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Controversy in Video Game Invention: The Infallible Pioneer Patents

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About the authors

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Of all the legal battles encountered in the video games industry to date, the "Pioneer Patents" associated with the Magnavox Odyssey – the first video game console -- have resulted in arguably the fiercest legal battles over the longest period of time. From the 1970s to the 1990s these patents proved insurmountable in a series of lawsuits. During this time, if you manufactured a computer game that ran on a console that plugged into a TV set then you could not ignore the legally-imposed market barriers erected by these patents. In particular, what has become known as the "'507 patent" was used to force video game manufactures to buy costly sublicenses from Magnavox in order to operate legally. By focusing on the results of the early legal cases, this paper presents a description as to why the '507 patent held up so well and attempts to clarify, for the non-legal mind, why the '507 patent, together with related patents, embodied and directed the origin and initial development of video games as we know them today.

1. Introduction

Controversial video games are rarely far from the headlines of the popular media and usually relate to, what some individuals may consider, an infringement of some moralistic code pertaining to video gaming content. However, arguably the most controversial video games presented during the industry's nascent stages gain their controversy based on disputes centered on their legal ownership and commercial practices, not necessarily their offending nature. Specifically, the use of United States patent laws has driven the industry since the pioneering video game patents emerged.

A patent for an invention is the United States government's grant of an exclusive property right to the inventor. In particular, the U.S. patent statute provides a patent owner with "the right to ***exclude*** others from making, using, offering for sale, or selling" the patented invention in the United States or "importing" the invention into the United States. Therefore, a patent does ***not*** grant the right to make, use, offer for sale, sell or import. Instead it empowers the patent owner to prevent others from doing so. As a result, a patent owner may charge others monopoly prices of market participants for the right to make, use, offer for sale, sell or import the patented invention and may prohibit infringers from doing so through civil enforcement proceedings. Patents can therefore be among a patent owner's most valuable assets.

Patents have been used in the video games industry, as in all industries, to protect technology ownership and prevent profiting from the work of others without due compensation. Some patents, irrelevant of what one's opinion regarding their apparent triviality or obviousness, can be worth millions – or billions - of dollars to a company or individual. Conversely, the successful effort to invalidate a patent can save companies millions of dollars in license fees and legal costs by eliminating a competing patent owner's rights to exclude others from making, using, offering for sale, selling or importing the patented invention in the United States.

In terms of the number of legal actions and their far reaching impact on all video game and console manufacturers, the most controversial patents are likely the first patents issued that relate to video gaming apparatus. These patents describe an invention that allows games to be represented on a standard TV set. The invention is quite specific in the style of gaming afforded to players and describes the simulation of collision and response via symbols on a TV screen. At first glance this seems like a far reaching patent which would hinder any manufacturer making similar "hitting" type games using a standard TV set. Considering some of the most popular games of the time (1970s) were based on this simple action (e.g., Pong), whoever had the exclusive rights to these patents would be in a strong business position: all manufacturers would have to sublicense their activities to enable the legal selling of such video games and their consoles.

Patents that define a new industry and herald a distinct new advance in an art are considered "pioneer" patents. Such patents are afforded broad legal protections. But, even today, after a number of costly legal battles, the pioneer patents of the video games industry are controversial, and the actual inventor of video games is questioned. One reason for this controversy is the fact that what the general public recognizes as video games did exist before these patents were sought. The general observer, lacking

expertise in this specialized area of United States law, could reasonably presume that if these early games were indeed “video” games then their existence as prior art would invalidate the Pioneer Patents, eliminating their monopolistic barriers to competition among video game firms. However, early incarnations of video games did not invalidate these pioneer patents, ensuring monopoly control of the state of the art technology for the duration of the patents by the patent-holders.

If prior art could not invalidate the pioneer patents of the video games industry then advances in technology may provide a distinctly different process for achieving video game implementation (a different invention), avoiding costly sublicensing fees. The pioneer patents did not, for example, use modern integrated circuitry such as CPUs. Therefore, one may assume that such an invention, so apparently different from that described in the pioneer patents, would not infringe the pioneer patents. However, the pioneer patents held their grip on the video game industry well beyond technological advances that made their originally implemented embodiments appear antiquated.

Numerous articles and books have considered the birth of the video games industry. However, a description focusing on the pioneer patents and their ability to withstand legal scrutiny is rarely offered in isolation. By considering the basic facts as decided upon in a number of lawsuits and the timeline of events surrounding them, this paper affords the reader an uncomplicated view of the birth of the video games industry. This paper seeks to allow the non-legally trained reader to construct their own informed opinions related to such questions as: (1) “why was prior art unable to act as a means by which the pioneer patents could be overturned?”; (2) “why did the patents hold up so well in the face of technological change?”; (3) “why did game developers, not only console developers, have to acknowledge the pioneer patents?”.

The results reached in the three lawsuits described later in this paper suitably demonstrate the strength of the pioneer patents in withstanding attacks on their validity. Via these lawsuits and references to historical fact - while leaving out the opinion of those involved - one may gain a clearer understanding regarding this first controversy in the video games industry.

2. The United States Patent System

In this section we provide a basic understanding of some key aspects of the United States patent system. This is not intended to address all principles of patent law but rather only to introduce some concepts necessary to our discussion.

2.1 Basis for the U.S. Patent System

The United States Constitution empowers Congress to enact laws relating to patents. Article I, section 8, provides that “Congress shall have power . . . to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and

discoveries." Congress has from time to time enacted various laws relating to patents, beginning with the first patent law, enacted in 1790. Among other things, the patent statute establishes the United States Patent and Trademark Office to administer the law relating to granting of patents.

Under U.S. Patent law, a person is generally free to make, use, offer for sale or sell or import anything (subject to non-patent related legal restrictions, of course). Therefore, it is important to recognize that the patent statute grants patent owners, "the right to ***exclude*** others from making, using, offering for sale, or selling" the patented invention in the United States or "importing" the invention into the United States. A patent does ***not*** grant the right to make, use, offer for sale, sell or import, but rather allows the patent owner a legal mechanism to prevent others from engaging in those activities with respect to an invention.

