PTO/AIA/01 (06-12)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	Multimedia Time Warping System

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 9/126,071

filed on July 30, 1998.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: James M. Barton Date (Optional): _____

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/SB/AIA/01 form for each additional inventor.

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LEGAL NAME OF INVENTOR

Inventor: Andrew Martin Goodman Date (Optional): 5/7/2014

Signature: [signature]

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/SB/AIA01 form for each additional inventor.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	Multimedia Time Warping System

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 9/126,071

filed on July 30, 1998.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

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LEGAL NAME OF INVENTOR

Inventor: Alan S. Moskowitz Date (Optional): _____

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/SB/AIA01 form for each additional inventor.

Doc code: Oath
Document Description: Oath or declaration filed

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SUBSTITUTE STATEMENT IN LIEU OF AN OATH OR DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (35 U.S.C. 115(d) AND 37 CFR 1.64)

Title of Invention	Multimedia Time Warping System

This statement is directed to:

☐ The attached application,

OR

☒ United States application or PCT international application number 09/126,071 filed on July 30, 1998.

LEGAL NAME of inventor to whom this substitute statement applies:

(*E.g.*, Given Name (first and middle (if any)) and Family Name or Surname)

Ching Tong Chow

Residence (except for a deceased or legally incapacitated inventor):

City	State	Country
Fremont	CA	US

Mailing Address (except for a deceased or legally incapacitated inventor):

920 Seville Place

City	State	Zip	Country
Fremont	CA	94539	US

I believe the above-named inventor or joint inventor to be the original inventor or an original joint inventor of a claimed invention in the application.

The above-identified application was made or authorized to be made by me.

I hereby acknowledge that any willful false statement made in this statement is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

Relationship to the inventor to whom this substitute statement applies:

- ☐ Legal Representative (for deceased or legally incapacitated inventor only),
- ☒ Assignee,
- ☐ Person to whom the inventor is under an obligation to assign,
- ☐ Person who otherwise shows a sufficient proprietary interest in the matter (petition under 37 CFR 1.46 is required), or
- ☐ Joint Inventor.

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SUBSTITUTE STATEMENT

Circumstances permitting execution of this substitute statement:

- ☐ Inventor is deceased,
- ☐ Inventor is under legal incapacity,
- ■ Inventor cannot be found or reached after diligent effort, or
- ☐ Inventor has refused to execute the oath or declaration under 37 CFR 1.63.

If there are joint inventors, please check the appropriate box below:

- ■ An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) naming the entire inventive entity has been or is currently submitted.

OR

- ☐ An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) has not been submitted. Thus, a Substitute Statement Supplemental Sheet (PTO/AIA/11 or equivalent) naming the entire inventive entity and providing inventor information is attached. See 37 CFR 1.64(b).

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PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name: Kirk D. Wong	Date (Optional):

Signature: /KirkDWong#43284/

APPLICANT NAME AND TITLE OF PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

If the applicant is a juristic entity, list the applicant name and the title of the signer:

Applicant Name: TiVo Inc.

Title of Person Executing This Substitute Statement: Attorney for Applicant

The signer, whose title is supplied above, is authorized to act on behalf of the applicant.

Residence of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent):

City Fremont	State CA	Country US

Mailing Address of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent)

4677 Old Ironsides Drive, Suite 370

City Santa Clara	State CA	Zip 95054	Country US

Note: Use an additional PTO/AIA/02 form for each inventor who is deceased, legally incapacitated, cannot be found or reached after diligent effort, or has refused to execute the oath or declaration under 37 CFR 1.63.

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Doc code: Oath
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SUBSTITUTE STATEMENT IN LIEU OF AN OATH OR DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (35 U.S.C. 115(d) AND 37 CFR 1.64)

Title of Invention	Multimedia Time Warping System

This statement is directed to:

☐ The attached application,

OR

☒ United States application or PCT international application number 09/126,071 filed on July 30, 1998.

LEGAL NAME of inventor to whom this substitute statement applies:

(*E.g.*, Given Name (first and middle (if any)) and Family Name or Surname)

Jean Swey Kao

Residence (except for a deceased or legally incapacitated inventor):

City	State	Country
Cupertino	CA	US

Mailing Address (except for a deceased or legally incapacitated inventor):

21876 Meadow View Lane

City	State	Zip	Country
Cupertino	CA	95014	US

I believe the above-named inventor or joint inventor to be the original inventor or an original joint inventor of a claimed invention in the application.

The above-identified application was made or authorized to be made by me.

I hereby acknowledge that any willful false statement made in this statement is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

Relationship to the inventor to whom this substitute statement applies:

☐ Legal Representative (for deceased or legally incapacitated inventor only),

☒ Assignee,

☐ Person to whom the inventor is under an obligation to assign,

☐ Person who otherwise shows a sufficient proprietary interest in the matter (petition under 37 CFR 1.46 is required), or

☐ Joint Inventor.

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SUBSTITUTE STATEMENT

Circumstances permitting execution of this substitute statement:

- ☐ Inventor is deceased,
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- ■ Inventor cannot be found or reached after diligent effort, or
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OR

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PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name: Kirk D. Wong	Date (Optional):

Signature: /KirkDWong#43284/

APPLICANT NAME AND TITLE OF PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

If the applicant is a juristic entity, list the applicant name and the title of the signer:

Applicant Name: TiVo Inc.

Title of Person Executing This Substitute Statement: Attorney for Applicant

The signer, whose title is supplied above, is authorized to act on behalf of the applicant.

Residence of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent):

City Fremont	State CA	Country US

Mailing Address of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent)

4677 Old Ironsides Drive, Suite 370

City Santa Clara	State CA	Zip 95054	Country US

Note: Use an additional PTO/AIA/02 form for each inventor who is deceased, legally incapacitated, cannot be found or reached after diligent effort, or has refused to execute the oath or declaration under 37 CFR 1.63.

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OR

☒ United States application or PCT international application number 09/126,071 filed on July 30, 1998.

LEGAL NAME of inventor to whom this substitute statement applies:

(*E.g.*, Given Name (first and middle (if any)) and Family Name or Surname)

Roderick James McInnis

Residence (except for a deceased or legally incapacitated inventor):

City	State	Country
Milpitas	CA	US

Mailing Address (except for a deceased or legally incapacitated inventor):

1299 Canton Drive

City	State	Zip	Country
Milpitas	CA	95035	US

I believe the above-named inventor or joint inventor to be the original inventor or an original joint inventor of a claimed invention in the application.

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- ☒ Assignee,
- ☐ Person to whom the inventor is under an obligation to assign,
- ☐ Person who otherwise shows a sufficient proprietary interest in the matter (petition under 37 CFR 1.46 is required), or
- ☐ Joint Inventor.

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PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name: Kirk D. Wong	Date (Optional):

Signature: /KirkDWong#43284/

APPLICANT NAME AND TITLE OF PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

If the applicant is a juristic entity, list the applicant name and the title of the signer:

Applicant Name: TiVo Inc.

Title of Person Executing This Substitute Statement: Attorney for Applicant

The signer, whose title is supplied above, is authorized to act on behalf of the applicant.

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Application Number:	09126071
International Application Number:	
Confirmation Number:	8489
Title of Invention:	MULTIMEDIA TIME WARPING SYSTEM
First Named Inventor/Applicant Name:	JAMES M. BARTON
Customer Number:	29989
Filer:	Kirk D. Wong
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Oath or Declaration filed	Barton.pdf	28252 835725d8f4a3f40bb530f3c10f4c0299740aade7	no	1

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2	Oath or Declaration filed	Goodman.pdf	118746 e07bdc14a9740f39fa95e7f6ee3fcd84ff9a0908	no	2
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AO 120 (Rev. 08/10)

TO:	**Mail Stop 8** **Director of the U.S. Patent and Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	**REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas, Texarkana Division on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
5:11-cv-00053	3/26/2012	Eastern District of Texas, Texarkana Division

PLAINTIFF	DEFENDANT
TiVo Inc. (Counterclaim Plaintiff)	Motorola Mobility, Inc., General Instrument Corporation, Time Warner Cable Inc., and Time Warner Cable LLC (Counterclaim Defendants)

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,233,389	5/15/2001	TiVo Inc.
2	7,529,465	5/5/2009	TiVo Inc.
3	5,949,948	9/7/1999	General Instrument Corporation
4	6,304,714	10/16/2001	General Instrument Corporation
5	6,356,708	3/12/2002	General Instrument Corporation

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☑ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 6,792,195	9/14/2004	TiVo Inc.
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

✎ AO 120 (Rev. 2/99)

TO: **Mail Stop 8** **Director of the U.S. Patent & Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	**REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**

In Compliance with 35 § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Northern District California on the ✔ Patents or ☐ Trademarks:

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
CV 12-02766 RS	5/30/2012	450 Golden Gate Avenue, 16th Floor San Francisco CA 94102
PLAINTIFF CISCO SYSTEMS INC.		DEFENDANT TIVO, INC.

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 6,233,389		
2 7,529,465		
3 7,493,015		
4 6,792,195		
5		

In the above—entitled case, the following patent(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
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3		
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5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
Order granting Motion to Transfer was entered on 8/10/2012

CLERK	(BY) DEPUTY CLERK	DATE
Richard W. Wieking	Gina Agustine-Rivas	September 4, 2012

Copy 1—Upon initiation of action, mail this copy to Commissioner **Copy 3—Upon termination of action, mail this copy to**
Copy 2—Upon filing document adding patent(s), mail this copy to Commissioner **Copy 4—Case file copy**

relating to the interest of justice." *Micron Tech.*, 518 F.3d at 902-05. While the "general rule favors the forum of the first-filed action, whether or not it is a declaratory judgment action," the Federal Circuit has recognized that "trial courts have discretion to make exceptions to this general rule in the interest of justice or expediency, as in any issue of choice of forum." *Id.* at 904 (citing *Genentech*, 998 F.2d at 937). Thus, a "district court may consider a party's intention to preempt another's infringement suit when ruling on the dismissal of a declaratory action, but that consideration is merely one factor" of many to be assessed, including "the convenience and availability of witnesses, the absence of jurisdiction over all necessary or desirable parties, and the possibility of consolidation with related litigation." *Id.*

1. Interests of justice

Analyzing the interests of justice entails an inquiry into "whether efficient and expeditious administration of justice would be furthered" by transfer. *Sherar v. Harless*, 561 F.2d 791, 794 (9th Cir. 1977); *accord Regents of the Univ. of Cal. v. Eli Lilly & Co.*, 119 F.3d 1559, 1565 (Fed. Cir. 1997). Matters of judicial economy "may be determinative to a particular transfer motion, even if the convenience of the parties and witnesses might call for a different result." *Regents*, 119 F.3d at 1565 (quoting *Coffey v. Van Dorn Iron Works*, 796 F.2d 217, 220-21 (7th Cir. 1986)). Thus, in patent litigation "in which several highly technical factual issues are presented and the other relevant factors are in equipoise, the interest of judicial economy may favor transfer to a court that has become familiar with the issues." *Id.*

Here, the interests of justice favor transfer, as the E.D. Tex. Court is entertaining the weight of the litigation concerning TiVo's DVR patents, and will soon have invested significant resources in claims construction and trial proceedings in TiVo's other cases, regardless of where the dispute between TiVo and Cisco is resolved. Should TiVo's motion to transfer be denied, and this case progress in parallel to the E.D. Tex. cases, there is certainly some risk of duplicative proceedings and inconsistent judicial decisions, given the substantial overlap in subject matter. To be sure, *Verizon* and *Motorola* are much farther along in the process than TiVo's recently-filed direct infringement action against Cisco, a factor that was apparently of some moment to the E.D. Tex. Court when it determined to sever TiVo's claims against Cisco from those previously-filed matters.

Still, the Texas Court is likely to develop considerable familiarity with TiVo's claims and defendants' counterclaims in disposing of the earlier-filed cases. The Federal Circuit has noted that "[e]xceptions [to the first-to-file rule] are not rare, and are made when justice or expediency requires, as in any issue of choice of forum." *Genentech,* 998 F.2d at 937. Even if the first-to-file rule does not, strictly speaking, apply, a departure may be warranted if there is "the possibility of consolidation with related litigation." *Id.* at 938. That is because "the existence of multiple lawsuits involving the same issues is a paramount consideration when determining whether a transfer is in the interest of justice." *In re Volkswagen of Am., Inc.,* 566 F.3d 1349, 1351 (Fed. Cir. 2009).

Granted, it is not unusual for the claims of heavily-litigated patents to be construed in separate proceedings or even multiple fora, and the fact that the E.D. Tex. Court will soon be required to hold *Markman* hearings in *Verizon* and *Motorola*, and in all likelihood, construe many of the same claims to be advanced against Cisco in these proceedings, does not necessarily settle the matter. Noting that invalidity and infringement analysis require individual assessment of the asserted claims, as well the accused product, Cisco insists that its "DVRs are substantially different from Motorola DVRs because they have different software, hardware, design, and functionality, which were developed by different engineers and different companies." Pl.'s Opp'n at 12:2-4. Cisco also emphasizes that not all of its DVR product lines have been accused of infringement in the Texas cases. To this, TiVo replies that the "underlying basic technology is in the same area and the infringement issues will involve similar technical concepts." Def.'s Reply at 4:22-23. While the arguments advanced by each side are valid, the balance tips in favor of the E.D. Tex. in light of its "head start" in these matters.

2. Other factors

In assessing a motion to transfer, the Court may also consider, *inter alia*, the convenience of the parties and witnesses, and ease of access to sources of proof. *See Gulf Oil Co. v. Gilbert,* 330 U.S. 501, 508-09 (1947); *Micron Tech.,* 518 F.3d at 902-05. Cisco urges that these factors support its position. Indeed, it has identified some documentary evidence, as well as non-party witnesses, who reside in this District, beyond the jurisdiction of the Texas Court. TiVo replies that Cisco's DVR business is mainly operated from Atlanta, Georgia, rather than this District, and that most

evidence and many witnesses are located there. Such considerations would have greater salience if this were a dispute between genuinely local parties. In reality, however, both Cisco and TiVo are large and sophisticated companies, quite accustomed to operating – and litigating – all around the country, including in the E.D. Tex. Both Cisco and TiVo are undoubtedly capable of furnishing documentary evidence in electronic form wherever it may be needed. As TiVo further points out, the inventors named in its DVR patents have already been deposed repeatedly in connection with the preexisting E.D. Tex. proceedings without incident. To the extent Cisco suggests that it would be costly for witnesses to travel to the E.D. Tex. to give testimony, in light of the scope and overall expense of litigating a case such as this, as well as the parties' resources, that contention is similarly unpersuasive. The transfer statute's "private interest" factors do not strongly support granting or denying the motion.

V. CONCLUSION

In service of the interests of justice and judicial economy, TiVo's motion to transfer is granted. To the extent TiVo requests dismissal, the motion is denied. The Clerk is directed to transfer the case file to the E.D. Tex.

IT IS SO ORDERED.

Dated: 8/10/12

RICHARD SEEBORG
UNITED STATES DISTRICT JUDGE

IN THE UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

CISCO SYSTEMS, INC.,

Plaintiff,

v.

TIVO, INC.,

Defendant.
_____/

No. C 12-02766 RS

ORDER GRANTING MOTION TO TRANSFER

I. INTRODUCTION

Defendant TiVo, Inc. moves to dismiss or to transfer this patent action for declaratory judgment of noninfringement and invalidity to the Eastern District of Texas (E.D. Tex.), pursuant to the "first-to-file" rule. Plaintiff Cisco Systems, Inc. opposes the motion. This particular dispute grows out of the now familiar patent chess game in which the players vie for the right to designate where and when the tournament will be played. As each side can advance a credible claim to the prized mantle of "first-to-file," ultimately the decision must rest on where it makes the most practical sense to have the battle play out. Here, after consideration of the briefs, the arguments raised at the hearing, and for all the reasons set forth below, the conclusion follows that the appropriate forum is the E.D. Tex. Accordingly, TiVo's motion is granted, and the case is ordered transferred to the E.D. Tex. Court.

II. BACKGROUND

Defendant TiVo is a supplier of digital video recorders ("DVRs"). It holds the right to the patents at issue in this action, including U.S. Patent Numbers 6,233,389 ("the '389 patent"), which claims DVR technology that allows users to record and replay television broadcasts, 7,529,465 ("the '465 patent"), directed to allowing multi-room viewing of television content, 7,493,015 ("the '015 patent"), claiming "overshoot correction" functionality for fast forwarding and rewinding, and 6,792,195 ("the '195 patent"), directed to "trickplay" functionality. TiVo is headquartered and has its principal place of business in Alviso, California, which is located in this District. It apparently maintains a distribution center in Fort Worth, Texas, a city located in the Northern District of Texas. Plaintiff Cisco similarly develops and supplies DVR technology. It sells approximately twenty different DVR models to customers that include cable and telecommunications providers such as Verizon, AT&T, and Time Warner Cable. It is headquartered and has its principal place of business in San Jose, California, but also maintains offices in Texas. TiVo insists that Cisco's DVR business is primarily based in Atlanta, Georgia, the location of Scientific Atlanta, a DVR vendor that Cisco purchased in 2006 to supplement its own business.

The procedural history underlying the patent battle between these parties reveals a dizzying back and forth between this district and its counterpart in eastern Texas. Cisco filed this suit on May 30, 2012, challenging the validity of the '389, '465, '015, and '195 patents, and seeking a declaration of non-infringement with respect to its DVR product lines. It did so purportedly to "ensure that all of TiVo's claims will be resolved against all of Cisco's DVRs in one suit, rather than having TiVo file separate lawsuits on Cisco's DVRs against each of Cisco's many customers." Pl.'s Opp'n at 1:14-16 (emphasis in original). A few days later, on June 4, 2012, TiVo filed a direct infringement action against Cisco in the E.D. Tex. alleging that numerous Cisco DVR products infringe the same four patents in dispute in this matter. As detailed below, that case now also encompasses claims later asserted by TiVo against several of Cisco's customers. Infringement contentions are due in that matter on August 15, and a fully-briefed motion by Cisco to transfer that case to this District is currently pending in the E.D. Tex.

Both parties have extensive experience litigating cases in this District, as well as in the E.D. Tex. Cisco notes that TiVo first asserted the '389 patent in the Northern District of California as

early as 2002, and the '195 patent in a 2011 case filed against Microsoft, which was transferred to this Court from the Western District of Washington.[1] In 2004, TiVo successfully asserted the '389 patent against EchoStar in January 2004 in that District, and ultimately won substantial damages and injunctive relief. Then, in 2009, TiVo sued AT&T in the E.D. Tex. on the '389, '465, and '015 patents, alleging that Cisco DVRs infringed its patents. After TiVo obtained discovery against Cisco, and the Court issued a claim construction order, the parties ultimately settled.

TiVo is presently in active litigation against Verizon, Motorola, Time Warner, and Cisco, in the E.D. Tex., in three cases pending before the same presiding judge. Like the prior *AT&T* action, TiVo's case against Verizon rests upon the '389, '465, and '015 patents, and initially concerned DVR products supplied to Verizon by Motorola. In the course of discovery, however, Verizon disclosed that it had distributed a Cisco DVR to customers in late 2010, prompting TiVo to move for leave to amend its infringement contentions in July of 2011. Owing to the retirement of the presiding judge and the reassignment of the action, the motion was not granted until June 5, 2012, a date after the initiation of this case. TiVo thus filed its amended infringement contentions encompassing the Cisco DVR on the day fact discovery closed, roughly three years into the proceedings. *Verizon* is scheduled to go to trial in the E.D. Tex. in October of 2012.

By the time TiVo filed its motion to dismiss or to transfer in this case, the E.D. Tex. Court had recognized Cisco's DVR products were at issue in *Verizon*, prompting Cisco to file a motion for leave to intervene, in hopes of obtaining a stay. On July 18, 2012, however, after TiVo filed suit directly against Cisco, the successor presiding judge in the E.D. Tex. reconsidered that Court's prior order permitting TiVo to file amended infringement contentions against Cisco's DVR, and instead severed those claims and consolidated them with the later-filed direct infringement suit.

Following the initiation of *Verizon*, Motorola filed its own declaratory judgment action against TiVo in the E.D. Tex., challenging the '389, '465, and '195 patents. TiVo, in turn, named Time Warner Cable as a counterclaim defendant. Although TiVo served pleadings accusing Time Warner of selling infringing DVR devices "without limitation," it did not specifically identify any

[1] TiVo counters that Cisco has also voluntarily availed itself of the E.D. Tex. as a plaintiff in other patent actions, although those matters do not have any apparent connection to the products or patents at issue here.

allegedly infringing Cisco products in its pleadings until June 29, 2012 – again, after initiation of the instant suit, and in fact, during briefing on the instant motion. As in *Verizon*, the E.D. Tex. Court ultimately severed TiVo's claims concerning Cisco DVRs supplied to Time Warner in the *Motorola* action and transferred them to the later-filed direct infringement case between TiVo and Cisco. Claim construction in *Motorola* is currently scheduled for November of 2012, and trial is set to begin in May of 2013.

In support of its motion to dismiss or to transfer, TiVo emphasizes the E.D. Tex.'s familiarity with the underlying DVR technology. Cisco, by contrast, argues that all of its DVR products are at issue in these proceedings, whereas only one product line was challenged in the preexisting *Verizon* action. To the extent Cisco now has more product lines at issue in the E.D. Tex. litigation, it emphasizes that all of those matters have been consolidated into the later-filed direct infringement action. Cisco also urges that the bulk of the documentary evidence and the witnesses, all of the named inventors (seven are non-parties), several of the patent prosecutors, and some inventors of the relevant prior art, reside here, beyond the subpoena power of the E.D. Tex. Court.

III. LEGAL STANDARD

The Declaratory Judgment Act permits courts the discretion to decline jurisdiction over declaratory judgment claims. *Wilton v. Seven Falls Co.*, 515 U.S. 277, 282 (1995); 28 U.S.C. § 2201 ("...any court of the United States, upon the filing of an appropriate pleading, *may* declare the rights and other legal relations of any interested party seeking such declaration ....") (emphasis added). Courts routinely do so under the "first-to-file" rule, the "generally recognized doctrine of federal comity which permits a district court to decline jurisdiction over an action when a complaint involving the same parties and issues has already been filed in another district." *Pacesetter Sys., Inc. v. Medtronic, Inc.*, 678 F.2d 93, 94-95 (9th Cir. 1982). The rule "favors the forum of the first-filed action, whether or not it is a declaratory action," *see Genetech, Inc. v. Eli Lilly & Co.*, 998 F.2d 931, 937 (Fed. Cir. 1993), in the service of "promot[ing] judicial efficiency and prevent[ing] the risk of inconsistent decisions that would arise from multiple litigations of identical claims." *Interactive Fitness Holdings, LLC v. Icon Health & Fitness, Inc.*, No. C 10-04628, 2011 WL 1302633, at *3 (N.D. Cal. Apr. 5, 2011). The rule "should not be disregarded lightly." *Alltrade, Inc. v. Uniwield*

Prods., Inc., 946 F.2d 622, 625 (9th Cir. 1991). That said, it is "not a rigid or inflexible rule to be mechanically applied, but rather is to be applied with a view to the dictates of sound judicial administration." *Pacesetter*, 678 F.2d at 95.

In applying the rule, courts focus primarily on the chronology of the filings, the identity of the parties, and whether the issues presented in the successive actions "substantially overlap." *Intersearch Worldwide, Ltd. v. Intersearch Grp., Inc.*, 544 F. Supp. 2d 949, 957-58 (N.D. Cal. 2008). The analysis may also encompass consideration of the "convenience factors" set forth in the transfer statute, 28 U.S.C. § 1404(a), including, "the convenience and availability of witnesses, absence of jurisdiction over all necessary or desirable parties, possibility of consolidation with related litigation, or considerations relating to the interest of justice." *Micron Tech., Inc. v. Mosaid Techs., Inc.*, 518 F.3d 897, 902-05 (Fed. Cir. 2008).

IV. DISCUSSION

A. Threshold factors

Although the first-to-file rule provides a relatively straightforward test for prioritizing proceedings between districts, here, application of the rule does not produce a clear result. TiVo requests dismissal or transfer on the premise that its existing cases in the E.D. Tex. meet the threshold requirements of the first-to-file rule: (1) chronology; (2) identity of the parties; and (3) "substantial overlap" of issues. As the foregoing procedural history makes clear, however, on the date that this case was filed, Cisco was not a party to any of the proceedings in Texas, and, with the exception of the settled *AT&T* matter, no Cisco products had been formally identified as infringing TiVo's patents.

In an attempt to minimize the significance of those facts, TiVo downplays the extent to which the identity of the parties and substantive issues must present commonality under the first-to-file rule. It quotes *Intersearch Worldwide*, a decision from this District,[2] noting that "exact identity

[2] TiVo also identifies some out-of-circuit cases standing for the principle that the analysis "turns on which court first obtains possession of the subject of the dispute, not the parties of the dispute." *Shire U.S., Inc. v. Johnson Matthey, Inc.*, 543 F. Supp. 2d 404, 407 (E.D. Pa. 2008). Those cases, however, arguably conflate the distinct requirements set forth by this Court's precedents – namely, the identity of the parties and issues that "substantially overlap." *See Intersearch*, 544 F. Supp. 2d at 957-58. Moreover, even accepting that position for argument's sake, Cisco's products were not put at issue in *Motorola* until after this case was filed, and were never effectively at issue in *Verizon*.

is not required to satisfy the first-to-file rule." 544 F. Supp. 2d at 959 n.6. The rule requires only that "some [of] the parties in one matter are also in the other matter, regardless of whether there are additional unmatched parties in one or both matters." *Id.* The word "parties," however, implies that more than one overlapping party is ordinarily required to meet the first-to-file rule's "identity" requirement, and the particular facts of *Intersearch* support that conclusion. There, the court granted defendant's motion to dismiss plaintiff's trademark claims, pursuant to the first-to-file rule, where the defendant had previously sued plaintiff in New York over the same issues. Of course, were a patentee's preexisting litigation against third parties to preclude all other alleged infringers from obtaining declaratory relief in other venues, regardless of convenience or economy considerations, the identity requirement would have no meaning, the rule would be rendered unworkable. *See, e.g., In re Vistaprint Ltd.*, 628 F.3d 1342, 1347 n.3 (Fed. Cir. 2010) (litigating a patent in a particular venue does not confer upon the patentee a "free pass to maintain all future litigation involving that patent in that venue").

Invoking another recent decision from this District, *Proofpoint, Inc. v. InNova Patent Licensing, LLC*, No. C 11-02288, 2011 WL 4915847, at *6-7 (N.D. Cal. Oct. 17, 2011), TiVo alternatively argues that a patentee's prior litigation against an alleged infringer's customers may meet the first-to-file rule's requirements. That suggestion is somewhat at odds with the "customer suit" exception to the first-to-file rule, which generally holds that "litigation against or brought by the manufacturer of infringing goods takes precedence over a suit by the patent owner against customers of the manufacturer." *See Katz v. Lear Siegler, Inc.*, 909 F.2d 1459, 1464 (Fed. Cir. 1990).[3] Although TiVo and Cisco debate the applicability of that doctrine to this action, it is not necessary to resolve that dispute in light of the result reached below, and given that *Proofpoint* is not as supportive to TiVo as it suggests.

In *Proofpoint*, plaintiff's declaratory judgment action was dismissed because the pleadings failed to establish the existence of an "actual controversy" sufficient to confer jurisdiction under the Declaratory Judgment Act. *Id.* at *2-6. The decision went on to note that even were declaratory

[3] It is typically invoked "where the first suit is filed against a customer who is simply a reseller of the accused goods, while the second suit is a declaratory action brought by the manufacturer of the accused goods." *Proofpoint*, 2011 WL 4915847, at *7 n.5.

jurisdiction perfected, it would be prudent to decline jurisdiction because of the pendency of preexisting litigation against Proofpoint's customers in the E.D. Tex. The opinion recognized that "[a]lthough the first-filed rule is not *clearly* applicable here because [plaintiff] Proofpoint is not a party to the Texas Action, the focus on judicial efficiency that underlies both the first-filed rule and the transfer analysis plainly supports the Court's decision to decline jurisdiction." *Id.* at *7 (internal citation omitted) (emphasis in original). The Court thus declined to exercise jurisdiction given that: (1) the challenged patents were asserted in the patentee's preexisting litigation; (2) the parties to the preexisting case were sophisticated and well-represented, and likely to raise many of the same defenses asserted in *Proofpoint*; and (3) the E.D. Tex. Court had already invested "considerable energy" in adjudicating the previously-filed case, including the likely issuance of a claim construction order, raising the prospect of conflicting judicial opinions should the later-filed case go forward. *Id.* at *7. TiVo maintains that the same analysis applies in this instance, where, analogously, the first-to-file rule is not met in the usual fashion since Cisco is not party to TiVo's previously-filed E.D. Tex. cases. While there are certainly some parallels between the instant case and *Proofpoint*, in that case, by the time the later suit was filed, Proofpoint's products had already been formally accused of infringement in the E.D. Tex. proceedings. Here, again, Cisco's products were not formally implicated in *Verizon* and *Motorola* at the time this matter was filed.[4]

Cisco insists that simple application of the first-to-file rule suggests that TiVo's motion should be denied because it had not been drawn into the E.D. Tex. litigation before it filed this suit, and invokes many cases for support. While that position might, at first blush, seem persuasive, it ignores the fact that TiVo made efforts to amend its infringement contentions to encompass Cisco's products almost a year before these proceedings were initiated. Those efforts were unavailing, not

[4] Cisco attempts to distinguish *Proofpoint* further on the grounds that there, unlike here: (1) the transfer statute's convenience considerations were not debated; and (2) intervention in the E.D. Tex. case was still reasonably available to the declaratory judgment plaintiff. Turning to the latter point first, now that Cisco is not a party to *Verizon* or *Motorola*, it will plainly have ample opportunity to defend itself in the proceedings which have just begun on TiVo's direct infringement claims. As for judicial economy, a consideration that figures prominently in application of the first-to-file rule, *see Meru Networks, Inc. v. Extricom, Ltd.*, No. C 10-02021, 2010 WL 3464315, at *1 (N.D. Cal. Aug. 31, 2010) (citing *Alltrade, Inc. v. Uniweld Products, Inc.*, 946 F.2d 622, 625 (9th Cir. 1991)), TiVo arguably has the stronger position, for reasons explained below.

due to any fault of TiVo's, but merely because the presiding judicial officer retired, and the case was reassigned. Had TiVo's motion to amend been granted more promptly, it would have had a fairly strong basis to invoke the first-to-file rule against Cisco's declaratory judgment action. None of the precedents Cisco identifies address this unusual factual circumstance. Instead, Cisco argues that TiVo "manufactured" the connection between Cisco DVRs and those earlier-filed cases. For the reasons set forth above, that is not entirely fair.

Moreover, to the extent that prior cases are helpful, they teach the first-to-file rule is not to be applied mechanistically, nor set aside only in "extraordinary circumstances," as Cisco suggests. *Pacesetter*, 678 F.2d at 95 ("not a rigid or inflexible rule"); *Genentech,* 998 F.2d at 937 (exceptions not unusual); *Church of Scientology of California v. United States Dep't of the Army*, 611 F.2d 738, 749, 750 (9th Cir. 1979) ("[T]he "first to file" rule normally serves the purpose of promoting efficiency well and should not be disregarded lightly. Circumstances and modern judicial reality, however, may demand that we follow a different approach from time to time...."). The simplistic approach urged by Cisco, which essentially calls for comparing the parties listed on the dockets in the relevant actions and the dates each was filed, is of little assistance in a case such as this, where both parties lay a plausible claim to first filer status, and the substantive overlap of the issues litigated, though not complete, is significant. In short, the first-to-file rule does not supply the answer to the pending venue related motions in this particular case.

B. Section 1404 factors

As noted above, the first-to-file rule encompasses the transfer statute's "convenience factors." Section 1404(a) provides: "For the convenience of parties and witnesses, in the interest of justice, a district court may transfer any civil action to any other district or division where it might have been brought...."[5] In adjudicating the instant motion it is therefore appropriate to consider such matters as "the convenience and availability of witnesses, absence of jurisdiction over all necessary or desirable parties, possibility of consolidation with related litigation, or considerations

[5] As an initial matter, the parties do not dispute that this case could have been brought in either venue. *See Glaxo Group Ltd. v. Genentech, Inc.*, No. C 10-00675, 2010 WL 1445666, at *2 (N.D. Cal. Apr. 12, 2010) (movant must show that the transferee court is one in which the original action could have been brought).

AO 120 (Rev. 2/99)

TO: Mail Stop 8 Director of the U.S. Patent & Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	**REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**

In Compliance with 35 § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Northern District of California on the following ☒ Patents or ☐ Trademarks:

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
CV 12-02766 LB	5/30/12	450 Golden Gate Ave, Box 36060, San Francisco, CA 94102

PLAINTIFF	DEFENDANT
CISCO SYSTEMS INC.	TIVO, INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6233389		SEE ATTACHED COMPLAINT
2	7529465		
3	7493015		
4	6792195		
5			

In the above—entitled case, the following patent(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
Richard W. Wieking	Felicia Reloba	June 1, 2012

Copy 1—Upon initiation of action, mail this copy to Commissioner **Copy 3—Upon termination of action, mail this copy to Commissioner**
Copy 2—Upon filing document adding patent(s), mail this copy to Commissioner **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:12-cv-00311	6/4/2012	Eastern District of Texas

PLAINTIFF	DEFENDANT
TiVo Inc.	Cisco Systems, Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,233,389	5/15/2001	TiVo Inc.
2	7,529,465	5/5/2009	TiVo Inc.
3	7,493,015	2/17/2009	TiVo Inc.
4	6,792,195	9/14/2004	TiVo Inc.
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas, Texarkana Division on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
5:11-cv-00053	2/25/2011	Eastern District of Texas, Texarkana Division

PLAINTIFF	DEFENDANT
Motorola Mobility, Inc. and General Instrument Corporation	TiVo Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	5,949,948	9/7/1999	General Instrument Corporation
2	6,304,714	10/16/2001	General Instrument Corporation
3	6,356,708	3/12/2002	General Instrument Corporation
4	6,233,389	5/15/2001	TiVo, Inc.
5	7,529,465	5/5/2009	TiVo, Inc.

In the above-entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above-entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

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Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

SOLICITOR

AO 120 (Rev. 3/04)

AUG 2 8 2009

U.S. PATENT & TRADEMARK OFFICE

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas on the following ☑ Patents or ☐ Trademarks:

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:09-cv-257		Eastern District of Texas

PLAINTIFF	DEFENDANT
TiVo Inc.	Verizon Communications, Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,233,389	5/15/2001	TiVo Inc.
2	7,529,465 B2	5/5/2009	TiVo Inc.
3	7,493,015 B1	2/17/2009	TiVo Inc.
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading		
	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 3/04)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas, Mars on the following ☑ Patents or ☐ Trademarks:

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:09-cv-259	8/26/2009	Eastern District of Texas, Marshall Division

PLAINTIFF	DEFENDANT
TiVo, Inc.	AT&T, Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,233,389	5/15/2001	TiVo, Inc.
2	7,529,465	5/5/2009	TiVo, Inc.
3	7,493,015	2/17/2009	TiVo, Inc.
4			
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Delaware on the following X Patents or ☐ Trademarks:

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
08cv327	5/30/08	DISTRICT OF DELAWARE

PLAINTIFF	DEFENDANT
Dish Network Corporation, et al.	TiVo Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	US 6,233,389 B1	5/15/01	TiVo Inc.
2			
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
PETER T. DALLEO, CLERK OF COURT		June 2, 2008

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER SECRETARY OF COMMERCE FOR
INTELLECTUAL PROPERTY AND
DIRECTOR OF THE UNITED STATES PATENT
AND TRADEMARK OFFICE
Alexandria, Virginia 22313

Patent No. 6,233,389 Paper No. 14

NOTICE OF *EX PARTE* REEXAMINATION

Notice is hereby given that a request for *ex parte* reexamination of U.S. Patent No. 6,233,389 was filed on 10/12/05 under 35 U.S.C. 302 and 37 CFR 1.510(a).

The reexamination proceeding has been assigned Control No. 90/007,750.

This Notice incorporates by reference into the patent file, all papers entered into the reexamination file.

Note: This Notice should be entered into the patent file and given a paper number.

UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS
UNITED STATES PATENT AND TRADEMARK OFFICE
P.O. BOX 1450
ALEXANDRIA, VA 22313-1450
www.uspto.gov

MAIL

Paper No. 13

GLENN PATENT GROUP
3475 EDISON WAY, SUITE L
MENLO PARK CA 94025

MAR 0 8 2004

DIRECTOR OFFICE
TECHNOLOGY CENTER 2600

In re Application of
BARTON et al.
Application No. 09/126,071
Filed: July 30, 1998
For:
MULTIMEDIA TIME WARPING SYSTEM

DECISION ON REQUEST TO WITHDRAW FROM RECORD

This is a decision on the request for withdrawal as agent of record filed on January 13, 2004.

A grantable request to withdraw as attorney/agent of record must:
(1) indicate the present mailing address of the attorney(s)/agent(s) who seek(s) to withdraw, and
(2) be signed by each attorney/agent seeking to withdraw or clearly be signed on their behalf, and
(3) be *approved* at least thirty (30) days prior to the maximum extendable period for response to any outstanding Office Action, and
(4) indicate the address to which future correspondence should be mailed.

Petitioner has met all of the above. Accordingly, the request is **GRANTED**.

Attorneys/agents listed in the Request to withdraw are withdrawn.

All future communications from the Office will be directed to the address listed below until otherwise notified by applicant. Applicant is reminded of the obligation to promptly notify the Patent and Trademark Office of any change in correspondence address to ensure receipt of all communications from the Office.

The file is being returned to TC 2600 Technical Support Staff to update the correspondence address and then will be forwarded to the files repository.

Krista Zele
Special Program Examiner
Technology Center 2600
Communications
(703) 305-4701

Cc:
Hickman Palermo Truong & Becker LLP
1600 Willow Street
San Jose, CA 95125-5106

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
09/126,071	07/30/1998	JAMES M. BARTON	TIVO0003

CONFIRMATION NO. 8489

OC000000012042648

29989
HICKMAN PALERMO TRUONG & BECKER, LLP
1600 WILLOW STREET
SAN JOSE, CA 95125

Date Mailed: 03/08/2004

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/13/2004.

- The withdrawal as attorney in this application has been accepted. Future correspondence will be mailed to the new address of record. 37 CFR 1.33.

