

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.

## 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/AIA01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1.11 and 1.14. This collection is estimated to take 1 minute 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*

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.

**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.

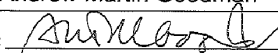
I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

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

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.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1.11 and 1.14. This collection is estimated to take 1 minute 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.

## 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.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
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.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
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.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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.

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

<b>Title of Invention</b>	Multimedia Time Warping System
<p>As the below named inventor, I hereby declare that:</p> <p>This declaration is directed to: <input type="checkbox"/> The attached application, or  <input checked="" type="checkbox"/> United States application or PCT international application number <u>9/126,071</u>  filed on <u>July 30, 1998</u>.</p> <p>The above-identified application was made or authorized to be made by me.</p> <p>I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.</p> <p>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.</p> <p style="text-align: center;"><b>WARNING:</b></p> <p>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.</p>	
<b>LEGAL NAME OF INVENTOR</b>	
Inventor: <u>Alan S. Moskowitz</u>	Date (Optional): _____
Signature: 	
<p>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.</p>	

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1.11 and 1.14. This collection is estimated to take 1 minute 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.

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.

**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)**

<b>Title of Invention</b>	Multimedia Time Warping System		
This statement is directed to:			
<input type="checkbox"/> The attached application,			
OR			
<input checked="" type="checkbox"/> United States application or PCT international application number <u>09/126,071</u> filed on <u>July 30, 1998</u> .			
<b>LEGAL NAME of inventor to whom this substitute statement applies:</b>			
(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	Fremont	State	CA US
Country			
Mailing Address (except for a deceased or legally incapacitated inventor):			
920 Seville Place			
City	Fremont	State	CA 94539
Zip		Country 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:			
<input type="checkbox"/> Legal Representative (for deceased or legally incapacitated inventor only),			
<input checked="" type="checkbox"/> Assignee,			
<input type="checkbox"/> Person to whom the inventor is under an obligation to assign,			
<input type="checkbox"/> Person who otherwise shows a sufficient proprietary interest in the matter (petition under 37 CFR 1.46 is required), or			
<input type="checkbox"/> Joint Inventor.			

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1.11 and 1.14. This collection is estimated to take 1 minute 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.

## 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).

### 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.

### 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:

TiVo Inc.

Applicant Name:

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.

## 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.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
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.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
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.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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.

**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)**

<b>Title of Invention</b>	Multimedia Time Warping System		
This statement is directed to:			
<input type="checkbox"/> The attached application,			
OR			
<input checked="" type="checkbox"/> United States application or PCT international application number <u>09/126,071</u> filed on <u>July 30, 1998</u> .			
<b>LEGAL NAME of inventor to whom this substitute statement applies:</b>			
(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	Cupertino	State	CA US
Country			
Mailing Address (except for a deceased or legally incapacitated inventor):			
21876 Meadow View Lane			
City	Cupertino	State	CA 95014
Zip		Country 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:			
<input type="checkbox"/> Legal Representative (for deceased or legally incapacitated inventor only),			
<input checked="" type="checkbox"/> Assignee,			
<input type="checkbox"/> Person to whom the inventor is under an obligation to assign,			
<input type="checkbox"/> Person who otherwise shows a sufficient proprietary interest in the matter (petition under 37 CFR 1.46 is required), or			
<input type="checkbox"/> Joint Inventor.			

[Page 1 of 2]

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1.11 and 1.14. This collection is estimated to take 1 minute 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.



## 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).

### 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.

### 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:

**TiVo Inc.**

Applicant Name:

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.

## 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.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
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.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
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.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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.

**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)**

<b>Title of Invention</b>	Multimedia Time Warping System		
This statement is directed to:			
<input type="checkbox"/> The attached application,			
OR			
<input checked="" type="checkbox"/> United States application or PCT international application number <u>09/126,071</u> filed on <u>July 30, 1998</u> .			
<b>LEGAL NAME of inventor to whom this substitute statement applies:</b>			
(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	Milpitas	State	CA US
Country			
Mailing Address (except for a deceased or legally incapacitated inventor):			
1299 Canton Drive			
City	Milpitas	State	CA
Zip	95035	Country	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:			
<input type="checkbox"/> Legal Representative (for deceased or legally incapacitated inventor only),			
<input checked="" type="checkbox"/> Assignee,			
<input type="checkbox"/> Person to whom the inventor is under an obligation to assign,			
<input type="checkbox"/> Person who otherwise shows a sufficient proprietary interest in the matter (petition under 37 CFR 1.46 is required), or			
<input type="checkbox"/> Joint Inventor.			

[Page 1 of 2]

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1.11 and 1.14. This collection is estimated to take 1 minute 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.

## 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).

### 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.

### 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:

TiVo Inc.

Applicant Name:

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.

## 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.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
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.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
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.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	20899302
<b>Application Number:</b>	09126071
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	8489
<b>Title of Invention:</b>	MULTIMEDIA TIME WARPING SYSTEM
<b>First Named Inventor/Applicant Name:</b>	JAMES M. BARTON
<b>Customer Number:</b>	29989
<b>Filer:</b>	Kirk D. Wong
<b>Filer Authorized By:</b>	
<b>Attorney Docket Number:</b>	TIVO0003
<b>Receipt Date:</b>	08-DEC-2014
<b>Filing Date:</b>	30-JUL-1998
<b>Time Stamp:</b>	18:46:42
<b>Application Type:</b>	Utility under 35 USC 111(a)

### Payment information:

Submitted with Payment	no
------------------------	----

### File Listing:

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 835725d8f4a3f40bb530f3c10f4c0299740a ade7	no	1

### Warnings:

### Information:

2	Oath or Declaration filed	Goodman.pdf	118746	no	2
			e07bdc14a9740f39fa95e7f6ee3fcd84ff9a0908		
<b>Warnings:</b>					
<b>Information:</b>					
3	Oath or Declaration filed	Moskowitz.pdf	89658	no	1
			de46c6136b384c5019692de32c973d0ec0a5424b		
<b>Warnings:</b>					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
<b>Information:</b>					
4	Oath or Declaration filed	Chow_Substitute_oath.pdf	204564	no	3
			f2382ccede403895f74decd3894a5a58ba3ab499		
<b>Warnings:</b>					
<b>Information:</b>					
5	Oath or Declaration filed	Kao_Substitute_oath.pdf	204596	no	3
			03c6672e4788675b1b766280e00ac40f3cc6dbbc		
<b>Warnings:</b>					
<b>Information:</b>					
6	Oath or Declaration filed	McInnis_Substitute_oath.pdf	204528	no	3
			3b256ca83a898392ab0504da48032ae435f81ea8		
<b>Warnings:</b>					
<b>Information:</b>					
<b>Total Files Size (in bytes):</b>			850344		
<p><b>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</b></p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b>  <b>If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</b></p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b>  <b>If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</b></p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b>  <b>If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</b></p>					

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

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. 5:11-cv-00053	DATE FILED 3/26/2012	U.S. DISTRICT COURT Eastern District of Texas, Texarkana Division
PLAINTIFF TiVo Inc. (Counterclaim Plaintiff)		DEFENDANT 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	<input type="checkbox"/> Amendment <input checked="" type="checkbox"/> Answer <input type="checkbox"/> Cross Bill <input type="checkbox"/> 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



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

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. CV 12-02766 RS	DATE FILED 5/30/2012	U.S. DISTRICT COURT 450 Golden Gate Avenue, 16 <sup>th</sup> 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 <input type="checkbox"/> Amendment <input type="checkbox"/> Answer <input type="checkbox"/> Cross Bill <input type="checkbox"/> Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
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 Richard W. Wiekling	(BY) DEPUTY CLERK Gina Agustine-Rivas	DATE 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

1 relating to the interest of justice.” *Micron Tech.*, 518 F.3d at 902-05. While the “general rule favors  
 2 the forum of the first-filed action, whether or not it is a declaratory judgment action,” the Federal  
 3 Circuit has recognized that “trial courts have discretion to make exceptions to this general rule in the  
 4 interest of justice or expediency, as in any issue of choice of forum.” *Id.* at 904 (citing *Genentech*,  
 5 998 F.2d at 937). Thus, a “district court may consider a party’s intention to preempt another’s  
 6 infringement suit when ruling on the dismissal of a declaratory action, but that consideration is  
 7 merely one factor” of many to be assessed, including “the convenience and availability of witnesses,  
 8 the absence of jurisdiction over all necessary or desirable parties, and the possibility of  
 9 consolidation with related litigation.” *Id.*

10 1. Interests of justice

11 Analyzing the interests of justice entails an inquiry into “whether efficient and expeditious  
 12 administration of justice would be furthered” by transfer. *Sherar v. Harless*, 561 F.2d 791, 794 (9th  
 13 Cir. 1977); accord *Regents of the Univ. of Cal. v. Eli Lilly & Co.*, 119 F.3d 1559, 1565 (Fed. Cir.  
 14 1997). Matters of judicial economy “may be determinative to a particular transfer motion, even if  
 15 the convenience of the parties and witnesses might call for a different result.” *Regents*, 119 F.3d at  
 16 1565 (quoting *Coffey v. Van Dorn Iron Works*, 796 F.2d 217, 220-21 (7th Cir. 1986)). Thus, in  
 17 patent litigation “in which several highly technical factual issues are presented and the other relevant  
 18 factors are in equipoise, the interest of judicial economy may favor transfer to a court that has  
 19 become familiar with the issues.” *Id.*

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

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

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

22         2. Other factors

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

United States District Court  
For the Northern District of California

1 evidence and many witnesses are located there. Such considerations would have greater salience if  
 2 this were a dispute between genuinely local parties. In reality, however, both Cisco and TiVo are  
 3 large and sophisticated companies, quite accustomed to operating – and litigating – all around the  
 4 country, including in the E.D. Tex. Both Cisco and TiVo are undoubtedly capable of furnishing  
 5 documentary evidence in electronic form wherever it may be needed. As TiVo further points out,  
 6 the inventors named in its DVR patents have already been deposed repeatedly in connection with  
 7 the preexisting E.D. Tex. proceedings without incident. To the extent Cisco suggests that it would  
 8 be costly for witnesses to travel to the E.D. Tex. to give testimony, in light of the scope and overall  
 9 expense of litigating a case such as this, as well as the parties’ resources, that contention is similarly  
 10 unpersuasive. The transfer statute’s “private interest” factors do not strongly support granting or  
 11 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

12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28

United States District Court  
For the Northern District of California

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28

ECF DOCUMENT  
I hereby attest and certify this is a printed copy of a document which was electronically filed with the United States District Court for the Northern District of California.  
Date Filed: 8/10/12  
RICHARD W. WILKING, Clerk  
BY: GINA AGUSTINE, Deputy Clerk

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

1 Defendant TiVo is a supplier of digital video recorders (“DVRs”). It holds the right to the  
2 patents at issue in this action, including U.S. Patent Numbers 6,233,389 (“the ‘389 patent”), which  
3 claims DVR technology that allows users to record and replay television broadcasts, 7,529,465 (“the  
4 ‘465 patent”), directed to allowing multi-room viewing of television content, 7,493,015 (“the ‘015  
5 patent”), claiming “overshoot correction” functionality for fast forwarding and rewinding, and  
6 6,792,195 (“the ‘195 patent”), directed to “trickplay” functionality. TiVo is headquartered and has  
7 its principal place of business in Alviso, California, which is located in this District. It apparently  
8 maintains a distribution center in Fort Worth, Texas, a city located in the Northern District of Texas.  
9 Plaintiff Cisco similarly develops and supplies DVR technology. It sells approximately twenty  
10 different DVR models to customers that include cable and telecommunications providers such as  
11 Verizon, AT&T, and Time Warner Cable. It is headquartered and has its principal place of business  
12 in San Jose, California, but also maintains offices in Texas. TiVo insists that Cisco’s DVR business  
13 is primarily based in Atlanta, Georgia, the location of Scientific Atlanta, a DVR vendor that Cisco  
14 purchased in 2006 to supplement its own business.

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

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

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

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

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

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

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

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

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

### 15 III. LEGAL STANDARD

16 The Declaratory Judgment Act permits courts the discretion to decline jurisdiction over  
 17 declaratory judgment claims. *Wilton v. Seven Falls Co.*, 515 U.S. 277, 282 (1995); 28 U.S.C. §  
 18 2201 (“...any court of the United States, upon the filing of an appropriate pleading, *may* declare the  
 19 rights and other legal relations of any interested party seeking such declaration ....”) (emphasis  
 20 added). Courts routinely do so under the “first-to-file” rule, the “generally recognized doctrine of  
 21 federal comity which permits a district court to decline jurisdiction over an action when a complaint  
 22 involving the same parties and issues has already been filed in another district.” *Pacesetter Sys.,*  
 23 *Inc. v. Medtronic, Inc.*, 678 F.2d 93, 94-95 (9th Cir. 1982). The rule “favors the forum of the first-  
 24 filed action, whether or not it is a declaratory action,” *see Genetech, Inc. v. Eli Lilly & Co.*, 998 F.2d  
 25 931, 937 (Fed. Cir. 1993), in the service of “promot[ing] judicial efficiency and prevent[ing] the risk  
 26 of inconsistent decisions that would arise from multiple litigations of identical claims.” *Interactive*  
 27 *Fitness Holdings, LLC v. Icon Health & Fitness, Inc.*, No. C 10-04628, 2011 WL 1302633, at \*3  
 28 (N.D. Cal. Apr. 5, 2011). The rule “should not be disregarded lightly.” *Alltrade, Inc. v. Uniworld*



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

4 In applying the rule, courts focus primarily on the chronology of the filings, the identity of  
5 the parties, and whether the issues presented in the successive actions “substantially overlap.”  
6 *Intersearch Worldwide, Ltd. v. Intersearch Grp., Inc.*, 544 F. Supp. 2d 949, 957-58 (N.D. Cal.  
7 2008). The analysis may also encompass consideration of the “convenience factors” set forth in the  
8 transfer statute, 28 U.S.C. § 1404(a), including, “the convenience and availability of witnesses,  
9 absence of jurisdiction over all necessary or desirable parties, possibility of consolidation with  
10 related litigation, or considerations relating to the interest of justice.” *Micron Tech., Inc. v. Mosaid*  
11 *Techs., Inc.*, 518 F.3d 897, 902-05 (Fed. Cir. 2008).

#### 12 IV. DISCUSSION

##### 13 A. Threshold factors

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

22 In an attempt to minimize the significance of those facts, TiVo downplays the extent to  
23 which the identity of the parties and substantive issues must present commonality under the first-to-  
24 file rule. It quotes *Intersearch Worldwide*, a decision from this District,<sup>2</sup> noting that “exact identity

25 <sup>2</sup> TiVo also identifies some out-of-circuit cases standing for the principle that the analysis “turns on  
26 which court first obtains possession of the subject of the dispute, not the parties of the dispute.”  
27 *Shire U.S., Inc. v. Johnson Matthey, Inc.*, 543 F. Supp. 2d 404, 407 (E.D. Pa. 2008). Those cases,  
28 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*.

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

14 Invoking another recent decision from this District, *Proofpoint, Inc. v. InNova Patent*  
 15 *Licensing, LLC*, No. C 11-02288, 2011 WL 4915847, at \*6-7 (N.D. Cal. Oct. 17, 2011), TiVo  
 16 alternatively argues that a patentee’s prior litigation against an alleged infringer’s customers may  
 17 meet the first-to-file rule’s requirements. That suggestion is somewhat at odds with the “customer  
 18 suit” exception to the first-to-file rule, which generally holds that “litigation against or brought by  
 19 the manufacturer of infringing goods takes precedence over a suit by the patent owner against  
 20 customers of the manufacturer.” *See Katz v. Lear Siegler, Inc.*, 909 F.2d 1459, 1464 (Fed. Cir.  
 21 1990).<sup>3</sup> Although TiVo and Cisco debate the applicability of that doctrine to this action, it is not  
 22 necessary to resolve that dispute in light of the result reached below, and given that *Proofpoint* is  
 23 not as supportive to TiVo as it suggests.

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

27 <sup>3</sup> It is typically invoked “where the first suit is filed against a customer who is simply a reseller of  
 28 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.

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

18 Cisco insists that simple application of the first-to-file rule suggests that TiVo’s motion  
 19 should be denied because it had not been drawn into the E.D. Tex. litigation before it filed this suit,  
 20 and invokes many cases for support. While that position might, at first blush, seem persuasive, it  
 21 ignores the fact that TiVo made efforts to amend its infringement contentions to encompass Cisco’s  
 22 products almost a year before these proceedings were initiated. Those efforts were unavailing, not  
 23

24 <sup>4</sup> Cisco attempts to distinguish *Proofpoint* further on the grounds that there, unlike here: (1) the  
 25 transfer statute’s convenience considerations were not debated; and (2) intervention in the E.D. Tex.  
 26 case was still reasonably available to the declaratory judgment plaintiff. Turning to the latter point  
 27 first, now that Cisco is not a party to *Verizon* or *Motorola*, it will plainly have ample opportunity to  
 28 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.

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

7 Moreover, to the extent that prior cases are helpful, they teach the first-to-file rule is not to  
 8 be applied mechanistically, nor set aside only in "extraordinary circumstances," as Cisco suggests.  
 9 *Pacesetter*, 678 F.2d at 95 ("not a rigid or inflexible rule"); *Genentech*, 998 F.2d at 937 (exceptions  
 10 not unusual); *Church of Scientology of California v. United States Dep't of the Army*, 611 F.2d 738,  
 11 749, 750 (9th Cir. 1979) ("[T]he "first to file" rule normally serves the purpose of promoting  
 12 efficiency well and should not be disregarded lightly. Circumstances and modern judicial reality,  
 13 however, may demand that we follow a different approach from time to time...."). The simplistic  
 14 approach urged by Cisco, which essentially calls for comparing the parties listed on the dockets in  
 15 the relevant actions and the dates each was filed, is of little assistance in a case such as this, where  
 16 both parties lay a plausible claim to first filer status, and the substantive overlap of the issues  
 17 litigated, though not complete, is significant. In short, the first-to-file rule does not supply the  
 18 answer to the pending venue related motions in this particular case.

19 B. Section 1404 factors

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

26 \_\_\_\_\_  
 27 <sup>5</sup> As an initial matter, the parties do not dispute that this case could have been brought in either  
 28 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).

