

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FREE STREAM MEDIA CORP.
D/B/A SAMBA TV,
Petitioner

v.

GRACENOTE, INC.,
Patent Owner

U.S. Patent No. 9,066,114

Issue Date: June 23, 2015

Title: METHOD AND DEVICE FOR GENERATING AND
DETECTING A FINGERPRINT FUNCTIONING AS A TRIGGER
MARKER IN A MULTIMEDIA SIGNAL

Case No. IPR2020-00216

**PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT 9,066,114
CHALLENGING CLAIMS 1-14 and 16-24
UNDER 35 U.S.C. § 312 AND 37 C.F.R. § 42.104**

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Petitioner's Exhibit List

<i>Exhibit</i>	<i>Description</i>
1001	U.S. Patent 9,066,114 to Oostveen et al., "Method and Device for Generating and Detecting a Fingerprint Functioning as a Trigger Marker in a Multimedia Signal," filed Jan. 10, 2014 ("the '114 Patent")
1002	U.S. Patent 9,407,962 to Oostveen et al., "Method and Device for Generating and Detecting a Fingerprint Functioning as a Trigger Marker in a Multimedia Signal," filed Mar. 16, 2015 ("the '962 Patent")
1003	U.S. Patent 9,479,831 to Oostveen et al., "Method and Device for Generating and Detecting a Fingerprint Functioning as a Trigger Marker in a Multimedia Signal," filed May 25, 2016 ("the '831 Patent")
1004	Select portions of prosecution history of the '114 Patent ("the '114 File History")
1005	Intentionally Omitted
1006	Intentionally Omitted
1007	Declaration of Dr. Ahmed H. Tewfik regarding U.S. Pat. No. 9,066,114 ("Tewfik Decl.")
1008	Intentionally Omitted
1009	Intentionally Omitted
1010	<i>Curriculum Vitae</i> of Dr. Ahmed H. Tewfik
1011	U.K. Published Patent Application GB 2,375,907A to Murphy, "An Automated Recognition System," filed May 14, 2001, and published November 27, 2002 ("Murphy")
1012	U.S. Patent Application Publication 2002/0126872 to Brunk et al., "Method, Apparatus and Programs for Generating and Utilizing Content Signatures," filed December 19, 2001, and published September 12, 2002 ("Brunk")
1013	W. Kate, et al. "trigg&link: A New Dimension in Television Program Making," in Lecture Notes in Computer Science 1197, vol. 1242, Multimedia Applications, Services and Techniques-ECMAST '97, (1997) 51-65 ("Kate")

<i>Exhibit</i>	<i>Description</i>
1014	J. Oostveen, T. Kalker, and J. Haitsma, “Feature Extraction and a Database Strategy for Video Fingerprinting,” in Recent Advances in Visual Information Systems, 5th International Conference, VISUAL (2002) 117-128 (“Oostveen”)
1015	S.E. Johnson and P.C. Woodland, “A Method for Direct Audio Search with Applications to Indexing and Retrieval,” IEEE International Conference on Acoustics, Speech, and Signal Processing, June 5-9 2000 (2000) 1427-1430 (“Johnson”)
1016	U.S. Patent Application Publication No. 2002/0178410 to Haitsma, J., Kalker, A, Baggen, C., and Oostveen J., “Generating and Matching Hashes of Multimedia Content,” filed February 11, 2002, and published November 28, 2002, claiming priority to EP applications 01200505.4 and 01202720.7 (“Haitsma”)
1017	R. Venkatesan, S.-M. Koon, M. H. Jakubowski, and P. Moulin, “Robust Image Hashing,” 0-7803-6297-7/00, IEEE (2000), 664-666 (“Venkatesan”)
1018	U.S. Patent 6,637,032 to Feinleib, David, “System and Method for Synchronizing Enhancing Content With A Video Program Using Closed Captioning,” filed Jan. 6, 1997 (“Feinleib”)
1019	Intentionally Omitted
1020	U.S. Patent Application Publication No. 2002/0032864 to Rhoads, Geoffrey B., Levy, Kenneth L. “Content Identifiers Triggering Corresponding Responses,” filed May 14, 2001, and published March 14, 2002 (“Rhoads”)

I. INTRODUCTION

Free Stream Media Corp. d/b/a Samba TV (“Petitioner”) petitions for *inter partes* review of U.S. Patent No. 9,066,114 (“’114 Patent”). The ’114 Patent recites using computer systems to take a specified action, such as displaying information on a display, at a specified time, when a portion of a media signal is recognized as matching a fingerprint of particular content. All of this was known in the art, as evidenced by the references discussed herein and the testimony of Petitioner’s expert, Dr. Ahmed Tewfik (Ex-1007). This petition demonstrates that Claims 1-14 and 16-24 (the “Challenged Claims”) are unpatentable under 35 U.S.C. § 103. As there is a reasonable likelihood that Petitioner will prevail with respect to at least one of these claims, Petitioner respectfully requests that the Board institute *inter partes* review on all Challenged Claims and grounds.

II. GROUNDS FOR STANDING UNDER 37 C.F.R. § 42.104(A)

Petitioner certifies that the Challenged Patent is available for *inter partes* review and that no Petitioner, real party-in-interest, or any privy of Petitioner is barred or estopped from requesting this review. 37 C.F.R. § 42.104(a).

III. OVERVIEW OF THE ’114 PATENT

A. Disclosure of the ’114 Patent

The ’114 Patent discloses a system following the then “current trend” of “enhance[ing] passive television viewing and/or music listening on a given playback device by creating more interactive programs and/or listening experiences or by

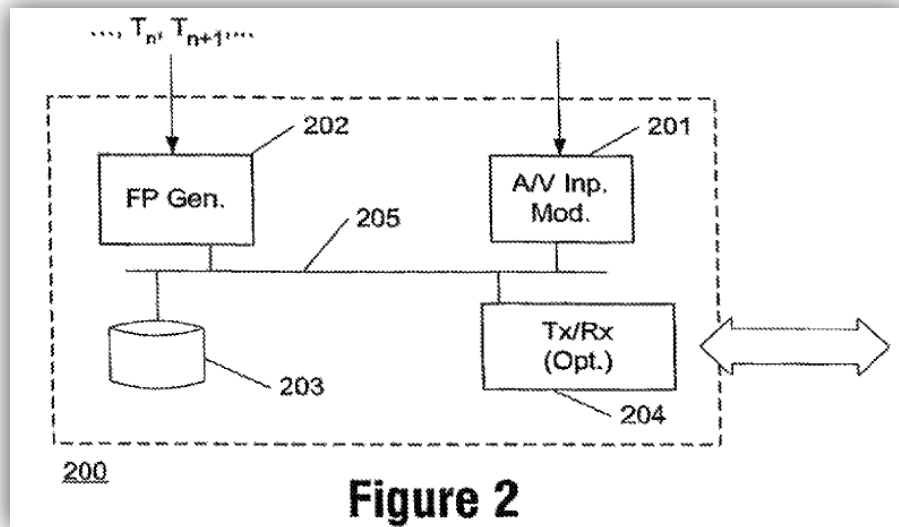
‘connecting’ external actions to a piece of video and/or audio content.” Ex-1001, 1:22-26. The patent acknowledges that numerous methods for triggering actions at particular instants in time during playback were known and further recognizes the industry’s interest in taking such actions at particular times during playback. *Id.*, 1:29-67; Ex-1007 ¶¶35-36. One such known method involved using watermarks, which (undesirably, according to the ’114 Patent) required changing the content signal to add a detectable marker as a trigger. Ex-1001, 2:31-35. Another involved embedding data into the broadcast signal to function as a trigger marker (*id.*, 1:67-2:12), but the patent disparages this solution as too dependent on the actors in the broadcast chain. *Id.*, 2:1-4, 2:13-29.

The ’114 Patent’s purported invention is a simple one: Instead of using watermarks or embedded signals, it uses fingerprinting—the known practice of generating and identifying specific portions of audio or video content—to form the trigger markers to obtain the same predictable results. Ex-1007 ¶¶37-38. *Compare* Ex-1001, Abstract and 2:36-3:16 (discussing purported invention) *with* 4:34-44 and 4:53-60 (discussing admitted fingerprinting techniques in prior art, corresponding to Oostveen (Ex-1014) and Haitsma (Ex-1016)).

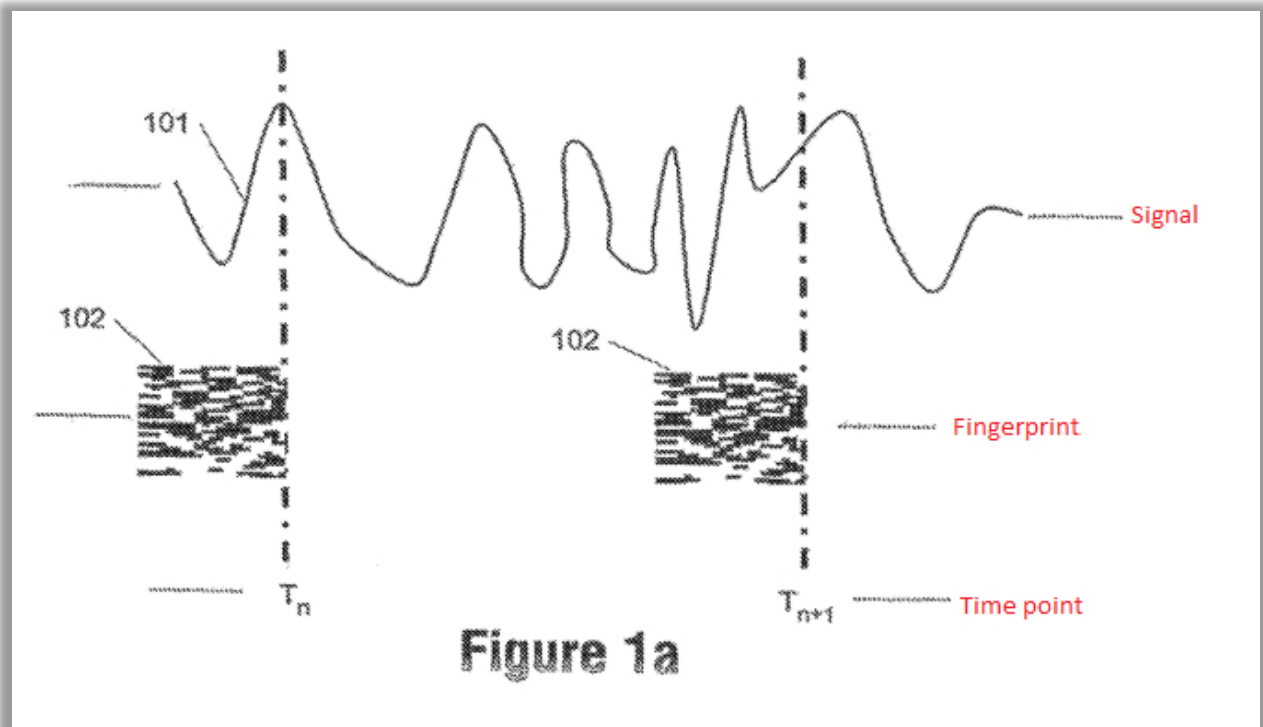
The specification of the ’114 Patent describes generating a fingerprint from a segment of audio and/or video content, storing it in a database, and later matching it to a fingerprint generated during playback. Ex-1001, Abstract, Claim 1, 3:25-27,

7:29-40; Ex-1007 ¶¶40-44. The system then triggers an action, such as displaying information or executing control commands, at a time relative to the location of the fingerprint in the content. Ex-1001, Abstract, 3:9-16, 3:64-4:10, 7:29-40; Ex-1007 ¶¶45-50.

The '114 Patent's fingerprint generation device (200) is depicted in Figure 2, and comprises multimedia signal input module (201), fingerprinting module (202), database (or memory or the like) (203) and transmitter and receiver (204):

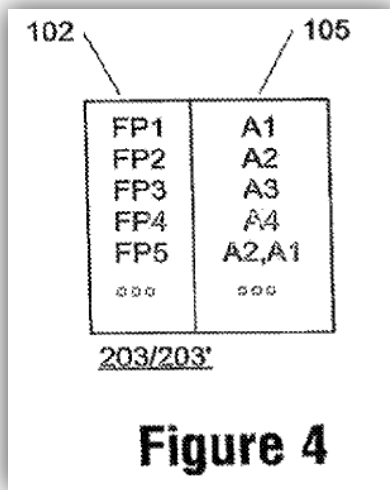


Ex-1001, Fig. 2, 6:48-58; Ex-1007 ¶¶ 40-41. These modules and components are controlled by microprocessors. *Id.* Signal input module (201) receives analog or digital content as signal (101), which is fed to fingerprinting module (202) to calculate fingerprints (102):



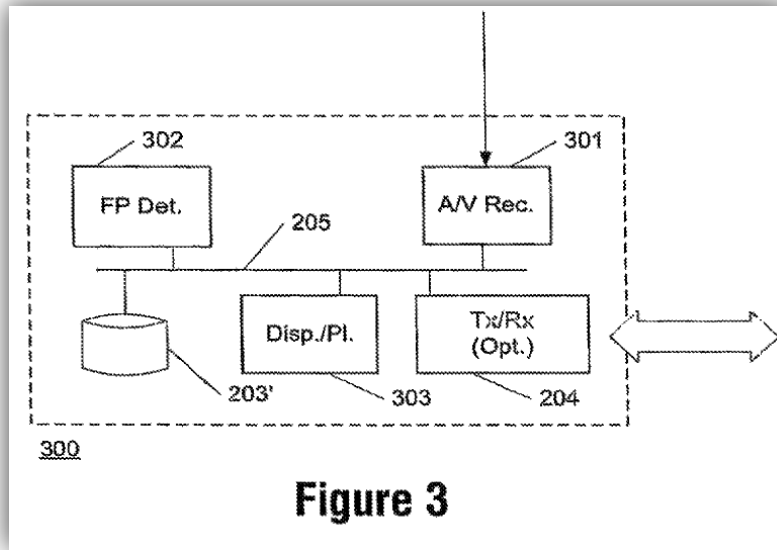
Ex-1001, Figs. 1a, 2, 3:50-52, 4:15-23, 6:59-64; Ex-1007 ¶¶42-43. Fingerprints are generated for each time point (T_n ; T_{n+1}) for which an action is to trigger during playback of signal 101. Ex-1001, 3:52-55, 4:15-17.