ALLYSON L DESPERTT
2600 (703) 305-4800

OFFICE COPY

UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS
UNITED STATES PATENT AND TRADEMARK OFFICE
P.O. BOX 1450
ALEXANDRIA, VA 22313-1450
www.uspto.gov

Paper No. 11

CHRISTOPHER J. PALERMO
HICKMAN PALERMO TRUONG & BECKER LLP
1600 WILLOW STREET
SAN JOSE, CA 95125-5106

COPY MAILED

JAN 2 9 2004

OFFICE OF PETITIONS

In re Application of :
James M. Barton et al :
Application No. 09/126,071 :
Filed: July 30, 1998 :
Attorney Docket No. TIVO0003

NOTICE

This is a notice regarding your request for acceptance of a fee deficiency submission under 37 CFR 1.28. On September 1, 1998, the Court of Appeals for the Federal Circuit held that 37 CFR 1.28(c) is the sole provision governing the time for correction of the erroneous payment of the issue fee as a small entity. **See DH Technology v. Synergystex International, Inc. 154 F.3d 1333, 47 USPQ2d 1865 (Fed. Cir. Sept. 1, 1998).**

The Office no longer investigates or rejects original or reissue applications under 37 CFR 1.56. **1098 Off. Gaz. Pat. Office 502 (January 3, 1989).** Therefore, nothing in this Notice is intended to imply that an investigation was done.

Your fee deficiency submission under 37 CFR 1.28 is hereby **ACCEPTED**.

Inquiries related to this communication should be directed to the Office of Petitions Staff at (703) 305-9285.

This file is being forwarded to the Files Repository.

Irvin Dingle
Petitions Examiner
Office of Petitions
Office of the Deputy Commissioner
for Patent Examination Policy

01-16-04

~~2711~~ 2611

#12 cdc

PTO/SB/83 (09-03)
Approved for use through 11/30/2005. OMB 0651-0035
U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

REQUEST FOR WITHDRAWAL AS ATTORNEY OR AGENT AND CHANGE OF CORRESPONDENCE ADDRESS

Application Number	09/126,071
Filing Date	7/30/1998
First Named Inventor	Barton
Art Unit	2711
Examiner Name	Unassigned
Attorney Docket Number	TIVO0003

To: Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Please withdraw me as attorney or agent for the above identified patent application, and

- [x] all the attorneys/agents of record.
- [ ] the attorneys/agents (with registration numbers) listed on the attached paper(s), or
- [x] the attorneys/agents associated with Customer Number 22862

NOTE: This box can only be checked when the power of attorney of record in the application is to all the practitioners associated with a customer number.

The reasons for this request are: Client/Assignee requested this application be transferred to another law firm. See letter attached.

CORRESPONDENCE ADDRESS

1. [ ] The correspondence address is NOT affected by this withdrawal.
2. [ ] Change the correspondence address and direct all future correspondence to:

[ ] Customer Number:

OR

[x] Firm *or* Individual Name	Hickman Palermo Truong & Becker LLP				
Address	1600 Willow Street				
Address					
City	San Jose	State	California	Zip	95125-5106
Country	USA				
Telephone	(408) 414-1080		Fax	(408) 414-1076	

Name	Michael A. Glenn		
Signature		Registration No.	30,176
Date	January 13, 2004	Telephone No.	(650) 474-8400

NOTE: Withdrawal is effective when approved rather than when received. Unless there are at least 30 days between approval of withdrawal and the expiration date of a time period for response or possible extension period, the request to withdraw is normally disapproved.

This collection of information is required by 37 CFR 1.36. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

November 13, 2003

Via Facsimile (650) 474-8401

Michael Glenn, Esq.
Glenn Patent Group
3475 Edison Way, Suite L
Menlo Park, CA 94025

Re: Patent Matters—File Transfer

Dear Michael:

As we have discussed, TiVo has decided to change counsel for its patent matters effective immediately. Please send your files for all TiVo patent applications and other matters to:

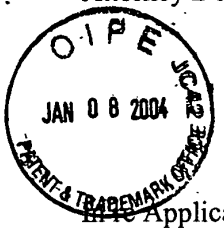
Christopher J. Palermo
Hickman Palermo Truong & Becker LLP
1600 Willow Street
San Jose, CA 95125-5106

Tel. 408/414-1080 x202
Fax 408/414-1076
cpalermo@hptb-law.com

We will pay shipping costs associated with the transfer, but we do not authorize photocopying of the files or any part thereof for the purpose of your own recordkeeping. Copying of any materials that you need to retain should be done at your own cost.

Because past fees invoiced to us have covered, in part, docketing of our cases, please generate and send with the files, a current docket report showing all dates currently docketed by you for all cases. HPTB will be solely responsible for our matters, and all associated response dates or deadlines, effective upon its receipt of the files. HPTB will prepare and file documents to effect a change in counsel in the U.S. Patent & Trademark Office and advise you, although you may prepare and file resignation documents at your own cost if desired. Please send us a closing invoice by the end of the month.

Attorney Docket No. 60097-0010



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

James M. BARTON

Serial No.: 09/126,071

Filing Date: July 30, 1998

Patent No.: 6,233,389

Issue Date: May 15, 2001

For: MULTIMEDIA TIME WARPING SYSTEM

Hon. Commissioner for Patents
P. O. Box 1450
Alexandria, Virginia 22301-1450

SUPPLEMENTAL SUBMISSION OF FEES—ISSUED PATENT—37 C.F.R. 1.28(c)

AND NOTIFICATION REGARDING STATUS—37 C.F.R. 1.27(g)(2)

Sir:

The undersigned patent owner hereby submits an issue fee payment of $1,330.00 under 37 C.F.R. §1.28(c) for deficient payments made in error. The following is an itemization of the fees paid in error:

Date Paid	Fee Type	Surcharge	Fee Paid	Fee Now Due	Difference
2001	Issue Fee	None	Unknown	$1,330.00	$1,330.00

The patent owner's file of papers relating to the patent does not presently permit determination of the issue fee that was originally paid. Therefore, enclosed herewith is a law firm check in the amount of $1,330.00 for the difference due, i.e., the issue fee at large entity rates

01/09/2004 AWONDAF2 00000137 09126071
01 FC:1501 1330.00 OP

effective as at October 1, 2003. The patent owner hereby requests acceptance of the enclosed check in full payment of the deficiency due. However, if the check is missing or insufficient, or in excess of the amount actually due, the Commissioner is hereby authorized to charge the foregoing total deficiency amount (including any applicable processing fee) or to credit any overpayment to our deposit account 50-1302.

The patent owner further states that, at the time of payment of each of the fees itemized above for the patent, the applicant and the patent owner believed in good faith that the applicant had small entity status. The patent owner recently discovered that such small entity status was claimed in error.

The patent owner also hereby notifies the Office, by this paper and the within payment, of loss of entitlement to small entity status under 37 C.F.R. §1.27(g)(2).

Questions regarding the within payment may be addressed to the undersigned.

Respectfully submitted,
HICKMAN PALERMO TRUONG & BECKER LLP

Christopher J. Palermo
Registration No. 42,056

1600 Willow Street
San Jose, California 95125-5106
Date: January 5, 2004
CJP:aj
Telephone: (408) 414-1080
Facsimile: (408) 414-1076

CERTIFICATE OF MAILING
I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Hon. Commissioner for Patents, P. O. Box 1450, Alexandria, Virginia 22301-1450.

on 1/5/04 by ~~Firena Say~~ Teresa Austin

03-16-01

Express Mail mailing label no. [redacted]6468671US
Date of Deposit: March 14, 2001
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Jessica Pallach

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Barton et al.
Serial No. : 09/126,071
Filed: July 30, 1998
Title: MULTIMEDIA TIME WARPING SYSTEM

Docket No.: TIVO0003
Art Unit: 2615
Examiner: T. Tran

March 14, 2001

TRANSMITTAL OF ISSUE FEE AND FORMAL DRAWINGS

Assistant Commissioner for Patents
BOX ISSUE FEE
Washington, DC 20231

Dear Sir:

Enclosed for the above-referenced patent are the following:

1. Issue Fee Transmittal in duplicate;
2. 12 Sheets of Formal Drawings; and
3. Return Postcard

The Commissioner is authorized to charge any additional fees, or credit any overpayments, to Deposit Account No. 07-1445 (Order No. TIVO0003). A copy is enclosed for this purpose.

Respectfully submitted,

Michael A. Glenn
Reg. No. 30,176

Customer No. 22862

01.01

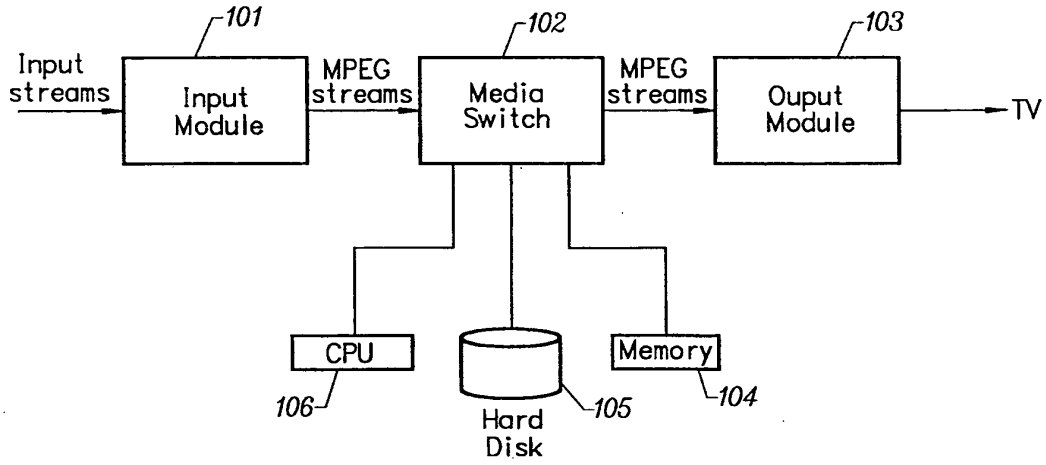

101
102
103
Input streams
Input Module
MPEG streams
Media Switch
MPEG streams
Ouput Module
TV
CPU
106
Hard Disk
105
Memory
104

FIG. 1

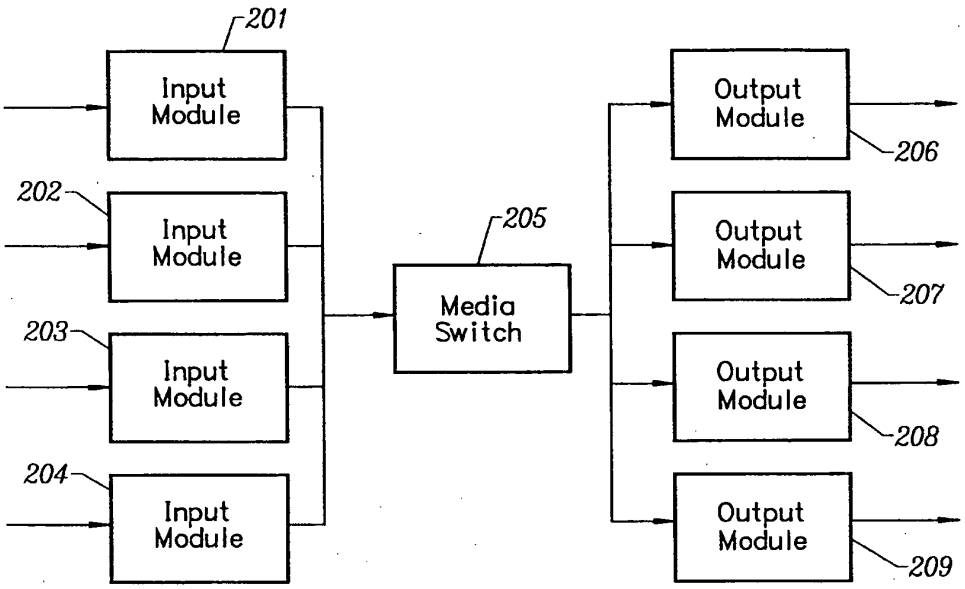

201
Input Module
202
Input Module
203
Input Module
204
Input Module
205
Media Switch
Output Module
206
Output Module
207
Output Module
208
Output Module
209

FIG. 2

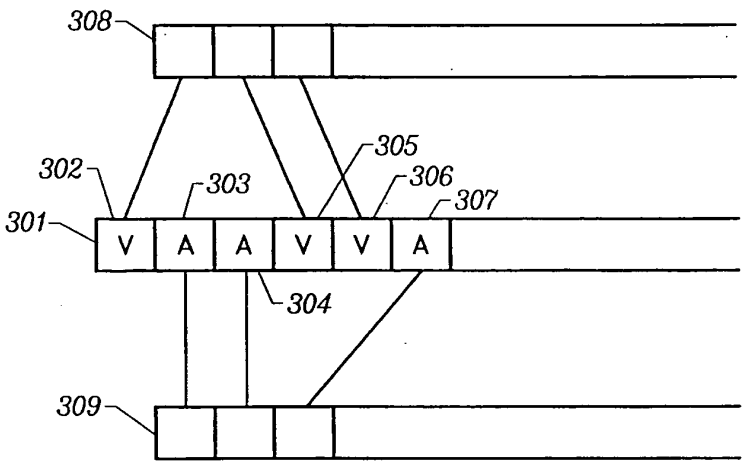


FIG. 3

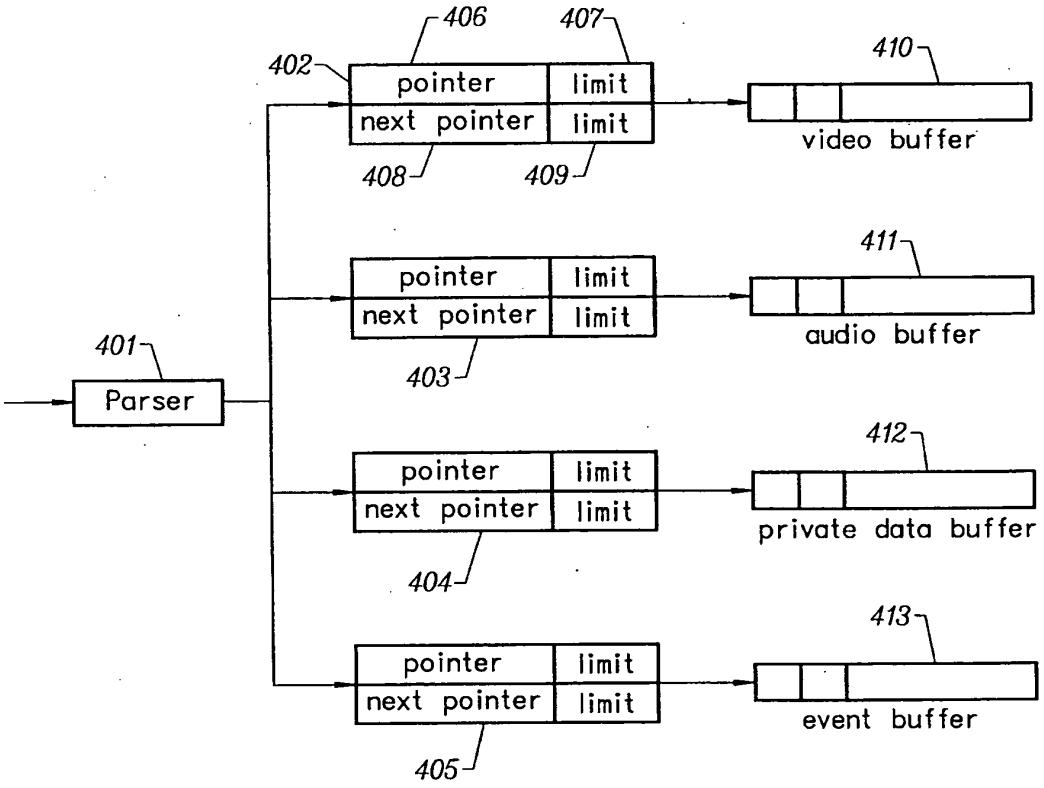

406
407
402
pointer
limit
next pointer
limit
410
video buffer
408
409
pointer
limit
next pointer
limit
411
audio buffer
401
Parser
403
pointer
limit
next pointer
limit
412
private data buffer
404
pointer
limit
next pointer
limit
413
event buffer
405

FIG. 4

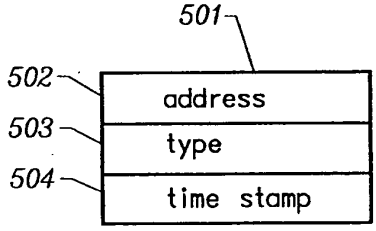

501
502
address
503
type
504
time stamp

FIG. 5

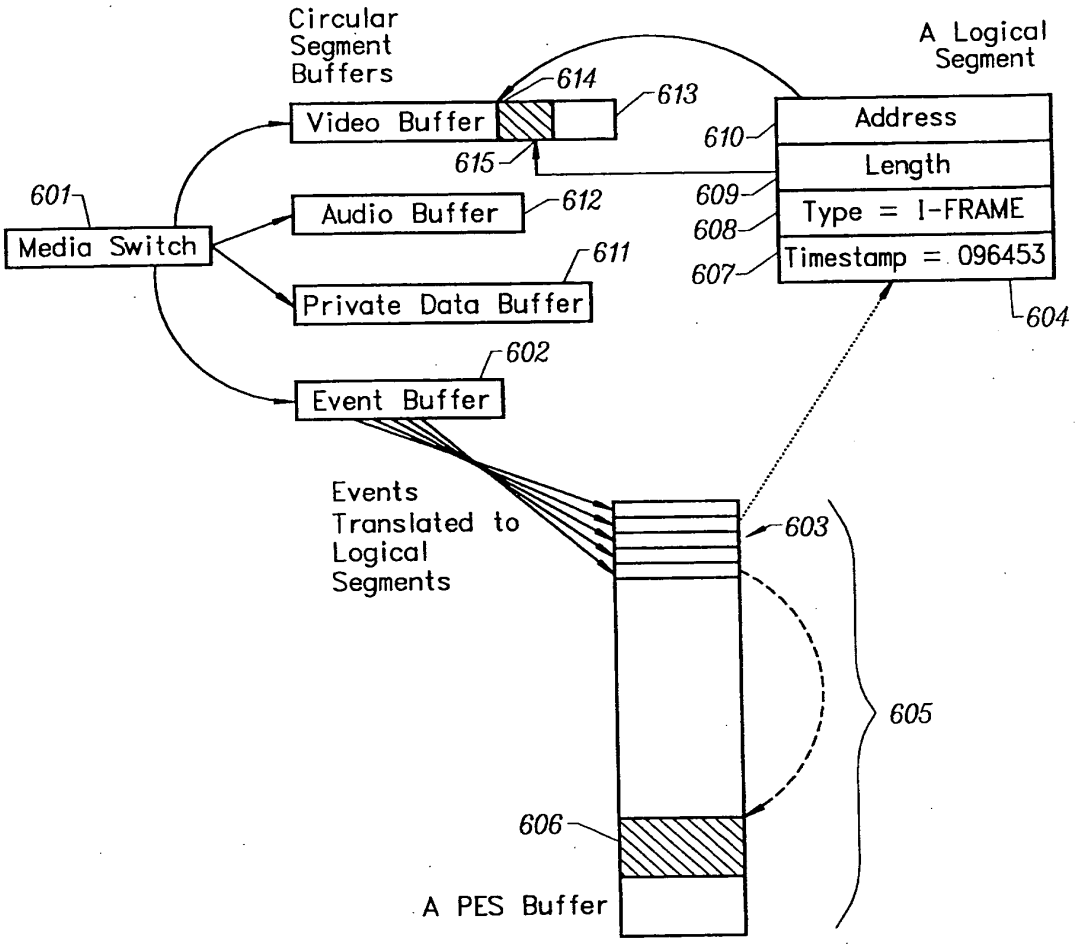

Circular
Segment
Buffers
A Logical
Segment
614
613
Video Buffer
Address
610
615
Length
601
Audio Buffer
612
609
Type = I-FRAME
Media Switch
608
611
Timestamp = 096453
607
Private Data Buffer
604
602
Event Buffer
Events
Translated to
Logical
Segments
603
605
606
A PES Buffer

FIG. 6

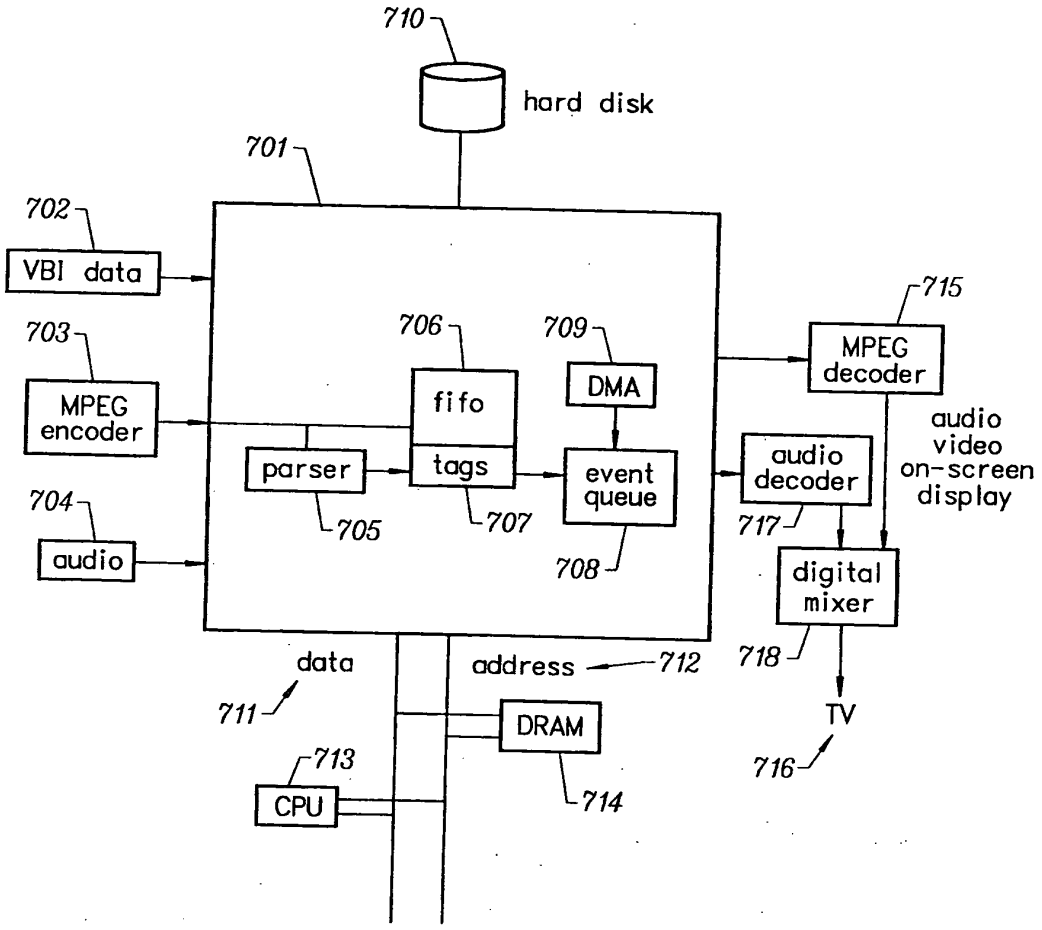

710
hard disk
701
702
VBI data
703
MPEG encoder
704
audio
706
fifo
tags
parser
705
707
709
DMA
event queue
708
715
MPEG decoder
audio video on-screen display
audio decoder
717
digital mixer
718
TV
716
data
711
address
712
DRAM
714
713
CPU

FIG. 7

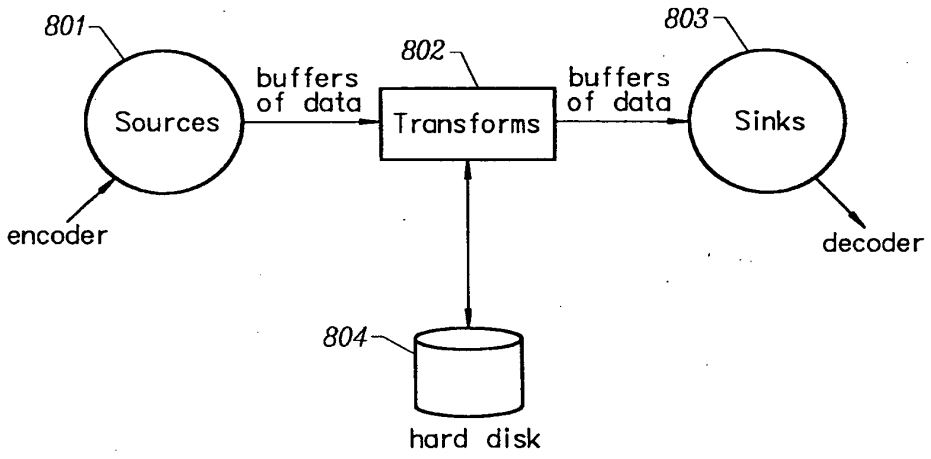

801
Sources
buffers
of data
802
Transforms
buffers
of data
803
Sinks
encoder
decoder
804
hard disk

FIG. 8

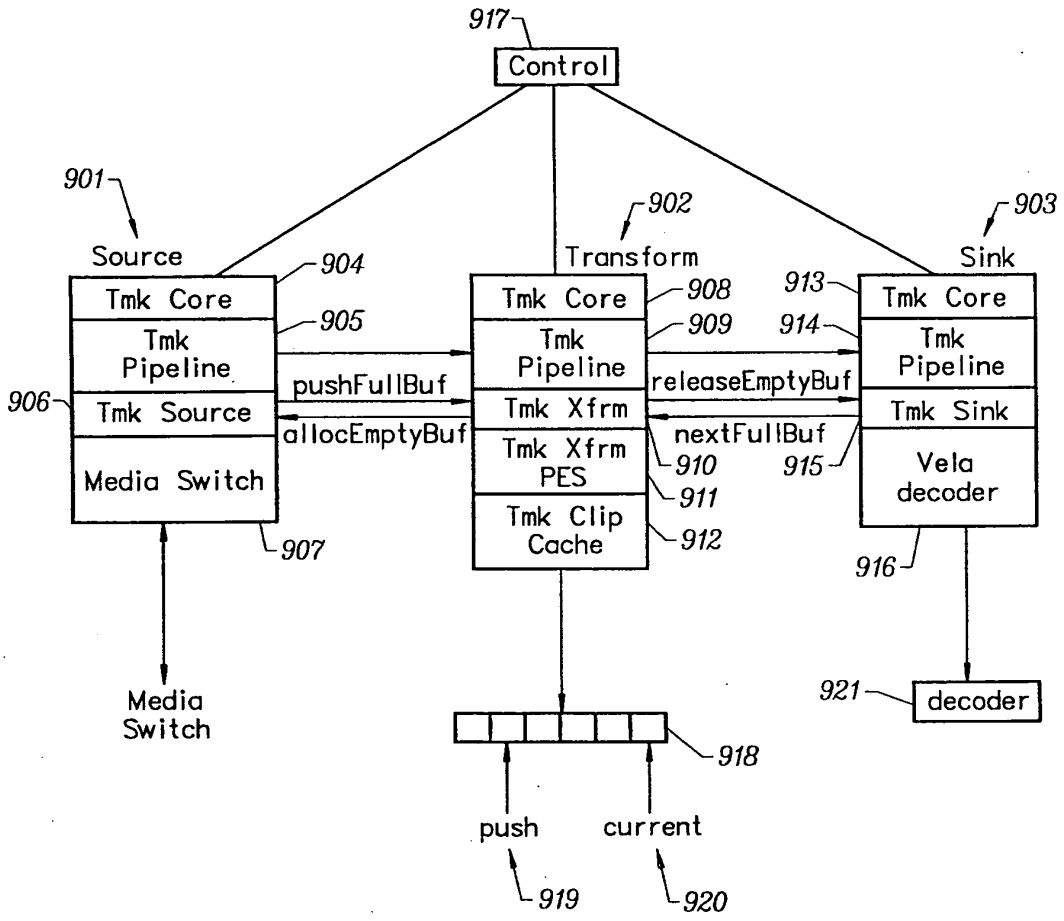

917
Control
901
Source
902
Transform
903
Sink
904
905
906
907
908
909
910
911
912
913
914
915
916
Tmk Core
Tmk Pipeline
Tmk Source
Media Switch
pushFullBuf
allocEmptyBuf
Tmk Core
Tmk Pipeline
Tmk Xfrm
Tmk Xfrm PES
Tmk Clip Cache
releaseEmptyBuf
nextFullBuf
Tmk Core
Tmk Pipeline
Tmk Sink
Vela decoder
Media Switch
decoder
921
918
push
current
919
920

FIG. 9

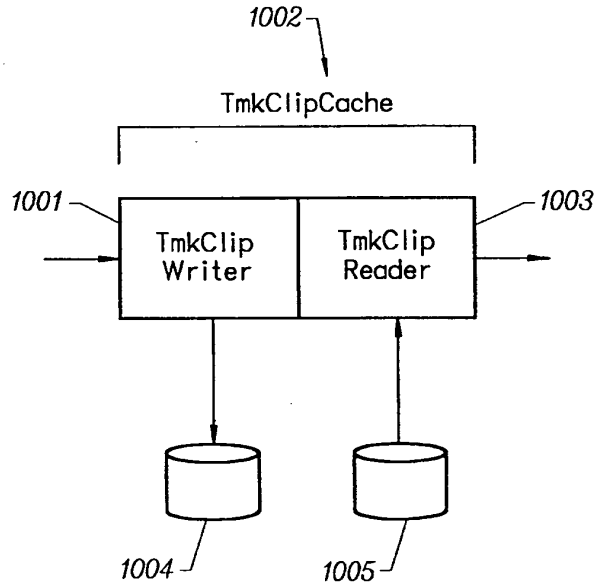

1002
TmkClipCache
1001
TmkClip Writer
TmkClip Reader
1003
1004
1005

FIG. 10

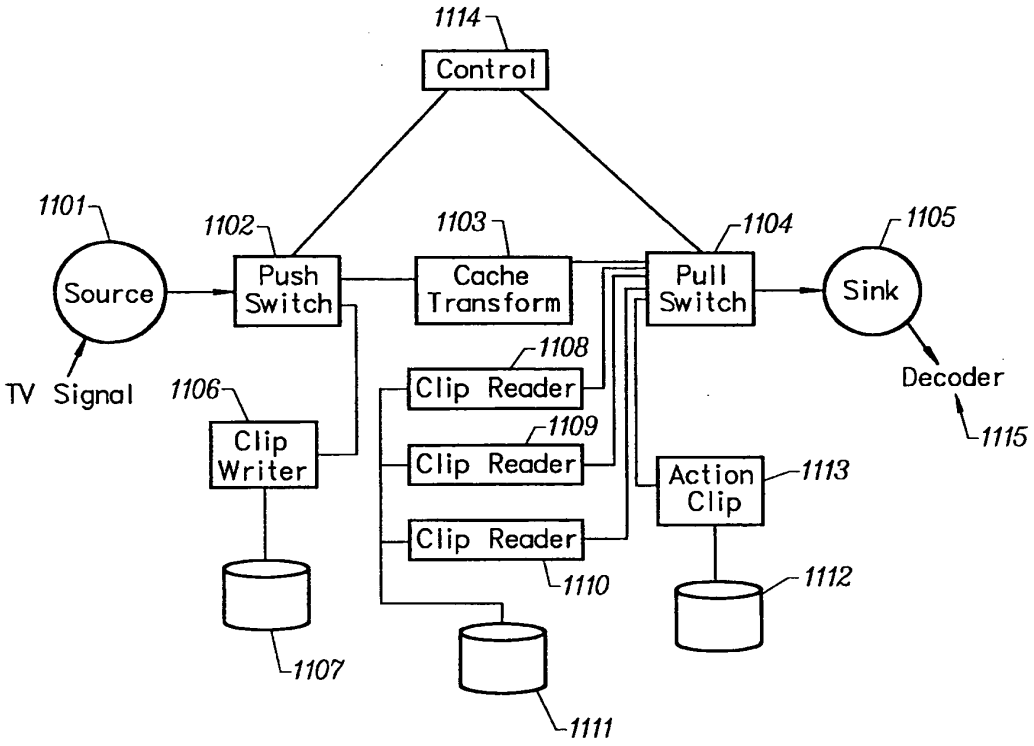

1114
Control
1101
Source
TV Signal
1102
Push Switch
1103
Cache Transform
1104
Pull Switch
1105
Sink
Decoder
1115
1106
Clip Writer
1107
1108
Clip Reader
1109
Clip Reader
Clip Reader
1110
1111
Action Clip
1113
1112

FIG. 11

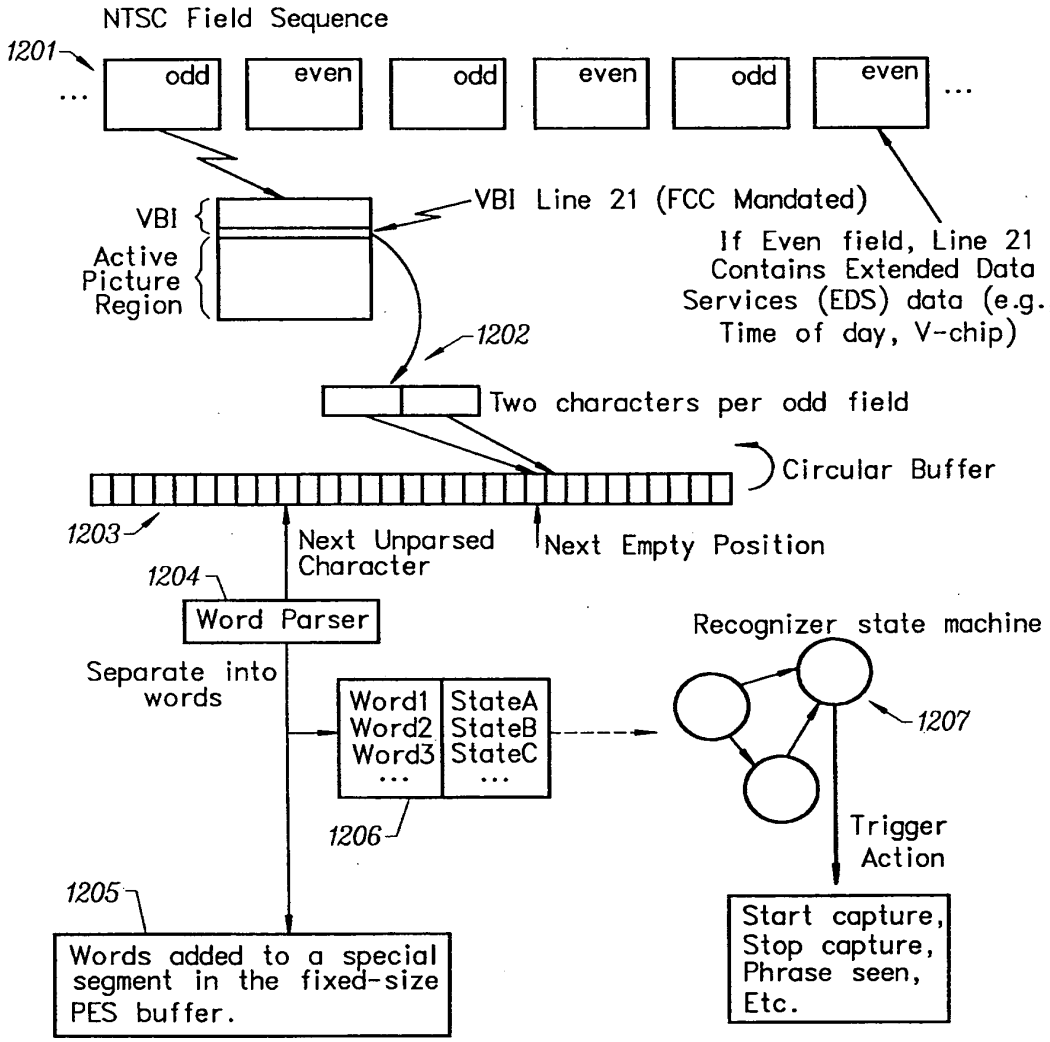

NTSC Field Sequence
1201
odd
even
odd
even
odd
even
VBI
Active Picture Region
VBI Line 21 (FCC Mandated)
If Even field, Line 21 Contains Extended Data Services (EDS) data (e.g., Time of day, V-chip)
1202
Two characters per odd field
Circular Buffer
1203
Next Unparsed Character
Next Empty Position
1204
Word Parser
Separate into words
Word1 Word2 Word3 ...
StateA StateB StateC ...
1206
Recognizer state machine
1207
Trigger Action
1205
Words added to a special segment in the fixed-size PES buffer.
Start capture, Stop capture, Phrase seen, Etc.

FIG. 12

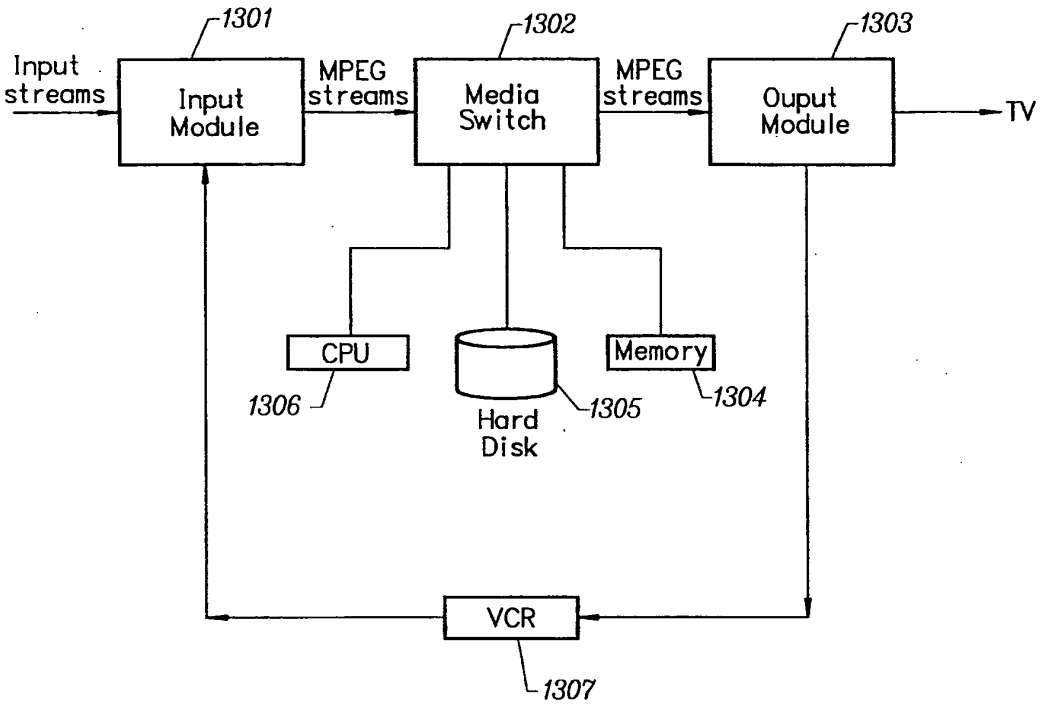

1301
1302
1303
Input streams
Input Module
MPEG streams
Media Switch
MPEG streams
Ouput Module
TV
CPU
1306
Hard Disk
1305
Memory
1304
VCR
1307

FIG. 13

BC

NW

OIPE JC1 MAR 14 2001 PATENT AND TRADEMARK OFFICE

PART B—ISSUE FEE TRANSMITTAL

Complete and mail this form, together with applicable fees, to: **Box ISSUE FEE**
Assistant Commissioner for Patents
Washington, D.C. 20231

MAILING INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE. Blocks 1 through 4 should be completed where appropriate. All further correspondence including the Issue Fee Receipt, the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Legibly mark-up with any corrections or use Block 1)

022862 WM02/0103
GLENN PATENT GROUP
3475 EDISON WAY
SUITE L
MENLO PARK CA 94025

Note: The certificate of mailing below can only be used for domestic mailings of the Issue Fee Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing.

