

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Alistair Bruce Kelman
U.S. Patent No.: 9,392,302 Attorney Docket No.: 45035-0013IP1
Issue Date: July 12, 2016
Appl. Serial No.: 13/990,372
Filing Date: May 29, 2013
Title: SYSTEM FOR PROVIDING IMPROVED FACILITIES IN TIME-SHIFTED BROADCASTS

DECLARATION OF W. LEO HOARTY IN SUPPORT OF PETITION FOR

INTER PARTES REVIEW OF U.S. PATENT NO. 9,392,302

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DECLARATION OF W. LEO HOARTY

I, W. Leo Hoarty, of Morgan Hill, CA, declare that:

I. QUALIFICATIONS AND BACKGROUND INFORMATION

1. I am currently the Principal of WLH Consulting LLC. My curriculum vitae is provided (as Appendix A). I studied electronic engineering and computer science at the Ohio State University for two years.

2. I am the founder of six technology startups over the last 30 years. While creating new technology companies over the preceding 30 years, I have raised over \$600M of investment capital from the top venture capital firms as well as from top technology companies such as IBM, Intel, Cisco, Samsung, among others. The companies that I founded have created jobs for thousands of technology workers.

3. Most of my work has focused on developing set-top technology and digital advertising support systems. Relevant to this matter, an interactive cable television technology company, called ICTV Inc., was founded by me in 1990, and renamed ActiveVideo Networks (AVN) in 2003. The company developed video-on-demand (VOD) as well as virtual cable TV set-top cloud-based systems to deliver video as well as interactive program guide over managed (cable TV) and unmanaged (Internet) networks. AVN is currently providing service to 24 million

cable TV set-top boxes in the households of the Charter and TimeWarner systems throughout the U.S.

4. I founded the Dotcast company in 1999 and served as CTO. The company developed a set-top box and service, called MovieBeam, that received both over-the-air (OTA) and broadband (Internet) delivery of feature films stored on an internal hard drive in the set-top box. Movies were delivered slower than real-time on a 24/7 schedule (trickle filled cache.) Metadata about each movie was stored in the file header on the internal hard drive. This information included the usual fields of title, actors, director, and importantly, the rating. The set-top featured parental controls that would not play R-rated films without a password, among other useful controls. Consumers selected programming from an internal user interface guide and purchased movies for rental under similar rules as Blockbuster. Service was live from 2004 to 2007 in the top 50 television markets (DMAs) in the U.S. and was backed by all nine movie studios, led by the Walt Disney Company.

5. In 2015, I was granted a patent for an audio-based automated content recognition (ACR) system and sold it to Vizio, Inc. I was then contracted by the company to assemble a software development team and create the system based on the patent that would run in a smart TV generating fingerprints from TV audio and sending the fingerprints to a cloud-based server system. I also wrote much of

server-side software that receives the streaming fingerprints in real-time from the TVs and identifies content currently playing. The Vizio ACR technology is running inside of over 20 million smart TVs and is widely used in the television industry for precision daily audience measurement. In some services provided by Vizio using the ACR technology, media related to currently playing programming is returned to the smart TV for display of supplemental information and for targeted advertising.

6. In 2018, I developed and patented a novel technology for video watermarking which places invisible data into the video signal for identification of the video segment. Under contract, I helped develop the software for a dynamic ad insertion system using the video watermarks. The technology is currently in use by major broadcast networks under the name Project OAR. Client software runs on smart TVs that detect and decode video watermarks and then communicates over the Internet to Content Delivery Network (CDN) servers to download a specific TV ad to substitute for the existing ad based on certain combinations of zip code, demographic profiles, and time of day. Ad swapping actions occur in less than tenth of a second. Information about the ad, including whether the ad was viewed in its entirety, or whether the person switched the channel, is passed back to the advertiser.

7. Additional technology I developed and patented for Vizio includes a TV ad attribution system using what is colloquially known as “tracking pixels.” The technology allows third-party verification of individual TVs displaying specific TV ads, a service of high value to advertisers.

8. Throughout my career I have received a variety of awards including, for example, the National Cable Television Association (NCTA)—Best New Technology 1996 for ICTV’s interactive TV and VOD service; Consumer Electronics Society (CES)—Best of Show in 2005 and 2006 for the MovieBeam set-top and service; 2003 Emmy Award went to Vizio, Inc for their precision audience measurement service which utilizes my patented audio automated content recognition (AACR) technology for high-resolution monitoring of household TV viewing.

9. I am an inventor on over 40 patents and my patent portfolio has been extensively cited by over a hundred third-party patents. My past work has been cited in many technology articles on cable television as well as on consumer electronics.

10. In writing this Declaration, I have considered and drawn upon the following: my own knowledge and experience, including my work experience in the fields of television set-top boxes, media server systems including video on demand, and advertising server and control systems; my experience in teaching

those subjects is manifest in the over forty patents of which I am the inventor and my experience in working with others involved in those fields. In addition, I have analyzed the following publications and materials, in addition to other materials I cite in my Declaration:

- U.S. Patent No. 9,392,302 B2 (EX1001), and its accompanying prosecution history (EX1002)
- PCT Publication No. WO 2011/012909 to Patten et al. (“Patten”) (EX1004)
- U.S. Patent Application Publication No. US 2002/0144262 A1 to Plotnick et al. (“Plotnick”) (EX1005)
- PCT Publication No. WO 2011/110893 to Ben-Rubi et al. (“Ben-Rubi”) (EX1006)
- U.S. Patent Application Publication No. US 2004/0158870 A1 to Paxton et al. (“Paxton”) (EX1007)
- U.S. Patent No. 7,480,382 to Dunbar et al. (“Dunbar”) (EX1008)
- U.S. Patent No. 8,976,871 to Chen et al. (“Chen”) (EX1009)
- U.S. Patent Application Publication No. 2014/0086338 A1 to Lu et al. (“Lu”) (EX1010)
- U.S. Patent Application Publication No. 2009/0070414 A1 to Singal et al. (“Singal”) (EX1011)
- U.S. Patent No. 8,782,691 to Noble et al. (“Noble”) (EX1012)
- U.S. Patent No. 8,214,256 to Riedl et al. (“Riedl”) (EX1013)
- U.S. Patent Application Publication No. 2005/0289588 A1 to Kinnear et al. (“Kinnear”) (EX1014)

II. OVERVIEW OF CONCLUSIONS FORMED

11. This expert Declaration explains the conclusions that I have formed based on my analysis. To summarize those conclusions:

- Based upon my knowledge and experience and my review of the materials listed above, I believe that Claims 1-4, 6-9, and 12-15 are rendered obvious by the references listed above.
- Specifically, it is my opinion that Claims 1-3, 6-9, 12, 13, and 15 of the '302 patent is rendered obvious by Patten in view of Ben-Rubi and Applicant Admitted Prior Art ("AAPA").
- Based upon my knowledge and experience and my review of the materials listed above, it is my opinion that claims 3, 4 and 14 of the '302 patent are rendered obvious by Patten in view of Ben-Rubi, AAPA, and Plotnick.

III. THE '302 PATENT

A. Brief Description

12. The technology in the '302 patent relates to "automatic exclusion of advertisements that should not be shown at the time the programme is being viewed when time-shifted." EX1001, cover, 2:60-63. It is my opinion that prior to the priority date of the '302 patent, there were numerous publications and patents that implemented or described the functionality claimed in the '302 patent. Thus, the system and methodology of the '302 patent was well-known in the prior art. Further, to the extent there was any problem to be solved in the '302 patent, it had already been solved in the prior art before the priority date of the '302 patent.

13. The '302 patent describes a system for managed and/or targeted advertising in pre-recorded, and hence time-shifted, viewing of television broadcasts that ensures advertisements within the time-shifted content comply with local broadcasting regulations. The title of the '302 patent is "System For Providing Improved Facilities in Time-Shifted Broadcasts." EX1001, cover. It relates to "automatic exclusion of advertisements that should not be shown at the time the programme is being viewed when time-shifted." EX1001, 2:60-63. The specification provides an example of a regulation prohibiting presentation of certain advertisements stating, that "[i]n the UK for example, if the advertisement is advertising alcoholic drinks containing more than 1.2% alcohol," then, "the advertisement may not be shown at a time when children under 10 are likely to be viewing—*i.e.*, before 7.30 pm, sometimes referred to as the 'watershed'." *Id.*, 1:19-26.

14. The '302 patent refers to its invention as relating to a Personal Video Recorder ("PVR") which is technology customarily embedded in Set-Top Boxes ("STBs"). *Id.* at 1:48–58, 1:30–40, 2:50–52. More specifically, the '302 patent describes "a PVR 60 for use in a system according to the invention." *Id.*, 4:43-44.

15. Notably, the hardware of the PVR was well-known in the prior art and the '302 patent does not purport to require or disclose any novel hardware. In fact, Figure 4 of the '302 patent which the '302 patent describes as illustrating the

purported invention is strikingly similar to Figure 1 of the '302 patent which the '302 patent describes as a prior art PVR. I have annotated both figures below:

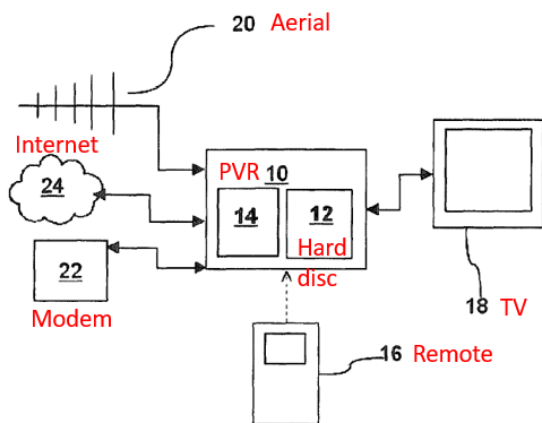


Figure 1
PRIOR ART

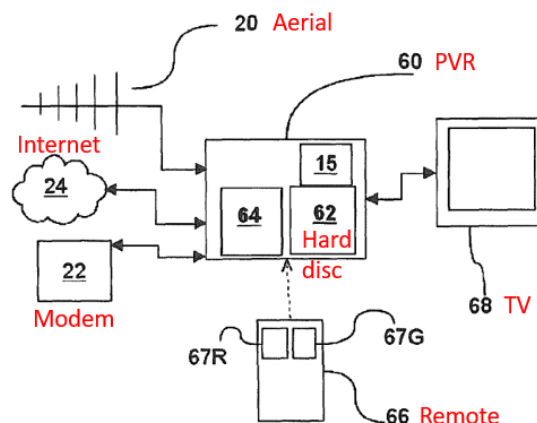
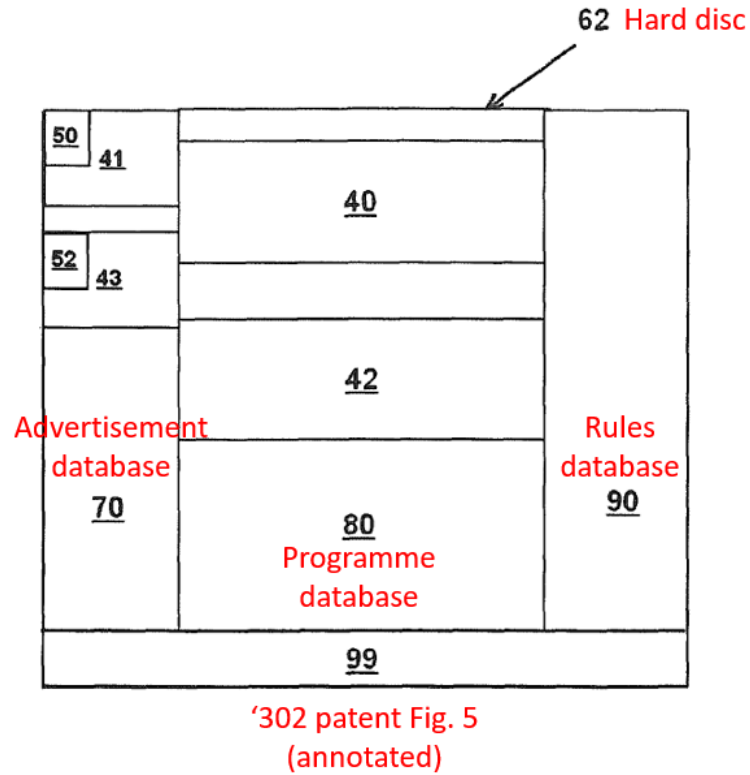


Fig 4

Id., Figs. 1 and 4 (annotated).

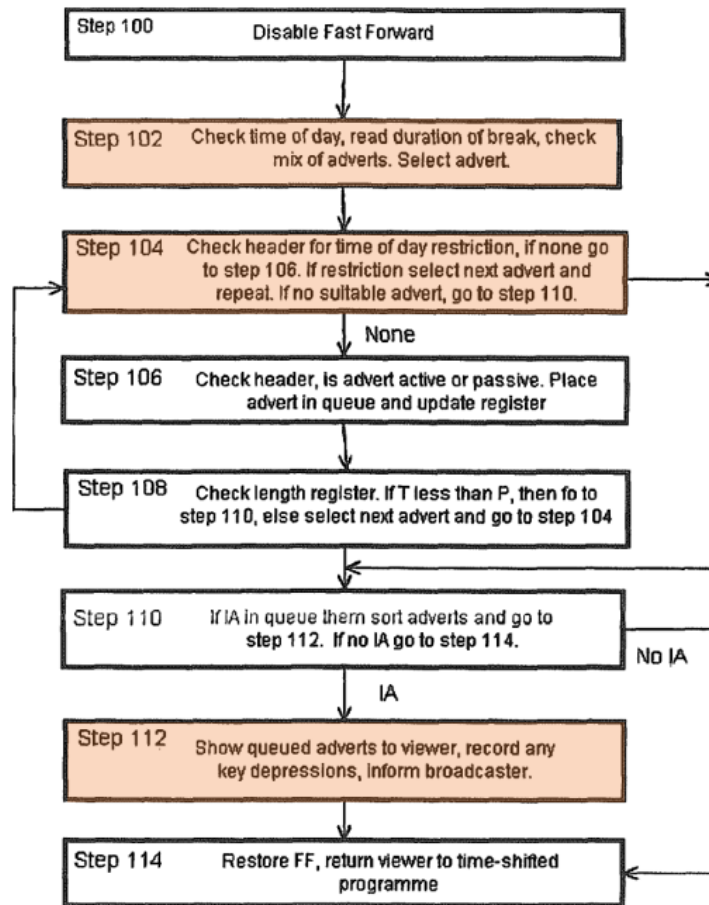
16. The '302 patent identifies the components of the PVR reflected in Figure 4. These components include a TV antenna 20, a modem 22, the Internet 24, hard disk 62, and a TV set 68. *Id.*, 4:43–55; *see* FIG. 4, *see also* 4:43–55.