As seen in Figure 4, the generated fingerprints are stored in database (203), which associates these “reference” fingerprints (‘FP1’, ‘FP2’, etc.) with one or more representations of actions (‘A1’, ‘A2’, etc.):

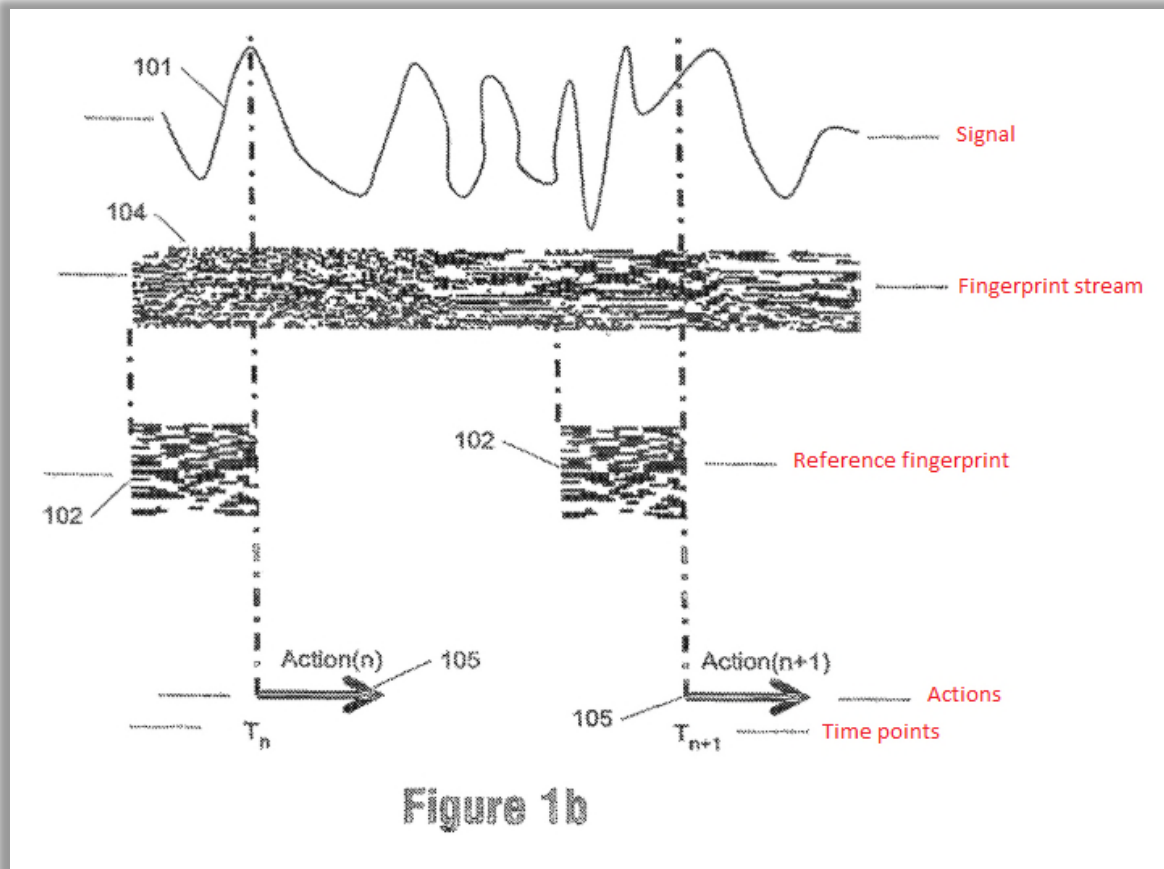


Id., Fig. 4, 7:5-17, Claim 1; Ex-1007 ¶44.

A playback device (300) comprising signal receiver (301), fingerprinting detector (302), database (or memory or the like) (203'), and transmitter and receiver (204) detects matches between the stored reference fingerprints (e.g., 'FP1') and those detected during subsequent playback of the signal (101). Ex-1001, 7:18-20; Ex-1007 ¶45. This playback device is operated by "one or more microprocessors" (Ex-1001, 7:23-25) and are depicted in Figure 3:



Referring to Figure 1b below, fingerprinting detector (302) receives the signal (101) from signal receiver (301) and generates a fingerprint stream (104). This stream is compared to the stored reference fingerprints (102) ('FP1', 'FP2', etc.) in database (203'):



Ex-1001, Fig. 1b, 7:28-37. Like the process for generating fingerprints, matching fingerprints was already known in the art. *Id.*, 6:25-42. When a match is found, the representation of the associated action (105) ('A1', 'A2', etc.) is retrieved and executed by the playback device at the associated time point (T_n ; T_{n+1}). *Id.*, 5:65-6:20, 7:36—40; Ex-1007 ¶¶47-48.

B. Prosecution History of the '114 Patent

The '114 Patent was filed on January 10, 2014, as a continuation of U.S. patent application 13/220,267. Ex-1001, (21, 22, 63). The examiner rejected the claims as anticipated and/or obvious over Haitsma (Ex-1016). The applicant overcame

Haitsma by arguing that it was merely used for content identification and did not teach “each reference fingerprint identif[ied] at least one corresponding reference action to be performed at a reference time point identified by the reference fingerprint.” Ex-1004, 47, 41, 51-52 (emphasis in original).

In allowing the ’114 Patent to issue, the examiner failed to appreciate that the specification admitted that the industry was already using markers to trigger actions at relevant times, and that using a fingerprint represented an obvious substitution of one type of marker for another with entirely predictable results. As discussed in detail below, the prior art references Murphy (Ex-1011) and Brunk (Ex-1012) specifically disclose what the examiner found lacking, i.e., using a fingerprint as a marker to trigger actions at the relevant times.

IV. STATE OF THE ART

A. Level of Ordinary Skill in the Art

The ’114 patent claims priority to July 11, 2003. A person of ordinary skill in the art (“POSITA”) for the ’114 Patent at that time would have a bachelor’s degree in computer science, electrical engineering, or a related discipline and two years of experience in the relevant technical field—multimedia signal processing, including watermarking, fingerprinting and their applications—or the equivalent. Ex-1007 ¶54.

B. General Information Known to a POSITA

This section describes the general knowledge of a POSITA as of July 11, 2003, based on the testimony of Petitioner's expert and the documentary evidence referenced therein. *Id.* ¶¶57-87. Dr. Tewfik's testimony and the prior art he relies upon demonstrates the predictable nature of the purported invention, identifies the motivations a POSITA would have had to modify or combine references, and explains the reasonable expectation of success that a POSITA would have when making modifications or combinations of art in this field.

First, it was known in the art to enhance media with time-specific actions and features. Ex-1007 ¶¶57-64. The '114 Patent admits that embedding trigger markers (such as watermarks) to trigger a specific action was known. Ex-1001, 1:29-35; Ex-1011 (Murphy), 13:21-26, 14:1-3 (disclosing actions to start and stop recording events and control the display of information); Ex-1007 ¶57.

Second, it was known to trigger time-specific actions at precise times using content identification, including through watermarking. Ex-1001, 1:22-32, 1:63-67, 2:5, 2:9, 2:31-34; Ex-1007 ¶¶65-70. Specifically, it was known to trigger actions at the beginning or end of a particular piece of content (Ex-1011, 14:17-20) or at some point in the middle (Ex-1018, 2:31-32). Ex-1007 ¶67. As Dr. Tewfik confirms, all of the concepts discussed in the background of the '114 Patent from column 1, line 22 through column 2, line 34 were well known. Ex-1007 ¶65.

Third, it was known that fingerprinting was a beneficial substitute for watermarking that would achieve known, predictable results in time-specific content identification. Ex-1007 ¶¶71-76. A POSITA knew that watermarking had disadvantages, including potentially becoming distorted or causing distortion of the content. Ex-1001, 2:34-35; Ex-1016, [0004]; Ex-1017, 666; Ex-1007 ¶72. Fingerprinting was also well known, and did not share the same disadvantages. Ex-1007 ¶74.

Fourth, algorithms for generating, storing, retrieving, and matching fingerprints for content recognition were well known. Ex-1007 ¶¶77-86. One known process involved dividing a signal into overlapping frames or windows and applying a hash to the frequency bands in the segmented signal. Ex-1016, [0025]-[0033]; Ex-1007 ¶¶83-85.

Fifth, it was known to associate trigger markers with actions using a database. Ex-1007 ¶87. The prior art referenced in the '114 Patent taught storing fingerprints in a database to match fingerprints detected during playback. *Id.*

V. CLAIM CONSTRUCTION

A. Plain and Ordinary Meaning

Claim construction is only necessary to the extent it is required to resolve the invalidity disputes presented in this petition. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). With the

exception of the terms expressly identified below, no terms need to be construed. Other than the terms identified below, the claims should be afforded their plain and ordinary meaning in view of the '114 Patent's specification and prosecution history, as would have been understood by a POSITA.

B. Claim 8 – “a processor”

The term “a processor” in claim 8 should be construed to mean “one or more processors.” Claim 8 recites a system comprising a fingerprint detector and “a processor” configured to access the reference fingerprint in a database, identify the corresponding reference action, and perform that corresponding action.

As a general rule, the word “a” in claim terms refers to “one or more.” *Baldwin Graphic Sys., Inc. v. Siebert, Inc.*, 512 F.3d 1338, 1342 (Fed. Cir. 2008). A patent reciting an “a” limitation is limited to a single instance only when the patentee “‘evince[s] a clear intent’ to limit ‘a’ or ‘an’ to ‘one.’” *Id.*

The '114 Patent is not so limited. It discloses that the playback device 300 comprises a fingerprint detector 302, a data base or memory storage 203, and other components “under the control of one or more microprocessors.” Ex-1001, 6:53-54. Thus, the '114 Patent need not use a single processor to perform each of the functionalities recited in claim 8. Rather, the system can be flexibly configured using “one or more microprocessors.” *Id.* And the '114 Patent expressly states that

the word “a” in the claims should not be read to exclude the presence of a plurality of elements. *Id.*, 7:58-63. Ex-1007 ¶¶25-28.

C. “Multimedia”

The term “multimedia” appears in claims 13-14, and 23-24 and should be construed to mean “audio and/or visual media.” The ’114 Patent frequently uses the word “multimedia” and invokes this definition. Ex-1001, 3:51-55 (describing a multimedia signal as comprising “video and/or audio information/content”); 5:21-25 (describing multimedia as “audio and/or video”); 6:59-62 (same); 7:29-33 (same). Likewise, the ’114 Patent also describes “audio clips” as a type of “multimedia content,” confirming that audio content alone is within the scope of “multimedia.” *Id.*, 4:38-41. This usage is consistent with how the term “multimedia” is used in the relevant prior art. Ex-1016, [0062] (likewise referring to “audio clips” as an example of “multimedia content.”). Ex-1007 ¶¶30-33

D. Means-Plus-Function

For purposes of this petition, it is not necessary to construe any of the Patent’s terms as means-plus-function limitations. None of the Challenged Claims recite “means” and thus each is presumed not to be governed by 35 U.S.C. § 112(6). *Williamson v. Citrix Online, LLC*, 792 F.3d 1339 (Fed. Cir. 2015) (en banc in relevant part); *see also Linear Tech. Corp. v. Impala Linear Corp.*, 379 F.3d 1311,

1319-21 (Fed. Cir. 2004); *Finjan, Inc. v. Proofpoint, Inc.*, No. 13-cv-05808, 2015 U.S. Dist. LEXIS 162504, at *31-*32 (N.D. Cal. Dec. 3, 2015).

During prosecution, the examiner rejected claims as indefinite based on finding the claim terms “fingerprint detector configured to,” and “module configured to” to be means-plus-function terms. Ex-1004, 30-31. The applicant overcame the rejection by identifying corresponding structure in the specification. *Id.*, 48-50, 55. In addition to the *Williamson* presumption, construing these terms as means-plus-function terms is unnecessary here because, as demonstrated below, the prior art discloses the same structures the applicant pointed to as “corresponding structure” during prosecution. *Kingston Tech. Co., Inc. v. Spex Techs., Inc.*, No. IPR2017-01021, 2018 WL 4773543, at *4 (P.T.A.B. Oct. 1, 2018) (ruling construction of alleged means-plus-function terms was not necessary to resolve dispute when identity of structures was not material to dispute); *Toshiba Corp. et. al. v. Gold Charm Ltd.*, No. IPR2017-01497, Paper No. 29, at 10 (P.T.A.B. Dec. 23, 2016) (finding unpatentable over prior art a claim containing the term “drive means for driving a display,” while declining to determine whether this term was governed by § 112(6) because the determination of patentability did “not turn on the construction.”).

To the extent the Board seeks to construe these terms, the following structures were identified by the applicant during prosecution as corresponding to the claimed functions under § 112(6):

“fingerprint detector configured to ...” (Claim 8): The function of the “fingerprint detector” of claim 8 is recited in the claim: “configured to determine ... to be triggered” (Ex-1001, Claim 8, 8:55-60). During prosecution, the applicant identified the following corresponding structure: “fingerprint detector 302” as depicted in Ex-1001, Fig. 3, and described at 7:20-24 and 7:33-40. Ex-1004, 48-49. The playback device 300, of which fingerprint detector 302 is a part, is described as being “under the control of one or more microprocessors.” Ex-1001, 7:20-24.

“fingerprint module configured to ... ” (Claim 21): The function of the “fingerprint module” of claim 21 is recited in the claim: “configured to: generate ... ; assign ... ; provide access ... ; provide the identifier ... segment.” (Ex-1001, Claim 21, 10:62-11:9). During prosecution, the applicant identified the following corresponding structure: “fingerprinting module (202)” as depicted in Ex-1001, Fig. 2 and described at 6:50-54 and 6:59-7:10. Ex-1004, 49. The fingerprint generation device 200, of which fingerprinting module 202 is a part, is described as being “under the control of one or more microprocessors.” Ex-1001, 6:50-54.