United States patent grants are only effective within the U.S., its territories and possessions. Since June 8, 1995, new patents have provided a 20-year period of exclusive right from the date on which the patent application was filed in the United States, subject to the payment of maintenance fees. Before that date – as with the Pioneer Patents - inventors received the longer of the 20-year term or a period extending 17 years from patent issuance. In special cases, the patent term extends from the date an earlier related application was filed. Under certain circumstances, patent term extensions or adjustments may be available. After a patent's term expires, others may generally make, use, offer for sale, or sell or import the previously-covered invention without permission from the patent owner.

2.2 Patentable Subject Matter

The patent statute specifies both the subject matter that can be patented and the conditions under which a patent may be obtained: any person who "invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent," subject to the conditions and requirements of the law. These enumerated classes of subject matter, when combined, include practically everything made by man and the processes for making such products.

The patent law also specifies that the subject matter must be "useful." That is, it must have a useful purpose and be operative. No patent would be granted for a machine which does not operate for the intended function, *i.e.*, it would not be deemed useful.

United States courts have established limits on the subject matter that can be patented, determining that a patent cannot be obtained for only an idea or suggestion. Physical phenomena, abstract ideas, and laws of nature do not constitute patentable subject matter. Instead, an applicant for a patent must provide a complete description of the machine or other type of subject matter.

2.3 Prior Art and Patents

Only new and novel inventions are patentable. No patent may be granted if the subject matter sought to be patented is shown by the so-called "prior art." In this regard, the patent law provides that an invention cannot be patented if the invention was: (1) "known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent," or (2) "patented or described in a printed publication in this or a foreign country or in public use or on sale in this country more than one year prior to the application for patent in the United States . . . ."

It does not matter when the invention was made or if any prior art printed publication or public use was by the inventor or another party. An inventor must apply for a patent before one year has elapsed if he or she has described the invention in a printed publication, used the invention publicly, or placed it on sale. Failing to do so will cause the inventor's right to a patent to be lost.

Where the subject matter is not exactly shown by the prior art, a patent may still be refused if the differences between the subject matter and the most similar, known thing would be obvious. For example, changes in the size or color of an invention are usually not patentable. Instead, the subject matter must be sufficiently different from what has been previously used or described to the extent that the invention may be said to be "nonobvious" to the hypothetical person having ordinary skill in the field of the invention.

2.4 Assignment and Licensing of Patent Rights

Under U.S. law, patents are regarded as personal property. They can be sold, mortgaged, passed on, and inherited. The patent law allows for the transfer or sale of a patent, or a patent application through a legally-operative writing. Such a written instrument is known as an "assignment." An assignment may transfer the owner's full interest in the patent. The party receiving the assigned patent, known as the "assignee," becomes the owner of the patent. An assignee owns the same rights as the original patentee.

The Patent law further provides for assignment of only a partial (or less than 100%) interest in a patent, *i.e.*, a patent "license." A patent owner may also grant the same interest as a full assignment but limit those rights to specific geographic region(s) within the United States. A conditional assignment transfers patent ownership. Such assignments are absolute unless and until canceled by the parties or a court.

2.5 Patent Infringement Lawsuits

Consistent with its exclusionary right, infringement of a patent consists of the unauthorized making, using, selling or offering for sale, any patented invention within the United States or its possessions during the term of the patent. Infringement also arises from a party importing any patented invention in that timeframe.

A patentee (or assignee or exclusive licensee) may sue to remedy past and ongoing infringement of its exclusion rights in United States federal court. A court is empowered to award damages to compensate the holder of patent rights for the infringement and to issue an injunction preventing further infringement.

Patent infringement is determined by interpreting the language of the patent's claims and then comparing those claims to the thing accused of infringing to determine if they are similarity or different. An accused infringer may argue that it does not infringe the claims of the patent. If what the defendant is making, using, selling, offering for sale, or importing does not fall within the scope of the language of any of the claims of the patent, there can be no "literal" infringement. However, an accused product may still infringe by achieving the same result as a claim in the patent, even if by slightly different – but "equivalent" - means. Pioneer patents – *i.e*., those that bring about a new technology – are afforded broader protections than patents that merely improve on existing technology.

Typically, in an infringement suit, the accused infringer will also defend itself by presenting a challenge to "validity" of the patent. Often, an accused infringer will present alleged prior art, arguing that the asserted patent's claims are not new, novel or nonobvious enough to be patentable. Such questions of validity, are decided by the court and the party seeking to invalidate the patent bears the difficult burden to prove such invalidity. However, when patent claims are deemed invalid by a court, those claims are lost and cannot be asserted by the patent owner.

3. Video Game Development History

In this section we seek to highlight the main events that occurred prior, during and immediately after the pioneer patents were filed. This latter information may be gained from many sources, often furnished with many additional anecdotes of the individuals involved. However, for the purposes of this paper the timeline of events and those involved in such events are all we are interested in.

3.1 Academia

With the initial development of "Tennis for Two" by William Higginbotham as an interactive exhibit for the Brookhaven National Laboratory the era of "video games" had arrived by 1958 [5]. Numerous web pages (e.g., [6]) describe earlier games such as OXO running on the EDSAC at Cambridge in the early 1950s and a missile style game simulator created in the 1940s in the USA. However, *Tennis for Two* was designed with the general public in mind as a form of entertainment (not computing demonstration). Although *Tennis for Two* was played by the public, these types of "video games" did not reach a mass appeal until the development of "Spacewar!" in the 1960s at MIT.

Spacewar! was an idea of Steve Russell, Martin Graetz and Wayne Wiitanen in 1961, with the eventual game running on the PDP-1 computer (Steve Russel was the primary developer). The PDP-1 [4] was

created by DEC and was more mainframe than what one would consider a microcomputer today and cost approximately $120, 000. *Spacewar!* was a popular game and was played in university campuses across Northern America. However, due to the nature of the computer required to play the game (primarily the size and cost) the general public rarely got a chance to play *Spacewar!*. Commercialization of such an expensive game could not be considered with such a high cost associated with the computer required to play it.

As miniaturization of components progressed in the computer industry, it became possible to reprogram *Spacewar!* onto a device sufficiently small to provide the first recognized video arcade machine. This delivered video gaming beyond the university mainframe computing science lab to a much wider audience. This coin operated arcade game known as "Galaxy Game" was created by Bill Pitts and Hugh Tuck. Only one was created and installed at Stanford University's student union building (Tresidder Union) from 1971 [3].