Certificate of Mailing

I hereby certify that this Issue Fee Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Box Issue Fee address above on the date indicated below.

Jessica Paltach (Depositor's name)
Jessica Paltach (Signature)
March 14, 2001 (Date)

APPLICATION NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT		DATE MAILED
09/126,071	07/30/98	061	TRAN, T	2615	01/03/01
First Named Applicant: BARTON,		35 USC 154(b) term ext. =	0 Days.		

TITLE OF INVENTION: MULTIMEDIA TIME WARPING SYSTEM

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
2 TIV00003	386-046.000	A23	UTILITY	YES	$620.00	04/03/01

1. Change of correspondence address or indication of " Fee Address" (37 CFR 1.363). Use of PTO form(s) and Customer Number are recommended, but not required.
   - ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
   - ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47) attached.

2. For printing on the patent front page, list (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
   1 Michael A. Glenn
   2 Kirk Wong
   3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)
   PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. Inclusion of assignee data is only appropiate when an assignment has been previously submitted to the PTO or is being submitted under separate cover. Completion of this form is NOT a subsititue for filing an assignment.
   (A) NAME OF ASSIGNEE
   TiVo, Inc.
   (B) RESIDENCE: (CITY & STATE OR COUNTRY)
   Alviso, California
   Please check the appropriate assignee category indicated below (will not be printed on the patent)
   ☐ individual ☒ corporation or other private group entity ☐ government

4a. The following fees are enclosed (make check payable to Commissioner of Patents and Trademarks):
   - ☐ Issue Fee
   - ☐ Advance Order - # of Copies

4b. The following fees or deficiency in these fees should be charged to:
   DEPOSIT ACCOUNT NUMBER 50-1240
   (ENCLOSE AN EXTRA COPY OF THIS FORM)
   - ☒ Issue Fee
   - ☒ Advance Order - # of Copies 10

The COMMISSIONER OF PATENTS AND TRADEMARKS IS requested to apply the Issue Fee to the application identified above.

(Authorized Signature) Michael A. Glenn, Reg. No. 30,176 (Date) 3/14/01

NOTE; The Issue Fee will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the Patent and Trademark Office.

03/19/2001 BHABTEM1 00000111 501240 09126071
01 FC:242 620.00 CH
02 FC:561 30.00 CH

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending on the needs of the individual case. Any comments on the amount of time required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, D.C. 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND FEES AND THIS FORM TO: Box Issue Fee, Assistant Commissioner for Patents, Washington D.C. 20231

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMIT THIS FORM WITH FEE

TP

Notice of Allowability	Application No.	Applicant(s)	
	09/126,071	BARTON ET AL.	
	Examiner	Art Unit	
	Thai Tran	2615	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance and Issue Fee Due or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *the amendment filed Dec. 13, 2000*.
2. ☒ The allowed claim(s) is/are *1-61*.
3. ☐ The drawings filed on _____ are acceptable as formal drawings.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.
5. ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application. **THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

6. ☐ Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.

7. ☒ Applicant MUST submit NEW FORMAL DRAWINGS
   (a) ☒ including changes required by the Notice of Draftsperson's Patent Drawing Review(PTO-948) attached
      1) ☐ hereto or 2) ☒ to Paper No. *6*.
   (b) ☐ including changes required by the proposed drawing correction filed _____, which has been approved by the examiner.
   (c) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No. _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings. The drawings should be filed as a separate paper with a transmittal letter addressed to the Official Draftsperson.

8. ☐ Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Any reply to this letter should include, in the upper right hand corner, the APPLICATION NUMBER (SERIES CODE / SERIAL NUMBER). If applicant has received a Notice of Allowance and Issue Fee Due, the ISSUE BATCH NUMBER and DATE of the NOTICE OF ALLOWANCE should also be included.

Attachment(s)

1☐ Notice of References Cited (PTO-892)
2☐ Notice of Informal Patent Application (PTO-152)
3☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
4☐ Interview Summary (PTO-413), Paper No.____ .
5☐ Information Disclosure Statements (PTO-1449), Paper No. ____.
6☐ Examiner's Amendment/Comment
7☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
8☐ Examiner's Statement of Reasons for Allowance
9☐ Other

THAI TRAN
PRIMARY EXAMINER

ATTACHMENT TO AND MODIFICATION OF NOTICE OF ALLOWABILITY (PTO-37)

(November, 2000)

NO EXTENSIONS OF TIME ARE PERMITTED TO FILE CORRECTED OR FORMAL DRAWINGS, OR A SUBSTITUTE OATH OR DECLARATION, notwithstanding any indication to the contrary in the attached Notice of Allowability (PTO-37).

If the following language appears on the attached Notice of Allowability, the portion lined through below is of no force and effect and is to be ignored[1]:

A SHORTENED STATUTORY PERIOD FOR RESPONSE to comply with the requirements noted below is set to EXPIRE **THREE MONTHS** FROM THE "DATE MAILED" of this Office action. Failure to comply will result in ABANDONMENT of this application. ~~Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).~~

Similar language appearing in any attachments to the Notice of Allowability, such as in an Examiner's Amendment/Comment or in a Notice of Draftperson's Patent Drawing Review, PTO-948, is also to be ignored.

---

[1] The language which is crossed out is contrary to amended 37 CFR 1.85(c) and 1.136. See *"Changes to Implement the Patent Business Goals"*, 65 *Fed. Reg.* 54603, 54629, 54641, 54670, 54674 (September 8, 2000), 1238 *Off. Gaz. Pat. Office* 77, 99, 110, 135, 139 (September 19, 2000).

NW

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

NOTICE OF ALLOWANCE AND ISSUE FEE DUE

022062
GLENN PATENT GROUP
3475 EDISON WAY
SUITE L
MENLO PARK CA 94025

NW02/0103

APPLICATION NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
09/126,071	07/30/98	061	TRAN, T 2615	01/03/01
First Named Applicant: BARTON,		35 USC 154(b) term ext. =	0 Days.	

TITLE OF INVENTION: MULTIMEDIA TIME WARPING SYSTEM

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
2 TIV00003	386-046.000	A23	UTILITY	YES	$620.00	04/03/01

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED.

THE ISSUE FEE MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED.

HOW TO RESPOND TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.
If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is changed, pay twice the amount of the FEE DUE shown above and notify the Patent and Trademark Office of the change in status, or
B. If the status is the same, pay the FEE DUE shown above.

If the SMALL ENTITY is shown as NO:

A. Pay FEE DUE shown above, or

B. File verified statement of Small Entity Status before, or with, payment of 1/2 the FEE DUE shown above.

II. Part B-Issue Fee Transmittal should be completed and returned to the Patent and Trademark Office (PTO) with your ISSUE FEE. Even if the ISSUE FEE has already been paid by charge to deposit account, Part B Issue Fee Transmittal should be completed and returned. If you are charging the ISSUE FEE to your deposit account, section "4b" of Part B-Issue Fee Transmittal should be completed and an extra copy of the form should be submitted.

III. All communications regarding this application must give application number and batch number.
Please direct all communications prior to issuance to Box ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PATENT AND TRADEMARK OFFICE COPY

PTOL-85 (REV. 10-96) Approved for use through 06/30/99. (0651-0033)

12-11-00

Gr 2615
#7/A
J. Douglas
12/20/00

Express Mail mailing label no. EL556467543US
Date of Deposit: December 13, 2000
I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D. C. 20231.

Jessica Pallach

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Barton

Docket No.: TIVO0003

Serial No. : 09/126,071

Art Unit: 2615

Filed: 30 July 1998

Examiner: Tran, T.

Title: MULTIMEDIA TIME WARPING SYSTEM

December 13, 2000

Assistant Commissioner for Patents
BOX NO FEE
Washington, DC 20231

AMENDMENT

Sir:

This Amendment is responsive to the Office Action, dated 22 November 2000, for the above-identified patent application.

Please amend the above application as follows:

In The Claims

Please amend Claims 1, 21, 25, 30, 32, 52, 55 and 60 as follows:

A1

1. (first amended) A process for the simultaneous storage and play back of multimedia data, comprising the steps of:

accepting television (TV) broadcast signals, wherein said TV signals are based on a multitude of standards, including, but not limited to, National Television Standards Committee (NTSC) broadcast, PAL broadcast, satellite transmission, DSS, DBS, or ATSC;

tuning said TV signals to a specific program;

providing at least one Input Section, wherein said [input section] Input Section converts said specific program to an Moving Pictures Experts Group (MPEG) formatted stream for internal transfer and manipulation;

providing a Media Switch, wherein said Media Switch parses said MPEG stream, said MPEG stream is separated into its video and audio components;

A1 cont.

storing said video and audio components on a storage device;

providing at least one Output Section, wherein said Output Section extracts said video and audio components from [a] said storage device;

wherein said Output Section assembles said video and audio components into an MPEG stream;

wherein said Output Section sends said MPEG stream to a decoder;

wherein said decoder converts said MPEG stream into TV output signals;

wherein said decoder delivers said TV output signals to a TV receiver; and

accepting control commands from a user, wherein said control commands are sent through the system and affect the flow of said MPEG stream.

A2 21. (first amended) The process of claim 1, wherein [a] said storage device is connected to said Media Switch.

A3 25. (first amended) The process of claim 24, wherein said user queues up programs from said [disk] storage device to be stored on said recording device.

A4 30. (first amended) The process of claim 24, wherein the output of said recording device is routed to said [input section] Input Section, allowing said recording device to act as a storage back up system, said recording device accepts overflow storage, TV programs, software updates, or other data that are later retrieved and sent to said [input section] Input Section.

32. (first amended) An apparatus for the simultaneous storage and play back of multimedia data, comprising:

a module for accepting television (TV) broadcast signals, wherein said TV signals are based on a multitude of standards, including, but not limited to, National Television Standards Committee (NTSC) broadcast, PAL broadcast, satellite transmission, DSS, DBS, or ATSC;

A5

a module for tuning said TV signals to a specific program;

at least one Input Section, wherein said [input section] Input Section converts said specific program to an Moving Pictures Experts Group (MPEG) formatted stream for internal transfer and manipulation;

a Media Switch, wherein said Media Switch parses said MPEG stream, said MPEG stream is separated into its video and audio components;

a module for storing said video and audio components on a storage device;

at least one Output Section, wherein said Output Section extracts said video and audio components from [a] said storage device;

wherein said Output Section assembles said video and audio components into an MPEG stream;

wherein said Output Section sends said MPEG stream to a decoder;

wherein said decoder converts said MPEG stream into TV output signals;

wherein said decoder delivers said TV output signals to a TV receiver; and

accepting control commands from a user, wherein said control commands are sent through the system and affect the flow of said MPEG stream.

A6

52. (first amended) The apparatus of claim 32, wherein [a] said storage device is connected to said Media Switch.

A7

55. (first amended) The apparatus of claim 54, wherein said user queues up programs from said [disk] storage device to be stored on said recording device.

A8

60. (first amended) The apparatus of claim 54, wherein the output of said recording device is routed to said [input section] Input Section, allowing said recording

device to act as a storage back up system, said recording device accepts overflow storage, TV programs, software updates, or other data that are later retrieved and sent to said [input section] Input Section.

REMARKS

1. Applicant thanks the Examiner for the Examiner's comments which have greatly assisted Applicant in responding.

2. 35 U.S.C. §112. The Examiner has rejected Claims 1-30 and 32-60 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicant has amended Claims 1, 21, 25, 30, 32, 52, 55 and 60 as the Examiner has suggested.

Therefore, Applicant believes Claims 1-30 and 32-60 to be in allowable condition. Applicant respectfully requests that the Examiner withdraw the rejection under 35 U.S.C. §112, second paragraph.

3. Allowable Subject Matter. The Examiner states that Claims 1-30 and 32-60 would be allowable if rewritten or amended to overcome the rejections under 35 U.S.C. §112, second paragraph. As noted above, Applicant has amended said Claims. Therefore, Applicant believes Claims 1-30 and 32-60 to be in allowable condition.

4. Allowable Subject Matter. Applicant acknowledges that Claims 31 and 61 are allowed as the Examiner states.

CONCLUSION

Based on the foregoing, Applicant considers the present invention to be distinguished from the art of record. Accordingly, Applicant earnestly solicits the Examiner's withdrawal of the rejections raised in the above referenced Office Action, such that a Notice of Allowance is forwarded to Applicant, and the present application is therefore allowed to issue as a United States patent.

Respectfully Submitted,

Michael A. Glenn
Reg. No. 30,176

Customer No. 22862

16

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/126,071	07/30/98	BARTON J	TIV00003

022862
GLENN PATENT GROUP
3475 EDISON WAY
SUITE L
MENLO PARK CA 94025

WM02/1122

EXAMINER	
TRAN, T	
ART UNIT	**PAPER NUMBER**
2615	6

DATE MAILED: 11/22/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

PTO-90C (Rev. 2/95)
U.S. G.P.O. 2000 ; 485-188/25268

1- File Copy

DN

Office Action Summary	Application No. 09/126,071	Applicant(s) Barton et al
	Examiner Thai Tran	Group Art Unit 2615

☐ Responsive to communication(s) filed on _____

☐ This action is **FINAL.**

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claim

☒ Claim(s) *1-61* is/are pending in the applicat

Of the above, claim(s) _____ is/are withdrawn from consideration

☒ Claim(s) *31 and 61* is/are allowed.

☒ Claim(s) *1-30 and 32-60* is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☒ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☒ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). *2, 3 + 5*

☐ Interview Summary, PTO-413

☒ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1-30 and 32-60 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1,

line 8, the term "said input section" should be changed to --said Input Section-- for proper antecedent basis; and

line 15, the term "a storage device" should be changed to --said storage device-- for proper antecedent basis.

In claim 21,

first line, the term "a storage device" should be changed to --said storage device-- for proper antecedent basis.

In claim 25,

lines 1-2, the term "said disk" lacks proper antecedent basis.

In claim 30,

line 2, the term "said input section" should be changed to --said Input Section-- for proper antecedent basis; and

lines 4-5, the term "said input section" should be changed to --said Input Section-- for proper antecedent basis.

In claim 32,

line 8, the term "said input section" should be changed to --said Input Section-- for proper antecedent basis; and

line 15, the term "a storage device" should be changed to --said storage device-- for proper antecedent basis.

In claim 52,

first line, the term "a storage device" should be changed to --said storage device-- for proper antecedent basis.

In claim 55,

line 2, the term "said disk" lacks proper antecedent basis.

In claim 60,

line 2, the term "said input section" should be changed to --said Input Section-- for proper antecedent basis; and

lines 4-5, the term "said input section" should be changed to --said Input Section-- for proper antecedent basis.

Allowable Subject Matter

3. Claims 1-30 and 32-60 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.

Claims 1-30 and 32-60 are considered allowable over the prior art since none of the references of record alone or in combination disclose or suggest a method/apparatus for the simultaneous storage and play back of multimedia data having a module for accepting television (TV) broadcast signals, wherein the TV signals are based on a multitude of standards, including, but not limited to, National Television Standards Committee (NTSC) broadcast, PAL broadcast, satellite transmission, DSS, DBS, or ATSC; a module for tuning the TV signals to a specific program; at least one Input Section, wherein the Input Section converts the specific program to an Moving Picture Experts Group (MPEG) formatted stream for internal transfer and manipulation; a Media Switch, wherein the Media Switch parses the MPEG stream, the MPEG stream is separated into its video and audio components; a module for storing the video and audio components on a storage device; at least one Output Section, wherein the Output Section extracts the video and audio components from the storage device; wherein the Output Section sends the MPEG stream to a decoder; wherein the decoder converts the MPEG stream into TV output signals; wherein the decoder delivers the TV output signals to a TV receiver; and accepting control commands form a user , wherein the control commands are sent through the system and affect the flow of the MPEG stream as recited in independent claims 1 and 32.

4. Claims 31 and 61 are allowed.

Claims 31 and 61 are considered allowable over the prior art since none of the references of record alone or in combination disclose or suggest a method/apparatus for the simultaneous storage and play back of multimedia data having a physical data source, wherein the physical data source accepts broadcast data from an input device, parses video and audio data from the broadcast data, and temporarily stores the video and audio data; a source object, wherein the source object extracts video and audio data from the physical data source; a transform object, wherein the transform object stores and retrieves data streams onto a storage device; wherein the source object obtains a buffer from the transform object, the source object converts video data into data streams and fills the buffer with the streams; wherein the source object is automatically flow controlled by the transform object; a sink object, wherein the sink object obtains data stream buffers from the transform object and outputs the streams to video and audio decoder; wherein the decoder converts the streams into display signals and sends the signals to a display; wherein the sink object is automatically flow controlled by the transform object; a control object, wherein the control object receives commands from a user, the commands control the flow of the broadcast data through the system; and wherein the control object sends flow command events to the source, transform, and sink objects as recited in independent claims 31 and 61.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thai Tran whose telephone number is (703) 305-4725.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
Washington, D.C. 20231

or faxed to:

(703) 308-6306 or (703) 308-6296, (for informal or draft communications, please label "PROPOSED" or "DRAFT")

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA., Sixth Floor (Receptionist).

TTQ

November 16, 2000

Form 1449 (Modified) Information Disclosure Statement By Applicant (Use Several Sheets if Necessary)	Atty Docket No. TIVO0003 Applicant: Barton et al. Filing Date 7/30/98	Serial No.: 09/126,071 Group ~~2777~~ 2615

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
TTG	A	Re. 33,535	2/14/1991	Cooper	358	149	10/23/1989
	B	4,313,135	1/26/1982	Cooper	358	149	7/28/1980
	C	4,665,431	5/12/1987	Cooper	358	145	8/16/1982
	D	5,202,761	4/13/1993	Cooper	358	149	5/28/1991
	E	5,550,594	8/27/1996	Cooper et al.	348	513	7/26/1993
	F	5,572,261	11/5/1996	Cooper	348	512	6/7/1995
	G	5,675,388	10/7/1997	Cooper	348	461	12/28/1993
TTG	H	5,920,842	7/6/1999	Cooper et al.	704	503	10/12/1994

Foreign Patent or Published Foreign Patent Application

Examiner Initial	No.	Document No.	Publication Date	Country or Patent Office	Class	Sub-class	Translation Yes	Translation No

Other Documents

Examiner Initial	No.	Author, Title, Date, Place (e.g. Journal) of Publication

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Form 1449 (Modified) **Information Disclosure Statement By Applicant** (Use Several Sheets if Necessary)	Atty Docket No. TIVO0003 Applicant: Barton et al. Filing Date 7/30/98	Serial No.: 09/126,071 Group ~~Not Assigned~~ 2615

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
TTG	A	5,438,423	8/1/95	Lynch et al.	358	335	5/11/94
TTG	B	5,706,388	1/6/98	Isaka	386	125	12/30/96
TTG	C	5,696,868	12/9/97	Kim et al.	386	46	8/19/96

Foreign Patent or Published Foreign Patent Application

Examiner Initial	No.	Document No.	Publication Date	Country or Patent Office	Class	Sub-class	Translation Yes	Translation No
TTG	D	0726574	8/14/96	EPO	G11B	27/034	X	

Other Documents

Examiner Initial	No.	Author, Title, Date, Place (e.g. Journal) of Publication

Examiner	Date Considered 11/15/2000

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Form 1449 (Modified) **Information Disclosure Statement By Applicant** (Use Several Sheets if Necessary)	Atty Docket No. TIVO0003 Applicant: Barton et al. Filing Date ~~Herewith~~ 7-30-98	Serial No.: 09/126,071 ~~Not Assigned~~ Group ~~Not Assigned~~ 2615

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
TTQ	A	5,371,551	12/6/94	Logan et al.	348	571	10/29/92
	B						
	C						
	D						
	E						
	F						
	G						
	H						
	I						
	J						
	K						

Foreign Patent or Published Foreign Patent Application

Examiner Initial	No.	Document No.	Publication Date	Country or Patent Office	Class	Sub-class	Translation Yes	Translation No
	L							
	M							
	N							
	O							
	P							

Other Documents

Examiner Initial	No.	Author, Title, Date, Place (e.g. Journal) of Publication
TTQ	R	ASTARTE DVDirector™ Beta Testing Program
	S	
	T	

Examiner	Date Considered 11/16/2000

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Notice of References Cited

Application No.	Applicant(s)		
09/126,071	Barton et al		
Examiner	Group Art Unit	Page 1 of 1	
Thai Tran	2615		

U.S. PATENT DOCUMENTS

		DOCUMENT NO.	DATE	NAME	CLASS	SUBCLASS
	A	5,937,138	8/10/99	Fukuda et al	386	112
	B	5,787,225	7/28/98	Honjo	386	111
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

		DOCUMENT NO.	DATE	COUNTRY	NAME	CLASS	SUBCLASS
	N						
	O						
	P						
	Q						
	R						
	S						
	T						

NON-PATENT DOCUMENTS

		DOCUMENT (Including Author, Title, Source, and Pertinent Pages)	DATE
	U		
	V		
	W		
	X		

FORM PTO 948 (REV. 01-97) U.S. DEPARTMENT OF COMMERCE-Patent and Trademark Office Application No. 09/126071

NOTICE OF DRAFTPERSON'S PATENT DRAWING REVIEW

The drawing filed (insert date) 7/30/98 are:

A. ____ not objected to by the Draftperson under 37 CFR 1.84 or 1.152.

B. ✓ objected to by the Draftperson under 37 CFR 1.84 or 1.152 as indicated below. The Examiner will require submission of new, corrected drawings whe necessary. Corrected drawings must be submitted according to the instructions on the back of this notice.

1. DRAWINGS. 37 CFR 1.84(a): Acceptable categories of drawings: Black ink. Color.
   - ____ Color drawing are not acceptable until petition is granted. Fig.(s) ____
   - ____ Pencil and non black ink is not permitted. Fig(s)____
2. PHOTOGRAPHS. 37 CFR 1.84(b)
   - ____ Photographs are not acceptable until petition is granted,
   - ____ 3 full-tone sets are required. Fig(s)____
   - ____ Photographs not properly mounted (must brystol board or photographic double-weight paper). Fig(s)____
   - ____ Poor quailty (half-tone). Fig(s)____
3. TYPE OF PAPER. 37 CFR 1.84(e)
   - ____ Paper not flexible, strong, white and durable. Fig.(s)____
   - ____ Erasures, alterations, overwritings, interlineations, folds, copy machine marks not acceptable. (too thin)
   - ____ Mylar, vellum paper is not acceptable (too thin). Fig(s)____
4. SIZE OF PAPER. 37 CFR 1.84(F): Acceptable sizes:
   - ____ 21.0 cm by 29.7 cm (DIN size A4)
   - ____ 21.6 cm by 27.9 cm (8 1/2 x 11 inches)
   - ____ All drawings sheets not the same size. Sheet(s)____
5. MARGINS. 37 CFR 18.4(g): Acceptable margins:
   - Top 2.5 cm Left 2.5 cm Right 1.5 cm Bottom 1.0 cm SIZE: A4 Size
   - Top 2.5 cm Left 2.5 cm Right 1.5 cm Bottom 1.0 cm SIZE: 8 1/2 x 11
   - X ____ Margins not acceptable. Fig(s)____
   - ____ Top (T) ____ Left (L)
   - ____ Right (R) ____ Bottom (B)
6. VIEWS. CFR 1.84(h)
   REMINDER: Specification may require revision to correspond to drawing changes.
   - ____ Views connected by projection lines or lead lines. Fig.(s)____

   Partial views. 37 CFR 1.84(h)(2)
   - ____ Brackets needed to show figure as one entity. Fig.(s)____
   - ____ Views not labeled separately or properly. Fig.(s)____
   - ____ Enlarged view not labeled separately or properly. Fig.(s)____
7. SECTIONAL VIEWS. 37 CFR 1.84(h)(3)
   - ____ Hatching not indicated for sectional portions of an object. Fig.(s)____
   - ____ Sectional designation should be noted with Arabic or Roman numbers. Fig.(s)____
8. ARRANGEMENT OF VIEWS. 37 CFR 1.84(i)
   - ____ Words do not appear on a horizontal, left-to-right fashion when page is either upright or turned, so that the top becomes the right side, except for graphs. Fig.(s)____
   - ____ Views not on the same plane on drawing sheet. Fig.(s)____
9. SCALE. 37 CFR 1.84(k)
   - ____ Scale not large enough to show mechansim with crowding when drawing is reduced in size to two-thirds in reproduction. Fig.(s)____
10. CHARACTER OF LINES, NUMBERS, & LETTERS. 37 CFR 1.84(l)
    - ____ Lines, numbers & letters not uniformly thick and well defined, clean, durable and black (poor line quality). Fig.(s)____
11. SHADING. 37 CFR 1.84(m)
    - ____ Solid black areas pale. Fig.(s)____
    - ____ Solid black shading not permitted. Fig.(s):____
    - ____ Shade lines, pale, rough and blurred. Fig.(s)
12. NUMBERS, LETTERS, & REFERENCE CHARACTERS. 37 CFR 1.48(p)
    - ____ Numbers and reference characters not plain and legible. Fig.(s)____
    - ____ Figure legends are poor. Fig.(s)____
    - ____ Numbers and reference characters not oriented in the same direction as the view. 37 CFR 1.84(p)(3) Fig.(s)____
    - ____ Engligh alphabet not used. 37 CFR 1.84(p)(3) Fig.(s)____
    - C ____ Numbers, letters and reference characters must be at least .32 cm (1/8 inch) in height. 37 CFR 1.84(p)(3) Fig.(s) 1,4,6-9 11-13 in part
13. LEAD LINES. 37 CFR 1.84(q)
    - ____ Lead lines cross each other. Fig.(s)____
    - ____ Lead lines missing. Fig.(s)____
14. NUMBERING OF SHEETS OF DRAWINGS. 37 CFR 1.48(t)
    - ____ Sheets not numbered consecutively, and in Ababic numerals beginning with number 1. Fig.(s)____
15. NUMBERING OF VIEWS. 37 CFR 1.84(u)
    - ____ Views not numbered consecutively, and in Abrabic numerals, beginning with number 1. Fig.(s)____
16. CORRECTIONS. 37 CFR 1.84(w)
    - ____ Corrections not made from PTO-948 dated ____
17. DESIGN DRAWINGS. 37 CFR 1.152
    - ____ Surface shading shown not appropriate. Fig.(s)____
    - ____ Solid black shading not used for color contrast. Fig.(s)____

COMMENTS

REVIEWER Tavi DATE 8/24/98 TELEPHONE NO. 703 305 8404

ATTACHMENT TO PAPER NO. 6

PTO COPY

REMINDER

Drawing changes may also require changes in the specification, e.g., if Fig. I is changed to Fig. IA, Fig. IB, Fig. IC, etc., the specification, at the Brief Description of the Drawings, must likewise be changed. Please make such changes by 37 CFR 1.312 Amendment at the time of submitting drawing changes.

INFORMATION ON HOW TO EFFECT DRAWING CHANGES

1. Correction of Informalities--37 CFR 1.85

File new drawings with the changes incorporated therein. The application number or the title of the invention, inventor's name, docket number (if any), and the name and telephone number of a person to call if the Office is unable to match the drawings to the proper application, should be placed on the back of each sheet of drawings in accordance with 37 CFR 1.84(c). Applicant may delay filing of the new drawings until receipt of the Notice of Allowability (PTOL-37). Extensions of time may be obtained under the provisions of 37 CFR 1.136. The drawing should be filed as a separate paper with a transmittal letter addressed to the Drawing Review Branch.

2. Timing of Corrections

Applicant is required to submit **acceptable** corrected drawings within the three-month shortened statutory period set in the Notice of Allowability (PTOL-37). If a correction is determined to be unacceptable by the Office, applicant must arrange to have acceptable correction resubmitted within the original three-month period to avoid the necessity of obtaining as extension of time and paying the extension fee. Therefore, applicant should file corrected drawings as soon as possible.

Failure to take corrective action within set (or extended) period will result in **ABANDONMENT** of the Application.

3. Corrections other than Informalities Noted by the Drawing Review Branch on the Form PTO 948

All changes to the drawings, other than informalities noted by the Drawing Review Branch, **MUST** be approved by the examiner before the application will be allowed. No changes will be permitted to be made, other than correction of informalities, unless the examiner has approved the proposed changes.

GAU 2711
2611
#5

I hereby certify that this transmittal of the below described document is being deposited with the United States Postal Service in an envelope bearing First Class Postage and addressed to the Commissioner of Patents and Trademarks, Washington, D.C., 20231, on the below date of deposit.					
Date of Deposit:	10/2/00	Name of Person Making the Deposit:	~~Karrie Martin~~ Jessica Pallach	Signature of the Person Making the Deposit:	10/2/00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Barton et al.
Docket No. : TIVO0003
Serial No. : 09/126,071
Art Unit: 2711
Filed:7/30/98
Examiner: Not Assigned
Title: **MULTIMEDIA TIME WARPING SYSTEM**

INFORMATION DISCLOSURE STATEMENT

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

This Information Disclosure Statement is submitted:

( ) under 37 CFR 1.97(b), or
(within three months of filing national application; or date of entry of international application; or before mailing date of first office action on the merits; whichever occurs last)

(X) under 37 CFR 1.97(c) together with either a:
- (X) Certification under 37 CFR 1.97(e), or
- ( ) a $220.00 fee under 37 CFR 1.17(p), or
(After the CFR 1.97(b) time period, but before final action or notice of allowance, whichever occurs first)

( ) under 37 CFR 1.97(d) together with a:
- ( ) Certification under 37 CFR 1.97(e), and
- ( ) a $220.00 fee under 37 CFR 1.17(d)(2)(ii), and

( ) a $130.00 petition fee set forth in 37 CFR 1.17(i)(1)
(Filed after final action or notice of allowance, whichever occurs first, but before payment of the issue fee)

( ) The Commissioner is authorized to charge any additional fees or credit any overpayment to Deposit Account No. 50-1240 (Order No. TIVO0003). A copy of this sheet is enclosed for accounting purposes.

(X) Applicant(s) submit herewith Form PTO 1449 -- Information Disclosure Citation together with copies of patents, publications or other information of which applicant(s) are aware, which applicant(s) believe(s) may be material to the examination of this application and for which there may be a duty to disclose in accordance with 37 CFR 1.25.

( ) A concise explanation of the relevance of foreign language patents, foreign language publications and other foreign language information listed on PTO Form 1449, as presently understood by the individual(s) designated in 37 CFR 156(c) most knowledgeable about the content is given on the attached sheet, or where a foreign language patent is cited in a search report or other action by a foreign patent office in a counterpart foreign application, an English language version of the search report or action which indicates the degree of relevance found by the foreign office is listed on form PTO 1449 and is enclosed herewith.

It is requested that the information disclosed herein be made of record in this application.

Respectfully Submitted,

Michael A. Glenn
Attorney For Applicant
Reg. No. 30,176

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER
OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

#4

CHANGE OF ADDRESS/POWER OF ATTORNEY

FILE LOCATION 27X1 SERIAL NUMBER 09126071 PATENT NUMBER

THE CORRESPONDENCE ADDRESS HAS BEEN CHANGED TO CUSTOMER # 22862

THE PRACTITIONERS OF RECORD HAVE BEEN CHANGED TO CUSTOMER # 22862

THE FEE ADDRESS HAS BEEN CHANGED TO CUSTOMER # 22862

ON 08/17/00 THE ADDRESS OF RECORD FOR CUSTOMER NUMBER 22862 IS:

GLENN PATENT GROUP
3475 EDISON WAY
SUITE L
MENLO PARK CA 94025

AND THE PRACTITIONERS OF RECORD FOR CUSTOMER NUMBER 22862 ARE:

30176 40355 43284 44804 45005

PTO INSTRUCTIONS: PLEASE TAKE THE FOLLOWING ACTION WHEN THE CORRESPONDENCE ADDRESS HAS BEEN CHANGED TO CUSTOMER NUMBER: RECORD, ON THE NEXT AVAILABLE CONTENTS LINE OF THE FILE JACKET, 'ADDRESS CHANGE TO CUSTOMER NUMBER'. LINE THROUGH THE OLD ADDRESS ON THE FILE JACKET LABEL AND ENTER ONLY THE 'CUSTOMER NUMBER' AS THE NEW ADDRESS. FILE THIS LETTER IN THE FILE JACKET. WHEN ABOVE CHANGES ARE ONLY TO FEE ADDRESS AND/OR PRACTITIONERS OF RECORD, FILE LETTER IN THE FILE JACKET.
THIS FILE IS ASSIGNED TO GAU 2711.

PTO-FMD
TALBOT-1/97

Attorney Docket No. TIVO0003

AU 2711

PATENT

#3
Rose
8-26-99

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:
Barton et al.

Serial No. 09/126,071

Filed: 7/30/98

For: Multimedia Time Warping System

Group: 2711

Examiner: Unknown

CERTIFICATE OF MAILING

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, DC 20231 on August 16, 1999.

Signed: _____
Glenn Bach

CERTIFICATION FOR INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR §§1.97(e)

Commissioner of Patents
and Trademarks
Washington, DC 20231

Dear Sir:

A certification is being made for the Information Disclosure Statement accompanying this certification.

CERTIFICATION

I, the person signing below, certify

(X) that each item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the statement. (37 CFR 1.97(e)(1))

( ) that no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign

application or to the knowledge of the person signing the certification after making reasonable inquiry, was known to any individual designated in §1.56(c) more than three months prior to the filing of the statement. 37 CFR 1.97(e)(2).

The person making this certification is the attorney who signs below on the basis of the information:

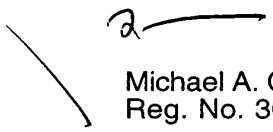
( ) supplied by the inventor(s)

( ) supplied by an individual designated in §1.56(c)

(X) in the attorney's file

the attorney who signs below on the basis on the information in the attorney's files.

Respectfully submitted,



Michael A. Glenn
Reg. No. 30,176

125 Lake Road
Portola Valley, CA 94028
Telephone: (650) 851-7138

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Barton et al. **Docket No. :** TIVO0003
Serial No. : 09/126,071 **Art Unit:** 2711
Filed: July 30, 1998 **Examiner:** Not Assigned
Title: MULTIMEDIA TIME WARPING SYSTEM

INFORMATION DISCLOSURE STATEMENT

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

This Information Disclosure Statement is submitted:

( ) under 37 CFR 1.97(b), or
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(X) Applicant(s) submit herewith Form PTO 1449 -- Information Disclosure Citation together with copies of patents, publications or other information of which applicant(s) are aware, which applicant(s) believe(s) may be material to the examination of this application and for which there may be a duty to disclose in accordance with 37 CFR 1.25.

(X) A concise explanation of the relevance of foreign language patents, foreign language publications and other foreign language information listed on PTO Form 1449, as presently understood by the individual(s) designated in 37 CFR 156(c) most knowledgeable about the content is given on the attached sheet, or where a foreign language patent is cited in a search report or other action by a foreign patent office in a counterpart foreign application, an English language version of the search report or action which indicates the degree of relevance found by the foreign office is listed on form PTO 1449 and is enclosed herewith.

It is requested that the information disclosed herein be made of record in this application.

Respectfully Submitted,

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I hereby certify that this paper is being deposited with the United States Postal Service " Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231.

Marcia D. Shea

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Date: July 29, 1998

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Sir:

Transmitted herewith for filing is the patent application of:

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For: MULTIMEDIA TIME WARPING SYSTEM

Docket No.: TIVO0003

Enclosed are:

(X) 13 sheets of drawings
(X) A copy of a patent application
(X) A declaration and power of attorney
(X) An assignment of the invention to: TIVO, INC.
(X) Verified Statement Claiming Small Entity Status- Individual
(X) Verified Statement Claiming Small Entity Status- Business
(X) An Information Disclosure Statement, 1449 Form and cited references
(X) One self addressed postcard

The filing fee has been calculated as shown below:

Fee Calculation (small entity)					
Fee Items	Claims Filed	Included with Basic Fee	Extra Claims	Fee Rate	Total
Total Claims	61	20	41	$ 11.00	$ 451.00
Independent Claims	4	3	1	$ 41.00	$ 41.00
Multiple Dependent Claim Fee (for one or more)				$ 135.00	
Assignment Recordation Fee				$ 40.00	$ 40.00
Basic Filing Fee				$ 395.00	$ 395.00
Total Fees					$ 927.00

A check in the amount of $927 is enclosed to cover the filing fee and assignment recording fee.
The Commmissioner is authorized to charge any additional fees or credit any overpayments to Deposit Account No. 07-1445 (Order No. TIVO0003). A copy of this sheet is enclosed for accounting purposes.

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MULTIMEDIA TIME WARPING SYSTEM

BACKGROUND OF THE INVENTION

TECHNICAL FIELD

The invention relates to the time shifting of television broadcast signals. More particularly, the invention relates to the real time capture, storage, and display of television broadcast signals.

DESCRIPTION OF THE PRIOR ART

The Video Cassette Recorder (VCR) has changed the lives of television (TV) viewers throughout the world. The VCR has offered viewers the flexibility to time-shift TV programs to match their lifestyles.

