicated to a computer other than by diskette, CD, or DVD. Use of signal claims can significantly reduce the number of claims in a patent application by eliminating the filing of separate sets of transmitter and receiver claims, since a manufacturer of a transmitter or receiver that uses the infringing signal will directly infringe a propagated signal claim.³ Lastly, signal claims are often the most applicable to standards bodies and patent pools because it is the structure of the signal that is defined by many of the industry communications standards.

¹ This paper is an updated version by Stephen G. Kunin and Bradley D. Lytle of a presentation prepared by Bradley Lytle on August 8, 2001, Oblon, Spivak, McClelland, Maier, and Neustadt PC

² Such infringers could include telephone companies and Internet service providers as well as those who manufacture, use or sell signal transmitters and receivers.

³ "A New Frontier in Patents: Patent Claims to Propagated Signals", Scott A. Horstemeyer and Daniel J. Santos, 17 J. Marshall J. Computer & Info. L. 75 (1998)

HISTORY

The history of the development of signal claims in many ways tracks the development of computer program product claims: they are related to similar technology and they are basically computer components. This will become evident when considering how patentable subject matter has been defined, especially related to signal claims and computer related inventions.

The first major event in the study of signal claims dates back to the creation of the telegraph. As early as the mid-1700s, visionaries were considering ways of using electricity to convey intelligence over distances. In 1753 an unknown Scottish author published an article suggesting the use of a wire to which a bell or a ball would be affixed. An electric current sufficient to move the ball or the bell would be applied and the movement of the ball or the bell would be used to create and decipher a message.

By the end of the 1700s and the early 1800s, scientists all over the world were working on the question of how to use electricity to communicate information from one remote point to another. Samuel F. B. Morse was the father of the American telegraph. He was a portrait painter educated at Yale. Although he was a respectable portrait painter, and was very busy, he was disenchanted with it. He decided to turn his attention to becoming an inventor. In 1826-1827 he attended lectures on electricity and magnetism in New York, and in the early 1830s he further developed his idea for the practical application of electricity for communications. It was on his way back from a trip to Paris where he first discussed with others his ideas of instantaneously transmitting intelligence by electricity. He devoted all of his time and study and energy to this end. Finally, by late 1835, he built his first telegraph machine.

Morse discovered how to use the relay to reinforce a feeble current after it traveled some distance, and he was able to use his machine in his apartment through a circuit of 1,700 feet of wire strung back and forth across his room at New York University. In September 1837 he applied for the first patent on the telegraph, which became U.S. Patent No. 1647, granted on June 20, 1840. This patent was later reissued with amendments in 1846 and 1848. He prevailed upon Congress to grant him money to develop his invention further and in 1842 was granted \$30,000 to put his invention into commercial use. A telegraph

line was constructed from Baltimore to Washington, a distance of about forty miles.⁴

The first public exhibition of the telegraph by Morse occurred on May 24, 1844 in the chamber of the U.S. Supreme Court. His assistant, Alfred Vale, was in Baltimore with paper tape and the recording device, when Samuel Morse sent the first message. The message was chosen by Annie Ellsworth, who was the daughter of Henry Ellsworth, the Commissioner of Patents at that time. Ms. Ellsworth selected a message from the Bible, "What hath God wrought?"⁵ Morse transmitted the message. The words were received at once by Vale and sent back in an instant. The telecommunications industry was born.

Morse became famous and was widely acclaimed for his scientific prowess. In 1848 Morse submitted Claim 8 via amendment stating:

I do not propose to limit myself to the specific machinery or parts of machinery described in the foregoing specifications and claims. The essence of my invention being the use of motive power of the electric or galvanic current, which I call electromagnetism, however developed for making or printing intelligible characters, signs or letters at any distances being a new application of that power of which I claim to be the first inventor or discoverer.