Although eager students waited in line to play *Galaxy Game*, it was not a commercial success. As such, the company responsible for *Galaxy Game* that was setup by Pitts and Tuck (Computer Recreations) played no significant role in the commercial video games industry. As with *SpaceWar!* before it, the major obstacle in commercialization was the cost. The PDP-11/20 [10], on which *Galaxy Game* ran, cost $14,000 with the display costing a further $3, 000. Such a price was beyond the usual outlets considered suitable for public entertainment games of the time (i.e., where one may find pinball machines, such as bars and coffee houses). Cost efficiency was improved in 1972 to allow four to eight consoles to be driven by the computer and installed in the Coffee House at Tresidder Union in June 1972. This provided students with gaming throughout the 1970s, but only at the original installation at Stanford. By 1972 other manufacturers had developed gaming systems that could be manufactured at a much reduced cost compared to *Spacewar!* and *Galaxy Game*, allowing the realization of the commercial benefits of video gaming by selling such devices for use by the general public.

3.2 Atari

In 1971 Nolan Bushnell, together with colleague Ted Dabney, commercialized a clone of *SpaceWar!* and created a standalone version that was much cheaper to produce than *Galaxy Game* [2]. Bushnell had played *SpaceWar!* during his days as an undergraduate at Utah University and must have considered the game engrossing enough to be a commercial success. Unlike the expensive minicomputer required for *Galaxy Game*'s construction, Bushnell and Dabney created the circuitry to play their game from relatively cheap electrical components (removing the high cost of a minicomputer) and replacing the high cost monitor with a standard TV; in essence, they created a dedicated platform with the sole purpose of running *SpaceWar!* The "Computer Space" arcade game seemed destined for success as Bushnell and Dabney sold their idea to Nutting Associates. However, this was not the case and *Computer Space* did not meet with universal praise, nor make sufficient money to warrant a business. One may assume that the Stanford University students may have been more inclined to take time to learn to play *Galaxy Game* than bar patrons were to learn *Computer Space*.

Not to be perturbed by this initial lack of interest Bushnell and Dabney tried again to commercialize video games, this time with their own company. By 1972 Bushnell and Dabney had incorporated their company and hired additional developer Al Alcorn to help produce a game more readily understood than *Computer Space*. The original name of the company was Syzygy, which was later changed to Atari as Syzygy was used by another company. The resultant game was "Pong". As with Computer Space, *Pong* was created with low cost electronic components to make it a viable option for commercialization.

Pong was trialed in a local bar and immediately found small scale success as patrons of the bar found the game instantly playable and started depositing quarters to play the game. This success convinced Bushnell to manufacture the arcade game himself, producing and selling 8,000 – 10,000 machines by 1973. However, due to the off-the-shelf component architecture of the *Pong* arcade machine anyone was able to copy the manufacturing of the game. Soon many imitations were available from a number a different companies (including "Computer Space Ball" from Nutting Associates).

3.3 Magnavox

Video games entered the home as soon as they had entered the arcade with the introduction of the Magnavox Odyssey games console in May 1972 [8], with mass production and subsequent sales to the general public occurring from late August that same year. The Magnavox Odyssey is based on a prototype developed by Ralph Baer, William Rush and William Harrison while at Sanders Associates.

Who actually developed the original idea and proof of concept of what eventually became the Odyssey is attributed to Baer [7]. In 1966 Baer created the initial plans for a game and later demonstrated a game using a prototype games console with the use of a TV screen in 1967. Subsequently, Baer recruited Harrison and Rusch to help with creating a gaming system designed to run on a regular home TV set [11]. By 1967 a fully functioning ping-pong style game was running and by 1968 a number of other game environments could be demonstrated (albeit very similar to each other). During 1969 demonstration of the device, commonly termed by Baer as the "Brown Box", was made to a number of TV companies to determine the validity of commercialization. One of these companies was Magnavox, which eventually agreed to produce and manufacture the device by signing an Exclusive License Agreement in March 1971 which was exercised by Magnavox on 27th January 1972 [8].

The Magnavox system was branded the Odyssey and sold over 100, 000 units on its release at $79.99 - $100 [12] (the system was quickly discounted). A feature of the Odyssey, which remains with today's consoles, was the manner with which a variety of games could be played on a single console. Games could be selected by inserting a cartridge that altered the electrical settings in the main console and afforded the home game player with 12 different gaming scenarios (more game cartridges were released later). Due to the technical specifications of the Odyssey, the system was not a general purpose programming environment (as you expect from a CPU in a modern computer) and each game altered settings of the machine to gain gaming variety. Color was possible by placing overlays on the screen. The original Brown Box could generate color images, but for cost purposes Magnavox decided against this for the commercial version [8]. The screen overlays provided an additional function in that they were

required to enable game play as without them the actual gaming environment would be missing for many of the games. For example, the lines pertaining to the tennis court were drawn on the overlays.

3.4 Protection

The earliest video games produced by academics and students were developed without awareness of their commercial potential. Higginbotham did not seek a patent on his earliest invention and the development of *SpaceWar!* and *Galaxy Game* were achieved in the spirit of academic freedom, predominantly to demonstrate computing ability. Although the initial popularity of *Galaxy Game* tempted the developers to pursue a business approach, expensive development costs provided no commercialization possibilities. Baer and Bushnell, however, did see commercial potential in video games.

Baer, Rusch and Harrison filed for patents associated with their invention – embodied by the Magnavox Odyssey game console - and explored commercialization with TV manufactures of the day. Their aim was to deliver video gaming to the home utilizing a standard TV set, which the majority of homes had in the late 1960s in the USA. Bushnell attempted commercialization of *SpaceWar!* and viewed the possibility of replacing existing entertainment machines in bars and other public spaces with video games. If the general public had shown no interest in video games, at home or in public places, then there would be no commercialization possible and therefore minor (if any) business issues with regard to legal implications. However, the revenue generated by Atari and Magnavox, as well as others, soon required legal proceedings to clarify certain rights associated with the business practices of the day.