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

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. CV 12-02766 LB	DATE FILED 5/30/12	U.S. DISTRICT COURT 450 Golden Gate Ave, Box 36060, 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 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 <input type="checkbox"/> Amendment <input type="checkbox"/> Answer <input type="checkbox"/> Cross Bill <input type="checkbox"/> Other Pleading		
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK	
1			
2			
3			
4			
5			

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

DECISION/JUDGEMENT
--------------------

CLERK Richard W. Wicking	(BY) DEPUTY CLERK Felicia Reloba	DATE 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

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

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. 2:12-cv-00311	DATE FILED 6/4/2012	U.S. DISTRICT COURT Eastern District of Texas
PLAINTIFF TiVo Inc.		DEFENDANT 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 <input type="checkbox"/> Amendment <input type="checkbox"/> Answer <input type="checkbox"/> Cross Bill <input type="checkbox"/> Other Pleading		
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK	
1			
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. 08/10)

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

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. 5:11-cv-00053	DATE FILED 2/25/2011	U.S. DISTRICT COURT Eastern District of Texas, Texarkana Division
PLAINTIFF Motorola Mobility, Inc. and General Instrument Corporation		DEFENDANT 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 <input type="checkbox"/> Amendment <input type="checkbox"/> Answer <input type="checkbox"/> Cross Bill <input type="checkbox"/> Other Pleading		
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK	
1			
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

# SOLICITOR

AUG 28 2009

AO 120 (Rev. 3/04)

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

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. 2:09-cv-257	DATE FILED	U.S. DISTRICT COURT Eastern District of Texas
PLAINTIFF TiVo Inc.		DEFENDANT 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	
	<input type="checkbox"/> Amendment <input type="checkbox"/> Answer <input type="checkbox"/> Cross Bill <input type="checkbox"/> Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
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. 3/04)

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

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. 2:09-cv-259	DATE FILED 8/26/2009	U.S. DISTRICT COURT Eastern District of Texas, Marshall Division
PLAINTIFF TiVo, Inc.		DEFENDANT 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		
5		

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

DATE INCLUDED	INCLUDED BY	
	<input type="checkbox"/> Amendment <input type="checkbox"/> Answer <input type="checkbox"/> Cross Bill <input type="checkbox"/> Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
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

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

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  Patents or  Trademarks:

DOCKET NO. 08cv327	DATE FILED 5/30/08	U.S. DISTRICT COURT DISTRICT OF DELAWARE
PLAINTIFF Dish Network Corporation, et al.		DEFENDANT 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		
3		
4		
5		

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

DATE INCLUDED	INCLUDED BY <input type="checkbox"/> Amendment <input type="checkbox"/> Answer <input type="checkbox"/> Cross Bill <input type="checkbox"/> Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

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

DECISION/JUDGEMENT
--------------------

CLERK PETER T. DALLEO, CLERK OF COURT	(BY) DEPUTY CLERK	DATE 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. 141

### 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 10/17/05 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

Paper No. 13

MAIL

MAR 08 2004

DIRECTOR OFFICE  
TECHNOLOGY CENTER 2600

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

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:

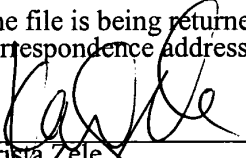
- (1) indicate the present mailing address of the attorney(s)/agent(s) who seek(s) to withdraw, and
- (2) be signed by each attorney/agent seeking to withdraw or clearly be signed on their behalf, and
- (3) be *approved* at least thirty (30) days prior to the maximum extendable period for response to 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.



Kriya 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

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

CONFIRMATION NO. 8489



\*OC000000012042648\*

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.

---

*A. L. Desperitt*  
 ALL YSON L DESPERTT  
 2600 (703) 305-4800

OFFICE COPY



Paper No. 11

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

**COPY MAILED**

JAN 29 2004

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

**OFFICE OF PETITIONS  
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).**

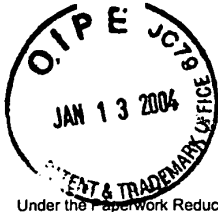
The Office no longer investigates or rejects original or reissue applications under 37 CFR 1.56. **1098 Off. Gaz. Pat. Office 502 (January 3, 1989).** Therefore, nothing in this Notice is intended to imply that an investigation was done.

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  
CAD

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.

<b>REQUEST FOR WITHDRAWAL AS ATTORNEY OR AGENT AND CHANGE OF CORRESPONDENCE ADDRESS</b>	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

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

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.

RECEIVED  
JAN 21 2004  
Technology Center 2600  
RECEIVED  
FEB - 5 2004  
DIRECTOR OFFICE  
TECHNOLOGY CENTER 2000

**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

<input checked="" type="checkbox"/> Firm or Individual Name	Hickman Palermo Truong & Becker LLP		
Address	1600 Willow Street		
Address			
City	San Jose	State	California
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.

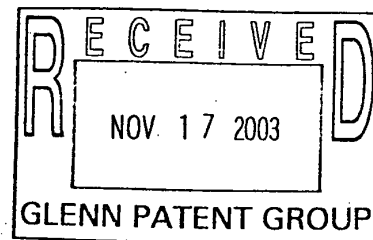
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



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	Tel. 408/414-1080 x202
✓ Hickman Palermo Truong & Becker LLP	Fax 408/414-1076
1600 Willow Street	cpalermo@hptb-law.com
San Jose, CA 95125-5106	

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.

TiVo Inc. • 2160 Gold Street • Alviso, CA 95002

Tel 408.519.9100 • Fax 408.519.5333 • www.tivo.com



~~\$ DAE~~  
(S)



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#10

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 )

RECEIVED  
JAN - 9 2004  
OFFICE OF PETITIONS

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:

<u>Date Paid</u>	<u>Fee Type</u>	<u>Surcharge</u>	<u>Fee Paid</u>	<u>Fee Now Due</u>	<u>Difference</u>
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

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   
Teresa Austin



03-16-01

✓ B\$ # 92

Express Mail mailing label no. E-6468671US  
Date of Deposit: March 14, 2001

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*  
\_\_\_\_\_  
Jessica Pallach