The Patent Office accepted Morse's claims and awarded the reissue patent. The telegraph spread throughout the country but, unfortunately, it often involved infringement of Morse's patents. When he sought to enforce his patent, there were many court battles, such as that with Henry O'Reilly who built a telegraph system in 1845 from Louisville, Kentucky to Nashville, Tennessee. In 1849 Morse sued O'Reilly in circuit court in Kentucky. The court found that his patent was valid and infringed, awarding damages to Morse and an injunction against O'Reilly. O'Reilly appealed to the Supreme Court, which heard the case in 1853. O'Reilly argued that Morse's legal claim that preempted the use of all electromagnetic power for communications at a distance was too broad, and was not enabled by the specification.⁶ The Supreme

⁴ This line was actually installed by Ezra Cornell, who later made a fortune installing telegraph wires and actually had patents on some inventions that were used to install telegraph wires. The company he founded became Western Union. He also later founded Cornell University in Ithaca, New York.

⁵ Numbers 23:23

⁶ Under today's law Morse's claim would run afoul of 35 U.S.C. §112, ¶1 for failing to provide a written description that would enable one of ordinary skill in the art to make or use *any system* the used electromagnetism for making or printing intelligible characters, signs or letters at any distances. At the time electromagnetism was an unpredictable art Morse had only described one way for conveying intelligible characters using electromagnetism.

Court agreed.⁷ It upheld the remainder of his claims, including a claim which may be the first successful signal claim:

I claim as my invention the system of signs consisting of dots and spaces and of dots, spaces and horizontal lines for numerals, letters, words or sentences substantially as herein set forth and illustrated for telegraph purposes.

The Court set the tone with *O'Reilly v. Morse*⁸ in 1854 that certain things were not eligible subject matter for patent protection: namely, the laws of nature, natural phenomena and abstract ideas. The Court said that the discovery of a principle in natural philosophy or physical sciences is not patentable.⁹

That was the state of the law for the next 130 years or so, including *Gottschalk v. Benson*,¹⁰ when Benson sought a patent on a computer algorithm for converting binary coded decimal numbers into binary numbers. The Supreme Court struck down that patent, holding that the invention was simply a mathematical formula with no tangible result or process, making it an abstract idea that is inherently non-patentable. The Court felt that granting monopoly protection on something that is a scientific truth such as an algorithm would have the deleterious affect of removing the scientific truth from the public domain. With that the Benson decision brought advancement of software patents to a grinding halt. Following that, software programs were routinely dismissed as mathematical algorithms that the United States Patent and Trademark Office (PTO) refused to patent. Most software inventors either quit seeking patent protection or disguised them as computer hardware.

Things began to change with *Diamond v. Chakrabarty*¹¹ in 1980. In this case, an inventor was denied a patent on an oil-eating bacteria because it was a living thing, namely a product of nature, and therefore was not patentable. The Supreme Court ruled that the invention was not a product of nature but was in fact a product of human ingenuity. The Court noted that in the legislative history of the Patent Act of 1952, that there was a statement that "anything under the sun that is made by man"

7 "Patenting Propagated Data Signals: What Hath God Wrought?", Gregory A. Stobbs, IEEE Communications Magazine, July 2000.

8 56 U.S. 62 (1854)

9 <http://inventors.about.com/library/inventors/bltelegraph.htm>

10 409 U.S. 63 (1972)

11 447 U.S. 303 (1980)

is potentially patentable subject matter. The Court stated that the courts should not read into the patent laws limitations and conditions that the legislature has not expressed.

This decision was followed a year later by *Diamond v. Diehr*¹² in which the Supreme Court held that a process is not unpatentable simply because it contains a law of nature or a mathematical algorithm. The claimed invention in *Diehr* was a process of determining the optimum time to open an oven in a rubber-curing process employing a mathematical algorithm. The Court held that the only question was whether the patent claim as a whole was directed to an otherwise statutory process regardless of whether a mathematical algorithm was employed for performing a function (curing rubber) that the patent laws were designed to protect. If that's the case, as was the case in *Diehr*, then the claims satisfy 35 U.S.C. §101 and are patentable subject matter.