17. In addition, the '302 patent provides some detail about the organization of advertisements, broadcast programs, and rules within the PVR. I have annotated Figure 5 below to emphasize the contents of hard disc 62 of PVR 60 which includes “an advertisement database 70 which stores advertisements from the broadcast programme; a programme database 80, which stores the broadcast programme segments; and a rules database 90 which stores the rules which apply to broadcast advertisements.” *Id.*, 4:57-62.



Id., Fig. 5 (annotated).

18. Figure 8 shows the '302 patent's methodology for selecting an advertisement based on time of day. *Id.*, 6:33-35.



**'302 patent Fig. 8
(annotated)**

Id., Fig. 8 (annotated). The '302 patent explains that, as part of step 102, the PVR checks the current time and selects an advertisement. *Id.*, 6:40-53. At step 104, the PVR reads the advertisement's header for a time restriction. *Id.*, 6:54-56. If the advertisement is restricted by the time, "the PVR 60 selects the next advertisement from the advertisement database 70 and continues checking the headers until an advertisement is found of a type which can be shown at the current time of day." *Id.*, 6:57-61. The PVR then plays the advertisements in step 112. *Id.*, 7:17-18.

19. The '302 patent explains that each advertisement has a header that may include fields containing metadata describing information about the advertisement. *Id.*, 3:63–4:41. Table 1 of the patent is entitled “Fields in advertisement headers.” *Id.*, 4:1–23. This table describes the header information used as part of step 104 of the flowchart in Figure 8 above.

Fields in advertisement headers	
Field Name	Activity
Time of Day validity	Code to indicate time of day when advert may be shown.
Days validity	Code to indicate the days of the week when advert may be shown

Showings	Number of times advert is to be shown
Viewings	Number of times this advert has been shown in time-shifted programme viewing
Frequency	Minimum period to elapse before repeat showing

**'302 patent Table 1
(partial, annotated)**

Id., Table 1 (partial, annotated). As illustrated, the header of an advertisement includes a “Time of Day validity” defined to reflect a “code to indicate time of day when advert may be shown” and “Viewings” defined to reflect the “number of times this advertisement has been shown in time-shifted programme viewing.” *Id.*

B. Prosecution History

20. The '302 patent issued on July 12, 2016 from U.S. Patent Application No. 13/990,372 filed on May 29, 2013, which is a National Stage application of PCT Application No. PCT/GB2011/052259, filed November 18, 2011. EX1001,

cover. During prosecution, in response to the first non-final office action dated April 28, 2014, the Applicant amended the independent claim to state that the claimed broadcasting regulation is “a local broadcasting time regulation which restricts the time of day at which said advertisement may be shown,” EX1002, 203. The Applicant then distinguished between rules set by advertisers and regulators stating that the prior art showed “limitations on time and date are set by the advertisers who provide the advertisements, and not by local regulations.” *Id.*, 206. The Examiner’s final rejection, dated August 18, 2014, found that the amendment did not overcome the rejection in view of the prior art. *Id.*, 215. In response, the Applicant again amended the independent claim requiring that the claimed local broadcasting regulation be “laid down by a broadcasting authority,” *id.*, 238, and provided an example of FCC regulation 47 C.F.R. § 73.3999 which the Applicant stated specifies “restrictions on times of day during which indecent material may or may not be broadcast” as “an example of exactly the kind of regulation that Applicant wishes to refer to in claim 1.” *Id.*, 240. In response, the Examiner referred to Paxton (US 2004/0158870) during an October 17, 2014 interview and noted Paxton’s disclosure of the broadcasting regulation through its discussion of the watershed restrictions. *Id.*, 247.

21. In response, on November 18, 2014, the Applicant amended the independent claim to add “a second field related to the number of times said

advertisement has previously been shown during time-shifted viewing.” *Id.*, 260. However, the Examiner referred to Poslinski’s (US 2006/0013556) disclosure of that limitation. *Id.*, 273. Later, the Applicant amended the independent claim to add “wherein the control means is further arranged to update the second field in the header of said advertisement when said advertisement is again shown during time-shifted viewing.” *Id.*, 380. And on the basis of this amendment, the Examiner issued a notice of allowance. *Id.*, 477.

C. Level of Ordinary Skill in the Art

22. The evidence here confirms that a person of ordinary skill in the art at the time of the ’302 patent (a “POSITA”) would have held a Bachelor’s Degree in Electrical or Computer Engineering or a related field (or equivalent understanding through actual work experience), and had at least two years of experience related to multimedia systems such as video and audio systems.

23. For at least the reasons I explained in the sections about my qualifications, I would consider myself to have qualified as a POSITA as of the earliest priority date for the ’302 patent of December, 2010.

D. INTERPRETATIONS OF THE ’302 PATENT CLAIMS AT ISSUE

24. I understand that, for purposes of my analysis in this *inter partes* review proceeding, the terms appearing in the patent claims should be interpreted under the *Phillips* standard. *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir.

2005). *See* 37 C.F.R. §42.100. In that regard, I understand that the best indicator of claim meaning is its usage in the context of the patent specification as understood by a POSITA. I further understand that the words of the claims should be given their plain meaning unless that meaning is inconsistent with the patent specification or the patent’s history of examination before the Patent Office. I also understand that the words of the claims should be interpreted as they would have been interpreted by a POSITA at the time of the invention was made (not today). Because I do not know at what date the invention as claimed was made, I have used the earliest priority date of U.S. Patent No. 9,392,302 as the point in time for claim interpretation purposes. That date was December 1, 2010.

25. I am also informed that certain claims of the ’302 patent include “means” limitations for a system or apparatus for automating compliance with local broadcasting regulations that are subject to means-plus-function treatment under 35 U.S.C. §112, ¶6.

26. I have been asked to apply the following constructions for the “means” terms for purposes of this Declaration.

“means” limitation (<u>recited functions underlined</u>)	Rule 42.104(b)(3) Structure
“ programme supply means to <u>supply broadcast digital video/audio programmes having therein periodic breaks for the insertion of</u>	Hard disc 62 in PVR 60 with a part that stores a programme database 80. <i>See</i> EX1001, 4:57-62, FIGS. 4-5.

“means” limitation (<u>recited functions underlined</u>)	Rule 42.104(b)(3) Structure
<u>advertisements</u> (claim element [1b])	
“ advertisement supply means to <u>supply advertisements within the periodic breaks</u> ” (claim elements [1c], [8], [9])	Hard disc 62 in PVR 60 with a part that stores an advertisement database 70. <i>See</i> EX1001, 4:57-62, FIGS. 4-5.
“ rules database means <u>containing rules relating to said local broadcasting time regulation</u> ” (claim elements [1f], [7])	Hard disc 62 in PVR 60 with a part that stores a rules database 90. <i>See</i> EX1001, 4:57-62, FIGS. 4-5.
“ data storage means <u>storing a programme episode database, an advertisement database, and a rules database</u> ” (claim element [12b])	Hard disc 62 in PVR 60. <i>See</i> EX1001, 4:57-62, FIGS. 4-5.
“ clock means to <u>supply a real-time clock signal</u> ” (claim element [1g])	Backchannel of a PVR via internet connection 24 or modem 22. <i>See</i> EX1001, 2:13-15, 2:26-30, 4:43-49, FIGS. 1 and 4.
“ input connection means for <u>connection to a source of video/audio signals and a real-time clock signal</u> ” (claim element [12g])	One or more connections between a PVR and (i) aerial 20, and (ii) internet connection 24 or modem 22. <i>See</i> EX1001, 1:65-67, 2:13-15, 2:26-30, 4:43-49, FIGS. 1 and 4.
“ output means for <u>connection to a consumer’s viewing/listening unit</u> ” (claim element [12h])	Connection between PVR 60 and TV set 68. <i>See</i> EX1001, 4:50, FIG. 4.
“ control means arranged to”: “ <u>read said first field and said</u>	Hardware or combination of hardware and software of PVR 60 arranged to perform steps 102, 104, and 112 of FIG. 8.

“means” limitation (recited functions underlined)	Rule 42.104(b)(3) Structure
<u>clock signal and said rules database and to apply said local broadcasting time regulation to each advertisement before said advertisement is shown</u>” (claim element [1h]) “<u>read said first field and said clock signal and said rules database and to apply said local broadcasting time regulation to each advertisement before said advertisement is shown during one of the periodic breaks</u>” (claim element [12i]) “<u>update the second field in the header of said advertisement when said advertisement is again shown during time-shifted viewing</u>” (clam elements [1i], [12j])	<i>See</i> EX1001, 6:33-35, 6:40-62, 7:17-27, FIG 8, Table 1 (“Viewings”).
“control means arranged to”: (3) “<u>check[] the keyword against the rules database during application of said local broadcasting time regulation to said advertisement</u>” (claim element [2])	Hardware or combination of hardware and software of PVR 60 arranged to perform steps 102, 104, and 112 of FIG. 8. <i>See</i> EX1001, 4:35-37, 6:10-12, FIG 8, Table 1 (“Warnings”).
“control means arranged to”: (4) “<u>when the application of said local broadcasting time regulation to a particular</u>	Hardware or combination of hardware and software of PVR 60 arranged to perform steps 102, 104, and 112 of FIG. 8.

“means” limitation (<u>recited functions underlined</u>)	Rule 42.104(b)(3) Structure
<u>advertisement indicates that showing the particular advertisement would violate the local broad-casting time regulation, search the advertisements stored in the advertisement supply means until either an advertisement is found that does not violate the local broadcasting time regulation or it is determined that no advertisement stored in the advertisement supply means is suitable for showing under the local broadcasting time regulation</u>” (claim element [8])	<i>See</i> EX1001, 6:54-62, FIG 8.
“control means arranged to”: (5) “<u>show during time-shifted viewing of the programme a mix of advertisements that were received during the live broad-cast of the programme and advertisements that were received other than in the live broadcast of the programme being shown during time-shifted viewing</u>” (claim element [9])	Hardware or combination of hardware and software of PVR 60 arranged to perform steps 102, 104, and 112 of FIG. 8. <i>See</i> EX1001, 6:51-53, FIG 8.

IV. LEGAL PRINCIPLES

A. Obviousness

27. I have been informed that a patent claim is invalid as “obvious” under 35 U.S.C. § 103 in light of one or more prior art references if it would have been obvious to a POSITA, taking into account (1) the scope and content of the prior art, (2) the differences between the prior art and the claims, (3) the level of ordinary skill in the art, and (4) any so called “secondary considerations” of non-obviousness, which include: (i) “long felt need” for the claimed invention, (ii) commercial success attributable to the claimed invention, (iii) unexpected results of the claimed invention, and (iv) “copying” of the claimed invention by others. For purposes of my analysis above and because I know of no indication from the patent owner or others to the contrary, I have applied a date of December 1, 2010, as the date of invention in my obviousness analyses, although in many cases the same analysis would hold true even at an earlier time than December 1, 2010.

28. I have been informed that a claim can be obvious in light of a single prior art reference or multiple prior art references. To be obvious in light of a single prior art reference or multiple prior art references, there must be a reason to modify the single prior art reference, or combine two or more references, in order to achieve the claimed invention. This reason may come from a teaching, suggestion, or motivation to combine, or may come from the reference or

references themselves, the knowledge or “common sense” of one skilled in the art, or from the nature of the problem to be solved, and may be explicit or implicit from the prior art as a whole. I have been informed that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. I also understand it is improper to rely on hindsight in making the obviousness determination.

V. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. [GROUND 1] – Patten in view of Ben-Rubi and Applicant Admitted Prior Art (Claims 1-3, 6-9, 12, 13, and 15)

i. Overview of Patten

29. Patten is an international publication No. WO 2011/012909 A2 filed on August 2, 2010. Patten’s title is “MEDIA INSERTION SYSTEM.” EX1004, cover. In summary, Patten teaches a media player for playing back recorded video content, *id.* at [0002], and it is intended to deliver targeted advertisement to enhance viewer engagement. EX1004, [0002] (“advertisements are tailored to the user profile”). Patten’s targeting uses a code and rule-based approach to match advertisements to the viewer. EX1004, [0031]. One relevant example of these codes is Patten’s use of “restriction codes” which “restrict the scheduling of the media item” based on factors like the advertisement’s content and time of day. *Id.*, [0060]; *see also, e.g., id.*, [0027], [0040], [0047], [0048], [0086], [0089]. The goal of an enhanced user experience is further achieved using Patten’s accounting of the

number of times an advertisement has been played and “no longer select[ing] that media item for output once the maximum has been reached.” EX1004, [00114].

30. The hardware and software Patten describes is substantially the same as in the '302 patent. In addition to describing a PVR, Patten teaches a hard disk 113 which has “two or more storage areas, one for the storage of television programme data, and the other for storing metadata and/or recorded media items.” EX1004, [00188]

31. Like the '302 patent, Patten teaches filtering and selecting advertisements that are displayed when recorded content is played back by a “Personal Video Recorder (PVR).” *Id.*, [0002]. Specifically, Patten discloses replacing advertisements in a program based, in part, on a user profile. *Id.* To select the right advertisement, Patten takes into account “[t]he time of day of playback” to comply with local broadcast restrictions called “watershed restrictions” which prohibit presentation of certain advertisements “outside the defined watershed times.” *Id.*, [00146].

32. To account for these watershed restrictions about time-of-day playback, Patten’s TV ads have associated metadata which include “restriction codes.” *Id.*, [0060]. The restriction codes relate to aspects of the advertisement that may impact when the advertisement can be played, for example, “the type of product or service,” “the minimum age of viewer,” and “the watershed after which

the media item may be shown.” *Id.*, [0060]. Thus, Patten’s personal video recorder selects advertisements to be inserted into the time-shifted video programming based on when the advertisement is played.

ii. Overview of Ben-Rubi

33. Ben-Rubi is titled, “COMBINING USER CONTENT WITH SUPPLEMENTAL CONTENT AT A DATA STORAGE DEVICE.” EX1006, cover. Ben-Rubi is directed to playback of recorded media such as videos, and inserting advertisement into such videos as depicted in Figure 3E, below. *Id.*, 2:18-3:2, 15:12-18, FIG. 3E.