Magnavox showed dissatisfaction with other vendors when they attempted to provide gaming systems similar to their Odyssey gaming console. Even the games appeared very similar as Atari's *Pong* and the *Pong* clones of other manufacturers had a very similar appearance to the Magnavox *Table Tennis* game. Posed with such similarities, lawsuits were initiated by Magnavox to protect its business. The Odyssey was indeed the embodiment of that company's exclusive license of the Baer, Rusch and Harrison patents. Magnavox sought to assert its monopoly and force all others to acknowledge it. The case was simple: Magnavox insisted that subsequent gaming devices developed and sold by other manufacturers infringed on the Baer, Rusch and Harrison patents, to which Magnavox held exclusive rights under their agreement with Sanders Associates.

4. Ownership

In this section we describe the patents associated with the earliest developments of the video games industry (those of Baer, Rusch and Harrison). A brief description of the inventions and how they worked is presented.

4.1 Patents

A number of patents were issued pertaining to the work carried out by Baer, Harrison and Rusch at Sanders Associates relating to their video game console:

- **U.S. Patent #3,659,284** "Television Gaming Apparatus," filed 27-May-1969, granted 25-April-1972, inventors: William T. Rusch, Assignee: Sanders Associates
- **U.S. Patent #3,659,285** "Television Gaming Apparatus and Method," filed 21-August-1969, granted 25-April-1972, inventors Ralph. H. Baer, William T. Rusch, William L. Harrison, Assignee: Sanders Associates.
- **U.S Patent #3,728,480** "Television Gaming and Training Apparatus", filed 22-march-1971, granted 1973, inventor Ralph H. Baer, Assignee: Sanders Associates).
- **U.S. Patent # RE28507** for "Television Gaming Apparatus", filed 25-April-1974, granted 1975

The reissue patent RE28507 relates to alterations made to patent 3,659,284. Reissue patents are used to fix problems an earlier patent may exhibit (e.g., inappropriate wording, clarifying claims). The original version of the patent provided 59 claims with the reissue patent adding a further 5 claims. For convenience and brevity, these patents shall be individually referred to by their last three digits in the remainder of the paper (i.e., '284, '285, '480, '507 individually, and collectively, the "Pioneer Patents").

4.2 Precedence

By just looking at the patents alone one may be misled into thinking that Baer does not hold the earliest patent. In fact this honor goes to Rusch when just considering filing dates and named inventors. However, the '480 Baer patent directly references an earlier patent application that was filed in 1968: continuation of a patent application with serial number 697,798 (which is classified on the '480 patent as abandoned). In the *Manual of Patent Examining Procedure* a continuation application is defined as: "*a second application for the same [or similar] invention claimed in a prior nonprovisional [regular] application and filed before the original [or prior application] becomes abandoned or patented*".

The patent application with serial number 697,798 was filed on January 15 in 1968 and therefore represents the original invention accredited to Baer alone. This backs up the claims made in [7] which also states "*Ralph patented his invention on January 15th 1968 and began the design of a more advanced system playing multiple games*". The '798 application (which was superseded by the '480 patent) referred to the earliest demonstrable device created by Baer and his team. The '284 and '285 patents both refer to the 697,798 application in their "Background to The Invention" sections, indicating that these patents acknowledge this earlier work. The '284 patent goes as far as to ensure a "Certificate of Correction" associated to the '284 patent (signed and sealed on 8th May 1973) requires that the number 697, 798 is read as 126, 966 which is the application number of the Baer '480 patent.

4.3 Invention

The patents associated to Baer, Rusch and Harrison clearly describe their Brown Box and the manner with which it operated. In essence, game play is described via the representation of symbols on a TV where such symbols may move and represent the notions of being "hit" and "hitting" as directed by a player via some controlling device. In addition, the invention also affords interactivity with such symbols by managing some symbols itself. Technically, this is described with numerous mentions to implementation details pertaining to the construction of the brown box. Importantly, how the circuitry handles the notion of "coincidence" between symbols is described in detail, using a number of games as references for such descriptions. References are made throughout the descriptions to how the aesthetics of representation may relate to certain types of games. For example the rounding of symbols to derive a more appropriate ball shapes.

The '284, '285, and '480 patents may appear somewhat similar on first glance. The '284 patent mentions the applicability of sawtooth wave generation in relation to symbol manipulation while the '285 patent mentions voltage controlled delay of pulses and coincidence gating in a similar vain. Sawtooth wave generation was a standard way for generating a raster image (image constructed from pixels) on a cathode ray tube (CRT). Therefore, the patents clearly associate themselves with the notion of generating a gaming device for use on a standard TV set of the time. To quote directly from the '284 and '285 patents: "*Since most homes are equipped with television receivers, the only expense required to provide added family enjoyment (as well as training means) is the expense of a control unit of one type or another*". The part in brackets is included in the '285 patent only.

4.4 Gaming

The patents are clearly related to the notion of gaming as all three patents emphasize the relationship of the invention to video gaming. The '285 patent has clear descriptions of the games possible on the device, with a series of diagrams showing the expected screenshot of the game and the associated circuitry required for the game to be implemented. The games shown in this manner are: Ping-pong, handball, volleyball, golf putting, "pumping" game, target shooting. In patent '284 a similar series of diagrams describing ping-pong, baseball, hockey, handball, pinball, and bowling games. The '480 patent includes diagrams that pertain to a target shooting game.

Of interest is the mention of the overlays required to play a variety of games. These overlays are translucent in nature and were a requirement to enable game play for many games on the original Odyssey console. However, the patents do not specifically inhibit the playing of a game without the overlays; in fact the patents cover content that may be generated for screen display by the invention itself or by third parties. All patents identify: "*….pictorial information originated in the television receiver by commercial TV, closed-circuit TV or CATV station*".

4.5 Odyssey

Marked on the Magnavox Odyssey casing are patents that protect it: "*Covered By One or More of The Foll. U. S. Patents: 3,659,284; 3,659,285; Other Patents Pending".* By acknowledging such patents Magnavox acted with the understanding that it had an exclusive license for video games from Sanders Associates via the Baer, Rusch and Harrison patents. However, only the '284 and '285 patents are used to identify this.

The games released with the Odyssey in the USA were as follows: Table Tennis, Tennis, Hockey, Cat and Mouse, Football, Ski, States, Roulette, Haunted House, Analogic, Submarine, Simon Says. A number of these games were mentioned in the patents of Baer, Rusch and Harrison with a number of additional games added with little complication [1]. Players determined which game they wanted to play by inserting the appropriate cartridge into the Odyssey. As the only symbol representation possible by the Odyssey was two paddles (representing player symbols) a ball and a vertical line, the use of the overlays was required on all games but *Table-Tennis*. As the console could only produce black and white, very simple, graphics the Odyssey came with additional accessories to help the gamer (e.g., roulette chips, dice, play money).