The next important case was decided 13 years later, where, in *In re Alappat*,¹³ the Federal Circuit court ruled that a new and useful computer software is patentable subject matter if it has a practical application that produces a concrete, useful and tangible result. The invention in *Alappat* involved use of an anti-aliasing algorithm for a rasterizer of an oscilloscope. In *In re Lowry*¹⁴, which was decided that same year, the invention involved claims directed to a data structure stored in a computer memory. The data structure included a plurality of attribute data objects, comprising information related characteristics of an object as well as information relating to its relationship to another object, establishing a hierarchy of the data objects. The examiner had rejected the claims as being nonstatutory subject matter; but the PTO Board of Patent Appeals and Interferences (BPAI) reversed that rejection. However, the BPAI affirmed the examiner's rejection that the claimed data structure corresponded to printed matter and held that as printed matter it was not patentable due to obviousness. The Federal Circuit reversed holding that the data structure could be patented as an article of manufacture and that because the data structure was structurally and functionally connected to the storage medium, it was not printed matter. Before the *Lowry* case was decided, IBM had filed a test case involving application number 07/521,858 with the PTO where the claims at issue were all directed to a computer program embodied on a computer usable medium. These claims were all rejected by the examiner as being

¹² 450 U.S. 175 (1981)

¹³ 33 F.3d 1526 (Fed. Cir. 1994) (En Banc)

¹⁴ 32 F.3d. 1579 (Fed. Cir. 1994)

nonstatutory subject matter because of an analogy of program code to printed matter. The BPAI affirmed the examiner's rejection on August 4, 1994. IBM, after the BPI denied its request for consideration, appealed the BPAI decision (Appeal No. 95-1054) to the Federal Circuit.¹⁵ After the Lowry decision the PTO decided not to oppose the computer program product claims in *In re Beauregard*, 53 F.3d 1583 (Fed. Cir. 1995). The case was dismissed and remanded to the PTO with the statement "the Commissioner now states that computer programs embodied in a tangible medium such as floppy diskettes are patent subject matter under 35 U.S.C. § 101." The *Beauregard* application was then issued as U.S. Patent No. 5,710,578.

A few months after *Beauregard*, the PTO issued new examination guidelines for computer-related inventions. They were published in the Federal Register on February 28, 1996. They were to become effective as of March 29, 1996; and they are now found in section 2106 of Chapter 21 of the MPEP.¹⁶ The guidelines set forth new examination policies for computer-related inventions. Training materials were distributed by the PTO to teach the application of these new guidelines and inside these training materials, which were published on March 28, 1996, there was a new kind of claim listed as Example 13 under Automotive Manufacturing Plant. It was "A computer data signal embodied in a carrier wave comprising a compression source code segment comprising [the code]; and an encryption source code segment comprising [the code]." The example was accompanied an analysis of the claim and the signal claim was determined to be statutory subject matter. In Appeal No. 2,002-1554 in the case of *Ex parte Rice* (Application 08/003,996) the BPAI reversed an examiner's rejection of signal claims as being directed to non-statutory subject matter under 35 U.S.C. § 101, holding that electromagnetic signals, although "transitory and ephemeral in nature," are statutory subject matter.¹⁷

EXAMPLES OF SIGNAL CLAIMS

There are two basic categories of signal claims, either of which must be tied to a practical application of electromagnetic energy in order to comply with 35 USC §101. The first type is based on structure, and

¹⁵ *In re Beauregard*, 53 F.3d. 1583 (Fed. Cir. 1995)

¹⁶ Manual of Patent Examining Procedure, 8th edition revision 2. May 2004

¹⁷ This decision is consistent with *O'Reilly v. Morse*, 56 U.S. at 114-19 and *In re Breslow*, 616 F.2d, 516 (CCPA 1980)

the second type is based on function, although hybrids of the two are equally suitable. Structural signal claims are typically an arrangement of data segments and content of data segments, not unlike *Beauregard*, although instead of being tangibly fixed in a computer readable medium, the signal is manufactured to be propagated from one location to another before being received and processed. For example, U.S. Patent No. 6,052,150 is directed to a baseband (no carrier) data structure. It defines subcomponents of a video data signal that contain different types of data segments arranged in a linear fashion (streamed) and are useful in computer to computer or network communications that communicate at baseband. U.S. Patent No. 5,500,739 includes claims¹⁸ that define a frequency-multiplexed signal in which different types of information are contained within the different spectral components. U.S. Patent No. 5,991,330 claims the structure of a pilot channel for code division multiple access (CDMA) signal that includes an arrangement of synchronization slots, a pilot code and a framing synchronization code.