The viewer stores TV programs onto magnetic tape using the VCR. The VCR gives the viewer the ability to play, rewind, fast forward and pause the stored program material. These functions enable the viewer to pause the program playback whenever he desires, fast forward through unwanted program material or commercials, and to replay favorite scenes. However, a VCR cannot both capture and play back information at the same time.

One approach to solving this problem is to use several VCRs. For example, if two video tape recorders are available, it might be possible to Ping-Pong between the two. In this case, the first recorder is started at the beginning of the program of interest. If the viewer wishes to rewind the broadcast, the second

recorder begins recording, while the first recorder is halted, rewound to the appropriate place, and playback initiated. However, at least a third video tape recorder is required if the viewer wishes to fast forward to some point in time after the initial rewind was requested. In this case, the third recorder starts recording the broadcast stream while the second is halted and rewound to the appropriate position. Continuing this exercise, one can quickly see that the equipment becomes unwieldy, unreliable, expensive, and hard to operate, while never supporting all desired functions. In addition, tapes are of finite length, and may potentially end at inconvenient times, drastically lowering the value of the solution.

The use of digital computer systems to solve this problem has been suggested. U.S. Pat. No. 5,371,551 issued to Logan *et al* ., on 6 December 1994, teaches a method for concurrent video recording and playback. It presents a microprocessor controlled broadcast and playback device. Said device compresses and stores video data onto a hard disk. However, this approach is difficult to implement because the processor requirements for keeping up with the high video rates makes the device expensive and problematic. The microprocessor must be extremely fast to keep up with the incoming and outgoing video data.

It would be advantageous to provide a multimedia time warping system that gives the user the ability to simultaneously record and play back TV broadcast programs. It would further be advantageous to provide a multimedia time warping system that utilizes an approach that decouples the microprocessor from the high video data rates, thereby reducing the microprocessor and system requirements which are at a premium.

SUMMARY OF THE INVENTION

The invention provides a multimedia time warping system. The invention utilizes an easily manipulated, low cost multimedia storage and display system that allows the user to view a television broadcast program with the option of instantly reviewing previous scenes within the program. In addition, the invention allows the user to store selected television broadcast programs while the user is simultaneously watching or reviewing another program.

A preferred embodiment of the invention accepts television (TV) input streams in a multitude of forms, for example, analog forms such as National Television Standards Committee (NTSC) or PAL broadcast, and digital forms such as Digital Satellite System (DSS), Digital Broadcast Services (DBS), or Advanced Television Standards Committee (ATSC). Analog TV streams are converted to an Moving Pictures Experts Group (MPEG) formatted stream for internal transfer and manipulation, while pre-formatted MPEG streams are extracted from the digital TV signal and presented in a similar format to encoded analog streams.

The invention parses the resulting MPEG stream and separates it into its video and audio components. It then stores the components into temporary buffers. Events are recorded that indicate the type of component that has been found, where it is located, and when it occurred. The program logic is notified that an event has occurred and the data is extracted from the buffers.

The parser and event buffer decouple the CPU from having to parse the MPEG stream and from the real time nature of the data streams. This decoupling allows for slower CPU and bus speeds which translate to lower system costs.

The video and audio components are stored on a storage device. When the program is requested for display, the video and audio components are extracted from the storage device and reassembled into an MPEG stream. The MPEG stream is sent to a decoder. The decoder converts the MPEG stream into TV output signals and delivers the TV output signals to a TV receiver.

User control commands are accepted and sent through the system. These commands affect the flow of said MPEG stream and allow the user to view stored programs with at least the following functions: reverse, fast forward, play, pause, index, fast/slow reverse play, and fast/slow play.

Other aspects and advantages of the invention will become apparent from the following detailed description in combination with the accompanying drawings, illustrating, by way of example, the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block schematic diagram of a high level view of a preferred embodiment of the invention according to the invention;

Fig. 2 is a block schematic diagram of a preferred embodiment of the invention using multiple input and output modules according to the invention;

Fig. 3 is a schematic diagram of an Moving Pictures Experts Group (MPEG) data stream and its video and audio components according to the invention;

Fig. 4 is a block schematic diagram of a parser and four direct memory access (DMA) input engines contained in the Media Switch according to the invention;

Fig. 5 is a schematic diagram of the components of a packetized elementary stream (PES) buffer according to the invention;

Fig. 6 is a schematic diagram of the construction of a PES buffer from the parsed components in the Media Switch output circular buffers;

Fig. 7 is a block schematic diagram of the Media Switch and the various components that it communicates with according to the invention;

Fig. 8 is a block schematic diagram of a high level view of the program logic according to the invention;

Fig. 9 is a block schematic diagram of a class hierarchy of the program logic according to the invention;

Fig. 10 is a block schematic diagram of a preferred embodiment of the clip cache component of the invention according to the invention;

Fig. 11 is a block schematic diagram of a preferred embodiment of the invention that emulates a broadcast studio video mixer according to the invention;

Fig. 12 is a block schematic diagram of a closed caption parser according to the invention; and

Fig. 13 is a block schematic diagram of a high level view of a preferred embodiment of the invention utilizing a VCR as an integral component of the invention according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

The invention is embodied in a multimedia time warping system. A system according to the invention provides a multimedia storage and display system that allows the user to view a television broadcast program with the option of instantly reviewing previous scenes within the program. The invention additionally provides the user with the ability to store selected television broadcast programs while simultaneously watching or reviewing another program and to view stored programs with at least the following functions: reverse, fast forward, play, pause, index, fast/slow reverse play, and fast/slow play.

Referring to Fig. 1, a preferred embodiment of the invention has an Input Section 101, Media Switch 102, and an Output Section 103. The Input Section 101 takes television (TV) input streams in a multitude of forms, for example, National Television Standards Committee (NTSC) or PAL broadcast, and digital forms such as Digital Satellite System (DSS), Digital Broadcast Services (DBS), or Advanced Television Standards Committee (ATSC). DBS, DSS and ATSC are based on standards called Moving Pictures Experts Group 2 (MPEG2) and MPEG2 Transport. MPEG2 Transport is a standard for formatting the digital data stream from the TV source transmitter so that a TV receiver can disassemble the input stream to find programs in the multiplexed signal. The Input Section 101 produces MPEG streams. An MPEG2 transport multiplex supports multiple programs in the same broadcast channel, with multiple video and audio feeds and private data. The Input Section 101 tunes the channel to a particular program, extracts a specific MPEG program out of it, and feeds it to the rest of the system. Analog TV signals are encoded into a similar MPEG format using separate video and audio encoders, such that the remainder of the system is unaware of how the signal was obtained. Information may be

modulated into the Vertical Blanking Interval (VBI) of the analog TV signal in a number of standard ways; for example, the North American Broadcast Teletext Standard (NABTS) may be used to modulate information onto lines 10 through 20 of an NTSC signal, while the FCC mandates the use of line 21 for Closed Caption (CC) and Extended Data Services (EDS). Such signals are decoded by the input section and passed to the other sections as if they were delivered via an MPEG2 private data channel.

The Media Switch 102 mediates between a microprocessor CPU 106, hard disk or storage device 105, and memory 104. Input streams are converted to an MPEG stream and sent to the Media Switch 102. The Media Switch 102 buffers the MPEG stream into memory. It then performs two operations if the user is watching real time TV: the stream is sent to the Output Section 103 and it is written simultaneously to the hard disk or storage device 105.

The Output Section 103 takes MPEG streams as input and produces an analog TV signal according to the NTSC, PAL, or other required TV standards. The Output Section 103 contains an MPEG decoder, On-Screen Display (OSD) generator, analog TV encoder and audio logic. The OSD generator allows the program logic to supply images which will be overlayed on top of the resulting analog TV signal. Additionally, the Output Section can modulate information supplied by the program logic onto the VBI of the output signal in a number of standard formats, including NABTS, CC and EDS.

With respect to Fig. 2, the invention easily expands to accommodate multiple Input Sections (tuners) 201, 202, 203, 204, each can be tuned to different types of input. Multiple Output Modules (decoders) 206, 207, 208, 209 are added as well. Special effects such as picture in a picture can be implemented with multiple decoders. The Media Switch 205 records one program while the user

is watching another. This means that a stream can be extracted off the disk while another stream is being stored onto the disk.

Referring to Fig. 3, the incoming MPEG stream 301 has interleaved video 302, 305, 306 and audio 303, 304, 307 segments. These elements must be separated and recombined to create separate video 308 and audio 309 streams or buffers. This is necessary because separate decoders are used to convert MPEG elements back into audio or video analog components. Such separate delivery requires that time sequence information be generated so that the decoders may be properly synchronized for accurate playback of the signal.

The Media Switch enables the program logic to associate proper time sequence information with each segment, possibly embedding it directly into the stream. The time sequence information for each segment is called a time stamp. These time stamps are monotonically increasing and start at zero each time the system boots up. This allows the invention to find any particular spot in any particular video segment. For example, if the system needs to read five seconds into an incoming contiguous video stream that is being cached, the system simply has to start reading forward into the stream and look for the appropriate time stamp.

A binary search can be performed on a stored file to index into a stream. Each stream is stored as a sequence of fixed-size segments enabling fast binary searches because of the uniform time stamping. If the user wants to start in the middle of the program, the system performs a binary search of the stored segments until it finds the appropriate spot, obtaining the desired results with a minimal amount of information. If the signal were instead stored as an MPEG stream, it would be necessary to linearly parse the stream from the beginning to find the desired location.

With respect to Fig. 4, the Media Switch contains four input Direct Memory Access (DMA) engines 402, 403, 404, 405 each DMA engine has an associated buffer 410, 411, 412, 413. Conceptually, each DMA engine has a pointer 406, a limit for that pointer 407, a next pointer 408, and a limit for the next pointer 409. Each DMA engine is dedicated to a particular type of information, for example, video 402, audio 403, and parsed events 405. The buffers 410, 411, 412, 413 are circular and collect the specific information. The DMA engine increments the pointer 406 into the associated buffer until it reaches the limit 407 and then loads the next pointer 408 and limit 409. Setting the pointer 406 and next pointer 408 to the same value, along with the corresponding limit value creates a circular buffer. The next pointer 408 can be set to a different address to provide vector DMA.

The input stream flows through a parser 401. The parser 401 parses the stream looking for MPEG distinguished events indicating the start of video, audio or private data segments. For example, when the parser 401 finds a video event, it directs the stream to the video DMA engine 402. The parser 401 buffers up data and DMAs it into the video buffer 410 through the video DMA engine 402. At the same time, the parser 401 directs an event to the event DMA engine 405 which generates an event into the event buffer 413. When the parser 401 sees an audio event, it redirects the byte stream to the audio DMA engine 403 and generates an event into the event buffer 413. Similarly, when the parser 401 sees a private data event, it directs the byte stream to the private data DMA engine 404 and directs an event to the event buffer 413. The Media Switch notifies the program logic via an interrupt mechanism when events are placed in the event buffer.

Referring to Figs. 4 and 5, the event buffer 413 is filled by the parser 401 with events. Each event 501 in the event buffer has an offset 502, event type 503, and time stamp field 504. The parser 401 provides the type and offset of each event as it is placed into the buffer. For example, when an audio event occurs, the event type field is set to an audio event and the offset indicates the location in the audio buffer 411. The program logic knows where the audio buffer 411 starts and adds the offset to find the event in the stream. The address offset 502 tells the program logic where the next event occurred, but not where it ended. The previous event is cached so the end of the current event can be found as well as the length of the segment.

With respect to Figs. 5 and 6, the program logic reads accumulated events in the event buffer 602 when it is interrupted by the Media Switch 601. From these events the program logic generates a sequence of logical segments 603 which correspond to the parsed MPEG segments 615. The program logic converts the offset 502 into the actual address 610 of each segment, and records the event length 609 using the last cached event. If the stream was produced by encoding an analog signal, it will not contain Program Time Stamp (PTS) values, which are used by the decoders to properly present the resulting output. Thus, the program logic uses the generated time stamp 504 to calculate a simulated PTS for each segment and places that into the logical segment time stamp 607. In the case of a digital TV stream, PTS values are already encoded in the stream. The program logic extracts this information and places it in the logical segment time stamp 607.

The program logic continues collecting logical segments 603 until it reaches the fixed buffer size. When this occurs, the program logic generates a new buffer, called a Packetized Elementary Stream (PES) 605 buffer containing these logical segments 603 in order, plus ancillary control information. Each logical

segment points 604 directly to the circular buffer,*e.g.*, the video buffer 613, filled by the Media Switch 601. This new buffer is then passed to other logic components, which may further process the stream in the buffer in some way, such as presenting it for decoding or writing it to the storage media. Thus, the MPEG data is not copied from one location in memory to another by the processor. This results in a more cost effective design since lower memory bandwidth and processor bandwidth is required.

A unique feature of the MPEG stream transformation into PES buffers is that the data associated with logical segments need not be present in the buffer itself, as presented above. When a PES buffer is written to storage, these logical segments are written to the storage medium in the logical order in which they appear. This has the effect of gathering components of the stream, whether they be in the video, audio or private data circular buffers, into a single linear buffer of stream data on the storage medium. The buffer is read back from the storage medium with a single transfer from the storage media, and the logical segment information is updated to correspond with the actual locations in the buffer 606. Higher level program logic is unaware of this transformation, since it handles only the logical segments, thus stream data is easily managed without requiring that the data ever be copied between locations in DRAM by the CPU.

A unique aspect of the Media Switch is the ability to handle high data rates effectively and inexpensively. It performs the functions of taking video and audio data in, sending video and audio data out, sending video and audio data to disk, and extracting video and audio data from the disk on a low cost platform. Generally, the Media Switch runs asynchronously and autonomously with the microprocessor CPU, using its DMA capabilities to move large quantities of information with minimal intervention by the CPU.

Referring to Fig: 7, the input side of the Media Switch 701 is connected to an MPEG encoder 703. There are also circuits specific to MPEG audio 704 and vertical blanking interval (VBI) data 702 feeding into the Media Switch 701. If a digital TV signal is being processed instead, the MPEG encoder 703 is replaced with an MPEG2 Transport Demultiplexor, and the MPEG audio encoder 704 and VBI decoder 702 are deleted. The demultiplexor multiplexes the extracted audio, video and private data channel streams through the video input Media Switch port.

The parser 705 parses the input data stream from the MPEG encoder 703, audio encoder 704 and VBI decoder 702, or from the transport demultiplexor in the case of a digital TV stream. The parser 705 detects the beginning of all of the important events in a video or audio stream, the start of all of the frames, the start of sequence headers - all of the pieces of information that the program logic needs to know about in order to both properly play back and perform special effects on the stream, *e.g.* fast forward, reverse, play, pause, fast/slow play, indexing, and fast/slow reverse play.

The parser 705 places tags 707 into the FIFO 706 when it identifies video or audio segments, or is given private data. The DMA 709 controls when these tags are taken out. The tags 707 and the DMA addresses of the segments are placed into the event queue 708. The frame type information, whether it is a start of a video I-frame, video B-frame, video P-frame, video PES, audio PES, a sequence header, an audio frame, or private data packet, is placed into the event queue 708 along with the offset in the related circular buffer where the piece of information was placed. The program logic operating in the CPU 713 examines events in the circular buffer after it is transferred to the DRAM 714.

The Media Switch 701 has a data bus 711 that connects to the CPU 713 and DRAM 714. An address bus 712 is also shared between the Media Switch 701, CPU 713, and DRAM 714. A hard disk or storage device 710 is connected to one of the ports of the Media Switch 701. The Media Switch 701 outputs streams to an MPEG video decoder 715 and a separate audio decoder 717. The audio decoder 717 signals contain audio cues generated by the system in response to the user's commands on a remote control or other internal events. The decoded audio output from the MPEG decoder is digitally mixed 718 with the separate audio signal. The resulting signals contain video, audio, and on-screen displays and are sent to the TV 716.

The Media Switch 701 takes in 8-bit data and sends it to the disk, while at the same time extracts another stream of data off of the disk and sends it to the MPEG decoder 715. All of the DMA engines described above can be working at the same time. The Media Switch 701 can be implemented in hardware using a Field Programmable Gate Array (FPGA), ASIC, or discrete logic.

Rather than having to parse through an immense data stream looking for the start of where each frame would be, the program logic only has to look at the circular event buffer in DRAM 714 and it can tell where the start of each frame is and the frame type. This approach saves a large amount of CPU power, keeping the real time requirements of the CPU 713 small. The CPU 713 does not have to be very fast at any point in time. The Media Switch 701 gives the CPU 713 as much time as possible to complete tasks. The parsing mechanism 705 and event queue 708 decouple the CPU 713 from parsing the audio, video, and buffers and the real time nature of the streams, which allows for lower costs. It also allows the use of a bus structure in a CPU environment that operates at a much lower clock rate with much cheaper memory than would be required otherwise.

The CPU 713 has the ability to queue up one DMA transfer and can set up the next DMA transfer at its leisure. This gives the CPU 713 large time intervals within which it can service the DMA controller 709. The CPU 713 may respond to a DMA interrupt within a larger time window because of the large latency allowed. MPEG streams, whether extracted from an MPEG2 Transport or encoded from an analog TV signal, are typically encoded using a technique called Variable Bit Rate encoding (VBR). This technique varies the amount of data required to represent a sequence of images by the amount of movement between those images. This technique can greatly reduce the required bandwidth for a signal, however sequences with rapid movement (such as a basketball game) may be encoded with much greater bandwidth requirements. For example, the Hughes DirecTV satellite system encodes signals with anywhere from 1 to 10Mb/s of required bandwidth, varying from frame to frame. It would be difficult for any computer system to keep up with such rapidly varying data rates without this structure.

With respect to Fig. 8, the program logic within the CPU has three conceptual components: sources 801, transforms 802, and sinks 803. The sources 801 produce buffers of data. Transforms 802 process buffers of data and sinks 803 consume buffers of data. A transform is responsible for allocating and queuing the buffers of data on which it will operate. Buffers are allocated as if "empty" to sources of data, which give them back "full". The buffers are then queued and given to sinks as "full", and the sink will return the buffer "empty".

A source 801 accepts data from encoders, *e.g.*, a digital satellite receiver. It acquires buffers for this data from the downstream transform, packages the data into a buffer, then pushes the buffer down the pipeline as described above. The source object 801 does not know anything about the rest of the system. The

sink 803 consumes buffers, taking a buffer from the upstream transform, sending the data to the decoder, and then releasing the buffer for reuse.

There are two types of transforms 802 used: spatial and temporal. Spatial transforms are transforms that perform, for example, an image convolution or compression/decompression on the buffered data that is passing through. Temporal transforms are used when there is no time relation that is expressible between buffers going in and buffers coming out of a system. Such a transform writes the buffer to a file 804 on the storage medium. The buffer is pulled out at a later time, sent down the pipeline, and properly sequenced within the stream.

Referring to Fig. 9, a C++ class hierarchy derivation of the program logic is shown. The TiVo Media Kernel (Tmk) 904, 908, 913 mediates with the operating system kernel. The kernel provides operations such as: memory allocation, synchronization, and threading. The TmkCore 904, 908, 913 structures memory taken from the media kernel as an object. It provides operators, new and delete, for constructing and deconstructing the object. Each object (source 901, transform 902, and sink 903) is multi-threaded by definition and can run in parallel.

The TmkPipeline class 905, 909, 914 is responsible for flow control through the system. The pipelines point to the next pipeline in the flow from source 901 to sink 903. To pause the pipeline, for example, an event called "pause" is sent to the first object in the pipeline. The event is relayed on to the next object and so on down the pipeline. This all happens asynchronously to the data going through the pipeline. Thus, similar to applications such as telephony, control of the flow of MPEG streams is asynchronous and separate from the streams themselves. This allows for a simple logic design that is at the same time powerful enough to support the features described previously, including pause,

rewind, fast forward and others. In addition, this structure allows fast and efficient switching between stream sources, since buffered data can be simply discarded and decoders reset using a single event, after which data from the new stream will pass down the pipeline. Such a capability is needed, for example, when switching the channel being captured by the input section, or when switching between a live signal from the input section and a stored stream.

The source object 901 is a TmkSource 906 and the transform object 902 is a TmkXfrm 910. These are intermediate classes that define standard behaviors for the classes in the pipeline. Conceptually, they handshake buffers down the pipeline. The source object 901 takes data out of a physical data source, such as the Media Switch, and places it into a PES buffer. To obtain the buffer, the source object 901 asks the down stream object in his pipeline for a buffer (allocEmptyBuf). The source object 901 is blocked until there is sufficient memory. This means that the pipeline is self-regulating; it has automatic flow control. When the source object 901 has filled up the buffer, it hands it back to the transform 902 through the pushFullBuf function.

The sink 903 is flow controlled as well. It calls nextFullBuf which tells the transform 902 that it is ready for the next filled buffer. This operation can block the sink 903 until a buffer is ready. When the sink 903 is finished with a buffer (*i.e.*, it has consumed the data in the buffer) it calls releaseEmptyBuf. ReleaseEmptyBuf gives the buffer back to the transform 902. The transform 902 can then hand that buffer, for example, back to the source object 901 to fill up again. In addition to the automatic flow-control benefit of this method, it also provides for limiting the amount of memory dedicated to buffers by allowing enforcement of a fixed allocation of buffers by a transform. This is an important feature in achieving a cost-effective limited DRAM environment.

The MediaSwitch class 909 calls the allocEmptyBuf method of the TmkClipCache 912 object and receives a PES buffer from it . It then goes out to the circular buffers in the Media Switch hardware and generates PES buffers. The MediaSwitch class 909 fills the buffer up and pushes it back to the TmkClipCache 912 object.

The TmkClipCache 912 maintains a cache file 918 on a storage medium. It also maintains two pointers into this cache: a push pointer 919 that shows where the next buffer coming from the source 901 is inserted; and a current pointer 920 which points to the current buffer used.

The buffer that is pointed to by the current pointer is handed to the Vela decoder class 916. The Vela decoder class 916 talks to the decoder 921 in the hardware. The decoder 921 produces a decoded TV signal that is subsequently encoded into an analog TV signal in NTSC, PAL or other analog format. When the Vela decoder class 916 is finished with the buffer it calls releaseEmptyBuf.

The structure of the classes makes the system easy to test and debug. Each level can be tested separately to make sure it performs in the appropriate manner, and the classes may be gradually aggregated to achieve the desired functionality while retaining the ability to effectively test each object.

The control object 917 accepts commands from the user and sends events into the pipeline to control what the pipeline is doing. For example, if the user has a remote control and is watching TV, the user presses pause and the control object 917 sends an event to the sink 903, that tells it pause. The sink 903 stops asking for new buffers. The current pointer 920 stays where it is at. The

sink 903 starts taking buffers out again when it receives another event that tells it to play. The system is in perfect synchronization; it starts from the frame that it stopped at.

The remote control may also have a fast forward key. When the fast forward key is pressed, the control object 917 sends an event to the transform 902, that tells it to move forward two seconds. The transform 902 finds that the two second time span requires it to move forward three buffers. It then issues a reset event to the downstream pipeline, so that any queued data or state that may be present in the hardware decoders is flushed. This is a critical step, since the structure of MPEG streams requires maintenance of state across multiple frames of data, and that state will be rendered invalid by repositioning the pointer. It then moves the current pointer 920 forward three buffers. The next time the sink 903 calls nextFullBuf it gets the new current buffer. The same method works for fast reverse in that the transform 902 moves the current pointer 920 backwards.

A system clock reference resides in the decoder. The system clock reference is sped up for fast play or slowed down for slow play. The sink simply asks for full buffers faster or slower, depending on the clock speed.

With respect to Fig. 10, two other objects derived from the TmkXfrm class are placed in the pipeline for disk access. One is called TmkClipReader 1003 and the other is called TmkClipWriter 1001. Buffers come into the TmkClipWriter 1001 and are pushed to a file on a storage medium 1004. TmkClipReader 1003 asks for buffers which are taken off of a file on a storage medium 1005. A TmkClipReader 1003 provides only the allocEmptyBuf and pushFullBuf methods, while a TmkClipWriter 1001 provides only the nextFullBuf and releaseEmptyBuf methods. A TmkClipReader 1003 therefore performs the

same function as the input, or "push" side of a TmkClipCache 1002, while a TmkClipWriter 1001 therefore performs the same function as the output, or "pull" side of a TmkClipCache 1002.

Referring to Fig. 11, a preferred embodiment that accomplishes multiple functions is shown. A source 1101 has a TV signal input. The source sends data to a PushSwitch 1102 which is a transform derived from TmkXfrm. The PushSwitch 1102 has multiple outputs that can be switched by the control object 1114. This means that one part of the pipeline can be stopped and another can be started at the users whim. The user can switch to different storage devices. The PushSwitch 1102 could output to a TmkClipWriter 1106, which goes onto a storage device 1107 or write to the cache transform 1103.

An important feature of this apparatus is the ease with which it can selectively capture portions of an incoming signal under the control of program logic. Based on information such as the current time, or perhaps a specific time span, or perhaps via a remote control button press by the viewer, a TmkClipWriter 1106 may be switched on to record a portion of the signal, and switched off at some later time. This switching is typically caused by sending a "switch" event to the PushSwitch 1102 object.

An additional method for triggering selective capture is through information modulated into the VBI or placed into an MPEG private data channel. Data decoded from the VBI or private data channel is passed to the program logic. The program logic examines this data to determine if the data indicates that capture of the TV signal into which it was modulated should begin. Similarly, this information may also indicate when recording should end, or another data item may be modulated into the signal indicating when the capture should end. The starting and ending indicators may be explicitly modulated into the signal or

other information that is placed into the signal in a standard fashion may be used to encode this information.

With respect to Fig. 12, an example is shown which demonstrates how the program logic scans the words contained within the closed caption (CC) fields to determine starting and ending times, using particular words or phrases to trigger the capture. A stream of NTSC or PAL fields 1201 is presented. CC bytes are extracted from each odd field 1202, and entered in a circular buffer 1203 for processing by the Word Parser 1204. The Word Parser 1204 collects characters until it encounters a word boundary, usually a space, period or other delineating character. Recall from above, that the MPEG audio and video segments are collected into a series of fixed-size PES buffers. A special segment is added to each PES buffer to hold the words extracted from the CC field 1205. Thus, the CC information is preserved in time synchronization with the audio and video, and can be correctly presented to the viewer when the stream is displayed. This also allows the stored stream to be processed for CC information at the leisure of the program logic, which spreads out load, reducing cost and improving efficiency. In such a case, the words stored in the special segment are simply passed to the state table logic 1206.

During stream capture, each word is looked up in a table 1206 which indicates the action to take on recognizing that word. This action may simply change the state of the recognizer state machine 1207, or may cause the state machine 1207 to issue an action request, such as "start capture", "stop capture", "phrase seen", or other similar requests. Indeed, a recognized word or phrase may cause the pipeline to be switched; for example, to overlay a different audio track if undesirable language is used in the program.

Note that the parsing state table 1206 and recognizer state machine 1207 may be modified or changed at any time. For example, a different table and state machine may be provided for each input channel. Alternatively, these elements may be switched depending on the time of day, or because of other events.

Referring to Fig. 11, a PullSwitch is added 1104 which outputs to the sink 1105. The sink 1105 calls nextFullBuf and releaseEmptyBuf to get or return buffers from the PullSwitch 1104. The PullSwitch 1104 can have any number of inputs. One input could be an ActionClip 1113. The remote control can switch between input sources. The control object 1114 sends an event to the PullSwitch 1104, telling it to switch. It will switch from the current input source to whatever input source the control object selects.

An ActionClip class provides for sequencing a number of different stored signals in a predictable and controllable manner, possibly with the added control of viewer selection via a remote control. Thus, it appears as a derivative of a TmkXfrm object that accepts a "switch" event for switching to the next stored signal.

This allows the program logic or user to create custom sequences of video output. Any number of video segments can be lined up and combined as if the program logic or user were using a broadcast studio video mixer. TmkClipReaders 1108, 1109, 1110 are allocated and each is hooked into the PullSwitch 1104. The PullSwitch 1104 switches between the TmkClipReaders 1108, 1109, 1110 to combine video and audio clips. Flow control is automatic because of the way the pipeline is constructed. The Push and Pull Switches are the same as video switches in a broadcast studio.

The derived class and resulting objects described here may be combined in an arbitrary way to create a number of different useful configurations for storing, retrieving, switching and viewing of TV streams. For example, if multiple input and output sections are available, one input is viewed while another is stored, and a picture-in-picture window generated by the second output is used to preview previously stored streams. Such configurations represent a unique and novel application of software transformations to achieve the functionality expected of expensive, sophisticated hardware solutions within a single cost-effective device.

With respect to Fig. 13, a high-level system view is shown which implements a VCR backup. The Output Module 1303 sends TV signals to the VCR 1307. This allows the user to record TV programs directly on to video tape. The invention allows the user to queue up programs from disk to be recorded on to video tape and to schedule the time that the programs are sent to the VCR 1307. Title pages (EPG data) can be sent to the VCR 1307 before a program is sent. Longer programs can be scaled to fit onto smaller video tapes by speeding up the play speed or dropping frames.

The VCR 1307 output can also be routed back into the Input Module 1301. In this configuration the VCR acts as a backup system for the Media Switch 1302. Any overflow storage or lower priority programming is sent to the VCR 1307 for later retrieval.

The Input Module 1301 can decode and pass to the remainder of the system information encoded on the Vertical Blanking Interval (VBI). The Output Module 1303 can encode into the output VBI data provided by the remainder of the system. The program logic may arrange to encode identifying information of various kinds into the output signal, which will be recorded onto tape using the

VCR 1307. Playing this tape back into the input allows the program logic to read back this identifying information, such that the TV signal recorded on the tape is properly handled. For example, a particular program may be recorded to tape along with information about when it was recorded, the source network, etc. When this program is played back into the Input Module, this information can be used to control storage of the signal, presentation to the viewer, etc.

One skilled in the art will readily appreciate that such a mechanism may be used to introduce various data items to the program logic which are not properly conceived of as television signals. For instance, software updates or other data may be passed to the system. The program logic receiving this data from the television stream may impose controls on how the data is handled, such as requiring certain authentication sequences and/or decrypting the embedded information according to some previously acquired key. Such a method works for normal broadcast signals as well, leading to an efficient means of providing non-TV control information and data to the program logic.

Additionally, one skilled in the art will readily appreciate that although a VCR is specifically mentioned above, any multimedia recording device (*e.g.*, a Digital Video Disk-Random Access Memory (DVD-RAM) recorder) is easily substituted in its place.

Although the invention is described herein with reference to the preferred embodiment, one skilled in the art will readily appreciate that other applications may be substituted for those set forth herein without departing from the spirit and scope of the present invention. For example, the invention can be used in the detection of gambling casino crime. The input section of the invention is connected to the casino's video surveillance system. Recorded video is cached and simultaneously output to external VCRs. The user can switch to any video

feed and examine (*i.e.*, rewind, play, slow play, fast forward, etc.) a specific segment of the recorded video while the external VCRs are being loaded with the real-time input video. Accordingly, the invention should only be limited by the Claims included below.

CLAIMS

1. A process for the simultaneous storage and play back of multimedia data, comprising the steps of:

accepting television (TV) broadcast signals, wherein said TV signals are based on a multitude of standards, including, but not limited to, National Television Standards Committee (NTSC) broadcast, PAL broadcast, satellite transmission, DSS, DBS, or ATSC;

tuning said TV signals to a specific program;

providing at least one Input Section, wherein said input section converts said specific program to an Moving Pictures Experts Group (MPEG) formatted stream for internal transfer and manipulation;

providing a Media Switch, wherein said Media Switch parses said MPEG stream, said MPEG stream is separated into its video and audio components;

storing said video and audio components on a storage device;

providing at least one Output Section, wherein said Output Section extracts said video and audio components from a storage device;

wherein said Output Section assembles said video and audio components into an MPEG stream;

wherein said Output Section sends said MPEG stream to a decoder;

wherein said decoder converts said MPEG stream into TV output signals;

wherein said decoder delivers said TV output signals to a TV receiver; and

accepting control commands from a user, wherein said control commands are sent through the system and affect the flow of said MPEG stream.

2. The process of claim 1, wherein said Input Section directs said MPEG stream to the destination indicated by said control commands.

3. The process of claim 1, wherein said Output Section extracts said video and audio components from the storage device indicated by said control commands.

4. The process of claim 1, further comprising the step of:

creating custom video output sequences, wherein said sequences are specified by a user or program control.

5. The process of claim 1, wherein the storing and extracting of said video and audio components from said storage device are performed simultaneously.

6. The process of claim 1, wherein said Media Switch calculates and logically associates a time stamp to said video and audio components.

7. The process of claim 1, wherein said Media Switch extracts time stamp values from a digital TV stream and logically associates said time stamp values to said video and audio components.

8. The process of claim 1, further comprising the steps of:

placing said video component into a circular video buffer;

posting an event in a circular event buffer, wherein said event contains an indication that a video component was found and the location of said video component in said circular video buffer; and

sending notice of said event posting.

9. The process of claim 1, further comprising the steps of:

placing said audio component into a circular audio buffer;

posting an event in a circular event buffer, wherein said event contains an indication that an audio component was found and the location of said audio component in said circular audio buffer; and

sending notice of said event posting.

10. The process of claims 8 or 9, further comprising the steps of:

receiving said notice;

retrieving said event posting from said event buffer; and

indexing into the appropriate buffer indicated by the type and location information in said event buffer.

11. The process of claim 10, further comprising the steps of:

generating a buffer containing the logical audio or video segments in order, including ancillary information, wherein each of said logical segments points to the appropriate circular buffer location where corresponding audio or video components have been placed.

12. The process of claim 1, further comprising the step of:

increasing the decoder system clock rate for fast playback or fast reverse playback.

13. The process of claim 1, further comprising the step of:

decreasing the decoder system clock rate for slow playback or slow reverse playback.

14. The process of claim 1, further comprising the step of:

combining system audio cues and on-screen displays with said TV output signals.

15. The process of claim 1, further comprising the steps of:

decoding the Vertical Blanking Interval (VBI) data or private data channel information from said TV signal; and

examining said data to determine the starting or ending indicators of a specific program.

16. The process of claim 1, further comprising the step of:

scanning the words contained within the closed caption (CC) fields to determine program starting and ending times, wherein particular words or phrases are used to trigger the recording of a specific program and wherein the CC information is preserved in time synchronization with the audio and video, and can be correctly presented to the viewer when the stream is displayed.

17. The process of claim 16, further comprising the step of:

performing a specific action when a specific word is found in said CC information.

18. The process of claim 1, wherein said Media Switch has a data bus connecting it to a CPU and DRAM.

19. The process of claim 1, wherein said Media Switch shares an address bus with a CPU and DRAM.

20. The process of claim 1, wherein said Media Switch operates asychronously and autonomously with a CPU.

21. The process of claim 1, wherein a storage device is connected to said Media Switch.

22. The process of claim 1, wherein said Media Switch allows the CPU to queue up Direct Memory Access (DMA) transfers.

23. The process of claim 1, wherein said Media Switch is implemented in hardware.

24. The process of claim 1, further comprising the step of:

providing a multimedia recording device, including, but not limited to, a Video Cassette Recorder (VCR) or a Digital Video Disk-Random Access Memory (DVD-RAM) device, wherein said recording device is attached to the output side of said decoder, allowing said user to record said TV output signals.

25. The process of claim 24, wherein said user queues up programs from said disk to be stored on said recording device.

26. The process of claim 24, wherein said user sets time schedules for said programs to be sent to said recording device.

27. The process of claim 24, wherein title pages may be sent to said recording device before sending a program to be stored on said recording device.

28. The process of claim 24, wherein a program that is longer in duration than a magnetic tape in said recording device allows, is sped up to fit within the desired time limit.

29. The process of claim 24, wherein a program that is longer in duration than a magnetic tape in said recording device allows, has frames dropped from it to fit within the desired time limit.

30. The process of claim 24, wherein the output of said recording device is routed to said input section, allowing said recording device to act as a storage back up system, said recording device accepts overflow storage, TV programs, software updates, or other data that are later retrieved and sent to said input section.

31. A process for the simultaneous storage and play back of multimedia data, comprising the steps of:

providing a physical data source, wherein said physical data source accepts broadcast data from an input device, parses video and audio data from said broadcast data, and temporarily stores said video and audio data;

providing a source object, wherein said source object extracts video and audio data from said physical data source;

providing a transform object, wherein said transform object stores and retrieves data streams onto a storage device;

wherein said source object obtains a buffer from said transform object, said source object converts video data into data streams and fills said buffer with said streams;

wherein said source object is automatically flow controlled by said transform object;

providing a sink object, wherein said sink object obtains data stream buffers from said transform object and outputs said streams to a video and audio decoder;

wherein said decoder converts said streams into display signals and sends said signals to a display;

wherein said sink object is automatically flow controlled by said transform object;

providing a control object, wherein said control object receives commands from a user, said commands control the flow of the broadcast data through the system; and

wherein said control object sends flow command events to said source, transform, and sink objects.

32. An apparatus for the simultaneous storage and play back of multimedia data, comprising:

a module for accepting television (TV) broadcast signals, wherein said TV signals are based on a multitude of standards, including, but not limited to, National Television Standards Committee (NTSC) broadcast, PAL broadcast, satellite transmission, DSS, DBS, or ATSC;

a module for tuning said TV signals to a specific program;

at least one Input Section, wherein said input section converts said specific program to an Moving Pictures Experts Group (MPEG) formatted stream for internal transfer and manipulation;

a Media Switch, wherein said Media Switch parses said MPEG stream, said MPEG stream is separated into its video and audio components;

a module for storing said video and audio components on a storage device;

at least one Output Section, wherein said Output Section extracts said video and audio components from a storage device;

wherein said Output Section assembles said video and audio components into an MPEG stream;

wherein said Output Section sends said MPEG stream to a decoder;

wherein said decoder converts said MPEG stream into TV output signals;

wherein said decoder delivers said TV output signals to a TV receiver; and

accepting control commands from a user, wherein said control commands are sent through the system and affect the flow of said MPEG stream.

33. The apparatus of claim 32, wherein said Input Section directs said MPEG stream to the destination indicated by said control commands.

34. The apparatus of claim 32, wherein said Output Section extracts said video and audio components from the storage device indicated by said control commands.

35. The apparatus of claim 32, further comprising:

a module for creating custom video output sequences, wherein said sequences are specified by a user or program control.

36. The apparatus of claim 32, wherein the storing and extracting of said video and audio components from said storage device are performed simultaneously.