“input module configured to ... ” (Claim 21): The function of the “input module” of claim 21 is recited in the claim: “configured to access segments ...

segment.”. (Ex-1001, Claim 21, 10:58-60). During prosecution, the applicant identified the following corresponding structure: “AV input module 201” (sometimes referred to as “multi-media signal input module 201”) as depicted in Ex-1001, Fig. 2 and described at 6:50-54 and 6:59-7:10. Ex-1004, 49. The fingerprint generation device 200, of which AV input module 201 is a part, is described as being “under the control of one or more microprocessors.” Ex-1001, 6:50-54.¹

VI. GROUND 1: CLAIMS 1-14, 16-24 ARE INVALID AS OBVIOUS UNDER 35 U.S.C. § 103 OVER MURPHY IN VIEW OF BRUNK AND THE KNOWLEDGE OF A POSITA

A. Summary

The Challenged Claims describe using computer technology to generate fingerprints from segments of an audiovisual signal that are matched against fingerprints detected during playback of the signal, thereby identifying a time point within the played-back segment of the signal at which an action is to be taken, as was known in the art. Ex-1007 ¶¶57-87; *supra* § IV(B). The specification does not describe any new technology, unexpected results, or how to overcome any technological challenge. Instead, it expressly relies on other references to provide the technical details of generating, detecting, and matching fingerprints. Ex-1007

¹ Only seven of the 23 Challenged Claims include the terms “fingerprint detector configured to...” or “fingerprint/module configured to...”

¶¶37-38; *supra* § III.A. Nor is there any evidence of relevant secondary indicia of non-obviousness that might impact the validity analysis. Ex-1007 ¶111. Consistent with the lack of patentable disclosure in the '114 Patent and the high state of the art discussed above, a POSITA would have found the Challenged Claims obvious over Murphy (Ex-1011) in light of Brunk (Ex-1012) and the background knowledge of a POSITA.

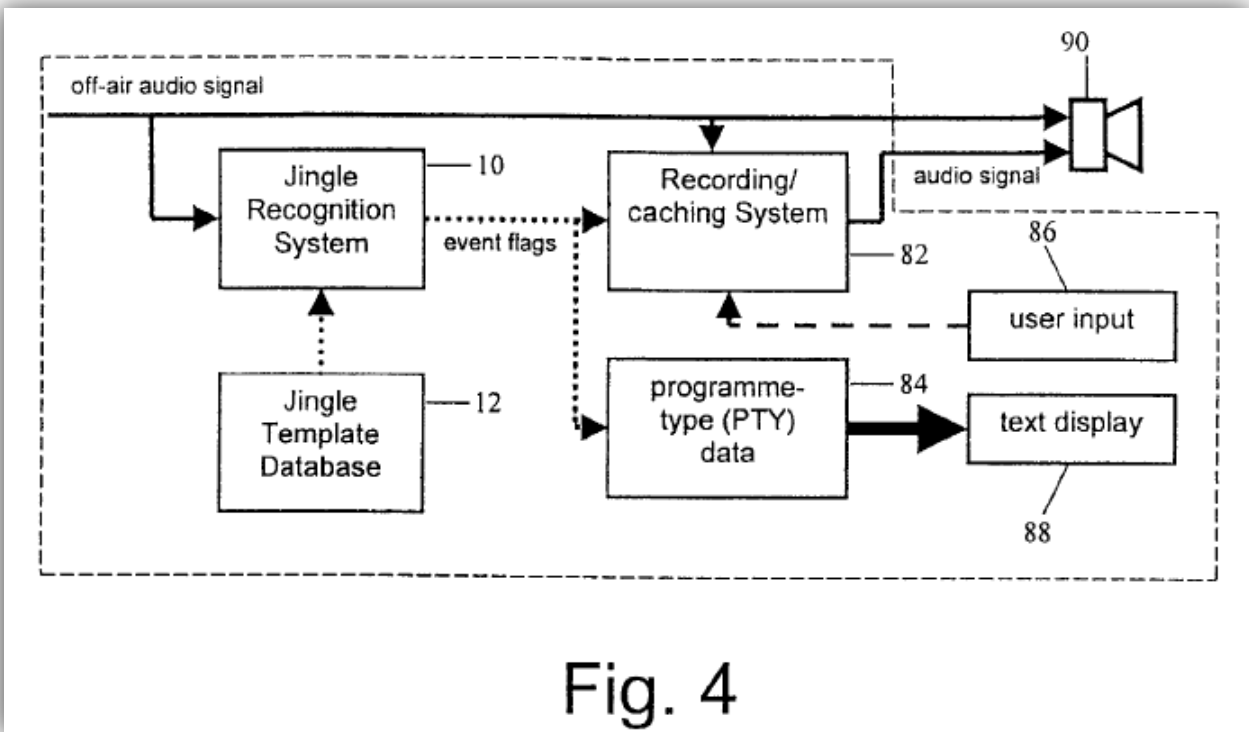
Murphy discloses an automated recognition system that performs actions at specified time points within a content signal by generating fingerprints that are stored for reference, detecting fingerprints in a subsequent playback of the signal, and matching the generated and detected fingerprints. Ex-1007 ¶¶88-101. Brunk is similar but provides certain additional explicit disclosures that are relevant to the Challenged Claims, such as storing actions in the same database as the fingerprint. Ex-1007 ¶¶102-108.

B. Overview of Murphy

Published as U.K. patent application GB 2,375,907A on November 27, 2002, Murphy is prior art under at least Pre-AIA 35 U.S.C. § 102(b). Ex-1011, cover page (43). Neither Murphy, nor any corresponding application publishing its disclosure, was cited during prosecution of the '114 Patent or its parents. Ex-1001, (56).

Like the '114 Patent, Murphy describes generating, detecting, and matching fingerprints and taking action(s) based on a match of fingerprints in two exemplary

embodiments: (1) a radio transmitter (Ex-1011, 10:1-13:7, Fig. 3); and, (2) an end-user receiver (*id.*, 13:8-14:31, Fig. 4). Ex-1007 ¶89. For the end-user embodiment of Figure 4 (reproduced below), Murphy discloses a receiver 80 having a recording/caching system 82 and speaker 90 (a *playback device*). Ex-1011, 13:16-17, Fig. 4. The playback device has a recognition system 10 (a *fingerprint detector*) that derives fingerprints from a radio broadcast “audio signal” (*content*) and matches them with preprocessed fingerprints (*reference fingerprints*) stored in database 12:



Id., 13:15-26, Fig. 4. Murphy explains that fingerprints for distinctive audio cues (such as a jingle) can be used as a preprocessed signature. *Id.*, 3:10-17, 6:32-7:3. One of ordinary skill in the art understood that the term “jingles” may be at the

beginning, end, or at points throughout a particular program (for example, the famous ticking clock from CBS's "60 Minutes" appears at the beginning and upon return from commercial break) and is not limited to refer only to a brief and catchy tune as the term is sometimes used in common parlance. Ex-1007 ¶¶175-176.

As signal 40 is received, recognition system 10 divides it into overlapping segments, called windows, and analyzes them to determine "covariance matrices" for each of the segments, which serve as fingerprints for the segments. Ex-1011, Fig. 1, (steps 20-24); Ex-1007 ¶¶91, 94-98. When receiver 80 finds a match between these detected fingerprints and those stored in database 12, an event flag is generated (*triggering*) that causes one or more of a variety of possible actions to be performed, e.g., recording system 82 starts recording (an *action*) and/or programme-type data unit 84 displays information on text display 88 (another *action*). *Id.* The displayed information is related to the played audio content (such as the name and artist of the song that is playing). Ex-1011, 13:8-14. Ex-1007¶¶ 91, 130. While the preferred embodiments of Murphy address audio signals, Murphy also teaches implementing the system for video signals. Ex-1011, 15:22-25, Abstract.

Murphy differs only slightly from the claimed system of the '114 Patent in that it does not expressly disclose storing the triggered actions in database 12 along with the fingerprints. Brunk, however, does disclose storing actions in the same

database as their corresponding fingerprints, and making this improvement to Murphy would have been obvious to a POSITA.

C. Overview of Brunk

Published as U.S. 2002/0126872 in September 2002, Brunk is prior art under at least pre-AIA 35 U.S.C. § 102(b). Ex-1012, cover page (43). Neither Brunk, nor any corresponding application publishing its disclosure, was cited during prosecution of the '114 Patent or its parents. Ex-1004.

Brunk was filed by Digimarc Corporation and describes fingerprinting techniques (*id.*, [0005]-[0007], [0020]-[0033], Figs. 1-4), watermarking techniques (*id.*, [0008]-[0010]), and related database techniques (*id.*, [0006], [0082]-[0101], Fig. 6). Ex-1007 ¶¶103-108. Brunk discloses using hashing algorithms on individual frames and sequences of frames in audio and/or video content to improve robustness of the signatures (also referred to as *fingerprints* and “robust hashes”) for use in fingerprint recognition systems. Ex-1012, [0005], [0021], [0026], [0031], [0033]; Ex-1007 ¶¶104-105. Brunk matches preprocessed content signatures stored in a database with signatures derived from media content. Ex-1012, [0006], [0029]; Ex-1007 ¶¶106-107.

Unlike Murphy, Brunk expressly discloses using the signature as an index to access additional data *stored in the same database*, including the identification of the content and an action to be performed as a result of matching signatures. Ex-

1012, [0006], [0028]; Ex-1007 ¶106. Like Murphy, Brunk's fingerprint recognition and database processing are implemented on computer hardware, including a processor. Ex-1012, [0107]; Ex-1007 ¶108.

D. Detailed Claim Mapping

As demonstrated in detail below, Murphy discloses each limitation of the independent Challenged Claims, with the sole exception of the '114 Patent's suggestion that reference fingerprints and their corresponding actions be stored together in the same database. Brunk discloses this missing detail and, when combined with Murphy, renders the Challenged Claims obvious. Additionally, Brunk overlaps significantly with Murphy and also discloses many of the claim elements on its own. Thus, although Brunk is not used as the primary reference, this petition identifies where Brunk also discloses certain claim elements to demonstrate that the subject matter was known in the prior art, how similar these references are, and why it would have been obvious for a POSITA to combine them.

1. Claim 1

[1.preamble] A method comprising:

Murphy discloses a method. Ex-1007 ¶115. Brunk also discloses a method. Ex-1012, [0020]; *Id.* ¶116.

[1.a] determining a plurality of trigger fingerprints from content being played back on a playback device, each trigger fingerprint identifying a corresponding trigger time point of a sequence of trigger time points in the content and at

which trigger time point at least one corresponding action is to be triggered, the determining being performed by a processor;

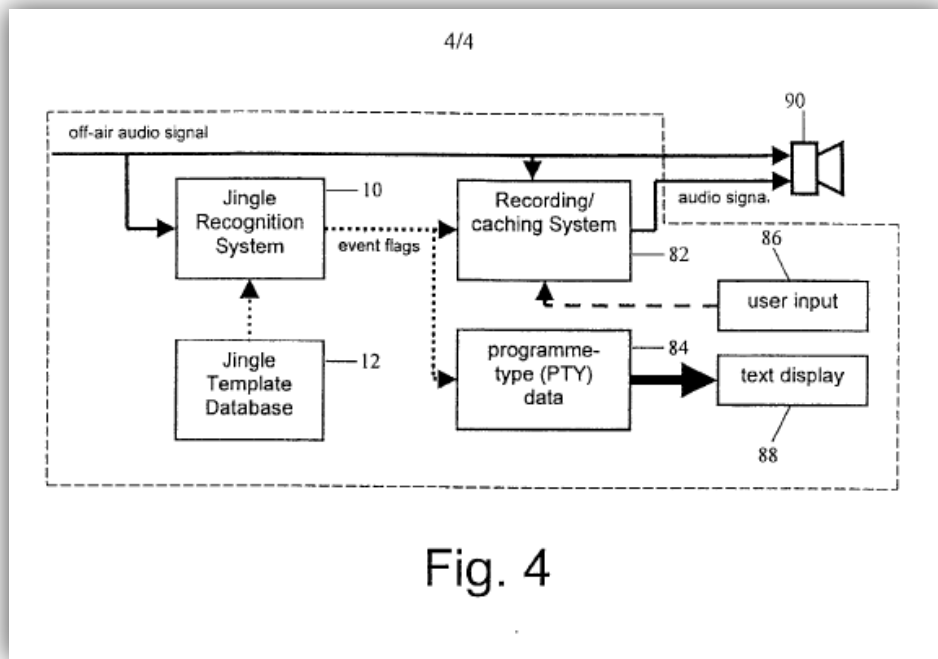
a. “determining ... fingerprints ... the determining being performed by a processor”

Murphy discloses a processor that “determines” fingerprints. Murphy discloses *processor* 14 of recognition system 10, which is used during playback to continually derive signatures (*determining fingerprints*) from the received signal. Ex-1011, 6:24-34; Ex-1007 ¶119. Murphy’s processor 14 further includes sub-processor 34 that derives covariance matrices (*fingerprints*) for segments of the received signal. Ex-1011, Abstract, 9:5-7; Ex-1007 ¶119.

Brunk also describes determining the presence of fingerprints during playback as implemented on a processor. Ex-1012 [0107], [0067]-[0068], [0083]; Ex-1007 ¶140.

b. “content being played back on a playback device”

Murphy discloses a receiver in Figure 4 that includes a recording/caching system 82 and speaker 90 (*playback device*) that plays a broadcast audio signal (*content*). Ex-1007 ¶120. Murphy discloses that “receiver 80 receives a broadcast audio signal which is outputted to the loudspeaker 90.” Ex-1011, 13:16-17.



Id., Fig. 4.

Brunk likewise discloses detecting fingerprints in content played back on a playback device. Ex-1012, [0029], [0066]-[0068]; Ex-1007 ¶141.

c. “fingerprint”

Murphy includes two disclosures of a fingerprint. Ex-1007 ¶¶121-126. First, Murphy discloses using an identifying “signature” (i.e., a *fingerprint*) of a cue in the audio signal: “the audio cue is pre-processed to determine an individual determining characteristic, or signature.” Ex-1011, 6:33-34. These cues can be generated using “[a]ny method of characterising a signal which makes it discernable from a different signal.” *Id.*, 5:9-14. Ex-1007 ¶ 121.

Second, Murphy discloses a specific method of generating covariance matrices for segments of content signals for use as a fingerprint. Ex-1011, 6:23-9:31, Figs. 1 and 2. Ex-1007 ¶123. Murphy acknowledges that audio cues must be able to resist failed detection or matching caused by signal changes. Ex-1011- 5:17-24. Using covariance matrices is beneficial because they uniquely identify the appropriate signal segment. Ex-1011, 8:35-9:4; Ex-1007 ¶124. Accordingly, a POSITA would understand that Murphy discloses that these covariance matrices are “robust” fingerprints that remain functional even if the content involved is subsequently transcoded, filtered, or otherwise modified. Ex-1007 ¶124. Thus, if the claims are deemed to require that the fingerprints have a degree of “robustness” (which they should not be), the covariance matrix fingerprints of Murphy would satisfy that requirement.