**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:** 2615

**Filed:** July 30, 1998

**Examiner:** T. Tran

**Title:** MULTIMEDIA TIME WARPING SYSTEM

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,

*[Signature]*

Michael A. Glenn  
Reg. No. 30,176

Customer No. 22862

M 01.01

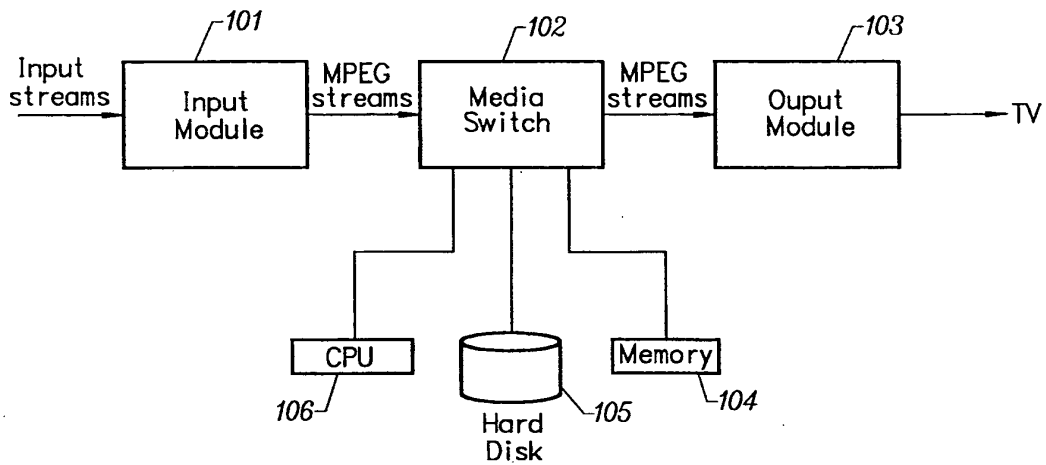


FIG. 1

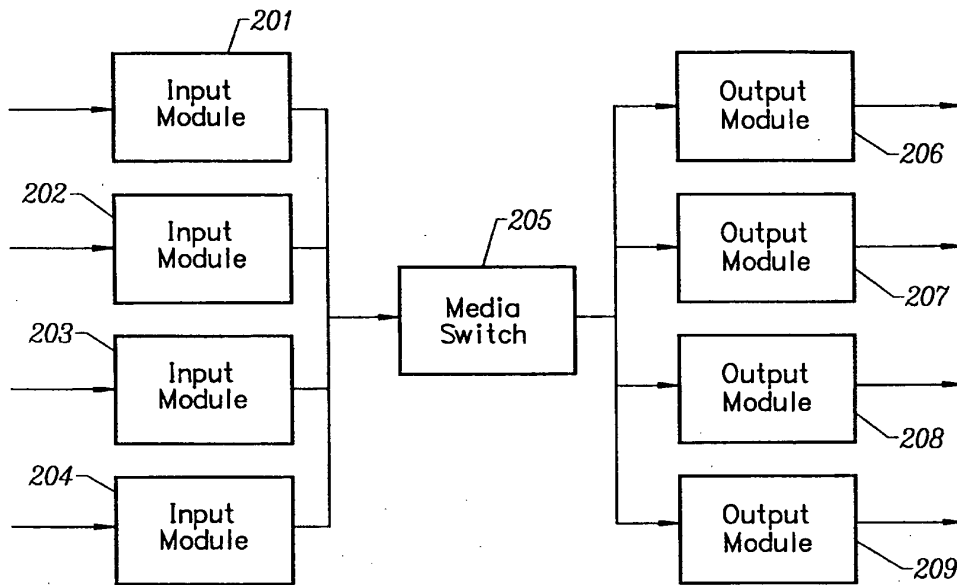


FIG. 2

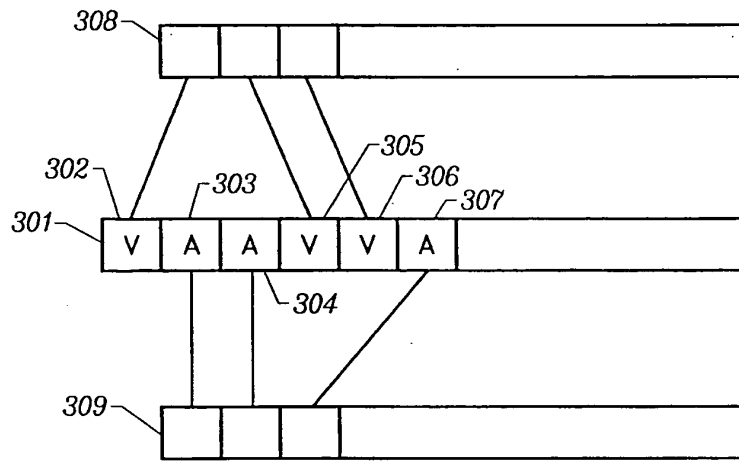


FIG. 3

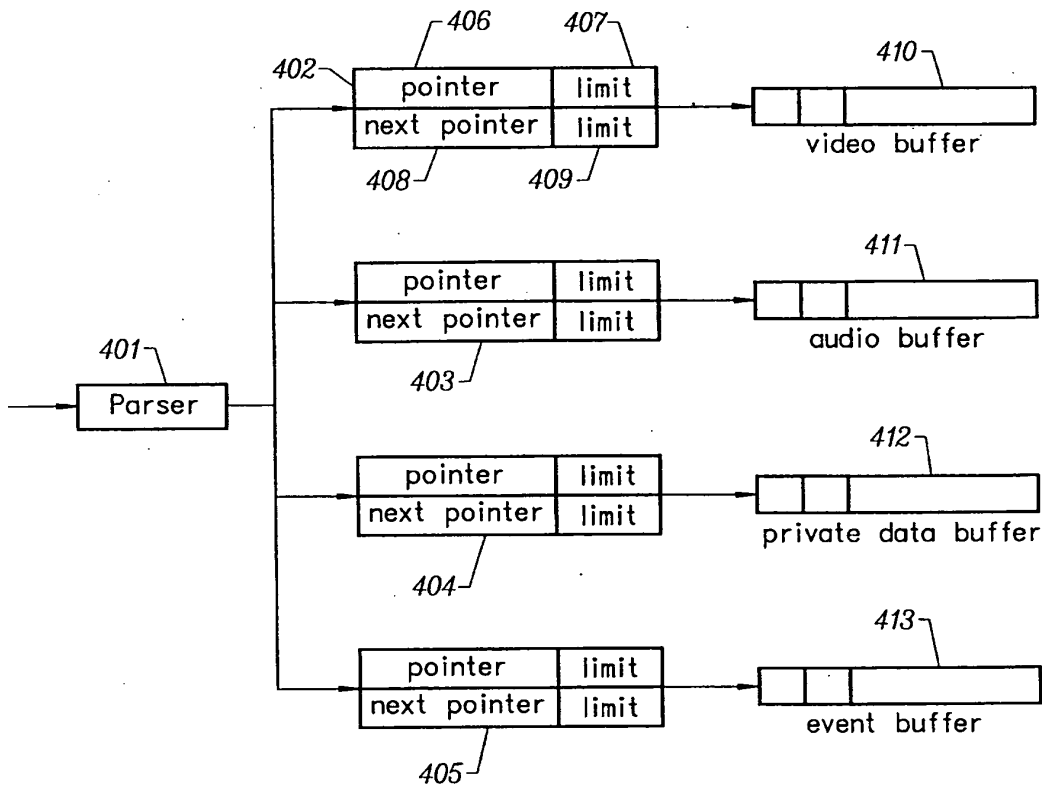


FIG. 4

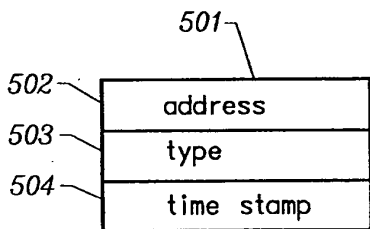


FIG. 5

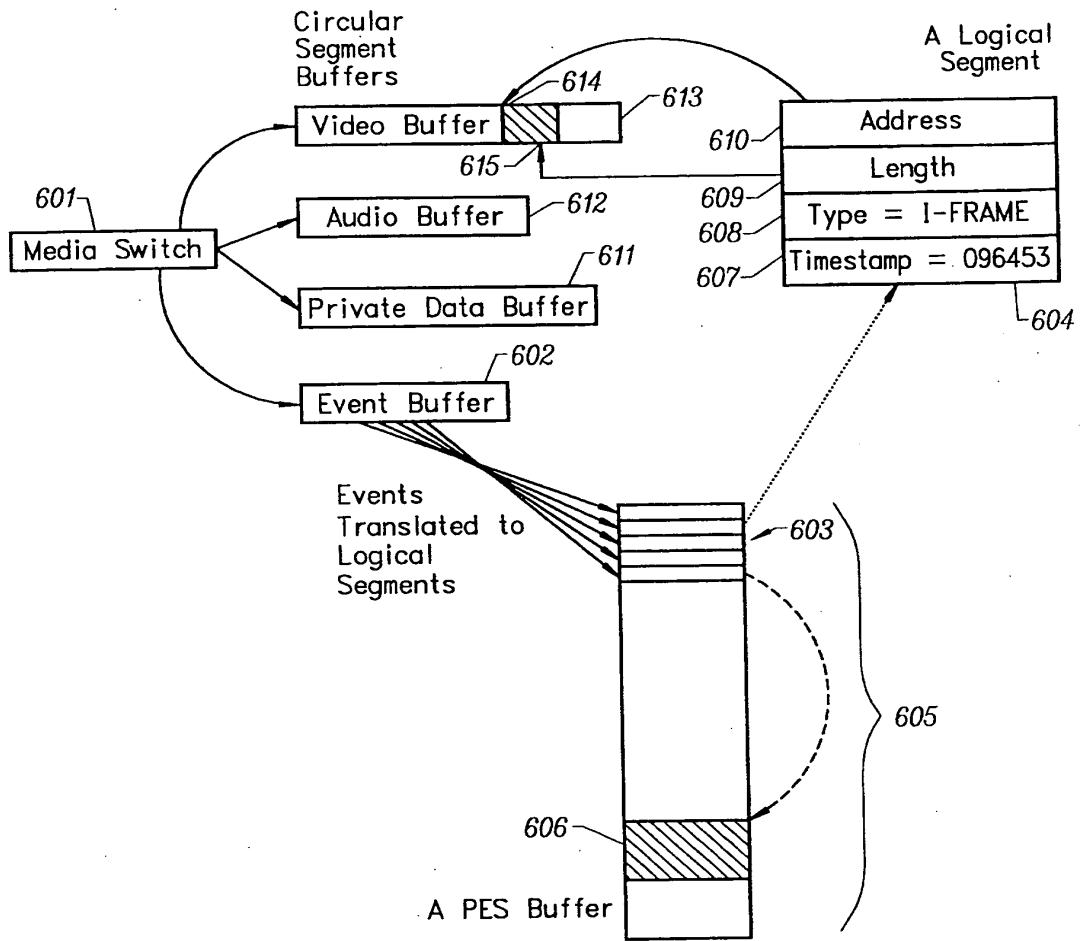


FIG. 6



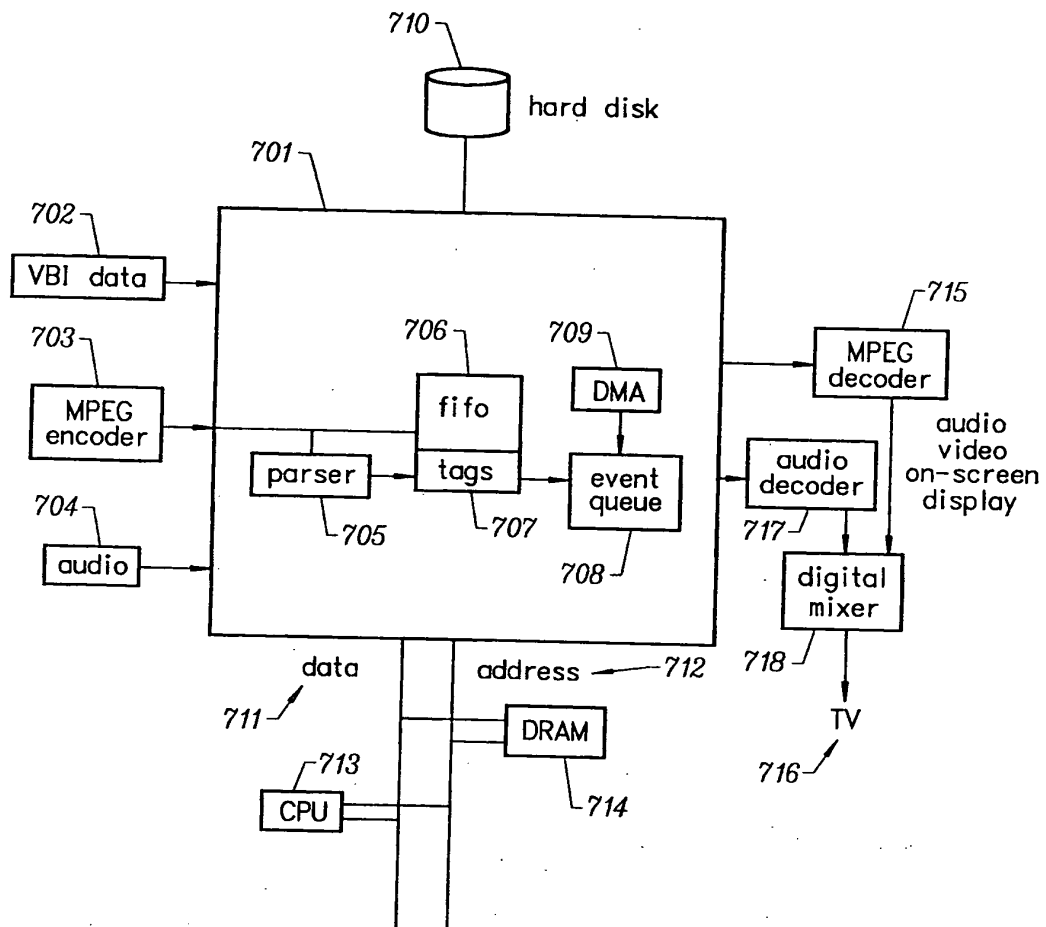


FIG. 7

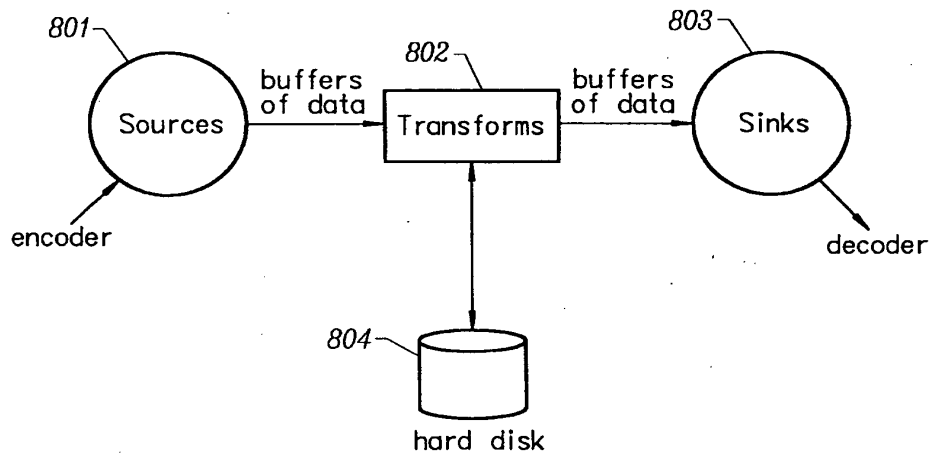


FIG. 8

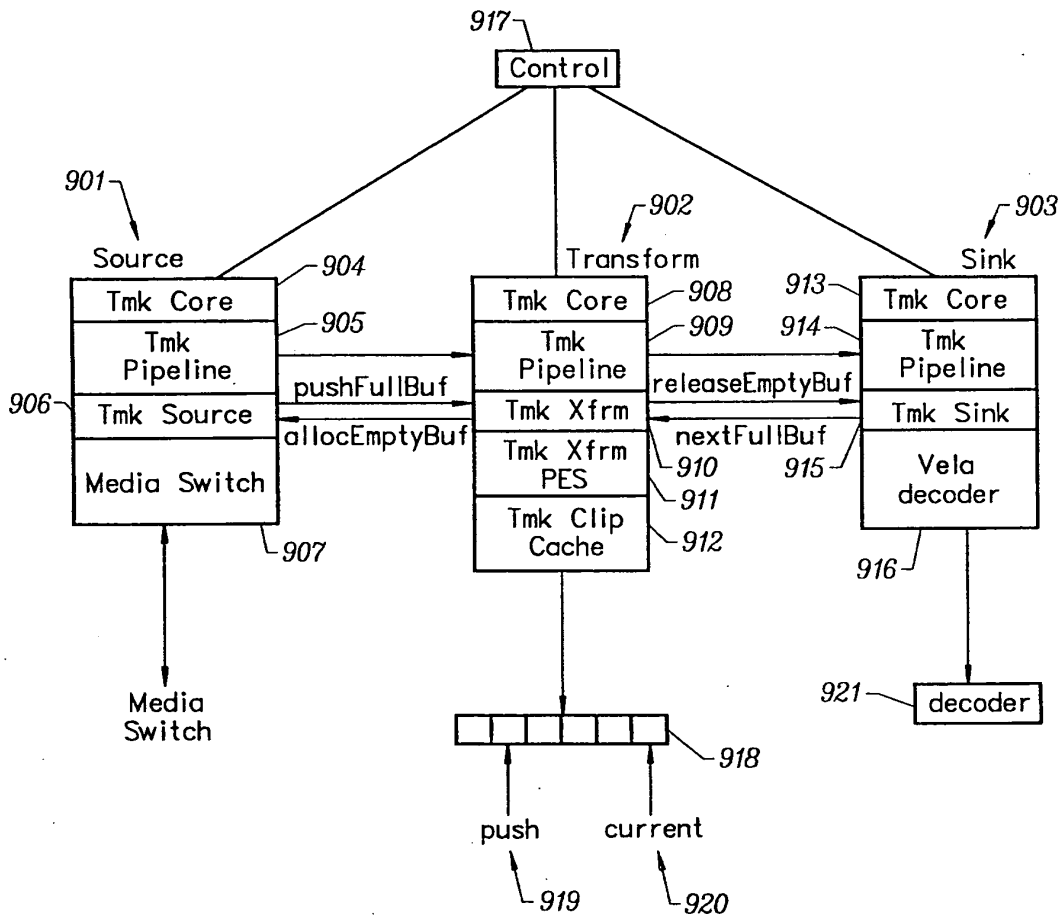


FIG. 9

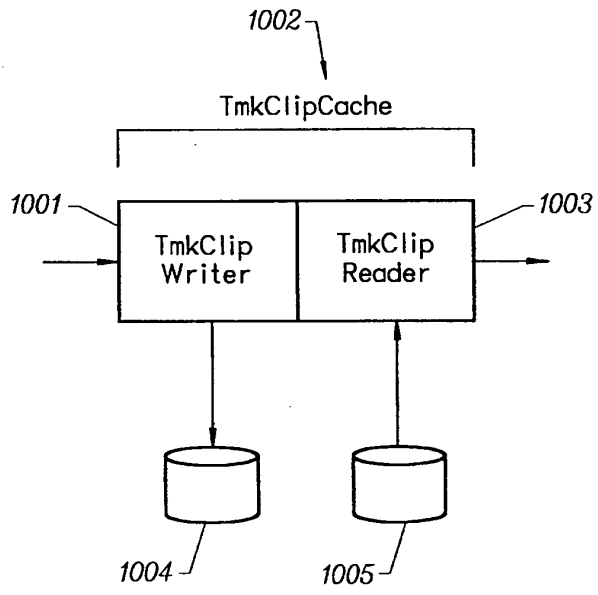


FIG. 10

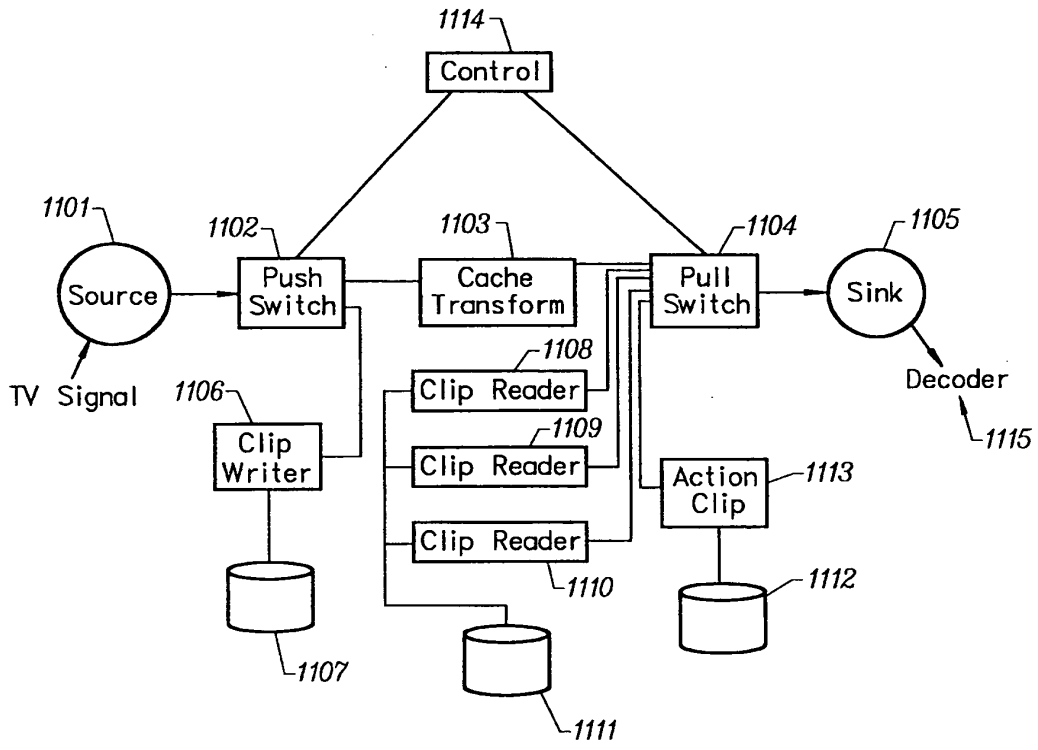


FIG. 11

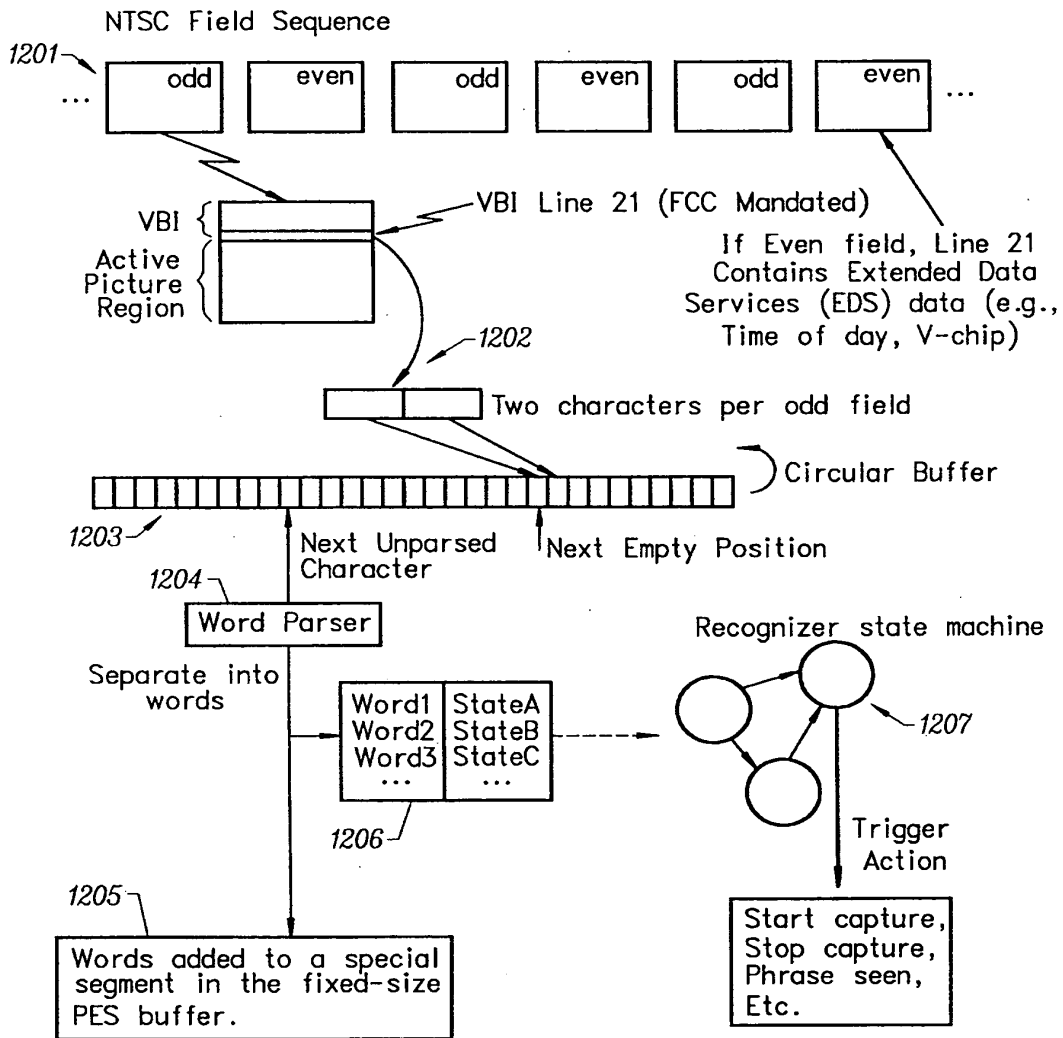


FIG. 12

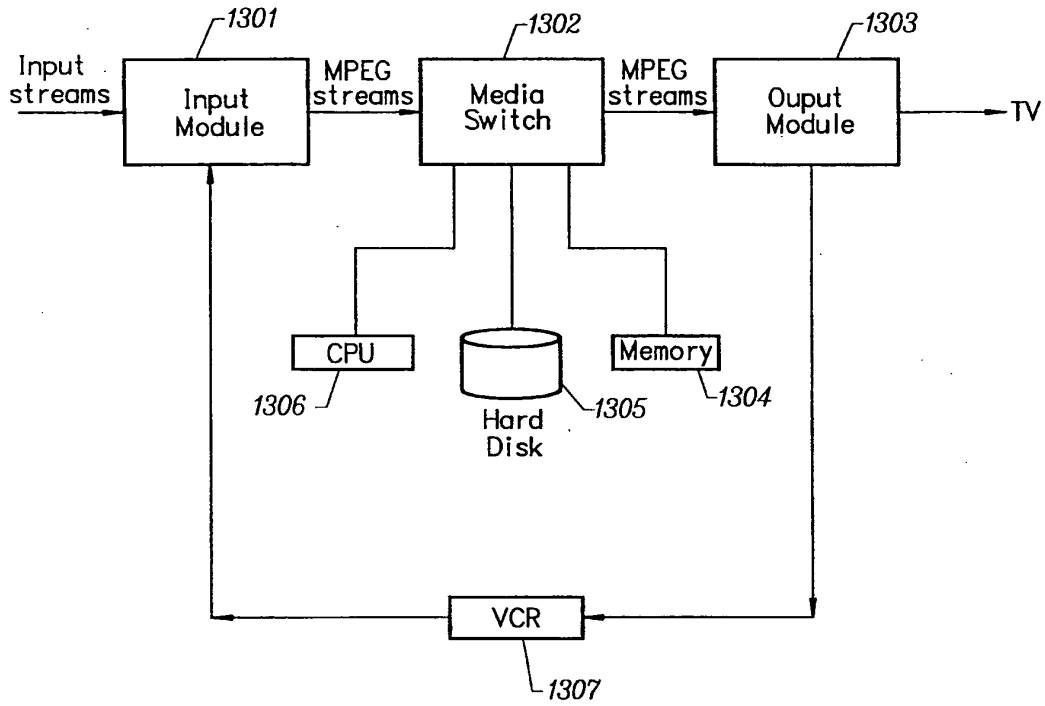


FIG. 13



PART B—ISSUE FEE TRANSMITTAL

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

BC NW

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.

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.

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

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

Table with columns: APPLICATION NO., FILING DATE, TOTAL CLAIMS, EXAMINER AND GROUP ART UNIT, DATE MAILED. Row 1: 09/126,071, 07/30/98, 061, TRAN, T, 2615, 01/03/01. Row 2: First Named Applicant BARTON, 35 USC 154(b) term ext. = 0 Days.

TITLE OF INVENTION MULTIMEDIA TIME WARPING SYSTEM

Table with columns: ATTY'S DOCKET NO., CLASS-SUBCLASS, BATCH NO., APPLN. TYPE, SMALL ENTITY, FEE DUE, DATE DUE. Row 1: 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.
Michael A. Glenn
Kirk Wong

- 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 appropriate when an assignment has been previously submitted to the PTO or is being submitted under separate cover. Completion of this form is NOT a substitute 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 [checked] 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 [checked]
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.

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.

03/19/2001 BHABTEN1 00000111 501240 09126071
01 FC:242 620.00 CH
02 FC:561 30.00 CH

TRANSMIT THIS FORM WITH FEE



**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. \_\_\_\_\_.

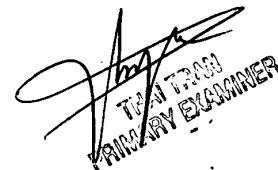
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings. The drawings should be filed as a separate paper with a transmittal letter addressed to the Official Draftsperson.

- 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)
- 3  Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 5  Information Disclosure Statements (PTO-1449), Paper No. \_\_\_\_\_
- 7  Examiner's Comment Regarding Requirement for Deposit of Biological Material
- 2  Notice of Informal Patent Application (PTO-152)
- 4  Interview Summary (PTO-413), Paper No. \_\_\_\_\_
- 6  Examiner's Amendment/Comment
- 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<sup>1</sup>:

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.

---

<sup>1</sup> 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

0002/0103

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:

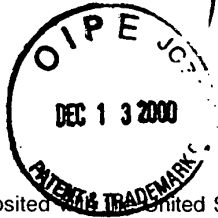
- A. Pay FEE DUE shown above, or
- B. File verified statement of Small Entity Status before, or with, payment of 1/2 the FEE DUE shown above.

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**



12-11-00

Gr 2615  
#7A  
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 in 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*  
\_\_\_\_\_  
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

**RECEIVED**

December 13, 2000

DEC 18 2000

Technology Center 2600

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:

1  
40

a

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;

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.

*A1  
cancel.*

*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.

*a*

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

*As  
cancel*

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.

<sup>4</sup>  
43

*a*

## 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







**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


DATE MAILED: 11/22/00

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

**Commissioner of Patents and Trademarks**

# Office Action Summary

Application No. <b>09/126,071</b>	Applicant <b>Barton et al</b>
Examiner <b>Thai Tran</b>	Group Art Unit <b>2615</b>



- 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*, 35 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 application.
- 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 ---

Art Unit: 2615

**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,

Art Unit: 2615

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.

Art Unit: 2615

*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, 2<sup>nd</sup> 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 from 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.

Art Unit: 2615

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.

Application/Control Number: 09/126,071

Page 6

Art Unit: 2615

**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")

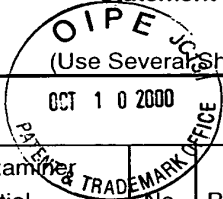
Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA., Sixth Floor (Receptionist).

  
THUAN TRAN  
PRIMARY EXAMINER

TTQ

November 16, 2000

<b>Form 1449 (Modified)</b>  <b>Information Disclosure Statement By Applicant</b>  (Use Several Sheets if Necessary)	Atty Docket No. TIVO0003	Serial No.: 09/126,071
	Applicant: Barton et al.	Group <del>277</del> 2615
	Filing Date 7/30/98	



**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	No

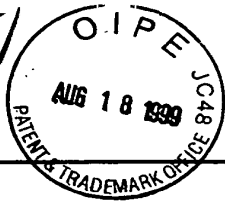
RECEIVED  
 OCT 19 2000  
 TECH CENTER 2700

**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.





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

**U.S. Patent Documents**

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
<i>TTG</i>	A	5,438,423	8/1/95	Lynch et al.	358	335	5/11/94
<i>TTG</i>	B	5,706,388	1/6/98	Isaka	386	125	12/30/96
<i>TTG</i>	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	No
<i>TTG</i>	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 <i>[Signature]</i>		Date Considered <i>11/15/2000</i>

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.

RECEIVED  
 AUG 20 1999  
 TC 2700 MAIL ROOM

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

**U.S. Patent Documents**

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
TTA	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	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 11/15/2000	

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.

A-R

<b>Notice of References Cited</b>	Application No. 09/126,071	Applicant(s) Barton et al
	Examiner Thai Tran	Group Art Unit 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		

TH

89/126071

NOTICE OF DRAFTERPERSON'S PATENT DRAWING REVIEW

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

- A. not objected to by the Drafterperson under 37 CFR 1.84 or 1.152.
B. objected to by the Drafterperson under 37 CFR 1.84 or 1.152 as indicated below. The Examiner will require submission of new, corrected drawings where necessary.