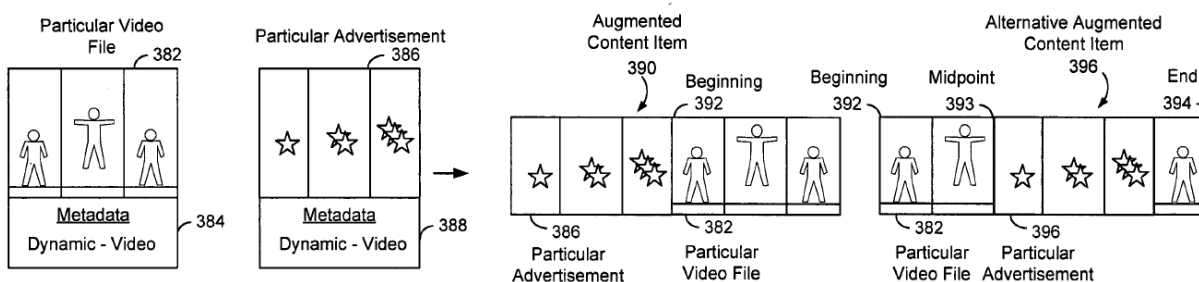
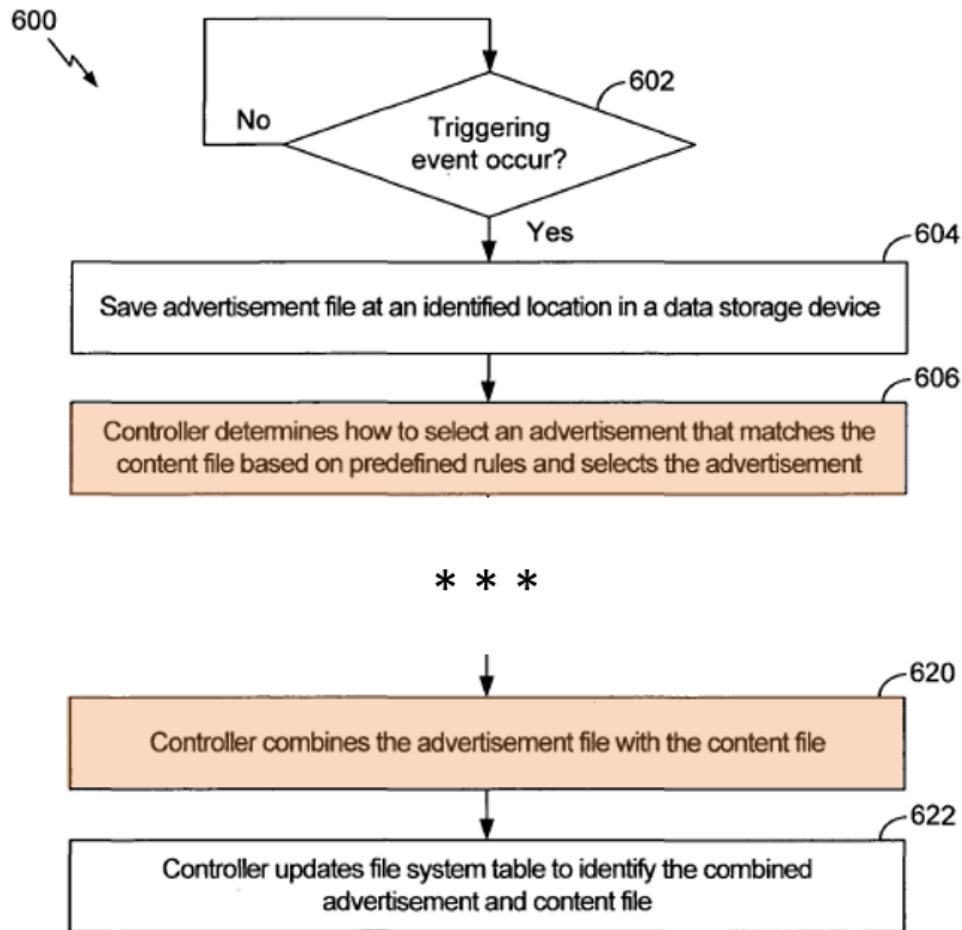


FIG. 3E

34. Ben-Rubi teaches a method of inserting advertisements into a content file, e.g., broadcast program, as shown in flowchart of Figure 6. *Id.*, 14:24-25, FIG. 6. Ben-Rubi teaches selecting “an advertisement that matches the content file based on one or more predefined rules.” *Id.*, 14:36-37. The selection process in Ben-Rubi is accomplished by reading “one or more selection rules . . . from **advertisement headers** or metadata to determine how to match an advertisement

with a content file.” *Id.*, 15:3-5 (emphasis added). Ben-Rubi then inserts the selected advertisement into the recorded video file. *Id.*, 15:33-16:9.



**Ben-Rubi Fig. 6
(partial, annotated)**

Id., Fig. 6 (partial, annotated). Therefore, Ben-Rubi utilizes selection rules from headers of advertisement files to insert the most appropriate advertisements.

iii. Overview of Applicant Admitted Prior Art

35. The '302 patent describes nearly all of the claimed features as known in the prior art. *See, e.g.*, EX1001, 1:61-2:62, 4:43-49, FIGS. 1-2. In the '302

patent specification, the Applicant describes various components of “a known PVR” depicted in Figure 1 as “PRIOR ART.” *Id.*, 1:61-2:35, Fig. 1.

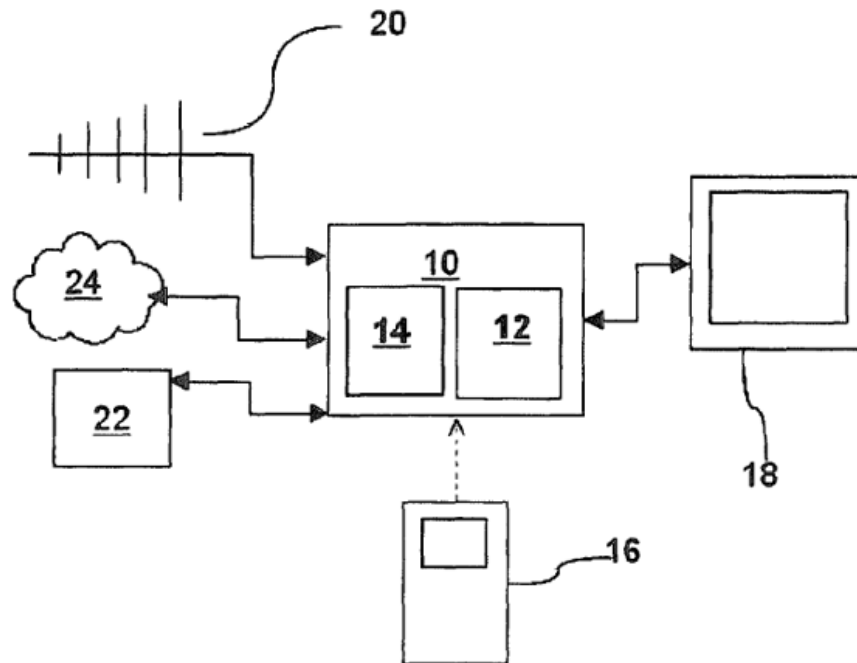


Figure 1

PRIOR ART

Id., Fig. 1. The specification states that “[t]he known PVR 10 has what is termed a ‘backchannel’ supplied by means of either a modem 22 or an Internet connection 24,” *id.*, 2:14-16, and that “[a] Real Time of day signal RT is received via the backchannel in either the Internet connection 24 or the connection via the modem 22.” *Id.*, 4:45-48. The specification also states that prior art “PVR receives broadcast digital television and audio signals from an aerial 20,” *id.*, 1:65-67, and

that “the connections to an aerial 20, a modem 22 and the Internet 24 are as in the prior art.” *Id.*, 4:44-45.

iv. Motivation to combine Patten with Ben-Rubi

36. A POSITA would have been motivated to modify Patten’s system to incorporate the teachings of Ben-Rubi with a reasonable expectation of success. Patten and Ben-Rubi are both directed to media players for playing back recorded video content. EX1004, [0002] (“Media insertion systems involve the selection of a media item for output by a receiver”); EX1006, 2:18-3:2 (“the host device 110 may include . . . a media player”). Furthermore, both are directed to delivering targeted advertisements to users to improve user engagement and to comply with broadcast regulations. EX1004, [0002] (“advertisements are tailored to the user profile”); EX1006, 14:36-15:11 (“select an advertisement that matches the content file based on one or more predefined rules”). The technical similarities between Patten and Ben-Rubi are many.

37. Ben-Rubi teaches rule-based targeted advertisement insertion by “combining a user content item,” *e.g.*, video, “with a supplemental content item, such as an advertisement.” EX1006, 1:4-5, 15:12-18. Ben-Rubi discloses rule-based selection of advertisements for the purpose of making advertisement more relevant to the user using “attributes such as a topic, an author, a performer, a genre, or a keyword” associated with the media content and the advertisement. *Id.*,

7:29-8:2. Patten similarly teaches rule-based targeted advertising, such as use of a “selection rule” to match advertisements to the viewer, EX1004, [0031] and “restriction codes” that “restrict the scheduling of the media item” based on various factors including content of the advertisement and the time of viewing. *Id.*, [0060]; *see also, e.g., id.*, [0027], [0040], [0047], [0048], [0086], [0089].

38. Both Ben-Rubi and Patten disclose using information about the advertisement including, for example, metadata fields related to the advertisements, as part of the selection and targeting process. Ben-Rubi refers to these fields as contained within headers of an advertisement. *Id.*, 15:3-5. And Patten teaches the use of fields, *i.e.*, “metadata,” that include “restriction codes” as part of the targeting objective. EX1004, [0060].

39. Ben-Rubi strives to make the inserted advertisement “appear[] ‘fresh’ or ‘live’ as opposed to fixed or repetitive” by accounting for the “number of times each of the plurality of” advertisements are “used to augment user content” and the “frequency of insertion of one or more particular advertisements.” EX1006, 8:3-15. Likewise, Patten also accounts for the number of advertisement playbacks by “no longer select[ing] that media item for output once the maximum has been reached.” EX1004, [00114]. Patten also accounts for “a frequency of insertion of one or more particular advertisements,” *id.*, [0029], by “selective disablement . . . to control the frequency with which each substitutional option is displayed,” for

example. *Id.*, [00100]. Thus, it is my opinion that a POSITA would have been motivated to incorporate a field related to the number of times the advertisement has been presented during recorded—or time-shifted—viewing and would have had a reasonable expectation of success in doing so. Indeed, introducing such a field would have required little more than modifications to software which were well within the capabilities of a POSITA.

40. It is my opinion, therefore, that these similarities between Ben-Rubi's and Patten's teachings would have led a POSITA to consider incorporating Ben-Rubi's implementation of header-based playout rules associated with an advertisement into Patten's PVR to extend and therefore improve Patten's advertisement targeting.

41. Moreover, a POSITA would have recognized that storing advertisement selection rules on the header of the advertisement itself to be a logical and efficient way of organizing information based on Ben-Rubi's teachings as it would have provided a known location for specific metadata values without a user needing to parse tens or hundreds of megabytes of data to evaluate the header value. Therefore, a POSITA would have been motivated to implement Ben-Rubi's header-based advertisement selection and insertion operation in Patten's advertisement selection to reduce processing burden on the limited capabilities of set-top boxes around the 2010 timeframe.

42. It is my opinion that a POSITA would have also recognized that Ben-Rubi's data storage device would be readily implemented in Patten's PVR based on the similarity and compatibility of the teachings across the two references. Patten discloses a hard disk 113 which has "two or more storage areas, one for the storage of television programme data, and the other for storing metadata and/or recorded media items." EX1004, [00188]. Ben-Rubi teaches that its data storage device 120 has a first storage area 126 for "user content items 132 such as . . . media files," and a second storage area 128 for storing "supplemental content items 142, such as advertisements." EX1006, 3:12-21. Ben-Rubi further discloses that its data storage device 120 is coupled to a "host device 110," EX1006, 3:22-36, which may be a "media player," such as Patten's PVR. *Id.*, 2:26-30. Moreover, Ben-Rubi's teaching that the storage device may be embedded within the host device further confirms my opinion. Ben-Rubi explains that the "data storage device 120 may be embedded within the host device 110." *Id.*, 3:22-36. For instance, Ben-Rubi lists "solid-state drive (SSD)" as an embodiment of its data storage device 120, *id.*, which a POSITA would have recognized as functionally identical to Patten's "hard disk 113," which receives "compressed video and/or audio data for recording and subsequent playback." EX1004, [00178];

43. Patten's PVR also includes an "external interface 135 such as a Universal Serial Bus 2 (USB2) port" that interfaces with removable storage

devices such as a USB flash drive. EX1004, [00189]; *see also id.*, [00192]-[00193]. A POSITA would have recognized that Ben-Rubi's data storage device 120, which in some embodiments may be an "external removable storage device, such as a Universal Serial Bus (USB) flash drive," EX1006, 3:30-32, would interface with Patten's USB port. Therefore, a POSITA would have been motivated to implement the teachings associated with Ben-Rubi's data storage device 120 in Patten's PVR and have a reasonable expectation of success in doing so as I note below.

44. It is my opinion that a POSITA would have had a reasonable expectation of success in combining Patten with Ben-Rubi because the combination would represent a simple integration of the software implementing Ben-Rubi's header-based advertisement selection into Patten's targeted advertisement functionality to be executed by Patten's processor. Storing and organizing data, such as in a header of a file, requires routine computer programming knowledge to modify software and is a task well within the skill of a POSITA. *Id.*

v. *Further Combining AAPA with the Patten/Ben-Rubi Combination*

45. It is also my opinion that a POSITA would have been motivated to modify the Patten/Ben-Rubi combination to also incorporate the teachings of AAPA with a reasonable expectation of success. Both the Patten/Ben-Rubi

Combination and AAPA are directed to a specific type of media player, a personal video recorder. EX1004, [0002]; EX1001, 4:43-55. And both are directed to solving the same problem—preventing playback of recorded advertisements that would violate time-based broadcasting regulations. EX1004, [00146]; EX1001, 8:28-31. Patten teaches that “[t]he time of day of playback may be taken into account, so that media items having watershed restrictions may not be selected outside the defined watershed times.” EX1004, [00146]. A POSITA would have understood that to enforce or apply watershed restrictions—which relate to time of day—the system would need to know the current time and a means for obtaining such clock signal. In my opinion, to implement this time-based regulation compliance technology on similar PVR platforms, a POSITA would have been motivated to apply the teachings and the conventional PVR hardware of the AAPA—such as the well-known means for obtaining a real-time clock signal—to Patten’s PVR receiver. In addition, a POSITA would have expected any set-top device, such as that of the ’302 patent, like all other devices containing a CPU to already contain a clock capable of being synchronized to a real-time clock source as an integral part of the overall architecture. A POSITA would have had a reasonable expectation of success in making this combination by taking conventional PVR hardware and applying it to another PVR. Specifically, the real-time clock signal of the AAPA would have been incorporated into Patten’s PVR

receiver by receiving the clock signal through AAPA's backchannel connection and making the signal available to Patten's PVR processor. This is confirmed by the fact that Patten already discloses an Internet connection, which a POSITA would have used to receive the time-of-day information, as the AAPA teaches. EX1004, [00198].