Moreover, it would have been obvious to implement Murphy’s system using any of the “robust hash” algorithms known in the art to reliably identify audio, video, or combined audio and video signals, including those taught by Brunk (Ex-1012). Ex-1007 ¶¶125-126. Both Murphy and Brunk acknowledge the benefits of using robust fingerprints, and one of ordinary skill in the art would have shared this acknowledged motivation to improve upon Murphy’s system using known hashing algorithms. *Id.*

Brunk also discloses the claimed fingerprint, including as generated through a segmenting-and-transforming process that is similar to Murphy, and various other robust fingerprinting algorithms. Ex-1012, [0020]-[0021], [0025], [0042]-[0044]; Ex-1007 ¶142.

- d. “plurality of trigger fingerprints ... each ... identifying a corresponding trigger time point of a sequence of trigger time points in the content and at which trigger time point at least one corresponding action is to be triggered”**

Murphy discloses these limitations. Specifically, Murphy discloses that when a fingerprint is matched to a previously stored fingerprint, an action is triggered using an action-specific control signal (“event flag”) that triggers corresponding actions. Ex-1011, 10:1-2, 13:21-26; Ex-1007 ¶¶127-138.

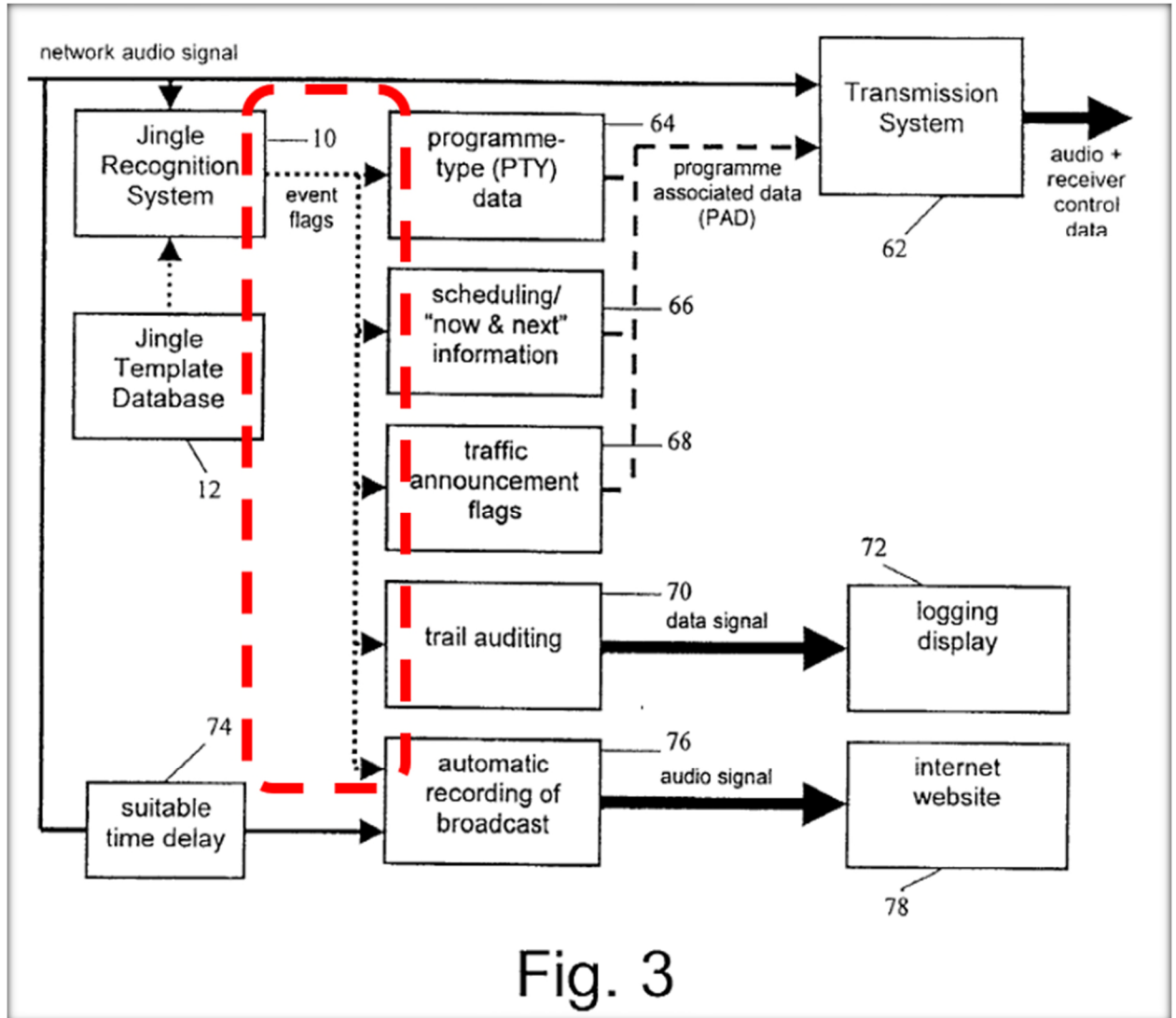
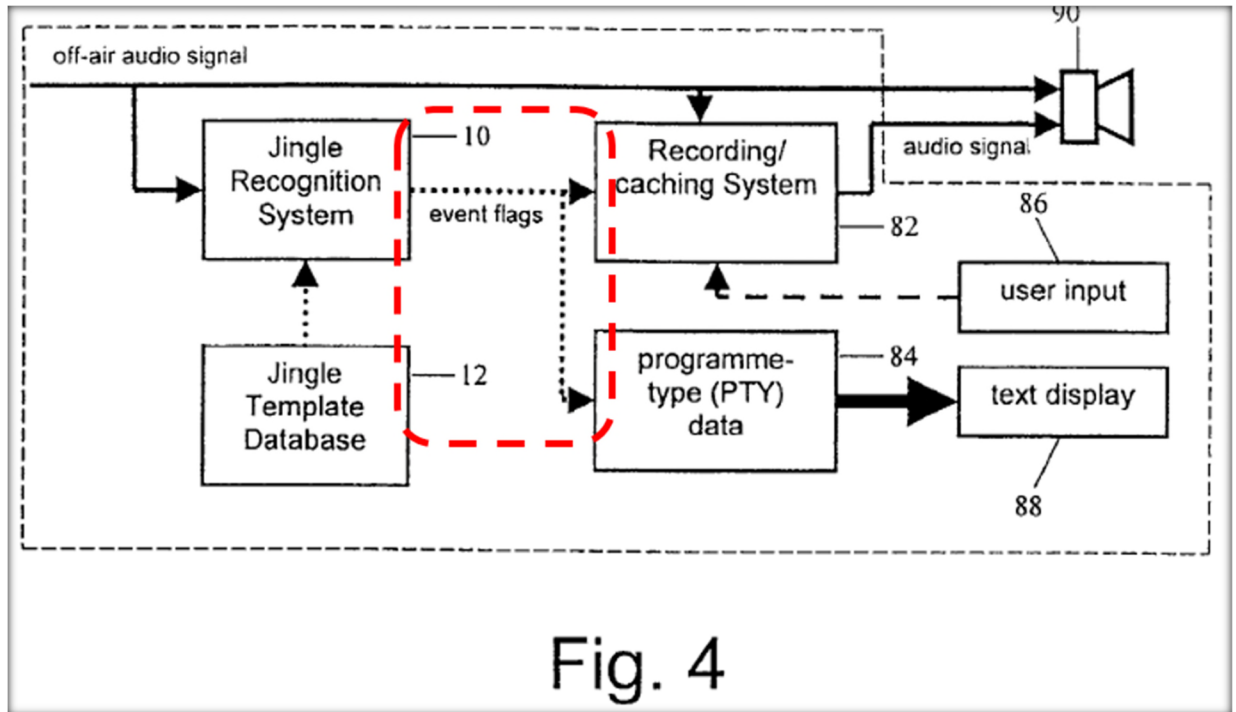


Fig. 3

Ex-1011, Fig. 3 (annotated), 10:1-12:29; Ex-1007 ¶130.



Ex-1011, Fig. 4 (annotated), 10:1-2, 13:8-14:3. Actions disclosed in Murphy include (a) identifying the start of a particular type of program, such as traffic announcements, (b) generating scheduling information, such as identifying the start and end of programs, (c) identifying program-type data, (d) updating scheduling information for an electronic program guide (EPG), (e) identifying for display the artist and title information of a song being played, (f) generating an audit trail identifying if and when programs were broadcast, including advertisements and news bulletins, and (g) controlling automated recording systems, and (h) causing the playback device to change channels to receive a different content signal. *Id.*, 10:1-12:29. Although Murphy discusses these actions for the transmitter-side

embodiment, a POSITA would have understood these actions could be utilized by the receiver embodiment as well. Ex-1007 ¶130.

For example, when Murphy detects particular fingerprints, the recognition system generates event flags to cause recording system 82 to start or stop recording the signal at specific times marked by the location of the fingerprint in the signal. Ex-1011, 13:20-26, 13:33-34, 14:2-3; Ex-1007 ¶132. Thus, Murphy discloses a plurality of signatures (*trigger fingerprints*) that identify a start point and stop point (*corresponding trigger time point in a sequence of trigger time points*) when recording is to begin and end (*corresponding action*). Ex-1007 ¶¶134-135. Based on Murphy's disclosure, a POSITA would have understood that one could use Murphy's signatures to generate any desirable sequence of triggers and actions, such as triggers that dynamically display information regarding the displayed content as it changed over time between, for example, different songs, commercials, and news broadcasts. Ex-1011, 13:8-14; Ex-1007 ¶136.

Brunk likewise discloses using a plurality of fingerprints to trigger corresponding actions, such as directing the user to a website. Ex-1012, [0028]-[0029].

Finally, independently of Murphy and Brunk, a POSITA knew to generate actions at a sequence of points in content. *Supra* § IV.B. (discussing, e.g., applicant's admitted prior art and Kate (Ex-1013), 5, 51-52, 62-64). A POSITA

further knew that fingerprints were a beneficial substitute for watermarks, which were known to be useable as time markers. *Supra* § IV.B. The '114 Patent admits that it merely uses fingerprints instead of watermarks (both of which were known) to perform this known time-marker function. Ex-1007 ¶146.

[1.b] accessing a database that includes a plurality of reference fingerprints, previously derived from the content, and a plurality of reference actions, each reference fingerprint identifying at least one corresponding reference action to be performed at a reference time point identified by the reference fingerprint;

Murphy combined with Brunk teaches these limitations. Ex-1007 ¶¶147-155.

Murphy discloses accessing a database 12 that holds signatures of cues, preferably covariance matrices (*supra* claim [1.a]), that were generated during preprocessing (*a plurality of reference fingerprints, previously derived from the content*), and holds information related to the cues, such as information to be displayed. Ex-1011, Abstract, 3:32-34, 6:30-32, 7:9-11, 13:8-14.

For example, Murphy discloses that the database can be populated by processing portions of the audio signals (e.g., cues) in advance, either locally or remotely, and using either clean, noise-free versions of the signal, or versions previously broadcast for the preprocessing. Ex-1011, 14:4-15; 7:1-9. The preprocessed signatures (*fingerprints*) are stored in database 12. *Id.*, 6:27-7:1, 8:30-9:8 (“The covariance matrix is stored as the signature of the audio cue.”); Ex-1007 ¶147.

Murphy discloses taking actions (e.g., display information, start recording, stop recording) at a time referenced to the location of the cues in the signal, for example, the time the cue is recognized. *Supra* claim [1.a], *See also, infra*, claims [3], [4], and [5] (discussing how Murphy teaches and renders obvious various permutations of the reference time being relative to the location of the fingerprint in the signal). Thus, *at least one corresponding reference action is to be performed at a reference time point identified by the reference fingerprint.* Ex-1007 ¶148.

Admittedly, Murphy does not expressly disclose that the **actions** corresponding to the fingerprints are stored in the same database as **the fingerprints**. But it would have been obvious to store any of Murphy's actions in database 12 of Murphy combined with Brunk's use of content signatures (*fingerprints*) as the index in a database to identify actions stored in the same database. *See* §§ VI.B-C, E(1); Ex-1007 ¶¶149-155.

Content signatures can be stored and used for identification of the content item **A content signature may even be utilized to index** (or otherwise be linked to data in) **a related database**. In this manner, **a content signature is utilized to access additional data, such as ... a desired action or behavior**, and validating data.

Brunk (Ex-1012) [0006] (emphasis added), [0028] ("When stored in a database, a signature may be linked or associated with additional data. Additional data may include ... data specifying actions or behavior (e.g., providing a URL, licensing

information or rights, etc.)”); [0029] (“In response, the database ... performs an action related to the signature.”).

In this Murphy/Brunk implementation, a database is indexed by the covariance matrix fingerprint (from Murphy) being used as the database index pursuant to Brunk. The “related information” stored with the fingerprint, as taught by Murphy, would simply include action-specific event flags that identify the corresponding actions (e.g., Murphy’s start recording pursuant to Brunk’s use of a database to store actions indexed to fingerprints). Ex-1007 ¶150.

The fingerprint recognition system 12 of Murphy’s receiver would trigger an action by generating an action-specific event flag when a particular audio cue is recognized by the recognition system 12. *Id.* For example, combined with Murphy’s use of codes to identify which particular programs are the ones the user wants to record (Ex-1011, 13:27-14:1), a POSITA would understand that the event flag may be a “start recording” event flag based on the database linking: (i) the signature of an audio cue identifying the start of a program, and (ii) the code used to signify that the user wants the associated program to be recorded. Ex-1007 ¶¶132-133, 148-150.

A POSITA would have been motivated to combine the teachings of the references for multiple reasons, and the combination would have achieved predictable results with a reasonable expectation of success. *Id.* ¶151. A POSITA would have understood that Brunk’s teaching of identifying the corresponding

actions in the same database as the fingerprints (Murphy's database 12), as opposed to, for example, in code external to the database or in another database, would be the natural and normal repository for the association of cues to desired actions when implementing Murphy. *Id.* ¶¶152-153.