37. The apparatus of claim 32, wherein said Media Switch calculates and logically associates a time stamp to said video and audio components.

38. The apparatus of claim 32, wherein said Media Switch extracts time stamp values from a digital TV stream and logically associates said time stamp values to said video and audio components.

39. The apparatus of claim 32, further comprising:

a module for placing said video component into a circular video buffer;

a module for posting an event in a circular event buffer, wherein said event contains an indication that a video component was found and the location of said video component in said circular video buffer; and

a module for sending notice of said event posting.

40. The apparatus of claim 32, further comprising:

a module for placing said audio component into a circular audio buffer;

a module for posting an event in a circular event buffer, wherein said event contains an indication that an audio component was found and the location of said audio component in said circular audio buffer; and

a module for sending notice of said event posting.

41. The apparatus of claims 39 or 40, further comprising:

a module for receiving said notice;

a module for retrieving said event posting from said event buffer; and

a module for indexing into the appropriate buffer indicated by the type and location information in said event buffer.

42. The apparatus of claim 41, further comprising:

a module for generating a buffer containing the logical audio or video segments in order, including ancillary information, wherein each of said logical segments points to the appropriate circular buffer location where corresponding audio or video components have been placed.

43. The apparatus of claim 32, further comprising:

a module for increasing the decoder system clock rate for fast playback or fast reverse playback.

44. The apparatus of claim 32, further comprising:

a module for decreasing the decoder system clock rate for slow playback or slow reverse playback.

45. The apparatus of claim 32, further comprising:

a module for combining system audio cues and on-screen displays with said TV output signals.

46. The apparatus of claim 32, further comprising:

a module for decoding the Vertical Blanking Interval (VBI) data or private data channel information from said TV signal; and

a module for examining said data to determine the starting or ending indicators of a specific program.

47. The apparatus of claim 32, further comprising:

a module for scanning the words contained within the closed caption (CC) fields to determine program starting and ending times, wherein particular words or phrases are used to trigger the recording of a specific program and wherein the CC information is preserved in time synchronization with the audio and video, and can be correctly presented to the viewer when the stream is displayed.

48. The apparatus of claim 47, further comprising:

a module for performing a specific action when a specific word is found in said CC information.

49. The apparatus of claim 32, wherein said Media Switch has a data bus connecting it to a CPU and DRAM.

50. The apparatus of claim 32, wherein said Media Switch shares an address bus with a CPU and DRAM.

51. The apparatus of claim 32, wherein said Media Switch operates asychronously and autonomously with a CPU.

52. The apparatus of claim 32, wherein a storage device is connected to said Media Switch.

53. The apparatus of claim 32, wherein said Media Switch allows the CPU to queue up Direct Memory Access (DMA) transfers.

54. The apparatus of claim 32, further comprising:

a multimedia recording device, including, but not limited to, a Video Cassette Recorder (VCR) or a Digital Video Disk-Random Access Memory (DVD-RAM) device, wherein said recording device is attached to the output side of said decoder, allowing said user to record said TV output signals.

55. The apparatus of claim 54, wherein said user queues up programs from said disk to be stored on said recording device.

56. The apparatus of claim 54, wherein said user sets time schedules for said programs to be sent to said recording device.

57. The apparatus of claim 54, wherein title pages may be sent to said recording device before sending a program to be stored on said recording device.

58. The apparatus of claim 54, wherein a program that is longer in duration than a magnetic tape in said recording device allows, is sped up to fit within the desired time limit.

59. The apparatus of claim 54, wherein a program that is longer in duration than a magnetic tape in said recording device allows, has frames dropped from it to fit within the desired time limit.

60. The apparatus of claim 54, wherein the output of said recording device is routed to said input section, allowing said recording device to act as a storage back up system, said recording device accepts overflow storage, TV programs, software updates, or other data that are later retrieved and sent to said input section.

61. An apparatus for the simultaneous storage and play back of multimedia data, comprising:

a physical data source, wherein said physical data source accepts broadcast data from an input device, parses video and audio data from said broadcast data, and temporarily stores said video and audio data;

a source object, wherein said source object extracts video and audio data from said physical data source;

a transform object, wherein said transform object stores and retrieves data streams onto a storage device;

wherein said source object obtains a buffer from said transform object, said source object converts video data into data streams and fills said buffer with said streams;

wherein said source object is automatically flow controlled by said transform object;

a sink object, wherein said sink object obtains data stream buffers from said transform object and outputs said streams to a video and audio decoder;

wherein said decoder converts said streams into display signals and sends said signals to a display;

wherein said sink object is automatically flow controlled by said transform object;

a control object, wherein said control object receives commands from a user, said commands control the flow of the broadcast data through the system; and

wherein said control object sends flow command events to said source, transform, and sink objects.

MULTIMEDIA TIME WARPING SYSTEM

ABSTRACT

A multimedia time warping system. The invention allows the user to store selected television broadcast programs while the user is simultaneously watching or reviewing another program. A preferred embodiment of the invention accepts television (TV) input streams in a multitude of forms, for example, National Television Standards Committee (NTSC) or PAL broadcast, and digital forms such as Digital Satellite System (DSS), Digital Broadcast Services (DBS), or Advanced Television Standards Committee (ATSC). The TV streams are converted to an Moving Pictures Experts Group (MPEG) formatted stream for internal transfer and manipulation and are parsed and separated it into video and audio components. The components are stored in temporary buffers. Events are recorded that indicate the type of component that has been found, where it is located, and when it occurred. The program logic is notified that an event has occurred and the data is extracted from the buffers. The parser and event buffer decouple the CPU from having to parse the MPEG stream and from the real time nature of the data streams which allows for slower CPU and bus speeds and translate to lower system costs. The video and audio components are stored on a storage device and when the program is requested for display, the video and audio components are extracted from the storage device and reassembled into an MPEG stream which is sent to a decoder. The decoder converts the MPEG stream into TV output signals and delivers the TV output signals to a TV receiver. User control commands are accepted and sent through the system. These commands affect the flow of said MPEG stream and allow the user to view stored programs with at least the following functions: reverse, fast forward, play, pause, index, fast/slow reverse play, and fast/slow play.

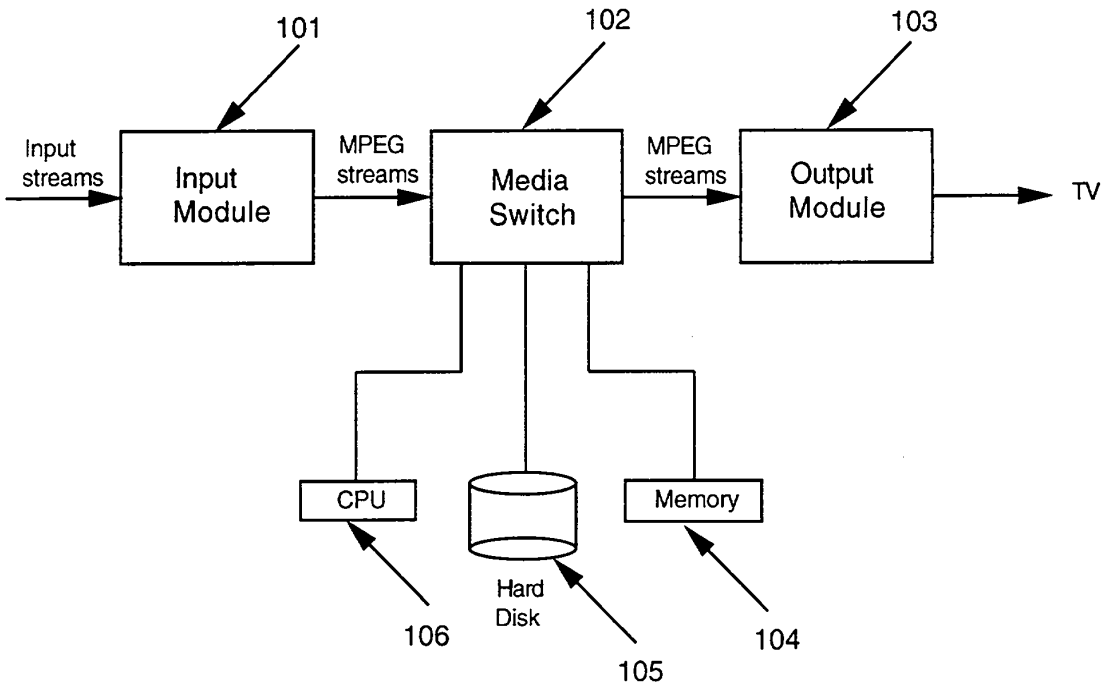
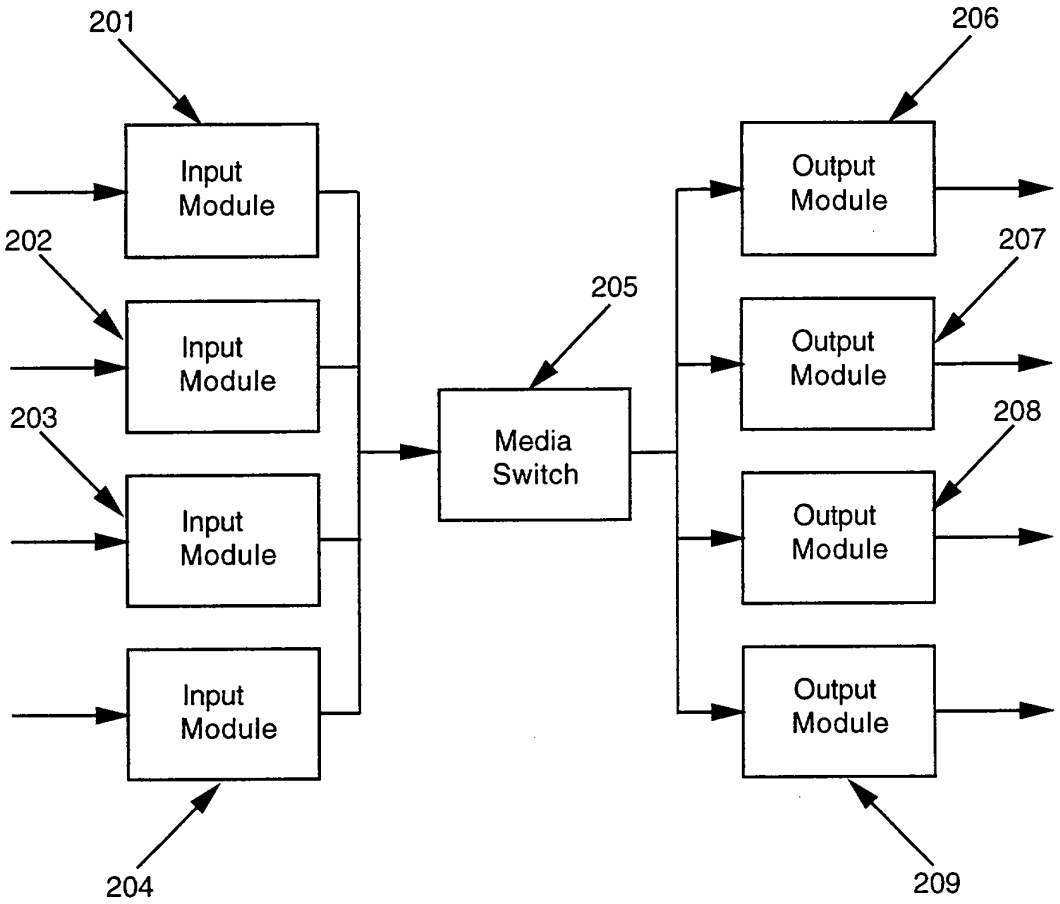

101
102
103
Input streams
Input Module
MPEG streams
Media Switch
MPEG streams
Output Module
TV
CPU
Hard Disk
Memory
106
105
104

Fig. 1


201
Input Module
202
Input Module
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Input Module
Input Module
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205
Media Switch
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Output Module
207
Output Module
208
Output Module
Output Module
209

Fig. 2

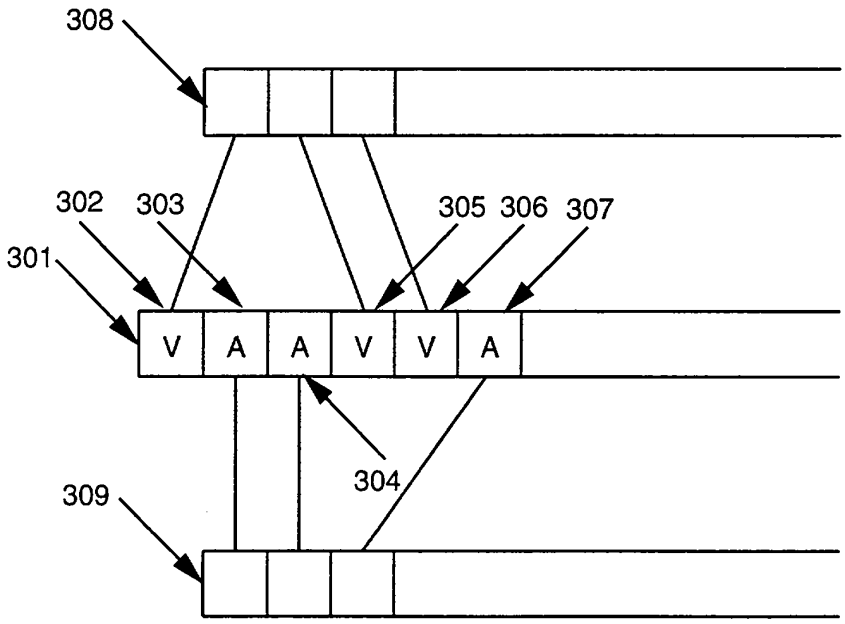
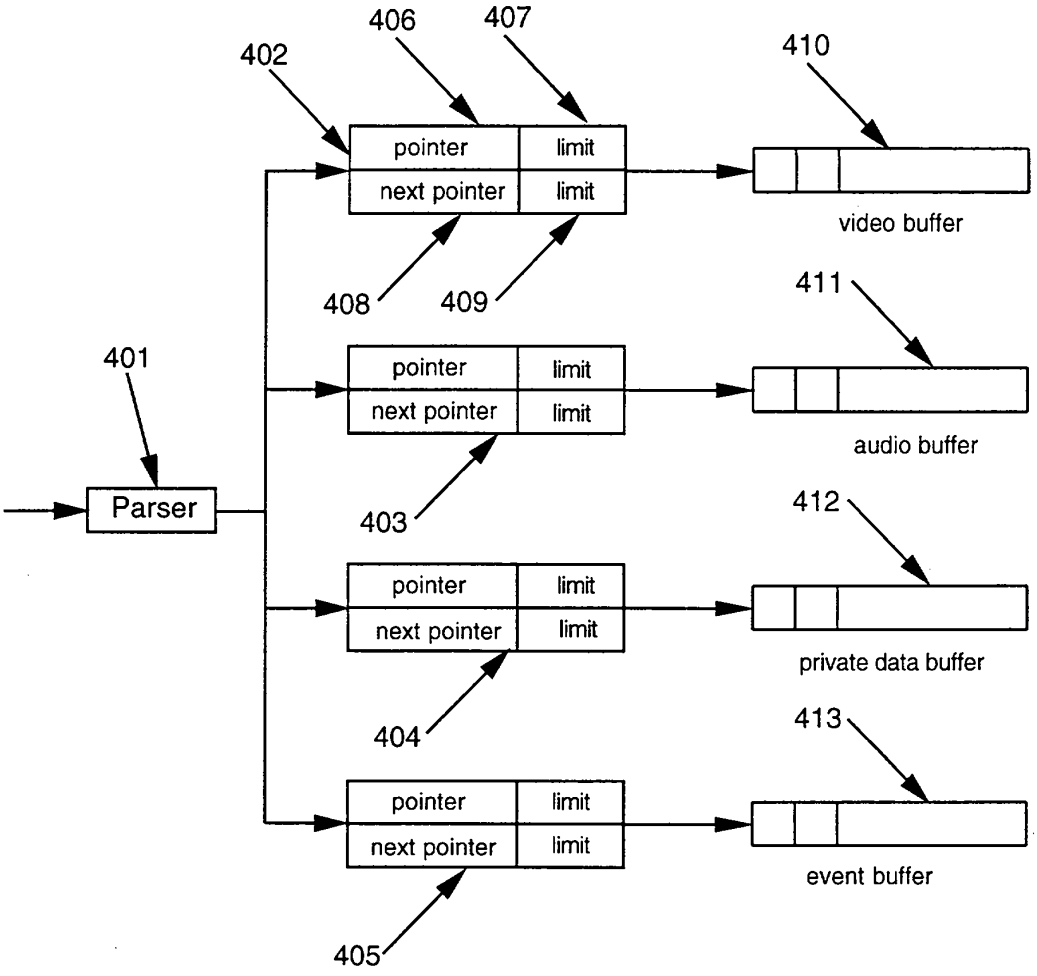


Fig. 3


406
407
402
410
pointer
limit
next pointer
limit
video buffer
408
409
411
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pointer
limit
next pointer
limit
audio buffer
Parser
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412
pointer
limit
next pointer
limit
private data buffer
404
413
pointer
limit
next pointer
limit
event buffer
405

Fig. 4

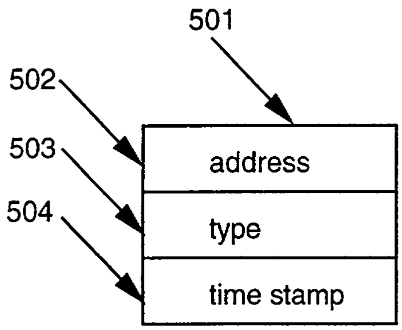
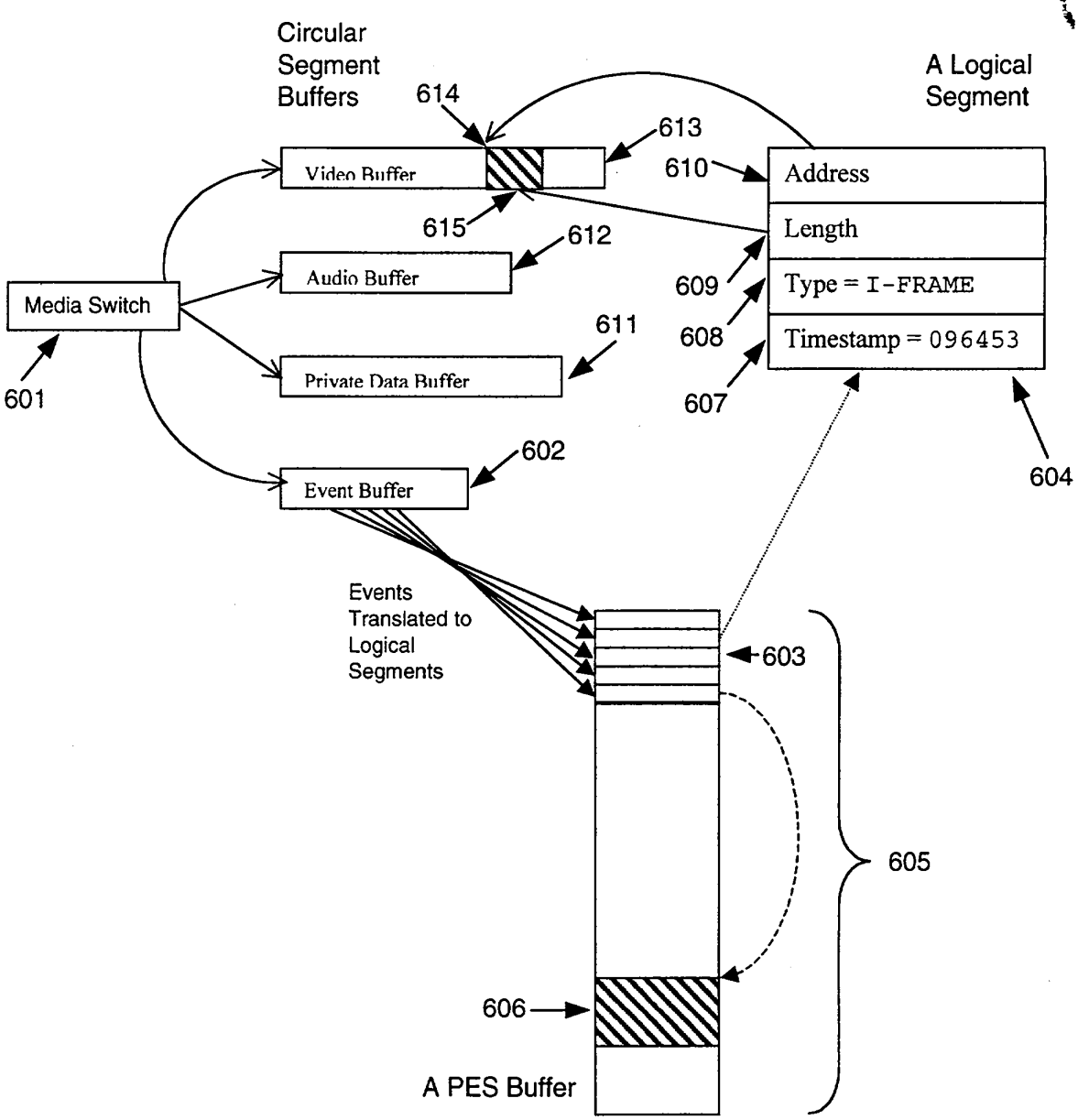


Fig. 5


Circular
Segment
Buffers
614
613
Video Buffer
615
612
Audio Buffer
611
Private Data Buffer
602
Event Buffer
Media Switch
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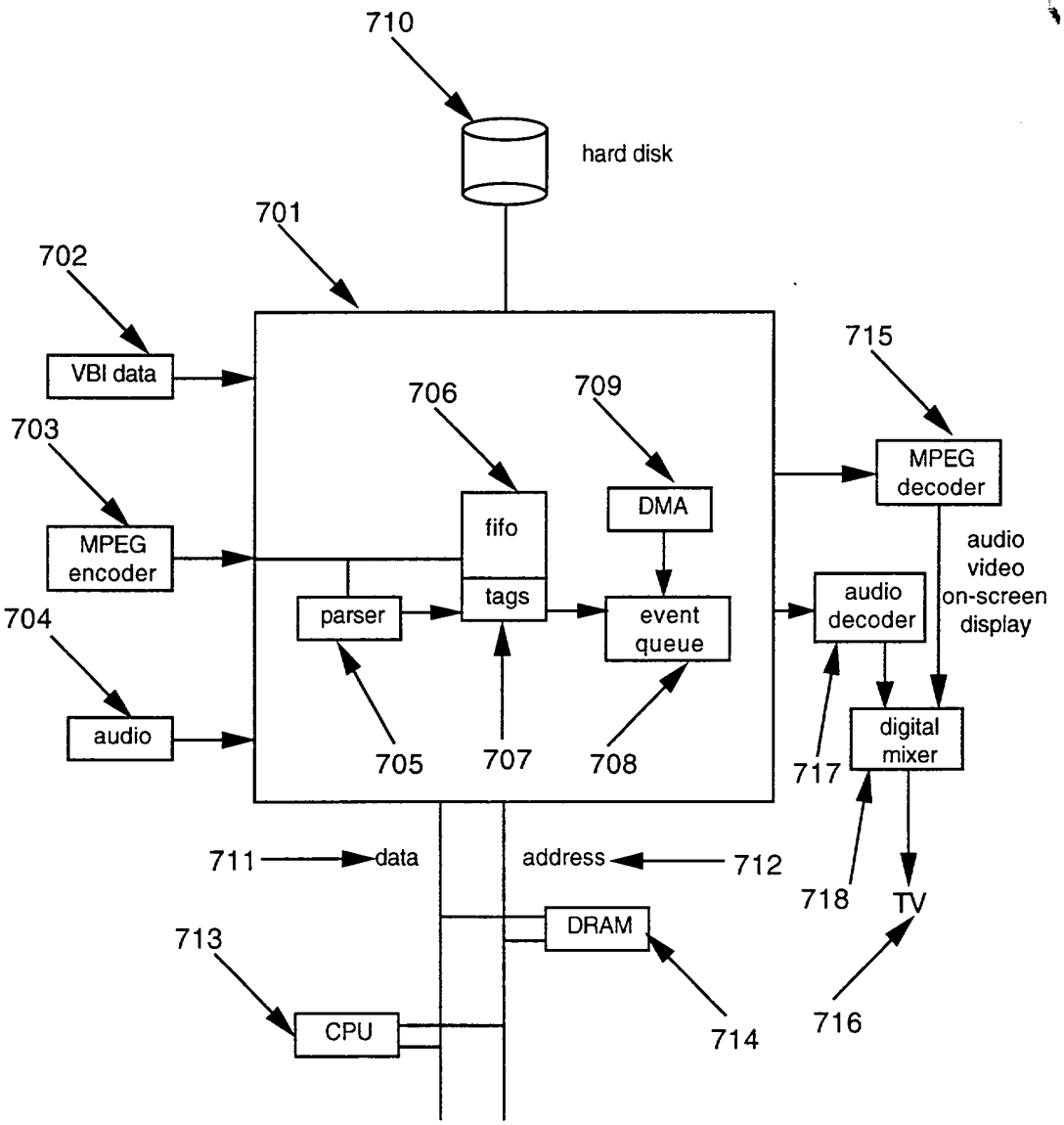
A Logical
Segment
610
Address
Length
Type = I-FRAME
Timestamp = 096453
609
608
607
604
Events
Translated to
Logical
Segments
603
605
606
A PES Buffer

Fig. 6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hard disk
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VBI data
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tags
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DMA
parser
event queue
705
707
708
715
MPEG decoder
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audio decoder
digital mixer
717
718
TV
716
711
data
address
712
713
CPU
DRAM
714

Fig. 7

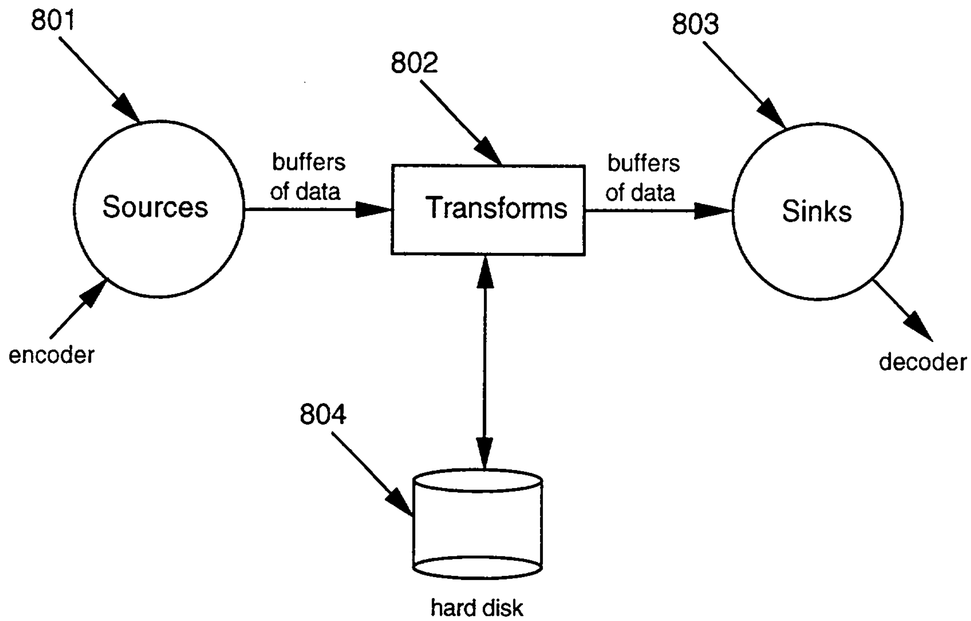
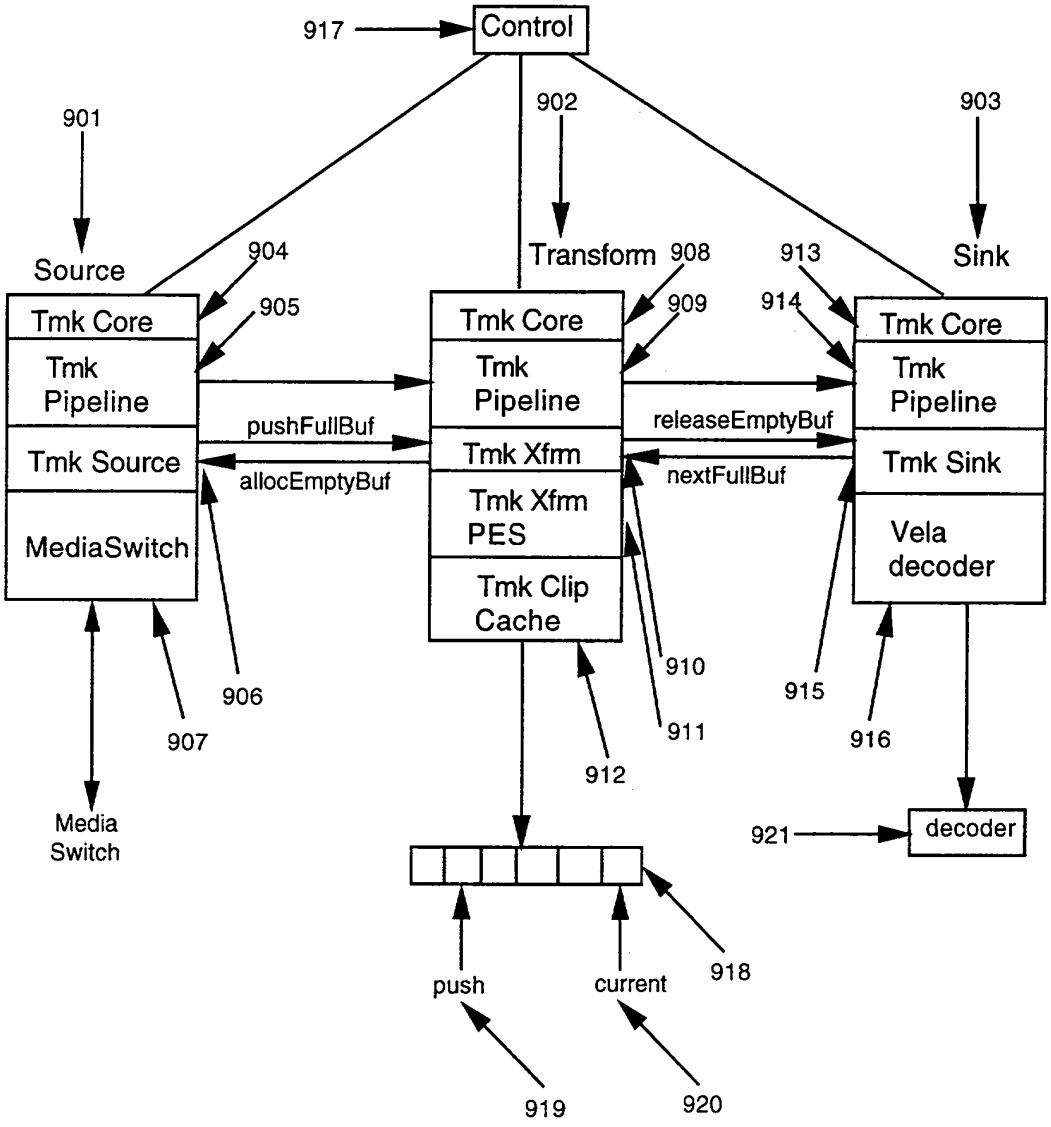


Fig. 8


917
Control
901
902
903
Source
Transform
Sink
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905
908
909
913
914
Tmk Core
Tmk Pipeline
Tmk Source
MediaSwitch
Tmk Core
Tmk Pipeline
Tmk Xfrm
Tmk Xfrm PES
Tmk Clip Cache
Tmk Core
Tmk Pipeline
Tmk Sink
Vela decoder
pushFullBuf
allocEmptyBuf
releaseEmptyBuf
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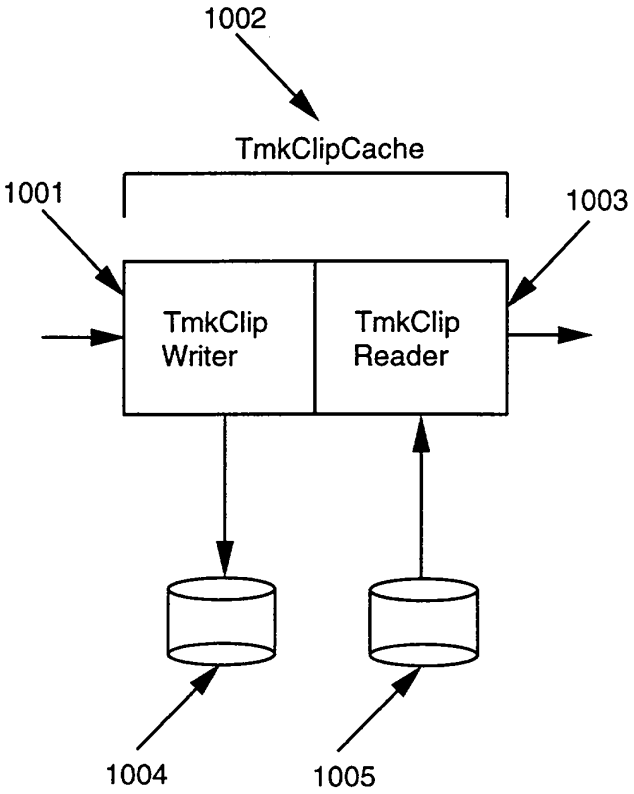
Media Switch
921
decoder
push
current
918
919
920

Fig. 9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TmkClipCache
1001
1003
TmkClip
Writer
TmkClip
Reader
1004
1005

Fig. 10

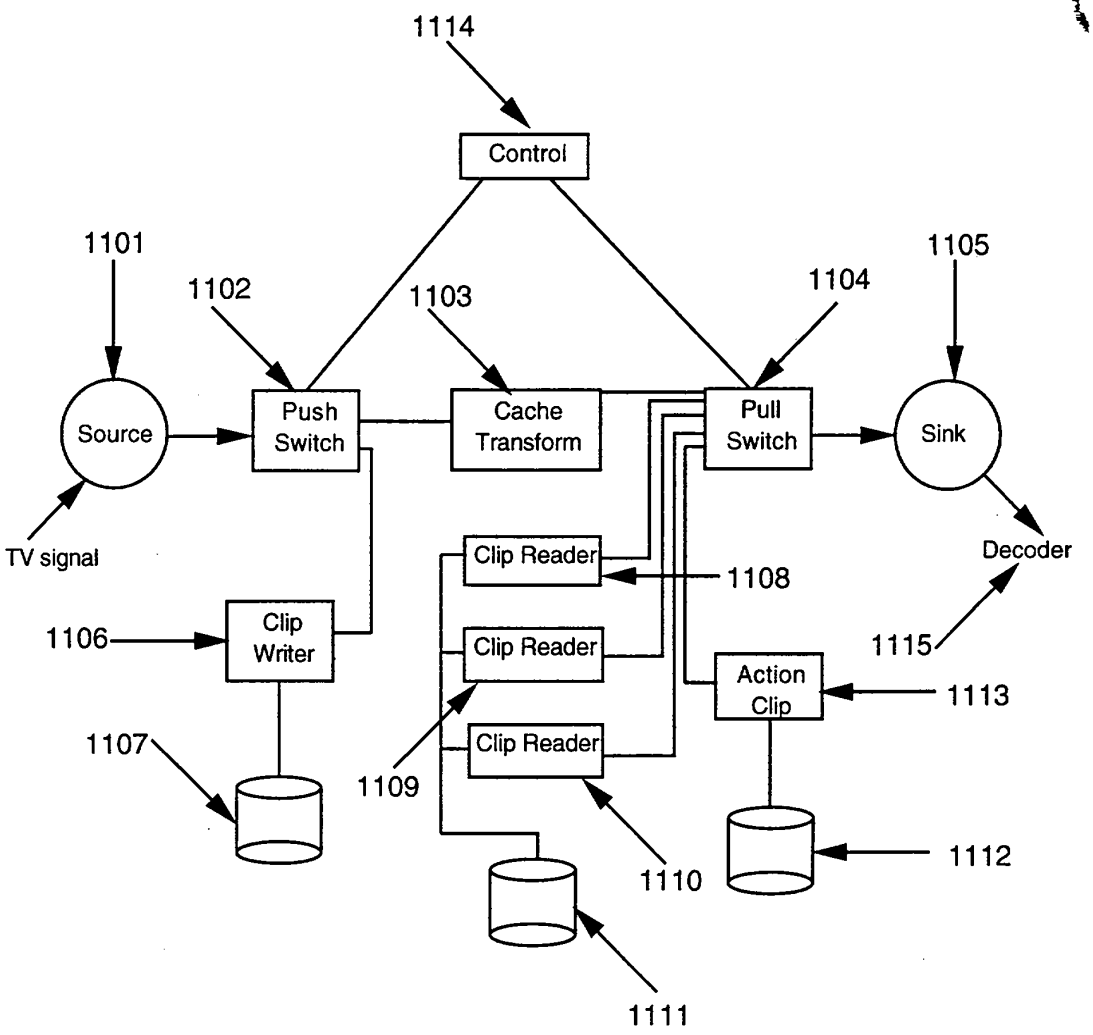
1114
Control
1101
1102
1103
1104
1105
Source
Push Switch
Cache Transform
Pull Switch
Sink
TV signal
Clip Reader
1108
Decoder
1106
Clip Writer
Clip Reader
1115
Action Clip
1113
1107
Clip Reader
1109
1112
1110
1111

Fig. 11

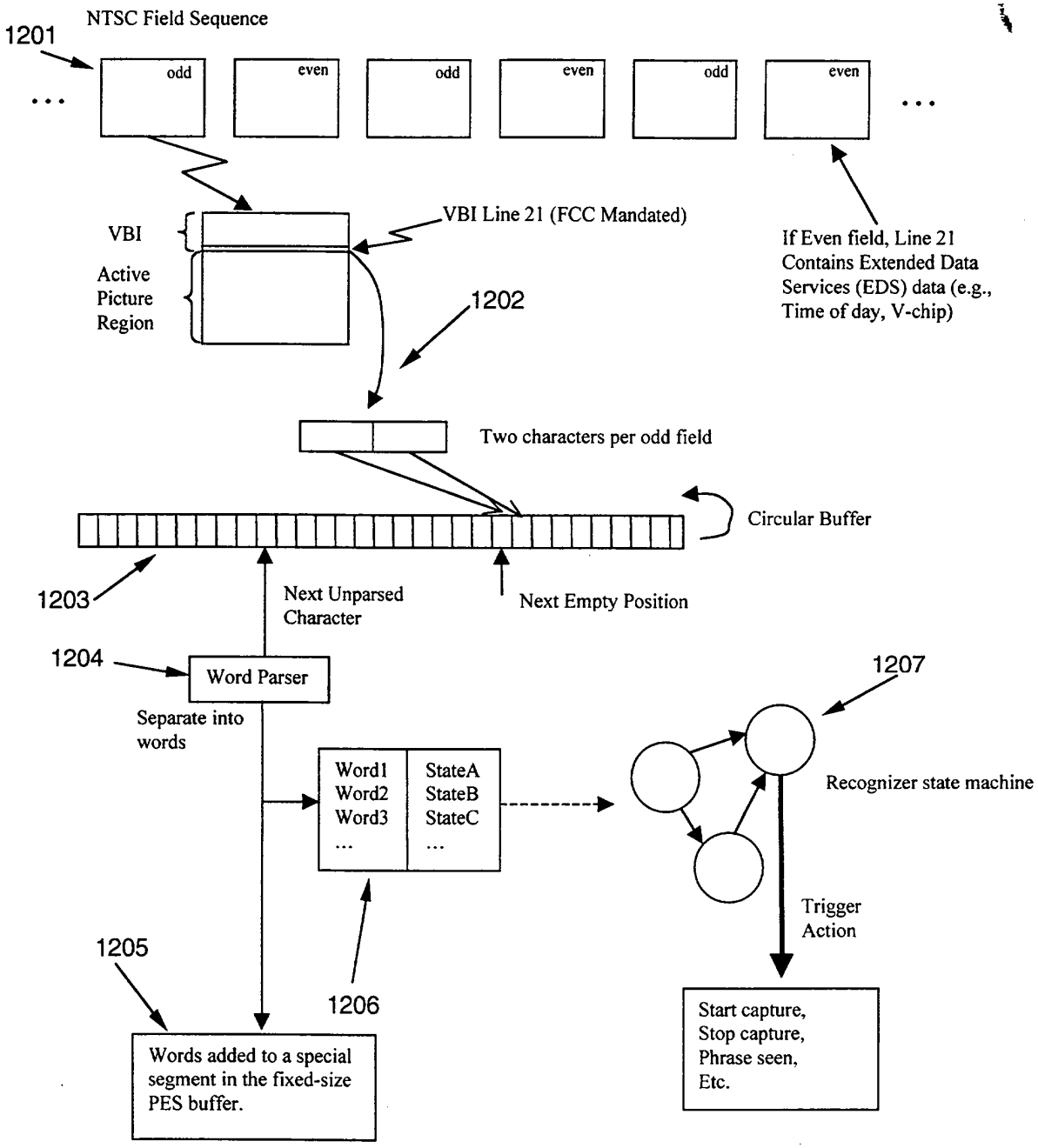
1201
NTSC Field Sequence
odd
even
odd
even
odd
even
VBI
Active Picture Region
VBI Line 21 (FCC Mandated)
1202
If Even field, Line 21 Contains Extended Data Services (EDS) data (e.g., Time of day, V-chip)
Two characters per odd field
Circular Buffer
1203
Next Unparsed Character
Next Empty Position
1204
Word Parser
Separate into words
Word1
Word2
Word3
StateA
StateB
StateC
1207
Recognizer state machine
Trigger Action
1205
1206
Words added to a special segment in the fixed-size PES buffer.
Start capture,
Stop capture,
Phrase seen,
Etc.