1. DRAWINGS. 37 CFR 1.84(a): Acceptable categories of drawings: Black ink. Color.
2. PHOTOGRAPHS. 37 CFR 1.84(b)
3. TYPE OF PAPER. 37 CFR 1.84(e)
4. SIZE OF PAPER. 37 CFR 1.84(F): Acceptable sizes:
5. MARGINS. 37 CFR 1.84(g): Acceptable margins:
6. VIEWS. CFR 1.84(h)
7. SECTIONAL VIEWS. 37 CFR 1.84(h)(3)
8. ARRANGEMENT OF VIEWS. 37 CFR 1.84(i)
9. SCALE. 37 CFR 1.84(k)
10. CHARACTER OF LINES, NUMBERS, & LETTERS. 37 CFR 1.84(l)
11. SHADING. 37 CFR 1.84(m)
12. NUMBERS, LETTERS, & REFERENCE CHARACTERS. 37 CFR 1.48(p)
13. LEAD LINES. 37 CFR 1.84(q)
14. NUMBERING OF SHEETS OF DRAWINGS. 37 CFR 1.48(t)
15. NUMBERING OF VIEWS. 37 CFR 1.84(u)
16. CORRECTIONS. 37 CFR 1.84(w)
17. DESIGN DRAWINGS. 37 CFR 1.152

COMMENTS

BEST AVAILABLE COPY

REVIEWER [Signature] DATE 8/24/98 TELEPHONE NO. 203 305 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 an 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.

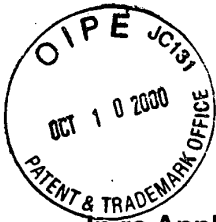
**3. Corrections other than Informalities Noted by the Drawing Review Branch on the Form PTO 948**

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.

**BEST AVAILABLE COPY**

GAU2711  
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
		Signature of the Person Making the Deposit:	Jessica Pallen



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

RECEIVED  
OCT 18 2000  
TECH CENTER 2700

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

RECEIVED

SEP -5 2000

TC 2700 MAIL ROOM



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.



Attorney Docket No. TIVO0003

28 2711

PATENT

#3  
ROSE  
8-2699

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, 1998.

Signed: Glenn Bach  
Glenn Bach

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

RECEIVED  
AUG 20 1999  
TC 2700 MAIL ROOM

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

Attorney Docket No. TIVO0003

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)
- 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

RECEIVED  
AUG 20 1999  
TC 2700 MAIL ROOM

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)
- 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.

(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,



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

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

Express Mail mailing label no. EL090779905US

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

A

Date: July 29, 1998

Assistant Commissioner for Patents  
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
<b>Total Fees</b>					<b>\$ 927.00</b>

A check in the amount of \$927 is enclosed to cover the filing fee and assignment recording fee.

The Commissioner 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,

*M. A. Glenn*  
Michael A. Glenn  
Reg. No. 30,176

07/30/98

JCS42 U.S. PTO  
09/126071

07/30/98

09126071 07/30/98

# MULTIMEDIA TIME WARPING SYSTEM

## BACKGROUND OF THE INVENTION

5

### 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.

10

### DESCRIPTION OF THE PRIOR ART

15

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.

20

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.

25

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**

5 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.

10 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.

15  
20 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.

25 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.



5 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.

10 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.

15 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**

20 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;

25 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;

Attorney Docket No. TIVO0003

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

5 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;

10 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;

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

20 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

25 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**

5 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:  
10 reverse, fast forward, play, pause, index, fast/slow reverse play, and fast/slow play.

15 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  
20  
25

5 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.

10 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.

15 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.

20  
25 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.

5 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  
10 the decoders may be properly synchronized for accurate playback of the signal.

15 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  
20 appropriate time stamp.

25 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.

5 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.

15 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.

10 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.

25 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.

5  
10  
15  
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.

20  
25  
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.

5 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.

10  
15  
20 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".

25 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.

5 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  
10 a later time, sent down the pipeline, and properly sequenced within the stream.

15 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.

20 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  
25 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.

5 The MediaSwitch class 909 fills the buffer up and pushes it back to the TmkClipCache 912 object.

10 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.

15 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.

20 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.

25 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.

5 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  
10 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  
15 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  
20 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  
25 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.

5 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  
10 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  
15 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  
20 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.  
25 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.

5 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.

20 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.

5

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.

10

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.

15

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.

20

25

09/20/01 07:30:50

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

Attorney Docket No. TIVO0003

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.

SECRET

**CLAIMS**

1. A process for the simultaneous storage and play back of multimedia data,  
5 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;

10 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;

15 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;

20 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

25 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.

5 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.

10 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.

15 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.

20 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.

25 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.

5

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  
10 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  
15 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  
20 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.

25

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  
5 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  
10 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:  
15 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.  
20

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  
25 asynchronously 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.

5 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:

10 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.

15 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.

20 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.

25 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.

5

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;

10

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;

15

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;

20

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;

25

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.

5 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.

10 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.

15 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.

20 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.

25 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.

- 5 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.
- 10 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.
- 15 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.
- 20 43. The apparatus of claim 32, further comprising:  
a module for increasing the decoder system clock rate for fast playback or  
fast reverse playback.
- 25 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.

5 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.

10 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.

15 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.

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

25 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 asynchronously and autonomously with a CPU.

5 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.

10 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.

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

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

25 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.

5 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.

10

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

15 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;

20

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;

25

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;

5 and

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

0915071-03099  
88220-709760

## MULTIMEDIA TIME WARPING SYSTEM

### ABSTRACT

5 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  
10 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  
15 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  
20 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  
25 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.