One motivating benefit of doing so is that cues and their desired actions can be conveniently stored and flexibly updated in the same database. Ex-1007 ¶154. This would also reduce processing time. Ex-1007 ¶¶281-282. Another motivating benefit would be that storing actions in the database precludes the need to provide further intelligence in Murphy's receiver's ancillary systems (i.e., the recording system, display system, etc.) to interpret what action is to be taken, which simplifies the design. *Id.* Yet another motivating benefit is that Murphy's database 12 already exists in the receiver. Accordingly, a POSITA would naturally seek to implement Brunk's teachings of storing the actions in a preexisting database as opposed to generating, maintaining, and correlating fingerprints to actions in a second data structure or database. Ex-1007 ¶ 284.

Implementing this Murphy/Brunk system by storing the actions (e.g., start recording, stop recording, and display information) in the database with the fingerprint merely represents exercising the common sense and ordinary creativity possessed by a POSITA faced with implementing the combined teachings of the prior art. *Id.* See also, *supra* §§ VI.B-C, E(1), Ex-1007 ¶¶279-284.

[1.c] identifying the corresponding reference action by obtaining a match in the database between a trigger fingerprint among the plurality of trigger fingerprints and a reference fingerprint among the plurality of reference fingerprints; and

Murphy teaches these limitations both alone and combined with Brunk. Ex-1007 ¶¶156-162. Murphy describes an algorithm for obtaining a match using a “distance measurement processor” in the fingerprint recognition system. Ex-1007 ¶¶158-159; Ex-1011, Fig. 1, 8:35-9:31. The distance measurement processor compares the signature determined from the audio signal (*trigger fingerprint*) to the stored signatures (*reference fingerprints*). Ex-1011, 5:9-11, 6:30-7:1, 9:23-28, 13:21-22 (“When a match with a particular audio cue is detected an event flag is set.”); Ex-1007 ¶¶158-159. Because Murphy teaches that the appropriate event flag (for the appropriate *corresponding action*) is generated, one of ordinary skill in the art would understand Murphy to teach *identifying the corresponding reference action* as a result of matching fingerprints. Ex-1007 ¶159.

Murphy further teaches that the match is *between a trigger fingerprint among the plurality of trigger fingerprints and a reference fingerprint among the plurality of reference fingerprints*. Ex-1007 ¶157. The fingerprint recognition system continually generates multiple trigger fingerprints during playback, and database 12 stores many reference fingerprints. A matched fingerprint is used to identify an action such as displaying information, start recording, or stop recording

(*corresponding reference action*). Ex-1011, 9:23-26, 13:22-25; Ex-1007 ¶159, 161-162; *supra* claim [1.b].

Further, Murphy combined with Brunk teaches these limitations. In the Murphy/Brunk combined system described in claim [1.b], the action is identified by referring to the same database as the reference fingerprints. Ex-1007 ¶ 160; *see also supra* claim [1.b].

Brunk likewise discloses identifying a reference action by obtaining a match between a trigger fingerprint among the plurality of trigger fingerprints and a reference fingerprint among the plurality of reference fingerprints. *Supra* claim [1.a, c]. Brunk further describes using the match to identify a corresponding reference action. *Supra* claim [1.b]; Ex-1007 ¶163.

[1.d] performing the reference action that corresponds to the reference fingerprint on the playback device.

Murphy discloses these limitations. Ex-1007 ¶165. Murphy discloses taking actions, e.g., displaying information, start recording, stop recording (*performing the reference actions*), using the systems of receiver 80 (*on the playback device*) that correspond to the reference fingerprint. *Supra* claim [1.a].

Brunk also teaches performing the corresponding action on the playback device, including, for example, directing the user device to a website. *Supra* claim [1.a], Ex-1007 ¶166.

2. Claim 2

[2] The method of claim 1, wherein: different corresponding actions are to be performed at different trigger time points in the sequence of trigger time points in the content.

Murphy discloses these limitations. Ex-1007 ¶168. Murphy discloses that *different corresponding actions are to be performed at different trigger time points in the sequence of trigger time points in the content* (i.e., start recording audio cue, stop recording playout cue). *Id.*; *supra* claim [1.a].

3. Claim 3

[3] The method of claim 1, wherein: the trigger fingerprint is determined from a segment of the content, the segment ending at the trigger time point at which the reference action is to be performed.

Murphy discloses these limitations. Ex-1007 ¶168. With respect to fingerprint recognition, Murphy discloses determining the *trigger fingerprint* from a window that is part of a *segment* of the audio signal (*content*). *Id.* Murphy discloses: “A window generator 22 segments the sampled audio signal into **windows corresponding in length to the length of the audio cues** to be recognised.” Ex-1011, 7:30-33 (emphasis added). Murphy teaches performing the action when (*trigger time point*) the audio cue is recognized, which a POSITA understands to be at the time at the end of the segment containing the cue. *Id.*, 13:20-26, 13:27-14:3; Ex-1007 ¶170. *See also supra* claim [1.a]. Specifically, because the system cannot determine which reference action to take until after the audio cue is recognized, and because the audio cue is a fingerprint that is determined from a

segment of the content equal in length to the cue, an action that occurs upon recognition will necessarily occur at the end time of the segment. Ex-1007 ¶170.

4. Claim 4

[4] The method of claim 1, wherein: the trigger fingerprint is determined from a segment of the content, the segment beginning at the trigger time point at which the reference action is to be performed.

Murphy teaches these limitations and includes other disclosures that render them obvious. Ex-1007 ¶¶171-177. Murphy teaches buffering in the context of its automated recording system in the transmission system of Figure 3 that allows actions to be taken earlier in a signal than at the end of the cue, and it would have been obvious to a POSITA to likewise apply that functionality in the context of Murphy's automated recording system in the playback device in the receiver of Figure 4 to achieve the benefits Murphy expressly teaches. *Id.*, Ex-1007 ¶¶174-176.

Murphy discloses using “a time delay unit 74” to allow the recording system to “record a delayed version of the audio signal provided by a time delay unit 74” to “avoid the possibility of losing the initial part of the programme.” Ex-1011, 12:18-26.

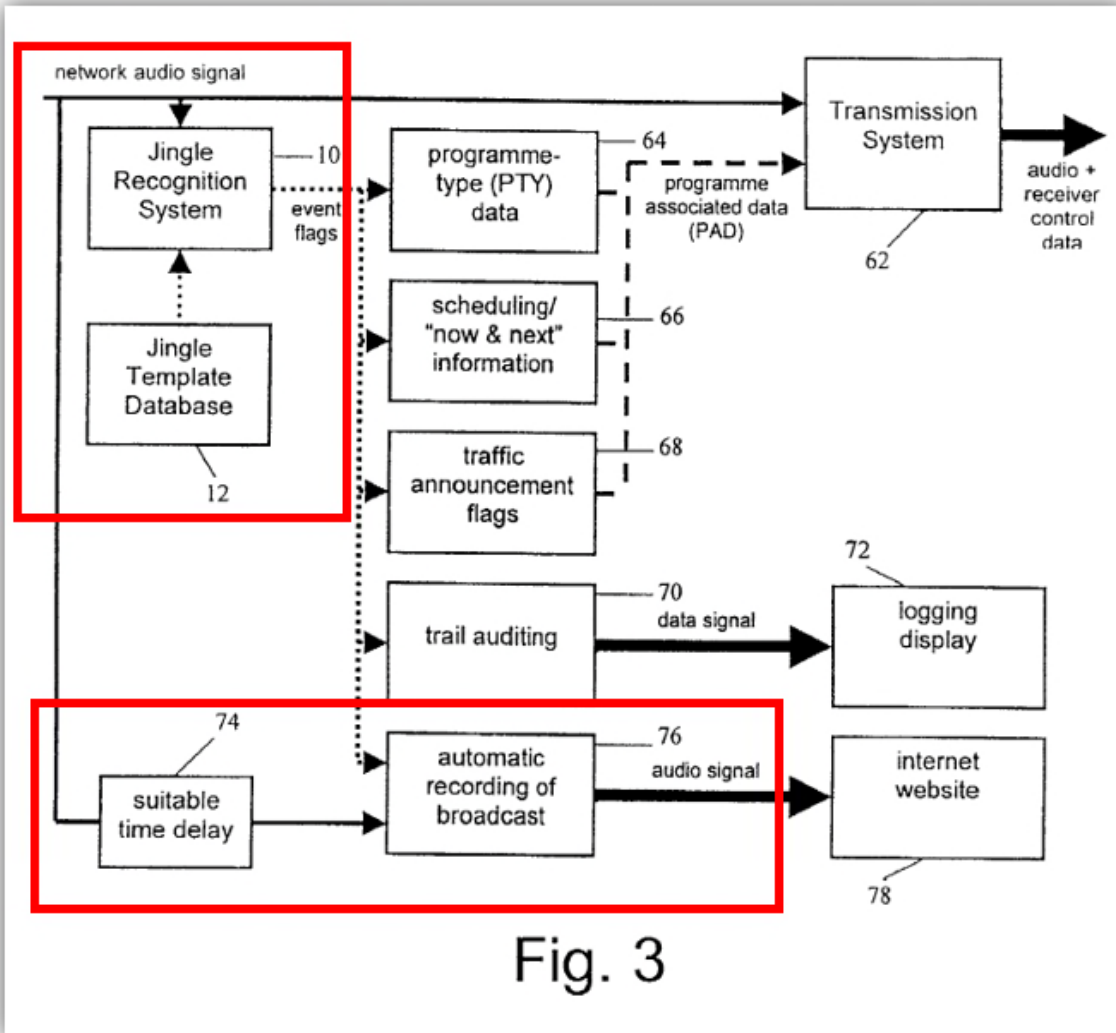
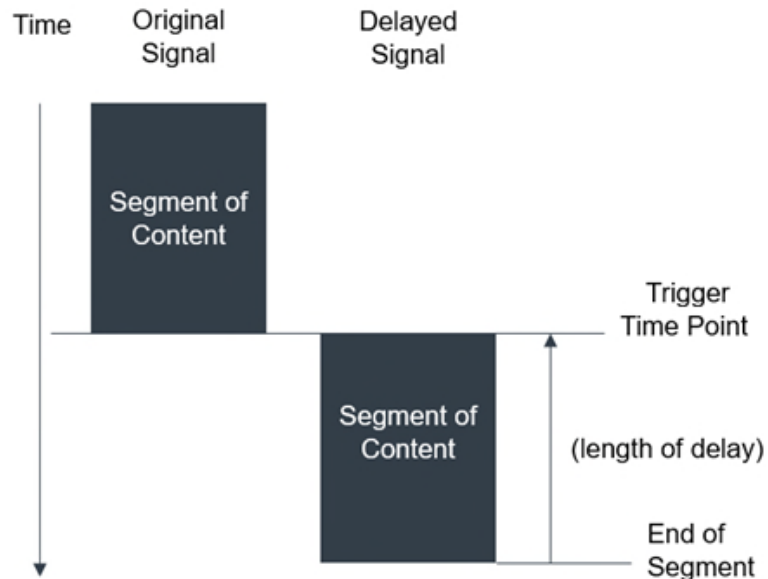


Fig. 3

Ex-1011, Fig. 3 (annotated). Murphy discloses processing a live signal for fingerprint recognition, but recording a delayed version of the signal to account for the time it takes to process the fingerprint and recognize the cue (e.g., a cue can be about 2 seconds, Ex-1011, 7:29-30), such that when the action occurs (start recording) upon cue recognition, the delayed (buffered) version of the audio signal is delayed for a time that ensures the recording automatically starts at the beginning of the program (i.e., at an earlier time relative to the cue). *Id.*; Ex-1007 ¶¶172-173.

The following illustration demonstrates how Murphy's live and delayed signals could be configured to cause the trigger time point detected in the live signal to cause the occurrence of an action at the beginning of the segment containing triggering fingerprint in the delayed signal:



A POSITA understands that an audio cue of the type disclosed in the preferred embodiment in Murphy (Ex-1011, 3:10-17) may not only be located immediately before the content of a program begins, but may also be considered part of (i.e., within) the program. Ex-1007 ¶176. Thus, by utilizing buffering, a POSITA would desire to start recording *before* the cue, such that the recorded version begins with the listener hearing the well-recognized audio cue. *Id.* ¶175. Thus, a POSITA would find it obvious to set delay unit 74 to the length of the cue such that the recording would start at the beginning of the program, providing a better-quality recording. *Id.*

¶176. Synchronizing the length of the delay to the length of a particular audio cue, to control exactly when the recorded version of the signal starts relative to the fingerprint to ensure capture of the audio cue was well within the skill of a POSITA and would have been a matter of routine engineering when implementing Murphy's teachings. *Id.* ¶177.

A POSITA would naturally employ Murphy's buffering as taught in the context of Figure 3 for Murphy's similar recording system in the playback device of Figure 4 using common sense and ordinary creativity following Murphy's benefits discussed for Figure 3. Ex-1007 ¶¶89, 100. Murphy states "[i]t should be noted that the features described by reference to particular figures and at different points of the description may be used in combinations other than those particularly described or shown." Ex-1011, 14:32-35. Doing so represents only using the taught technique (delay buffer) to improve similar devices (automated recognition systems) in the same way to achieve the same predictable benefits of improved recording quality taught by Murphy. Ex-1007 ¶176.

Accordingly, Murphy discloses and/or renders obvious *the trigger fingerprint is determined from a segment of the content, the segment beginning at the trigger time point at which the reference action is to be performed.*

5. Claim 5

[5] The method of claim 1, wherein: the trigger fingerprint is determined from a segment of the content, the segment beginning or ending at a predetermined

distance before or after the trigger time point at which the reference action is to be performed.

This claim has multiple alternative limitations. Because Murphy discloses and/or renders obvious at least one of them, Murphy teaches this claim. *Fresenius USA, Inc. v. Baxter Int'l, Inc.*, 582 F.3d 1288, 1298 (Fed. Cir. 2009). Three different scenarios are discussed below.

Scenario 1, teaches claim 5. In one embodiment, Murphy discloses initiating recording upon recognition of an audio cue and then stopping the recording after the “length of the programme.” Ex-1011, 13:27-14:3; Ex-1007 ¶180. Thus, in an embodiment where the recording stops a fixed amount of time after it begins and where no delay buffer is used in the receiver, Murphy teaches the triggering *segment ending at a predetermined distance before the trigger time point at which the reference action (stop recording) is to be performed*, satisfying this claim. Ex-1007 ¶180.