1. Independent Claim 1

[1a] A system for automating compliance with local broadcasting regulations laid down by a broadcasting authority and applicable to advertisements, said advertisements being provided during time-shifted viewing/listening comprises:

46. I have been asked to consider whether the Patten/Ben-Rubi/AAPA combination discloses the preamble of claim 1 but have not been asked to render an opinion on whether the preamble should be considered a limitation. If the preamble of claim 1 is deemed to be a limitation, it is my opinion that the Patten/Ben-Rubi/AAPA combination discloses this limitation.

47. Specifically, Patten discloses "targeted substitutional advertising (TSA)" which a POSITA would have understood to mean that advertisements are picked or selected in light of the factors about the advertisement and other information without the need for user input. That is, advertisements are automatically selected based on rules available at the set-top. EX1004, [0002]. The Patten system performs this selection at the receiver or PVR as shown through Patten's explanation that its "selection [is] made at the broadcast receiver." *Id.*

48. Patten discloses selecting the advertisements in view of a number of different factors including profile data, campaign metadata, and time of day. *Id.*, [00141]. One of the factors that Patten’s receiver takes into account when selecting substitute advertisements is “[t]he time of day of playback . . . so that media items having watershed restrictions may not be selected outside the defined **watershed times.**” *Id.*, [00146] (emphasis added).¹ Patten’s “media items” are advertisements. *Id.*, [0040] (“Each substitutional advertising campaign may comprise one or more media items, sometimes referred to as ‘copy’ or ‘copy items’”); *see also id.*, [0011] (“[S]ubstitutional item as seamless as possible. Ideally, the transition should be imperceptible to the user, so that the user experience is indistinguishable from watching a media item, such as an advertisement, included as part of a broadcast or playback programme.”).

49. A POSITA would have understood that a “watershed restriction” referred to as part of Patten’s restriction code is a local broadcasting regulation that applies to all broadcasted content including advertisements. Specifically, watershed restrictions prohibit certain content from being played during specific times of the day. EX1007 (US2004/0158870 by Paxton), [0071] (“For example, in the United Kingdom (and other countries), ‘watershed’ rules may proscribe certain

¹ All emphasis is added unless otherwise noted.

types of broadcasts at certain times of the day (for example, adult programs are not to be broadcast at certain times of the day).”). Watershed rules or regulations are “statutory rules” requiring service provider compliance. *Id.*, [0130] (“Further, embodiments of the present invention allow broadcasters and Service providers to remain within Statutory rules (e.g., Such as ‘watershed’ rules), by requiring PIN-protection on relevant programs and by denying access to others.”). It is my opinion that watershed restrictions are the type of broadcast regulations contemplated by the ’302 patent. My opinion is further confirmed by the fact that ’302 patent specification expressly emphasizes that time-based broadcasting restrictions by UK “Broadcast Committee of Advertising practice” are watershed restrictions. EX1001, 1:19-26 (“In addition, the time of day at which some adverts may be shown may also be strictly controlled. In the UK for example, if the advertisement is advertising alcoholic drinks containing more than 1.2% alcohol and the advertising regulator responsible is OFCOM then under the Broadcast Committee of Advertising Practice Rules on Scheduling of Television Advertisement the advertisement may not be shown at a time when children under 10 are likely to be viewing—before 7.30 pm, sometimes referred to as the ‘watershed’.”). Therefore, it is my opinion that a POSITA would have understood Patten to disclose “a system for automating compliance with local broadcasting

regulations laid down by a broadcasting authority and applicable to advertisements.”

50. Patten also discloses substituting media in time-shifted content: “media substitution may be performed on playback.” EX1004, [00141]. Patten’s reference to “on playback” refers to when a user records a program then views the program at a later time. In Patten’s operation, therefore, a user may see a different advertisement when viewing the recording of the program on playback than the advertisement originally included in the broadcast version. *Id.*; *see also id.*, [00145] (“The substitutional selection for a slot may differ between a live break and a playback break.”). Therefore, Patten discloses possibly different “advertisements being provided during time-shifted viewing/listening.”

[1b] programme supply means to supply broadcast digital video/audio programmes having therein periodic breaks for the insertion of advertisements;

51. It is my opinion that the Patten/Ben-Rubi/AAPA combination teaches this limitation through the recording of video programming having periodic advertisement breaks onto a hard disk associated with the set-top device.

52. First, as to periodic breaks, it is my opinion that both the AAPA and Patten disclose broadcast digital video/audio programs containing periodic breaks (called ad pods which contain multiple ads back-to back) for the insertion of advertisements as this limitation requires. For AAPA, Figure 2 illustrates the

“known format of a television programme” and is “broken up into segments 30, 32, 34 which are separated by advertising breaks, 31, 33.” EX1001, 2:35-39, Fig. 2. The '302 patent confirms those advertising breaks are periodic and common to almost all commercial television programming. *Id.*

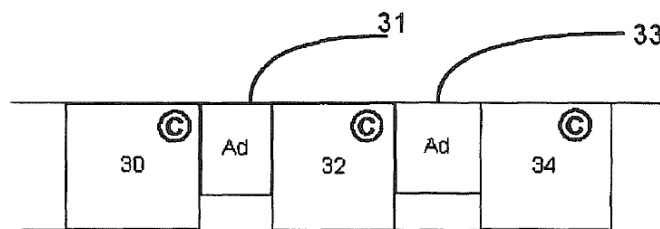


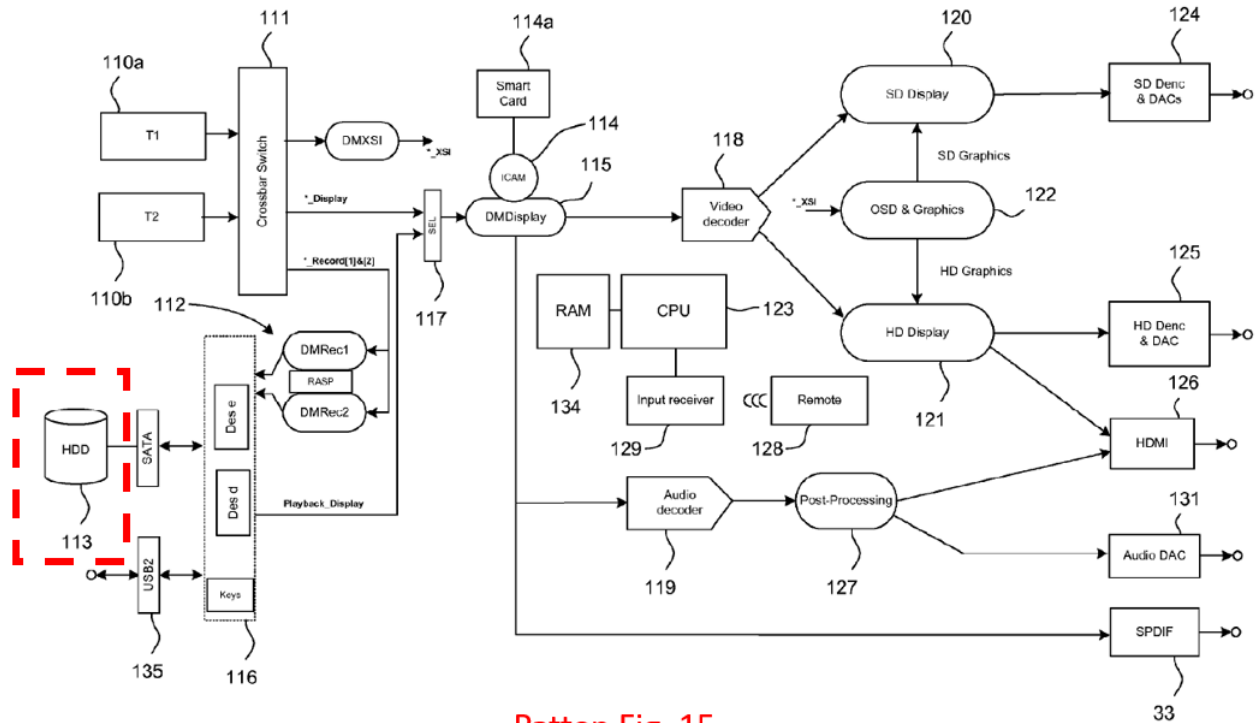
Figure 2

PRIOR ART

53. For Patten, it describes a “programme receiver” which receives broadcast video programming. EX1004, [0018] (“there is provided a media 20 insertion method in which programming is received by a programme receiver and may be output substantially immediately by the receiver and/or recorded at the receiver for subsequent output, the programming having a break defined therein such that media stored at the receiver may be output during the break, wherein the break in output of the recorded programming is shorter than the break in output of the programming 25 substantially immediately.”). As stated, the programming is “recorded at the receiver for subsequent output” and has “a break defined therein such that media stored at the receiver may be output during the break.” *Id.* A

POSITA would have readily understood that Patten's recorded programming has breaks for insertion of stored advertisements just like the advertising breaks of AAPA discussed above and as the '302 patent requires.

54. Next, a POSITA would have understood that Patten discloses the "programme supply means" this limitation requires. As I noted above, the function of the "programme supply means" is to "supply broadcast digital video/audio programmes having therein periodic breaks for the insertion of advertisements" and the associated structure from the '302 patent is "Hard disc 62 in PVR 60 with a part that stores a programme database 80." Patten discloses a hard disk within the receiver that stores the broadcast programs in a database. Illustrated in Figure 15 below, Patten's receiver has "a hard disk 113" that receives "compressed video and/or audio data for recording and subsequent playback." *Id.*, [00178]. That hard disk 113 "comprise two or more storage areas, one for the storage of television programme data." *Id.*, [00188]. The hard disk 113 with storage area for storing television programme data corresponds to '302 patent's hard disc 62 in PVR 60 with a part that stores a programme database 80 as the proposed construction of "programme supply means" requires.



Patten Fig. 15
(annotated)

Id., Fig. 15 (annotated).

55. Although Patten does not expressly state the programs are organized in a database structure, a POSITA would have understood that Patten’s storage of programs would occur through a database contained within hard disk 113. Furthermore, a POSITA would have known that audio/video media file size is large and that storing large media files limits by definition the number of database members that a set-top storage device can hold such that a simple indexing scheme to store and later recall any desired database member would be relatively trivial to implement from a software development standpoint, and thus, well within the capabilities of a POSITA. Patten explains that the hard disk 113 “may be similar

to conventional hard disks used in computer systems for storing large amounts of data.” *Id.*, [00188]. And for the organization of other data, Patten explains that “items stored locally at the receiver” would be organized in a “database.” *Id.*, [0041]. Thus, in light of these disclosures, a POSITA would have readily understood the programs to be organized in a database on hard disk 113 in a conventional manner and a POSITA would have had a reasonable expectation of success configuring the Patten/Ben-Rubi/AAPA combination in this manner. It is my opinion that a POSITA would have readily understood from routine prior art disclosures how to implement the storage of programs through programmatically constructed databases using routine programming techniques.

56. Other prior art references confirms the routine and conventional nature of storing audio/video files in a database. For instance, US 2005/0289588 by Kinnear teaches an “improved system 10 and method for targeting video advertising” on a digital video recorder, which “stor[es] several hours of analog and digital video program files 20, video advertisement files 30” by “creat[ing] on the device’s hard drive 16 [] a video program library database 21, [and] a video advertisement library database 31.” EX1014 (US2005/0289588 by Kinnear), [0020], [0022]. Thus, it is my opinion that a POSITA would have known that video programs would be stored in a database and would have implemented this storage technique and had a reasonable expectation of success in so doing.

[1c] advertisement supply means to supply advertisements within the periodic breaks,

57. It is my opinion that the Patten/Ben-Rubi/AAPA combination also discloses an advertisement supply means to supply advertisements within the periodic breaks as this limitation requires. As I noted above, the function of the “advertisement supply means” is to “supply advertisements within the periodic breaks” and the corresponding structure in the ’302 patent is “Hard disc 62 in PVR 60 with a part that stores an advertisement database 70.”

58. A POSITA would have understood that Patten discloses recording “media items” or advertisements onto a hard disk. Again, Patten’s “media items” are advertisements in a digital media format. *Id.*, [0040] (“Each substitutional advertising campaign may comprise one or more media items, sometimes referred to as ‘copy’ or ‘copy items’”). Patten’s “hard disk 113” is described as containing “two or more storage areas” where one is for “**storing** metadata and/or **recorded media items.**” EX1004, [00188]; *see also id.*, [0050] (“The media items may be stored in a partition of a local hard disc[.]”), [00135] (“In an additional or alternative embodiment, the receiver 1 may store additional substitutional media items that are not allocated to a particular campaign, but may be selected for output in slots where no campaign-related substitutional media items are available to the receiver 1.”). Thus, it is my opinion that the media items are stored on hard disk 113.

59. It is also my opinion that Patten supplies the advertisements within the periodic breaks based on Patten's disclosure that the advertisements may be shown during a break. Patten teaches that these "recorded media items," *i.e.*, advertisements, are "stored at the receiver" and "may be output during the break" of the video programs. *Id.*, [0018]. Therefore, it is my opinion that Patten discloses "advertisement supply means to supply advertisements within the periodic breaks" as this limitation requires.

60. And as I explained above, it is my opinion that a POSITA would understand that Patten's media items, which includes advertising, would be stored in the hard disk 113 and arranged in a database with a reasonable expectation of success.

[1d] each advertisement having associated therewith a header comprising a first field related to a local broadcasting time regulation laid down by the broadcasting authority which local broadcasting time regulation restricts the time of day at which said advertisement may be shown,

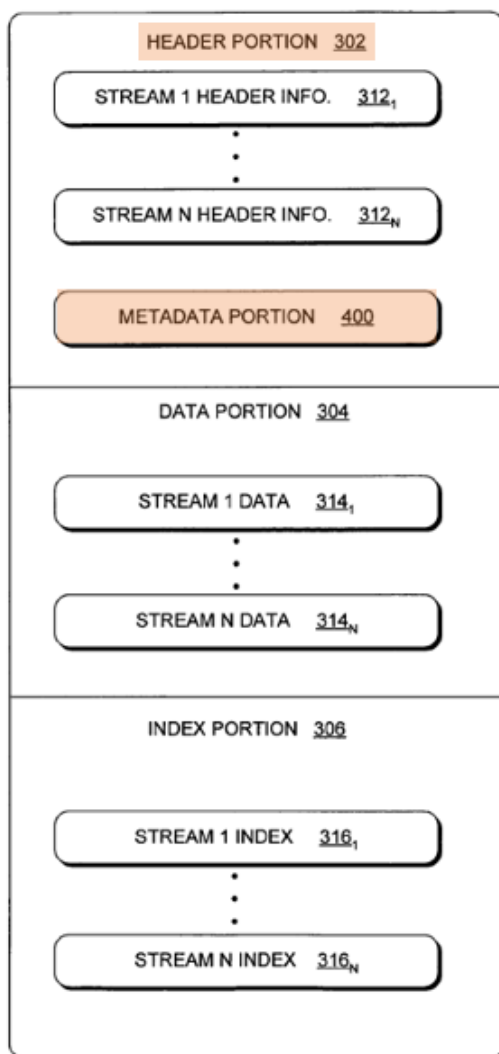
61. It is my opinion that the Patten/Ben-Rubi/AAPA combination renders obvious this limitation through the embedding of watershed restriction codes with advertisement files. Patten teaches that each of its advertisements is associated with "restriction codes" that prevent an advertisement from playing at certain times based on the code. EX1004, [0060] ("Restriction codes - a media item for a campaign has a set of restriction codes, which may be defined only after the

booking stage. *The codes define properties of the content of the media item which may restrict the scheduling of the media item*, such as the type of product or service being advertised, the minimum age of viewer *or the watershed after which the media item may be shown.*”). These restriction codes “restrict the scheduling of the media item” and include the “watershed after which the media item may be shown.” *Id.*; *see also id.*, [0069] (“The restriction codes applied to the media item should be compatible with the contents of the programming, the break, and the time of day”). And as I explained in [1a] above, a POSITA would have understood that a “watershed” refers to a specific type of local broadcasting regulation imposed by a broadcasting authority that applies to all broadcasted content, including advertisements. A POSITA would have further understood that the programming played back from a PVR or similar device that inserted TV advertisements in available ad slots during playback from a PVR would also be subject to the local broadcast regulations imposed by a broadcast authority.