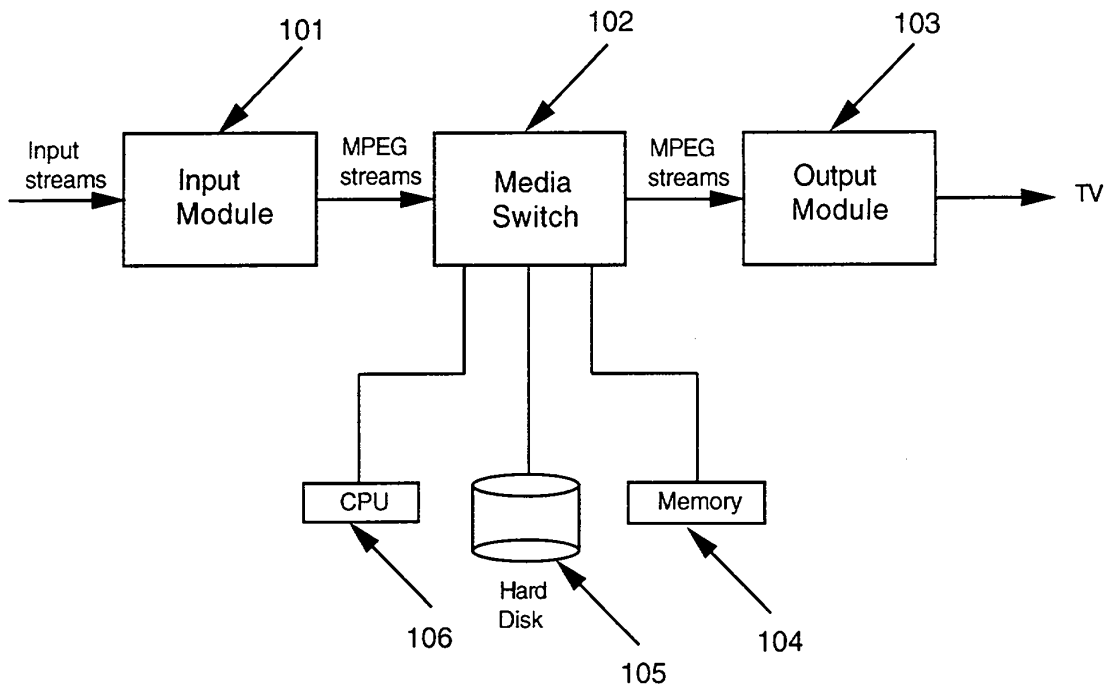


Fig. 1

200207000000

SECRET

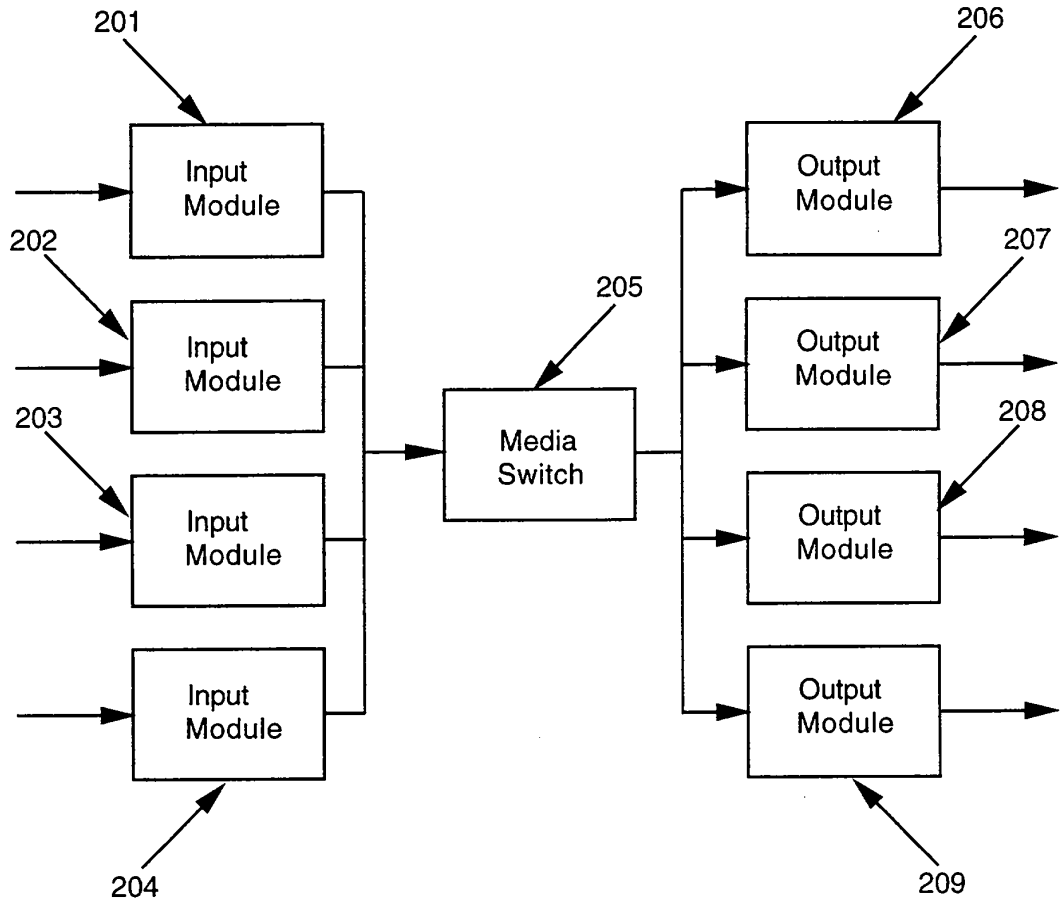


Fig. 2

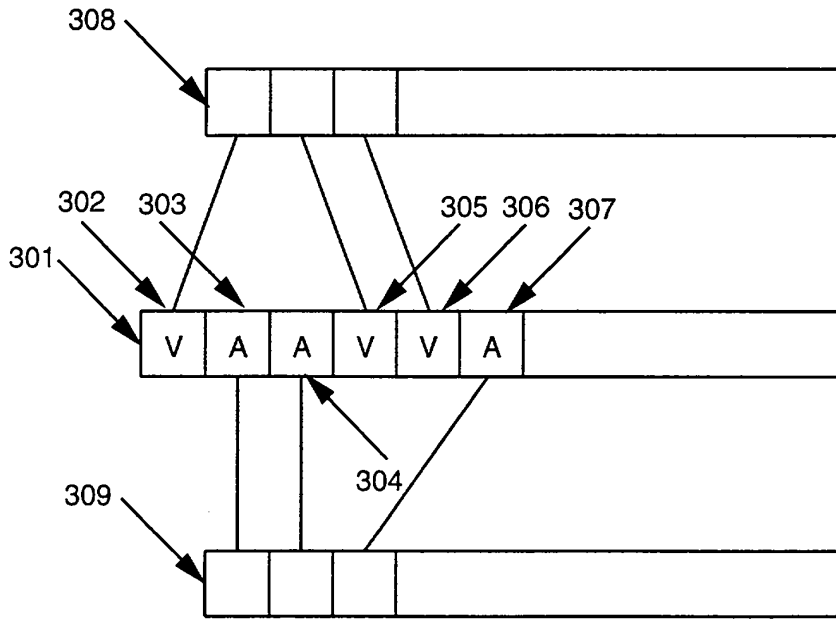


Fig. 3

9506201209260

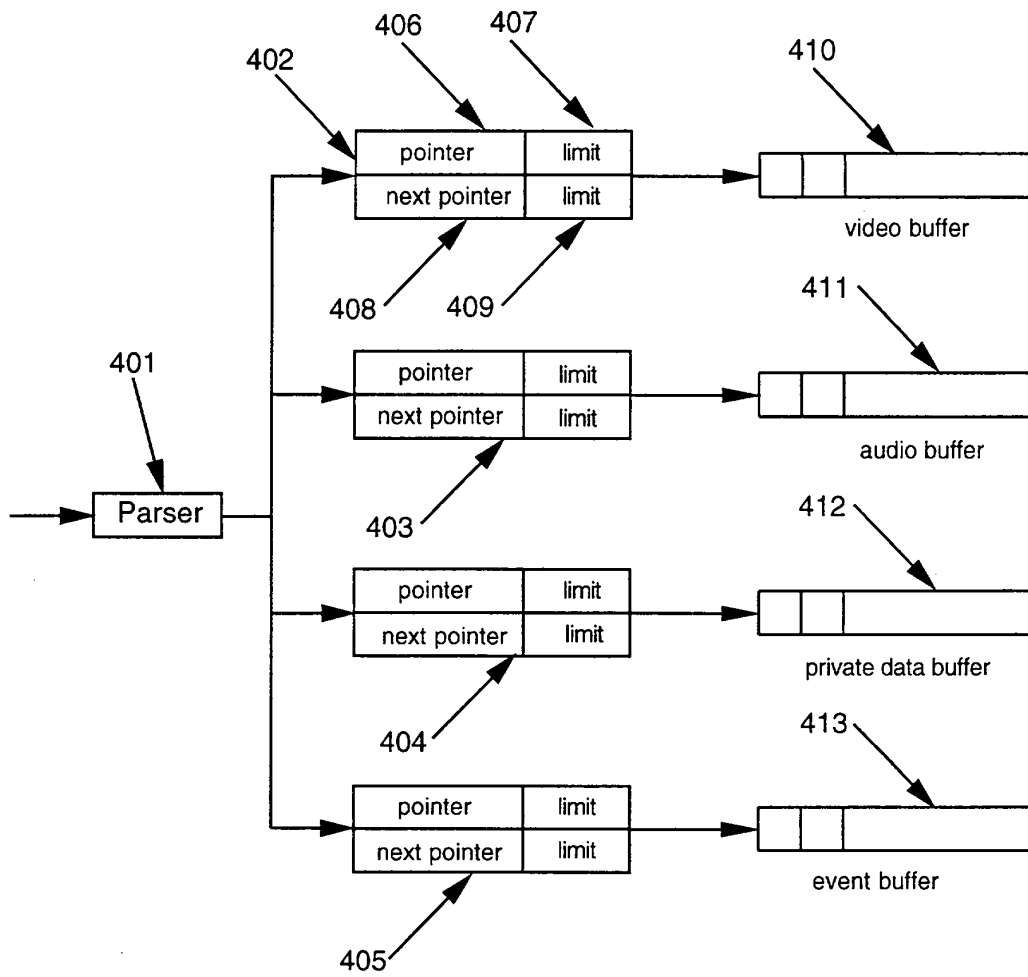


Fig. 4

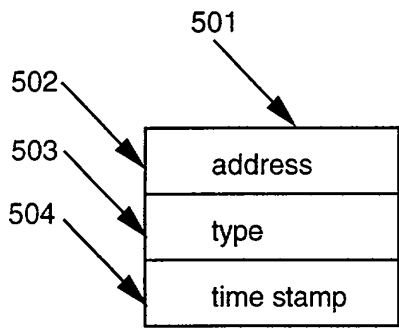


Fig. 5

2025 RELEASE UNDER E.O. 14176



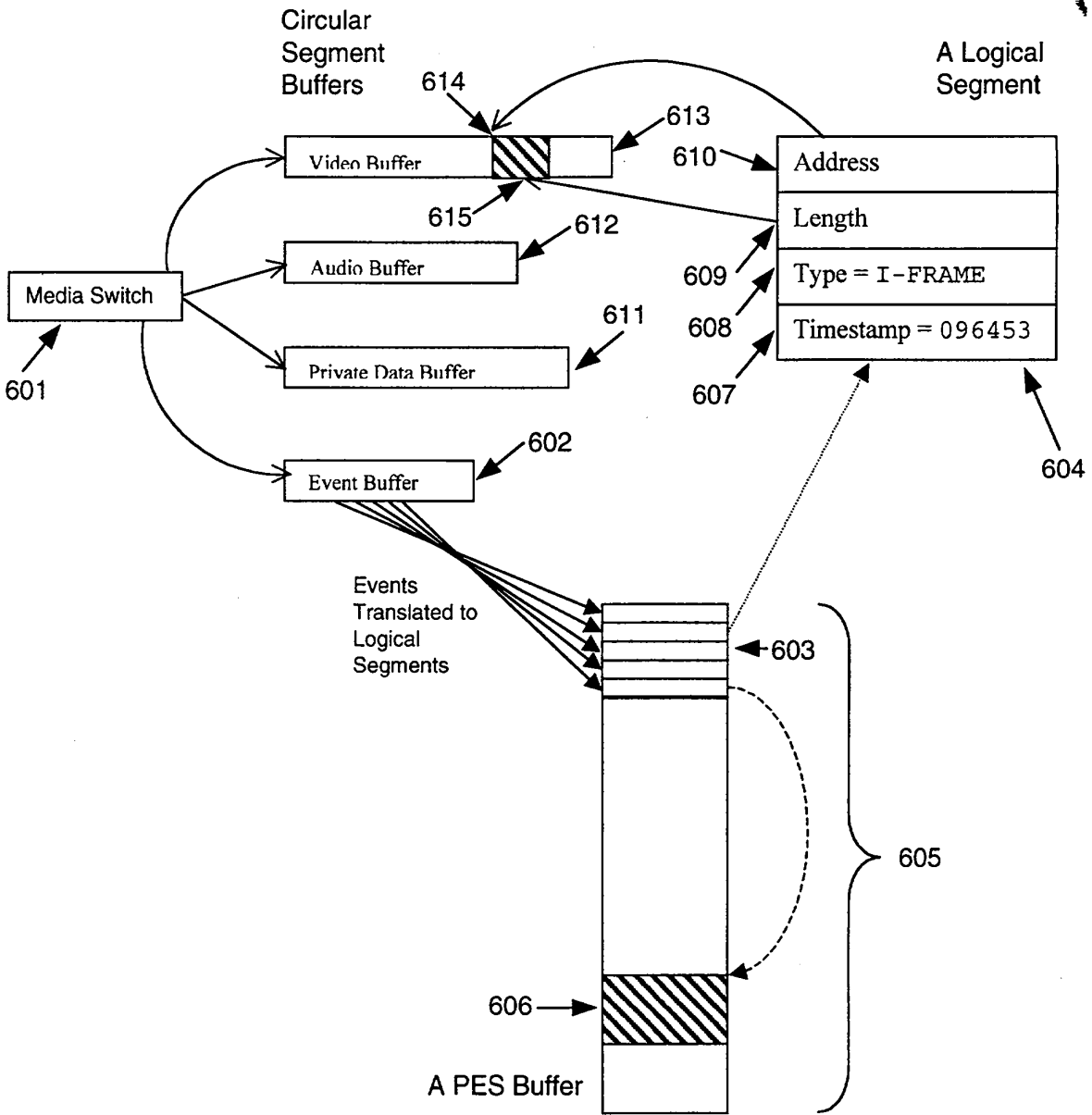


Fig. 6

56520-100000

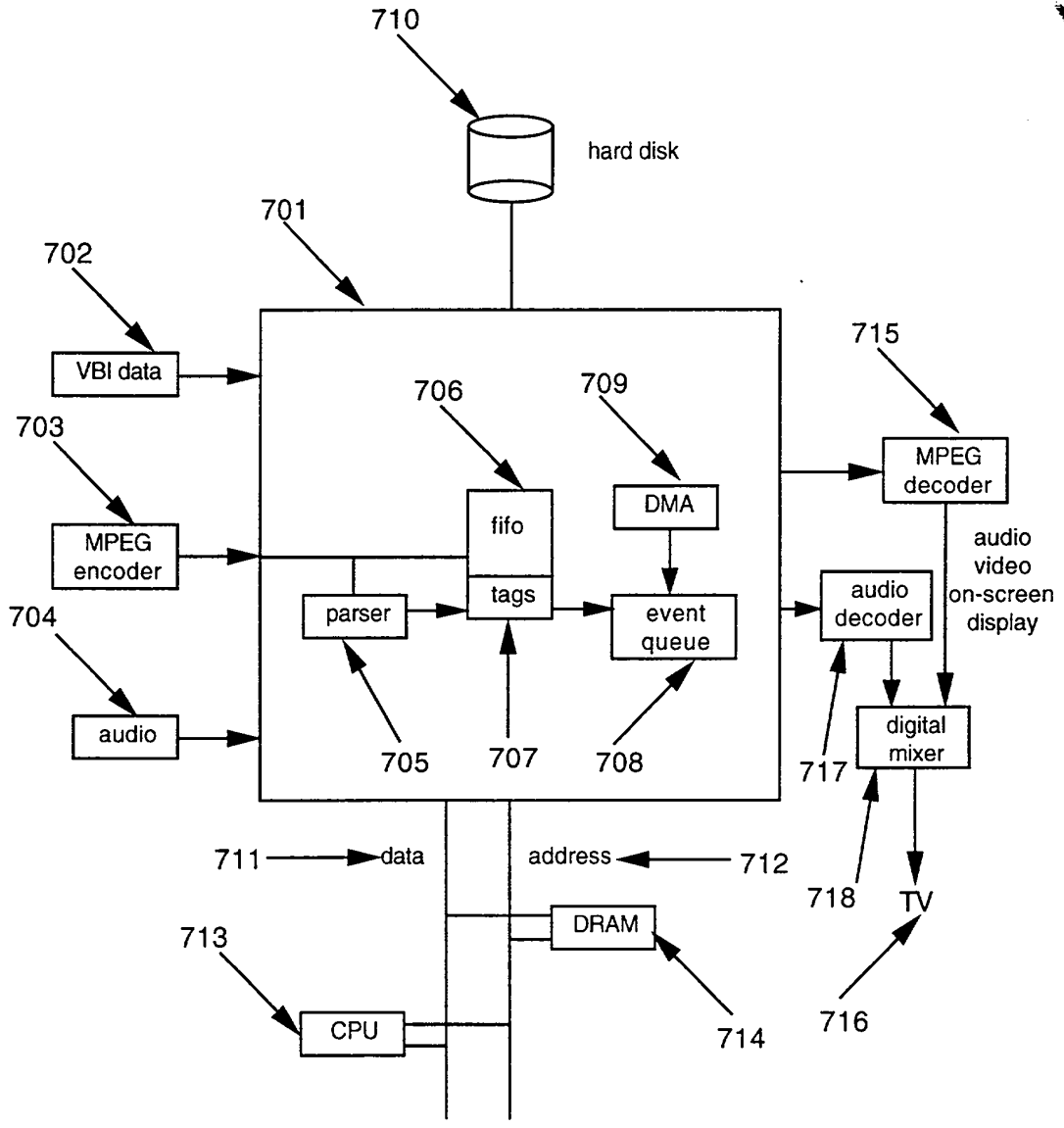


Fig. 7

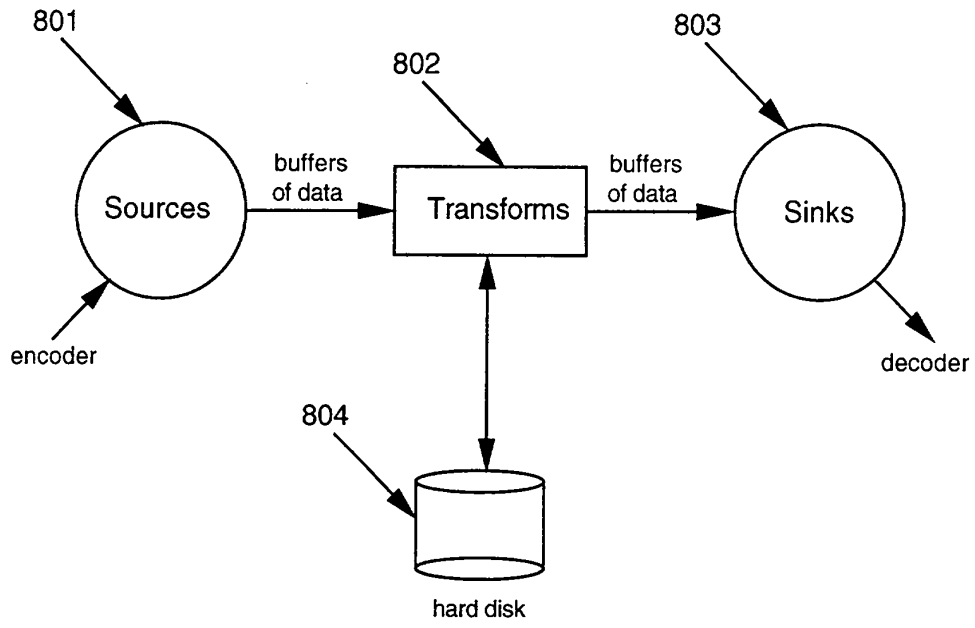


Fig. 8

0948074-0202750

800207409760

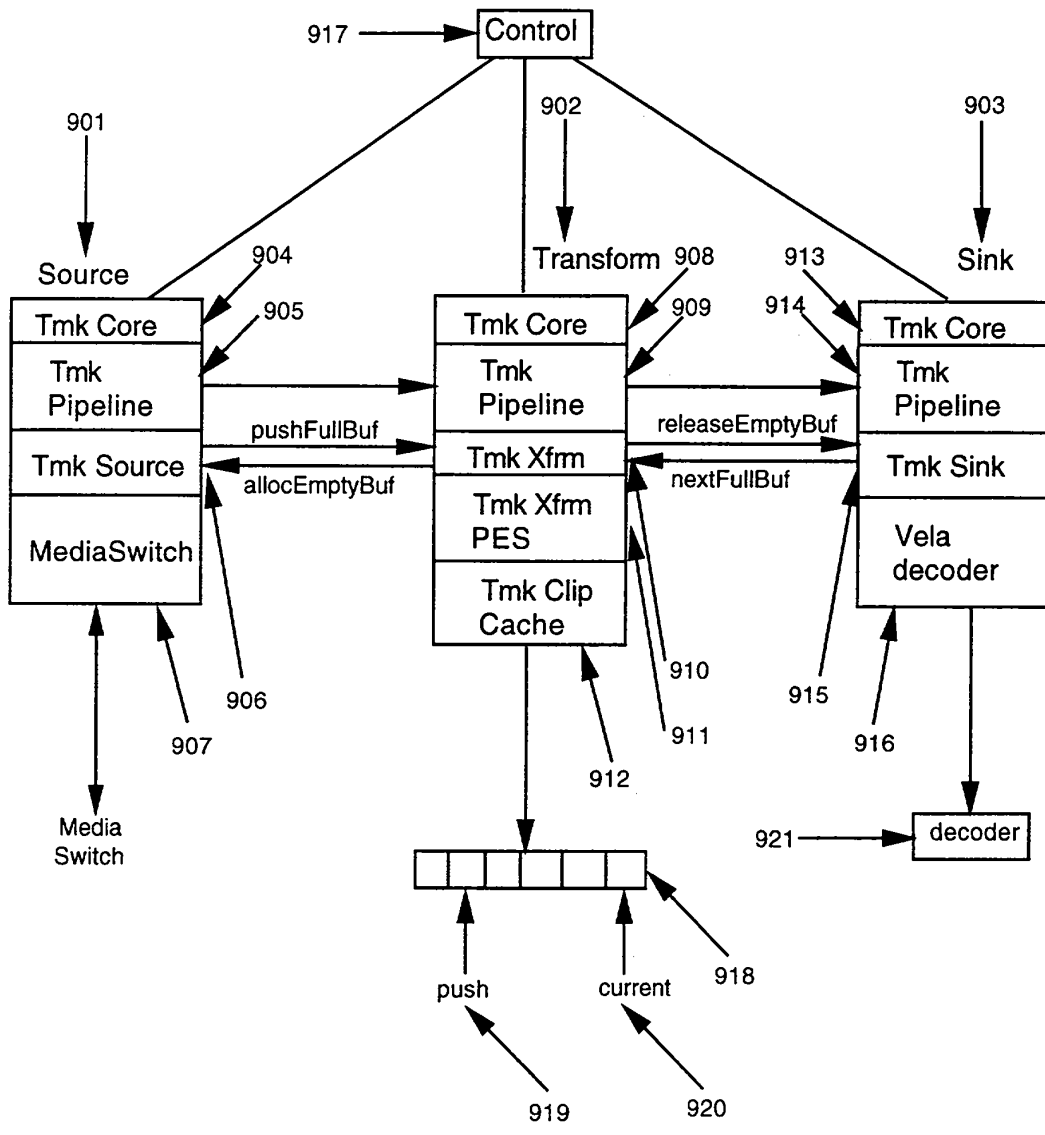


Fig. 9

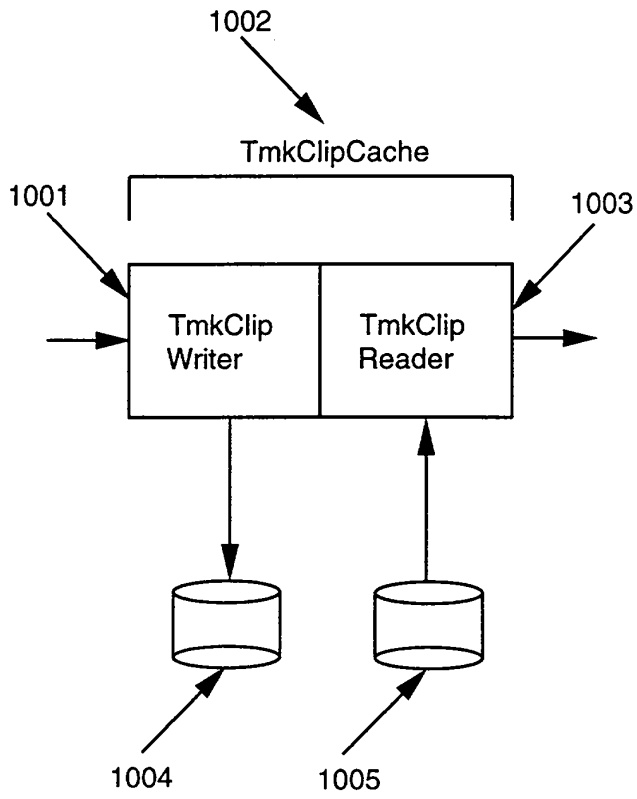


Fig. 10

2025 RELEASE UNDER E.O. 14176

09426074.022008

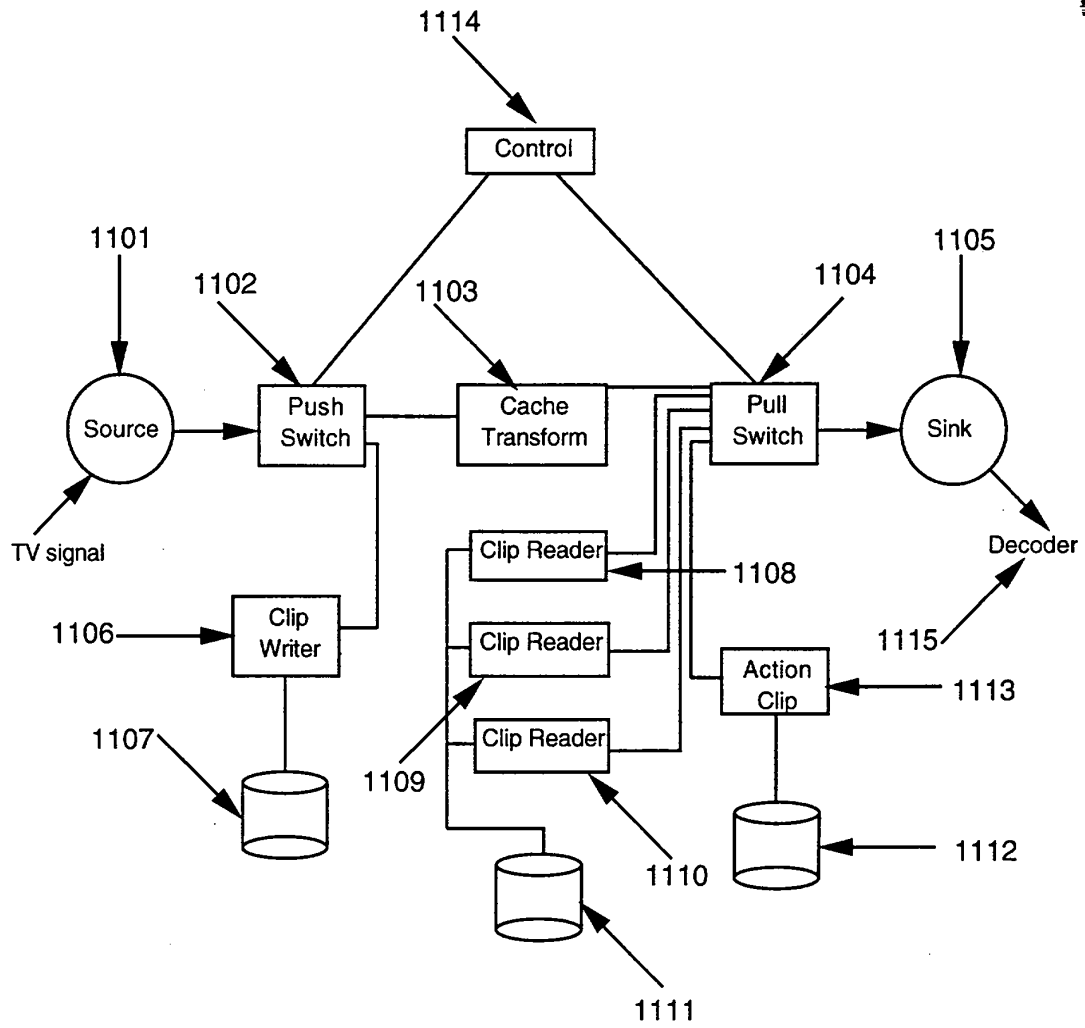


Fig. 11

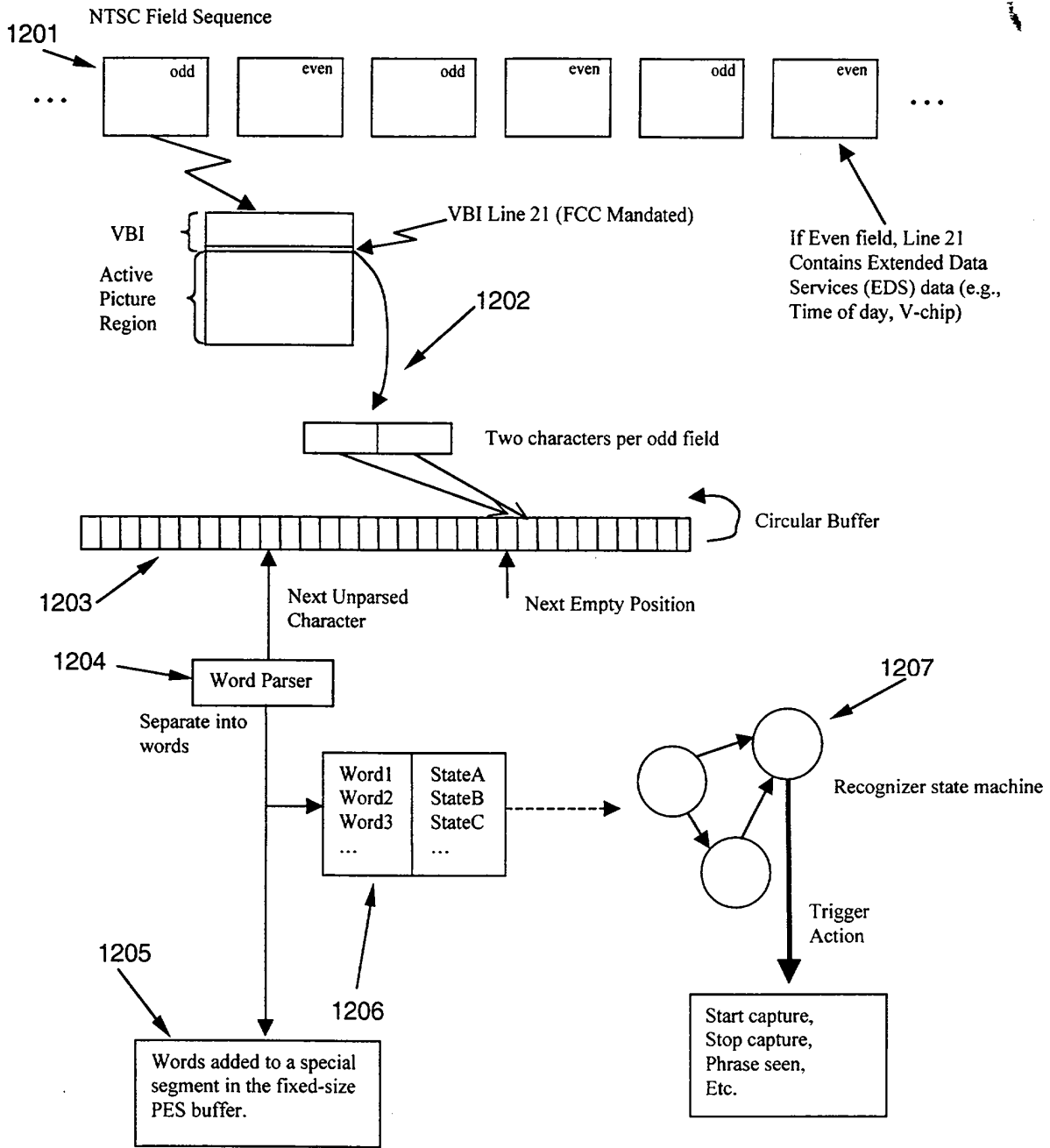


Fig. 12

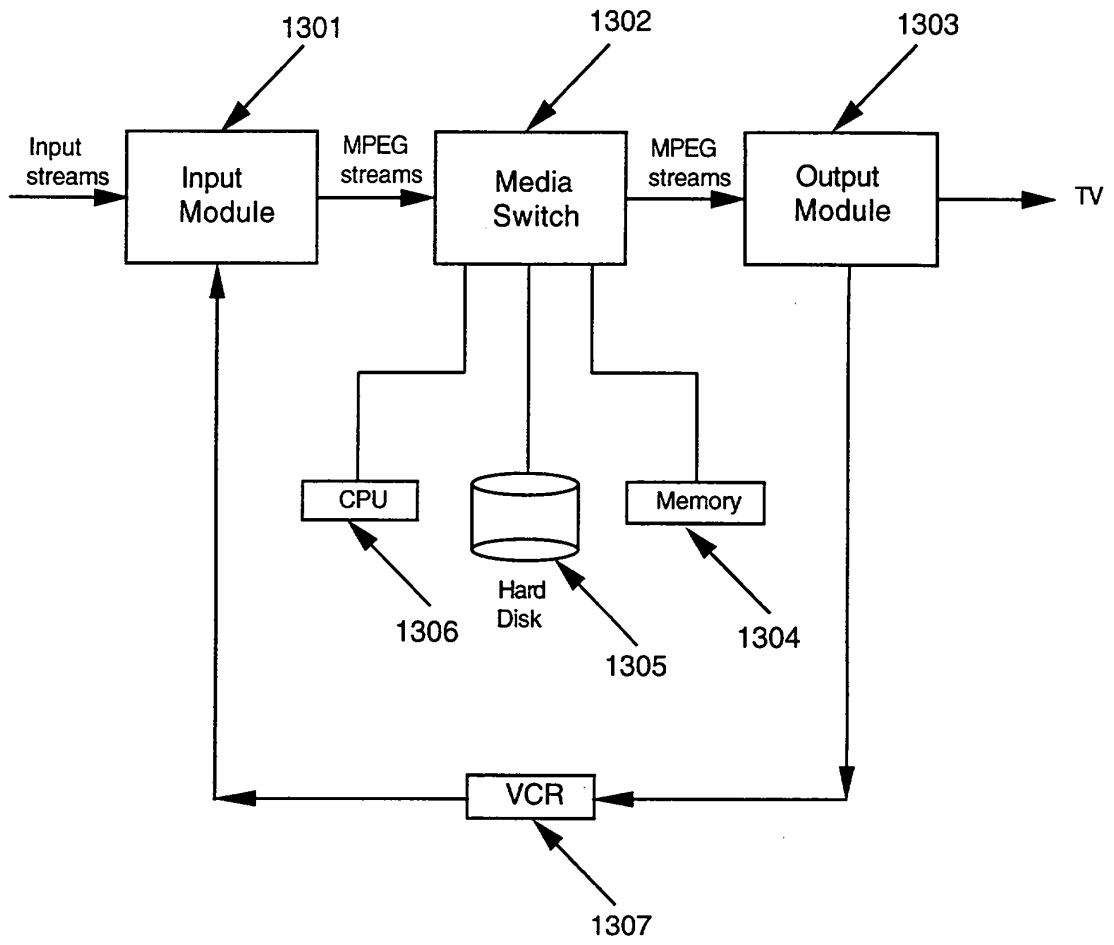



Fig. 13

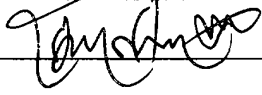


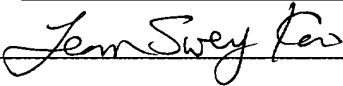




Attorney Docket No. TIVO0003

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

093304-0000

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\*

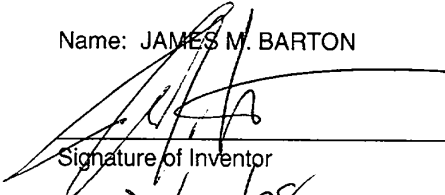
\* NOTE: Separate verified statements are required from each named person, concern, or organization having rights to the invention averring to their status as small entities (37 CFR 1.27).

09125074-07099

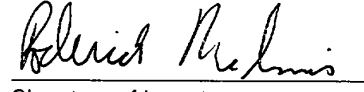
Attorney Docket No. TIVO0003

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.

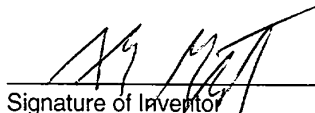
Name: JAMES M. BARTON

  
\_\_\_\_\_  
Signature of Inventor  
7/27/98  
\_\_\_\_\_  
Date

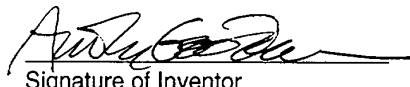
Name: RODERICK MCINNIS

  
\_\_\_\_\_  
Signature of Inventor  
7/21/98  
\_\_\_\_\_  
Date


Name: ALAN MOSKOWITZ

  
\_\_\_\_\_  
Signature of Inventor  
24 July 1998  
\_\_\_\_\_  
Date

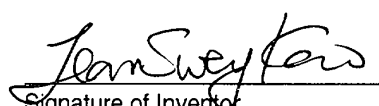
Name: ANDREW GOODMAN

  
\_\_\_\_\_  
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

888207402760

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)).

09436074-073098

Attorney Docket No. TIVO0003

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 7/27/18

20180727 10:09:50

POSITION	INITIALS	ID NO.	DATE
FEE DETERMINATION	T.D.		8/9/98
O.I.P.E. CLASSIFIER			
FORMALITY REVIEW		71435	8/17/98

**INDEX OF CLAIMS**

- ✓ ..... Rejected
- = ..... Allowed
- (Through numeral) Canceled
- ± ..... Restricted
- N ..... Non-elected
- I ..... Interference
- A ..... Appeal
- O ..... Objected

Claim	Final	Original	Date
1	1	1	
2	2	2	
3	3	3	
4	4	4	
5	5	5	
6	6	6	
7	7	7	
8	8	8	
9	9	9	
10	10	10	
11	11	11	
12	12	12	
13	13	13	
14	14	14	
15	15	15	
16	16	16	
17	17	17	
18	18	18	
19	19	19	
20	20	20	
21	21	21	
22	22	22	
23	23	23	
24	24	24	
25	25	25	
26	26	26	
27	27	27	
28	28	28	
29	29	29	
30	30	N	
31	31	N	
32	32	N	
33	33	33	
34	34	34	
35	35	35	
36	36	36	
37	37	37	
38	38	38	
39	39	39	
40	40	40	
41	41	41	
42	42	42	
43	43	43	
44	44	44	
45	45	45	
46	46	46	
47	47	47	
48	48	48	
49	49	49	
50	50	50	

Claim	Final	Original	Date
51	51	51	
52	52	52	
53	53	53	
54	54	54	
55	55	55	
56	56	56	
57	57	57	
58	58	58	
59	59	59	
60	60	60	
61	61	61	
62	62	62	
63	63	63	
64	64	64	
65	65	65	
66	66	66	
67	67	67	
68	68	68	
69	69	69	
70	70	70	
71	71	71	
72	72	72	
73	73	73	
74	74	74	
75	75	75	
76	76	76	
77	77	77	
78	78	78	
79	79	79	
80	80	80	
81	81	81	
82	82	82	
83	83	83	
84	84	84	
85	85	85	
86	86	86	
87	87	87	
88	88	88	
89	89	89	
90	90	90	
91	91	91	
92	92	92	
93	93	93	
94	94	94	
95	95	95	
96	96	96	
97	97	97	
98	98	98	
99	99	99	
100	100	100	

Claim	Final	Original	Date
110	110	110	
112	112	112	
113	113	113	
114	114	114	
115	115	115	
116	116	116	
117	117	117	
118	118	118	
119	119	119	
120	120	120	
121	121	121	
122	122	122	
123	123	123	
124	124	124	
125	125	125	
126	126	126	
127	127	127	
128	128	128	
129	129	129	
130	130	130	
131	131	131	
132	132	132	
133	133	133	
134	134	134	
135	135	135	
136	136	136	
137	137	137	
138	138	138	
139	139	139	
140	140	140	
141	141	141	
142	142	142	
143	143	143	
144	144	144	
145	145	145	
146	146	146	
147	147	147	
148	148	148	
149	149	149	
150	150	150	

BEST AVAILABLE COPY

If more than 150 claims or 10 actions  
staple additional sheet here

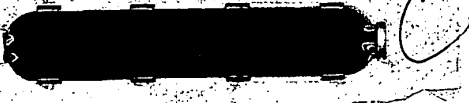
(LEFT INSIDE)



JCS42 U.S. PTO  
09/126071



386	Class	Subclass	ISSUE CLASSIFICATION
46			



PATENT NUMBER

6233389



6233389

### U.S. UTILITY PATENT APPLICATION

O.I.P.E.	PATENT DATE
SCANNED <i>CC</i> Q.A.	MAY 15 2009

SECTOR	CLASS 345 386	SUBCLASS 327 46	ART UNIT 2615	EXAMINER Tran <i>Tran</i>
FILED WITH: <input type="checkbox"/> DISK (CRF) <input type="checkbox"/> 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			
#04N	5/92		

Continued on Issue Slip Inside File Jacket

<input type="checkbox"/> <b>TERMINAL DISCLAIMER</b>	DRAWINGS			CLAIMS ALLOWED	
	Sheets Drwg. 13	Figs. Drwg. 13	Print Fig. 1	Total Claims 61	Print Claim for O.G. 1
<input type="checkbox"/> a) The term of this patent subsequent to _____ (date) has been disclaimed.	_____ (Assistant Examiner)			NOTICE OF ALLOWANCE MAILED 1-3-01	
<input type="checkbox"/> b) The term of this patent shall not extend beyond the expiration date of U.S Patent. No. _____	_____ (Primary Examiner)			ISSUE FEE Amount Due: \$620-W Date Paid: 3/14/01	
<input type="checkbox"/> c) The terminal _____ months of this patent have been disclaimed.	Darcy Rose 1-6-01 (Legal Instruments Examiner) (Date)			ISSUE BATCH NUMBER A23	

**WARNING:**  
The information disclosed herein may be restricted. Unauthorized disclosure may be prohibited by the United States Code Title 35, Sections 122, 181 and 368. Possession outside the U.S. Patent & Trademark Office is restricted to authorized employees and contractors only.

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

ISSUE FEE IN FILE  
(LABEL AREA)

(FACE)

BEST AVAILABLE COPY

SEARCHED			
Class	Sub.	Date	Exmr.
386	1, 33, 45,	11/15/2000	TTQ
↓	46, 111-112,		
	125-126, 68		
369	60		
366	7, 33,		
348	7, 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.

BEST AVAILABLE COPY

Express Mail mailing label no. EL090779

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

A

07/30/98  
0878  
010

Date: July 29, 1998

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

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

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

09126071

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
<b>Total Fees</b>					<b>\$ 927.00</b>

A check in the amount of \$927 is enclosed to cover the filing fee and assignment recording fee.

The Commissioner 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*  
Michael A. Glenn  
Reg. No. 30,176

# MULTIMEDIA TIME WARPING SYSTEM

## BACKGROUND OF THE INVENTION

5

### TECHNICAL FIELD

10

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

15

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.

20

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.

25

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

1

2

050620" T 2092150

recorder begins recording, while the first recorder is halted, rewind 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 rewind 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.

350E20" T2092160

SUMMARY OF THE INVENTION

5 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.

10 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.

15  