Fig. 12

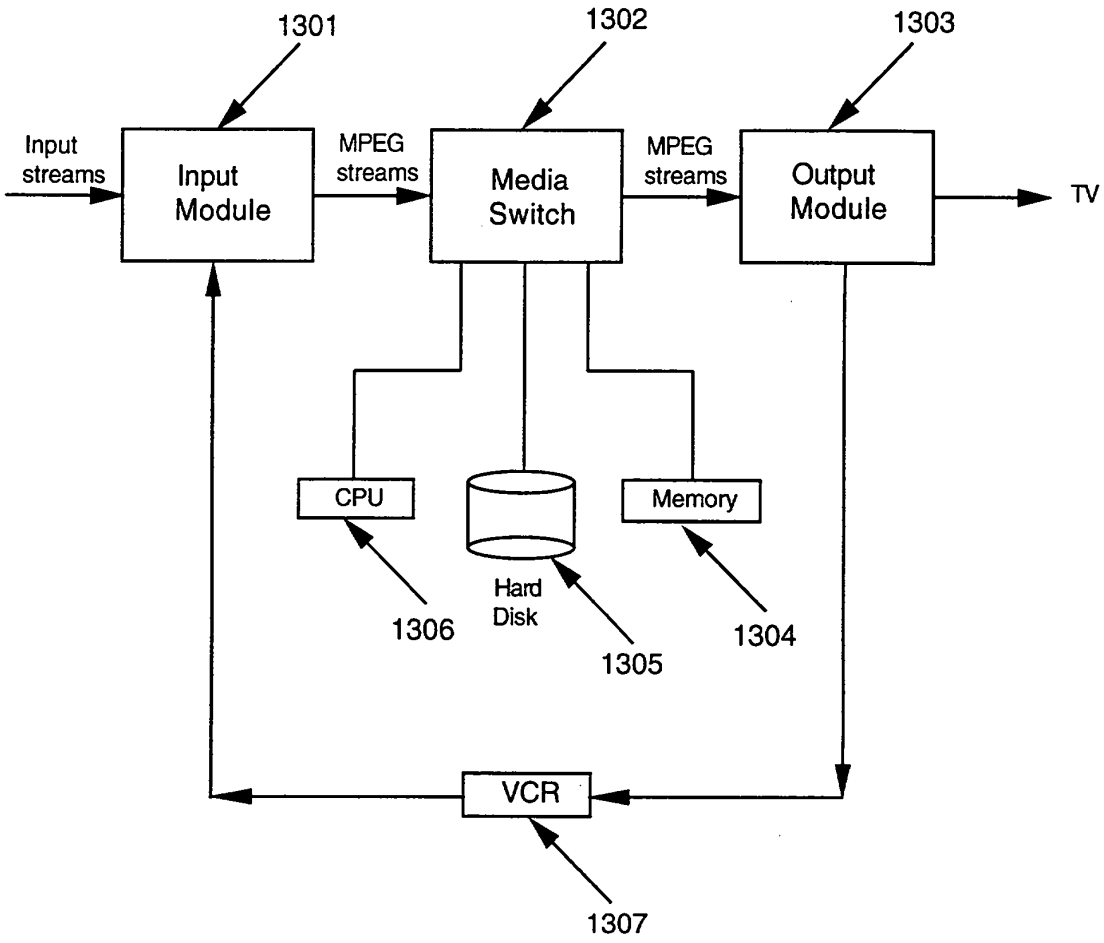
1301
1302
1303
Input streams
Input Module
MPEG streams
Media Switch
MPEG streams
Output Module
TV
CPU
Hard Disk
Memory
1306
1305
1304
VCR
1307

Fig. 13

Attorney Docket No. TIVO0003

DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name;

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

MULTIMEDIA TIME WARPING SYSTEM

the specification of which (check one) X is attached hereto, or ___ was filed on _____ as Application Serial No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

==========

I hereby claim foreign priority benefits under Title 35, United Sates Code, Section 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)	Priority Claimed Yes	No
_____	____	____
Number Country Day/Month/Year Filed		
_____	____	____
Number Country Day/Month/Year Filed		

==========

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

MICHAEL A. GLENN, Reg. No. 30,176
DONALD M. HENDRICKS, Reg. No. 40,355
KIRK D. WONG, Reg. No. P-43,284

SEND CORRESPONDENCE TO:

MICHAEL A. GLENN, P.O. Box 7831, Menlo Park, CA 94026

Attorney Docket No. TIVO0003

==========

I hereby claim the benefit under Title 35, United States code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application Ser. No.	Filing Date	Status: Patented, Pending, Abandoned

==========

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor: JAMES M. BARTON

Inventor's signature _____ Date 7/27/98

Residence 101 Sund Avenue, Los Gatos, California 95032

Post Office Address Same

Citizenship United States of America

Full name of second inventor: RODERICK JAMES MCINNIS

Inventor's signature _____ Date 7/21/98

Residence 1299 Canton Drive, Milpitas, California 95035

Post Office Address Same

Citizenship United States of America

Full name of third inventor: ALAN S. MOSKOWITZ

Inventor's signature _____ Date 24 July 1998

Residence 300 Third Street, San Francisco, California 94107

Post Office Address Same

Citizenship United States of America

Attorney Docket No. TIVO0003

Full name of fourth inventor: ANDREW MARTIN GOODMAN

Inventor's signature ____________ 7/27/98
Date

Residence 2171 Avy Avenue, Menlo Park, California 94025

Post Office Address Same

Citizenship United States of America

Full name of fifth inventor: CHING TONG CHOW

Inventor's signature ____________ 7/21/98
Date

Residence 920 Seville Place, Fremont, California 94539

Post Office Address Same

Citizenship Hong Kong

Full name of sixth inventor: JEAN SWEY KAO

Inventor's signature ____________ 7/24/98
Date

Residence 21876 Meadow View Lane, Cupertino, California 95014

Post Office Address Same

Citizenship United States of America

Attorney Docket No. TIVO0003

Applicants or Patentees: James M. Barton, Roderick J. McInnis, Alan Moskowitz, Andrew Goodman, Ching Tong Chow, and Jean Kao
Serial No.: Unassigned Filing Date: Herewith
Patent No.: Unassigned Issued: Unassigned

For: **MULTIMEDIA TIME WARPING SYSTEM**

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
37 CFR 1.9(f) and 1.27(b) - SMALL BUSINESS CONCERN

I hereby declare that I am:

( ) the owner of the small business concern identified below:

(X) an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN TiVo, Inc.
ADDRESS OF CONCERN 894 Ross Drive, Suite 100, Sunnyvale, California 94089

I hereby declare that the above-identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3 - 18 and reproduced in 37 CFR 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time, or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention entitled: **MULTIMEDIA TIME WARPING** by inventor(s) **James M. Barton, Roderick J. McInnis, Alan Moskowitz, Andrew Goodman, Ching Tong Chow, and Jean Kao** described in:

(x) the application filed herewith

( ) application serial no. _____, filed _____

( ) patent no. _____, issued _____

If the rights held by the above-identified small business concern are not exclusive, each individual, concern, or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than an inventor, who could not qualify as a small business concern under 37 CFR 1.9(d), or by any concern that could not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e).

( ) no such person, concern, or organization

( ) persons, concerns, or organizations listed below*

* NOTE: Separate verified statements are required from each named person, concern, or organization having rights to the invention averring to their status as small entities (37 CFR 1.27).

Attorney Docket No. TIVO0003

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Name: JAMES M. BARTON

Signature of Inventor

7/27/98

Date

Name: RODERICK MCINNIS

Signature of Inventor

7/21/98

Date

Name: ALAN MOSKOWITZ

Signature of Inventor

24 July 1998

Date

Name: ANDREW GOODMAN

Signature of Inventor

7/27/98

Date

Name: CHING TONG CHOW

Signature of Inventor

7/21/98

Date

Name: JEAN KAO

Signature of Inventor

7/27/98

Date

Attorney Docket No. TIVO0003

Applicants or Patentees: James M. Barton, Roderick McInnis, Alan Moskowitz, Andrew Goodman, Ching Tong Chow, and Jean Kao
Serial No.: _____ Filing Date: Herewith
Patent No.: _____ Issued: _____
For: **MULTIMEDIA TIME WARPING SYSTEM**

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
37 CFR 1.9(f) and 1.27(b) - INDEPENDENT INVENTOR

As a below-named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled:

MULTIMEDIA TIME WARPING SYSTEM

described in:

(X) the application filed herewith
( ) application serial no. _____, filed _____
( ) patent no. _____, issued _____

I have not assigned, granted, conveyed, or licensed and am under no obligation under contract or law to assign, grant, convey, or license any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

(x) no such person, concern, or organization

( ) persons, concerns, or organizations listed below*

* NOTE: Separate verified statements are required from each named person, concern, or organization having rights to the invention averring to their status as small entities (37 CFR 1.27).

FULL NAME _____
ADDRESS _____
( ) INDIVIDUAL ( ) SMALL BUSINESS CONCERN ( ) NONPROFIT ORGANIZATION

FULL NAME _____
ADDRESS _____
( ) INDIVIDUAL ( ) SMALL BUSINESS CONCERN ( ) NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate (37 CFR 1.28(b)).

FULL NAME ____
ADDRESS ____
( ) INDIVIDUAL ( ) SMALL BUSINESS CONCERN ( ) NONPROFIT ORGANIZATION

FULL NAME ____
ADDRESS ____
( ) INDIVIDUAL ( ) SMALL BUSINESS CONCERN ( ) NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING James M. Barton
TITLE OF PERSON OTHER THAN OWNER Chief Technical Officer & Vice President Engineering
ADDRESS OF PERSON SIGNING 101 Sund Avenue
Los Gatos, California 95032

SIGNATURE ______________ DATE 7/27/98

(... references)

POSITION	INITIALS	ID NO.	DATE
FEE DETERMINATION	T.D.		8/4/98
O.I.P.E. CLASSIFIER			/
FORMALITY REVIEW		71435	8/17/98

INDEX OF CLAIMS

✔	Rejected	N	Non-elected
=	Allowed	I	Interference
— (Through numeral)	Canceled	A	Appeal
÷	Restricted	O	Objected

Claim Final	Claim Original	Date 11/15/2000	Date 11/2/2000
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If more than 150 claims or 10 actions staple additional sheet here

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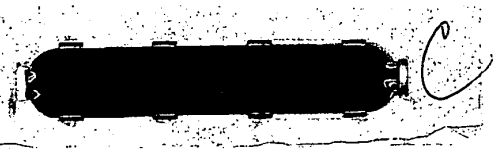
JC542 U.S. PTO
09/126071
07/30/98

ISSUE CLASSIFICATION	
Class	Subclass
386	46



PATENT NUMBER
6233389
6233389

U.S. UTILITY PATENT APPLICATION

O.I.P.E.	PATENT DATE
SCANNED ____ Q.A. ____	MAY 15 2001

SECTOR	CLASS	SUBCLASS	ART UNIT	EXAMINER
	345	327	2615	Tran
	386	46		

FILED WITH: ☐ DISK (CRF) ☐ FICHE
(Attached in pocket on right inside flap)

PREPARED AND APPROVED FOR ISSUE

ISSUING CLASSIFICATION

ORIGINAL		CROSS REFERENCE(S)							
CLASS	SUBCLASS	CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)						
386	46	386	68						
INTERNATIONAL CLASSIFICATION									
H04N	5/92								
	/								
	/								
	/								
	/								
				☐ Continued on Issue Slip Inside File Jacket					

☐ TERMINAL DISCLAIMER	DRAWINGS			CLAIMS ALLOWED	
	Sheets Drwg.	Figs. Drwg.	Print Fig.	Total Claims	Print Claim for O.G.
	13	13	1	61	1

☐ a) The term of this patent subsequent to ____ (date) has been disclaimed.	(Assistant Examiner) (Date)	NOTICE OF ALLOWANCE MAILED: 1-3-01
☐ b) The term of this patent shall not extend beyond the expiration date of U.S Patent. No. ____	(Primary Examiner) 11/2/2000 (Date)	ISSUE FEE MK Amount Due: $620-00 Date Paid: 3/14/01
☐ c) The terminal ____ months of this patent have been disclaimed.	Nancy Rose 1-6-01 (Legal Instruments Examiner) (Date)	ISSUE BATCH NUMBER: A23

WARNING:
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Form PTO-436A
(Rev. 10/97)

ISSUE FEE IN FILE

(LABEL AREA)

(FACE)

[redacted]

SEARCHED

Class	Sub.	Date	Exmr.
386	1, 33, 45, 46, 111-112, 125-126, 68	11/15/2000	TTQ
↓ 369	60		
366	7, 33,		
348	8, 10, 571, 714, 722 725		
↓ #04N	5/76 5/92 9/79 5/14		
updated the above search		1/2/2000	TTQ

INTERFERENCE SEARCHED

Class	Sub.	Date	Exmr.
386	46, 68	1/2/2000	TTQ

SEARCH NOTES
(INCLUDING SEARCH STRATEGY)

	Date	Exmr.

(RIGHT OUTSIDE)

Express Mail mailing label no. EL090779[redacted]
Date of deposit: July 29, 1998
I hereby certify that this paper is being deposited with the United States Postal Service " Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231.

Marcia D. Shea

Marcia D. Shea

07/30/98 JC542 U.S. PTO 09/126071 07/30/98

Date: July 29, 1998

Assistant Commissioner for Patents
BOX PATENT APPLICATIONS
Washington, D.C. 20231

Sir:

Transmitted herewith for filing is the patent application of:

Inventors: James M. BARTON, Roderick James McINNIS, Alan S. MOSKOWITZ, Andrew Martin GOODMAN, Ching Tong CHOW, Jean Swey KAO

For: MULTIMEDIA TIME WARPING SYSTEM

Docket No.: TIVO0003

Enclosed are:

(X) 13 sheets of drawings
(X) A copy of a patent application
(X) A declaration and power of attorney
(X) An assignment of the invention to: TIVO, INC.
(X) Verified Statement Claiming Small Entity Status- Individual
(X) Verified Statement Claiming Small Entity Status- Business
(X) An Information Disclosure Statement, 1449 Form and cited references
(X) One self addressed postcard

The filing fee has been calculated as shown below:

Fee Calculation (small entity)					
Fee Items	Claims Filed	Included with Basic Fee	Extra Claims	Fee Rate	Total
Total Claims	61	20	41	$ 11.00	$ 451.00
Independent Claims	4	3	1	$ 41.00	$ 41.00
Multiple Dependent Claim Fee (for one or more)				$ 135.00	
Assignment Recordation Fee				$ 40.00	$ 40.00
Basic Filing Fee				$ 395.00	$ 395.00
Total Fees					$ 927.00

A check in the amount of $927 is enclosed to cover the filing fee and assignment recording fee.
The Commmissioner is authorized to charge any additional fees or credit any overpayments to Deposit Account No. 07-1445 (Order No. TIVO0003). A copy of this sheet is enclosed for accounting purposes.

All correspondence connected herewith should be sent to:
Michael A. Glenn
P.O. Box 7831
Menlo Park, CA 94026

All telephone calls connected herewith should be directed to:
Michael A. Glenn (650) 851-7138

Respectfully submitted,

Michael A. Glenn
Reg. No. 30,176

Attorney Docket No. TIVO0003

MULTIMEDIA TIME WARPING SYSTEM

BACKGROUND OF THE INVENTION

TECHNICAL FIELD

The invention relates to the time shifting of television broadcast signals. More particularly, the invention relates to the real time capture, storage, and display of television broadcast signals.

DESCRIPTION OF THE PRIOR ART

The Video Cassette Recorder (VCR) has changed the lives of television (TV) viewers throughout the world. The VCR has offered viewers the flexibility to time-shift TV programs to match their lifestyles.

The viewer stores TV programs onto magnetic tape using the VCR. The VCR gives the viewer the ability to play, rewind, fast forward and pause the stored program material. These functions enable the viewer to pause the program playback whenever he desires, fast forward through unwanted program material or commercials, and to replay favorite scenes. However, a VCR cannot both capture and play back information at the same time.

One approach to solving this problem is to use several VCRs. For example, if two video tape recorders are available, it might be possible to Ping-Pong between the two. In this case, the first recorder is started at the beginning of the program of interest. If the viewer wishes to rewind the broadcast, the second

recorder begins recording, while the first recorder is halted, rewound to the appropriate place, and playback initiated. However, at least a third video tape recorder is required if the viewer wishes to fast forward to some point in time after the initial rewind was requested. In this case, the third recorder starts recording the broadcast stream while the second is halted and rewound to the appropriate position. Continuing this exercise, one can quickly see that the equipment becomes unwieldy, unreliable, expensive, and hard to operate, while never supporting all desired functions. In addition, tapes are of finite length, and may potentially end at inconvenient times, drastically lowering the value of the solution.

The use of digital computer systems to solve this problem has been suggested. U.S. Pat. No. 5,371,551 issued to Logan *et al*., on 6 December 1994, teaches a method for concurrent video recording and playback. It presents a microprocessor controlled broadcast and playback device. Said device compresses and stores video data onto a hard disk. However, this approach is difficult to implement because the processor requirements for keeping up with the high video rates makes the device expensive and problematic. The microprocessor must be extremely fast to keep up with the incoming and outgoing video data.

It would be advantageous to provide a multimedia time warping system that gives the user the ability to simultaneously record and play back TV broadcast programs. It would further be advantageous to provide a multimedia time warping system that utilizes an approach that decouples the microprocessor from the high video data rates, thereby reducing the microprocessor and system requirements which are at a premium.

SUMMARY OF THE INVENTION

The invention provides a multimedia time warping system. The invention utilizes an easily manipulated, low cost multimedia storage and display system that allows the user to view a television broadcast program with the option of instantly reviewing previous scenes within the program. In addition, the invention allows the user to store selected television broadcast programs while the user is simultaneously watching or reviewing another program.

A preferred embodiment of the invention accepts television (TV) input streams in a multitude of forms, for example, analog forms such as National Television Standards Committee (NTSC) or PAL broadcast, and digital forms such as Digital Satellite System (DSS), Digital Broadcast Services (DBS), or Advanced Television Standards Committee (ATSC). Analog TV streams are converted to an Moving Pictures Experts Group (MPEG) formatted stream for internal transfer and manipulation, while pre-formatted MPEG streams are extracted from the digital TV signal and presented in a similar format to encoded analog streams.

The invention parses the resulting MPEG stream and separates it into its video and audio components. It then stores the components into temporary buffers. Events are recorded that indicate the type of component that has been found, where it is located, and when it occurred. The program logic is notified that an event has occurred and the data is extracted from the buffers.

The parser and event buffer decouple the CPU from having to parse the MPEG stream and from the real time nature of the data streams. This decoupling allows for slower CPU and bus speeds which translate to lower system costs.

The video and audio components are stored on a storage device. When the program is requested for display, the video and audio components are extracted from the storage device and reassembled into an MPEG stream. The MPEG stream is sent to a decoder. The decoder converts the MPEG stream into TV output signals and delivers the TV output signals to a TV receiver.

User control commands are accepted and sent through the system. These commands affect the flow of said MPEG stream and allow the user to view stored programs with at least the following functions: reverse, fast forward, play, pause, index, fast/slow reverse play, and fast/slow play.

Other aspects and advantages of the invention will become apparent from the following detailed description in combination with the accompanying drawings, illustrating, by way of example, the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block schematic diagram of a high level view of a preferred embodiment of the invention according to the invention;

Fig. 2 is a block schematic diagram of a preferred embodiment of the invention using multiple input and output modules according to the invention;

Fig. 3 is a schematic diagram of an Moving Pictures Experts Group (MPEG) data stream and its video and audio components according to the invention;

Fig. 4 is a block schematic diagram of a parser and four direct memory access (DMA) input engines contained in the Media Switch according to the invention;

Fig. 5 is a schematic diagram of the components of a packetized elementary stream (PES) buffer according to the invention;

Fig. 6 is a schematic diagram of the construction of a PES buffer from the parsed components in the Media Switch output circular buffers;

Fig. 7 is a block schematic diagram of the Media Switch and the various components that it communicates with according to the invention;

Fig. 8 is a block schematic diagram of a high level view of the program logic according to the invention;

Fig. 9 is a block schematic diagram of a class hierarchy of the program logic according to the invention;

Fig. 10 is a block schematic diagram of a preferred embodiment of the clip cache component of the invention according to the invention;

Fig. 11 is a block schematic diagram of a preferred embodiment of the invention that emulates a broadcast studio video mixer according to the invention;

Fig. 12 is a block schematic diagram of a closed caption parser according to the invention; and

Fig. 13 is a block schematic diagram of a high level view of a preferred embodiment of the invention utilizing a VCR as an integral component of the invention according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

The invention is embodied in a multimedia time warping system. A system according to the invention provides a multimedia storage and display system that allows the user to view a television broadcast program with the option of instantly reviewing previous scenes within the program. The invention additionally provides the user with the ability to store selected television broadcast programs while simultaneously watching or reviewing another program and to view stored programs with at least the following functions: reverse, fast forward, play, pause, index, fast/slow reverse play, and fast/slow play.

Referring to Fig. 1, a preferred embodiment of the invention has an Input Section 101, Media Switch 102, and an Output Section 103. The Input Section 101 takes television (TV) input streams in a multitude of forms, for example, National Television Standards Committee (NTSC) or PAL broadcast, and digital forms such as Digital Satellite System (DSS), Digital Broadcast Services (DBS), or Advanced Television Standards Committee (ATSC). DBS, DSS and ATSC are based on standards called Moving Pictures Experts Group 2 (MPEG2) and MPEG2 Transport. MPEG2 Transport is a standard for formatting the digital data stream from the TV source transmitter so that a TV receiver can disassemble the input stream to find programs in the multiplexed signal. The Input Section 101 produces MPEG streams. An MPEG2 transport multiplex supports multiple programs in the same broadcast channel, with multiple video and audio feeds and private data. The Input Section 101 tunes the channel to a particular program, extracts a specific MPEG program out of it, and feeds it to the rest of the system. Analog TV signals are encoded into a similar MPEG format using separate video and audio encoders, such that the remainder of the system is unaware of how the signal was obtained. Information may be

modulated into the Vertical Blanking Interval (VBI) of the analog TV signal in a number of standard ways; for example, the North American Broadcast Teletext Standard (NABTS) may be used to modulate information onto lines 10 through 20 of an NTSC signal, while the FCC mandates the use of line 21 for Closed Caption (CC) and Extended Data Services (EDS). Such signals are decoded by the input section and passed to the other sections as if they were delivered via an MPEG2 private data channel.

The Media Switch 102 mediates between a microprocessor CPU 106, hard disk or storage device 105, and memory 104. Input streams are converted to an MPEG stream and sent to the Media Switch 102. The Media Switch 102 buffers the MPEG stream into memory. It then performs two operations if the user is watching real time TV: the stream is sent to the Output Section 103 and it is written simultaneously to the hard disk or storage device 105.

The Output Section 103 takes MPEG streams as input and produces an analog TV signal according to the NTSC, PAL, or other required TV standards. The Output Section 103 contains an MPEG decoder, On-Screen Display (OSD) generator, analog TV encoder and audio logic. The OSD generator allows the program logic to supply images which will be overlayed on top of the resulting analog TV signal. Additionally, the Output Section can modulate information supplied by the program logic onto the VBI of the output signal in a number of standard formats, including NABTS, CC and EDS.

With respect to Fig. 2, the invention easily expands to accommodate multiple Input Sections (tuners) 201, 202, 203, 204, each can be tuned to different types of input. Multiple Output Modules (decoders) 206, 207, 208, 209 are added as well. Special effects such as picture in a picture can be implemented with multiple decoders. The Media Switch 205 records one program while the user

is watching another. This means that a stream can be extracted off the disk while another stream is being stored onto the disk.

Referring to Fig. 3, the incoming MPEG stream 301 has interleaved video 302, 305, 306 and audio 303, 304, 307 segments. These elements must be separated and recombined to create separate video 308 and audio 309 streams or buffers. This is necessary because separate decoders are used to convert MPEG elements back into audio or video analog components. Such separate delivery requires that time sequence information be generated so that the decoders may be properly synchronized for accurate playback of the signal.

The Media Switch enables the program logic to associate proper time sequence information with each segment, possibly embedding it directly into the stream. The time sequence information for each segment is called a time stamp. These time stamps are monotonically increasing and start at zero each time the system boots up. This allows the invention to find any particular spot in any particular video segment. For example, if the system needs to read five seconds into an incoming contiguous video stream that is being cached, the system simply has to start reading forward into the stream and look for the appropriate time stamp.

A binary search can be performed on a stored file to index into a stream. Each stream is stored as a sequence of fixed-size segments enabling fast binary searches because of the uniform time stamping. If the user wants to start in the middle of the program, the system performs a binary search of the stored segments until it finds the appropriate spot, obtaining the desired results with a minimal amount of information. If the signal were instead stored as an MPEG stream, it would be necessary to linearly parse the stream from the beginning to find the desired location.

With respect to Fig. 4, the Media Switch contains four input Direct Memory Access (DMA) engines 402, 403, 404, 405 each DMA engine has an associated buffer 410, 411, 412, 413. Conceptually, each DMA engine has a pointer 406, a limit for that pointer 407, a next pointer 408, and a limit for the next pointer 409. Each DMA engine is dedicated to a particular type of information, for example, video 402, audio 403, and parsed events 405. The buffers 410, 411, 412, 413 are circular and collect the specific information. The DMA engine increments the pointer 406 into the associated buffer until it reaches the limit 407 and then loads the next pointer 408 and limit 409. Setting the pointer 406 and next pointer 408 to the same value, along with the corresponding limit value creates a circular buffer. The next pointer 408 can be set to a different address to provide vector DMA.

The input stream flows through a parser 401. The parser 401 parses the stream looking for MPEG distinguished events indicating the start of video, audio or private data segments. For example, when the parser 401 finds a video event, it directs the stream to the video DMA engine 402. The parser 401 buffers up data and DMAs it into the video buffer 410 through the video DMA engine 402. At the same time, the parser 401 directs an event to the event DMA engine 405 which generates an event into the event buffer 413. When the parser 401 sees an audio event, it redirects the byte stream to the audio DMA engine 403 and generates an event into the event buffer 413. Similarly, when the parser 401 sees a private data event, it directs the byte stream to the private data DMA engine 404 and directs an event to the event buffer 413. The Media Switch notifies the program logic via an interrupt mechanism when events are placed in the event buffer.

Referring to Figs. 4 and 5, the event buffer 413 is filled by the parser 401 with events. Each event 501 in the event buffer has an offset 502, event type 503, and time stamp field 504. The parser 401 provides the type and offset of each event as it is placed into the buffer. For example, when an audio event occurs, the event type field is set to an audio event and the offset indicates the location in the audio buffer 411. The program logic knows where the audio buffer 411 starts and adds the offset to find the event in the stream. The address offset 502 tells the program logic where the next event occurred, but not where it ended. The previous event is cached so the end of the current event can be found as well as the length of the segment.

With respect to Figs. 5 and 6, the program logic reads accumulated events in the event buffer 602 when it is interrupted by the Media Switch 601. From these events the program logic generates a sequence of logical segments 603 which correspond to the parsed MPEG segments 615. The program logic converts the offset 502 into the actual address 610 of each segment, and records the event length 609 using the last cached event. If the stream was produced by encoding an analog signal, it will not contain Program Time Stamp (PTS) values, which are used by the decoders to properly present the resulting output. Thus, the program logic uses the generated time stamp 504 to calculate a simulated PTS for each segment and places that into the logical segment time stamp 607. In the case of a digital TV stream, PTS values are already encoded in the stream. The program logic extracts this information and places it in the logical segment time stamp 607.

The program logic continues collecting logical segments 603 until it reaches the fixed buffer size. When this occurs, the program logic generates a new buffer, called a Packetized Elementary Stream (PES) 605 buffer containing these logical segments 603 in order, plus ancillary control information. Each logical

segment points 604 directly to the circular buffer,*e.g.*, the video buffer 613, filled by the Media Switch 601. This new buffer is then passed to other logic components, which may further process the stream in the buffer in some way, such as presenting it for decoding or writing it to the storage media. Thus, the MPEG data is not copied from one location in memory to another by the processor. This results in a more cost effective design since lower memory bandwidth and processor bandwidth is required.

A unique feature of the MPEG stream transformation into PES buffers is that the data associated with logical segments need not be present in the buffer itself, as presented above. When a PES buffer is written to storage, these logical segments are written to the storage medium in the logical order in which they appear. This has the effect of gathering components of the stream, whether they be in the video, audio or private data circular buffers, into a single linear buffer of stream data on the storage medium. The buffer is read back from the storage medium with a single transfer from the storage media, and the logical segment information is updated to correspond with the actual locations in the buffer 606. Higher level program logic is unaware of this transformation, since it handles only the logical segments, thus stream data is easily managed without requiring that the data ever be copied between locations in DRAM by the CPU.

A unique aspect of the Media Switch is the ability to handle high data rates effectively and inexpensively. It performs the functions of taking video and audio data in, sending video and audio data out, sending video and audio data to disk, and extracting video and audio data from the disk on a low cost platform. Generally, the Media Switch runs asynchronously and autonomously with the microprocessor CPU, using its DMA capabilities to move large quantities of information with minimal intervention by the CPU.

Referring to Fig: 7, the input side of the Media Switch 701 is connected to an MPEG encoder 703. There are also circuits specific to MPEG audio 704 and vertical blanking interval (VBI) data 702 feeding into the Media Switch 701. If a digital TV signal is being processed instead, the MPEG encoder 703 is replaced with an MPEG2 Transport Demultiplexor, and the MPEG audio encoder 704 and VBI decoder 702 are deleted. The demultiplexor multiplexes the extracted audio, video and private data channel streams through the video input Media Switch port.

The parser 705 parses the input data stream from the MPEG encoder 703, audio encoder 704 and VBI decoder 702, or from the transport demultiplexor in the case of a digital TV stream. The parser 705 detects the beginning of all of the important events in a video or audio stream, the start of all of the frames, the start of sequence headers - all of the pieces of information that the program logic needs to know about in order to both properly play back and perform special effects on the stream, *e.g.* fast forward, reverse, play, pause, fast/slow play, indexing, and fast/slow reverse play.

The parser 705 places tags 707 into the FIFO 706 when it identifies video or audio segments, or is given private data. The DMA 709 controls when these tags are taken out. The tags 707 and the DMA addresses of the segments are placed into the event queue 708. The frame type information, whether it is a start of a video I-frame, video B-frame, video P-frame, video PES, audio PES, a sequence header, an audio frame, or private data packet, is placed into the event queue 708 along with the offset in the related circular buffer where the piece of information was placed. The program logic operating in the CPU 713 examines events in the circular buffer after it is transferred to the DRAM 714.

The Media Switch 701 has a data bus 711 that connects to the CPU 713 and DRAM 714. An address bus 712 is also shared between the Media Switch 701, CPU 713, and DRAM 714. A hard disk or storage device 710 is connected to one of the ports of the Media Switch 701. The Media Switch 701 outputs streams to an MPEG video decoder 715 and a separate audio decoder 717. The audio decoder 717 signals contain audio cues generated by the system in response to the user's commands on a remote control or other internal events. The decoded audio output from the MPEG decoder is digitally mixed 718 with the separate audio signal. The resulting signals contain video, audio, and on-screen displays and are sent to the TV 716.

The Media Switch 701 takes in 8-bit data and sends it to the disk, while at the same time extracts another stream of data off of the disk and sends it to the MPEG decoder 715. All of the DMA engines described above can be working at the same time. The Media Switch 701 can be implemented in hardware using a Field Programmable Gate Array (FPGA), ASIC, or discrete logic.

Rather than having to parse through an immense data stream looking for the start of where each frame would be, the program logic only has to look at the circular event buffer in DRAM 714 and it can tell where the start of each frame is and the frame type. This approach saves a large amount of CPU power, keeping the real time requirements of the CPU 713 small. The CPU 713 does not have to be very fast at any point in time. The Media Switch 701 gives the CPU 713 as much time as possible to complete tasks. The parsing mechanism 705 and event queue 708 decouple the CPU 713 from parsing the audio, video, and buffers and the real time nature of the streams, which allows for lower costs. It also allows the use of a bus structure in a CPU environment that operates at a much lower clock rate with much cheaper memory than would be required otherwise.

The CPU 713 has the ability to queue up one DMA transfer and can set up the next DMA transfer at its leisure. This gives the CPU 713 large time intervals within which it can service the DMA controller 709. The CPU 713 may respond to a DMA interrupt within a larger time window because of the large latency allowed. MPEG streams, whether extracted from an MPEG2 Transport or encoded from an analog TV signal, are typically encoded using a technique called Variable Bit Rate encoding (VBR). This technique varies the amount of data required to represent a sequence of images by the amount of movement between those images. This technique can greatly reduce the required bandwidth for a signal, however sequences with rapid movement (such as a basketball game) may be encoded with much greater bandwidth requirements. For example, the Hughes DirecTV satellite system encodes signals with anywhere from 1 to 10Mb/s of required bandwidth, varying from frame to frame. It would be difficult for any computer system to keep up with such rapidly varying data rates without this structure.

With respect to Fig. 8, the program logic within the CPU has three conceptual components: sources 801, transforms 802, and sinks 803. The sources 801 produce buffers of data. Transforms 802 process buffers of data and sinks 803 consume buffers of data. A transform is responsible for allocating and queuing the buffers of data on which it will operate. Buffers are allocated as if "empty" to sources of data, which give them back "full". The buffers are then queued and given to sinks as "full", and the sink will return the buffer "empty".

A source 801 accepts data from encoders, *e.g.,* a digital satellite receiver. It acquires buffers for this data from the downstream transform, packages the data into a buffer, then pushes the buffer down the pipeline as described above. The source object 801 does not know anything about the rest of the system. The

sink 803 consumes buffers, taking a buffer from the upstream transform, sending the data to the decoder, and then releasing the buffer for reuse.

There are two types of transforms 802 used: spatial and temporal. Spatial transforms are transforms that perform, for example, an image convolution or compression/decompression on the buffered data that is passing through. Temporal transforms are used when there is no time relation that is expressible between buffers going in and buffers coming out of a system. Such a transform writes the buffer to a file 804 on the storage medium. The buffer is pulled out at a later time, sent down the pipeline, and properly sequenced within the stream.

Referring to Fig. 9, a C++ class hierarchy derivation of the program logic is shown. The TiVo Media Kernel (Tmk) 904, 908, 913 mediates with the operating system kernel. The kernel provides operations such as: memory allocation, synchronization, and threading. The TmkCore 904, 908, 913 structures memory taken from the media kernel as an object. It provides operators, new and delete, for constructing and deconstructing the object. Each object (source 901, transform 902, and sink 903) is multi-threaded by definition and can run in parallel.

The TmkPipeline class 905, 909, 914 is responsible for flow control through the system. The pipelines point to the next pipeline in the flow from source 901 to sink 903. To pause the pipeline, for example, an event called "pause" is sent to the first object in the pipeline. The event is relayed on to the next object and so on down the pipeline. This all happens asynchronously to the data going through the pipeline. Thus, similar to applications such as telephony, control of the flow of MPEG streams is asynchronous and separate from the streams themselves. This allows for a simple logic design that is at the same time powerful enough to support the features described previously, including pause,

rewind, fast forward and others. In addition, this structure allows fast and efficient switching between stream sources, since buffered data can be simply discarded and decoders reset using a single event, after which data from the new stream will pass down the pipeline. Such a capability is needed, for example, when switching the channel being captured by the input section, or when switching between a live signal from the input section and a stored stream.