Taking advantage of the Odyssey's ability to play games based on the cartridge inserted, Magnavox released additional games for $5.49 each or $24.99 for six [1]. In addition, a rifle with associated games was released to allow a player to "shoot" their TV screen. All games worked in accordance to the Baer, Rusch and Harrison patents. Two details worth mentioning are the facts that the Odyssey did not have on screen scoring (the player had to keep track of scoring themselves) and had no sound [22].

5. Lawsuits

We concentrate on the three main lawsuits relating to the Pioneer Patents described in the previous section. We consider the results of these lawsuits to sufficiently assess the importance of those patents.

5.1 Magnavox Co. and Sanders Associates v. Chicago Dynamic Industries, et al.

As the first video games where constructed with readily available electrical components and they proved popular with the public, it was not long before a number of competing devices were being sold by others to turn a profit. Atari's *Pong* was well known to the public and the Magnavox Odyssey sold in excess of 100, 000 units. Other manufacturer's created video gaming devices, predominantly in direct competition with Atari *Pong*'s dominance in the arcade business.

In 1976 legal proceedings were started by Magnavox and Sanders Associates in the United States federal court in Illinois that would ultimately help in defining not only who had the legal right to license the sell, but who would be credited with actually inventing the video game. A number of arcade device manufacturers of the time were involved and they all appeared to provide *Pong* type clones: Bally Manufacturing Corporation (Bally Playtime); Midway Mfg. Co. (*Winner*); Chicago Dynamic Industries Inc.

(*TV Ping Pong*); Empire Distributing Inc.; Seeburg Industries (*Paddle Ball*); Sears, Roebuck & Co. (Atari *Pong* – home edition); Atari Inc. (*Pong*). Atari fired back its own patent infringement counterclaim against Magnavox.

In summary, the court identified the subject art as one for playing video games on cathode ray tubes by means of electronic circuitry. Magnavox, as the patent holder for the invention, alleged that its competitors' games infringed the '507 patent. The court ruled in favor of Magnavox, determining that although the circuitry of the patent did not contain anything novel or patentable, that novelty and patentability existed entirely in the feature of the player-controlled hitting symbol. The court also found that the concept embodied in the patent had great commercial success. The patent was valid because it was not obvious at the time of its invention. Judge Grady ruled that the competitor's games infringed on the claims of the patent because they contained or used a player-controlled hitting symbol. Finally, the court found that the various ways that the competitors' games were argued to be different than the claimed invention were insufficient to avoid a finding of infringement. In particular, he found that the use of digital, instead of analog, circuitry by the defendants was immaterial because those two equivalent means could be used interchangeably to achieve the patented invention.

The case lasted from November 4th 1976 until January 10th 1977 and focused on the '507 patent (reissue of the '284 Rusch patent). Judge John F. Grady presided and heard the claims and counterclaims relating to possible infringement and validity of the '507 patent. As one would expect, this included a number of demonstrations of the devices in question and the testimony of a number of individuals who created the devices (including Baer himself). Of all the early video game cases, this is probably the most groundbreaking, by virtue of being both the first lawsuit in the video games industry and a key event to establish the availability of patent protection in relation to commercial video games.

The case in issue was not as simple as who invented a specific game (*Table Tennis*/*Pong*/*Tennis-for-Two*). This misconception is understandable as Atari had made *Pong* the most famous game of the age and the cost efficient technology (suitable for commercialization) of the time leant itself to this type of game most conveniently (and the public could readily understand how to play it). The case was more focused on the underlying mechanisms associated with video game representation (display) and manipulation (the invention described in the '507 patent). Therefore, key to understanding the claim scope of the patented invention - and therefore whether infringed – was whether a device allowed players to influence the manipulation of hitting and being hit within a video game and the representation of these actions via symbols on a TV screen.

The trial lasted a significant amount of time, with substantial amounts of technical details heard and considered. Due to technical limitations of the devices of the day, most of the games produced by manufacturers appeared similar in style and operation. However, for a technically minded individual such similarity is quite misleading when getting to the core of the issue (the essence of what commercial video gaming devices actually attempt to simulate).

A few interesting notes may be found in the court documents that clarifies the timeline associated to Bushnell and Baer's work and the subsequent commercialization of such work. This is important as

Magnavox must clarify that their patents are associated to work prior to Bushnell's attempts at commercialized *Pong* and *SpaceWar!*, as Bushnell used a similar avenue to technical implementation for cost efficient reasons.

Bushnell is discounted as having realized the cheap production possibilities afforded by TV related technologies before the Baer, Rusch and Harrison patents associated to the Odyssey had been filed. The court documents describe that prior to August 21st 1969 Bushnell had not invented, designed, or built any apparatus for playing games using television type raster scan display. The court documents also clarify that Bushnell had no knowledge of any other apparatus for achieving this before 21st August 1969.

An interesting account is provided describing how Bushnell had played *Table Tennis* on the Odyssey before Pong was created on 24th May 1972 while still employed by Nutting Associates. This occurred at a demonstration of the Magnavox Odyssey at Mountain View California. The documents then go on to clarify that it was not until after June 26th 1972 that Al Alcorn was employed by Bushnell to create what eventually became known as *Pong*.

These statements appear to dismiss Bushnell as the original inventor of the video games industry. Baer has written himself that he thought Bushnell appeared to take too much credit for creating the video games industry while downplaying Baer's part [11]. However, the Judge does go so far as to credit Bushnell's *Pong* together with the *Pong* clones of other manufacturers at having created the arcade television game industry, if not the games themselves.

During the trial Bushnell decided to take up a licensing agreement with Magnavox, allowing Atari to settle out of court and play no further part in the trial itself. This was quite an astute move as Atari was then free to press ahead with their manufacture of video game devices while its competitors were mired in the court case. In addition, if Magnavox was successful then other competitors would have to obtain similar license agreements in addition to paying the additional legal costs incurred during the remainder of the trial.