20 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.

25 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.

03092760



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.

5

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.

10

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.

15

**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;

20

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;

25

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;

0932601-070998

Attorney Docket No. TIVO0003

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

5

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;

10

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;

15

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;

20

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

25

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.



000001-073000





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 overlaid 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

0912601209160

7  


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

5 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  
10 the decoders may be properly synchronized for accurate playback of the signal.

15 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  
20 appropriate time stamp.

25 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.

0942201-073098  
BUREAU OF THE CLERK

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.

09122010 10:00:00

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,  
5 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  
10 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  
15 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.  
20 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.

25 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

015020120304050607080910111213141516171819202122232425

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.

12

0912601-07092160







5 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. 10 It would be difficult for any computer system to keep up with such rapidly varying data rates without this structure. 15

20 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". 25

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

050E20" F2092T50

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

5 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  
10 a later time, sent down the pipeline, and properly sequenced within the stream.

15 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.

20 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  
25 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,

09122160  
15064047092160

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.

5

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.

10

15

20

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.

25

17

09120107308

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.

5 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.

10

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.

15

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.

20

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

25

09/20/2004 10:20:00 AM





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.

5 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  
10 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  
15 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  
20 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.  
25 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

094600103099







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,  
5 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.

10 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  
15 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.

20 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.

25 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

LB

094240742092750

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,  
5 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  
10 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  
15 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  
20 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  
25 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

24

0948010999

Attorney Docket No. TIVO0003

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.

850E20" F2092E60

25

**CLAIMS**

*Sub A*

860E20" TCO92F60

5  
10  
15  
20  
25

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.

*27*





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.

5

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.

10

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.

15

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

20

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  
asynchronously and autonomously with a CPU.

25

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

*Sub A*

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

5 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  
10 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.

0948501-0730960  
860620-1-092660

15 *Sub A* 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.

20 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.

25 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 A*

5

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:

10

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;

15

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;

20

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;

25

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;

*32*

09/20/2009 10:00 AM

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.

5

*Sub A5*  
10  
15  
20  
25  
PAGE 20 OF 209260

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*



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.

00929260

35

45. The apparatus of claim 32, further comprising:  
a module for combining system audio cues and on-screen displays with  
said TV output signals.

5 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.

10 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  
15 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.

20 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.

25 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.

00929260

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

*Sub A6*  
5

~~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.

10 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.

86049-109260

15

*Sub A7*

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

20

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

25

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.

35  
*37*



Attorney Docket No. TIVO0003

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;

5 and

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

0932607-03099

37

39



## MULTIMEDIA TIME WARPING SYSTEM

### ABSTRACT

5 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  
10 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  
15 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  
20 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  
25 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.