Scenario 2, renders claim 5 obvious. Alternatively, and additionally, because Murphy teaches that the length of its segments (and therefore the length of its audio cues/fingerprints) is standardized, a stop recording action triggered after the “length of the programme” results in a segment *beginning at a predetermined distance before the trigger time point at which the reference action (stop recording) is to be performed* (the length of the programme plus the standard length of the segment), thereby teaching this claim. Ex-1011, 7:28-8:2. Ex-1007 ¶181.

Scenario 3, renders claim 5 obvious. Alternatively, and additionally, if Murphy's time delay buffer *is* used (Ex-1011, 12:20-26), the action to *start* recording also renders this claim obvious. Ex-1007 ¶182; *supra* claim [4]. More specifically, in that scenario, recording of the delayed signal starts before the end of the fingerprint in the delayed signal that is used to initiate the recording when detected in the identical live signal. Ex-1007 ¶182. Thus the triggering *segment ends at a predetermined distance after the trigger time point at which the reference action* (start recording) *is to be performed*. Ex-1007 ¶182; *supra* claim [4]. Because that scenario is obvious, Murphy also renders claim 5 obvious.

6. Claim 6

[6] The method of claim 1, wherein: the reference action corresponds to multiple reference fingerprints that include the reference fingerprint.

Murphy discloses these limitations. Ex-1007 ¶183. Murphy discloses that the same start recording action (*the reference action*) is used for each of the many different programs that the user wants to record (*corresponds to multiple reference fingerprints*), including the one that presently matches the cue in the audio signal discussed in claim 1 (i.e., *that include the reference fingerprint*). Ex-1011, 13:27-14:3; Ex-1007 ¶161, 183; *see also supra* claim [1].

7. Claim 7

[7] The method of claim 1, wherein: multiple reference actions correspond to the reference fingerprint and are to be performed at the trigger time point; and

the performing of the reference action is part of performing the multiple reference actions that correspond to the reference fingerprint.

Murphy discloses these limitations. Ex-1007 ¶¶184-185. Murphy discloses triggering multiple actions, such as start recording, updating program scheduling information, and displaying information, when an audio cue is recognized (*multiple reference actions correspond to the reference fingerprint and are to be performed at the trigger time point*) and performing those actions as part of the presently matched audio signal discussed in claim 1 (*the performing of the reference action is part of performing the multiple reference actions that correspond to the reference fingerprint*). Ex-1007 ¶185; *see* claim [1.b, c].

For example, Murphy discloses generating multiple event flags for a single match: “When a match is detected, appropriate event flags are generated ... ” Ex-1011, 10:16-17. A POSITA would have understood that Murphy teaches a recognition system in the receiver that would trigger both recording and information display actions based on a match to an audio cue. Ex-1011, 14:27-29, 13:21-26, Fig. 4; Ex-1007 ¶185.

8. Claim 8

[8.preamble] A system comprising:

Murphy discloses a system. Ex-1007 ¶187. The method described for claim 1 is performed on a system, including the playback device of Murphy’s Figure 4. Ex-1011, Fig. 4.

Brunk likewise discloses a system, as it is implemented on a computer. Ex-1012, [0107]; *supra* claim [1.preamble], Ex-1007 ¶188.

[8.a] a fingerprint detector configured to determine a plurality of trigger fingerprints from content being played back on a playback device, each trigger fingerprint identifying a corresponding trigger time point of a sequence of trigger time points in the content and at which trigger time point at least one corresponding action is to be triggered; and

Murphy discloses these limitations. Ex-1007 ¶¶189-192; *supra* claim [1.a]. Murphy's recognition system 10 is implemented on a processor as a *fingerprint detector* configured to make the determination claimed. Ex-1007 ¶190; *supra* claim [1.a].

If “fingerprint detector configured to ...” is found to be a means-plus-function phrase, the applicant asserted during prosecution that the corresponding structure is “fingerprint detector 302”, a processor programmed to perform the function claimed (Ex-1001, Fig. 3, 7:20-24 and 7:33-40). *Supra* § V.C. A POSITA would have recognized Murphy's processor 14 and distance measurement processor 16 together in fingerprint recognition system 10 in receiver 80 to be the same or equivalent to fingerprint detector 302. Ex-1007 ¶¶191-192; *supra* claim [1.a]. Specifically, processor 14, including its sub-components 20-34, divide the received signal *being played on a playback device* into windows and frames, and ultimately detect one covariance matrix per window. Ex-1011, 7:28-8:35; *supra* claim [1.a]; Ex-1007 ¶119. Then distance measurement processor 16 determines if these detected

fingerprints match any preprocessed fingerprints in database 12, resulting in the triggering of time-specific actions during playback. Ex-1007 ¶¶97, 156; *supra* claim [1.a]

Brunk also discloses software operating as a claimed fingerprint detector to determine a plurality of fingerprints from the played-back content, but does not expressly disclose identifying corresponding trigger time points. Ex-1012, [0032], [0068]; *supra* claim [1.a]; Ex-1007 ¶¶193.

[8.b] a processor configured to: access a database that includes a plurality of reference fingerprints, previously derived from the content, and a plurality of reference actions, each reference fingerprint identifying at least one corresponding reference action to be performed at a reference time point identified by the reference fingerprint;

Murphy combined with Brunk teaches these limitations. Ex-1007 ¶¶194-195; *supra* claim [1.b]. Murphy’s “recognition system is implemented on a processor” (Ex-1011, 6:24-26, Figs. 2, 4), and the processor is configured to access template database 12 as claimed when modified to incorporate Brunk’s teaching regarding the storage of actions in the database. Ex-1012, [0028]; *supra* claim [1.b]; Ex-1007 ¶¶195.

[8.c] [the processor configured to] identify the corresponding reference action by obtaining a match in the database between a trigger fingerprint among the plurality of trigger fingerprints and a reference fingerprint among the plurality of reference fingerprints; and

Murphy alone and combined with Brunk teaches these limitations. Ex-1007 ¶¶196; *supra* claim [1.c]. Murphy’s processor is configured to identify the

corresponding action as claimed. *Id.* Alternatively, it would have been obvious for Murphy's processor to do so based on Brunk. *Supra* claim [1.c].

[8.d] [the processor configured to] perform the reference action that corresponds to the reference fingerprint on the playback device.

Murphy teaches these limitations. Murphy teaches taking actions on receiver 80 that correspond to the reference fingerprint. Ex-1007 ¶¶197-202. *Supra* claim [1.d]. A POSITA would have understood that a computer processor on Murphy's receiver 80 performs such actions, including start recording and stop recording. For example, Murphy discloses that the recording system is programmable. Ex-1011, 13:27 ("The recording system 82 may be programmed by the user ... "); Ex-1007 ¶197.

Likewise, Brunk discloses that actions associated with the detection of a signature can include accessing "a web site that returns information to the user device." Ex-1012, [0029]. *Supra* claim [1.d]; Ex-1007 ¶198.

As properly construed, the claims do not require that a single processor perform all of the functions in claim [8.b-d]. *See* Section V.B. Nor does the specification describe the system as such. *See* Ex-1001, 6:54, 7:24-25, 7:61-63; Ex-1007 ¶199.

Should Patent Owner argue or the Board find that one processor must perform all of the functions in claim [8.b-d], a POSITA would have understood that the processor performing the actions may be considered part of the same overall

processor that includes the fingerprint-matching and action-identifying functions.

Ex-1007 ¶¶200-201.

For example, a POSITA would have recognized that Murphy describes its fingerprint recognition system as comprising at least two processors: “processor 14” in communication with “distance measurement processor 16.” Ex-1011, 6:23-30, Fig. 1; *Id.*. And processor 14, in turn, is described as having at least three processors within it (“frequency processor,” “log processor,” “covariance processor”). Ex-1011, Fig. 1. Nonetheless, Murphy describes all five processors as being part of a larger processor: “The recognition system is implemented on *a processor*.” *Id.*, 6:24-26, Fig. 1 (emphasis added). Likewise, a POSITA would have considered the action-performing processor, together with the recognition system, as constituting a larger processor. Ex-1007 ¶201.

Alternatively, and additionally, it would have been obvious to implement Murphy’s receiver having a single central processing unit that controls the various functions of Murphy’s receiver, including playback, record, and text display. Ex-1007 ¶202. That would have been the normal and expected implementation, known to a POSITA, for consumer electronics such as Murphy’s receiver at the time of the invention. *Id.*

9. Claim 9

[9] The system of claim 8, wherein: the reference action corresponds to multiple reference fingerprints that include the reference fingerprint.

Murphy discloses these limitations. Ex-1007 ¶183, 203; *supra* claim [6].

10. Claim 10

[10.preamble] A non-transitory machine-readable storage medium comprising instructions that, when executed by one or more processors of a machine, cause the machine to perform operations comprising:

Murphy teaches the preamble of claim 10. Ex-1007 ¶205; *supra* claims [1.preamble], [8.preamble].

A POSITA would have understood that the playback device in Murphy (*machine*) includes software in memory (*non-transitory machine-readable storage medium comprising instructions*) that is executed on a processor(s) to perform the operations claimed (*when executed by one or more processors of a machine, cause the machine to perform operations comprising*). Ex-1007 ¶205; *see also supra* claim [8.d]. For example, Murphy teaches that its “recognition system is automated” and “implemented on a processor or as a program [in] a computer” (Ex-1011, 6:24-26, Fig. 1) and thus a POSITA would have understood Murphy to have the medium, instructions, and processors as claimed. Ex-1007 ¶205. Brunk likewise discloses this limitation. Ex-1012, [0107]; *Id.* ¶206.

[10.a] determining a plurality of trigger fingerprints from content being played back on a playback device, each trigger fingerprint identifying a corresponding

trigger time point of a sequence of trigger time points in the content and at which trigger time point at least one corresponding action is to be triggered;

Murphy discloses these limitations. Ex-1007 ¶207; *supra* claims [1.a], [8.a].

[10.b] accessing a database that includes a plurality of reference fingerprints, previously derived from the content, and a plurality of reference actions, each reference fingerprint identifying at least one corresponding reference action to be performed at a reference time point identified by the reference fingerprint;

Murphy combined with Brunk teaches these limitations. Ex-1007 ¶208; *supra* claims [1.b], [8.b].

[10.c] identifying the corresponding reference action by obtaining a match in the database between a trigger fingerprint among the plurality of trigger fingerprints and a reference fingerprint among the plurality of reference fingerprints; and

Murphy alone and combined with Brunk teaches these limitations. Ex-1007 ¶209; *supra* claims [1.c], [8.c].

[10.d] performing the reference action that corresponds to the reference fingerprint on the playback device.

Murphy discloses these limitations. Ex-1007 ¶210; *supra* claims [1.d], [8.d].

11. Claim 11

[11.preamble] A method comprising:

Murphy discloses a method. Ex-1007 ¶212; *see also supra* claim [1].

[11.a] accessing segments of content, a segment among the segments being associated with a corresponding action to be triggered during playback of the segment;

Murphy discloses these limitations. Ex-1007 ¶¶213-218; *supra* claim [1.a].

Murphy teaches a segment among the segments being associated with a

corresponding action to be triggered during playback of the segment. Ex-1007 ¶213; *supra* claim [1.a].

Murphy discloses accessing such segments of content in at least two contexts: *First*, during playback (as discussed extensively for claim 1); and *second*, in support of the generation of reference fingerprints for storage in a database. Ex-1007 ¶¶214-25. With respect to the latter, Murphy teaches accessing segments of the content in a variety of ways, both remotely and locally. *Supra* claim [1.a-b]. *See also*, Ex-1011, 6:30-7:9; 14:4-15. For example, Murphy teaches generating reference fingerprints by accessing audio cues by providing the cue to the fingerprint recognition system, or by providing the cue to a compatible system. Ex-1011, 6:32-7:5; *see also* 14:4-15; Ex-1007 ¶¶216-217.

Murphy further teaches that the corresponding action can be triggered during playback of the segment with which it is associated. A POSITA would have understood that Murphy's time delay can be employed to allow the action to be triggered during playback of the segment containing the fingerprint that triggers the action. Ex-1007 ¶218. Thus, in multiple contexts, Murphy teaches accessing segments of content or a segment among the segments being associated with a corresponding action to be triggered during playback of the segment. *Supra* claim [1.a].

[11.b] generating a reference fingerprint of the segment associated with the corresponding action, the generating being performed by a processor;

Murphy teaches these limitations. Ex-1007 ¶¶219-220; *supra* claim [1.a-b]. Murphy teaches generating a reference fingerprint of the segment associated with the corresponding action. *Supra* claim [1.a-b] (discussing processing a signal to generate a covariance matrix associated with actions).

Murphy teaches multiple alternative locations and devices to do the preprocessing to generate the reference fingerprints. Ex-1011, 6:30-7:9, 14:4-15. In any number of these contexts, a POSITA would have understood Murphy to teach that the generating is *performed by a processor*. Ex-1007 ¶220. For example, Murphy discloses using the recognition system of the receiver of Figure 4 “to process the signal and store in the database the appropriate audio cue information.” Ex-1011, 14:13-15. In that context, a POSITA would have understood that *processor* 14 of Murphy’s recognition system is generating the reference fingerprint. Ex-1011, 7:1-2, 7:12-9:8, 9:5-7 (“The covariance matrix of the audio cue is determined in a similar manner except that windowing of the audio cue is not required.”) Ex-1007 ¶220.

Brunk also discloses dividing a content item into segments and generating a signature (*reference fingerprint*) for particular segments. Ex-1012, [0020]; *supra* claim [1.a-b]. Brunk further discloses that actions can correspond to signatures, ostensibly including signatures associated with particular segments. Ex-1012,

[0029]; *supra* claim [1.a-b]. Brunk likewise discloses that its processes are implemented by a processor running software. Ex-1012, [0107], Ex-1007 ¶221.