62. Patten’s “restriction codes” are “attributes or metadata” of individual advertisements. EX1004, [0060] (“In addition, an individual copy (i.e., media) item for a particular campaign has its own set of attributes or metadata: . . . Restriction codes”). Furthermore, it is my opinion that a POSITA would have known that metadata would be part of a header of an advertisement video file, and therefore would have found the claimed header obvious in light of Patten’s

disclosure. This knowledge of a POSITA is corroborated through a number of contemporaneous examples.

63. One such reference is U.S. 7,480,382 to Dunbar (“Dunbar”) which teaches a video file header that includes metadata: “this embodiment includes a metadata portion 400 in header portion 302.” EX1008, 6:1-5.



Dunbar Fig. 4
(annotated)

Id., Fig. 4 (annotated). Dunbar’s metadata portion 400 holds information related to “the image (or audio or video clip)” including “information that may be desirable depending on the application.” *Id.*, 6:36-44. And a POSITA would have known, as Dunbar teaches, that “[b]ecause metadata portion 400 is extensible, **applications and/or users can define their own metadata** and such extensions can be used simultaneously within a single container and metadata portion without conflict.” *Id.*, 6:36-44. Therefore, a POSITA would have known that a video file with a header that includes metadata would be used to implement Patten’s automated watershed compliance function without causing conflicts with other functionalities of a PVR. This would require no more than the routine modification of software to specify the values in the header to achieve a well-known result of the header containing the restriction codes. A POSITA would have had a high degree of confidence that the modification would be successful.

64. There are many other examples of headers containing metadata values at the beginning of files. Another example is U.S. Patent No. 8,976,871 to Chen which also teaches video files with “metadata located in the header of the file.” EX1009, 17:19-21. U.S. Patent Publication No. 2014/0086338 to Lu teaches that “metadata may be built into one or more headers that are appended the encoded video.” EX1010, [0002]; *see also id.*, [0017] (“header data represents metadata that may be incorporated into headers”). Thus, it is my opinion that Dunbar, Chen,

Lu all demonstrate a POSITA's knowledge that metadata of a video would be implemented as a header of a video or be part of a header.

65. A POSITA, by the priority data of the '302 patent, would have also been familiar with industry standards for video encoding such as the ubiquitous ISO MPEG standards that since the 1990's specified mean of embedding metadata within a digital video transport stream such that certain metadata and many other forms of control information traveled with the video content to be decoded and utilized by a receiving device. Furthermore, the broadcast standards of Europe (DVB) and the United States (ATSC) contain specification for embedding metadata and control information with broadcast television signals.

66. Placing metadata in the header of a video file would also have been an obvious design choice for a POSITA. The specification and prosecution history of the '302 patent does not identify any unique or novel benefits for placing the claimed first field in the header of an advertisement as opposed to any other location, *see* EX1001 and EX1002, especially in light of the many open standards for digital video well-known and practiced in the television industry. Consequently, it is my opinion that embedding Patten's metadata at the header of the advertisement is an obvious design choice well within the skill of a POSITA.

67. And there are other well-known and obvious benefits for incorporating metadata as the header of a video file rather than in another part of

the file such as in the middle or end, because, as Dunbar states, doing so “allows an end user of [video] file container 106 to access the metadata without having to process data portion 304.” EX1008, 6:9-11. Having a known location to select the header reduces the processing burden on the PVR, because video payload size is very large and variable compared to the size of metadata and seeking through many megabytes of data takes a relatively significant amount of time and computing power especially within the context of television set-top boxes or PVRs around the 2010 timeframe.

68. For all these reasons, it is my opinion that a POSITA would have found it obvious to modify Patten’s metadata (which includes the restriction codes) and embed it in a header of the advertisement video file. And as I explained above, it is my opinion that a POSITA would have had a reasonable expectation of success in making this modification because storing and organizing data, as well as writing the software necessary to achieve these results, has been a routine task well before the priority date of the ’302 patent and well within the skill of a POSITA.

69. Alternatively, if Patten in view of a POSITA’s knowledge does not render obvious use of an advertisement header to store information associated with the advertisement, another reference, Ben-Rubi, expressly teaches storing selection rules and other information about an advertisement in its header. For example, Ben-Rubi discloses that its controller “reads one or more selection rules from . . .

advertisement headers or metadata to determine how to match an advertisement with a content file,” confirming its teaching that advertisements with metadata are stored in headers. EX1006, 15:3-5. Furthermore, Ben-Rubi itself confirms that the header is part of the advertisement file, as opposed to a separate file. EX1006 at 17:28-29(“New or updated selection and placement rules received via the application command may be stored with the commercial file, such as in a header or in metadata, or stored in a separate file.”).

70. Ben-Rubi’s advertisement headers contain “selection rules.” EX1006, 15:3-5. These “selection rules” are used by Ben-Rubi to match an appropriate advertisement to be inserted into the video content. *Id.* Thus, it is my opinion that a POSITA would have recognized Ben-Rubi’s header to be the logical place to store Patten’s “restriction codes.” Recall, Patten’s restriction codes are also selection rules that exclude certain advertisements from being displayed during watershed time periods, for example. A POSITA would have been motivated to employ Ben-Rubi’s header teachings with Patten’s restriction code teachings with a reasonable expectation of success, using conventional programming techniques that were well within the skill of a POSITA. Therefore, it is my opinion that Patten as modified by Ben-Rubi teaches advertisements having “a header comprising a first field.” *Id.*

[1e] and a second field related to the number of times said advertisement has previously been shown during time-shifted viewing:

71. It is my opinion that the combination of Patten/Ben-Rubi/AAPA discloses “a second field related to the number of times said advertisement has previously been shown during time-shifted viewing” as this limitation requires. Patten discloses that its receiver “update[s] a counter associated with respective individual media items, when that media item is output.” EX1004, [0057]; *see also id.* at [0036] (“the PVR may record viewing data 7 indicating the broadcast programmes and/or media items output for display by the receiver 1, for reporting purposes.”). And this is true for time-shifted viewing as I explained above. Patten includes this counter in its system also because it is “important to determine . . . how many times the campaign has actually been displayed” for reporting purposes in order to bill the advertiser for the ad play. EX1004, [00148]. And because Patten teaches that each advertisement has associated “attributes and metadata,” a POSITA would have understood those attributes and metadata (themselves located in a header as discussed in [1d]) would include a second field related to the number of times said advertisement has previously been shown during time-shifted viewing for each advertisement as this limitation requires. *Id.*, [0060].

72. Alternatively, if Patten does not disclose the “second field related to the number of times said advertisement has previously been shown during time-

shifted viewing,” a POSITA would have found it obvious to implement such a header field in the Patten/Ben-Rubi/AAPA combination and would have had a reasonable expectation in doing so. As discussed above in [1d], a POSITA would have found it obvious to implement a header containing “attributes and metadata” that provides various information regarding the associated advertisement.

EX1004, [0060]. Again, Dunbar teaches that “metadata portion 400 is extensible” and that “applications and/or users can define their own metadata.” EX1008, 6:36-44. Therefore, a POSITA would have found it obvious to incorporate a field for information regarding advertising playback count into Patten/Ben-Rubi/AAPA’s metadata in the header, as a matter of obvious design choice as discussed in [1d]. And like I explained for the first field above, the specification and prosecution history of the ’302 patent does not emphasize any benefit for the second field related to the number of times the advertisement has been viewed in time-shifted playback. *See* EX1001, EX1002. Thus, it is my opinion that putting the second field related to number of times the advertisement has been played in the header solves no stated problem and presents no novel or unexpected result.

73. It is my opinion that other contemporaneous references, such as U.S. 2009/0070414 to Singal (“Singal”) corroborate the obviousness of placing a field related to the number of times an advisement has been played in time-shifted viewing in the header of a video file. Singal counts the number of times a media

file has been played in “asset metadata 136.” EX1011, [0019] (one value is “number of plays for the media content 138.”). Singal explains that the metadata is located at the start of the file, *i.e.*, the header, and “following the asset metadata 136 is the media content 138.” *Id.* That is, Singal’s metadata 136 is located before video data which, in my opinion, a POSITA would have understood to be the header of a video file. And as I explained above, a POSITA would have readily understood that metadata is part of a header. EX1008, 6:1-5 (“metadata portion 400 in header portion 302.”); EX1009, 17:19-21 (“metadata located in the header of the file.”); EX1010, [0002] (“metadata may be built into one or more headers that are appended the encoded video.”). Therefore, it is my opinion that placing Patten’s advertisement playback counter at the header of the advertisement is an obvious design choice well within the skill of a POSITA. *Id.*

74. It is also my opinion that a POSITA would have found the second field to be obvious in light of Ben-Rubi’s use of the advertisement playback count in its selection process. Ben-Rubi teaches counting the number of advertisement playbacks because it seeks to keep the inserted advertisement “appear[] ‘fresh’ or ‘live’ as opposed to fixed or repetitive” by tracking the “number of times each of the plurality of” advertisements are “used to augment user content” and the “frequency of insertion of one or more particular advertisements.” EX1006, 8:3-15. Furthermore, a POSITA would have understood that the advertiser also does

not want overexposure of their ad in any given time period because of the fact that excessive repetition can be counter productive by annoying a viewer instead of inspiring a purchase. In fact, it is well known in the television industry that an advertiser can be compensated with a “make good” if their ad should run back-to-back or even within a specific period. A “make good” means a free playout of the ad at a later time.

75. As I discussed above, Ben-Rubi uses “selection rules” stored in headers for selecting advertisements. EX1006, 15:3-5. Thus, it is my opinion that a POSITA would have found it obvious that Ben-Rubi’s advertisement playback count would be stored in the header of the advertisement in the Patten/Ben-Rubi/AAPA combination, consistent with the overarching header-based approach of Ben-Rubi and would have had a reasonable expectation of success in doing so.

[1f] rules database means containing rules relating to said local broadcasting time regulation;

76. It is my opinion that the Patten/Ben-Rubi/AAPA combination discloses a rules database means containing rules relating to said local broadcasting time regulation as this limitation requires. The function of the “rules database means” is to exist for “containing rules relating to said local broadcasting time regulation” and its structure corresponds to “Hard disc 62 in PVR 60 with a part that stores a rules database 90.”

77. Again, Patten discloses a “hard disk 113” with “two or more storage areas” with one area “for **storing metadata**[.]” EX1004, [00188]. The hard disk 113 with storage area for storing metadata corresponds to ’302 patent’s hard disc 62 in PVR 60 with a part that stores a rules database 90. And for the reasons I explained above, the stored metadata in hard disk 113—which includes the watershed restriction codes—are “rules relating to said local broadcasting time regulation.” Although Patten does not expressly state the rules would be stored in a database, for the reasons I stated above, a POSITA would have known to store the rules in a database, and had a reasonable expectation of success in doing so.

78. Another way Patten discloses this limitation is through its disclosure that “[t]he programming schedule itself may include . . . Restriction codes (by time)—e.g. codes that indicate time restrictions for certain types of advertisement, such as a watershed.” EX1004, [0059]. Patten teaches that the “programme schedule data may be stored in the hard disk 113.” *Id.*, [00185]. Thus, Patten’s programming schedule—itsself embedded with rules relating to said local broadcasting time regulation—corresponds to the claimed rules database as this limitation requires. Patten’s hard disk 113 with storage area for storing the metadata and programming schedule corresponds to ’302 patent’s hard disc 62 in PVR 60 with a part that stores a rules database 90 and the proposed construction requires. For the same reasons as I explained above, it is my opinion that a

POSITA would have found it obvious that the rules and other content stored in the hard disk 113 would be arranged in a database.

79. In the alternative, if Patten does not disclose the rules database means, it is my opinion that Ben-Rubi teaches such rules database means. Specifically, Ben-Rubi discloses a “second storage area 128” within its data storage device 120 that “stores selection and/or placement rules 178.” EX1006, 5:13-17. This set of selection rules 178 “control selection of the particular advertisement 170 from the plurality of other supplemental items 174.” *Id.* Thus, it is my opinion that a POSITA would have understood that Ben-Rubi’s selection rules 178 would include Patten’s watershed restriction codes, among other selection rules within the Patten/Ben-Rubi/AAPA combination. As a result, it is my opinion that the Patten/Ben-Rubi/AAPA combination renders this limitation obvious.

[1g] clock means to supply a real-time clock signal;

80. It is my opinion that the combination of Patten/Ben-Rubi/AAPA discloses a clock reference means to supply a real-time clock signal as this limitation requires. The function of the “clock means” is to “supply a real-time clock signal” and the corresponding structure is “[b]ackchannel of a PVR via internet connection 24 or modem 22.”

81. As I explained in limitations [1a] and [1d] above and in [1h] and [1i] below, Patten teaches automatically replacing advertisements in a recorded video

program in compliance with the “watershed” restriction code which is a time-based content restriction based on the current time. *See, e.g.*, EX1004, [00146] (“The time of day of playback may be taken into account, so that media items having watershed restrictions may not be selected outside the defined watershed times.”). To apply a time-based content restriction during playback of recorded content, a POSITA would have understood that Patten’s receiver requires knowledge of current time within a reasonable margin of error because in applying watershed restrictions it is essential to compare the current time to the possible restricted time. Therefore, it is my opinion that a POSITA would have understood that Patten’s receiver discloses a clock means to supply a real-time clock signal. In addition, Patten teaches that its receiver is part of a “broadcast system, such as . . . [an] Internet broadcast system,” which must require an internet connection. EX1004, [00198]. Therefore, it is my opinion that Patten discloses to a POSITA the claimed clock means with the corresponding backchannel structure of “internet connection 24.”