850E40" F2092T60

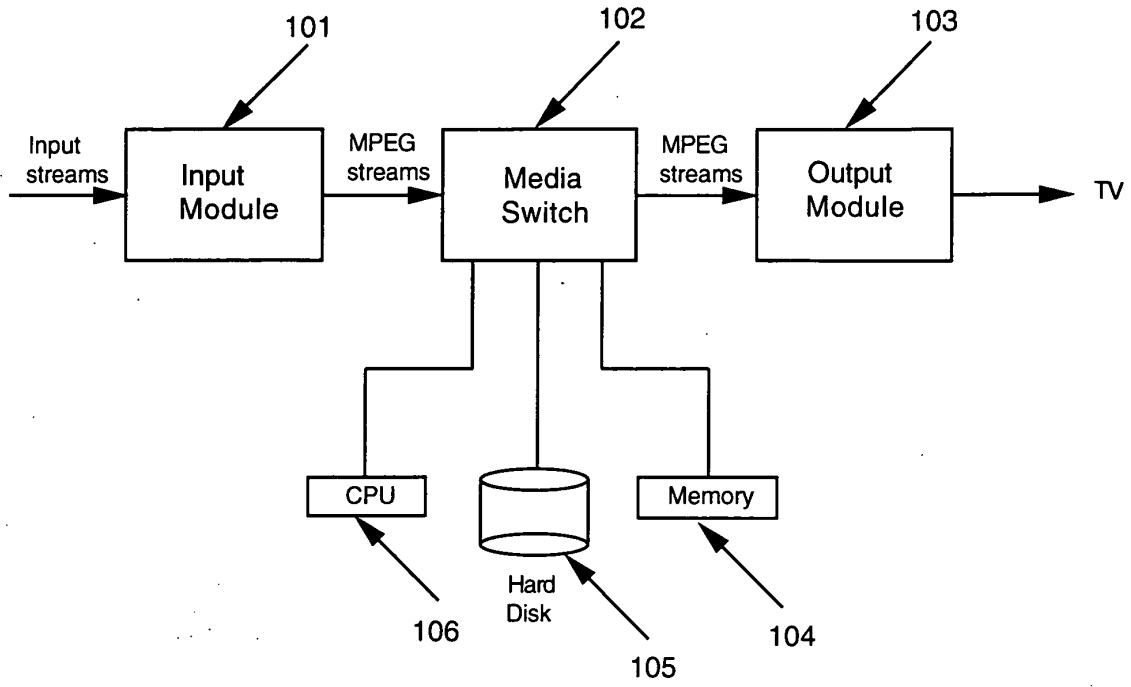


Fig. 1

950E20" T2092T50

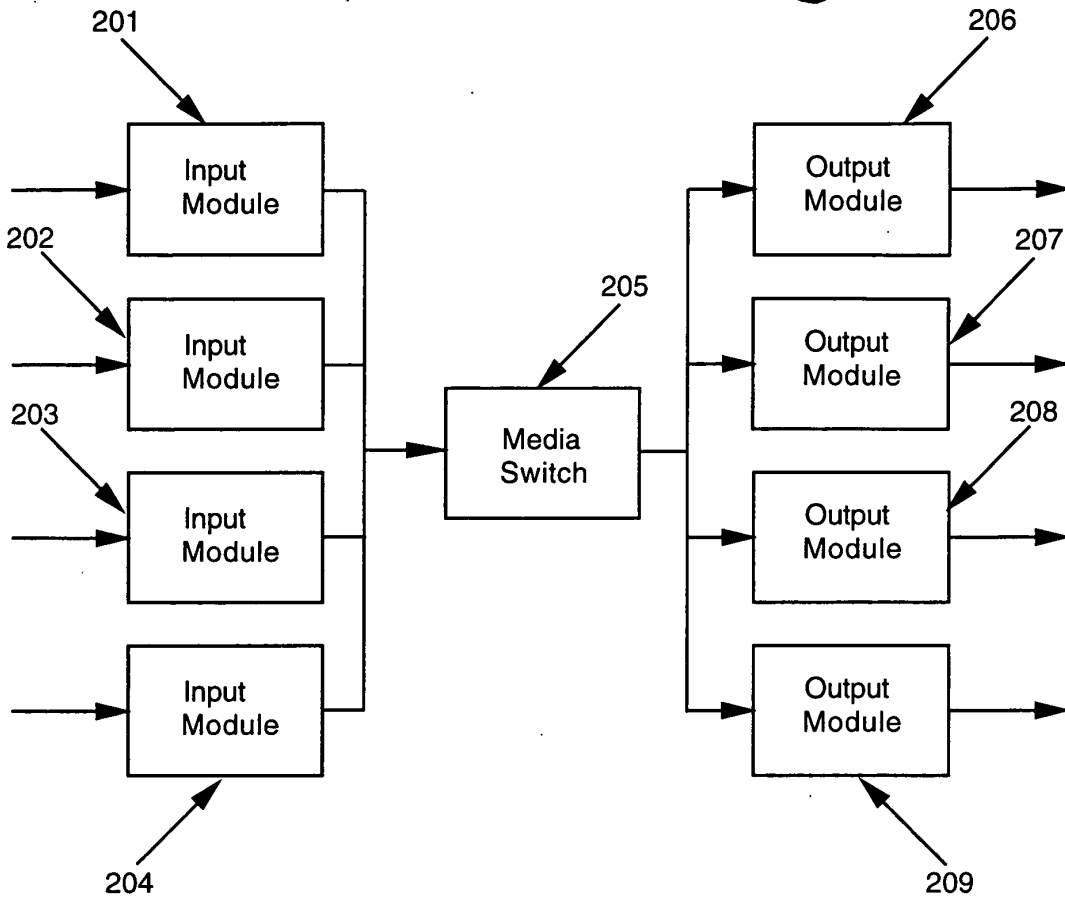


Fig. 2

SECRET

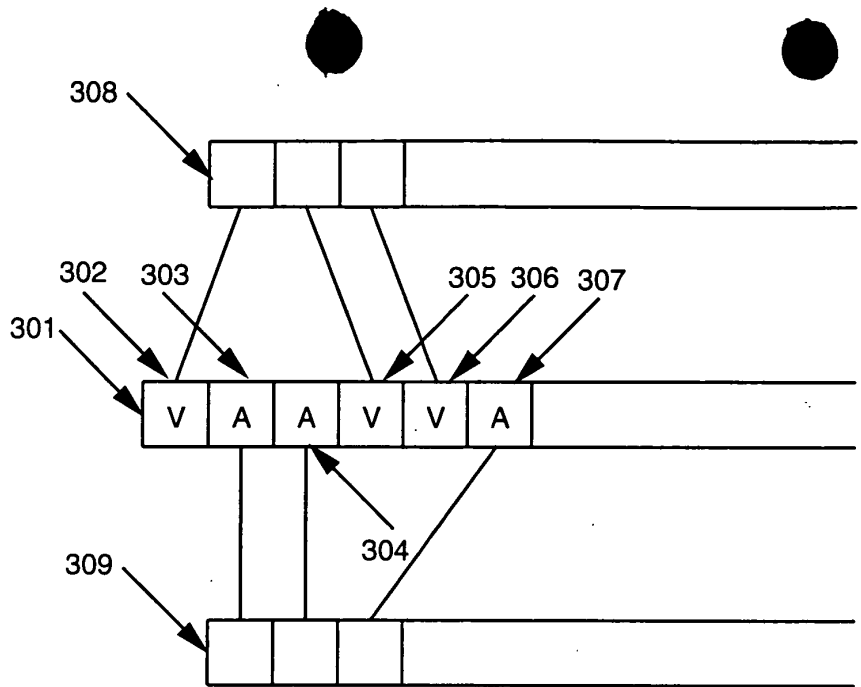


Fig. 3

850E40" F409E450

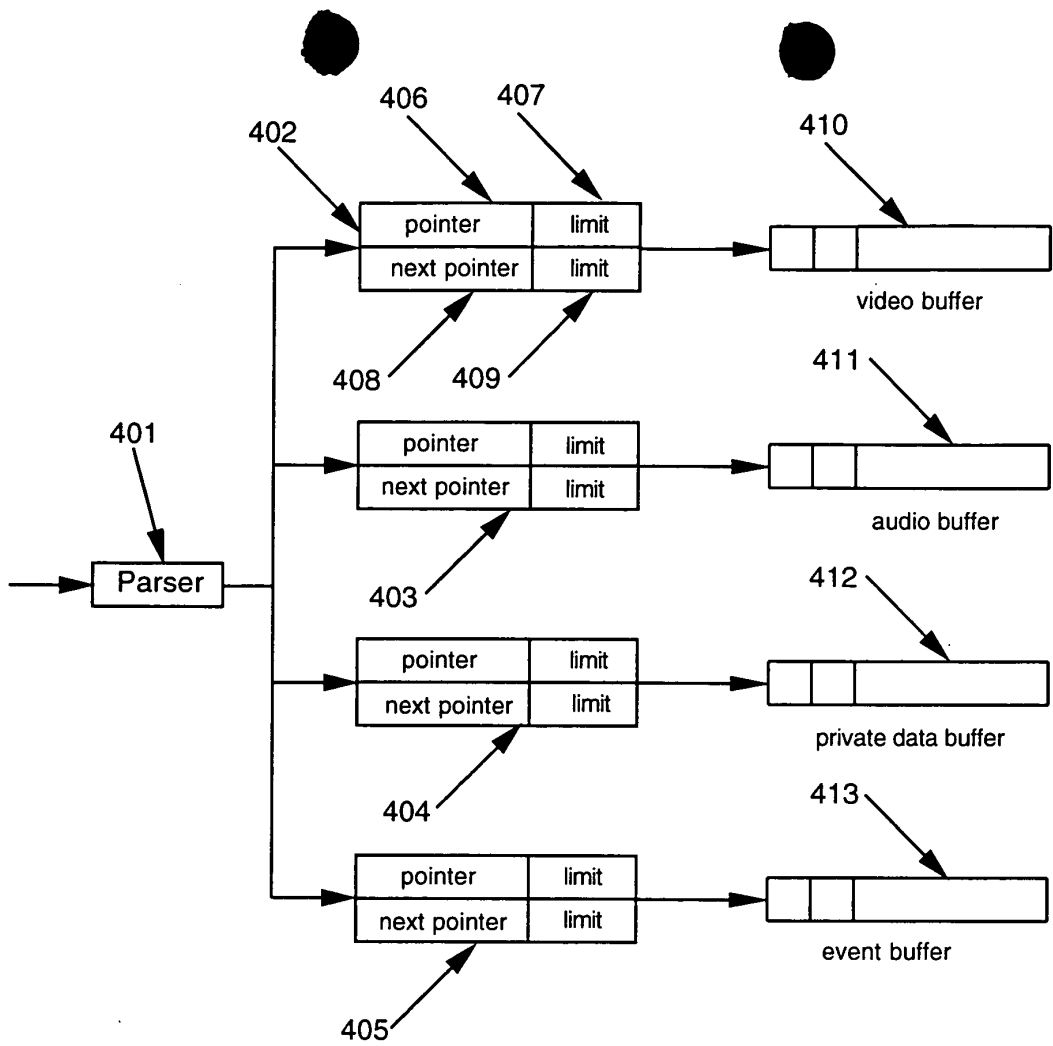


Fig. 4

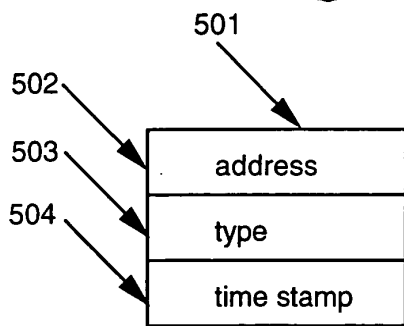
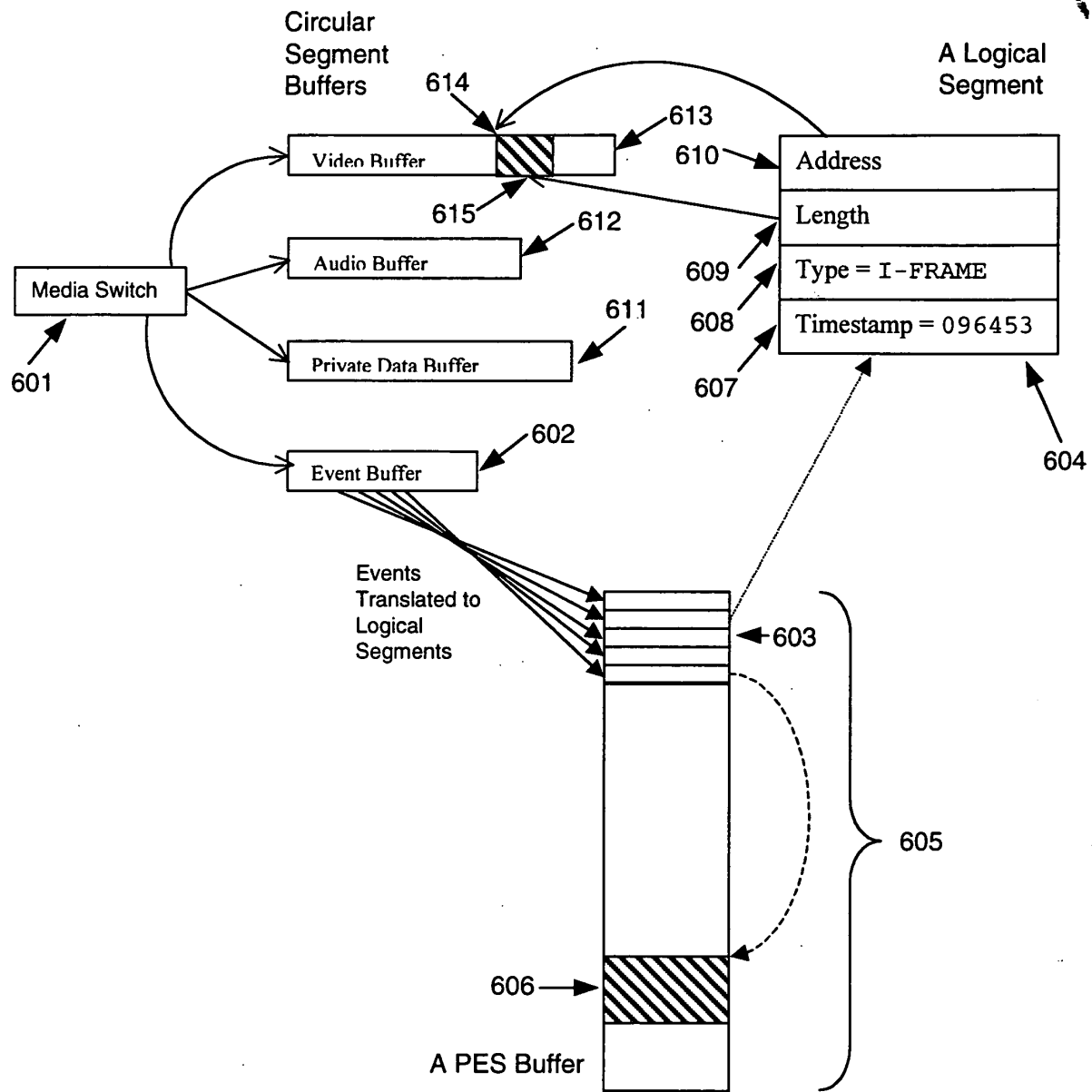