[11.c] assigning the reference fingerprint of the segment to the corresponding action that is to be triggered during playback of the segment of the content;

Murphy alone and combined with Brunk teaches these limitations. Ex-1007 ¶¶222-224; *supra* claim [1.b]. Murphy teaches assigning actions to reference fingerprints. This claim further refers to *assigning the reference fingerprint to the corresponding action that is to be triggered during playback*. A POSITA would have understood that Murphy's receiver assigns a reference fingerprint to a corresponding action, as evident from Murphy's disclosure of triggering the correct event flags when a matching fingerprint is recognized. Ex-1007 ¶222; *supra* claim [1.b]. Furthermore, Murphy teaches such assignment when Murphy describes programming receiver 80 to record particular programs, resulting in a particular fingerprint triggering the recording system during playback. Ex-1011, 13:27-14:1; Ex-1007 ¶223. Thus, this limitation is taught by Murphy.

Additionally, and alternatively, populating Murphy's database 12 with reference actions assigned to particular fingerprints is an example of *assigning* as claimed. Ex-1007 ¶224. For the reasons discussed in claim [1.b], it would have been obvious to assign actions to be triggered during playback to reference fingerprints and store them in database 12 of Murphy. Doing so would have been

obvious to a POSITA over Murphy combined with Brunk. *Supra* claim [1.b]; Ex-1007 ¶224.

[11.d] providing access to the reference fingerprint of the segment to a playback device configured to match the reference fingerprint to a playback fingerprint derived from the segment by the playback device; and

Murphy teaches these limitations. Murphy teaches that the receiver includes a *playback device* that has distance measurement processor 16 that is *configured to match* the signature, preferably a covariance matrix, (*reference fingerprint*) of an audio cue in database 12 to a covariance matrix generated by processor 14 during playback (*playback fingerprint derived from the segment by the playback device*). *Supra* claim [1.a-c]; Ex-1007 ¶¶224-228

This claim element further refers to *providing access to the reference fingerprint of the segment to a playback device*. Murphy teaches providing this access in at least two contexts:

First, Murphy teaches downloading the reference fingerprint to database 12 (Ex-1011, 14:4-15) and thereby provides the reference fingerprint to the playback device as part of populating the database. This includes providing the local database 12 at the playback device with access to, e.g., “a centrally provided database” having the fingerprints. Ex-1001, 14:8; Ex-1007 ¶226.

Second, Murphy teaches that the playback device gains access to the reference fingerprint in database 12 as part of fingerprint recognition during playback, as described, e.g., for [1.b] and [1.c]. Ex-1007 ¶ 227.

Brunk likewise describes these limitations. Brunk teaches that a broadcast monitoring application (*playback device*) derives a signature following a cue signal (*a playback fingerprint derived from the segment by the playback device*). Ex-1012, [0068]. The application then accesses the database to compare the derived fingerprint to those stored in the database (*reference fingerprints*) to identify a match. *Id.*, [0068]-[0069]; Ex-1007 ¶228.

[11.e] providing the identifier of the corresponding action to the playback device based on the reference fingerprint matching the playback fingerprint, the provided identifier causing the playback device to trigger the corresponding action during the playback of the segment.

Murphy alone and combined with Brunk teaches these limitations. Ex-1007 ¶¶229-231; *supra* claim [1.b-c]. Murphy teaches providing an identifier of the corresponding action—that is ultimately performed during playback—in the form of an event flag that is generated by matching a stored fingerprint in database 12 with a detected fingerprint in the signal. *Supra* claim [1.c]. Furthermore, an event flag identifying the action is provided to the appropriate recording or display systems of the playback device, *triggering the corresponding action during the playback of the segment*. *Id.* *Supra* claims [11.c] and [1.b]; Ex-1007 ¶230.

In the Murphy/Brunk combination, where database 12 has reference actions linked to reference fingerprints as taught by Brunk, database 12 *provides an identifier of the corresponding action to the playback device* when an audio cue is matched to a *playback fingerprint* and then *triggers the corresponding action* as described above. Ex-1007 ¶231.

12. Claim 12

[12.preamble] The method of claim 11, wherein:

[12.a] the assigning of the reference fingerprint to the identifier of the corresponding action includes storing the reference fingerprint with the identifier of the corresponding action in a database; and

[12.b] the playback device is configured to search the database to match the reference fingerprint to the playback fingerprint.

Murphy alone and combined with Brunk teaches these limitations. Ex-1007 ¶232; *supra* claim [11.c, e].

13. Claim 13

[13] The method of claim 11, wherein: the playback device is configured to trigger the corresponding action at a time point that is a predetermined distance from a start of the segment of the multimedia content.

Murphy teaches and renders obvious these limitations. Ex-1007 ¶¶233-236; *supra* claims [11], [5]. Murphy discloses that its playback device triggers the stop recording action at the predetermined program length after the start of the segment having the fingerprint. *Supra* claim 5 (Scenario 2). Ex-1007 ¶¶233-234

14. Claim 14

[14] The method of claim 11, wherein: the playback device is configured to trigger the corresponding action at a time point that is a predetermined distance from an end of the segment of the multimedia content.

Murphy teaches these limitations. Ex-1007 ¶¶237-238; *supra* claims [11], [5], [13]. Murphy's playback device triggers the *stop recording* action at the predetermined program length *from* when it recognizes the fingerprint, which is at the *end* of the segment having the fingerprint. *Supra* claim 5 (Scenario 1). Ex-1007 ¶180, 237.

Additionally, and alternatively, Murphy renders these limitations obvious. Ex-1007 ¶238; *supra* claims [11], [5], [13]. If Murphy's time delay buffer *is* used (Ex-1011, 12:20-26) in the receiver, then the action of the *start* recording renders this claim obvious. *Supra* claim 5 (Scenario 3); Ex-1007 ¶182. Murphy teaches that *the playback device is configured to trigger the corresponding action* (start recording) *at a time point that is a predetermined distance* (the amount of the time delay) ***from an end of the segment of the multimedia content*** (the end of the segment having the audio cue that initiated recording). Ex-1007 ¶238.

15. Claim 16

[16] The method of claim 11, wherein: the corresponding action for the reference fingerprint and for the segment of the content includes retrieving and displaying on a display additional information selected from a group consisting

of: biography data for an actor that appears in the segment of the content, a link to a website, a local weather forecast, and a local commercial.

Murphy combined with Brunk teaches these limitations. Ex-1007 ¶¶239-241. This claim has multiple alternative actions and, because Murphy combined with Brunk teaches at least one of them, they teach this claim. *Fresenius*, 582 F.3d at 1298.

For example, Brunk discloses that the corresponding action associated with a stored signature (*reference fingerprint*) may include “providing a URL” and linking to “a website that returns information to the user device.” Ex-1012, [0028]-[0029]. Because Brunk discloses user devices with displays, a POSITA would have understood that executing the above-mentioned actions would inherently, or at least obviously, involve displaying “a link to a website” on the device’s display, as this is how conventional browser applications present URLs. Ex-1012, [0029]; Ex-1007 ¶240. In any event, a POSITA would have found it obvious to display Brunk’s URL or linked website on the playback device’s display in light of Murphy’s teaching that recognition system 10 may be used to “display information on a given programme.” Ex-1011, 4:25-32, *see also* 13:8-14; Ex-1007 ¶241.

16. Claim 17

[17] The method of claim 11, wherein: the corresponding action for the reference fingerprint and for the segment of the content includes retrieving and playing via a speaker additional information selected from a group consisting

of: biography data of an actor that appears in the segment of the content, a local weather forecast, and a local commercial.

Murphy teaches these limitations. Ex-1007 ¶¶242-248. This claim has multiple alternative actions and, because Murphy teaches at least one of them, Murphy teaches this claim. *Fresenius*, 582 F.3d at 1298.

Murphy renders it obvious to take a corresponding action to play a local weather forecast via a speaker. Ex-1007 ¶243. The playback device of Murphy includes a speaker 90. *supra* claim [1.a]. Murphy further teaches that the recognition of a particular fingerprint can trigger the playback device to change the channel to listen to a traffic announcement playing on another channel. Specifically, Murphy teaches an example of an action where an audio cue corresponds to a segment of a signal played at the start of a traffic announcement, which triggers the playback device to change the channel to another channel to play the appropriate traffic announcement. Ex-1011, 10:21-31. Ex-1007 ¶244. A POSITA would have understood from Murphy's discussion of triggering the playing of traffic information to be motivated by the same desire to provide local information to listeners of a non-local broadcast, as was known in the art and discussed in the '114 Patent as a known practice. Ex-1007 ¶¶246-47. A POSITA would have found it obvious to modify Murphy to substitute local weather information rather than local traffic information, as both types of information are of specific interest to particular localities and were commonly provided on radio broadcasts. *Id.* Further, a POSITA would have

understood that the type of information—weather vs. traffic—would not have a relevant impact on the design or functionality of the system. Ex-1007 ¶246.

17. Claim 18

[18] The method of claim 11, wherein: the corresponding action for the reference fingerprint and for the segment of the content is selected from a group consisting of: replacing the content with different content for a period of time, pausing playback of the content, stopping playback of the content, executing a control command, and preparing the playback device to receive user input.

Murphy teaches these limitations. Ex-1007 ¶¶249-251. This claim has multiple alternative actions and, because Murphy teaches at least one of them, Murphy teaches this claim. *Fresenius*, 582 F.3d at 1298.

For example, Murphy teaches using fingerprints to start or stop recording. *Supra* claim [1.a]. Specifically, Murphy discloses the setting of event flags when a fingerprint match is detected, which can command recording system 82 to start recording the signal or stop recording the signal. Ex-1011, 13:20-26; 14:2-3. This use of event flags to control the operation of recording system 82 constitutes *executing a control command*. Ex-1007 ¶250; *supra* claim [1.a].

Murphy also teaches “replacing the content with different content for a period of time.” Specifically, Murphy teaches an example where an audio cue corresponds to a segment of a signal played at the start of a traffic announcement. Ex-1011, 10:21-31. In this example, when the cue is recognized an event flag is sent to the transmission system that includes a Traffic Programme Identification Code. *Id.*,

10:21-26. The receiver recognizes this code, and uses it to display additional information (retrieving and displaying additional information on a display), or alternatively to change the channel to listen to a traffic announcement being broadcast on another channel. This change of the channel results in the content that was being played being replaced by the new content of the destination channel, thereby “replacing the content with different content for a period of time.” Ex-1007, ¶251.

18. Claim 19

[19] The method of claim 11, wherein: the content includes at least one of audio content or video content.

Murphy discloses both alternatives referenced in this claim. Murphy discloses content that includes audio content. *Supra* claim [1.a]. Murphy further discloses using the audio track associated with video in a television broadcast, and further discloses using video itself. Ex-1011, 15:18-25; Ex-1007 ¶252.

Brunk likewise discloses using both audio or video content. Ex-1012, [0025]; Ex-1007 ¶253.

19. Claim 20

[20.preamble] A non-transitory machine-readable storage medium comprising instructions that, when executed by one or more processors of a machine, cause the machine to perform operations comprising:

Murphy teaches this preamble. Ex-1007 ¶255; *supra* claims [11.preamble], [10.preamble], [1].

[20.a] accessing segments of content, a segment among the segments being associated with a corresponding action to be triggered during playback of the segment;

Murphy teaches these limitations. Ex-1007 ¶256; *supra* claims [11.a], [1.a].

[20.b] generating a reference fingerprint of the segment associated with the corresponding action;

Murphy and Brunk teach these limitations. Ex-1007 ¶257; *supra* claims [11.b], [1.a-b].

[20.c] assigning the reference fingerprint of the segment to the corresponding action that is to be triggered during playback of the segment of the content;

Murphy alone and combined with Brunk teaches these limitations. Ex-1007 ¶258; *supra* claims [11.c], [1.b].

[20.d] providing access to the reference fingerprint of the segment to a playback device configured to match the reference fingerprint to a playback fingerprint derived from the segment by the playback device; and

Murphy teaches these limitations. Ex-1007 ¶259; *supra* claims [11.d], [1.a-c].

[20.e] providing the identifier of the corresponding action to the playback device based on the reference fingerprint matching the playback fingerprint, the provided identifier causing the playback device to trigger the corresponding action during the playback of the segment.

Murphy alone and combined with Brunk teaches these limitations. Ex-1007 ¶260; *supra* claims [11.e, c], [1.b].

20. Claim 21

[21.preamble] A system comprising:

Murphy discloses a system, as further discussed below. Ex-1007 ¶262; *see also supra* claim [11].

[21.a] an input module configured to access segments of content, a segment among the segments being associated with a corresponding action to be triggered during playback of the segment; and

Murphy teaches these limitations. Ex-1007 ¶¶263-265; *supra* claims [11.a], [1.a]. Murphy teaches *accessing segments of content, a segment among the segments being associated with a corresponding action to be triggered during playback of the segment* in multiple contexts. Ex-1007 ¶263; *supra* claim [11.a]. In each context, a POSITA would have understood that the claimed accessing functionality is performed by components that constitute an *input module*. Ex-1007 ¶264.

For example, when the recognition system of Figure 4 is used to generate reference fingerprints, Murphy's processor 14 of Figure 1 includes *an input module* that accesses the segments, the module including one or all of analog-to-digital converter 20, window generator 22, and frame generator 24 shown and discussed for Figure 1, where the input module accesses segments of content. Ex-1011, Fig. 1, 7:17-8:13. Where instead a "compatible system" (Ex-1011, 7:1-5) does the accessing, similar components would be used. Ex-1007 ¶264.

In either context, to the extent the “input module configured to ...” phrase is means-plus-function (*supra* § V.C), a POSITA would have recognized Murphy’s input module at the input of processor 14 to be the same or equivalent to the structure identified by the applicant as corresponding structure during prosecution: AV input module 201 (Ex-1001, Fig. 2, 6:50-54, 6:59-7:10). Ex-1007 ¶265. This module is described as “receiv[ing] multimedia content e.g. in the form of an analog or digital audio and/or video signal and feed[ing] the multimedia content to the fingerprinting module.” Ex-1001, 6:59-62. Murphy describes the input components of processor 14 performing these same tasks. *Id.*; Fig. 1, 7:17-8:13.