The source object 901 is a TmkSource 906 and the transform object 902 is a TmkXfrm 910. These are intermediate classes that define standard behaviors for the classes in the pipeline. Conceptually, they handshake buffers down the pipeline. The source object 901 takes data out of a physical data source, such as the Media Switch, and places it into a PES buffer. To obtain the buffer, the source object 901 asks the down stream object in his pipeline for a buffer (allocEmptyBuf). The source object 901 is blocked until there is sufficient memory. This means that the pipeline is self-regulating; it has automatic flow control. When the source object 901 has filled up the buffer, it hands it back to the transform 902 through the pushFullBuf function.

The sink 903 is flow controlled as well. It calls nextFullBuf which tells the transform 902 that it is ready for the next filled buffer. This operation can block the sink 903 until a buffer is ready. When the sink 903 is finished with a buffer (*i.e.*, it has consumed the data in the buffer) it calls releaseEmptyBuf. ReleaseEmptyBuf gives the buffer back to the transform 902. The transform 902 can then hand that buffer, for example, back to the source object 901 to fill up again. In addition to the automatic flow-control benefit of this method, it also provides for limiting the amount of memory dedicated to buffers by allowing enforcement of a fixed allocation of buffers by a transform. This is an important feature in achieving a cost-effective limited DRAM environment.

The MediaSwitch class 909 calls the allocEmptyBuf method of the TmkClipCache 912 object and receives a PES buffer from it . It then goes out to the circular buffers in the Media Switch hardware and generates PES buffers. The MediaSwitch class 909 fills the buffer up and pushes it back to the TmkClipCache 912 object.

The TmkClipCache 912 maintains a cache file 918 on a storage medium. It also maintains two pointers into this cache: a push pointer 919 that shows where the next buffer coming from the source 901 is inserted; and a current pointer 920 which points to the current buffer used.

The buffer that is pointed to by the current pointer is handed to the Vela decoder class 916. The Vela decoder class 916 talks to the decoder 921 in the hardware. The decoder 921 produces a decoded TV signal that is subsequently encoded into an analog TV signal in NTSC, PAL or other analog format. When the Vela decoder class 916 is finished with the buffer it calls releaseEmptyBuf.

The structure of the classes makes the system easy to test and debug. Each level can be tested separately to make sure it performs in the appropriate manner, and the classes may be gradually aggregated to achieve the desired functionality while retaining the ability to effectively test each object.

The control object 917 accepts commands from the user and sends events into the pipeline to control what the pipeline is doing. For example, if the user has a remote control and is watching TV, the user presses pause and the control object 917 sends an event to the sink 903, that tells it pause. The sink 903 stops asking for new buffers. The current pointer 920 stays where it is at. The

sink 903 starts taking buffers out again when it receives another event that tells it to play. The system is in perfect synchronization; it starts from the frame that it stopped at.

The remote control may also have a fast forward key. When the fast forward key is pressed, the control object 917 sends an event to the transform 902, that tells it to move forward two seconds. The transform 902 finds that the two second time span requires it to move forward three buffers. It then issues a reset event to the downstream pipeline, so that any queued data or state that may be present in the hardware decoders is flushed. This is a critical step, since the structure of MPEG streams requires maintenance of state across multiple frames of data, and that state will be rendered invalid by repositioning the pointer. It then moves the current pointer 920 forward three buffers. The next time the sink 903 calls nextFullBuf it gets the new current buffer. The same method works for fast reverse in that the transform 902 moves the current pointer 920 backwards.

A system clock reference resides in the decoder. The system clock reference is sped up for fast play or slowed down for slow play. The sink simply asks for full buffers faster or slower, depending on the clock speed.

With respect to Fig. 10, two other objects derived from the TmkXfrm class are placed in the pipeline for disk access. One is called TmkClipReader 1003 and the other is called TmkClipWriter 1001. Buffers come into the TmkClipWriter 1001 and are pushed to a file on a storage medium 1004. TmkClipReader 1003 asks for buffers which are taken off of a file on a storage medium 1005. A TmkClipReader 1003 provides only the allocEmptyBuf and pushFullBuf methods, while a TmkClipWriter 1001 provides only the nextFullBuf and releaseEmptyBuf methods. A TmkClipReader 1003 therefore performs the

same function as the input, or "push" side of a TmkClipCache 1002, while a TmkClipWriter 1001 therefore performs the same function as the output, or "pull" side of a TmkClipCache 1002.

Referring to Fig. 11, a preferred embodiment that accomplishes multiple functions is shown. A source 1101 has a TV signal input. The source sends data to a PushSwitch 1102 which is a transform derived from TmkXfrm. The PushSwitch 1102 has multiple outputs that can be switched by the control object 1114. This means that one part of the pipeline can be stopped and another can be started at the users whim. The user can switch to different storage devices. The PushSwitch 1102 could output to a TmkClipWriter 1106, which goes onto a storage device 1107 or write to the cache transform 1103.

An important feature of this apparatus is the ease with which it can selectively capture portions of an incoming signal under the control of program logic. Based on information such as the current time, or perhaps a specific time span, or perhaps via a remote control button press by the viewer, a TmkClipWriter 1106 may be switched on to record a portion of the signal, and switched off at some later time. This switching is typically caused by sending a "switch" event to the PushSwitch 1102 object.

An additional method for triggering selective capture is through information modulated into the VBI or placed into an MPEG private data channel. Data decoded from the VBI or private data channel is passed to the program logic. The program logic examines this data to determine if the data indicates that capture of the TV signal into which it was modulated should begin. Similarly, this information may also indicate when recording should end, or another data item may be modulated into the signal indicating when the capture should end. The starting and ending indicators may be explicitly modulated into the signal or

other information that is placed into the signal in a standard fashion may be used to encode this information.

With respect to Fig. 12, an example is shown which demonstrates how the program logic scans the words contained within the closed caption (CC) fields to determine starting and ending times, using particular words or phrases to trigger the capture. A stream of NTSC or PAL fields 1201 is presented. CC bytes are extracted from each odd field 1202, and entered in a circular buffer 1203 for processing by the Word Parser 1204. The Word Parser 1204 collects characters until it encounters a word boundary, usually a space, period or other delineating character. Recall from above, that the MPEG audio and video segments are collected into a series of fixed-size PES buffers. A special segment is added to each PES buffer to hold the words extracted from the CC field 1205. Thus, the CC information is preserved in time synchronization with the audio and video, and can be correctly presented to the viewer when the stream is displayed. This also allows the stored stream to be processed for CC information at the leisure of the program logic, which spreads out load, reducing cost and improving efficiency. In such a case, the words stored in the special segment are simply passed to the state table logic 1206.

During stream capture, each word is looked up in a table 1206 which indicates the action to take on recognizing that word. This action may simply change the state of the recognizer state machine 1207, or may cause the state machine 1207 to issue an action request, such as "start capture", "stop capture", "phrase seen", or other similar requests. Indeed, a recognized word or phrase may cause the pipeline to be switched; for example, to overlay a different audio track if undesirable language is used in the program.

Note that the parsing state table 1206 and recognizer state machine 1207 may be modified or changed at any time. For example, a different table and state machine may be provided for each input channel. Alternatively, these elements may be switched depending on the time of day, or because of other events.

Referring to Fig. 11, a PullSwitch is added 1104 which outputs to the sink 1105. The sink 1105 calls nextFullBuf and releaseEmptyBuf to get or return buffers from the PullSwitch 1104. The PullSwitch 1104 can have any number of inputs. One input could be an ActionClip 1113. The remote control can switch between input sources. The control object 1114 sends an event to the PullSwitch 1104, telling it to switch. It will switch from the current input source to whatever input source the control object selects.

An ActionClip class provides for sequencing a number of different stored signals in a predictable and controllable manner, possibly with the added control of viewer selection via a remote control. Thus, it appears as a derivative of a TmkXfrm object that accepts a "switch" event for switching to the next stored signal.

This allows the program logic or user to create custom sequences of video output. Any number of video segments can be lined up and combined as if the program logic or user were using a broadcast studio video mixer. TmkClipReaders 1108, 1109, 1110 are allocated and each is hooked into the PullSwitch 1104. The PullSwitch 1104 switches between the TmkClipReaders 1108, 1109, 1110 to combine video and audio clips. Flow control is automatic because of the way the pipeline is constructed. The Push and Pull Switches are the same as video switches in a broadcast studio.

The derived class and resulting objects described here may be combined in an arbitrary way to create a number of different useful configurations for storing, retrieving, switching and viewing of TV streams. For example, if multiple input and output sections are available, one input is viewed while another is stored, and a picture-in-picture window generated by the second output is used to preview previously stored streams. Such configurations represent a unique and novel application of software transformations to achieve the functionality expected of expensive, sophisticated hardware solutions within a single cost-effective device.

With respect to Fig. 13, a high-level system view is shown which implements a VCR backup. The Output Module 1303 sends TV signals to the VCR 1307. This allows the user to record TV programs directly on to video tape. The invention allows the user to queue up programs from disk to be recorded on to video tape and to schedule the time that the programs are sent to the VCR 1307. Title pages (EPG data) can be sent to the VCR 1307 before a program is sent. Longer programs can be scaled to fit onto smaller video tapes by speeding up the play speed or dropping frames.

The VCR 1307 output can also be routed back into the Input Module 1301. In this configuration the VCR acts as a backup system for the Media Switch 1302. Any overflow storage or lower priority programming is sent to the VCR 1307 for later retrieval.

The Input Module 1301 can decode and pass to the remainder of the system information encoded on the Vertical Blanking Interval (VBI). The Output Module 1303 can encode into the output VBI data provided by the remainder of the system. The program logic may arrange to encode identifying information of various kinds into the output signal, which will be recorded onto tape using the

VCR 1307. Playing this tape back into the input allows the program logic to read back this identifying information, such that the TV signal recorded on the tape is properly handled. For example, a particular program may be recorded to tape along with information about when it was recorded, the source network, etc. When this program is played back into the Input Module, this information can be used to control storage of the signal, presentation to the viewer, etc.

One skilled in the art will readily appreciate that such a mechanism may be used to introduce various data items to the program logic which are not properly conceived of as television signals. For instance, software updates or other data may be passed to the system. The program logic receiving this data from the television stream may impose controls on how the data is handled, such as requiring certain authentication sequences and/or decrypting the embedded information according to some previously acquired key. Such a method works for normal broadcast signals as well, leading to an efficient means of providing non-TV control information and data to the program logic.

Additionally, one skilled in the art will readily appreciate that although a VCR is specifically mentioned above, any multimedia recording device (*e.g.*, a Digital Video Disk-Random Access Memory (DVD-RAM) recorder) is easily substituted in its place.

Although the invention is described herein with reference to the preferred embodiment, one skilled in the art will readily appreciate that other applications may be substituted for those set forth herein without departing from the spirit and scope of the present invention. For example, the invention can be used in the detection of gambling casino crime. The input section of the invention is connected to the casino's video surveillance system. Recorded video is cached and simultaneously output to external VCRs. The user can switch to any video

feed and examine (*i.e.*, rewind, play, slow play, fast forward, etc.) a specific segment of the recorded video while the external VCRs are being loaded with the real-time input video. Accordingly, the invention should only be limited by the Claims included below.

CLAIMS

Sub A'

1. A process for the simultaneous storage and play back of multimedia data, comprising the steps of:

accepting television (TV) broadcast signals, wherein said TV signals are based on a multitude of standards, including, but not limited to, National Television Standards Committee (NTSC) broadcast, PAL broadcast, satellite transmission, DSS, DBS, or ATSC;

tuning said TV signals to a specific program;

providing at least one Input Section, wherein said input section converts said specific program to an Moving Pictures Experts Group (MPEG) formatted stream for internal transfer and manipulation;

providing a Media Switch, wherein said Media Switch parses said MPEG stream, said MPEG stream is separated into its video and audio components;

storing said video and audio components on a storage device;

providing at least one Output Section, wherein said Output Section extracts said video and audio components from a storage device;

wherein said Output Section assembles said video and audio components into an MPEG stream;

wherein said Output Section sends said MPEG stream to a decoder;

wherein said decoder converts said MPEG stream into TV output signals;

wherein said decoder delivers said TV output signals to a TV receiver; and

accepting control commands from a user, wherein said control commands are sent through the system and affect the flow of said MPEG stream.

2. The process of claim 1, wherein said Input Section directs said MPEG stream to the destination indicated by said control commands.

3. The process of claim 1, wherein said Output Section extracts said video and audio components from the storage device indicated by said control commands.

4. The process of claim 1, further comprising the step of:

creating custom video output sequences, wherein said sequences are specified by a user or program control.

5. The process of claim 1, wherein the storing and extracting of said video and audio components from said storage device are performed simultaneously.

6. The process of claim 1, wherein said Media Switch calculates and logically associates a time stamp to said video and audio components.

7. The process of claim 1, wherein said Media Switch extracts time stamp values from a digital TV stream and logically associates said time stamp values to said video and audio components.

8. The process of claim 1, further comprising the steps of:

placing said video component into a circular video buffer;

posting an event in a circular event buffer, wherein said event contains an indication that a video component was found and the location of said video component in said circular video buffer; and

sending notice of said event posting.

9. The process of claim 1, further comprising the steps of:

placing said audio component into a circular audio buffer;

posting an event in a circular event buffer, wherein said event contains an indication that an audio component was found and the location of said audio component in said circular audio buffer; and

sending notice of said event posting.

10. The process of claims 8 or 9, further comprising the steps of:

receiving said notice;

retrieving said event posting from said event buffer; and

indexing into the appropriate buffer indicated by the type and location information in said event buffer.

11. The process of claim 10, further comprising the steps of:

generating a buffer containing the logical audio or video segments in order, including ancillary information, wherein each of said logical segments points to the appropriate circular buffer location where corresponding audio or video components have been placed.

12. The process of claim 1, further comprising the step of:

increasing the decoder system clock rate for fast playback or fast reverse playback.

13. The process of claim 1, further comprising the step of:

decreasing the decoder system clock rate for slow playback or slow reverse playback.

14. The process of claim 1, further comprising the step of:

combining system audio cues and on-screen displays with said TV output signals.

15. The process of claim 1, further comprising the steps of:

decoding the Vertical Blanking Interval (VBI) data or private data channel information from said TV signal; and

examining said data to determine the starting or ending indicators of a specific program.

16. The process of claim 1, further comprising the step of:

scanning the words contained within the closed caption (CC) fields to determine program starting and ending times, wherein particular words or phrases are used to trigger the recording of a specific program and wherein the CC information is preserved in time synchronization with the audio and video, and can be correctly presented to the viewer when the stream is displayed.

17. The process of claim 16, further comprising the step of:

performing a specific action when a specific word is found in said CC information.

18. The process of claim 1, wherein said Media Switch has a data bus connecting it to a CPU and DRAM.

19. The process of claim 1, wherein said Media Switch shares an address bus with a CPU and DRAM.

20. The process of claim 1, wherein said Media Switch operates asychronously and autonomously with a CPU.

Sub A2

21. The process of claim 1, wherein a storage device is connected to said Media Switch.

22. The process of claim 1, wherein said Media Switch allows the CPU to queue up Direct Memory Access (DMA) transfers.

23. The process of claim 1, wherein said Media Switch is implemented in hardware.

24. The process of claim 1, further comprising the step of:

providing a multimedia recording device, including, but not limited to, a Video Cassette Recorder (VCR) or a Digital Video Disk-Random Access Memory (DVD-RAM) device, wherein said recording device is attached to the output side of said decoder, allowing said user to record said TV output signals.

25. The process of claim 24, wherein said user queues up programs from said disk to be stored on said recording device.

26. The process of claim 24, wherein said user sets time schedules for said programs to be sent to said recording device.

27. The process of claim 24, wherein title pages may be sent to said recording device before sending a program to be stored on said recording device.

28. The process of claim 24, wherein a program that is longer in duration than a magnetic tape in said recording device allows, is sped up to fit within the desired time limit.

29. The process of claim 24, wherein a program that is longer in duration than a magnetic tape in said recording device allows, has frames dropped from it to fit within the desired time limit.

Sub A4

30. The process of claim 24, wherein the output of said recording device is routed to said input section, allowing said recording device to act as a storage back up system, said recording device accepts overflow storage, TV programs, software updates, or other data that are later retrieved and sent to said input section.

31. A process for the simultaneous storage and play back of multimedia data, comprising the steps of:

providing a physical data source, wherein said physical data source accepts broadcast data from an input device, parses video and audio data from said broadcast data, and temporarily stores said video and audio data;

providing a source object, wherein said source object extracts video and audio data from said physical data source;

providing a transform object, wherein said transform object stores and retrieves data streams onto a storage device;

wherein said source object obtains a buffer from said transform object, said source object converts video data into data streams and fills said buffer with said streams;

wherein said source object is automatically flow controlled by said transform object;

providing a sink object, wherein said sink object obtains data stream buffers from said transform object and outputs said streams to a video and audio decoder;

wherein said decoder converts said streams into display signals and sends said signals to a display;

wherein said sink object is automatically flow controlled by said transform object;

providing a control object, wherein said control object receives commands from a user, said commands control the flow of the broadcast data through the system; and

wherein said control object sends flow command events to said source, transform, and sink objects.

Sub A5

32. An apparatus for the simultaneous storage and play back of multimedia data, comprising:

a module for accepting television (TV) broadcast signals, wherein said TV signals are based on a multitude of standards, including, but not limited to, National Television Standards Committee (NTSC) broadcast, PAL broadcast, satellite transmission, DSS, DBS, or ATSC;

a module for tuning said TV signals to a specific program;

at least one Input Section, wherein said input section converts said specific program to an Moving Pictures Experts Group (MPEG) formatted stream for internal transfer and manipulation;

a Media Switch, wherein said Media Switch parses said MPEG stream, said MPEG stream is separated into its video and audio components;

a module for storing said video and audio components on a storage device;

at least one Output Section, wherein said Output Section extracts said video and audio components from a storage device;

wherein said Output Section assembles said video and audio components into an MPEG stream;

wherein said Output Section sends said MPEG stream to a decoder;

wherein said decoder converts said MPEG stream into TV output signals;

wherein said decoder delivers said TV output signals to a TV receiver; and

accepting control commands from a user, wherein said control commands are sent through the system and affect the flow of said MPEG stream.

33. The apparatus of claim 32, wherein said Input Section directs said MPEG stream to the destination indicated by said control commands.

34. The apparatus of claim 32, wherein said Output Section extracts said video and audio components from the storage device indicated by said control commands.

35. The apparatus of claim 32, further comprising:

a module for creating custom video output sequences, wherein said sequences are specified by a user or program control.

36. The apparatus of claim 32, wherein the storing and extracting of said video and audio components from said storage device are performed simultaneously.

37. The apparatus of claim 32, wherein said Media Switch calculates and logically associates a time stamp to said video and audio components.

38. The apparatus of claim 32, wherein said Media Switch extracts time stamp values from a digital TV stream and logically associates said time stamp values to said video and audio components.

39. The apparatus of claim 32, further comprising:

a module for placing said video component into a circular video buffer;

a module for posting an event in a circular event buffer, wherein said event contains an indication that a video component was found and the location of said video component in said circular video buffer; and

a module for sending notice of said event posting.

40. The apparatus of claim 32, further comprising:

a module for placing said audio component into a circular audio buffer;

a module for posting an event in a circular event buffer, wherein said event contains an indication that an audio component was found and the location of said audio component in said circular audio buffer; and

a module for sending notice of said event posting.

41. The apparatus of claims 39 or 40, further comprising:

a module for receiving said notice;

a module for retrieving said event posting from said event buffer; and

a module for indexing into the appropriate buffer indicated by the type and location information in said event buffer.

42. The apparatus of claim 41, further comprising:

a module for generating a buffer containing the logical audio or video segments in order, including ancillary information, wherein each of said logical segments points to the appropriate circular buffer location where corresponding audio or video components have been placed.

43. The apparatus of claim 32, further comprising:

a module for increasing the decoder system clock rate for fast playback or fast reverse playback.

44. The apparatus of claim 32, further comprising:

a module for decreasing the decoder system clock rate for slow playback or slow reverse playback.

45. The apparatus of claim 32, further comprising:

a module for combining system audio cues and on-screen displays with said TV output signals.

46. The apparatus of claim 32, further comprising:

a module for decoding the Vertical Blanking Interval (VBI) data or private data channel information from said TV signal; and

a module for examining said data to determine the starting or ending indicators of a specific program.

47. The apparatus of claim 32, further comprising:

a module for scanning the words contained within the closed caption (CC) fields to determine program starting and ending times, wherein particular words or phrases are used to trigger the recording of a specific program and wherein the CC information is preserved in time synchronization with the audio and video, and can be correctly presented to the viewer when the stream is displayed.

48. The apparatus of claim 47, further comprising:

a module for performing a specific action when a specific word is found in said CC information.

49. The apparatus of claim 32, wherein said Media Switch has a data bus connecting it to a CPU and DRAM.

50. The apparatus of claim 32, wherein said Media Switch shares an address bus with a CPU and DRAM.

51. The apparatus of claim 32, wherein said Media Switch operates asychronously and autonomously with a CPU.

Sub A6

52. The apparatus of claim 32, wherein a storage device is connected to said Media Switch.

53. The apparatus of claim 32, wherein said Media Switch allows the CPU to queue up Direct Memory Access (DMA) transfers.

54. The apparatus of claim 32, further comprising:

a multimedia recording device, including, but not limited to, a Video Cassette Recorder (VCR) or a Digital Video Disk-Random Access Memory (DVD-RAM) device, wherein said recording device is attached to the output side of said decoder, allowing said user to record said TV output signals.

Sub A7

55. The apparatus of claim 54, wherein said user queues up programs from said disk to be stored on said recording device.

56. The apparatus of claim 54, wherein said user sets time schedules for said programs to be sent to said recording device.

57. The apparatus of claim 54, wherein title pages may be sent to said recording device before sending a program to be stored on said recording device.

58. The apparatus of claim 54, wherein a program that is longer in duration than a magnetic tape in said recording device allows, is sped up to fit within the desired time limit.

59. The apparatus of claim 54, wherein a program that is longer in duration than a magnetic tape in said recording device allows, has frames dropped from it to fit within the desired time limit.

60. The apparatus of claim 54, wherein the output of said recording device is routed to said input section, allowing said recording device to act as a storage back up system, said recording device accepts overflow storage, TV programs, software updates, or other data that are later retrieved and sent to said input section.

61. An apparatus for the simultaneous storage and play back of multimedia data, comprising:

a physical data source, wherein said physical data source accepts broadcast data from an input device, parses video and audio data from said broadcast data, and temporarily stores said video and audio data;

a source object, wherein said source object extracts video and audio data from said physical data source;

a transform object, wherein said transform object stores and retrieves data streams onto a storage device;

wherein said source object obtains a buffer from said transform object, said source object converts video data into data streams and fills said buffer with said streams;

wherein said source object is automatically flow controlled by said transform object;

a sink object, wherein said sink object obtains data stream buffers from said transform object and outputs said streams to a video and audio decoder;

wherein said decoder converts said streams into display signals and sends said signals to a display;

wherein said sink object is automatically flow controlled by said transform object;

a control object, wherein said control object receives commands from a user, said commands control the flow of the broadcast data through the system; and

wherein said control object sends flow command events to said source, transform, and sink objects.

MULTIMEDIA TIME WARPING SYSTEM

ABSTRACT

A multimedia time warping system. The invention allows the user to store selected television broadcast programs while the user is simultaneously watching or reviewing another program. A preferred embodiment of the invention accepts television (TV) input streams in a multitude of forms, for example, National Television Standards Committee (NTSC) or PAL broadcast, and digital forms such as Digital Satellite System (DSS), Digital Broadcast Services (DBS), or Advanced Television Standards Committee (ATSC). The TV streams are converted to an Moving Pictures Experts Group (MPEG) formatted stream for internal transfer and manipulation and are parsed and separated it into video and audio components. The components are stored in temporary buffers. Events are recorded that indicate the type of component that has been found, where it is located, and when it occurred. The program logic is notified that an event has occurred and the data is extracted from the buffers. The parser and event buffer decouple the CPU from having to parse the MPEG stream and from the real time nature of the data streams which allows for slower CPU and bus speeds and translate to lower system costs. The video and audio components are stored on a storage device and when the program is requested for display, the video and audio components are extracted from the storage device and reassembled into an MPEG stream which is sent to a decoder. The decoder converts the MPEG stream into TV output signals and delivers the TV output signals to a TV receiver. User control commands are accepted and sent through the system. These commands affect the flow of said MPEG stream and allow the user to view stored programs with at least the following functions: reverse, fast forward, play, pause, index, fast/slow reverse play, and fast/slow play.

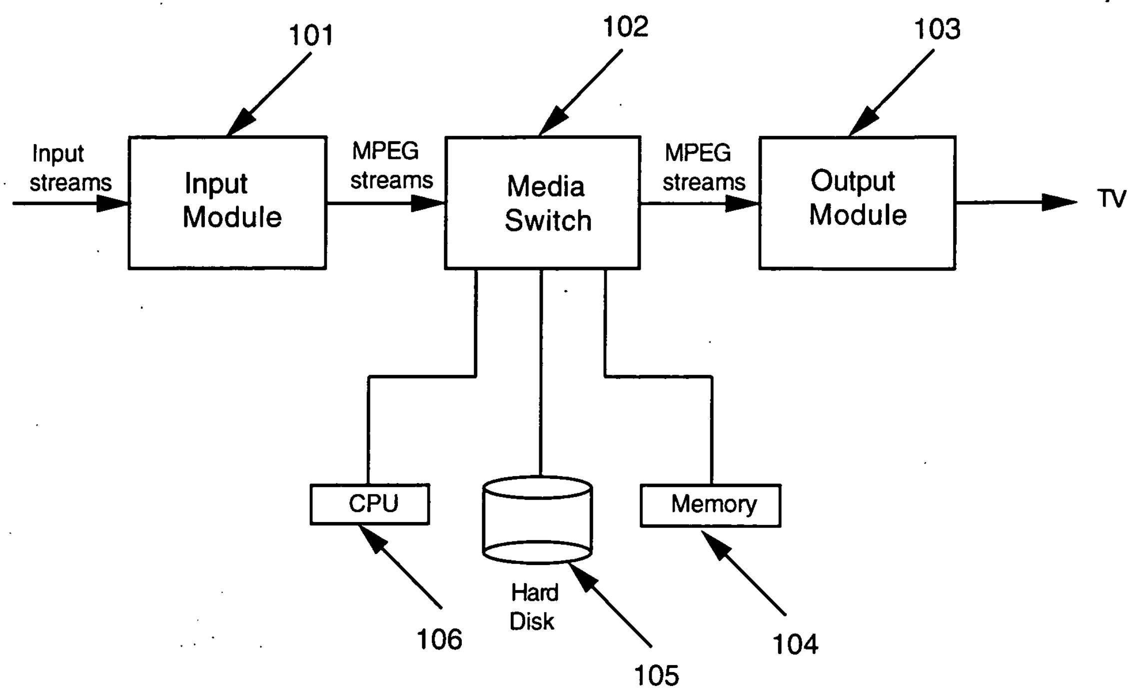

101
102
103
Input streams
Input Module
MPEG streams
Media Switch
MPEG streams
Output Module
TV
CPU
Hard Disk
Memory
106
105
104

Fig. 1

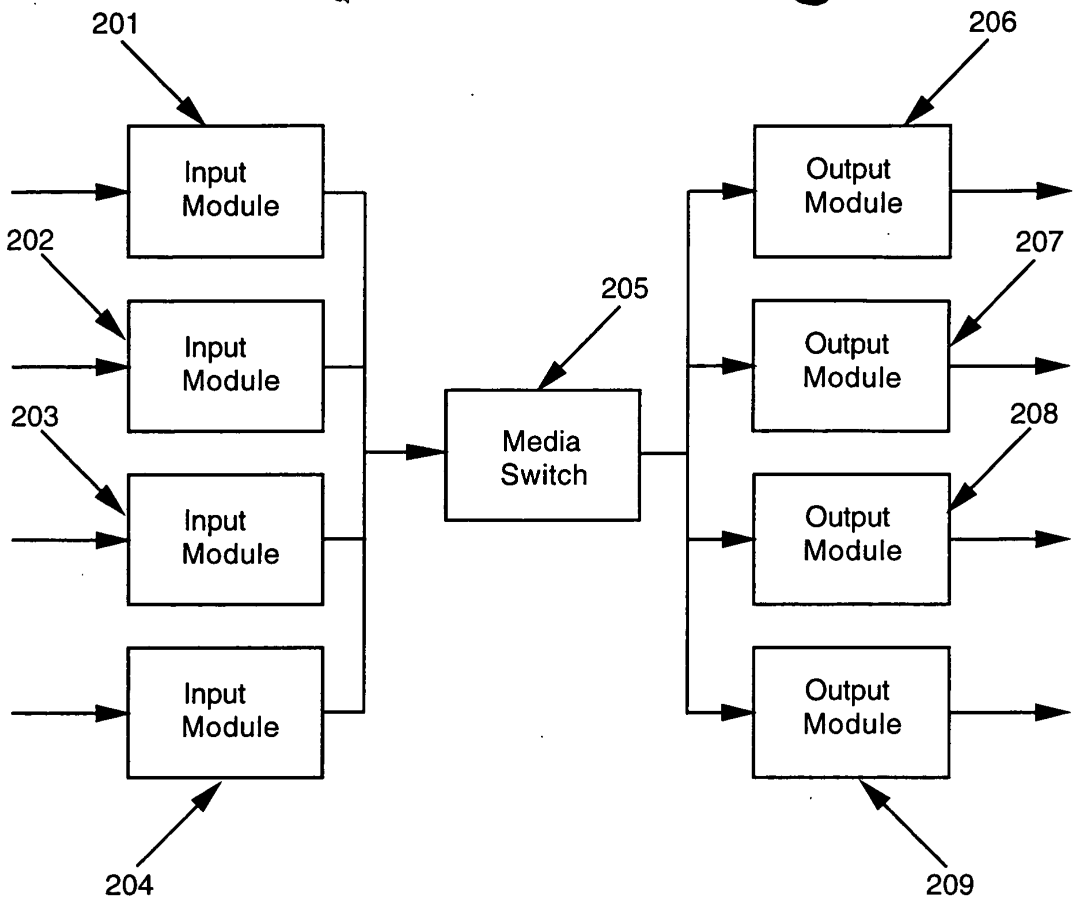
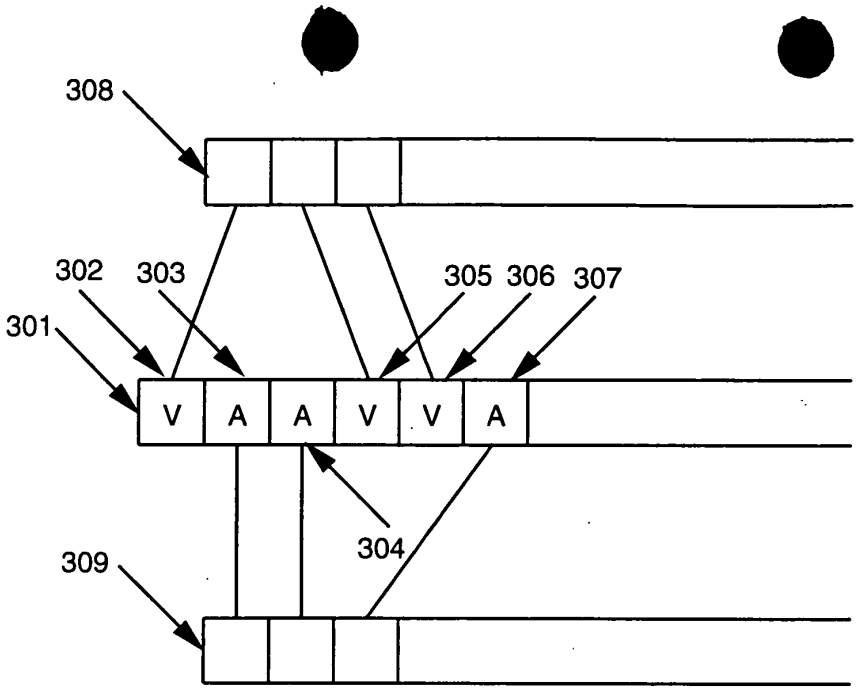


Fig. 2



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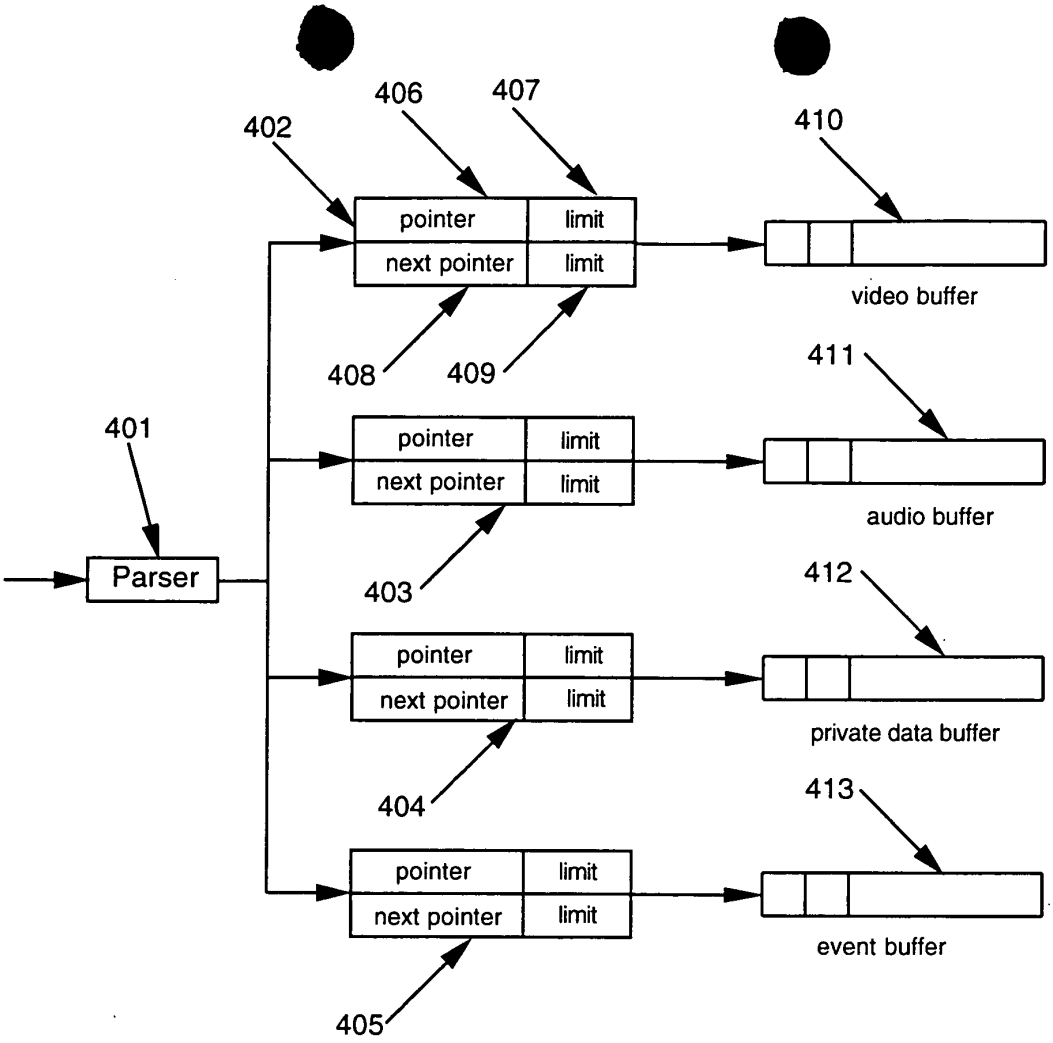
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407
402
410
pointer
limit
next pointer
limit
video buffer
408
409
411
401
pointer
limit
next pointer
limit
audio buffer
Parser
403
412
pointer
limit
next pointer
limit
private data buffer
404
413
pointer
limit
next pointer
limit
event buffer
405