The outcome of the case established that the '507 patent was valid and had indeed being infringed. Magnavox had won. The '507 patent had stood up to rigorous legal scrutiny. The invention the '507 patent gave Magnavox the knowledge that it had the exclusive legal right to commercialize its video game consoles and that any similar video game exhibiting hitting type scenarios that are represented via symbols on a TV set could be taken to court if sold without the appropriate licensing agreement with Magnavox in place.

One may consider that prior art may have been the undoing of the case (the fact that SpaceWar! existed before Odyssey). However Judge Grady stated that the Baer 480 patent, of all the prior art, best shows the importance of the Rusch invention in the development of the television game industry.

Significantly, Judge Grady's reasoning was based on the use of standard TV technologies of the time coupled with the manner with which hitting games are managed and manipulated by the invention (the "Brown Box") and interaction afforded to players.

5.2 Magnavox Co. and Sanders Associates v. Mattel, Inc.

When considering the implications of the earlier lawsuit, the fact that a company could actually own the way the majority of video games were implemented using a TV set seemed extremely inhibitive to competition. Yet this monopoly is precisely the right granted by U.S. patent law as a benefit to the inventor.

As the years passed the technology with which video game consoles could be implemented changed dramatically (especially with the introduction of the CPU). Surely a console developed with modern technology made it so different from the Odyssey that the Baer, Rusch and Harrison patents would no longer be infringed? This must have been the thought of Mattel Inc. as they released the Intellivision gaming console without licensing from Magnavox.

Mattel created and sold its own game console - the “Intellivision: Intelligent Television”. The system was test marketed in 1979 and released the following year [9]. Magnavox took little time in taking Mattel to court for infringing the Baer, Rusch and Harrison patents. As with the earlier case, the ‘507 reissue patent was the foundation for their claims of patent infringement. The case was litigated again in the Federal court in Illinois, but this time adjudicated by Judge George N. Leighton in 1982.

In relevant part, Magnavox, brought its patent infringement suit alleging that its competitors' sale and distribution of television video games and players infringed the ‘507 reissue patent. The court again acknowledged that the ‘507 patent covered a game in which two players controlled symbols moved about through human control to make something happen to another symbol on the screen, to hit a symbol, and to change its motion. Defendants claimed that the patent was invalid and not infringed. The court held that defendants' games mimicked plaintiff's games and showed only a small difference. Accordingly, defendants had infringed. Judge Leighton further determined that advanced technology allowed defendants to create more complex games than originally patented. Nevertheless, use of the more advanced technology did not prevent infringement. As in the prior case, the court established that where defendants' processor in the game player was digital, versus Magnavox’s analog processor, the processor was an equivalent and still infringed. The court held plaintiffs' patent was not obvious and was therefore valid. Prior art was not a defense.

The court recognized that Magnavox had entered into sublicenses with 65 other parties by this time, granting 43 non-exclusive licenses using the ‘507 reissue patent as a basis for their authority. This had amounted to U.S. $18, 500, 000 in royalty payments by May 1982. This appears to indicate that the majority of the games industry had acknowledged the patents exclusively licensed to Magnavox by Sanders Associates as legally sound. Furthermore, the lucrative nature of the licenses indicates that pursuing infringement cases was financially viable for Magnavox, as to lose its monopoly would be financially significant.

The court documents highlight the sublicensing agreement used by Magnavox. In essence, a distinction is made between consoles and the cartridges themselves, providing a two step approach to

sublicensing: console and game cartridge combination and game cartridge alone. What this indicates is that the game cartridges themselves are subject to a sublicensing agreement and not just the consoles they are expected to run on.

The Intellivision system was quite advanced and could play a wide variety of games, many more than the Magnavox Odyssey. However, the games specifically mentioned in the case which infringed the '507 patent were: Tennis, Football, Baseball, Hockey, Soccer and Basketball. All these games exhibit the notion of "hit" and "hitting", aspects that were key to the success of the earlier lawsuit brought by Magnavox. The judgment in the Mattel case specifically mentions that the selling of the console with such games and the selling of the game cartridges alone infringe the '507 patent.

Mattel based its case on the defense that the '507 patent was not infringed due to prior art and the fact that their console was not recognizable, in technical terms, compared to the patented technology. In addition, the implementation of the games themselves used software routines that are quite different from anything the Odyssey may achieve. In essence, argued Mattel, its console was closer to computer than games console and as such the process by which games are implemented by their console did not infringe the '507 patent. As an example of the defense offered by Mattel it is interesting to consider the following from the court documents:

"*Mattel argues that only the presence of proximity is determined and that because the ball symbol can appear to be hit and change direction without actual overlap of the ball and player or racquet symbols occurring on the screen, actual coincidence of the ball and player or racquet symbols is neither ascertained or determined*".

A computer scientist familiar with real-time collision detection will recognize the approach used by the games programmers at Mattel to afford the illusion of collision and response; preventing intersection by basing their software routines on proximity.

Probably the most telling blow to Mattel's argument may be found in the findings of the case when it is made clear that the type of circuitry described by the '507 reissue patent is not the sole reason for its validity:

"*The asserted claims, however, are not directed to specific circuitry; and even Mattel does not contend that they should be limited to only the circuits disclosed in the '507 patent."*

Further into the findings the following is stated, which seems to negate the Mattel argument:

"*However, the use of currently available technology to implement its television games does not alter the basic nature of those games or avoid the Rusch '507 patent."*

Finally, the final rebut of the differences in process are provided by Judge Leighton:

"*First, the use of digital instead of analogue circuitry, it seems to me, is a difference which is not material. I regard analog and digital circuitry as a means which are interchangeable largely, which are*

equivalent, and which are, therefore, essentially the same means for achieving substantially the same results in substantially the same way."

The previous lawsuit established the Busch '480 patent as best representing prior art. The same type of arguments for prior art failed again, and given that Judge Leighton dismissed the technical differences as irrelevant (integrated circuitry vs. the original Odyssey hardware), Mattel lost. Magnavox had won again. Worth mentioning at this point is Baer's annoyance with individuals describing his system as analogue [22]. Clearly, the Brown Box and the Magnavox odyssey were made from discrete electrical components and may be considered digital devices in the broadest term.

5.3 Magnavox Co. and Sanders Associates v. Activision Inc.

Considering the previous cases, one may think it quite odd that the '507 patent would be challenged again. However, another video game manufacturer decided to do so, perhaps seeking to avoid the need for a Magnavox sublicensing agreement.