[21.b] a fingerprint module implemented in a processor and configured to: generate a reference fingerprint of the segment associated with the corresponding action;

Murphy alone and combined with Brunk teaches these limitations. Ex-1007 ¶¶266-270; *supra* claims [11.b], [1.a-b]. Murphy discloses a fingerprint recognition system that is implemented in a processor and configured to perform the generating claimed. *Supra* claim [11.b]. A POSITA would have understood that the components that populate database 12 with fingerprints and their assigned actions, and provide access to that database via distance measurement processor 16 and identifies the actions to the playback device, together constitute a *fingerprint module*. Ex-1007 ¶267. For example, when the recognition system of Figure 4 is used to generate reference fingerprints, the *fingerprint module* includes components

26-34 of Murphy's processor 14 shown in Figure 1. Ex-1011, Fig. 1; Ex-1007 ¶267. Additionally, when the reference fingerprint is generated remotely by a "compatible system" (see 6:30-7:9), corresponding components of Figure 1 would constitute part of the *fingerprint module*. Ex-1007 ¶267; *supra* claim [11.b].

To the extent the "fingerprint module configured to ..." phrase is means-plus-function (*supra* § V.C) for the functions claimed in claim [21.b-e], a POSITA would recognize that Brunk's processor and/or Murphy's processor 14 (or such components in the "compatible system"), when used for preprocessing as described in claims 1 and 11, would be the same or equivalent to a processor configured to carry out the functions claimed, e.g., the corresponding embodiment of fingerprint generator 202 (Ex-1001, Fig. 2, 6:50-54, 6:59-7:10). Ex-1007 ¶268. Specifically, processor 14 (as part of recognition system 10) can be used to preprocess signatures (*generate a reference fingerprint*) for matching. Ex-1011, 7:1-5, Fig. 1, Fig. 2; Ex-1007 ¶268.

For example, the Murphy/Brunk system uses a processor to not only preprocess the signal to generate the set of fingerprints, but also to populate Murphy's database 12 with those fingerprints and the actions to be triggered thereby, and thus a POSITA further recognizes that the Murphy/Brunk implementation has a processor programmed with the functions claimed in claim [21.b-e] that is the same

or equivalent to the corresponding embodiment of fingerprint generator 202. Ex-1007 ¶269.

Further, Brunk discloses a processor dividing content into segments and generating a signature for particular segments, where that signature corresponds with an action. Ex-1012 [0020], [0029], [0107]; *supra* claim [1.a-b], [11.b]; Ex-1007 ¶270.

[21.c] [the fingerprint module configured to] assign the reference fingerprint of the segment to the corresponding action that is to be triggered during playback of the segment of the content;

Murphy alone and combined with Brunk teaches these limitations. Ex-1007 ¶271; *supra* claims [11.c], [1.b], [21.b].

[21.d] [the fingerprint module configured to] provide access to the reference fingerprint of the segment to a playback device configured to match the reference fingerprint to a playback fingerprint derived from the segment by the playback device; and

Murphy alone and combined with Brunk teaches these limitations. Ex-1007 ¶272; *supra* claims [11.d], [1.a-c], [21.b].

[21.e] [the fingerprint module configured to] provide the identifier of the corresponding action to the playback device based on the reference fingerprint matching the playback fingerprint, the provided identifier causing the playback device to trigger the corresponding action during the playback of the segment.

Murphy alone and combined with Brunk teaches these limitations. Ex-1007 ¶273; *supra* claims [11.e], [1.b], [21.b].

21. Claim 22

[22] The system of claim 21, wherein: the system further comprises a database; the fingerprint module is configured to store the reference fingerprint with the identifier of the corresponding action in the database; and the playback device is configured to search the database to match the reference fingerprint to the playback fingerprint.

Murphy combined with Brunk teaches these limitations. Ex-1007 ¶274; *supra* claims [12], [11.c, e], [21.b].

22. Claim 23

[23] The system of claim 21, wherein: the corresponding action is to be triggered by the playback device at a time point that is a predetermined distance from a start of the segment of the multimedia content.

Murphy teaches and renders these limitations obvious. Ex-1007 ¶275; *supra* claims [13], [5] (e.g., discussing Scenario 2).

23. Claim 24

[24] The system of claim 21, wherein: the corresponding action is to be triggered by the playback device at a time point that is a predetermined distance from an end of the segment of the multimedia content.

Murphy teaches and renders obvious these limitations. Ex-1007 ¶276; *supra* claims [14], [5] (e.g., discussing Scenario 1 and 3), [21.b].

E. Motivation to Modify or Combine

In light of the above-discussed disclosures, a POSITA would have found it obvious to modify Murphy based on the general knowledge in the art and also to combine Murphy and Brunk for multiple reasons and in highly predictable ways with a reasonable expectation of success. Ex-1007 ¶¶277-278. Both Murphy and

Brunk teach methods of generating and utilizing fingerprints derived from content to trigger actions, and they are thus readily combined in an obvious manner. Indeed, both Murphy and Brunk independently teach numerous limitations claimed by the '114 Patent, and this substantial overlap, along with the additional factors discussed below, would lead a POSITA to readily combine their teachings into a single system that practices the Challenged Claims.

1. Brunk teaches storing actions with fingerprints in databases

Murphy already teaches triggering a time-specific action during playback of a signal by detecting a match between a fingerprint generated during playback with a fingerprint stored in a database, where the database stores information about an action to be taken (e.g., information to be displayed, etc.). *See, e.g., supra* § VI.B. Brunk similarly teaches triggering an action, and further teaches storing the action in the database with the fingerprint. *See, e.g., supra* § VI.C. Ex-1007 ¶¶279-280.

A POSITA would have found it obvious to combine the references by implementing Brunk's teaching of storing fingerprints **with the associated actions** in the same database when implementing Murphy's teaching of a fingerprint database having information associated with actions. Ex-1007 ¶¶279-284. A POSITA would have been motivated to do so for any number of reasons, as discussed below. *Id.*

For example, a POSITA would have been motivated to follow Brunk’s own teachings, suggestions, and motivations. Ex-1007 ¶¶281-282. Brunk teaches that an “advantage[]” of a signature is that it can be used to “enabl[e] actions or specifying behavior” and that such advantage may be realized by using the content signature “to index ... a related database.” Ex. 1012, [0006]. “In this manner, a content signature is utilized to access ... a desired action or behavior.” *Id.* Brunk further teaches the advantage of “quickly” identifying the action. *Id.*, [0095], [0096] (same) (emphasis added). Thus, a POSITA would have readily recognized that Brunk’s database teaching would provide speed advantages in an entirely predictable manner. Ex-1007 ¶¶281-282.

Alternatively, and additionally, the combination would involve using a known technique (storing actions in a fingerprint database as taught by Brunk) to improve similar devices in the same way (i.e., Murphy and Brunk’s similar fingerprint detection systems that trigger actions based on fingerprint matching using a fingerprint database). Ex-1007 ¶¶283-284. More specifically, Murphy’s fingerprint detection system can be considered a base system that teaches or renders obvious each limitation of the Challenged Claims. *Id.* ¶283. Brunk teaches a comparable system that, with the addition of an explicit teaching of storing the actions in the database with the fingerprint, improving Brunk’s fingerprint detection system in the same ways that it would improve Murphy’s—including allowing the system to

“quickly” find the correct actions to take. *Id.* ¶284. A POSITA in this field was well informed about fingerprinting, using fingerprint databases, and triggering actions using fingerprint detection systems. *Id.*; *see also supra* Section IV. Thus, a POSITA would have been more than capable of making the minor improvement to Murphy with entirely predictable results, and with a reasonable expectation of success. *Id.* ¶282.

For example, a POSITA understood that the purpose of a database is to organize datasets of information (i.e., attributes or values) into useful associations. *Id.* ¶284. A POSITA would have readily understood that the database of Murphy would include the fingerprints that trigger actions, motivating a need to associate the actions with the fingerprints. *Id.* A POSITA would note that Murphy already teaches storing information related to the actions in Murphy’s fingerprint database. *Id.* Thus, storing the actions themselves with the fingerprints in the database of Murphy represents a trivial enhancement that would already be a matter of common sense to a POSITA based on Murphy alone. *Id.* In addition, a POSITA would recognize that Murphy’s database was suitable for the minor enhancement expressed in Brunk. *Id.* Further, a POSITA would have understood that additional information—Brunk’s identification of an action—could be associated with information in an existing record—Murphy’s fingerprint-information association—

with ease. *Id.* As such, a POSITA would find it straightforward to combine Brunk’s identification of action in Murphy’s fingerprint record database. *Id.* ¶¶279-284.

2. Robust hash fingerprints of video

To the extent the Patent Owner argues or the Board finds that any of the claims (or an amendment thereto) requires robust hashing for video content, it also would have been obvious to implement Murphy’s fingerprint recognition system using any of the “robust hash” algorithms known in the art to reliably identify audio, video, or combined audio and video signals and/or combined with Brunk (Ex-1012). *Id.* ¶¶285-290; *see also supra* § IV.B A POSITA would have been motivated to use such algorithms and content with Murphy’s fingerprint recognition system for multiple reasons. Ex-1007 ¶¶285-286.

For example, a POSITA would be motivated by the teaching, suggestion, and motivation in the references themselves. *Id.* ¶¶286-288. Murphy itself expressly teaches and suggests that “[a]ny method of characterising a signal which makes it discernable from a different signal could be used” and further teaches using *any* “individual determining characteristic, or signature” with its fingerprint detection system. Ex-1011, 5:9-14, 6:33-34. Furthermore, Murphy teaches that its fingerprint recognition system can be used with the audio track portion of an associated television signal (*id.*, 15:17-22) or, alternatively, used to recognize video cues in video signals (*id.*, 15:22-25). Thus, a POSITA would have understood Murphy to

teach, suggest, and motivate using any advantageous fingerprinting algorithm known in the art as appropriate for the particular signal (audio, visual, or a combination thereof) of a given implementation based on routine design considerations for a particular use case. Ex-1007 ¶286.

For example, a POSITA would have understood Murphy could be implemented using known fingerprinting techniques. *Id.*; *supra* § IV.B (discussing Oostveen (Ex-1014), Haitsma (Ex-1016) and Brunk (Ex-1012)). Following Murphy's suggestion would have been well within the skill of a POSITA to achieve predictable results with reasonable expectations of success given the state of the art previously detailed. Ex-1007 ¶286; *supra* § IV.B. Doing so would involve using a known technique (a particular fingerprinting technique) to improve similar devices (fingerprint recognition systems) in the same way to achieve the same predictable results. Ex-1007 ¶286.

More specifically, it would have been obvious to implement Murphy's fingerprint recognition system using Brunk's (Ex-1012) teaching of using a "robust hash" as the fingerprinting algorithm. Ex-1007 ¶287. Brunk teaches using hashing algorithms to create a fingerprint and teaches the advantage that, if the signature is based on a larger number of perceptual features, the robustness of the signature increases, and a hash of a large number of perceptual features provides a suitable signature. Ex-1012, Fig. 1, [0021], [0026], and [0033]. Thus, Brunk itself provides

a teaching, suggestion, or motivation to use robust hashing. *Id.*; Ex-1007 ¶288.

Furthermore, a POSITA would readily appreciate that the Brunk's hashing would advantageously provide an appropriate level of robustness for the signatures suggested by Murphy for its fingerprint recognition system. Doing so would only involve using a known technique (a particular fingerprinting technique of a robust hash) to improve similar devices (fingerprint recognition systems) in the same way to achieve the same robustness in Murphy that would have been entirely predictable to a POSITA based on Brunk. Ex-1007 ¶¶290-291.

VII. CONCLUSION

For the foregoing reasons, Petitioner respectfully requests institution of an *inter partes* review and cancellation of all Challenged Claims.

Respectfully submitted,

Dated: December 6, 2019

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IPR2020-00216, Petition

U.S. Patent 9,066,114

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MANDATORY NOTICES – 37 C.F.R. § 42.8

A. Real Party-in-Interest (37 C.F.R. § 42.8(b)(1))

The real party-in-interest in this Petition is Free Stream Media Corp., doing business as Samba TV. Petitioner certifies that no other party exercised control or could exercise control over Petitioner's participation in this proceeding, the filing of this petition, or the conduct of any ensuing trial.

B. Related Matters (37 C.F.R. § 42.8(b)(2))

Petitioner identifies the following related matters to the best of Petitioner's knowledge as of the filing date of this Petition:

1. Judicial Matters

Gracenote asserts the '114 Patent against Petitioner in: *Gracenote, Inc. v. Free Stream Media Corp.*, D. Del. Case No. 1:18-cv-01608, filed October 17, 2018. Petitioner was served with the complaint in this action on December 10, 2018, and thus this petition is timely under 35 U.S.C. § 315(b).

2. Administrative Matters

The '114 Patent has not been subject of any other *inter partes* review or reexamination. Petitioner is separately filing petitions for *inter partes* review of the '962 Patent (Ex-1002) and the '831 Patent (Ex-1003), which are continuations of the '114 Patent and share the same specification.

3. Related Patents

In addition to the '962 Patent (Ex-1002) and '831 Patent (Ex-1003), the '114 Patent is related to U.S. 8,020,000, 8,660,267, 9,712,853, 10,045,054 and 10,250,916, and to pending U.S. Patent Application No. 16/264,134.

C. Lead/Back-Up Counsel (37 C.F.R. § 42.8(b)(3))

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TVPPTABDocket@orrick.com and P52PTABDocket@orrick.com. Petitioner's
Power of Attorney is attached.

The USPTO is authorized to charge the filing fee and any other fees incurred by Petitioner to the deposit account of Orrick, Herrington, & Sutcliffe LLP: 15-0665.

D. Service Information (37 C.F.R. § 42.8(b)(4))

Please direct all correspondence to lead and backup counsel at the above address. Petitioner consents to electronic service at the email addresses above.

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CERTIFICATION OF SERVICE ON PATENT OWNER

Pursuant to 37 C.F.R. §§ 42.6(e), 42.8(b)(4) and 42.105, the undersigned certifies that on December 6, 2019, a complete and entire copy of this Petition for *Inter Partes* Review of U.S. Patent 9,066,114 and all supporting documents and exhibits were served via Federal Express, postage prepaid, on the Patent Owner by serving the correspondence address of record for the '114 Patent:

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A courtesy copy was provided to Patent Owner's litigation counsel in the action *Gracenote, Inc. v. Free Stream Media Corp.*, D. Del. Case No. 1:18-cv-01608 pending between Petitioner and Patent Owner and involving the '114 Patent:

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CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24 *et seq.*, the undersigned certifies that this document complies with the type-volume limitations. This document contains 13,626 words as calculated by the “Word Count” feature of Microsoft Word 2010, the word processing program used to create it.

Dated: December 6, 2019

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