Fig. 4

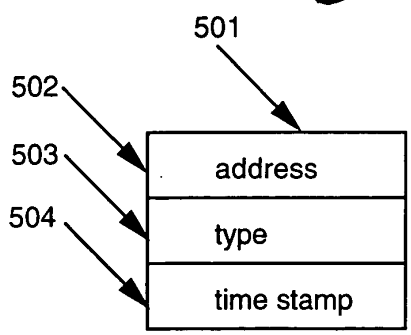


Fig. 5

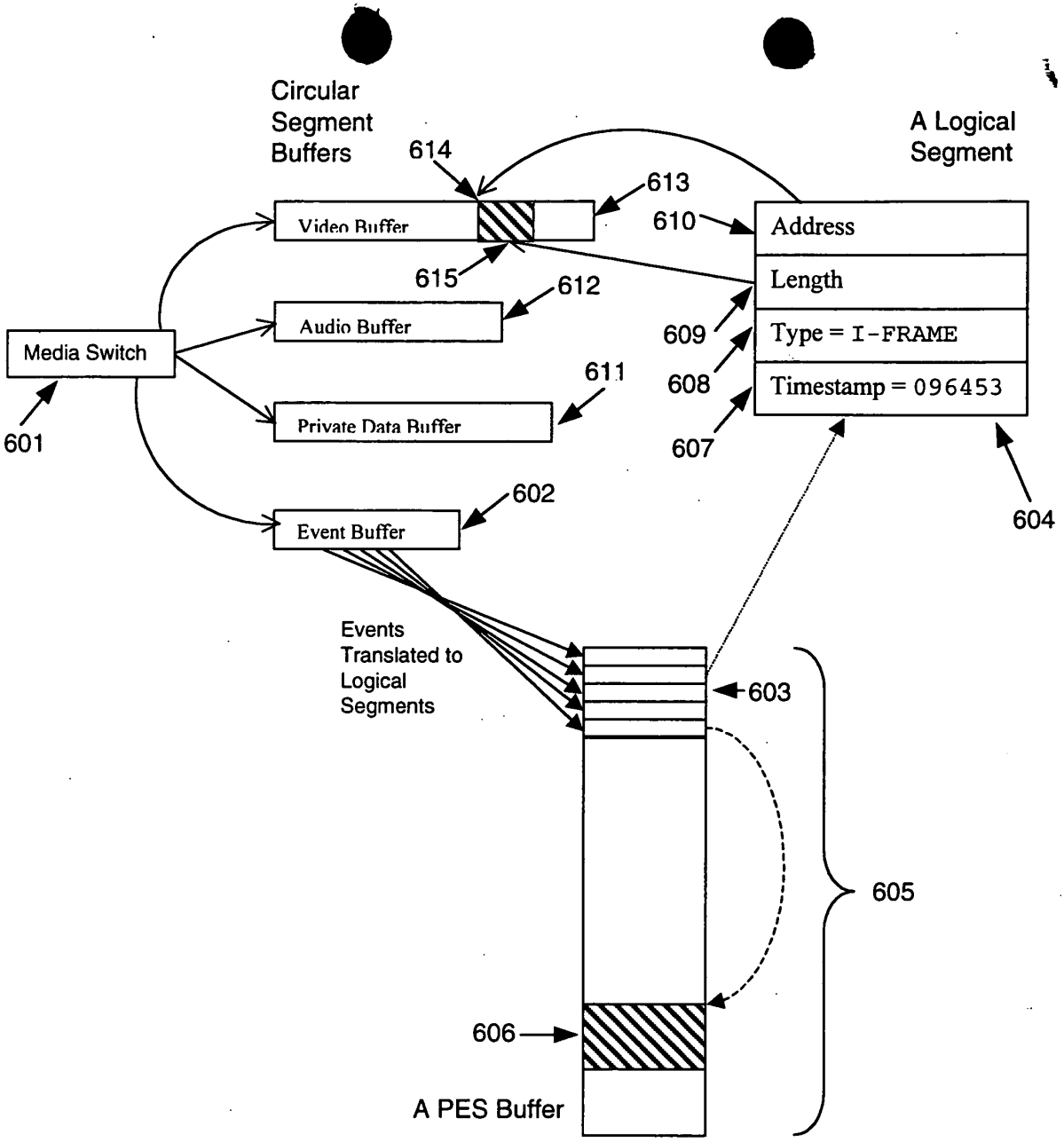
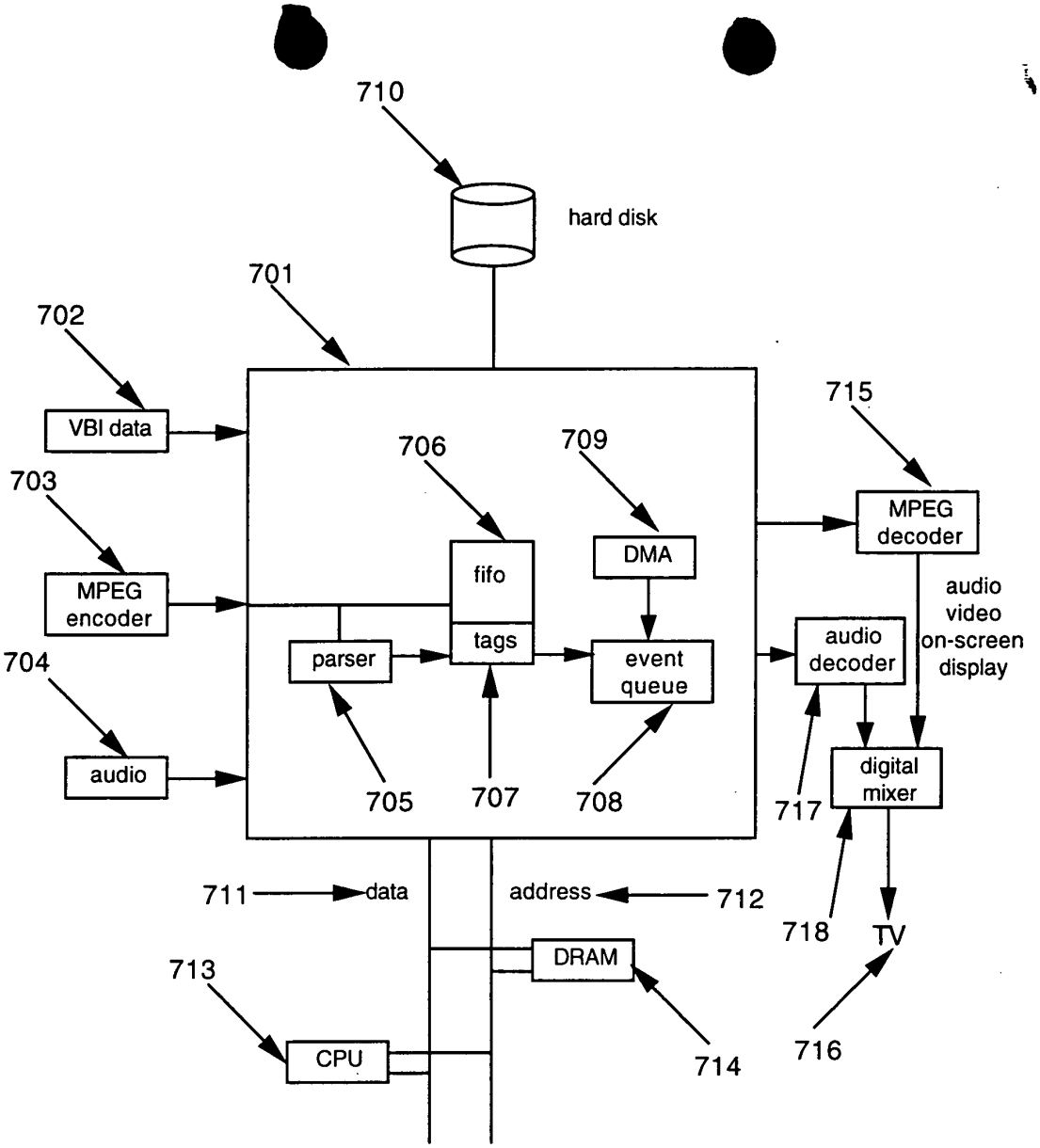

Circular
Segment
Buffers
614
613
Video Buffer
610
Address
615
Length
612
Audio Buffer
609
Type = I-FRAME
Media Switch
611
608
Timestamp = 096453
601
Private Data Buffer
607
602
604
Event Buffer
Events
Translated to
Logical
Segments
603
605
606
A PES Buffer

Fig. 6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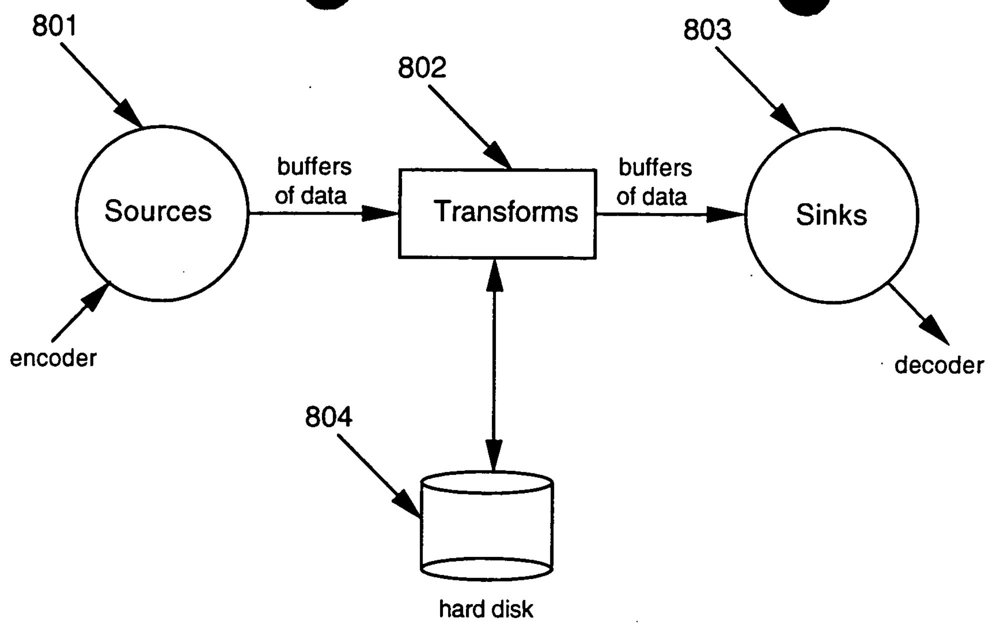
hard disk
701
702
VBI data
703
MPEG encoder
704
audio
706
fifo
tags
709
DMA
parser
event queue
705
707
708
715
MPEG decoder
audio video on-screen display
audio decoder
digital mixer
717
718
TV
716
711
data
address
712
DRAM
713
CPU
714

Fig. 7



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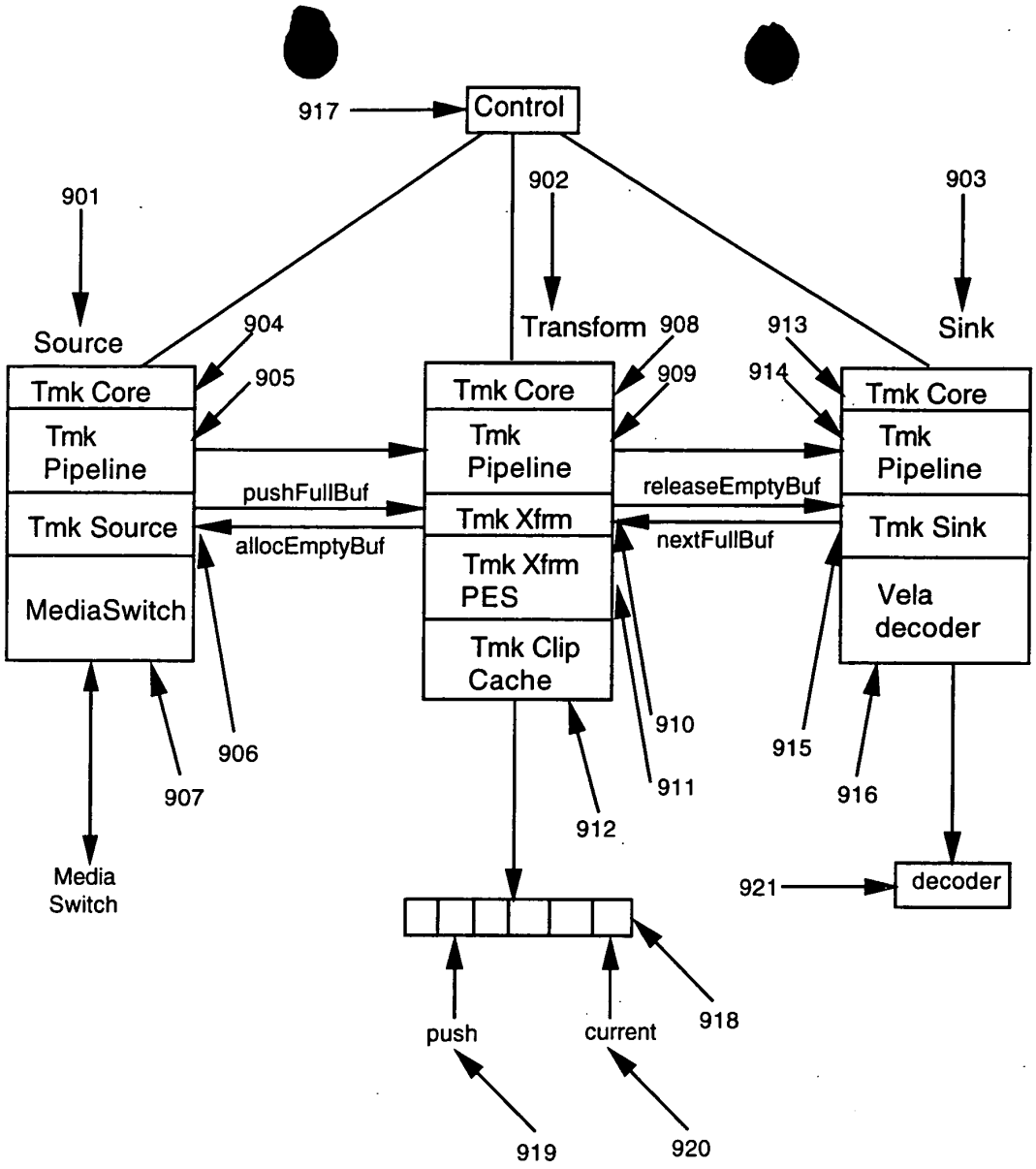
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Control
901
902
903
Source
Transform
Sink
904
905
908
909
913
914
Tmk Core
Tmk Pipeline
Tmk Source
MediaSwitch
Tmk Core
Tmk Pipeline
Tmk Xfrm
Tmk Xfrm PES
Tmk Clip Cache
Tmk Core
Tmk Pipeline
Tmk Sink
Vela decoder
pushFullBuf
allocEmptyBuf
releaseEmptyBuf
nextFullBuf
906
907
910
911
912
915
916
Media Switch
921
decoder
push
current
918
919
920

Fig. 9

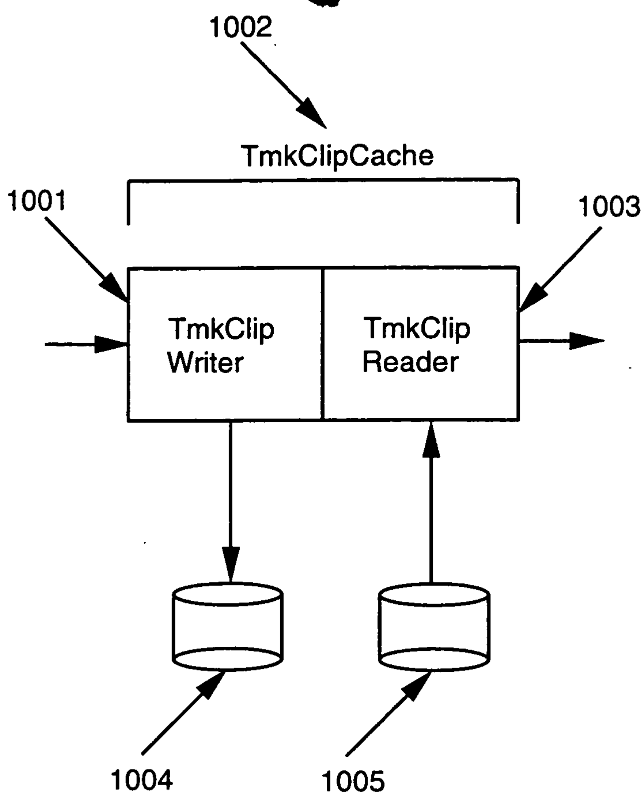

Fig. 10

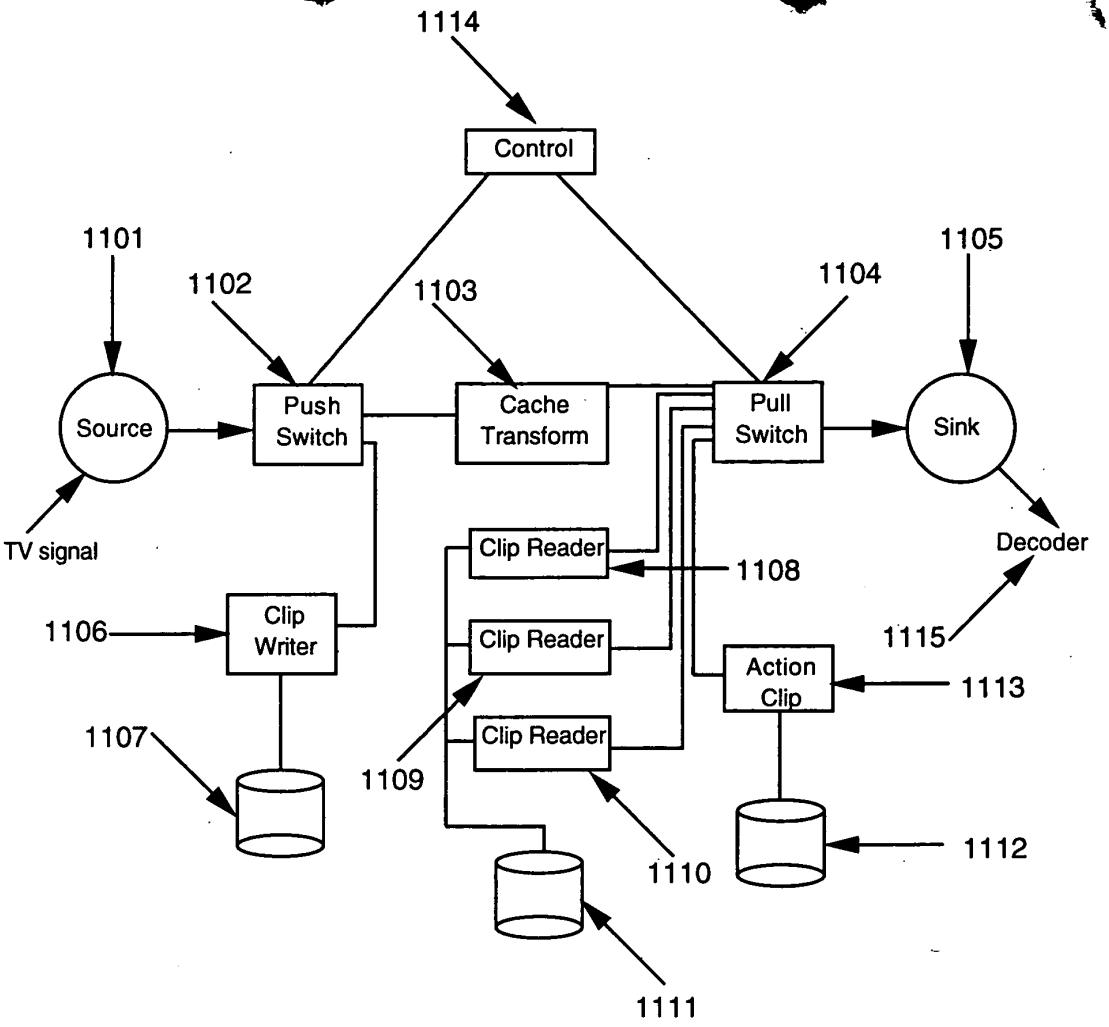
1114
Control
1101
1102
1103
1104
1105
Source
Push Switch
Cache Transform
Pull Switch
Sink
TV signal
Clip Reader
1108
Decoder
1106
Clip Writer
Clip Reader
1115
Action Clip
1113
1107
Clip Reader
1109
1110
1112
1111

Fig. 11

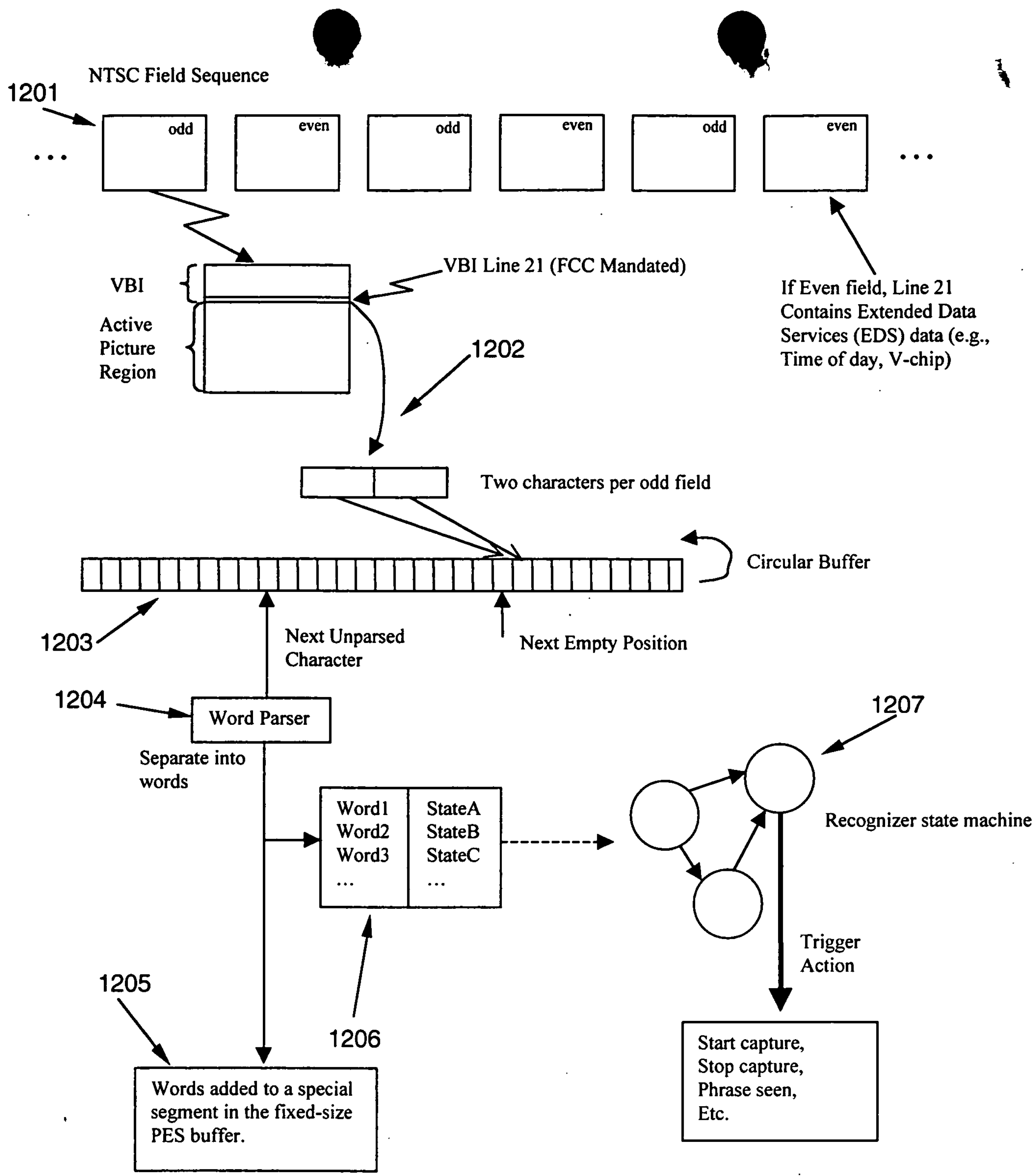

Fig. 12

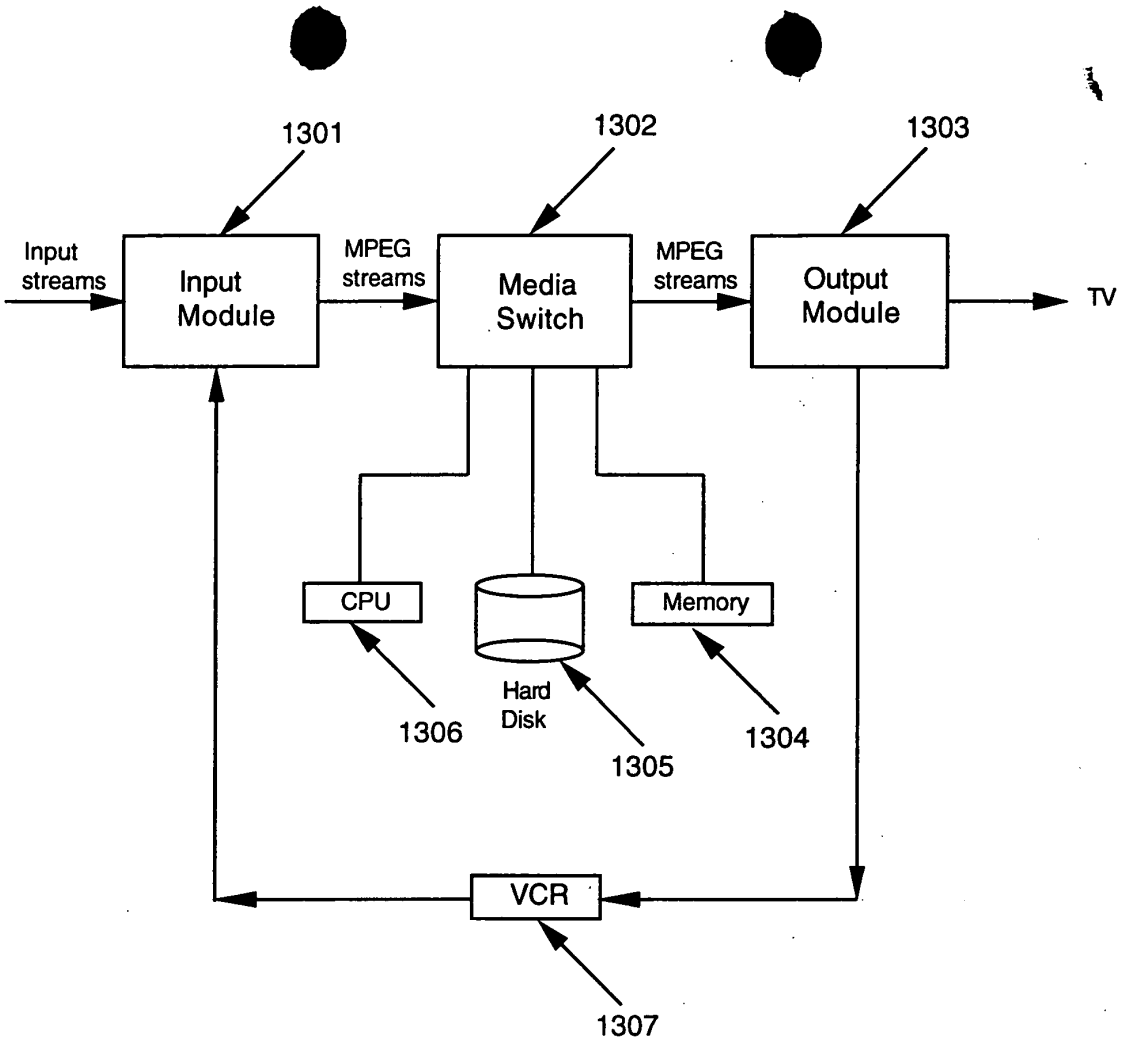
1301
1302
1303
Input streams
Input Module
MPEG streams
Media Switch
MPEG streams
Output Module
TV
CPU
Hard Disk
Memory
1306
1305
1304
VCR
1307

Fig. 13

Attorney Docket No. TIV[redacted]03

DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name;

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

MULTIMEDIA TIME WARPING SYSTEM

the specification of which (check one) X is attached hereto, or ___ was filed on _____ as Application Serial No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

==========

I hereby claim foreign priority benefits under Title 35, United Sates Code, Section 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)	Priority Claimed Yes	No
_____	____	____
Number Country Day/Month/Year Filed		
_____	____	____
Number Country Day/Month/Year Filed		

==========

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

MICHAEL A. GLENN, Reg. No. 30,176
DONALD M. HENDRICKS, Reg. No. 40,355
KIRK D. WONG, Reg. No. P-43,284

SEND CORRESPONDENCE TO:

MICHAEL A. GLENN, P.O. Box 7831, Menlo Park, CA 94026

Attorney Docket No. TIV[illegible]03

Full name of fourth inventor: ANDREW MARTIN GOODMAN

Inventor's signature ______________________ 7/27/98
Date

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Post Office Address Same

Citizenship United States of America

Full name of fifth inventor: CHING TONG CHOW

Inventor's signature ______________________ 7/21/98
Date

Residence 920 Seville Place, Fremont, California 94539

Post Office Address Same

Citizenship Hong Kong

Full name of sixth inventor: JEAN SWEY KAO

Inventor's signature ______________________ 7/24/98
Date

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Post Office Address Same

Citizenship United States of America

Attorney Docket No. TIV[redacted]03

Applicants or Patentees: James M. Barton, Roderick J. McInnis, Alan Moskowitz, Andrew Goodman, Ching Tong Chow, and Jean Kao
Serial No.: Unassigned Filing Date: Herewith
Patent No.: Unassigned Issued: Unassigned

For: **MULTIMEDIA TIME WARPING SYSTEM**

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
37 CFR 1.9(f) and 1.27(b) - SMALL BUSINESS CONCERN

I hereby declare that I am:

( ) the owner of the small business concern identified below:

(X) an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN TiVo, Inc.
ADDRESS OF CONCERN 894 Ross Drive, Suite 100, Sunnyvale, California 94089

I hereby declare that the above-identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3 - 18 and reproduced in 37 CFR 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time, or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention entitled: **MULTIMEDIA TIME WARPING** by inventor(s) **James M. Barton, Roderick J. McInnis, Alan Moskowitz, Andrew Goodman, Ching Tong Chow, and Jean Kao** described in:

(x) the application filed herewith

( ) application serial no. _____, filed _____

( ) patent no. _____, issued _____

If the rights held by the above-identified small business concern are not exclusive, each individual, concern, or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than an inventor, who could not qualify as a small business concern under 37 CFR 1.9(d), or by any concern that could not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e).

( ) no such person, concern, or organization

( ) persons, concerns, or organizations listed below*

* NOTE: Separate verified statements are required from each named person, concern, or organization having rights to the invention averring to their status as small entities (37 CFR 1.27).

Attorney Docket No. TIV[illegible]03

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Name: JAMES M. BARTON

Signature of Inventor

7/27/98

Date

Name: RODERICK MCINNIS

Signature of Inventor

7/21/98

Date

Name: ALAN MOSKOWITZ

Signature of Inventor

24 July 1998

Date

Name: ANDREW GOODMAN

Signature of Inventor

7/27/98

Date

Name: CHING TONG CHOW

Signature of Inventor

7/21/98

Date

Name: JEAN KAO

Signature of Inventor

7/27/98

Date

Attorney Docket No. TIV[redacted]03

Applicants or Patentees: James M. Barton, Roderick McInnis, Alan Moskowitz, Andrew Goodman, Ching Tong Chow, and Jean Kao
Serial No.: _____ Filing Date: Herewith
Patent No.: _____ Issued: _____
For: **MULTIMEDIA TIME WARPING SYSTEM**

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
37 CFR 1.9(f) and 1.27(b) - INDEPENDENT INVENTOR

As a below-named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled:

MULTIMEDIA TIME WARPING SYSTEM

described in:

(X) the application filed herewith
( ) application serial no. _____, filed _____
( ) patent no. _____, issued _____

I have not assigned, granted, conveyed, or licensed and am under no obligation under contract or law to assign, grant, convey, or license any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

(x) no such person, concern, or organization

( ) persons, concerns, or organizations listed below*

* NOTE: Separate verified statements are required from each named person, concern, or organization having rights to the invention averring to their status as small entities (37 CFR 1.27).

FULL NAME _____
ADDRESS _____
( ) INDIVIDUAL ( ) SMALL BUSINESS CONCERN ( ) NONPROFIT ORGANIZATION

FULL NAME _____
ADDRESS _____
( ) INDIVIDUAL ( ) SMALL BUSINESS CONCERN ( ) NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate (37 CFR 1.28(b)).

Attorney Docket No. TI[illegible]03

FULL NAME ____
ADDRESS ____
( ) INDIVIDUAL ( ) SMALL BUSINESS CONCERN ( ) NONPROFIT ORGANIZATION

FULL NAME ____
ADDRESS ____
( ) INDIVIDUAL ( ) SMALL BUSINESS CONCERN ( ) NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING James M. Barton
TITLE OF PERSON OTHER THAN OWNER Chief Technical Officer & Vice President Engineering
ADDRESS OF PERSON SIGNING 101 Sund Avenue
Los Gatos, California 95032

SIGNATURE ____________________ DATE 7/27/98

Attorney Docket No. TIV[illegible]03

==

I hereby claim the benefit under Title 35, United States code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application Ser. No.	Filing Date	Status: Patented, Pending, Abandoned

==

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor: JAMES M. BARTON

Inventor's signature ____________ 7/27/98
Date

Residence 101 Sund Avenue, Los Gatos, California 95032

Post Office Address Same

Citizenship United States of America

Full name of second inventor: RODERICK JAMES MCINNIS

Inventor's signature ____________ 7/21/98
Date

Residence 1299 Canton Drive, Milpitas, California 95035

Post Office Address Same

Citizenship United States of America

Full name of third inventor: ALAN S. MOSKOWITZ

Inventor's signature ____________ 24 July 1998
Date

Residence 300 Third Street, San Francisco, California 94107

Post Office Address Same

Citizenship United States of America

SERIAL NUMBER	FILING DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET N.
09/126,071	07/30/98	348	2711	TIVO0003

APPLICANT

JAMES M. BARTON, LOS GATOS, CA; RODERICK JAMES MCINNIS, MILPITAS, CA; ALAN S. WOSKOWITZ, SAN FRANCISCO, CA; ANDREW MARTIN GOODMAN, MENLO PARK, CA; CHIN TONG CHOW, FREMONT, CA; JEAN SWEY KAO, CUPERTINO, CA.

CONTINUING DOMESTIC DATA********
VERIFIED

✓ TTQ

371 (NAT'L STAGE) DATA********
VERIFIED

✓ TTQ

FOREIGN APPLICATIONS********
VERIFIED

✓ TTQ

FOREIGN FILING LICENSE GRANTED 08/17/98 ***** SMALL ENTITY *****

Foreign Priority claimed 35 USC 119 (a-d) conditions met	STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐yes ☒no ☐yes ☒no ☐Met after Allowance Verified and Acknowledged TQ (Examiner's Initials) _____ (Initials)	CA	13	65	4

ADDRESS

MICHAEL A GLENN
P O BOX 7831
MENLO PARK CA 94026

TITLE

MULTIMEDIA TIME WARPING SYSTEM

FILING FEE RECEIVED	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT NO. _____ for the following:	
$1,066		☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

PATENT APPLICATION SERIAL NO. 09/126071

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

08/05/1998 TDADE1 00000003 071445 09126071

01 FC:201		395.00 OP
02 FC:203		495.00 OP
03 FC:202	4.00 CH	37.00 OP
04 FC:204	135.00 CH	

PTO-1556
(5/87)

PATENT APPLICATION FEE DETERMINATION RECORD

Effective October 1, 1997

Application or Docket Number: 09/126071

CLAIMS AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA
BASIC FEE		
TOTAL CLAIMS	65 minus 20 =	* 45
INDEPENDENT CLAIMS	4 minus 3 =	* 1
MULTIPLE DEPENDENT CLAIM PRESENT		

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY TYPE [2] RATE	FEE	OR	OTHER THAN SMALL ENTITY RATE	FEE
	395.00	OR		790.00
x$11=	495	OR	x$22=	
x41=	41	OR	x82=	
+135=	135	OR	+270=	
TOTAL	1066	OR	TOTAL	

CLAIMS AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				

SMALL ENTITY RATE	ADDITIONAL FEE	OR	OTHER THAN SMALL ENTITY RATE	ADDITIONAL FEE
x$11=		OR	x$22=	
x41=		OR	x82=	
+135=		OR	+270=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				

RATE	ADDITIONAL FEE	OR	RATE	ADDITIONAL FEE
x$11=		OR	x$22=	
x41=		OR	x82=	
+135=		OR	+270=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				

RATE	ADDITIONAL FEE	OR	RATE	ADDITIONAL FEE
x$11=		OR	x$22=	
x41=		OR	x82=	
+135=		OR	+270=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

FORM PTO-875 (Rev. 8/97) *U.S. Government Printing Office: 1997 - 430-571/69194 Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET

(FOR USE WITH FORM PTO-875)

SERIAL NO.	FILING DATE
APPLICANT(S)	

CLAIMS

	AS FILED		AFTER 1st AMENDMENT		AFTER 2nd AMENDMENT	
	IND.	DEP.	IND.	DEP.	IND.	DEP.
1	1					
2						
3						
4						
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10		2				
11		2				
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31	1					
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41		2				
42						
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49						
50						
TOTAL IND.	4					
TOTAL DEP.	61					
TOTAL CLAIMS	65					

	*		*		*	
	IND.	DEP.	IND.	DEP.	IND.	DEP.
51						
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61	1					
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98						
99						
100						
TOTAL IND.						
TOTAL DEP.						
TOTAL CLAIMS						

* *MAY BE USED FOR ADDITIONAL CLAIMS OR ADMENDMENTS*

U.S.DEPARTMENT OF COMMERCE
Patent and Trademark Office

FORM **PTO-1360** (REV. 3-78)

#21DS
ND 10/98
Today

JC542 U.S. PTO
09/126071
07/30/98

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Barton et al. **Docket No. :** TIVO0003
Serial No. : Not Assigned **Art Unit:** Not Assigned
Filed: Herewith **Examiner:** Not Assigned
Title: **MULTIMEDIA TIME WARPING SYSTEM**

INFORMATION DISCLOSURE STATEMENT

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

This Information Disclosure Statement is submitted:

(X) under 37 CFR 1.97(b), or
(within three months of filing national application; or date of entry of international application; or before mailing date of first office action on the merits; whichever occurs last)

( ) under 37 CFR 1.97(c) together with either a:
- ( ) Certification under 37 CFR 1.97(e), or
- ( ) a $220.00 fee under 37 CFR 1.17(p), or

(After the CFR 1.97(b) time period, but before final action or notice of allowance, whichever occurs first)

( ) under 37 CFR 1.97(d) together with a:
- ( ) Certification under 37 CFR 1.97(e), and
- ( ) a $220.00 fee under 37 CFR 1.17(d)(2)(ii), and
- ( ) a $130.00 petition fee set forth in 37 CFR 1.17(i)(1)

(Filed after final action or notice of allowance, whichever occurs first, but before payment of the issue fee)

( ) The Commissioner is authorized to charge any additional fees or credit any overpayment to Deposit Account No. 07-1445 (Order No. _____). A copy of this sheet is enclosed for accounting purposes.

(X) Applicant(s) submit herewith Form PTO 1449 -- Information Disclosure Citation together with copies of patents, publications or other information of which applicant(s) are aware, which applicant(s) believe(s) may be material to the examination of this application and for which there may be a duty to disclose in accordance with 37 CFR 1.25.

( ) A concise explanation of the relevance of foreign language patents, foreign language publications and other foreign language information listed on PTO Form 1449, as presently understood by the individual(s) designated in 37 CFR 156(c) most knowledgeable about the content is given on the attached sheet, or where a foreign language patent is cited in a search report or other action by a foreign patent office in a counterpart foreign application, an English language version of the search report or action which indicates the degree of relevance found by the foreign office is listed on form PTO 1449 and is enclosed herewith.

It is requested that the information disclosed herein be made of record in this application.

Respectfully Submitted,

Michael A. Glenn
Attorney For Applicant
Reg. No. 30,176

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