82. But even if Patten does not disclose to a POSITA the clock means, AAPA discloses this limitation. The ’302 patent specification expressly states that “[i]t is well known that a digital television signal and a **backchannel** each **contain highly accurate time information** which can be used by equipment in a PVR 10.” EX1001, 2:26-30. The specification further states that “a modem 22 and the

Internet 24 are **as in the prior art**,” and that “[a] Real Time of day signal RT is received via the backchannel in either the Internet connection 24 or the connection via the modem 22.” *Id.*, 4:43-48. And the specification states unequivocally that the time of the day “signal is provided in known systems.” *Id.*, 4:48-49.

Therefore, AAPA discloses the clock means with the corresponding structure of backchannel of a PVR via Internet connection 24 or modem 22.

[1h] and control means arranged to read said first field and said clock signal and said rules database and to apply said local broadcasting time regulation to each advertisement before said advertisement is shown

83. It is my opinion that the combination of Patten/Ben-Rubi/AAPA teaches the claimed control means arranged as this limitation requires. As an initial matter, Patten’s control means is a processor. Patten explains its “receiver 1 is controlled by a processor 123,” and thus, acts as the control means for Patten’s PVR receiver. EX1004, [00182]. Relevant to this limitation, control means must perform the following steps:

- read said first field and said clock signal and said rules database and to apply said local broadcasting time regulation to each advertisement before said advertisement is shown
- read said first field and said clock signal and said rules database and to apply said local broadcasting time regulation to each advertisement

before said advertisement is shown during one of the periodic breaks

84. The corresponding control means structure is “Hardware or combination of hardware and software of PVR 60 arranged to perform steps 102, 104, and 112 of FIG. 8.”

85. A POSITA would have understood that Patten’s processor 123 is arranged as this limitation requires. For the “Recording & Playback” operation, Patten teaches that “[t]he time of day of playback may be taken into account, so that media items having watershed restrictions may not be selected outside the defined watershed times.” *Id.*, [00140], [00146]. The phrase “taking into account” means that the time of day is considered to avoid watershed-restricted advertisement playback. This means that Patten discloses “apply[ing] said local broadcasting time regulation to each advertisement before said advertisement is shown.” This can be done through reading the first field, *i.e.*, restriction code, the clock signal, *i.e.*, real time clock or internet broadcast system, and the rules database as I described above. As discussed in [1d], each media item (advertisement) contains the first field having watershed restriction codes. The restriction codes of the advertisement and programming schedules are stored in a rules database as discussed in [1f]. And as I discussed above, Patten’s receiver must know the current time to compare against the restricted watershed time period. Thus, it is my opinion that a POSITA would have understood that a

processor must read (1) the watershed restrictions of the advertisements, (2) other restriction codes applicable to advertisement insertion, and (3) the clock signal before it can apply the rules to avoid playback of watershed-restricted advertisements. Therefore, a POSITA would have understood Patten to disclose the claimed function of the control means “to read said first field and said clock signal and said rules database.” *Id.*

86. It is my opinion that Patten’s processor 123, *i.e.*, the claimed control means, orchestrates this process. Patten discloses that “receiver 1 is controlled by a processor 123.” EX1004, [00182]. Patten’s processor 123 corresponds to ’302 patent’s hardware or combination of hardware and software of PVR 60 arranged to perform steps 102, 104, and 112 of FIG. 8.

[1i] wherein the control means is further arranged to update the second field in the header of said advertisement when said advertisement is again shown during time-shifted viewing.

87. It is my opinion that the combination of Patten/Ben-Rubi/AAPA teaches the claimed control means arranged as this limitation requires. Relevant to this limitation, control means must perform the following step: update the second field in the header of said advertisement when said advertisement is again shown during time-shifted viewing. The corresponding control means structure is “Hardware or combination of hardware and software of PVR 60 arranged to perform steps 102, 104, and 112 of FIG. 8.”

88. Patten teaches that “[t]he receiver may update a counter associated with respective individual media items, when that media item is output.” EX1004, [0057]. As I discussed in limitation [1e], Patten and Ben-Rubi’s playback counter teaches the second field. And Patten’s “receiver 1 is controlled by a processor 123.” EX1004, [00182]. It is my opinion, therefore, that a POSITA would have understood that the claimed function is performed by the processor 123, *i.e.*, the control means.

* * *

89. As discussed above, the combination of Patten/Ben-Rubi/AAPA renders obvious claim 1.

2. Dependent Claim 2

[2] The system according to claim 1 in which each header includes a keyword, and the control means checks the keyword against the rules database during application of said local broadcasting time regulation to said advertisement.

90. It is my opinion that the combination of Patten/Ben-Rubi/AAPA renders obvious this claim. Patten discloses “Restriction codes,” which “define properties of the content of the media item which may **restrict** the scheduling of the media item, such as the **type of product or service being advertised.**” EX1004, [0060]. The type of product or service being advertised are words or phrases that characterize the advertisement. In my opinion, a POSITA would have understood these words and phrases to be keywords. And as I explained for

limitation [1d] above, restriction codes are located in the header of each advertisement.

91. A POSITA would have understood that restricting playback of advertisement based on “type of product or service being advertised” (keywords) would involve comparing those keywords against a set of rules, in my opinion. This is true because the keywords standing alone could not be used to filter or select an advertisement without a comparison using rules. A POSITA would have further understood that such rules must be stored in Patten’s rules database as I discussed in limitation [1f] to allow Patten’s receiver to make such comparisons. And because Patten’s “receiver 1 is controlled by a processor 123,” (as I explained above), EX1004, [00182], a POSITA would have understood that Patten’s processor (*i.e.*, the control means) checks the keyword against the rules database during application of the local broadcasting time regulation to the advertisement.

3. Dependent Claim 3

[3] The system according to claim 2 in which a further local broadcasting regulation forbids the provision of certain types of advertisement on certain days of the week and each header further indicates a day of the week validity.

92. It is my opinion that the combination of Patten/Ben-Rubi/AAPA renders obvious this claim. As I discussed in limitation [1d] above, Patten discloses restriction codes that “restrict the scheduling of the media item,” and provides various examples of such restrictions in scheduling of advertisements,

including watershed regulations. EX1004, [0060]. A POSITA, in my opinion, would have recognized that there is only a finite, in fact very limited, number of criteria for broadcasting scheduling, including time of the day and day of the week. For instance, U.S. 2002/0144262 to Plotnick (“Plotnick”) teaches that advertisement scheduling in a time-shifted viewing context “may vary based on . . . what time of day it is, what day of the week” it is, which confirms my opinion that a POSITA would have the knowledge that day of the week is a commonly used criteria for determining when advertisement should be scheduled. EX1005, [0194]. For example, advertisers may wish to avoid certain days of the week based on business reasons, *e.g.*, restaurants may prefer to advertise on days near the end of a work week when people are more likely to dine at a restaurant and not at the beginning of the week when they are not.

93. Other contemporaneous references confirm my opinion. U.S. 8,782,691 to Noble (“Noble”), for example, also corroborates the same, teaching that “[t]he invention can also allow the insertion of a promotion targeted according to the **day that the recorded program is played back** from the video storage device 604.” EX1012, 15:58-60. Similarly, U.S. 8,214,256 to Riedl et al. (“Riedl”) further corroborates the same, teaching advertisement targeting using “day/time, etc., that [is] associate[d] with the advertisement.” EX1013, 5:32-36.

94. Thus, in light of Patten's use of time-based restriction for complying with watershed restrictions, it is my opinion that a POSITA would have found it obvious to modify Patten to further consider the day of the week and thereby ensure compliance with local broadcasting regulations that have day of the week restrictions. And it is my opinion that doing so would have been obvious in light of the well-known use of day of week in scheduling advertisements, and would have the predictable result of a system that complies with all manner of time-based broadcasting regulations. Moreover, because Patten already includes the restriction codes in a header of the advertisement for automated regulation compliance, a POSITA would have found it obvious to include another field in the header that indicates a day of the week validity. A POSITA would have had a reasonable expectation of success in making this modification because storing and organizing data is a routine task well within the skill of a POSITA as I explained in limitation [1d]. Thus, in my opinion a POSITA would have understood that the Patten/Ben-Rubi/AAPA combination discloses the system according to claim 2 in which a further local broadcasting regulation forbids the provision of certain types of advertisement on certain days of the week and each header further indicates a day of the week validity.

4. Dependent Claim 6

[6] The system according to claim 1 in which the broadcast video/audio programme is arranged to contain information

including the duration of each segment of programme between periodic breaks and the duration of the next periodic break.

95. It is my opinion that the combination of Patten/Ben-Rubi/AAPA renders obvious this claim. Patten explains that the broadcasted “programming [has] a **break defined therein** such that media stored at the receiver may be output during the break.” EX1004, [0019]. In my opinion, a POSITA would have understood defining a break for playing an advertisement as at least providing information relating to when the advertisement break is to start relative to the programming, and the duration of the break. Furthermore, the information on start time of the advertisement relative to the programming is, by definition, information on the duration of each programming segment. Indeed, for Patten to provide “a time-divided system in which the insertable media items are output during **breaks within or between programmes**,” EX1004, [00201], a POSITA would have understood that Patten’s programming contains information including the duration of each segment of programme between periodic breaks and the duration of the next periodic break. Moreover, Patten repeatedly discusses “break schedule data” and scheduling advertisement playback in those scheduled breaks, EX1004, [0054], [00120], [00144-45], as well as “programme schedule data . . . defining the scheduling of programmes in each channel.” *Id.*, [00185]; *see also id.*, [0069], [0091]. It is my opinion that these disclosures further show that Patten has

information about program segment duration and periodic break durations.

Therefore, it is my opinion that Patten discloses this limitation.

5. Dependent Claim 7

[7] The system according to claim 1, wherein the system is a personal video recorder (PVR), and wherein the rules database means is a rules database stored locally in the PVR.

96. It is my opinion that the combination of Patten/Ben-Rubi/AAPA renders obvious this claim. Patten teaches that the “broadcast receiver 1 comprises a personal video recorder (PVR).” EX1004, [0034]; *see also id.*, [00140]. Furthermore, as discussed in [1f], the rules database is stored within Patten’s “hard disk 113” of receiver 1. *Id.*, [00185], [00188], Fig. 15. Therefore, a POSITA would have understood that Patten discloses a rules database stored locally in the PVR as this limitation requires.

6. Dependent Claim 8

[8] The system according to claim 1, wherein the control means is further arranged to, when the application of said local broadcasting time regulation to a particular advertisement indicates that showing the particular advertisement would violate the local broadcasting time regulation, search the advertisements stored in the advertisement supply means until either an advertisement is found that does not violate the local broadcasting time regulation or it is determined that no advertisement stored in the advertisement supply means is suitable for showing under the local broadcasting time regulation.

97. It is my opinion that the combination of Patten/Ben-Rubi/AAPA renders obvious this claim. As I discussed in claim 1, Patten discloses targeted

advertising that applies watershed restriction associated with each advertisement, “so that media items having watershed restrictions may not be selected outside the defined watershed times.” EX1004, [00146]. In my opinion, a POSITA would have understood that selecting advertisements that comply with watershed restrictions involves “application of said local broadcasting time regulation to a particular advertisement,” to avoid selection of advertisements for which “showing the particular advertisement would violate the local broadcasting time regulation” as specified in this claim.

98. Furthermore, Patten discloses that “the receiver 1 obtains the long list” of potential advertisement candidates for a given advertisement break, and “filters out **invalid** or unavailable items” . . . “to obtain a short list” of advertisements that may be shown. EX1004, [00132]; *see also id.*, [00125]. It is my opinion that a POSITA would have understood that creation of a shortlist of candidate advertisements by filtering out invalid advertisements involves “search[ing] the advertisements stored in the advertisement supply means until [] an advertisement is found that does not violate the local broadcasting time regulation” as claimed. A POSITA, in my opinion, would have also understood that Patten’s watershed restriction compliance operation would display no advertisement if all candidate advertisements violated the watershed (*i.e.*, “it is determined that no advertisement stored in the advertisement supply means is

suitable for showing under the local broadcasting time regulation”), to comply with the statutory watershed regulation. *See also* EX1007, [0071], [0130]. Searching through a list of data entries to determine whether there are any entries that meet the criteria is one of elementary operation of a software system and easily implemented by a POSITA using well-understood techniques. And as I discussed in [1h], Patten’s processor 123 performs the operations discussed above, thereby disclosing the control means. EX1004, [00182].

7. Dependent Claim 9

[9] The system according to claim 8, wherein the advertisements stored in the advertisement supply means include advertisements that were broadcast live with a programme being shown during time-shifted viewing and also include advertisements that were received by the system other than in the live broadcast of the programme being shown in time-shifted viewing, and wherein the control means is further arranged to show during time-shifted viewing of the programme a mix of advertisements that were received during the live broadcast of the programme and advertisements that were received other than in the live broadcast of the programme being shown during time-shifted viewing.

99. It is my opinion that the combination of Patten/Ben-Rubi/AAPA renders obvious this claim. First, Patten teaches storing and displaying advertisements originally broadcasted with the recorded program because it discloses a viewing mode where “the inserted substitutional items,” *i.e.*, advertisements, “may be **recorded within** the recording of the received broadcast stream, so that the displayed content on playback is **identical to that seen when**

watching the live broadcast stream with any inserted substitutional media items.” EX1004, [00140]. A POSITA would have understood that the advertisements played back by Patten’s receiver in this time-shifted viewing are the same advertisements that were “broadcasted live with a programme being shown during time-shifted viewing.” It is my opinion that this disclosure confirms that the “advertisement supply means include advertisements that were broadcast live with a programme being shown during time-shifted viewing” as this limitation requires.

100. Next, a POSITA would have understood Patten’s disclosure to include storing and displaying advertisements that were *not* originally broadcasted with the recorded program because Patten teaches a time-shifted viewing scenario where “user experience is **different from conventional recording**, in which the user expects to see on playback the same content that was previously viewed live.” EX1004, [00141]. Thus, a POSITA would have understood that the advertisements played back by Patten’s receiver in this scenario have been “received by the system other than in the live broadcast of the programme being shown in time-shifted viewing” as this claim requires.

101. Then, Patten discloses a process for creating such a viewing experience. Specifically, Patten teaches “media substitution may be performed on playback,” resulting in advertisement playback that was not broadcasted with the

original program. EX1004, [00141]. As a result, a POSITA would have understood that Patten discloses the requirement that the system “also include advertisements that were received by the system other than in the live broadcast of the programme being shown in time-shifted viewing” as the claim requires.