Activision, Inc. created video games for a number of consoles, including Atari's 2600. Activision was created by a number of ex-Atari employees and became a successful independent game developer (not associated to any one console). Atari tried to prevent Activision from releasing games for its 2600 console but failed [11]. As such, Activision was not a console manufacturer and may be considered an independent game developer. Surely, Activision may have reasoned, if you only make the games and not the consoles you won't infringe the '507 patent and therefore don't need a sublicense from Magnavox. This must have been Activision's assumption when they entered into a legal battle during 1985 over what was now the most scrutinized patent in video games history.

In 1986, the Federal court in Northern California entertained Magnavox and Sanders Associates' patent infringement case, again asserting the '507 patent, against Activision. Judge Charles Legge ruled that the '507 patent was valid in light of the prior rulings of the Illinois Federal court and the prior art presented to him by Activision. He further found that Activision infringed the '507 patent. On appeal, the United States Court of Appeals for the Federal Circuit affirmed the lower court's judgment in all respects.

Activision based its case on the notion that the '507 patent should only relate to the circuitry described in the '507 patent and that the use of modern technology does not infringe the '507 patent. This is perhaps surprising in light of the existence of the prior two courts' decisions and the fact that Atari was already a sub-licensee of Magnavox (a console which Activision sold many of its games for). There is no need to go into great detail here regarding the arguments in this case as they reflect the previous cases in which Magnavox gained victory.

Of interest is Activision's insistence that it did not need a sublicense as Atari already had one and their games play on the Atari console. However, the result of the case confirmed the indistinguishable

distinction between consoles and cartridges sold together and those cartridges sold separately: one still needed a license for the cartridges.

Considering the results of the two earlier cases, and with the benefit of hindsight, it appears that Activision's likelihood of victory was low. As with the prior cases, Magnavox won and maintained its monopoly in the industry.

6. Conclusions

On drawing our conclusions we summarize our findings with respect to the significant importance of the Pioneer Patents ('507 in particular) and consider how these patents influenced the industry (beyond simple licensing agreements).

6.1 A Successful Patent

The '507 patent did its job well and ensured that Magnavox maintained its monopoly control of the games industry long after many other video game consoles had come onto the market. The Odyssey was followed by a number of other Odyssey models, each of which provided similar gaming to the original Odyssey with minimum technical improvement.

The Atari VCS (later called 2600) easily eclipsed the Odyssey in capability by the late 1970s. Subsequently, as technology improved the Intellivision easily outperformed the Atari 2600 by the early 1980s. Given this tough competition, the series of Odyssey machines produced by Magnavox over the years could not be called a great commercial nor technical success, selling no more than a few hundred thousand units and still presenting little more than *Table Tennis* after years of "development". Consequently, it is the Atari 2600 that became known as the video game console that launched the home video games industry into the mainstream. The utilization of integrated circuitry technology combined with transferring hit arcade games of the time to the home allowed the Atari 2600 to easily outsell the Magnavox Odyssey consoles. However, as well-demonstrated by the first two lawsuits, such technological advancement could not escape the claims of the '507 patent.

One may wonder why Magnavox would need to improve their console at all. There appears little incentive to progress the video games console market when you know that you have an exclusive license agreement with Sanders Associates to exploit the Baer, Rusch and Harrision patents. Considering these patent claims appear to be so well constructed as to be "immune" from technology advancements of the day (circuitry miniaturization) it seems quite foolish to compete, at some significant cost of research and development, against your own sub-licensees. This may be one reason why Magnavox did not create a video game console to rival others: they didn't have to, as the success of others was Magnavox's success. However, a party makes much more revenue from commercializing and selling a

successful product than merely collecting license fees. On the other hand, a company that does both adequately may maximize its profits that way.

Not only did the broad scope of the '507 patent claims successfully prevent consoles from being sold without a sublicense, it also prevented the sale of game cartridges themselves without the appropriate sublicense. As experienced by Activision, just because it did not make a console did not mean it could avoid an agreement with Magnavox to sell its games. This is one oversight made by historians: it is not only the consoles but the games played on them that fell within the scope of the '507 patent's claims. Indeed, one might conclude that the '507 patent is so forward thinking that it covered both markets (even before either existed)!

6.2 Who Invented Video Games?

Ralph H. Baer is credited as inventing the video game console and hence modern video games: at the very least, consoles that allow players to participate in game play represented as symbols on a standard TV set that simulate real-time collision detection and response. Baer had the initial idea, but more than this, he made his idea a reality. First he drafted the original design and process by which to realize his idea and then, with his co-developers Rusch and Harrison, created the first commercial games console. This may seem slightly odd as it was the Rusch '507 patent that was used in court to ensure sublicenses were paid to Magnavox and only the 284 ('507) and 285 patents appear on the original Odyssey console. However, as Judge Grady indicated in the first lawsuit, it was Baer's pioneering '480 patent that best represented the prior art. In addition, both the '284 and '285 patents reference the previous application filed by Baer in 1968 (which eventually became the '480 patent).

Nolan Bushnell is credited in the first lawsuit as creating the arcade video game industry (with a little help from his competitors). Although Bushnell's work closely resembles the work of Baer, Rusch and Harrision (low cost commercialization using standard TV technologies), Bushnell implemented *Computer Space* after the '284 and '285 patent applications had been filed. In fact, Baer had developed his initial idea and demonstrated it at Sanders Associates nearly 4 years before Bushnell and his colleagues had created their first video arcade machine. One assumes that Bushnell did create Computer Space without knowledge of Baer's work (this is stated in the lawsuits), it is just unfortunate for Bushnell that Baer beat him to the invention.

What of *Spacewar!*, *Tennis-for-Two*, and all those other earlier video games (there were others mentioned in the case notes pertaining to the lawsuits described in this paper)? One way to consider the video games that appeared to have existed before Baer's work is to describe them more appropriately as computer games/simulations (e.g., *Spacewar!)* or interactive display automata (*Tennis-for-Two*). People have used technology for amusement and gaming whenever it has appeared, usually against purpose. When someone first used a computational device associated with a display mechanism for amusement/gaming purposes may well be lost to us. Of the ones we know about, the strongest contender must be *Tennis-for-Two*. This event is well documented and the demonstration is

recognizable as a very early version of *Pong* and it was played by the general public. However, this is opinion and the reader must make up their own mind on this matter.