Fig. 5

860520" T2092T50

860E20" T 2032T60



**Fig. 6**

95040743260

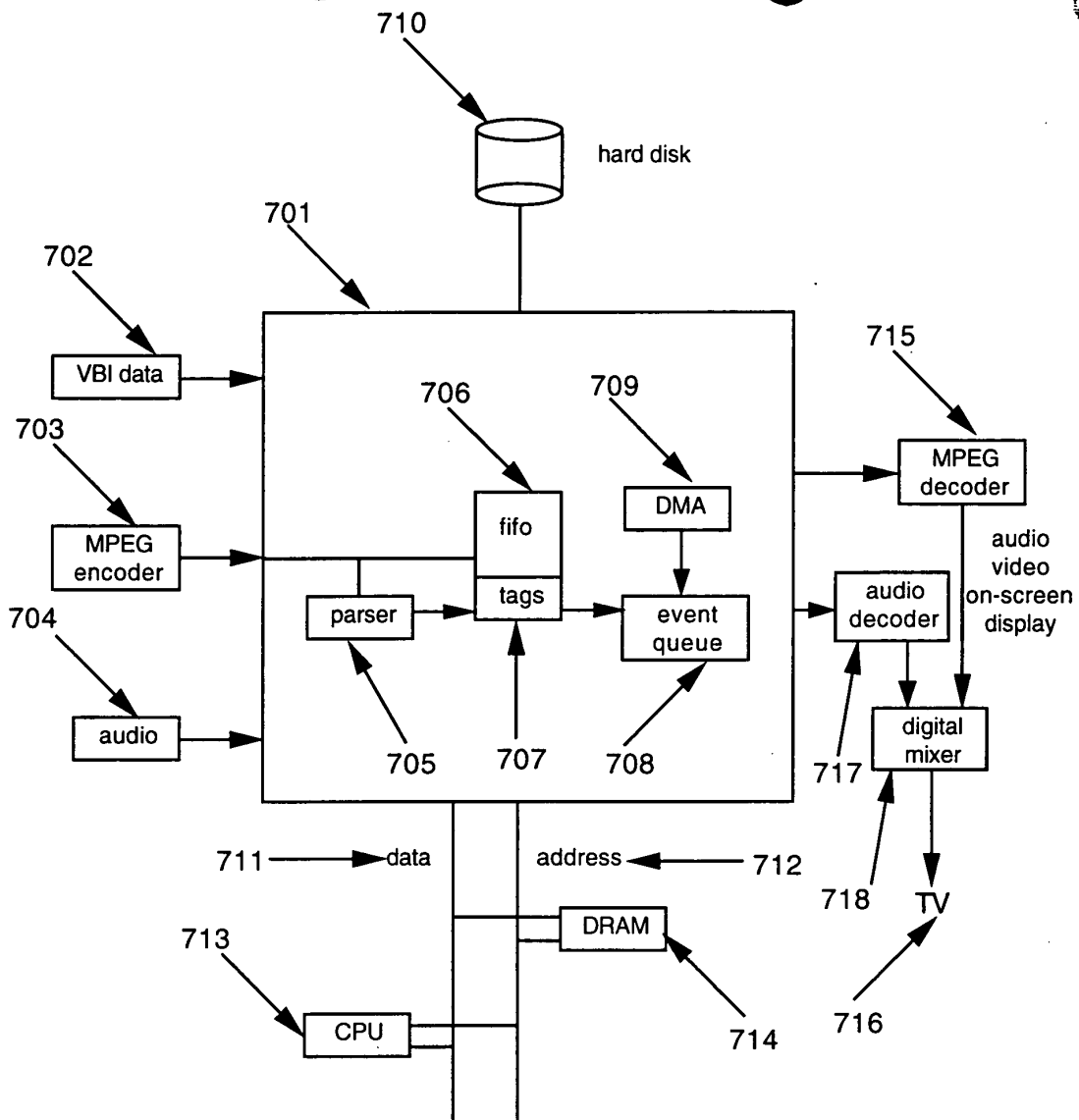


Fig. 7



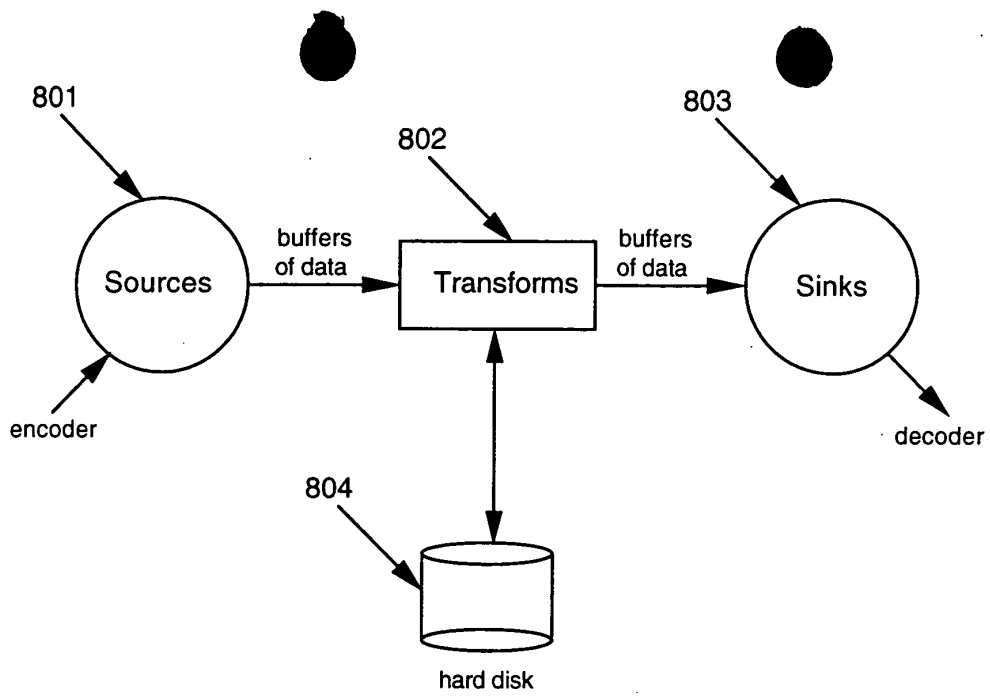


Fig. 8

09126071-073098

20020420

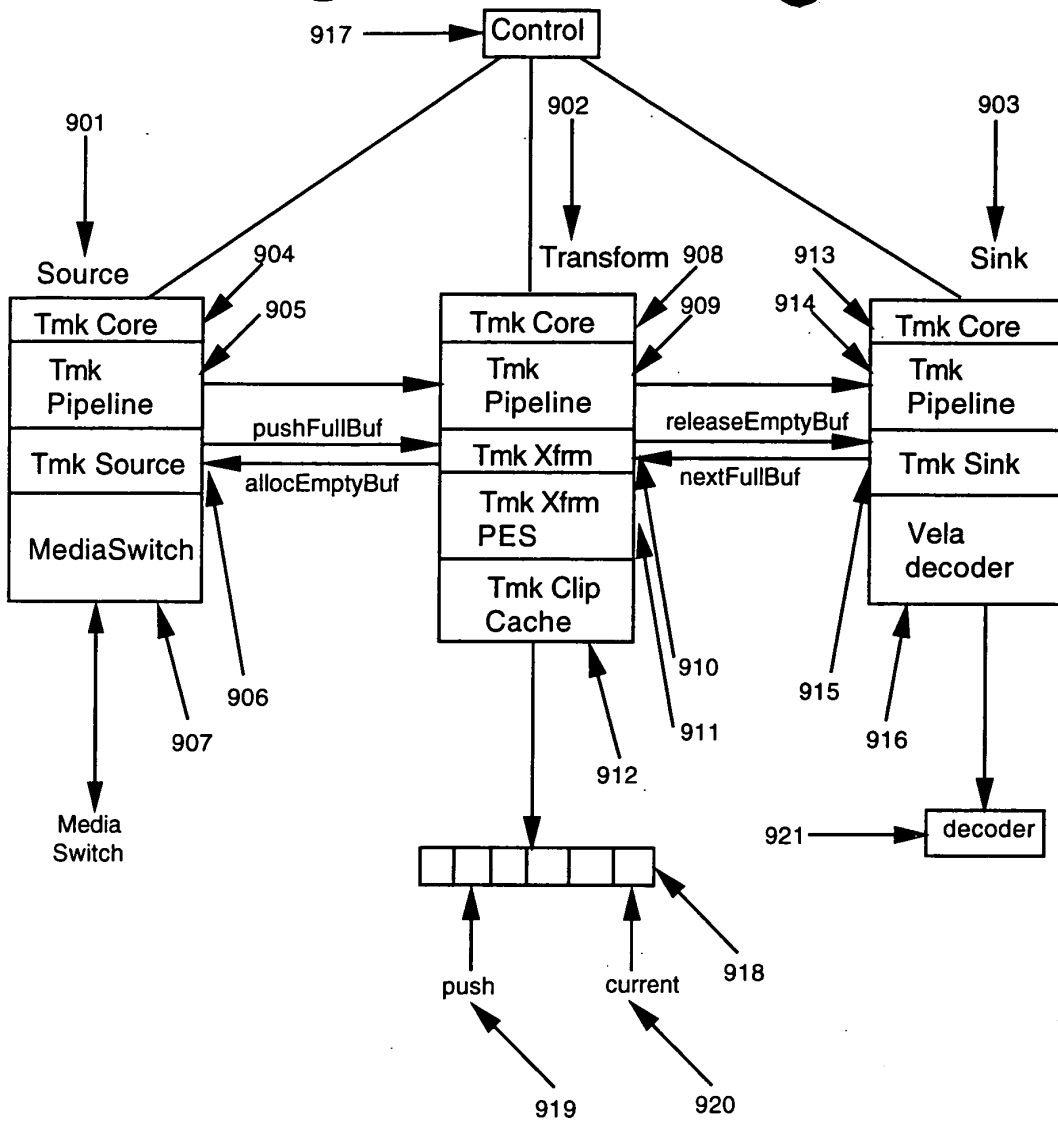


Fig. 9

2009-07-20 10:30:00

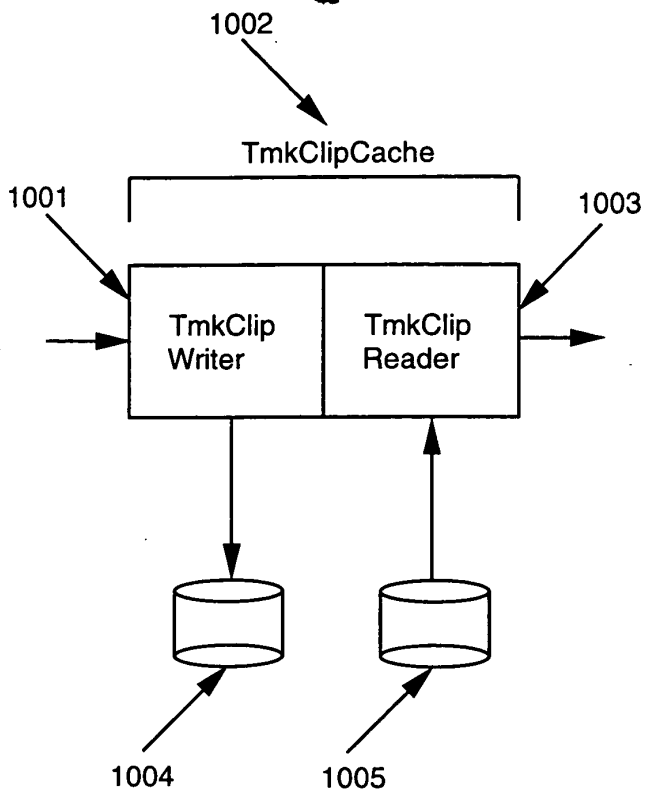


Fig. 10

850E20" F2032T50

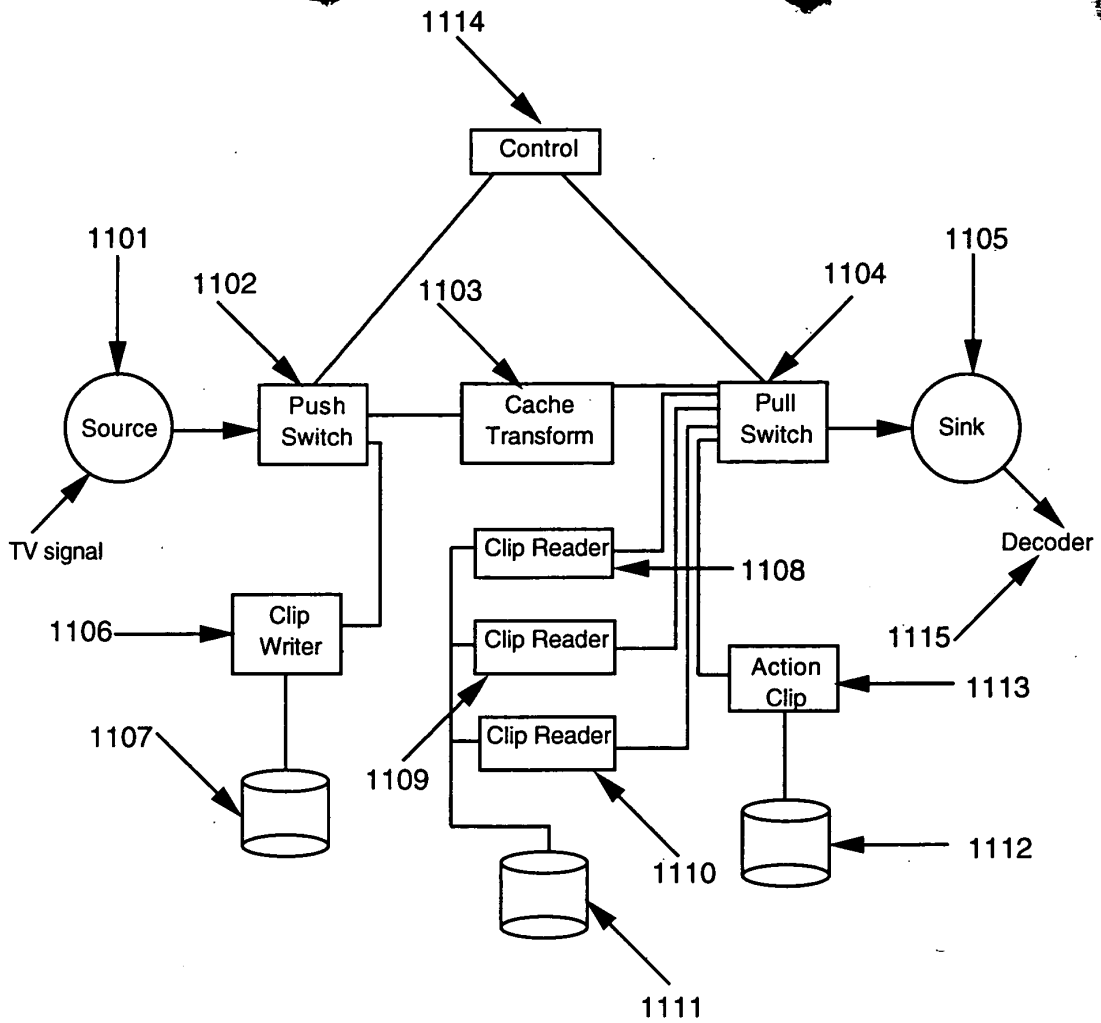


Fig. 11

850E20-7032F50

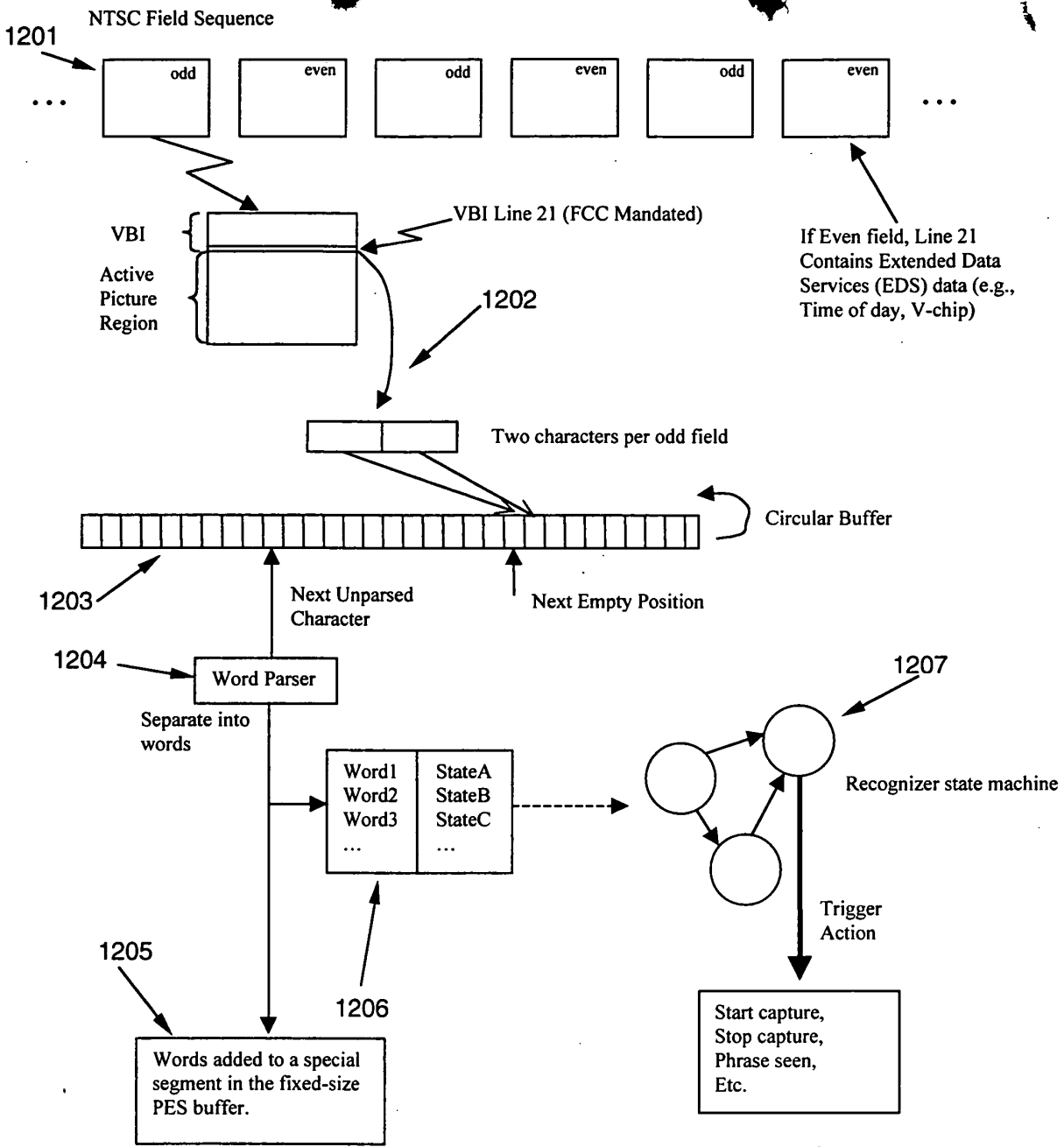


Fig. 12

09125074.073098

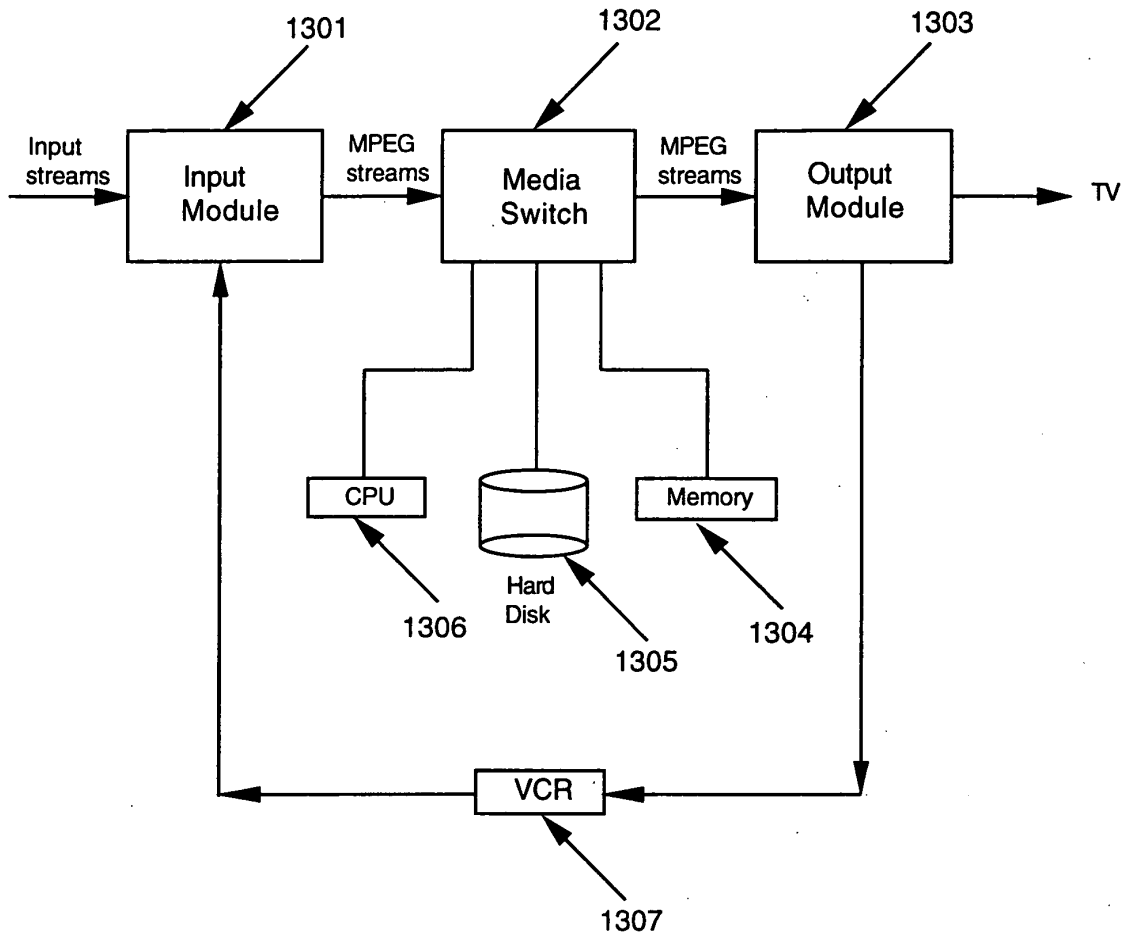


Fig. 13

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)  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 States 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

09122007 1 0 23098

Full name of fourth inventor: ANDREW MARTIN GOODMAN  
Inventor's signature *Andrew Goodman* 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 *Ching Tong Chow* 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 *Jean Swey Kao* 7/24/98  
Date  
Residence 21876 Meadow View Lane, Cupertino, California 95014  
Post Office Address Same  
Citizenship United States of America

860E20" T2092T60



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).

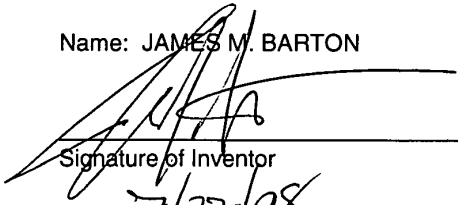
- ( ) no such person, concern, or organization
- ( ) persons, concerns, or organizations listed below\*

\* 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).

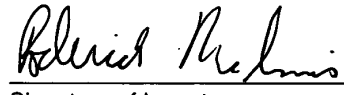
09122071 072098

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.

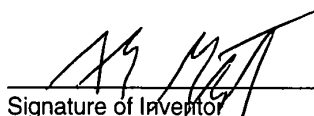
Name: JAMES M. BARTON

  
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

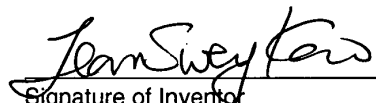
Name: ANDREW GOODMAN

  
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

09126074-073098

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)).

850420" F2092T60

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 [Signature] DATE 7/27/18

860520" T 2092T 60

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 [Signature] Date 2/27/98

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 [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 [Signature] Date 24 July 1998

Residence 300 Third Street, San Francisco, California 94107

Post Office Address Same

Citizenship United States of America

09126071-0398

SERIAL NUMBER 09/126,071	FILING DATE 07/30/98	CLASS 348	GROUP ART UNIT 2711	ATTORNEY DOCKET NO. 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	<input type="checkbox"/> yes <input checked="" type="checkbox"/> no <input type="checkbox"/> yes <input checked="" type="checkbox"/> no	<input type="checkbox"/> Met after Allowance	STATE OR COUNTRY CA	SHEET'S DRAWING 13	TOTAL CLAIMS 65	INDEPENDENT CLAIMS 4
Verified and Acknowledged	TTQ Examiner's Initials Initials					

ADDRESS

MICHAEL A GLENN  
P O BOX 7831  
MENLO PARK CA 94026

TITLE

MULTIMEDIA TIME WARPING SYSTEM

FILING FEE RECEIVED  \$1,066	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT NO. _____ for the following:	<input type="checkbox"/> All Fees <input type="checkbox"/> 1.16 Fees (Filing) <input type="checkbox"/> 1.17 Fees (Processing Ext. of time) <input type="checkbox"/> 1.18 Fees (Issue) <input type="checkbox"/> Other _____ <input type="checkbox"/> Credit
---------------------------------------	---	---

PATENT APPLICATION SERIAL NO. 09-126071

U.S. DEPARTMENT OF COMMERCE  
PATENT AND TRADEMARK OFFICE  
FEE RECORD SHEET

08/05/1998 TDAE1 00000003 071445 09126071

01 FC:201		395.00	DP
02 FC:203		495.00	DP
03 FC:202	4.00		CH
04 FC:204	135.00		CH

# PATENT APPLICATION FEE DETERMINATION RECORD

Effective October 1, 1997

Application or Docket Number

09/126071

## CLAIMS AS FILED - PART I

(Column 1)

(Column 2)

FOR	NUMBER FILED	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

OR

### OTHER THAN SMALL ENTITY

RATE	FEE
	395.00
x\$11=	495
x41=	41
+135=	135
TOTAL	1066

OR

OR

OR

OR

OR

RATE	FEE
	790.00
x\$22=	
x82=	
+270=	
TOTAL	

## CLAIMS AS AMENDED - PART II

(Column 1)

(Column 2)

(Column 3)

AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	EQUALS	
	Total	*	Minus	**	=	
	Independent	*	Minus	***	=	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					

### SMALL ENTITY

OR

### OTHER THAN SMALL ENTITY

RATE	ADDITIONAL FEE
x\$11=	
x41=	
+135=	
TOTAL ADDIT. FEE	

OR

OR

OR

OR

OR

RATE	ADDITIONAL FEE
x\$22=	
x82=	
+270=	
TOTAL ADDIT. FEE	

(Column 1)

(Column 2)

(Column 3)

AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	EQUALS	
	Total	*	Minus	**	=	
	Independent	*	Minus	***	=	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					

### SMALL ENTITY

OR

### OTHER THAN SMALL ENTITY

RATE	ADDITIONAL FEE
x\$11=	
x41=	
+135=	
TOTAL ADDIT. FEE	

OR

OR

OR

OR

OR

RATE	ADDITIONAL FEE
x\$22=	
x82=	
+270=	
TOTAL ADDIT. FEE	

(Column 1)

(Column 2)

(Column 3)

AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	EQUALS	
	Total	*	Minus	**	=	
	Independent	*	Minus	***	=	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					

### SMALL ENTITY

OR

### OTHER THAN SMALL ENTITY

RATE	ADDITIONAL FEE
x\$11=	
x41=	
+135=	
TOTAL ADDIT. FEE	

OR

OR

OR

OR

OR

RATE	ADDITIONAL FEE
x\$22=	
x82=	
+270=	
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.



**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						
2						
3						
4						
5						
6						
7						
8						
9						
10		2				
11		2				
12						
13						
14						
15						
16						
17						
18						
19			2			
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42		2				
43						
44						
45						
46						
47						
48						
49						
50						
TOTAL IND.	4					
TOTAL DEP.	61					
TOTAL CLAIMS	65					

	*		*		*	
	IND.	DEP.	IND.	DEP.	IND.	DEP.
51						
52						
53						
54						
55						
56						
57						
58						
59						
60						
61						
62						
63						
64						
65						
66						
67						
68						
69						
70						
71						
72						
73						
74						
75						
76						
77						
78						
79						
80						
81						
82						
83						
84						
85						
86						
87						
88						
89						
90						
91						
92						
93						
94						
95						
96						
97						
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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#2105  
10/10/98  
tokey

JCS42 U.S. PTO  
09/126071  
07/30/98

**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

P.O. Box 7831  
Menlo Park, CA 94026  
(650) 851-7138