102. And Patten discloses that the substitution of advertisements is optional. That is, Patten explains that “media substitution **may be performed** on playback” to mean that media substitution is sometime not performed, resulting in playback of originally recorded advertisement from time to time. *Id.* Indeed, a POSITA would have recognized that advertisement substitution is not always necessary nor desirable, including, for example when time-shifted playback is merely delayed from the live broadcast by a short period of time, *e.g.*, minutes or days. Consequently, a POSTA would have understood that Patten discloses displaying “a mix of advertisements” that were broadcasted live with the recorded program and others that were later recorded for advertisement substitution as this claim requires.

103. Finally, the optional substitution of advertisements occurs under the control of “processor 123” which is a control means for Patten’s PVR receiver. EX1004, [00182]. A POSITA would have understood that the claimed functions discussed above are performed by the processor 123, and the processor 123 is therefore the claimed control means.

8. Independent Claim 12

[12a] A Personal Video Recorder (PVR) for use in a system for automating compliance with local broadcasting regulations laid down by a broadcasting authority and applicable to advertisements, said advertisements being provided during time-shifted viewing/listening, the PVR comprising:

104. It is my opinion that the combination of Patten/Ben-Rubi/AAPA discloses this limitation for the reasons discussed in Ground 1, claim 1 element [1a] and claim 7.

[12b] data storage means storing a programme episode database, an advertisement database, and a rules database,

105. It is my opinion that the combination of Patten/Ben-Rubi/AAPA discloses this limitation for the reasons discussed in Ground 1, claim 1 elements [1b], [1c], and [1f].

[12c] each stored advertisement having associated therewith a header comprising a first field related to a local broadcasting time regulation laid down by the broadcasting authority, which local broadcasting time regulation restricts the time of day at which said advertisement may be shown,

106. It is my opinion that the combination of Patten/Ben-Rubi/AAPA renders obvious this limitation for the reasons discussed in Ground 1, claim 1 element [1d].

[12d] and a second field related to the number of times said advertisement has previously been shown during time-shifted viewing,

107. It is my opinion that the combination of Patten/Ben-Rubi/AAPA discloses this limitation for the reasons discussed in Ground 1, claim 1 element [1e].

[12e] wherein the rules database contains rules relating to said local broadcasting time regulation

108. It is my opinion that the combination of Patten/Ben-Rubi/AAPA discloses this limitation for the reasons discussed in Ground 1, claim 1 element [1f].

[12f] and wherein the stored programme episodes have periodic breaks for the insertion of advertisements;

109. It is my opinion that the combination of Patten/Ben-Rubi/AAPA discloses this limitation for the reasons discussed in Ground 1, claim 1 element [1b].

[12g] input connection means for connection to a source of video/audio signals and a real-time clock signal;

110. It is my opinion that the combination of Patten/Ben-Rubi/AAPA discloses this limitation. The function of the “input means” is “connection to a source of video/audio signals and a real-time clock signal” and the corresponding structure is “[o]ne or more connections between a PVR and (i) aerial 20, and (ii) internet connection 24 or modem 22.”

111. As for Patten, it explains the “received signals are input to first and second tuners 110a and 110b” for satellite televisions broadcast, which perform “simultaneous reception of the same or different television programmes and/or media items.” EX1004, [00178]. A POSITA would have understood that the tuners 110a and 110b are connected to the source of video/audio signals for the signals to be input to the tuners. Patten also discloses this limitation because a POSITA would have understood that a satellite antenna is the most obvious way for a satellite television receiver to receive a satellite signal and that the antenna would be connected to the satellite tuners that receive satellite broadcast programming.

112. And, as I discussed in [1g], a POSITA would have understood that the claimed “real-time clock signal” is provided through a modem or an Internet connection. EX1001, 4:43-48. Patten discloses an Internet connection. EX1004, [00198]. Thus, a POSITA would have understood that Patten teaches an “input connection means for connection to a source of . . . a real-time clock signal” with the corresponding structure of one or more connections between a PVR and Internet connection 24 or modem 22.

113. In addition, AAPA also discloses this limitation. Specifically, the ’302 patent specification states that “the connections to an aerial 20, a modem 22 and the Internet 24 are **as in the prior art.**” EX1001, 4:43-45. These structures

admitted to be in the prior art are the very structures specifying the corresponding structure for the input connection means term. And these structures provide the claimed functions as well. EX1001, 4:43-48 (“A Real Time of day signal RT is received via the backchannel in either the Internet connection 24 or the connection via the modem 22.”), 1:65-67 (“The PVR receives broadcast digital television and audio signals from an aerial 20.”). Therefore, AAPA also discloses the input connection means.

[12h] output means for connection to a consumer’s viewing/listening unit;

114. It is my opinion that the combination of Patten/Ben-Rubi/AAPA discloses this limitation. The function of the output means is for “connection to a consumer’s viewing/listening unit” and the corresponding structure is “Connection between PVR 60 and TV set 68.” Patten teaches “a High Definition Multimedia Interface (HDMI) interface 126” which “output to an HDMI input of a high definition TV.” EX1004, [00181]. A POSITA would have understood that the high-definition TV is the claimed “viewing/listening unit” as the limitation requires. The HDMI interface 126 corresponds to ’302 patent’s connection between PVR 60 and TV set 68. Thus, a POSITA would have understood that Patten teaches this limitation.

[12i] and control means arranged to read said first field and said clock signal and said rules database and to apply said local

broadcasting time regulation to each advertisement before said advertisement is shown during one of the periodic breaks;

115. It is my opinion that the combination of Patten/Ben-Rubi/AAPA discloses this limitation for the reasons discussed in Ground 1, claim 1 elements [1b] and [1h].

[12j] wherein the control means is further arranged to update the second field in the header of said advertisement when said advertisement is again shown during time-shifted viewing.

116. It is my opinion that the combination of Patten/Ben-Rubi/AAPA discloses this limitation for the reasons discussed in Ground 1, claim 1 element [1i].

9. Dependent Claim 13

[13] The PVR according to claim 12 arranged to read the real-time clock to read the first field in the header of an advertisement to read the rules database, and to provide that advertisement to a consumer's viewing/listening unit only when its header and the rules database do not indicate that the advertisement may not be viewed at the real time of day indicated by the clock signal.

117. It is my opinion that the combination of Patten/Ben-Rubi/AAPA renders obvious this claim for the reasons discussed in Ground 1, claim 1 element [1h] and claim 12 element [12i]. As discussed in relation to [1h] and [12i], Patten's watershed compliance system only allows playback of advertisements that do not violate the watershed time restriction based on the "time of day of playback," EX1004, [00140], [00145], [00146], *i.e.*, "when its header and the rules

database do not indicate that the advertisement may not be viewed at the real time of day indicated by the clock signal” as claimed. A POSITA, therefore, would have understood that Patten teaches this limitation.

10. Dependent Claim 15

[15] The PVR according to claim 13, further arranged to update the second field in the header when said advertisement is provided to the consumer’s viewing/listening unit.

118. It is my opinion that the combination of Patten/Ben-Rubi/AAPA renders obvious this claim for the reasons discussed in Ground 1, claim 1 elements [1e] and [1i]. Patten discloses that “[t]he receiver may update a counter associated with respective individual media items, **when that media item is output.**” EX1004, [0057]. A POSITA would have understood that outputting of a media item is providing the advertisement to the viewer’s viewing/listening unit, such as a television.

B. [GROUND 2] – Patten in view of Ben-Rubi, AAPA, and Plotnick (claims 4, 14)

11. Overview of Plotnick

119. U.S. Patent Publication No. US 2002/0144262 A1 (“Plotnick”) is titled, “Alternative Advertising In Prerecorded Media.” EX1005, cover. Broadly, Plotnick describes set-top boxes with PVR functionality which implement “client side STB ad targeting system” that “select and present advertisements based on user profiles” and other criteria. *Id.*, [0107], [0134], [0154]. Relevant here is

Plotnick's disclosure of "interactive ads" in which the "user is participating in the advertisement" and attendant benefits. *Id.*, [0131].

12. Motivation to combine Plotnick with Patten-Ben-Rubi-AAPA

120. It is my opinion that a POSITA would have been motivated to modify Patten's system to incorporate Plotnick's interactive advertisements with a reasonable expectation of success. As I discussed above, both Patten and Plotnick are directed to inserting targeted advertisements into recorded programs played back by a PVR. EX1004, [0002]; EX1005, [0134]. Plotnick also teaches various benefits of interactive advertisements for advertisers, such as "a significant and positive impact on recall" and their ability to "supply a vast amount of information to the viewer." EX1005, [0131]. In light of such benefits of interactive advertisements, a POSITA would have been motivated to implement interactive advertisements in Patten's PVR receiver, to improve value of the advertisements displayed by the system. It is my opinion that strong market pressures would have encouraged such a combination. A POSITA would have also understood Plotnick to disclose benefits associated with targeting advertisements based on the day of the week, as I explain in claims 3-5 in detail below. EX1005, [0194]

121. Further, combining these elements into the Patten/Ben-Rubi/AAPA combination would represent a simple integration of the software implementing Plotnick's advertisement targeting criteria and interactive advertisements to

Patten's PVR receiver to be executed by Patten's processor. It is my opinion that such modifications would have been well within the capabilities of a POSITA because they would require simple software modifications and a POSITA would have had a reasonable expectation of success in making the combination.

1. Dependent Claim 3

[3] The system according to claim 2 in which a further local broadcasting regulation forbids the provision of certain types of advertisement on certain days of the week and each header further indicates a day of the week validity.

122. It is my opinion that the combination of Patten/Ben-Rubi/AAPA/Plotnick renders obvious this claim. As I explained in detail for element [1d] above, Patten discloses restriction codes that “restrict the scheduling of the media item,” and provides various examples of such restrictions in scheduling of advertisements, including watershed regulations. EX1004, [0060]. A POSITA would have recognized that there are only a finite number of criteria for broadcasting scheduling, namely the time of the day and the day of the week. A POSITA, therefore, would have looked to combine Plotnick's teaching that advertisement scheduling in a time-shifted viewing context “may vary based on ... what time of day it is, what day of the week” it is. EX1005, [0194].

123. Incorporating a criteria to select advertisements based on the day of the week was known before the '302 patent. And several references contemporaneous with the '302 patent confirm a POSITA would have been

motivated to incorporate this functionality in the PVR of Patten/Ben-Rubi/AAPA.

As I identified above, Noble (US 8,782,691) corroborates this same teaching: “The invention can also allow the insertion of a promotion targeted according to the **day that the recorded program is played back** from the video storage device 604.”

EX1012, 15:58-60. Another reference, Riedl, also corroborates the same, teaching advertisement targeting using “day/time, etc., that [is] associate[d] with the advertisement.” EX1013, 5:32-36.

124. And as I explained above, a POSITA would have had a reasonable expectation of success in incorporating the day-of-the-week scheduling into Patten/Ben-Rubi/AAPA. Because Patten’s PVR already includes the restriction codes in a header of the advertisement for automated regulation compliance, a POSITA would have found it obvious to include another field in the header that indicates a day of the week validity. A POSITA would have had a reasonable expectation of success in making this modification because storing and organizing data is a routine task well within the skill of a POSITA as explained above regarding element [1d] and required no more than the routine modification of software which was well within the skillset of a POSITA.

2. Dependent Claim 4

[4] The system according to claim 1 in which the advertisements include interactive advertisements to which a response by a consumer is requested.

125. It is my opinion that the Patten/Ben-Rubi/AAPA/Plotnick combination renders obvious this claim. Plotnick discloses that “[i]nteractive ads can also be utilized to deliver advertising to subscribers.” EX1005, [0131]. In an interactive advertisement, “a user may be prompted to indicate which ad he/she wants to watch and then may be asked to interact with that ad.” *Id.* Thus, a POSITA would have understood that Patten/Ben-Rubi/AAPA/Plotnick teaches this limitation.

3. Dependent Claim 14

[14] The PVR according to claim 13 further arranged to supply to the viewing unit interactive advertisements which request a response from the viewer, and to record such a response.

126. It is my opinion that the Patten/Ben-Rubi/AAPA/Plotnick combination renders obvious this claim for the reasons discussed in Ground 2, claim 4. Plotnick discloses that “a user may be prompted to indicate which ad he/she wants to watch and then may asked to interact with that ad.” EX1005, [0131]. A POSITA would have understood that an input must be recorded in a storage medium (*e.g.*, a register or a memory) for a processor to be able to process the viewer’s response (*e.g.*, user’s ad preference) and react to the viewer’s response (*e.g.*, play the requested ad).

VI. **ADDITIONAL REMARKS/CONCLUSION**

127. I currently hold the opinions expressed in this Declaration. But my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations.

128. I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of the Title 18 of the United States Code. I declare under penalty of perjury that the foregoing is true and correct.

Dated: June 22, 2023

By: W Leo Hoarty

APPENDIX A

Expert Witness Consultant—Curriculum Vitae

W. Leo Hoarty
Mountain View, CA

leo@wlhconsulting.llc
408-500-9999

Professional Summary

Mr. Hoarty is a professional engineer with over 35 years of experience in both electronics engineering and computer science. He holds 42 granted US patents in many areas of technology. He has considerable experience in the development of all levels of complex software systems as well as designing and bringing to market electronic hardware products. He is the author of numerous technology papers on data communications, consumer electronics, and broadcast & cable television technology. He has served on the Standards Committees of ATSC, ISO/MPEG, OpenCable, and IEEE. He is also an experienced Expert Witness having been engaged in multiple patent infringement matters in jury trials as well as in the PTAB/IPR process.

Technology Summary

Technology Expertise:

Automatic Content Recognition (ACR), audio&video [Viggle, SweetVinyl, Vizio]
Cable and satellite set-top design [Motorola, ActiveVideo, MovieBeam]
Consumer electronics product design [MovieBeam, Mediatronics, SweetVinyl]
Dynamic/Targeted Ad Insertion [Google, ActiveVideo, Vizio]
DSP, audio/video codecs [ActiveVideo, Dotcast, SweetVinyl, Vizio]
Digital watermarking, digital rights mgmt. [19 Entertainment, MovieBeam, Vizio]
Interactive television systems [ActiveVideo, Inscape]
Machine learning, CNN, RNN, Directory [Enterprise Neurosystems, Vizio]
Mobile software app development [Aviga, 19 Entertainment, Viggle, SweetVinyl]
Speech recognition, IVR embedded & ML-based [Aviga, 19 Entertainment, Vizio]
Television ad automated QA systems, server-side [Inscape, Google]
Video-on-demand, OTT, & ad server systems [Inscape, ActiveVideo, Google]

Software Languages, OS Systems, Development & ML Tools:

Languages: C, C++, C#, Java, Python, Perl, JavaScript/HTML/CSS, SQL
OS: Linux, Windows, MacOS, iOS, Android
VM & Cloud: VMware, Parallels, Amazon Web Services, Azure
Dev & Debug: Android Studio, Xcode, Eclipse, Wireshark, JTAG, adb
CAD: Altium, Autodesk
ML/AI Tools: TensorFlow, PyTorch, MatLab

Expert Witness Summary

Expert witness, PTAB declarations, depositions, and court appearances for:

ActiveVideo, Amazon, Arris Corp., DirecTV, DISH Networks, Fandango, Google, LG Electronics, Motorola, Rovi (TiVo), Samsung, Solaborate, Vizio

Total cases: 36 | PTAB: 10 | Depositions: 15 | Court appearances: 4

Expert Witness Consultant—Curriculum Vitae

Employment History

To Present **WLH Consulting, LLC**
From 2011 Mountain View, CA
Position *Intellectual Property and Technology Architecture Consultant*

Expert Witness Consultant: Expert witness consulting for patent litigation matters with significant experience in prior art analysis; expert witness/IPR report generation; software analysis of complex code bases; court room testimony experience in US federal and state court and the High Court of England; including significant international patent litigation experience.