In contrast functional signal claims are an alternative to method claims and describe a mechanism for accomplishing a result. The function can be combined with structure to limit its field of use. For example U.S. Patent No 5,534,933 claims TV signals performing certain functions. Claim 1 of U.S. Patent No. 6,923,653 is directed to a computer data signal that is embedded in a carrier wave and represents a program for execution by a processor. The elements of the claim essentially describe the steps performed by the processors once the signal is received and executed by the processor. U.S. Patent No. 6,306,033 claims a computer data signal embodied in a carrier wave for causing a computer to execute a video game.

An example of a hybrid structure/function signal claim is found in U.S. Patent No. 6,505,032, which claims a carrierless ultrawideband (UWB) signal that uses a certain type of wavelet shape to avoid interference with aircraft communication systems. In this case it is the structure of the signal (certain UWB wavelet shapes) that provides a desirable end goal (avoiding interference with aircraft communication systems).

The range of structures of signals, whether formed with unique spectral or time-based shapes, baseband process, or data modulation, and the functions performed by those signals are virtually endless, and so the range of acceptable claim

¹⁸ See, e.g., Claim 109.

language is also endless. However, the flexibility in the terms used to describe an inventive signal can also be a curse because it puts the burden on the patent practitioner to accurately describe the signal so the claim will be commercially valuable. One of the most common mistakes is the adoption of language from one set of signal claims to another application. For example, a number of patent claims include the preamble “a computer data signal embedded in a carrier wave,”¹⁹ where it appears all commercial embodiments of the signal will be sent at baseband without being embedded in a carrier wave.²⁰ Accordingly, while there is no language that is *per se* unacceptable for signal claims, there may also be no “safe harbor” language that can be universally applied to describe any signal in a claim.

WHY SIGNAL CLAIMS ARE USEFUL

The use of signal claims can revolutionize how communications and software companies protect their intellectual property by providing more extensive coverage than other types of claims to increase the patent owner's litigation or licensing odds of success. They are potentially useful for any invention that involves the communication of information. For example, a method patent is not infringed unless the accused process substantially follows the patented method and employs all of the steps or stages of the patented process in the U.S.²¹ In such case the infringer is often not the patent holder's competitor but is more often the customer of the patent holder's competitor. The competitor, who is supplying the customer with the software that results in infringing the process claims, would only be liable for contributory infringement. Contributory infringement is defined in 35 U.S.C. § 271. To be liable for contributory infringement, the end user must be found liable for direct infringement. However, there can be no contributory infringement without direct infringement.²² Furthermore, the contributory infringer must have had knowledge of the infringement.²³ Many courts require a showing of intent as well.²⁴ Moreover, there is no active inducement of

¹⁹ We see no value in identifying specific patents that use this language.

²⁰ Carrier waves are used to shift signals up to higher frequencies so they can be transmitted wirelessly, or frequency-multiplexed in multiple access systems.

²¹ See *Pelligrini v. Analog Devices, Inc.*, 375 F.3d 1113, 71 USPQ2d 1630 (Fed. Cir. 2004). However compare *NTP, Inc. v. Research in Motion, Ltd.*, 03-1615 (Fed. Cir. 2005) where the Federal Circuit held that infringement occurs within the U.S. when two domestic users communicate even though the message may travel through Canada. The court reasoned that “control and beneficial use” of the product claims occurred in the U.S.