6.3 Other Patents and Lawsuits

The patents and lawsuits mentioned in this paper are the first of many. Further lawsuits regarding the '507 patent came to court and the '507 patent won the day for Magnavox every time. Baer's book "Videogames: in the Beginning" provides an interesting, and often amusing, look at these other cases as time and again lawyers failed to win against Magnavox.

Lawsuits relating to copyright infringement, patent infringement and all other types of legal matters one expects in everyday business are now commonplace in the video games industry. Indeed, one may argue that the litigation that ensues after a party secures intellectual property rights to a gaming technology drives the industry in a way at least equivalent to the innovation and development generally believed to be associated with a competitive marketplace. However, an astute analysis of the industry must account for the significant impact the Pioneer Patents had on the first video games and their inventors.

6.4 Summary

In answer to our 3 questions posed in the introduction of this paper we may answer them in this manner:

(1) "Why was prior art unable to act as a means by which the pioneer patents could be overturned?" [*Answer* – because the '507 patent claimed subject matter that was adequately new and novel and nonobvious, primarily because it claimed a new player interface.];

(2) "Why did the patents hold up so well in the face of technological change?" [*Answer* – because the '507 patent claimed subject matter that was adequately broad to encompass the new technologies, because minor improvements in circuitry etc, did not create a new invention outside the scope of the patent claims.]

(3) "Why did game developers, not only console developers, have to acknowledge the pioneer patents?". [*Answer* – because the '507 patent claimed subject matter that was adequately broad to encompass both the game and the console.]

References

[1] The Video Game Console Web Pages, Odyssey Advertisement, http://www.videogameconsolelibrary.com/pg70-odyssey.htm (Accessed October 20, 2008)

[2] Fulton, S., “The History of Atari”, Gamasutra, http://www.gamasutra.com/view/feature/2000/the_history_of_atari_19711977.php (accessed October 17, 2008)

[3] Pitts, Bill., “The Galaxy Game”,http://infolab.stanford.edu/pub/voy/museum/galaxy.html (accessed September 20, 2008)

[4] Bell, C. G., G. Butler, R. Gray, J. E. McNamara, D. Vonada, and R. Wilson, 1978. "The PDP-1 and Other 18-Bit Computers," in *Computer Engineering: A DEC View of Hardware Systems Design*, Digital Press, Bedford, Massachusetts

[5] Kristin, K., “The anatomy of the first video game: “Tennis for Two” created in 1958, was a science experiment”, http://www.msnbc.msn.com/id/27328345/ (accessed October 30, 2008)

[6] Nowak, P., “Video games: out of the lab and into the living room”, CBC News, http://www.cbc.ca/technology/story/2008/10/16/tech-consoles.html, (accessed November 1, 2008)

[7] Gegan, S, (maintained by Winter, David), Magnavox Odyssey FAQ, http://www.pong-story.com/o1faq.txt

[8] Baer, R. H., “Video Game History, Getting Things Straight”, Pong Story, http://www.pong-story.com/RHB_getting_things_straight.pdf (accessed November 15, 2008)

[9] Barton, M., Loguidice, B., “A History of Gaming Platforms: Mattel Intellivision”, Gamasutra, http://www.gamasutra.com/view/feature/3653/a_history_of_gaming_platforms_.php (Accessed September 20, 2008)

[10] Bell, G. and Strecker, W. D. 1998., “Retrospective: what have we learned from the PDP-11—what we have learned from VAX and Alpha”, In *25 Years of the international Symposia on Computer Architecture (Selected Papers)* (Barcelona, Spain, June 27 - July 02, 1998). G. S. Sohi, Ed. ISCA '98. ACM, New York, NY, 6-10

[11] Fleming, J., “The History Of Activision”, Gamasutra, http://www.gamasutra.com/view/feature/1537/the_history_of_activision.php, (Accessed October 20, 2008)

Bibliography

Rusch, W. T., “TELEVISION GAMING APPARATUS”, U. S. Patent RE28,507, Filed Apr. 25, 1974, Assignee: Sanders Associates

Rusch, W. T., “TELEVISION GAMING APPARATUS”, U. S. Patent 3,659,284, Filed May 27, 1969, Assignee: Sanders Associates

Baer, H. R., Rusch, W. T., Harrison, W. L., “TELEVISION GAMING APPARATUS AND METHOD”, U. S. Patent 3,659,285, Filed Aug. 21, 1969, Assignee: Sanders Associates

Baer, H. R., “TELEVISION GAMING AND TRAINING APPARATUS”, U. S. Patent 3,728,480, Filed Mar. 22, 1971, Assignee: Sanders Associates

Kent, S. L., *The Ultimate History of Video Games* (New York, Three Rivers Press, 2001)

Baer, R. H., *Videogames: in the Beginning,* (New Jersey, Rolenta Press, 2005)

Weiss, B., *Classic Home Video Games, 1972-1984: A Complete Reference Guide* (North Carolina, McFarland, 2007)

Title 35, United States Code Section 1 *et seq*.

The Magnavox Company, et al. v. Chicago Dynamic Industries, et al., Nos. 74 C 1030 and 74 C 2510, United States District Court for the Northern District of Illinois, Eastern Division, 1977 U.S. Dist. LEXIS 17996; 201 U.S.P.Q. (BNA) 25, Jan. 10, 1977

THE MAGNAVOX COMPANY and SANDERS ASSOCIATES, INC., Plaintiffs, vs. MATTEL, INC., et al., Defendants., No. 80 C 4124, UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF ILLINOIS EASTERN DIVISION, 1982 U.S. Dist. LEXIS 13773; 216 U.S.P.Q. (BNA) 28, July 29, 1982

THE MAGNAVOX COMPANY, a corporation, and SANDERS ASSO-CIATES, INC., a corporation, Plaintiffs, v. ACTIVISION, INC., a corporation, Defendant. AND RELATED CROSS-ACTION., No. C-82-5270-CAL,UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF CALIFORNIA, 1986 U.S. Dist. LEXIS 30999, March 13, 1986, Decided, March 13, 1986, Filed; March 14, 1986, Entered in Civil Docket