- A detailed list of prior experience is available in a separate document.

IP Development Summary: Intellectual property development consulting for technology companies drafting patent applications and assisting in patent prosecution including Substantial patent generation and prosecution experience with more than 100 patent applications written over a 35-year period, with 34 US grants in my name.

- Companies include: ActiveVideo Networks, Viggie, epoxy.ai, Vizio

Technology Design Consultant in cloud-based media management, automated content recognition (ACR), voice recognition systems, video-on-demand, targeted advertising, Internet streaming technologies, and mobile and automotive app development.

- **Vizio--Inscape Data Division**, San Francisco—Company awarded an Emmy in 2023 for its advanced audience measurement technology made possible by the automated content recognition technology of which I was one of the inventors.
- Assisted in the company formation and development of Inscape (formerly Cognitive Media Networks) in 2012, the leading automated content recognition (ACR) and audience measurement service provider. Helped architect the core cloud server system running on Amazon Web Services capable of tracking content consumption of millions of IP-connected devices, such as smart TVs. Contributed to the development of an audience measurement system based on combined device-map generation and ACR. Assisted in the development of a proprietary dynamic ad insertion system currently in use by major broadcast networks. Authored several key patents around DAI. Wrote more than twenty patents for the company covering novel aspects of their proprietary media matching and audience measurement technology. Helped develop AI-based ad recognition system currently in service for audience measurement data sales.
- **Vizio--Inscape Data Division**, San Francisco—Sold Hoarty patent US 9,465,867: *System and Method for Continuous Media Segment Identification* to Vizio Corp based on audio ACR. Successfully developed the software and deployed the technology which has been deployed nationwide on an initial about 20 million Vizio smart TVs as part of the Inscape service. Systems is made up of an embedded app running in Vizio smart TVs as well as a cloud-based audio matching system running on Amazon Web Services written in Python & C lang. This technology is currently in use for data analytics providing hyper-accurate TV viewing statistics.
- **Vizio**, Irvine, CA—Produced three patents as inventor for digital watermarking for dynamic ad insertion in broadcast television. Technology exploits novel aspects of digital video and is currently deployed on Vizio smart TVs. Assisted in the software development of the dynamic ad insertion system which is currently under test with the OAR consortium of broadcast networks, cable TV operators, and certain ad agencies. Designed and installed an in-house cable TV system to test watermark robustness to the set-top.

Expert Witness Consultant—Curriculum Vitae

- **Epoxy.ai**, Philadelphia—designed and developed a novel software system using a speech recognition framework that compares unknown speech to a database of known speech to identify the unknown speech using a novel phoneme matching process. A software app operates on a mobile device and receives room audio typically from a local television broadcast. The mobile app then matches the audio to that of known real-time audio of certain broadcast genres to identify the live program being viewed. In contrast to current ACR systems, the matching process is performed on the client.
- **ActiveVideo Networks**, San Jose—Developed patent portfolio and assisted in architecture of television service for both over-the-top and managed networks (MVPDs). The system is built upon proprietary, intelligent adaptive bit rate streaming and advanced virtualized application services. Wrote more than twenty patents in this technology arena for the company. System has been deployed by Spectrum Cable (Charter/Time Warner) across the U.S.

Consumer Electronics Product Development

- SweetVinyl Inc., Mountain View—www.sweetvinyl.com—Owner, Chief Technology Officer—a boutique consumer products manufacturer providing audiophile-grade noise removal in real-time for vinyl LPs (clicks and pops) or reel-to-reel tape (tape hiss) with no detectable impact on the sound quality. Devices also can record analog from the turntable or tape to digital and simultaneously link to an online music metadata service to download music album metadata. Products are a combination of audiophile grade electronics processed by an internal Intel-based processor running advanced digital signal processing software. Devices are controlled via iOS & Android apps currently in apps stores under “SweetVinyl SugarCube”. Products have received very favorable reviews in *Stereophile* magazine as well as other high-end audio journals.

To 2011 **Interactive Mobile Media Inc.**
From 2007 Campbell, CA
Position *President*

Summary: Company provided development of voice-activated and touch-based mobile device applications for major media companies as well as embedded systems for telematics companies.

- Developed digital media discovery and control systems for smartphone/tablet apps, laptop, and embedded-system telematics applications. Company developed proprietary semantic search engine for media discovery, among several other areas of novelty, including interest-graph and device-map generation from among Internet-connected devices in a household. System linked to third-party digital ad servers for targeted advertising opportunities. Software was crafted for laptop as well as mobile devices.
- Customers included: **19 Entertainment** (Owner of American Idol)—developed voice-response music player and service, dba **Aviga Systems, Inc.**; **Viggle TV** affinity app—developed proprietary automated content recognition (ACR) technology for identifying TV programming from a mobile app; **ThumbPlay Music** (Clear Channel)—developed music metadata and tagging system; Tangerine-Global, Marina Del Ray, CA—hotel entertainment systems based on RTP, RTMP, RGMP-based IP streaming. **Mediatronics** (Tier 1 supplier to General Motors)—developed voice recognition system for automotive applications that was marketed as “VCommand Automotive Route Guidance System.”

Expert Witness Consultant—Curriculum Vitae

To 2007 **Google Inc.**
From 2006 Mountain View, CA
Position *Technology Consultant*

Summary: lead special projects group in the development of a new product division for auctioning of television ad slots for placement with major satellite and cable television operators.

- Developed architecture for ad network-connected ingest system that automated the processing of television ads for an automated Google service that auctions ad slots on satellite and cable television networks.
- Developed processing center for managing customer video ingest into Google network, provides quality assurance of video asset, and then delivers to partner ad servers. Helped develop interface to Dish Networks ad serving system at satellite facility in Wyoming for insertion of TV ads.

To 2006 **Dotcast Inc.**
From 2000 Mountain View, CA
Position *Founder, President & Chief Technology Officer*

Summary: Formed company and raised significant funds of over \$150 million from a mix of strategic partners and VC's; grew company to over 170 employees; as CTO, built group to developed custom systems-on-a-chip; developed set-top box using that custom chip for a consumer service called *MovieBeam* that won Best of Show at the Consumer Electronics Show in Las Vegas two years (2004 & 2005); the nationwide service was sold thru most major consumer product outlets.

- Principle founder of Dotcast. Invented wireless metropolitan-area digital media service delivery system utilizing satellite-delivered content to edge-network. System was adopted by the Walt Disney Company-led MovieBeam consortium and used as the basis of their wireless, HD-quality feature film set-top service which was active in the top 50 US television markets with set-top distribution through major consumer electronics channels (Circuit City, Sears, BestBuy, among others.)
- Content was delivered by wireless means over major metropolitan areas by company's patented wireless data transmission technology feed by satellite-delivered content originating from Hollywood studios. Additionally, the MovieBeam set-top featured a LAN connection and could acquire content streamed over the Internet where broadband was available.
- Principle interface to the FCC, successfully petitioned for regulatory approval of company's proprietary metropolitan-area wireless data transmission technology. Principle interface to the movie industry, successfully won acceptance of set-top's high-quality video compression scheme which was based on Hoarty patents in video compression.

To 1999 **EnCamera Sciences Corp.**
From 1998 Scottsdale, AZ
Position *Partner*

Expert Witness Consultant—Curriculum Vitae

Summary: Helped develop core technology; positioned company for acquisition; sold company for 20x return on investment.

- Helped develop the underlying technology of high-speed, low-cost, metropolitan-area data transmission system.
- Developed a novel MPEG video compression technique later used by The Walt Disney Company for its *MovieBeam* technology (achieved a 4:1 improvement in efficiency for similar picture quality).

To 1998 **ICTV Inc. (renamed ActiveVideo Networks in 2006)**
From 1990 San Jose, CA
Position *Founder, President & Chief Technology Officer*

Summary: Raised significant funding from IBM, Cox Communications and several venture capital companies; grew company to 125+ employees; products used by major cable TV operators.

- Developed and deployed the first interactive TV and video-on-demand server system for cable TV. The system also supported targeted advertising. Designed and built custom interactive TV set-top box. Worked with CableLabs on many cable TV standards including the OpenCable initiative. Partnered with IBM and first deployed system in Omaha, NE on Cox Cable in 1994.
- The company was renamed ActiveVideo Networks and currently sells server-based products used by Cablevision Systems, Comcast, Charter Cable and many European and S. American cable systems.
- The company was purchased in 2015 by Arris Group, Inc. (owner of Motorola cable TV products, among others) and Charter Communications, Inc. (now renamed Spectrum after acquisition of Time-Warner Cable.)
- Company's interactive TV technology is currently in use in 25 million U.S. cable households on Charter and Time-Warner systems.

To 1989 **PaineWebber**
From 1986 New York
Position *Vice President, Capital Market Systems*

Summary: VP in charge of specially formed team of technologists in the development of advanced real-time information management systems for support of securities trading.

- Pioneered client-server architectures for trading floor support using real-time computer systems. First to exploit the then new Sun Microsystems distributed computing systems. Created display system consolidating multiple live market feeds with custom analytics.
- Deployed first functioning artificial intelligence-based system on Wall Street. Lisp-language-based expert system provided hedging advisories in real-time to equities block trading. System based on Symbolics Lisp computer acting as a server to Sun workstations at the trading desks.

Expert Witness Consultant—Curriculum Vitae

To 1986 **Goldman Sachs & Co.**
From 1984 New York
Position *Manager, Trading Support Systems*

Summary: Led one of the first real-time computing technology groups on Wall Street; developed real-time trading support and derivatives computing systems. Helped design and setup trading systems in branch offices in London and Tokyo.

- Designed and led team to deploy company-wide flat-screen multi-function trader workstation for use on trading floors, replaced the existing IBM mainframe-based system. System utilized a fiber optic-based data distribution system in company's buildings in NYC, Tokyo, and London.
- Designed and deployed fixed-income-based trader workstation system consolidating many disparate information services onto single windowed flat-screen displays.
- Designed and deployed financial data analysis systems for equities trading desk working with the noted economist, Fischer Black, to develop real-time equities hedging analysis using the Black-Scholes options strategies.

To 1984 **United Nations**
From 1979 International
Position *Technical Advisor, United Nations Development Program (UNDP)*

Summary: served as Technical Advisor in Computer Methods in support of field projects in developing nations. Based at UN headquarters in New York and Geneva. Traveled extensively to dozens of countries in Africa, South America, the Caribbean, and Asia to assist with computer installations for UNDP field projects including population census and natural resource development.

- Developed and deployed field computer systems for water resource development and population census for developing nations in Africa and Latin America.
- Designed, developed, and deployed in China a novel Chinese-language graphics workstations and local area network to support first computerized population census of mainland China in 1981.

To 1979 **ACM Technology**
From 1973 San Francisco, CA
Position *Owner, Electronics Engineer*

- Owned and operated a boutique contract electronics engineering firm. Designed, prototyped, tested, and delivered novel electronic systems for computer numerically controlled (CNC) machine-control systems using microprocessor and minicomputer-based controllers. Designed, built, and delivered a novel automated non-invasive multi-bed blood pressure monitoring technology used in *Phase I* hypertension medication trials for FDA submission and review. Contracted by the United Nations to design and build a digital voting system for the General Assembly Hall plus two other large conference rooms.

Expert Witness Consultant—Curriculum Vitae

Extracurricular Activities:

To current **Enterprise Neurosystems (sponsored by IBM)**
From 2022 San Francisco, CA
Position *Signal Processing & ML Consultant*

- Designed biological monitoring systems for various earth monitoring projects. Developed novel microphone system for monitoring beehives using MEMS-based microphone elements with ultrasonic sensitivity. System design also includes atmospheric sensors to measure temperature, humidity, methane, CO₂, among other parameters. A processor system at the base of the hive receives audio and digitizes signals then preprocesses the audio for input to a machine learning (ML) processor. The AI system analyzes the audio spectrograms with local climate and environmental measurements as input. The AI system will link to a global network of AI systems via an IBM model for federated learning. The system is designed to allow scientists to better understand stresses on bee colonies and help mitigate the significant decline in the honeybee population. Once linked to the federated network, the system will also be useful for monitoring climate changes globally.
- The USDA announced collaborating with my group at the COP27 conference in Egypt (11/22). We concluded co-sponsoring a smart agriculture technology summit with the USDA called “AIM4C”. I presented a paper on sensor systems for monitoring nature’s networks. Al Gore and John Kerry both spoke at the conference along with the Secretary of Agriculture Vilsack.
- United Nations FCCC, the parent organization of the Inter-governmental Panel on Climate Change (IPCC) has invited Enterprise Neurosystems to the upcoming COP28 meeting in Dubai in November 2023. I will be presenting a paper on global biometric monitoring and machine learning approaches to evaluating climate trends using data from natural networks.

Professional Associations, Standards Bodies Participation and Awards:

- Delivered papers to and presented at numerous technical conferences in U.S., Asia and Europe including the National Association of Broadcasters (NAB), National Cable Television Association (NCTA), Society of Cable Telecommunication Engineers (SCTE), International Broadcast Conference (IBC) and the Montreux International Television Symposium, as well as many IEEE conferences and other industry related trade shows. (Papers available upon request.) Published two technical articles in trade magazines on graphics systems and networking.
- Member of IEEE, SMPTE, SCTE and Association of Computing Machinery (ACM).
- Served on many standards bodies over several decades including: ISO MPEG2, ATSC (HDTV standards), IEEE (802.14), CableLabs for plant and set-top standards efforts, EIA for cable TV compatibility (IR pass-through) and, in conjunction with CableLabs, cable TV interfaces such as CableCard.
- Awards: Society of Cable Television Engineers (SCTE)—Best New Technology at National Cable Television Association (NCTA) 1996 for ICTV’s interactive TV and VOD service; Best of Show at CES 2004 and 2005, MovieBeam set-top and service; 2003 Emmy Award went to Vizio, Inc for their precision audience measurement service which utilizes my patented audio automated content recognition (ACR) technology.

Education:

To: 1972 **Ohio State University**
From: 1970 Electrical Engineering