²² *Porter v. Farmers Supplies Services Inc.*, 790 F.2d. 882 (Fed. Cir. 1986)

²³ *Preemption Devices, Inc. v. Minnesota Mining & Mfg. Co.*, 803 F.2d 1170 (Fed. Cir. 1986)

²⁴ *Water Technologies Corp. v. Calco Ltd.*, 850 F.2d. 660 (Fed. Cir. 1988), Cert. denied, 488 U.S. 968 (1988)

infringement if the software has other non-infringing uses.²⁵ Establishing a case of contributory infringement is a significant burden on the patent owner. Furthermore, most direct infringers are end users of software, namely, consumers, who have limited resources and make for unattractive candidates for a lawsuit. Because of these hurdles in enforcing software method patents, these patents can be perceived as having limited commercial value and so many software developers will opt not to pursue such claims. The use of claims to software embodied on an article of manufacture improves the enforceability of software patents. With these claims, the patent holder would be able to sue anyone who makes, uses, offers to sell, or sells the invention.²⁶ Thus, the patent holders' competitors who sell an infringing product will be liable for infringement.

Signal claims provide broader rights that address some of the problems associated with computer program product claims. They can be drafted using functional and/or structural language. They are different from a business method claim, and there is no prior user right defense that is applicable.²⁷ Signal claims carrying a computer program cover downloadable software that makes a competitor who makes the signal and offers to sell or sells it an attractive target of an infringement suit. Literal infringement can be established if the signal is imported into the United States. Direct infringement doesn't require proof of knowledge or intent to infringe; therefore, the fact that some of these infringers lack knowledge of the infringement is not relevant. Thus, telecommunications companies and internet service providers face a high risk of infringement liability. Current technology allows for relatively simple detection of direct infringement of signal claims.²⁸

Signal claims can be especially useful in arguing to a patent pool administrator, or a licensee that the claims are essential to a standard, such as a telecommunication standard. Industry standards are the mechanism by which companies achieve interoperability for new products. Regardless of how the signal is produced, the signal is readable observable when outputted from an electronic device, and must be of a certain format to be compatible with third party products. Having

²⁵ C.R. Bard, Inc. v. Advanced Cardiovascular Systems, Inc., 911 F.2d. 670 (Fed. Cir. 1990)

²⁶ 35 U.S.C. § 271(a)

²⁷ 35 U.S.C. § 273

²⁸ "A New Frontier in Patents: Patent Claims to Propagated Signals", Scott A. Horstemeyer and Daniel J. Santos, 17 J. Marshall J. Computer & Info. L. 75 (1998)

a claim that reads on a signaling standard is sufficient to prove infringement if the alleged infringer admits that its product is compliant with the signaling standard.

SIGNAL CLAIMS ABROAD

The U.S. is leading in this area of patenting signal claims with the Europeans still resistant to allowing patenting of software *per se* and they have not substantively addressed the question of signal claims. In one Appeal decision, T163/85, the Technical Board of Appeal (TBA) of the European Patent Office (EPO) decided that while a TV system solely characterized by the information *per se*, e.g., the moving pictures modulated on a standard TV signal may fall under the exclusion to patentability as per Art. 52(2)d and (3), a TV signal defined in terms which inherently comprised the technical features of the TV system in which it occurred is available for patent protection. The law in Europe is better developed with regard to software. The European Patent Convention (EPC) and the TBA decisions require software to possess a technical character in order to be considered patentable subject matter. Computer programs as such are precluded under Articles 52(2) and 52(3) of the EPC. Under Article 52(1) of the EPC, and under rules 27 and 29 of the European Patent Office, an invention must be of a "technical character" to the extent that it must be in a technical field, must be concerned with a technical problem, and must have technical features. The EPO does grant patents on computer program product claims that have a technical character.²⁹ The European Commission's Communication of February 5, 1999 stated that the law on patentability of computer programs in the United States has had a positive impact on the development of the software industry there. The Commission proposed a directive (COM (2002) 92-2002/0047) to harmonize patentability of computer programs in the European Union including Amendment 18 that included signal claims as subject matter eligible patent protection. However, the directive failed to pass in 2005. Nevertheless, at a March 18, 1999 conference in Munich, Germany, Paul Van Den of the European Patent Office, reacted favorably to a participant's suggestion that signal claims having a technical character could be patented.

²⁹ <http://library.findlaw.com/1999/Mar/1/128760.html>

In Japan, the application of a scientific principle is a prerequisite to patentability under Article 2 of the Japanese Patent Act.³⁰ Japan has expressly addressed signal claims with its revision of the examination guidelines for computer-related inventions in January 2001 in section 1.1.2, 1a quoting “when a patent is sought for program signals or data signals, since they cannot be classified into a statutory category ... it violates section 36(6)ii of the Patent Law.” To qualify as a statutory invention as prescribed under Japanese patent law, the invention must be “a creation of technical ideas using a law of nature.”³¹ Japan does however allow “program” claims, which are not statutory subject matter in the US unless the program is embodied in a physical media. Thus many Japanese companies obtain program claims as a way to protect against offshore infringers that may download software into Japan. Of course, in the U.S. similar type of protection would be available with signal claims or computer program product claims because once the offshore infringer sends its program to a network in the U.S., the program is embodied in the memory of a router, memory buffer or the like.

In Canada, the Canadian Patent Office has issued examination guidelines that expressly provide for the patentability of signal claims.³²

THE FUTURE

The courts have not addressed the issue of whether the propagated signal claim is statutory³³. It is wise to include the other conventional claims to ensure adequate protection in the event that the signal claim is held to be non-statutory.

In the future, after it is more certain that signal claims will be accepted as patentable subject matter by the courts, propagated signal claims can potentially be a boon to patent owners. It will reduce the number of claims required to obtain strong patent protection for

³⁰ An invention is defined as “the creation of technical ideas by which a law of nature is utilized.”

³¹ See LES Journal of Japan, Issue No. 15, October 2001 http://72.14.207.104/search?q=cache:g6lP_qA23ucJ:www.lesj.org/contents/english/image/04wind/winds_pdf/No15.pdf+signal+claims+japan+patent+office&hl=en

³² “Software and Business Method Patents—The Latest Development,” Isis E. Caulder, IT.CAN Annual Meeting October 23-24, 2003, Toronto, Ontario, Canada.

³³ A signal claim that has a practical application producing a concrete, useful and tangible result should be eligible for patenting. It defines a physical phenomenon that can be detected and serve as a machine element that affects the operation of a computer when acted upon. *In re Alappat*, 33 F.3d 1526, 31 USPQ2d 1545 (Fed. Cir. 1994)(*en banc*)

computer programs and therefore reduce the costs of applying for patents. Many of the currently standard claims for receivers and transmitters will likely be eliminated.

A major concern with propagated signal claims is the effect on "innocent infringers" such as ISPs and telecommunication companies. Direct infringement is a strict liability offense. It is unclear how the courts and legislatures will address what these "innocent infringers" consider to be a significant problem. It is instructive to consider what has occurred in the area of copyright infringement on the Internet.

In the copyright area, there have been significant efforts to address the "innocent infringer" problem. In the major case, *Religious Technology Center v. Netcom On-Line Communications Services, Inc.*³⁴, the court found that Netcom was not liable for direct infringement merely because it installed and maintained a software system that automatically forwarded messages received onto its network. The court stated that it would be unreasonable to hold the entire Internet liable for conduct it could not reasonably control because of the volume of data passing through it. The court also held that Netcom couldn't be held liable because it didn't receive a direct financial benefit from the infringement.

Little has yet been done in this area of patent infringement. Critics contend that holding ISPs and telecom companies liable as direct infringers would not be appropriate, as it would be a substantial hardship on these parties. Further, such hardship, and related expense, will likely be spread to the public through higher fees.³⁵ It is not clear where the Bush administration stands on the issue.

It is clear, however, that if the availability of "deep pockets" infringers is a significant impetus for the development of signal claim patents, then the answer to the question of subject matter eligibility for signal claims is very important.

³⁴ 907 F. Supp. 1361 (N.D. Cal. 1995)

³⁵ "Patenting Signals, Richard H. Stern, IEEE Micro, March/April 1998.